

APRIL 1993

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STUDIO SOUND

AND BROADCAST ENGINEERING

THE INTERNATIONAL
PRO AUDIO MAGAZINE

MICROPHONES

Sennheiser, Microtech Gefell, Groove Tubes
Mic Pre amplification, Condenser Design



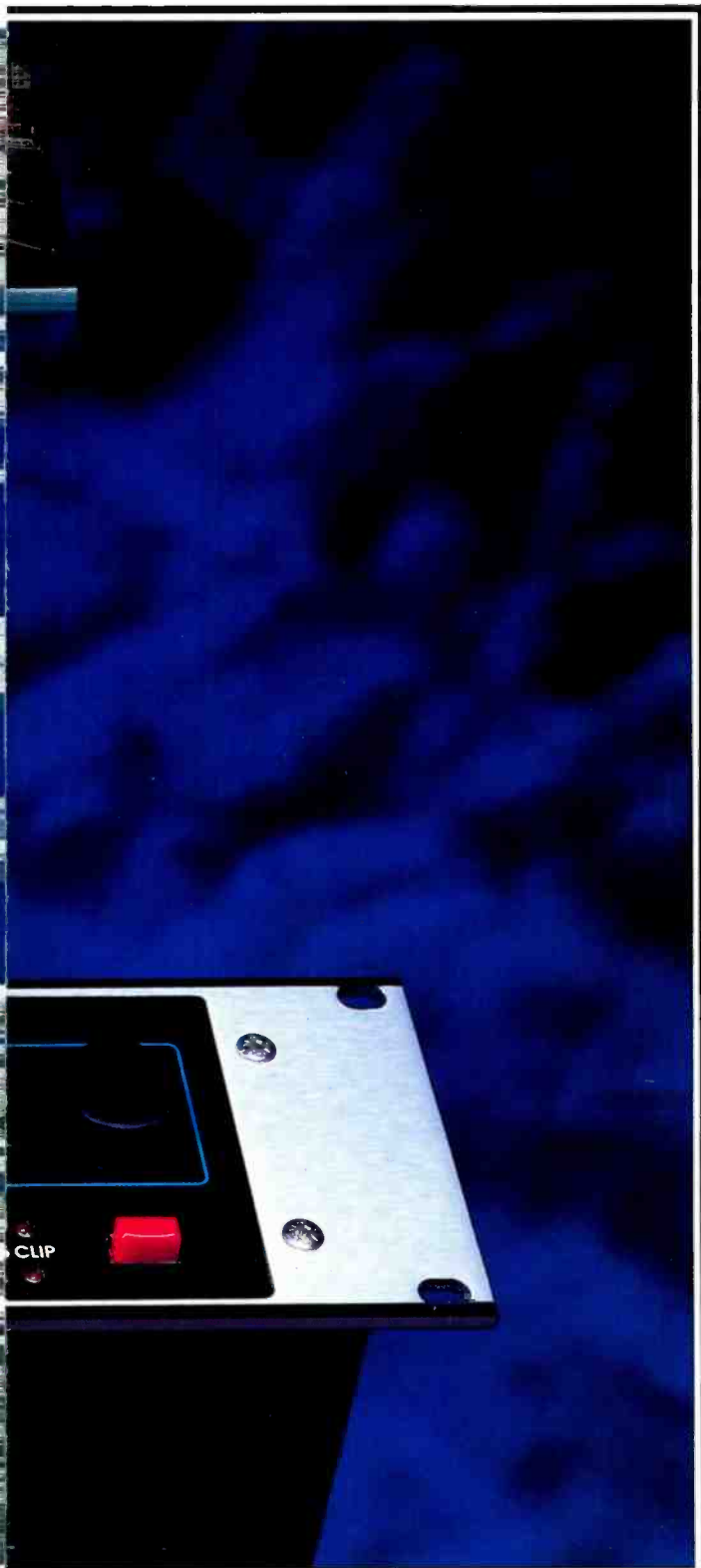
Digital Multitrack

Alesis ADAT and BRC, Tascam DA-88,
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dCS 800B

The Classical A-D Convertor





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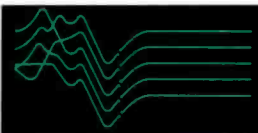
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DN3600

PROGRAMMABLE
GRAPHIC EQUALISER

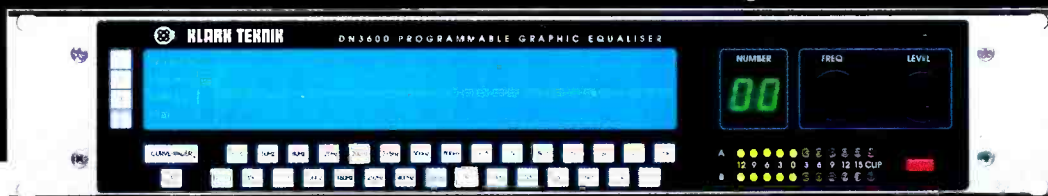


KLARK TEKNIK

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SSL G+ console at the Berlin AES Convention. More AES product news on page 11

Editorial:	Standardisation—kiss or curse?	5
News:	Pro audio news and events including 21-bit recording from Deutsche Grammophon, Lexicon's buy out and a new Portuguese studio development	8
AES Products:	This month's hot new products from the recent Berlin AES show	11
Music News:	MIDI finds Zenon Schoepe with hard and software on his hands	15
Red Rooster Studio:	Zenon Schoepe visits a Bavarian recording studio experiencing runaway success	16
Groove Tubes MD-1:	The glowing 12AT7 double triode valve works its magic on Dave Foister	19
Microtech Gefell UM70:	A condenser mic from the Eastern arm of Neumann finds favour with Dave Foister	20
Sennheiser MKH-80:	Keith Spencer-Allen gives an exclusive view of Sennheiser's new multipattern mic	22
The Case for Condensers:	The state of condenser mic design from B&K designer Ole Sorenson	27
Sony PCM 3324S:	Carrying new features and a lower price tag, Sony's DASH recorder attracts Patrick Stapley	33
Mic Pre amplification:	Manuel Huber argues the case for new practices in mic pre amplification	37
DDA Profile:	Patrick Stapley tries tracking on a budget with DDA's <i>Profile</i> console and <i>Pro-File</i> automation	43
Pieces of Eight:	Alesis and Tascam 8-track digital machines in the field with Dave Foister and Zenon Schoepe	51
Business:	Barry Fox on salvaging recordings from sticky tape and the developing world of <i>Photo CD</i>	61
Perspective:	Martin Polon examines a tax regime currently damaging American recording studios	63
dCS 800B:	Sam Wise evaluates the A-D converter favoured in classical circles	65
Craft:	Thoughts on evaluating a listening environment from Keith Spencer-Allen	74

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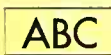
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Standard Fare

The trouble with defining a standard for any application is that the same parameters also define the limitations of that application. The 640K of RAM dictated by IBM's PC computer standard, for example, has since turned out to be a major obstacle in the advancement of its own applications; in the audio world, CD's 16 bits are presenting an interesting challenge to developers seeking to employ high-bit recording techniques.

Properly implemented standards do, however, have much to offer the vast majority of users. In the good old days before MIDI, synthesisers were largely regarded as instruments with 'independent' identities much like the instruments comprising an orchestra—to those prepared to concede them the status of musical instruments, that is. As systems encompassing sequencers and drum machines evolved, anyone wishing to employ them largely found themselves tied to one manufacturer's proprietary communications facilities. For obvious reasons, MIDI was not an instantly popular proposition with all the manufacturers concerned but once use of the interface had gathered momentum, non-inclusion of the tell-tale DIN socket spelled commercial disaster. More significantly, the implementation of MIDI signalled the start of a new era in music.

A similar turning point may be just around the corner for live sound installations. The imminent incorporation of American company Lone Wolf's optically-based *MediaLink* LAN into equipment from QSC, Rane, Carver, TOA, Fender and JBL means that remote status monitoring and control of installations incorporating over 9500 units will soon become possible. As in the case of MIDI, once new ways of working have been established, users may be reluctant to return to less sophisticated systems.

Sadly, such an idyllic future seems a distant prospect for those of us interested in exchanging digital audio information. While various format specifications exist, there is wilful confusion between professional and consumer formats and also frequent differences in interpretation by different manufacturers. The situation is not greatly different from pre-MIDI days, or from a problem which recently confronted a new facet of MIDI: General MIDI. GM—as it was instantly tagged—is intended to ensure a high degree of compatibility between sound modules and commercially available MIDI Files. When different manufacturers adorned ineligible equipment with a GM logo intended to announce its adherence to the standard, the situation was resolved by removing the logo from the public domain by making it a trademark.

No such policy is applicable to the AES-EBU digital audio standard however, as the AES prefer to treat pro audio fraternity as adults and expect them to respect a recommended format.

At the 93rd (San Francisco) AES Convention last year, a preliminary meeting was held between users of digital audio formats—the Digital Manufacturers' Exchange. The primary aim was to establish a database containing details of format implementation to be available to participating parties. Should it get off the ground, such a body could hope to greatly ease the (often considerable) problems experienced by many users. The meeting was chaired by Mel Lambert and elicited an encouraging level of enthusiasm at the time—a level that has not been sustained in a subsequent trawl for support and information. It seems that we would all prefer to live with the frustration, inefficiency and expense of the limited compatibility we presently enjoy. Are we sure we are acting shrewdly? ■

Tim Goodyer

Cover: Sennheiser's MKH-80 and U67

Photography: The Pinsharp Company

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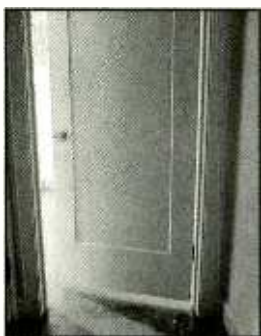
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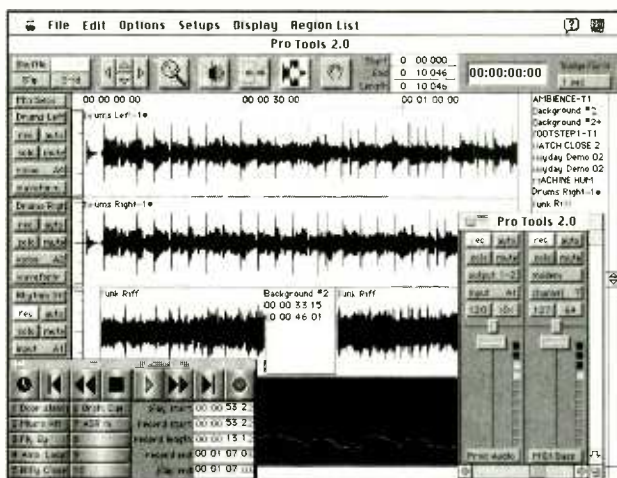
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Of course, all past and present Pro Tools systems will be easily and affordably upgradable, to be totally compatible

Contracts

- BBC Radio has bought two Sony DASH 48-track recorders. A PCM3348 will be based at Maida Vale, the other will be used for outside broadcasts.
- Doremi labs have just achieved their most successful sales period with the installation of over 40 DAWN II digital postproduction systems worldwide. Users include Todd A/O; Rainbow Sound and Dead Sync, all in Los Angeles; and Sharpe Sound in Vancouver.
- Digital audio CODEC specialists, Nicral, have reported a steady increase in the use of British Telecom's digital switched telephone service, ISDN, among sound recording and production houses. Alfasound, a sound recording studio in Manchester have recently installed a fully Duplex CDQ2000 Encoder-decoder and two receive-only CDQ2000 decoders.



- ▲ BBC Pebble Mill in Birmingham used two Akai DD1000 recently for their *Clothes Show Live* programme at Earls Court in London. Music was played out live from the DD1000s using the Playsheet facility.
- Following the purchase of three Solid State Logic SL 5000 M Series consoles last year, VTM, Belgium's only commercial television network, has bought an SSL ScreenSound digital audio editing system and a SoundNet digital audio network, plus an SL 4024 G Series console as part of a major reorganisation of the network's post-pro facilities
- Amek's monitor desk, the TAC SR6500 has been put to use recently by Johnny Cash on his European tour and Thalia Theatre in Germany for a tour of Tom Wait's musical *The Black Rider*
- The Warsaw-based Polskie Radio, the national broadcaster for Poland, has bought 60 FRED editing machines and 60 FRIDA tape recorders from Lyrec
- After a two-month refurbishment Audio Electronics Mattijssen has reopened its recording studio doors. Acoustically designed by Ben Kok, the recent upgrade includes a new 56-channel AMEK Einstein with 24-track Alesis ADAT. The studio will be renamed Giessenhof Studio.

International News

Harman buy Lexicon

Harman International Industries recently announced the signing of a definitive agreement to acquire Lexicon Inc of Massachusetts, manufacturers of digital audio signal processing equipment and disk-based audio production systems for the professional audio and high-end consumer electronics industries.

As a wholly-owned subsidiary of Harman, Lexicon will retain existing distributors, independent representatives and internal staff. Ron Noonan, President of Lexicon commented, 'As a member of the Harman group, we will have a strong and compatible partner with similar values which will enable us to increase our market presence and product capabilities. With Harman's track record in fostering growth in acquired companies and their expertise in both the professional audio and home theatre market, we will be better able to take on the multinational challenges of the 1990s'.

BRPG becomes Re-Pro

At a recent meeting, the Executive of the British Record Producers Guild

voted in favour of changing the name of the Guild to Re-Pro, The Guild of Recording Producers, Directors and Engineers. The change of name represents the Guild's desire to broaden the scope of its activities and membership to include sound engineers, overseas applicants and those involved with audio recording, not only record production.

There are now two membership categories—Full and Associate. Full membership is only available to applicants based in the UK. Under the new rules, applicants from anywhere in the world may apply to join Re-Pro and enjoy the benefits of

Associate membership. Applications for membership will now be welcomed from sound engineers and those involved in non-record audio production such as TV, Film, Radio and Jingles.

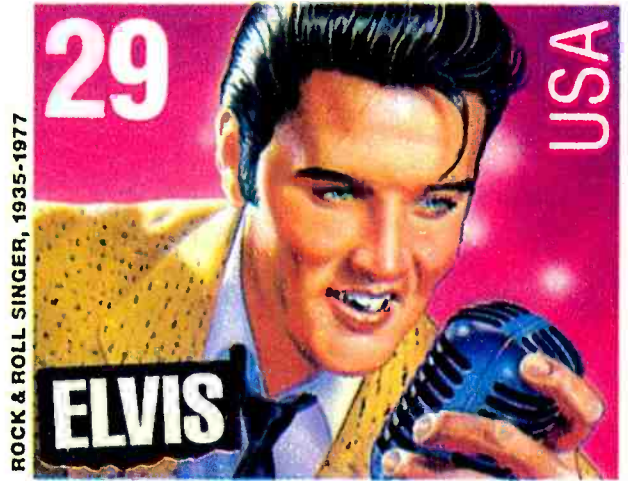
In place of regular monthly general meetings, the membership of Re-Pro will enjoy a series of forum-style meetings. These will take the form of an invited panel of industry luminaries answering questions from members and guests in a *Question Time* format.

Re-Pro, PO Box 310, London SW13 0AH. Tel: 081 876 3411. Fax: 081 876 8252.

APRS recognises new formats

The APRS, the UK professional audio association, is also changing the way it gathers member. The Association will now welcome applications from studios working in the newer formats after recognising the improvements in quality offered by current tape formulation as well as in the latest analogue and digital equipment.

The APRS will not, however, relax its other present strict criteria for studio members—formal maintenance agreements, insurances, planning permission, etc. Dave Harries, chairman of APRS commented, 'Technology has moved forward and we thought it time to look again at our technical parameters. As the active body for



'The most sought-after postage stamp in US history' features the King of Rock 'n' Roll and the distinctive Shure Unidyne microphone. Originally released in 1938, the Unidyne is currently available as the 55SH Series II



The Euphonix CS11 digitally controlled audio mixing system made its debut as a Front-of-House live mixing console during the recent American Music Awards. Audiotek provided sound reinforcement for acts like Michael Jackson, and Bon Jovi

the studio fraternity, we see nothing but benefit if properly set up commercial studios with the right professional approach can now come into membership—irrespective of the recording format they support.’
APRS Tel: 0734 756218.
Fax: 0734 75616.

Pro-Bel form US company

Pro-Bel Limited, one of Europe’s leading manufacturers of broadcast equipment has set up a wholly-owned American subsidiary, Pro-Bel Inc. The new company is based in Dunwoody (Atlanta), Georgia and will be launched officially at NAB in Las Vegas.

Commenting on the launch, Derek Owen Pro-Bel said, ‘North America now accounts for over 40% of the world market for professional television television products and we view Pro-Bel Inc as a long term investment. We are world leader in custom control software and , as many routing systems require custom engineering, we believe we can offer America customers a better solution than our competitors.’
Pro-Bel Ltd Tel: 0734 866123

Touchdown in the Algarve

Touchdown Studios of Kranzberg, Munich, have recently celebrated the formal ground-breaking ceremony for their latest recording facility in Portugal. Touchdown have bought a 3km² resort area and will build a recording and post-production complex there that they claim will be second to none in Europe. Scheduled to open during the latter part of 1993, Touchdown Portugal will be a fully residential ‘resort complex’ with two studios and additional service rooms including digital editing, CD preparation and mastering, audio for video suites, MIDI-music preproduction suites and the capacity for video editing. Leisure facilities will include a fully equipped gym and fitness club, swimming pool, bar and lounge areas, plus access to a secluded beach. More information from Kiera Leeming.
Touchdown Studios.
Tel: +49 89 081 66 3677.



The technique is anti-technology—the only judge is the human ear

DG in the fourth dimension

The Henry Wood Hall in south-east London was the venue for the launch of the latest recording technology from classical music label and recording centre Deutsche Grammophon. The new system used is called 4-D as in four dimensions. Klaus Hiemann, Head of the DG recording centre in Hanover explained, ‘4-D is a revision of the complete audio chain. The technique is anti-technology—the only judge is the human ear.’

In fact, 4-D is an equipment-based reassessment featuring four steps. The first is the use of low-interference microphone amplifiers positioned as close as possible to the recording microphone to avoid any transmission interference. The second is the use of High-bit Delta-Sigma A-D converters from Yamaha. The 21-bit DG 8X is specially built by Yamaha for DG. Thirdly, The Stagebox Principle—the remote controlled mic amplifiers and converters form a single unit called The Stagebox. In order to avoid any transmission problems, Deutsche Grammophon has developed a digital network that offers a dynamic range of more than 144dB—the equivalent of 24-bit per channel. The final step in this technology chain is the digital mixing console. DG have bought 50 Yamaha DMC1000 mixing consoles and have equipped them with 1.30G operating software specially developed with Yamaha. The use of the Yamaha console has led to the development of a new software programmed. In the future, Computer Aided Recording (CAR) will support the key operations of system and administrative control during a recording.

The final stage is mastering and here DG use what they call Authentic Bit Imaging or ABI. This is their own dithering process based on the AES findings of Stanley Lipschitz. ABI has

been used on remastering work as shown by the Karajan Gold release—all of Karajan’s work had been remastered using ABI.

4-D is Deutsche Grammophon’s first major revision in the way they record classical music digital recordings started in the mid-eighties. The first digital recording used the 3M digital multitrack system and seems that DG were less than satisfied with the results they achieved at the time, Klaus Hiemann: ‘In the early 1980s no one really knew what digital was, it was designed by computer and video engineers not audio engineers, but we had to use it.’ The first recording using 4-D was Mahler’s 7th and the first commercial release is John Elliot-Gardener’s Brahms’ *Hungarian Dances*. All these and future releases will have 4-D marked on the front of the CD.

Deutsche Grammophon Gesellschaft MBH, Alte Rabenstrasse 2, D-2000 Hamburg 13, Germany.



Klaus Hiemann: ‘No-one really knew what digital was.’

In-brief

● President of SPARS Dwight Cook has announced that the organisation is now offering comprehensive health insurance coverage for members. A variety of plans with competitive rates are available through Home Life Benefits & Services.

SPARS Tel: +1 800 771 7727

● Amek Systems & Controls, who launched the *Einstein* console in January 1992 have recorded first year sales of 80 units worldwide. half of them in the USA.

● The RIAA in the US have announced the seizure of more than 2.5 million counterfeit cassettes - an increase of more than 80% over 1991. CD piracy has apparently decreased by 56% - from 36,857 CDs in 1991 to 16,213 in 1992. This is due in part to the ongoing efforts of the RIAA’s CD Plant Education Programme as well as increased cooperation on the part of the US Customs Service.

● WEA Manufacturing will be incorporating Dolby *S-Type* noise reduction on all new analogue cassette releases in the United States according to a recent Dolby announcement

● For the UK’s comic relief day staged on the 12th March, Ampex donated 1% from each sales of tape to the charity

● Just four months after the opening of Hilton Sound’s Italian office, The pan-European renting company have now opened a Spanish office based at the premises of Jim Kashishian’s Kash Productions.

People

● Bob Orban of Orban Acoustics has been honoured with the Oscar Award by the Academy of Motion Pictures Arts and Sciences

● Mingles Music in London has appointed Heather James as producer with special responsibilities for client liaison

● Derek West has been appointed as Professional Product Manager for Tannoy’s Pro Audio products. The new position has been created to mark Tannoy’s dedication to the Pro Audio side of its loudspeaker business

● Martin Audio have announced the appointment of Bill Webb as the full-time head of the company’s engineering department.

● HHB Communications have added four more people to their technical support team. Mike Gallavan, Andrew Silk, James Gott and Jim Gross have all joined in the last four months.

AT 4033

THE STUDIO CONDENSER FOR ENGINEERS *and* ACCOUNTANTS



AT4033 shown with optional shock mount AT8441

“Audio Technica is still in its infancy in the professional market, and not having encountered it before, the 4033 Transformerless Capacitor Studio Microphone came as a very pleasant surprise. Its styling is distinctive and elegant, the finish is excellent, and the cat's cradle, again supplied as standard, is simple and effective and balances the microphone very well. Everything about the microphone looks and feels sturdy and professional. Once again the facilities are simple, the only switches are for the high pass filter and the pad, and the polar pattern is cardioid.

But the biggest surprise was the sound. On everything I tried – including a Steinway grand – the output was virtually indistinguishable from that of the 414 – open, transparent and clean, quiet and free of colouration. The main difference was in the sensitivity – the 4033 is few dB more sensitive than the 414.

If this is an example of what Audio Technica has to offer, I await further developments with interest. A variable-pattern microphone with the sound of the 4033 would be a very useful addition to the arsenal indeed. As it stands, I can't imagine it will be long before this microphone is a much more familiar sight.”

Reprinted from
**STUDIO
SOUND**
JANUARY 1992
February 1992



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ATM-003

AES PRODUCTS

AGM

The AGM *MR1* Periphonic microphone is a 4-channel package for Ambisonic-style recording and features a tetrahedral microphone assembly using Bruel & Kjaer capsules, a 20-bit A-D conversion unit and a matrix control unit. The latter is fitted with a full 4-channel digital processing card (*TMS-320c30* processor, 32-bit) that provides the ability to electronically reposition the microphone plus signal processing. **AGM Digital Arts Ltd.** 14-16 Deacons Lane, Ely, Cambs CB7 4PS, UK. Tel: 0353 665 588. Fax: 0353 667 637.

DDA

A new medium-priced SR console has been launched by DDA. The *Q2* takes a basic 8-bus format with eight dedicated aux sends together with true LCR master outputs and stereo-LCR pan on each input channel. The console can be fitted with a variety of output groups – eight mono, 16 mono and four LCR – which, in turn, are equipped with a 14-way output matrix. Another outstanding feature is a very comprehensive Cue system for all inputs and outputs. A ClearCom communications system interface is also provided. **DDA, U-1, Inwood Business Park, Whitton Road, Hounslow, Middx TW3 2EB, UK.** Tel: 081 570 7161. Fax: 081 577 3677.

AKG

The *C522 MS* microphone has been designed for M-S stereo recording and covers applications for music and speech production for broadcast and music recording. The *C522 MS* is supplied complete with carrying case and all accessories. The *CK 68-ULS* combines two shotgun mic capsules in a single divisible interference tube, providing a medium and short range shotgun mic in a single unit. The capsules are designed to be used with the *C460B* preamplifier and feature a linear frequency response between 20Hz and 18kHz. Operating temperature is quoted as -20° to +60°C.

The *DSM 7* is a hand-held Digital Status Monitor for checking the status of digital connections to both the AES-EBU and SPDIF standards. The unit incorporates an extensive LED display for possible errors, level

meters and headphone output. The *Audiosphere BAP 1000* provides binaural audio for headphone listening and features Individual Virtual Acoustics (*IVA*) which simulate ideal listening conditions. The *BAP 1000* allows the user to select from nine different typical ear transfer patterns.

AKG Akustisch GmbH, Brunhildengasse 1, 1150 Vienna, Austria.

Tel: +43 1 98124 241.

Fax: +43 1 98124 205.

UK: AKG Acoustics plc, Vienna Court, Lammas Road, Godalming, Surrey GU7 1JG. Tel: 0483 4 25702. Fax: 0483 4 28967.

Neumann

A new digital desk called *Strategy 2002* has been unveiled by Georg Neumann. Control is via a combination of centrally located functions and nine controls on each channel strip. Strips are freely assignable, and the console features snapshot and dynamic automation. Neumann intend the *Strategy* to be aimed at SR applications as well as music production as its assignability allows a large number of signal paths to be controlled by a physically small console.

Georg Neumann GmbH, Charlottenstrasse 3, D-1000 Berlin 61, Germany.

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

DAR

Digital Audio Research have released the *Sabre* optical disc-based recorder-editor and the *SoundStation Delta* range of digital audio systems.

The *Sabre* is an 8-channel workstation with removable optical disc with a wide variety of operating modes including eight-channel playback, simple and advanced editing, multiple external machine control, Word Fit, and ergonomic control system and compatibility with existing DAR systems.

The *Delta* is based on the *SoundStation II*, and links a high spec with a low price. The system features a touch screen (omitted from the *Sabre*) and can be configured for 4, 8 and 16-channel operation. The *Delta* also supports the complete range of DAR options.

DAR, 2 Silverglade Business Park, Leatherhead Road,



Periphonic—AGM *MR1*

Chessington, Surrey KT9 2QL, UK. Tel: 0372 742848. Fax: 0372 743532.

Pearl

The *MS* range of mics from the Pearl Microphone Laboratory has been updated with the *MS8 CL* which is particularly suited to users of boom stands. The phantom powered mic weighs in at just 160g, has a sensitivity of 20mV/Pa and is unmatrixed—although a matrixed model, *MS2 CL*, sporting left and right channel outputs will follow. **Pearl Microphone Laboratory, PO Box 98, S-265 21 Astorp, Sweden.** Tel: +46 42 58810. Fax: +46 42 59890.

Groove Tubes

Following the *MD-1*, Groove Tubes have released the *MD-2* tube condenser mic. Features include adjustable sensitivity and SPL handling, with a quoted frequency response of 40Hz–20kHz ±2dB. The mic characteristics are pressure gradient with a cardioid polar pattern.

Groove Tubes, 12866 Foothill Blvd, Sylmar, CA 91342, USA.

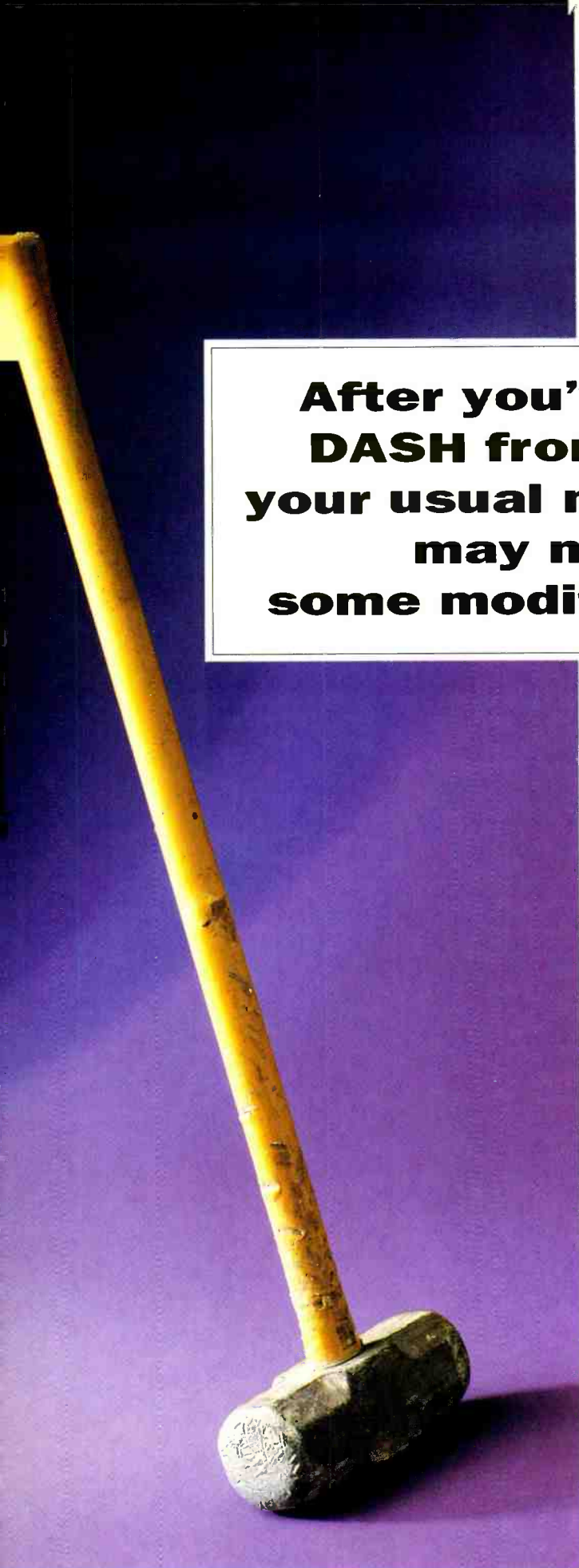
Tel: +1 818 361 4500.

Fax: +1 818 365 9884.

UK: Groove Tubes, 8 Barn Green, Bradmore, Wolverhampton WV3 7AY. Tel: 0902 62156. Fax: 0902 620207.

Klark Teknik

Last month's *Studio Sound* cover gave the world its first glimpse of the Klark Teknik *DN3600* Programmable Graphic Equaliser launched at AES. The unit features two channels which may be operated individually or in tandem, each having 30 ISO frequency bands, sweepable high and low-pass filters and two variable notch filters. Other features ▶



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Sony Broadcast
International 

To: Marketing Communications Department, Sony Broadcast International, Jays Close, Viables, Basingstoke, Hampshire, RG22 4SB, United Kingdom.

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EAST CENTRAL EUROPE (OTHERS) - UK 0256 483294; MIDDLE EAST/NORTH AFRICA - GENEVA 022 7336350; AFRICA - UK 0256 55011. Sony is a registered trademark of the Sony Corporation, Japan.

include rotary encoders for frequency selection and level, switchable Q characteristics (DN27 or DN360), auto make-up gain, 66 memory locations and large LCD. The DN3600 has electronically balanced inputs and outputs together with MIDI, an open architecture port and parallel port for interfacing the DN60 spectrum analyser.

Klark Teknik plc, Klark Industrial Park, Walter Nash Road, Kidderminster, Worcs DY11 7HJ, UK.
Tel: 0562 741515.
Fax: 0562 745371.

Lab Gruppen

The new DSP 24 from Lab Gruppen is a 2-input, 4-output digital crossover and speaker equalisation system for fixed and touring SR installations. The unit uses FIR filters and allows the creation (via a PC) of independent filter characteristics for each band. Other features include time delay on each output, up to 66-band parametric EQ, 18-bit 64 times oversampling,

programmable limiters for each output and backup analogue filters in case of digital failure. The DSP 24 may be used in conjunction with systems such as MLSSA and TEF for complete system alignment.

Lab Gruppen, Lilla Verkstadsgatan, 434 42 Kungsbacka, Sweden.

Tel: +46 300 16823.
Fax: +46 300 14246.

UK: Network, Unit 2, 12-48 Northumberland Park, London N17 0TX. Tel: 081 885 5858.
Fax: 081 885 5151.

Lexicon

Designed for the NuBus slot in Macintosh computers, Lexicon's NuVerb card integrates with Digidesign's TDM digital audio bus system as well as allowing direct connection to Pro Tools or Sound Tools II. The NuVerb features many well-known Lexicon effects and a dual-machine architecture for various operating modes. Program parameters can also be automated via time code and MIDI.



Neumann's console strategy—the Strategy 2002

Lexicon Inc, 100 Beaver Street, Waltham, MA 02154-8425, USA.

Tel: +1 617 736 0300.

Fax: +1 617 891 0340.

UK: Stirling Audio Systems Ltd, Kimberley Road, London NW7 6SF.
Tel: 071 624 6000. Fax: 071 372 6370.

Otari

The Concept One digitally controlled console made news at AES. The console has all operating controls centralised in the Digital Master Module while each input module

includes two identical channels with 4-band EQ, 100mm faders and a shared total of ten aux sends. The console features Diskmix VCA automation and a high degree of system customisation via 'soft keys'. All faders and switches may be automated via time code or used in snapshot mode for live sound production. Planned options include stereo input and output modules, moving fader automation and virtual dynamics using the channel VCAs.
Otari Inc., 4-33-3 Kokuryo-cho, Chofu-shi, Tokyo 182, Japan.
Tel: +81 424 81 8626.

AIWA HHB 1 PRO. PROFESSIONAL, PORTABLE DAT



The Aiwa HHB 1 Pro – well known as a "Best Buy" low cost professional portable DAT recorder – packs an uncompromising list of features into a rugged, compact design. Facilities like dry cell and rechargeable battery power, a multi-voltage power supply, AES/EBU digital I/O and a unique - non SCMS - copy prohibit-free SPDIF digital I/O, balanced mic./line inputs and illuminated LCD display, a wired remote control and full indexing facilities.

The HHB 1 Pro is supplied complete with an XLR splitter lead for the balanced XLR mic. input. For failsafe operation, a "Key Hold" switch disables front panel controls. Counter functions include "Program Time", "Absolute Time" and "Tape Counter". The unit can simultaneously accommodate ten dry cell batteries and a rechargeable battery, extending power-up time to up to 4 hours. The HHB 1 PRO is also available as part of "The Kit", along with Sony ECM979 microphone and accessories in a steel reinforced flight case.

A BATTERY OF FEATURES AND A CHOICE OF BATTERIES

Fax: +81 424 81 8633.

UK: Otari (UK) Ltd, Unit 13, Elder Way, Waterside Drive, Langley, Slough, Berkshire SL3 6EP.

Tel: 0753 580777. Fax: 0753 542600.

Studer

Studer's *D820* digital multitrack features the Digital Handler program for the Apple *Macintosh* which allows all of the parameters of a session to be stored and recalled as required. The *990* console now features moving fader and VCA automation (large and small faders) as well as a Recall by Function facility for resetting the console for different sessions.

New products include the *D730/D731* professional CD players which can read partially recorded CD-R discs and incorporate many useful functions for on-air broadcast, together with the *D732* CD player intended for 'straight' audio production.

Reportis is a portable console for OB applications and incorporates an ISDN interface for direct linking to the main studio. Also new are the

DS-D C4 A-D and *D-A* dual stereo convertors and the *TASFC-20* precision sampling frequency convertor, which has 22-bit processing accuracy with selectable output redithering for 16-bit, 18-bit and 20-bit interfacing.

Studer Revox AG, Althardstrasse 10, 8105 Regensdorf, Switzerland.

Tel: +41 1 870 7511.

Fax: +41 1 840 4737.

QSC-Lone Wolf

QSC have adopted Lone Wolf's *MediaLink* open system sound reinforcement control system for their *Ex-series* amplifiers as the basis of *QSControl*. This lead is soon to be followed by others such as Rane, Carver, TOA, Fender and JBL in incorporating the necessary control circuitry into their SR equipment to enable a comprehensive control system for SR installations to be created.

The *QSControl* system runs on both *Mac* and *PCs* (running *Windows*) and supports multiple control stations in one network.

QSC's Virtual Venue Control software allows profiles of different installations to be created and stored for later use—for repeat visits to live venues for example.

QSC Audio, 1675 MacArthur Blvd, Costa Mesa, CA 92626, USA.

Tel: +1 714 754 6175.

Fax: +1 714 754 6174.

Lone Wolf Inc, 1509 Aviation Blvd, Redondo Beech, CA 90278, USA. Tel: +1 310 379 2036.

Fax: +1 310 374 2496.

UK: HW International, 3-5 Eden Grove, London N7 8EQ.

Tel: 071 607 2717.

Sony

Sony's AES launches were obviously intended to provide the basis of an all-digital signal path for pro audio operations. *TDMX-S6000* digital postproduction console is based around an in-line configuration and offers ready accessibility to the engineer. The completely automated desk includes a wide selection of interfaces including AES-EBU, SPDIF and MIDI. Four analogue

mic-line inputs are fitted to each input channel. The console can control up to six transports and can read BVE-series EDLs.

The *PCM-9000* optical disc recorder will store up to 80 minutes of 20-bit stereo digital audio on a 130mm M-O disc and shares much of the technology arising from the development of Sony's MiniDisc. The recorder can be used for the preparation of CD masters and is a direct replacement for the *U-Matic* recorders used in the *1630* mastering system.

Other new digital products from Sony are aimed at broadcasters and include the *CDP-3100* CD player, *DMX-B4000* on-air radio console, *7000-series* DAT recorders and a new remote controller for on-air applications, the *RM-D7200*.

UK: Sony Broadcast and Communications Ltd, Jays Close, Viabes, Basingstoke, Hampshire RG22 4SB. Tel: 0256 483366.

Fax: 0256 474585.

US: Sony Corporation of America, 3 Paragon Drive, Montvale, NJ 07645 1735. Tel: +1 201 930 1000.

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To be, or not to be, that is the question : Whether 'tis
nobler in the mind to suffer The slings and arrows
of **A HORSE, A HORSE, MY KINGDOM FOR** outrageous fortune,
Or to take arms to sea a iustice troubles,
And by *opposing*, end them
To die,
to sleep.....



THE CUTTING EDGE



To be, or not to be, that is the question: Whether 'tis nobler in the mind to suffer
The slings and arrows of outrageous fortune, Or to take arms against a sea of
troubles, And by opposing, end them. To die, to sleep- No more, and by a sleep
to say we end The heart-ache and the thousand natural shocks That flesh is heir to;.....
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Algohythm Hot Foot

Faced with the prospect of controlling a MIDI set up in a live situation the options at the lower-priced end of the market are limited. Most guitarists rely on a combination of unit-specific foot controllers supplemented with trips to and from the rack. While workable and learnable this state of affairs is fundamentally unacceptable because the majority of these tasks can be performed via MIDI.

Algohythm's *Hot Foot* is unusual in being a British MIDI product which concerns itself entirely with the generation of MIDI commands to outboard devices and synthesisers. Based around a pedalboard with 10 footswitches with LEDs, and with a 2-character LED display, the floor unit communicates via a multipin connector to a 1U 19-inch rackmount that contains all the processing involved plus MIDI In, Out and thru connections. In itself *Hot Foot* is not an especially revolutionary device because MIDI has by definition made remote control available, but *Hot Foot* is ingenious in presenting the business in a very straightforward and accessible manner.

One hundred and fifty MIDI commands can be stored in the unit arranged in eight banks of eight groups of performance memories. Each footswitch can be programmed to send a command when pressed or released when in a normal or a shifted mode, unlocking a total of 32 different commands in each performance memory. Additionally switches can be programmed to be momentary or latched and can even be held down to generate data continuously. A footswitch can also be programmed to send a string of messages up to 64bytes in length which equates to around 20 to 30 MIDI commands.

Programming commands to a footswitch is achieved from the rackmount unit which employs a 40 x 2 line LCD which is bright and legible from a variety of angles. Dedicated keys are provided for cursor movement, a dial for entering parameter values, OK and CANCEL buttons, INSERT and DELETE buttons for editing or a stream of MIDI commands plus mode keys for Performance, Stream, Assign and



A British MIDI-controller that should appeal to novice and advanced user alike

Naming functions. All incorrect key presses or dial movements are accompanied by an irritating bleep and a card slot allows personalised setups to be stored externally.

Commands that can be generated by the *Hot Foot* include Note on and off, polyphonic aftertouch, control change, programme change, channel aftertouch, pitch bend, song position, system exclusive, song select, tune, start, continue, stop and reset. Additionally, power is further increased by the presence of two separate MIDI outputs. Each event can be named individually and subsequently be called up and referred to by name. The process revolves around naming a MIDI command, specifying what it does and then assigning this function to a pedal in a performance memory which for clarity's sake should be regarded as a bunch of commands that are likely to be used in a song.

The approach is simple yet effective and the naming functions contribute greatly to the device's accessibility as it is effectively referring to your own rig and talking your own language from the onset. Other benefits includes the copying of performances memories and streams around the unit plus a very quick way of setting up a stream which involves squirting the desired MIDI commands into the unit at its MIDI in which is immediately read and allocated to the stream.

The usefulness of a device like the *Hot Foot* will depend entirely upon the need for such a device in the user. The convenience, however, once the potential is grasped is immense particularly for live work. Guitarists will be able to adjust their outboard during the set and the hierarchical arrangement of the contents of performance memories makes a song-based approach the natural one. Keyboard players will be able to switch synths and sounds while playing as well as changing

parameters within patches, starting sequencers and performing changes in MIDI volume, for example.

If a criticism has to be made then it would have to be aimed at the pedalboard and its switches which are too close together and require aiming with a toe as opposed to a foot. The footswitches themselves also have little in the way of positive click and travel and through a thick-soled shoe are almost imperceptible. More resistance and more travel would improve matters.

That being said the *Hot Foot* is a well designed unit that should appeal to the novice as well as the advanced user and satisfies a very real need in MIDI setups.

**Ablesure Ltd, Brunel Way,
Severalls Industrial Park,
Colchester, Essex CO4 4QX.
Tel: 0206 751165.
Fax: 0206 751190.**

Dr Beat

While it is hard to get excited about MIDI file-format drum patterns, I have been looking forward to the latest releases in Heavenly Music's *Dr Beat* series with great expectation. I was staggered by the first two volumes and secretly did not believe they would be able to keep steam up for the next offerings. As it is they have arrived with no less than four all-new absolutely stonking discs titled *'50s and '60s, Rock and R&B, Soul and Dance* and *Hot Jazz* and *World Rhythms* and they have surpassed themselves.

What I like about *Dr Beat* in comparison to other types of drum pattern programmers is the sheer immediacy of the material and the amount of unadulterated swing on tap. The patterns are again not over complicated but have a developing and evolving simplicity that makes them incredibly usable. It says

something if you can listen to in excess of 40-odd one-minute-and-over snatches of pure percussion and instantly tell what they are about. It is the swing and groove that stands them apart with the sort of latent aggression that, when released, has you asking them to join the band even though they have not got their own transport.

The *'50s and '60s* disk has stacks of tight and sparse pop combo stuff with plenty of snap graduating into some hearty stomps and Spectroesque patterns. *Rock and R&B* covers the territory from power trios to smooth driving grooves and some very aggressive shuffles. They have even had the cheek to include a couple of low tom rolls at the end of patterns. *Soul and Dance* sees *Dr Beat* at his best with walloping kick and snare work and marvellously intricate hi-hats. There are plenty of James Brown 'ones' here as well as genuinely musical breakdowns and developments. I was sure that *Hot Jazz* and *World Rhythms* would be the weakest disk but it was not to be. The swing is masterful and the *World* section, while requiring more varied noises from the source modules, creates some heavy and sinister moods that slot in nicely as back drops. As ever the patterns cut and splice easily, contain a lot of dynamics and sound like a human being is involved as opposed to a drummer who can double-hand the hi-hat, crash and roll at the same time.

In summary, another corking collection that will blow you away. Instant gratification and ludicrously cheap. Most highly recommended.

**Heavenly Music, 39 Garden Road,
Jaywick Village, Clacton, Essex
CO15 2RT. Tel: 0255 434217.**

Music News is compiled
by Zenon Schoepe

LITTLE RED ROOSTER

Zenon Schoepe reports on an international class studio on the shores of Lake Starnberg in Bavaria, Germany

Over the last couple of years, great changes have been under way at Red Rooster Studios in Tutzing near Munich. Another SSL room has been added, for example, as have full accommodation facilities, and the studio is now associated with Red Rooster Records—a joint venture with BMG. Established in 1982 as a private home studio for Germany's leading singer/songwriter Peter Maffay, the original room was hired out on an *ad hoc* basis and the word got around so successfully that Maffay eventually had to build another room to double his chances of being able to get into his own studio when he wanted to. Red Rooster Records has been set up within the last six months under the auspices of MD Franz von Auersperg, and now the two-studio complex is fulfilling the role of record label house studio in addition to its normal commercial duties.

'It's not a must for our artists to use our studios,' says von Auersperg, who is keen to extol the virtues of a studio owned by an artist as opposed one owned by producers or businessmen. 'If something sounds good in a small demo studio and the artist is happy, then they record there. It's important to offer artists choice even if it conflicts with Red Rooster Studios.

'The vision in maybe three to five years is to have more apartments, and perhaps another studio, and to create a place where artists like to come, work and meet other artists,' he says. 'We want to have an image of contemporary rock music.'

Maffay, who is presently working at Red Rooster, is a little less ornate in his description: 'There is no artist in Germany who was foolish enough to do what we have done here,' he states. 'The setting is beautiful and the arrangement is different. People like being here.'

Maffay, who has maintained his position as Germany's best-selling artist for years, has worked in many international



'People like being here,' says Maffay

studios in the course of his career and remembers with fondness how late night sessions at IPC in Great Portland Street, London would be interrupted by radio transmissions from the Chinese Embassy next door. However, he admits that when it came to building Red Rooster ten years ago, he still knew very little about recording studios. He knew, however, that he wanted a place that would appeal to musicians and he wanted to get away from the trend of studios with small live areas.

'I wanted a control room big enough for a band to sit in and I wanted a big recording area where five people could go in, count in and play in their own space,' he says.

A 100m² live area and 32m² control room resulted and evolved as improvements were made and new ideas were tried—Maffay freely admits that mistakes were made that took around eight years to correct fully. 'We tore half the studios down and refitted it twice,' he says.

The 42-channel SSL 4000 *E-Series* was extended in-house to 56 channels by cannibalising a donor desk in order to support a Studer A800 and a newly acquired Sony 3324A. Maffay considered the time and money invested would be wasted if he only used the studio twice a year, so it was rented out. And the inevitable happened. . .

'When we were in the studio someone else would show up and want to record and when someone else was working we also wanted to,' says Maffay.

A new studio was planned, arranged in such a way that the two studios could function independently.



The new control room is 80m²



Peter Maffay: 'I wanted a big recording area where five people would go in, count in and play in their own space.'

'A studio is a very complicated thing and if you don't have the right people to tell you how to build it, then you can make major mistakes. I was therefore very sceptical when we started to build the new studio with all the experiences we had had with the old one. I had some sleepless nights.'

However, he believes that the choice of Neil Grant for the job made him rest easier. Grant had been recommended by musician friends and Maffay was impressed with his work at Peter Gabriel's Real World Studios.

'I saw pictures of Real World, and to this day I still don't know what it sounds like but it looked very good! Now you see what my criteria were!' he jokes.

'From what I now know about studios, what Neil Grant said to me made a lot of sense. He never made promises that he didn't keep and the whole job was finished within budget and in time,' he continues. 'I am convinced that we have good studio designers in Germany, but the best are for sure in the UK and US. Similarly, I always try to work with British light and stage designers for my live work because I consider them to be the most experienced.'

With even bigger rooms—an 80m² control room and 1452m² live area—the new Studio 1 opened last year with the same intentions as the original in being orientated towards live recording. Another SSL was installed.

'I never regretted going for an SSL,' comments Maffay. This time it was an 80-channel 4000 G-Series to accommodate Sony 3348 and Studer A800 recorders. Maffay likes the Sony machine because it allows him to start a project on a 24-track DASH and transfer to the bigger machine in the bigger room to complete the work—although he is aware that to remain competitive on the international circuit, ownership is essential. He is also resigned to a policy of continued investment in hardware.

'When we rent this place we promise that people will find all they need and we couldn't say things like that without keeping up to the standards that people are used to,' he says.

To this end, von Auersperg adds that it is not simply a matter of providing good technology but of creating an environment.

'We can get away from the production factory feel and take care of the individual needs of artists here,' he says quoting a recent example. 'Richie Blackmore was here for four weeks and he likes to play football every day. I talked to the bank manager who happens to manage the Tutzing soccer club and he arranged for Blackmore to attend training sessions throughout his stay.'

Engineer Erwin Musper who most recently recorded the last Scorpions album at Red Rooster is full of praise for the studios and German studios in general.

'The whole concept of building studios in Germany is sophisticated and so much more pleasant to work in,' he says, but adds that his repeated return to Tutzing says most about Red Rooster's standard of maintenance. 'It's the main reason I stay in a studio. If the maintenance is not right then, I'll never go back again no matter how perfect everything else is,' he says. 'When I work at Red Rooster I always find that I end up ahead of schedule.' ■

**Red Rooster Studios,
Klenzestr. 1 G-8132
Tutzing, Germany.
Tel: +1 49 8158 8001.
Fax: +1 49 8158 3579.**

STUDIO 1

Monitoring:

Boxer 412

Desk:

SSL 80-channel 4000 G-Series, Total Recall, 32-channel effects return mixer.

Multitracks:

Sony 3348, Studer A800.

Mastering:

Studer A820, Dolby SR, Sony PCM2500.

STUDIO 2

Main monitoring:

Quessted 412

Desk:

SSL 56-channel 4000 E-Series, 24-channel effects return mixer.

Multitracks:

Sony 3324A, Studer A800.

Mastering:

Studer A80, Sony PCM2500.

Effects in both studios include:

Lexicon 480s, 224Ls, PCM60s, PCM70s, Eventide H3000s, Publison Infernal Machines, Dynachord DRP20s, TC2290s, Yamaha Rev 1s and SPX1000s. Dynamics and EQs by Aphex, Drawmer, Dbx, Urei, and Tube Tech.

Instruments include:

Hammond B3 with Leslie, Bosendorfer Imperial, and Petrof Flugel.

The noisy and the tinkering who cannot resist taking it apart (the valve is user-replaceable) should beware when reassembling it—the review sample had its case on back to front which meant that the singer standing in front of it sounded as though she was out in the corridor. If nothing else, this proved that the cardioid pattern (which is all it has) is reasonably accurate.



MD-1—flattering to deceive?

for whatever reason, I thoroughly enjoyed. ■
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APPETIZER

Microtech Gefell are soon to launch a valve microphone. By way of an aperitif Dave Foister sampled the established *UM70*

While much of the business excitement surrounding the opening up of the Eastern Bloc has focussed on what the rest of the world can sell its inhabitants, it came as a surprise to many to realise that those on the 'other side' might have something to offer them. After all, if you're running broadcast services and making records you need equipment, and if you can't import it you have to make it yourself. Although it is easy to depict the whole of Eastern Europe as still being in the technological dark ages—barely past the wax cylinder stage—common sense suggests that this cannot be the case. They must be using some equipment matching Western professional standards, and we are unlikely to have ever seen it before.

One such surprise was the 'forgotten' Eastern half of Neumann, now known as Microtech Gefell, which carried on developing its own product line from the same roots as the familiar Neumann family. One of the more readily-available of these microphones is the *UM70*. This is a side-fire condenser microphone offering three polar patterns—cardioid, omni and figure-of-eight—together with a 10dB pad and a low-frequency filter. It appears to be part of a modular system, since the capsule head and the amplifier body have separate model numbers and simply screw together, but the rest of the range seems to be little known as yet. This is in spite of the fact that this is by no means a new microphone; the capsule assembly is apparently similar to that in the Neumann *U47*.

The *UM70* is neat and elegant, with an unusually slender tubular body for a medium-to-large diaphragm side-fire design. So untypical is its shape that it would not surprise me to see someone singing into its top in the mistaken belief that it was the front. The polar pattern switch is a chunky rotating ring beneath the grilles, clearly labelled at the front, with good positive detents and finger grips, while the other two switches are

recessed into the back of the tubular body (although not so far so as to need a sharp implement to move them). The whole thing is supplied in a beautiful wooden box; I would almost rather have had a stand adaptor thrown in, although a kit including a clamp and a windshield is available for a quite modest price.

The standard of construction is extremely high, with attention to detail right down to the unusually crisp engraving. The whole thing gives the impression of a quality professional instrument—no price-led corner-cutting here.

On paper, the specs are all one would hope for: good frequency response curves, particularly in omni, and almost perfect polar patterns up to 8kHz in both omni and figure-of-eight. The cardioid plots show the usual lumps, bumps and general inconsistencies round the sides and back but are pretty uniform with frequency at the front. The bass roll-off switch gives 10dB of cut at 60Hz, and the claimed maximum SPL for 0.5% THD is 137dB with the 10dB pad switched in.

The quality of sound the *UM70* produced came as a very pleasant surprise. This is a top-notch microphone, clean, smooth, accurate and detailed, with highs and lows apparently extending beyond those of the industry-standard favourite whose stand it shared for my tests. On female voice it was relaxed and powerful however high and loud she went, on cello crisp—not thin—and full-bodied in the lower registers, drums had bite, depth and clarity, while a trumpet retained all its subtleties with no hint of stridency. Everything I heard through it sounded natural and convincing; this is everything a high-quality all-rounder should be and it is very hard to fault. I would like to have heard two *UM70*s as a crossed pair, as I would expect outstanding results—the comparatively small size should allow good coincidence—but this was not possible in the time available.

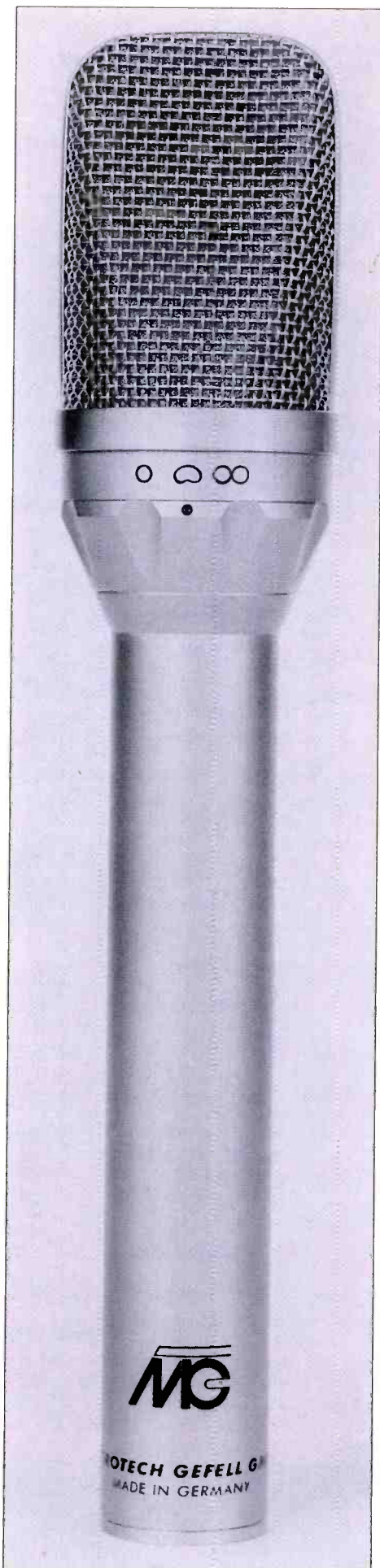
If this is what we've been missing all these years then I for one would like to see more of it. Despite its anonymous, unimposing appearance, this is an awful lot of microphone for the money, outshining more expensive competition, and should be snapped up in large quantities before someone realises how much they could be selling it for. At present prices it's probably the bargain of the year. ■

Microtech Gefell GmbH, Muhlberg 2, 0-6552 Gefell, Germany. Tel: +49 03 6649 262.

Fax: +49 03 6649 280.

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With the advent of DCC and Minidisc, it seems likely that the production of high quality "consumer" DAT recorders will stop. That's a shame for professional audio facilities because that's where the vast majority of these machines are sold. As Europe's leading supplier of DAT technology, we at HHB are understandably concerned about this situation. So much so that we've purchased



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THE FLEXIBLE FAMILY

The latest addition to Sennheiser's *MKH-Series* is the *MKH-80*. Keith Spencer-Allen discovers its multipatterned talents

Sennheiser introduced the current *MKH* condenser microphones series in 1985, starting with the *MKH-40* cardioid model. In common with most manufacturers active around this time, the range was introduced to meet the requirements of digital recording and featured improved specifications in distortion and self-noise, together with higher SPL handling.


Since then, new models have been added at periodic intervals and the six mic series now extends from the omni *MKH-20* and figure-of-eight *MKH-30* to the *MKH-60/70* high directional interference-valve mics. All these models are fixed polar pattern designs optimised for their function. Sennheiser's RF condenser technology is also implemented in each model.

The latest addition to the *MKH* range is the *MKH-80*, a compact multiple polar pattern design with twin capsules. Multiple pattern mics of this size are actually quite unusual as most manufacturers have opted for the approach of a standard preamplifier body with an interchangeable range of different pattern capsules. The only other mics of comparable dimensions and variable pattern are the now obsolete Neumann *KM88*, the Schoeps *Collete* body when partnered with *MK5* or *MK6* capsules, and the Josephson-MB *C-600*. The Schoeps mics do rely on mechanical adjustment of the internal capsules while the Josephson design uses a single diaphragm and mechanically closes acoustic ports to alter polar patterns. As such, it seems that the *MKH-80* is the only compact model with fully electrical switching.

The first surprise the *MKH-80* has to offer comes when you first pick it up—it is far lighter than you might imagine. The capsules are arranged so that their axis is perpendicular to the mic body and so pick-up is from the side. The capsules are easily visible through the single-layer grille mesh, and it is quite clear how to position it with regard to the capsule axis. Less clear, if you do not read the instruction manual, is which side is actually the front of the mic. It largely depends



Sennheiser *MKH-80*—the only compact multipattern with electrical switching

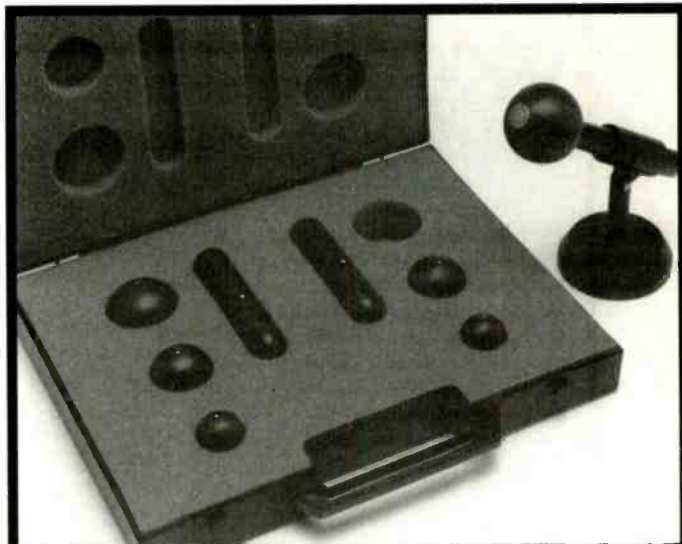


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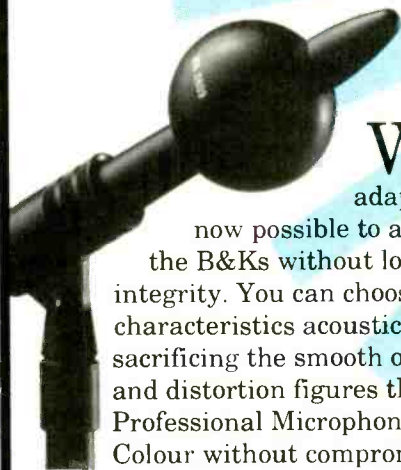
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For details of the APE acoustic equalisation attachment kits, and the full range of omnidirectional and cardioid microphones, contact Morten Støve at Danish Pro Audio.

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advanced clean room techniques, very tight mechanical tolerances, a special diaphragm construction and artificial ageing technique. If you fulfil the above requirements you end up with a microphone which can pick up sounds which only deflect the diaphragm a fraction of the diameter of a simple atom. Almost as impressive as the human ear, which is able to detect sounds that deflect the eardrum by less than a tenth of the hydrogen atom's diameter!

So, although we have a very simple principle to adhere to, few people appreciate the complexity of the development processes we need to go through in order to achieve success.

Acoustic design

Grid design and the physical size of the microphone are very important factors, since they influence both frequency response and polar response. The bigger the microphone, the more difference there will be between front and back responses. And the grid has to be of rotational symmetric design so as not to emphasise sounds from particular angles.

A polar response with peaks and valleys due to resonances in the grid or improper housing design would give you a distorted 'sound picture', just as a bad camera lens gives you a distorted photograph.

Once inside the microphone, we have to deal with very thin diaphragms, flat honed surfaces, little air volumes, narrow air gaps and very small holes. The probe microphone is fitted with a thin tube through which it is possible to measure inside a microphone. Well-specified surfaces, holes, volumes and air gaps dictate the very low distortion, both harmonic and non-harmonic.

A very useful tool in microphone development is an equivalent (acoustic to electronic) model of a microphone, given that an electric model that does not work in theory cannot be realised in the acoustic world. Our model deals with all kinds of microphones and contains 39 elements-variables, such as compliance (=capacitance), diameter and mass of diaphragm (=inductance), resistors in the front and back ports and slits, inductances in slits and pipes, and capacitance in slits and cavities.

B&K have accumulated 45 years of experience in producing measuring microphones and keeping tolerances low and narrow. Without doubt, the Series 4000 range of microphones benefits from this tradition, making them, with the measuring microphones, the most carefully tested microphones on earth.

Environmental design

Although we badge them as studio microphones, most of these mics will have to withstand rigorous demands in their employment on stage, on location and even within the apparently neutral environment of the recording studio. And they have to be robust enough to cope with severe environmental conditions, and continue to work perfectly without losing their supreme acoustic properties.

Therefore, during the development of the Series 4000 microphones, we continually referred to the question: how rugged are they? Extensive tests and experiments were made: we stirred the coffee with them, we stirred cold beer, we placed the microphones among ordinary tools in the toolbox of a fishing boat to test their response to salt mist,

we used the microphone housing as a hammer. The ultimate test of cruelty was to let children play with them!

Like the B&K test and measurement microphones, we demanded that our studio microphones be constructed to tolerate any and every environmental condition, such as extreme heat and humidity, strong magnetic fields, aggressive gases, strong light (the main power frequency could enter a microphone via light modulating with this frequency!), acid from the sweat on an artist's hands, high and low mains voltage, variations in the static pressure and exposure to RF fields.

Environmental measurements are done in special heating-cooling chambers where humidity is added under control. These kinds of tests can run up to 96 hours in 90%RH and 70°C. During this kind of test, we found out that the common diaphragm material for gradient microphones absorbed water, causing increased self-noise, and so we had to find a new type of film for our 4011/12 cardioid microphones.

Objective testing

Acoustic testing is done on sensitivity, frequency response, distortion, self-noise and actuator response. Sensitivity testing is done with pistonphone, 1kHz calibrator or multitone-c calibrator. In cases where extreme accuracy is wanted, reciprocity calibration is done. (All these methods are mastered on B&K and all instrumentation is made by B&K, and can be found in the factory catalogue.)

The electrostatic actuator is useful in both production and in R&D. This device is a special grid placed on the microphone instead of the

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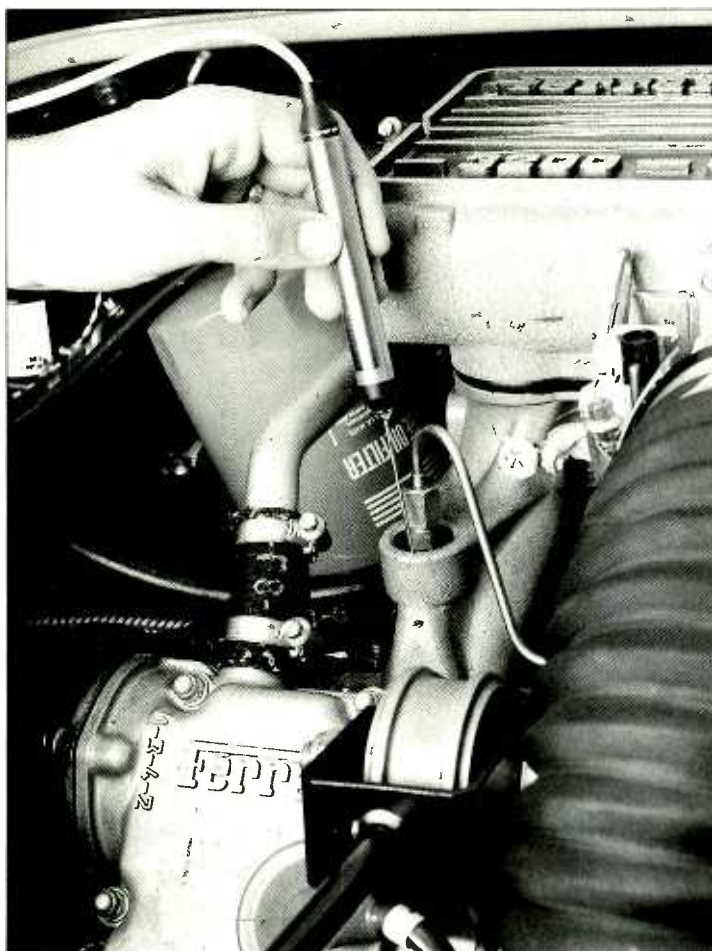
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Close-miking the interior of a Ferrari engine with a probe mic



protection grid. Through electrostatic forces due to 800V DC polarisation and 100V AC signal between the actuator and the diaphragm, the microphone is exposed to a constant force on the diaphragm, and from a swept AV signal a frequency response is measured.

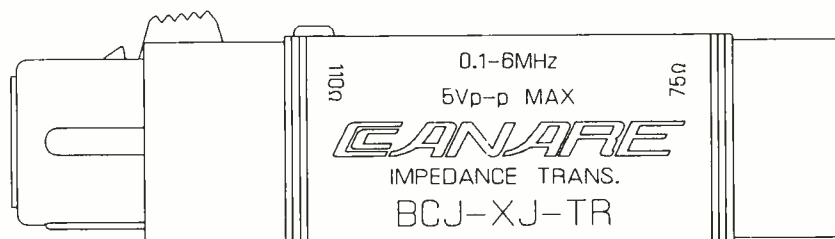
The pistonphone calibrations measured the cavity closed in by the microphone. Cavity volume is altered by pistons moving in and out of the cavity, producing a very well-defined sound pressure level.

Frequency response is taken through free field reciprocity calibration in anechoic rooms or with impulse testing using gating technique. Recently, we started using type 2012 for testing studio microphones using selected 3mm and 6mm microphones as references. This is permissible since such small microphones cover the frequency range up to nearly 200kHz. (The method of substitution-measurements is described in the DIN 45 491/3.)

Simple in principle, but very accurate reciprocity calibration is based on the fact that condenser microphones are passive linear elements-devices, and as such, can act as both receivers and transmitters. Calibration can take place in free field and in cavities. With any three microphones, this method yields an absolute calibration, on all three, within 0.05dB. A special apparatus for this calibration is made at B&K.

The self-noise test is done in a special heavy insulated chamber. Acoustic testing of distortion is a little more tricky, but can be done using tuned pipes-horns and compressed air. This is necessary because of the very high dynamic range of the Series 4000.

Some of the trickier problems can be fun to solve! Recently, we took a heavy signal-alarm ►



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horn from a delivery truck, fed it with approximately 10 atmospheres of compressed air, and produced a peak SPL of 170dB in front of the horn so the level could be varied by changes in the compressed air pressure. Using a special measuring microphone (type 4136; handling capacity 180dB) and B&K analysers, we were able to find some of the limiting data on our studio microphones. We also tried with plane wave tubes, but could not produce SPLs high enough to find our limiting data!

Subjective testing

Subjective testing is an invaluable and irreplaceable process in audio: after all, it is the listener's ear at the end of the chain, and this should be satisfied.

B&K's first brush with subjective testing resulted from an experiment in the Seventies, suggested by the sound pioneers of Danish Radio in Copenhagen and Aarhus, and the B&K team. The idea was to use measuring microphones on a live transmission of a concert from the Danish Radio Symphony Hall: producers and technicians from Danish Radio hooked up 16 omni-measuring microphones with special 120 and 200V power supplies.

When the letters from listeners started to pour in, surprised at how good the sound of that transmission had been, B&K as a company decided to investigate further. Using a 24-track Lyrec recorder, a chamber orchestra was recorded with 11 stereo pairs of reputable and popular microphones, including some B&Ks. We used skilled and unskilled listeners, some skilled enough to tell which microphones were which.

We went even further and tested the listeners themselves, using the Békesy method. The hearing curves were very different, as you would expect with an age range of 16-65 years, some suffering heavy losses at high frequencies. They all agreed B&K microphones had the best sound.

It proved a fascinating combination: the trained listeners from Danish Radio are essential because they have very good ears and know how to create a specified 'sound picture', but blind people develop extremely good hearing, and provided us with surprising and valuable insights. Among the reasons they liked the B&Ks were: they could almost see into the sound, and the s's (sibilance) remained in the speaker!

During the last five years, we have made literally thousands of acoustic measurements and held many many listening tests—it is pleasing to see both sets of criteria match so well.

Back to the future

We are sometimes asked to manufacture a microphone with a tube-valve preamplifier. Personally, I am reluctant to do this. I can easily remember the old days of acoustic measuring amplifiers and other equipment, and the problems we had with high self-noise and microphony in the valves, not to mention the rapid ageing!

On the other hand, as a commercial manufacturer, we have to consider what the market wants us to make. We try to accommodate the demands of the marketplace without compromising our own reputation. Although some of those old-style microphones have a certain something, our design direction is moving forward to a time when there will be smaller microphones, multi-capsule microphones, system microphones and wireless microphones.

Many people ask me what the B&K marque will produce next. How do you improve on a reference

standard?

Acoustic equalisation is one way. Last year, we started producing acoustic pressure equalisation (APE) kits for our microphones, enabling the engineer to alter the front-to-back frequency response and, to a significant extent, to simulate large diaphragm capsules.

The size and shape of a microphone are among the parameters that determine its sound. With different grids, it is possible to simulate old microphones and different frequency responses, in a way that is not possible with electric equalising since this cannot distinguish front from back sounds. During our work with sound engineers from Danish Radio, we made a special grid to simulate the *M49*. On speech at 0.5m distance, you could not hear the difference.

Take the *APE L50B*, the popular spherical attachment. When fitted to the microphone, this produces a distinct audible change (less reverberation and more acoustical 'presence' of source.) In a concert hall, with the *L50B* installed, you can move your microphone further away from the stage and still obtain a satisfactory balance of direct-to-reverberation, because the attachment gives better 'reach' for the sound sources on stage.

In very reverberant venues, particularly during recordings in empty halls without an audience, the appropriate balance of direct-to-reverberation can be restored using the *L50B*. In a studio, the greater boost provided in the 2kHz region can be useful in attempting to bring out the 'presence' or a 'dramatic impact' from the acoustic source. On the other hand, the increased off-axis attenuation above 1kHz can be used to soften the sounds (both the wanted and unwanted ones) or to reduce undesirable brightness of the sound source.

Using the *APE* attachments allows the engineer to modify the response characteristics without compromising the electronic integrity of the microphone.

In conclusion

Development in our business is rather a challenge because the classic condenser microphones, like the Series 4000, are actually quite close to the optimum. As a designer, my objective is to strive for that tiny bit extra, as well as researching the answers to the market's specific needs, for example, a stereo mic in one housing.

New techniques are coming into the picture, using micromechanics and 'transistor' technology, and maybe the first steps will be made with new diaphragm technology allowing us to make better diaphragms at lower cost. Later in the year, we will unveil the first fruits of our current R&D programme, with its focus on spot miking and instrument miking.

Ironically, a recent project in Copenhagen, led by our Prime Minister, assembled a 'technology chest' which had been buried, not to be opened for 100 years. Among the diverse items in the chest, a B&K microphone. My regret is that I will probably not be there to conduct the ageing tests when it is finally retrieved. ■

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Belgium:	Mills Music 003238289230
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Czechoslovakia:	Uber Compu - Musik 0896516094
Denmark:	Da Distribution ApS 004531682811
Finland:	Ms Audiotron 0035805664644
France:	Sound Studio Technique 0033142815047
Greece:	Production Sound 003016424459
Holland:	Ampco Audio Products Bv 003130414500
Hong Kong:	Jolly Sound 008523620202
Hungary:	Best Studio Technika Kft 003611561953
Indonesia:	Kirana Yudha Teknik 0062213806222
Israel:	R.B.X. International Ltd 009723298251
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Singapore:	Swee Lee Company 008225653565
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If you want a professional workstation you can afford now and upgrade later, Delta is the answer. It starts as a 4 or 8 channel system, expandable to 8 or 16 channels. Delta features the same superb DAR interface, control console and touchscreen as Sigma, along with up to sixteen hours of hard disk storage, optional optical drive and WordFit. Best of all, you can put the high-quality editing of DAR's SoundStation Delta to work for you today and upgrade it to full SoundStation Sigma capabilities tomorrow.

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Over 70 PCM 3324Ss have now been sold

SONY PCM 3324S

The PCM 3324S represents the fourth generation of DASH multitrack recorder from Sony and replaces the popular PCM 3324A. The DASH format is now over ten years old and worldwide some 1,300 machines are in service. The DASH format first appeared in 1982 with Sony's 24-track PCM 3324; this was superseded six years later by the PCM 3324A and in the same year the 48-track PCM 3324S was introduced. Last year saw the launch of the PCM 3324S at the Vienna AES show and since being made officially available in September, over 70 machines have been sold with 45 going to European territories, in particular France and Germany.

The PCM 3324S is fully compatible with previous DASH multitracks. Tapes recorded on the new machine will play perfectly on any DASH machine whether it be Sony, Tascam or Studer and vice versa; even cue tracks which now use PWM rather than the old bias system are compatible. A PCM 3324S tape can also be

upwardly expanded by recording tracks 25-48 on the PCM 3348.

Three factors have played a significant part in the design of the machine—modularity, the use of new technology, and competitive pricing. The standard machine includes basic record and replay functions to which 14 options can be added. Depending on application and budget, it can be configured in many different ways to suit music recording, postproduction, broadcast and so on; in fact there are so many permutations that Sony have made it company policy to talk in depth to potential customers to get a clear and detailed idea of their requirements. All the options, with the exception of an additional head, are supplied on plug-in cards which can be installed in a matter of minutes making system expansion a very simple exercise.

The machine makes extensive use of LSI circuitry, which has resulted in a considerable reduction in the number of processing boards. This in turn has made the machine very compact and

lightweight compared to previous designs—it is actually half the weight of the PCM 3348. Other advantages are cooler running due to low power consumption (less than 800W, fully fitted), which results in reduced cooling requirements and thus a quieter machine.

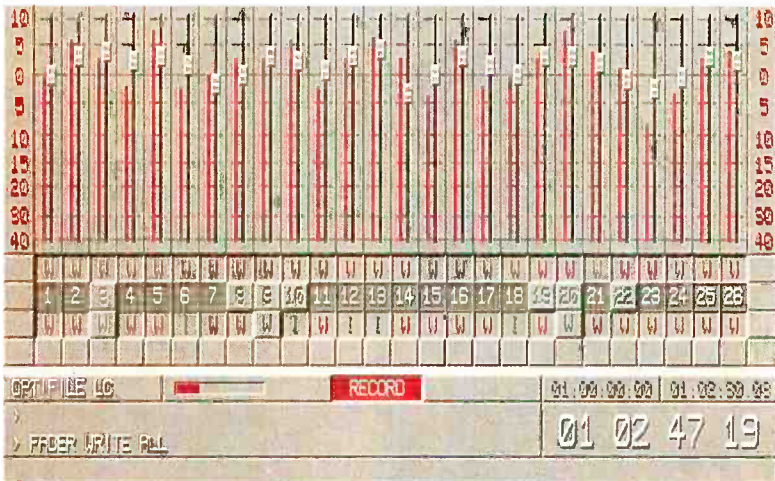
The PCM 3324S uses new converters similar to those incorporated in Sony's latest PCM 7000 range of professional DAT recorders: 1-bit delta sigma A-D with 64 x oversampling, and an ►

Patrick Stapley
gives an update on
Sony's low-cost
PCM 3324S DASH
multitrack machine

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SPRING 93

Solid State Logic

Elliptical G Series at The Hit Factory

Unique console for famous NY studio

First Scenarias
Installed
Three Systems to
Post Perfect, NY

ALSO INSIDE

Multi-Format Console to Air Lyndhurst
Record Plant Expands with SL 8000
ScreenSound for Computer Animation
100th SL 5000 Broadcast Console



Solid State Logic

First Scenarias Installed Around the World

New York audio post facility installs three systems, others ordered worldwide

Since its introduction a few months ago, Scenaria has proved extremely popular with facilities around the world. The largest single order, for three systems, came from a celebrated New York facility.

Post Perfect, a major video and special effects facility in New York, has installed three Scenaria digital audio/video production systems in its new audio post facility, 'Mixed Nuts', which opened late last year.

"We had been planning the perfect, top-of-the-line audio post facility, and when we had a demonstration of Scenaria, we knew that it would fit perfectly into our plans," says Dean Winkler, VP and Director of Creative Services. "Scenaria is the first audio system that we've seen which rationally integrates video. It solves what we believe was the biggest problem in audio post-production - having to lock-up."

Mixed Nuts has 8,000 square feet of floor space separate from Post Perfect, with four acoustically correct rooms. It has been designed to offer state-of-the-art audio post-production with leading edge digital technology.

"We initially planned to build analogue rooms," Winkler adds. "But when we sat down for a Scenaria demo, we were floored! Scenaria is such an incredibly good product; it really enhances our business. Besides,



Repeater monitors allow clients at Mixed Nuts to follow proceedings on Scenaria's graphic screen displays

One of three Scenaria rooms at Mixed Nuts, the new audio post facility-within-a-facility at Post Perfect in New York City

Scenaria is comparable in price to the analogue rooms that we were going to build.

"The first outstanding thing about Mixed Nuts is our three really creative mixers, Richie Becker, Joe Vignoni and Bart Smith, who will be responsible for the work at the

new facility. The second is the amazing speed we can offer our clients with Scenaria. When clients come in for a revision, it is easy, quick and with no generation loss. Scenaria introduces them to a whole new way of approaching audio post-production."

Using Scenaria's VisionTrack™

Digital video system complements Scenaria's digital audio

VisionTrack is a digital, non-linear video system devised by SSL to complement the on-line speed and editing capabilities which Scenaria brings to audio. Picture storage is on hard disk, with one hour of digital video integral with each Scenaria system.

By keeping both audio and picture in a digital random access form, a number of new operational possibilities are opened up. Audio and picture can instantly locate to any point in the programme material, for example. Rollback is instantaneous, and frame-accurate.

Inserting or deleting scenes is straightforward, allowing work on the soundtrack to continue even if further picture edits have



▲ VisionTrack offers a variety of display modes, with controls overlaid as required

▼ SSL-patented VisionCue display shows picture edits and transitions

been made, without the delay of waiting for a new videotape copy to be produced.

A further feature of VisionTrack is the SSL-patented VisionCue™ location device. Here, all the scene changes and major picture events are displayed in a simple graphical form. By simply pointing to the event with Scenaria's pen and tablet, both audio and picture will locate to these events instantly.

When using VisionTrack, it becomes the master machine, and Scenaria the slave. Just swiping the pen across the tablet returns control to Scenaria's hardware panel for further audio manipulation and mixing.

As both devices are fully integrated with one another, the conventional concept of master and slave no longer applies. Movement between the two could not be simpler.

VisionTrack is the first video device ever designed by an audio manufacturer, yet it shows the same breadth of imagination as any of SSL's audio systems. It further emphasises the company's total commitment to an integrated future for audio/video post-production.

G Series Automation Update

While SSL's Ultimotion moving fader system has become a popular addition to many consoles, the company continues to support and develop G Series automation for the benefit of its many users.

G3.2 is the latest edition of G Series Studio Computer software. It brings a number of the operational benefits of Ultimotion to G Series users for the first time, and also offers full mix compatibility with Ultimotion.

New operational features include:

- ❑ 15 Software Groups - any channel fader can be a master to any other fader(s).
- ❑ Inverse Cut - slave channels cut when master is uncut, allowing A/B switching.
- ❑ Off-line Cuts - cut events can be created and stored without having to run tape. Cuts can also be modified in replay via cut buttons or keyboard, and copied across channels.
- ❑ Insert Mixing - allowing moves to be inserted into the current mix without destroying subsequent moves.
- ❑ Faders can now be locked into different update status cycles.
- ❑ Auto-Takeover is now available in a New Mix.
- ❑ Safe Replay status.
- ❑ Computer now handles non-integer tach rates.
- ❑ Full mix compatibility with Ultimotion™.

Full details are available from your local SSL office or representative.

Hit Factory, NY, Installs SSL In-The-Round

New York's famous Hit Factory opened a new complex last November called The Hit Factory Digital Recording Studios.

The new seven-storey building is in the same street as the existing Hit Factory site, which will continue to operate as before. The new facility has a total of four recording studios and five mastering rooms, all designed by Harris Grant Associates.

Studio 4 features an incredible, customised SL 4000 G Series console, which was built by SSL in a crescent shape. Custom furniture provides outboard storage and additional work surfaces, and creates a wrap-around working environment.

This is certainly the most unique console that SSL has produced to date. Apart from the shape there are other refinements, such as surfaces inlaid with finest blue slate from the English Lake District.

The console perfectly illustrates SSL's



▲ Customised, crescent-shaped SL 4000 G Series console, with additional custom-built furniture, installed in Studio 4 at The Hit Factory Digital Recording Studios, New York City

policy of providing whatever a studio needs, from 'wings' set at any angle, to a choice of equalisers. The Hit Factory console has both E and G Series equalisation.

Since the console was installed at The Hit Factory it has been used on several projects, including a new Cyndi Lauper album produced by Frank Filipetti.

Sting Praises Portable SSL

"Everyone felt very connected to the project, and to each other"

The Steerpike Portable Studio is a complete digital multitrack recording studio that can be packed into flight cases, taken anywhere in the world, and set up in less than two hours.

Manufactured by SSL for Sting's New York hire company, Steerpike, the portable studio is based around a 64-channel SL 4000 G Series console, with Ultimotion™ and Total Recall™. The console breaks into three sections and folds up into flight cases. Other flight cases contain the patchbay, G Series computer, power supply, outboard equipment and a Sony 3348 digital multitrack.

The first client for the Portable Studio was Sting himself, who together with producer Hugh Padgham, used it at his Wiltshire home to record his new album, *Ten Summoner's Tales*.

"The SSL Portable Studio allows me to work at home and, when the project is finished, have my house put back to normal within a day," says Sting. "The system is as

comprehensive and up-to-date as any, and there were no technical disadvantages as far as the recording went. Everything was done in the same room as the desk and, although the drums were a little loud, everyone felt very connected, both to the project and to each other. Communicating ideas between musicians and engineers was easy.

"I'm more than satisfied – and can't wait to do the next album."



▲ The Steerpike Portable Studio, with Sting and producer Hugh Padgham, at Sting's home in rural Wiltshire

ScreenSound in Brussels

C'est bien fait pour vous!



Comedia Digital, one of Belgium's most respected post-production studios, has installed a ScreenSound as the centrepiece of its multi-project production company.

ScreenSound's versatility is proving invaluable, enabling Comedia Digital's entire library of sound effects to be stored on the system, and transferred rapidly to individual productions.

Pierre Fabry of Comedia Digital (above left) says: "With ScreenSound's networking capability, we plan to expand with more ScreenSOUNDS and a SoundNet soon."

Solid State Logic

SL 8000 Console for TV in Japan

Multi-Format console used for Surround Sound TV audio

NHK, Japan's national broadcaster, is amongst the first in Asia to install an SL 8000 Multi-Format Production System.

The console, which is sited in NHK's CT102 studio in Tokyo, is used for live



broadcast sound and for off-air recording, mainly of music and educational programmes.

The audio is provided for both terrestrial and satellite transmission, and is often Surround Sound encoded. In the case of satellite transmission, digital audio is transmitted in two standards; either 14 bit 32kHz or 16 bit 48kHz.

The ability of the SL 8000 to handle these diverse requirements was a major factor in NHK's purchasing decision.

◀ The SL 8000 G Series Multi-Format Production System installed in NHK's television production headquarters in Tokyo

Record Plant Expands with SL 8000 G Series

96-input console, with Ultimatum, is centrepiece of new high-tech studio

The Record Plant, one of Hollywood's most famous studios, has installed a 96-channel SL 8000 G Series console as part of the most extensive technological renovation in its 25-year history.

"We like the flexibility that the SL 8000 provides for the variety of clients that we work with," says Record Plant president, Rick Stevens. "It allows us to provide the most highly evolved console technology to our film and other audio-for-picture clients, while offering advanced audio mixing capabilities to our rock star clients, for which the Record Plant has always been famous."

The Record Plant has doubled the number of its studios with the construction of two new, self-contained recording studio suites, provid-



◀ SL 8000 G Series installed in one of two new rooms at the extensively refurbished Record Plant in Hollywood

ing clients with the highest level of privacy and convenience. As always, the Record Plant also offers a wide spectrum of top audio equipment, ranging from the latest digital

outboard gear to vintage tube equipment.

The SL 8000's first session was with Prince, who arrived only hours after the room was completed.

Berklee College adds Two SL 4000 G Series Consoles

World-famous music college expands its recording and production facilities

Berklee College of Music, the world-acclaimed music education establishment in Boston, USA, has purchased two SL 4000 G Series consoles as part of a massive expansion of its recording and production studios.

"We chose SSL consoles because of their extensive user-base; SSLs are installed in the top studios in every major country around the world," says Don Puluse, Chairman of the Music Technology Division at Berklee College of Music. "Our students will now be able to walk into studios anywhere in the world and immediately be familiar with the console."

The first console is installed in Studio A, the college's main multitrack studio. The second SL 4000 is being installed in the new multitrack teaching studio.

"Our recording studios are used by students around the clock," adds Puluse. "We chose equipment that is reliable enough



▲ SL 4000 G Series Master Studio System – two of which have been installed at Berklee College, Boston

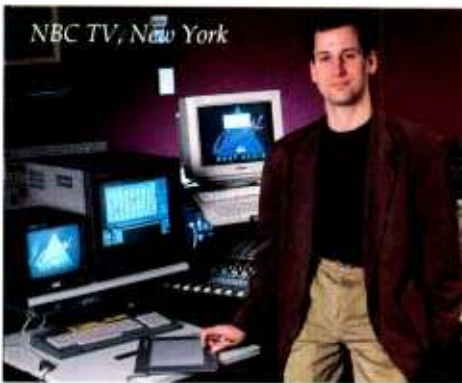
to be in constant use, and high-tech enough to serve our industry's producers, engineers, and recording artists for the future."

Broadcasters Turning to SSL Digital Worldwide

Many of the world's national broadcast organisations have confirmed their commitment to the introduction of digital technology by specifying SSL Digital systems. Recent additions to this impressive list include:

NBC, New York

One of the USA's major networks, NBC has installed two ScreenSounds in its New York production centre, where internationally syndicated programmes such as *Saturday Night Live* are produced.



NRK, Norway

NRK, the national broadcast organisation for Norway, has purchased two ScreenSounds and a SoundNet for use on all of its video and film post-production.

Slovak TV, Bratislava

Two ScreenSounds and two SoundNets have been installed by the national broadcaster of

Slovakia. They are sited in a new post-production suite at STV's headquarters, and in a regional studio in Kosice.

ORF, Vienna

ORF (Osterreichischer Rundfunk) is the national broadcasting company of Austria. It recently added a Scenaria for use on all of the network's post-production work.

SBC, Singapore

SBC (Singapore Broadcasting Co.) has now installed five networked ScreenSound systems to become the world's largest ScreenSound and SoundNet user to date. A sixth ScreenSound is installed at subsidiary company, SBC Enterprises.



Carlton TV, London

The new weekday commercial television station for the British capital selected ScreenSound and SoundNet to form the centrepiece of its promotional post-production suite.

Globo TV, Rio de Janeiro

This Brazilian broadcaster, the fourth largest



Berlin radio station, RIAS, recently commissioned an OB truck fitted with an SL 5000 M Series console. Its first outing, coinciding with the AES in Berlin, was for the recording of a pop concert at the Berlin-Friedrich-Stadt-Palast.

The mobile is used for recording and the live broadcast of concerts, both classical and pop, and also for the live broadcast of magazine programmes.

RIAS chose the SL 5000 for its flexibility, the convenience of the Instant Reset™ computer, and its proven reliability in previous OB installations.

Also choosing an SSL console for OB use is fellow German broadcaster, Deutsche Welle, which has ordered a similar SL 5000 M Series console for its new OB truck.

TV network in the world, has installed two ScreenSounds for use on a wide range of programme material, including its popular soap operas.

Fox TV, Los Angeles

Fox Tape Division, which handles on-air promotions work for the Fox Broadcasting Co., has expanded its digital network with a third ScreenSound plus two Scenaria systems.

100th SL 5000 M Series Console to Belgian Broadcaster

Commercial TV station chooses four SSL consoles and ScreenSound for new broadcast complex

VTM, Vlaamse Televisie Maatschappij, the only commercial TV station in Belgium, has purchased three SL 5000 M Series consoles, plus an SL 4000 G Series console, a ScreenSound digital audio editor and a SoundNet network; all of which will be installed in a new facility to be opened by mid-1993.

With the opening of the new building, the amount of live programming will increase substantially, so VTM chose to invest in high quality desks. On-air reliability, soft switching of all main audio routing



Chris Wolters, Head of Sound Engineering at VTM (centre), with Paul Lindsay, SSL (left) and Stefaan Henssens of SSL's Belgian Distributor, TM Audio, at the site of VTM's new broadcast facility, undergoing construction at Vilvoordes, Brussels.

and processing, ease of operation, and SSL's reputation, were all important factors when considering the purchase.

The three SL 5000 consoles, all of which

are fitted with Instant Reset™, are a 24-channel version (4 mono and 20 stereo) for Continuity; a 36-channel version (16 mono/20 stereo) for News; while VTM's largest console (which will be the 100th SL 5000 manufactured) is a 46-channel frame (26 mono/20 stereo) Production Desk.

The 24-input SL 4000 console and ScreenSound are to be installed in the audio post-production suite at VTM's new premises. VTM needed a small but flexible console for this suite and the SL 4000 was the obvious choice when comparing specifications and performance. The SL 4000/ScreenSound suite will be used for voice and effects dubbing of VTM's in-house programme trailers.

Chris Wolters van der Wey, Head of Sound Engineering at VTM, comments: "I am very happy with the choice of the SSL consoles and ScreenSound. It reflects the serious efforts of our department to improve on TV sound wherever possible."

Solid State Logic

From the Desk of...

Shep Pettibone

"Nowadays the remixer is stepping into the producer's shoes, and rather than going in and taking songs that are already there, the remixer is reproducing the songs, with new bass, new drums, new strings, and adding more tracks to the multitrack," says Shep Pettibone, who has pioneered the art of remixing, with his work for artists such as The Pet Shop Boys, MC Hammer, Paula Abdul, Janet Jackson, Elton John and Mariah Carey.

And, of course, there's Madonna, whose union with Pettibone has spawned a string of remix hits including *Into the Groove*, *True Blue*, *Like a Prayer* and *Express Yourself*. Pettibone also co-wrote and co-produced



Vogue, *This Used to be My Playground*, and Madonna's current *Erotica* album.

"I like to over emphasise the LP feeling in the mix," says Pettibone. "When you put a needle on a record you hear it - I like the surface noise that you get on vinyl. I try to over emphasise that a bit, so that it comes across on the CD. It brings the listener right into the music."

Shep sees the SSL console as one of the instruments that he 'plays' to get the right sound for his famous remixes. "The great thing about the SSL console is that I can play the mutes and ride the effects on the fly because of the simple and ergonomic layout of the system," he says. "The SSL system is also very user-friendly; the variety of fader statuses make it easy to do several things at once, making the console a more creative and powerful tool."

Training For Digital Products

SSL helps users get the best from digital systems

The availability of well-trained operators is an important consideration for anyone adding new equipment to their facility. In recognition of this, SSL offers detailed practical training on newly-installed equipment at user's own premises.

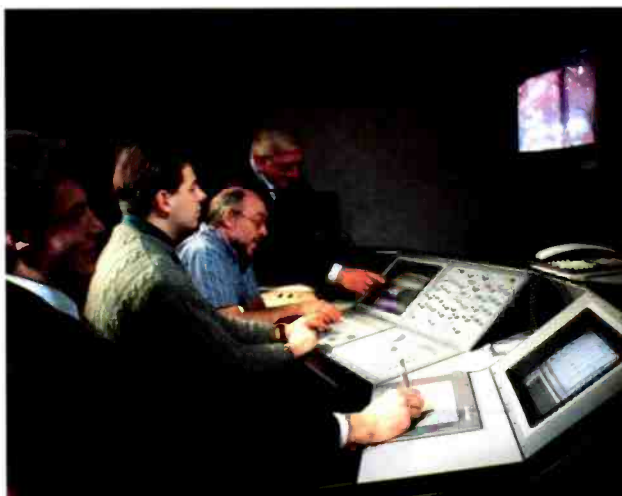
Recently, training sessions on SSL's new digital products have been held at broadcast facilities throughout the world, keeping their many operators fully up to date. These include Singapore Broadcasting Company (SBC), Slovak TV - the new national TV station for Slovakia - and Globo TV, in Brazil. In the case of SBC, fifty operators were trained by SSL staff during the course, with the successful candidates each receiving a special proficiency award on completion of the sessions.

An introductory 'hands-on' seminar on Scenaria was also recently held at the Paris headquarters of COPRA Film, to provide a detailed overview of the new system for many

leading French facility owners and engineers.

"Training operators is the only way to ensure that they get the best from our systems," says Dave Grinsted, SSL's Training and Documentation Manager. "It also keeps us closely in touch with our clients' specific operational needs."

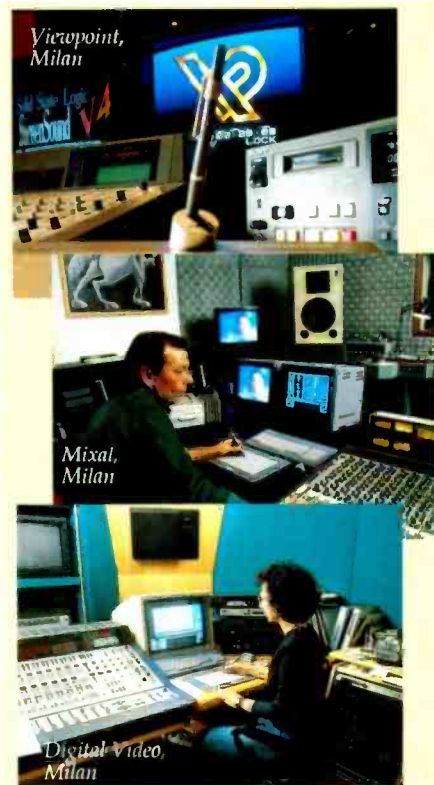
For further information about operational or maintenance training, contact Dave Grinsted at SSL's Oxford headquarters, or your nearest SSL office or agent.



▲ A recent 'hands-on' seminar on Scenaria at the Paris headquarters of COPRA Film was attended by leading figures in the French audio post-production industry

ScreenSound Success in Italy

SSL's office in Milan reports increasing demand from Italian post-production studios for ScreenSound and SoundNet, with many systems being installed over recent months, including:



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USA (Western Region)

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CA 90028
Tel: (213) 463 4444
Fax: (213) 463 6568

18-bit D-A with 8 x oversampling. The sample rate is selectable between 44.056kHz, 44.1kHz and 48kHz, and the two higher frequencies can be lowered by 0.1% in playback for advanced postproduction applications—for example to compensate for speed differences encountered in film-to-video transfers and subsequent postproduction work in NTSC.

Two types of remote control unit are available for the machine: the *RM 3324* which is essentially the same as used with the *RM 3324A* and offers features such as DASH synchronisation, Multichannel Ping-Pong, and sample memory control; and the *RM 3324S* which is a much simpler unit at a third of the cost. Alternatively the machine can be used without a remote if interfaced to a mixing console equipped with record ready switching and machine control facilities.

All connection facilities remain as before with the exception that a MADI board is now optionally available. The standard digital I-Os are via AES-EBU and SPDIF2. Other features that are unique to the machine include High Speed (four times normal); Prestriping for CTL and time code (this is a standard facility); Multiple Digital Ping-Pong which allows all 24 tracks to be bounced in the digital domain with control from the large remote unit; an optional Stereo Sound Memory Board which can sample up to 20 seconds (40 seconds in mono) of full 16-bit audio which may be edited, triggered, looped, and inserted onto tape using the *RM 3324* remote—the sample can also be played backwards; a Time Code Chase Synchroniser (standard feature) which will work with either of the remote control units providing the optional time code board is included. In addition, the machine will chase lock to the CTL

The *PCM 3324S* uses convertors similar to those incorporated in Sony's *PCM 7000* series DAT Recorder

signals of other DASH machines providing multimachine synchronisation.

The *PCM 3324A* included a 2-channel digital I-O (SDIF or AES-EBU) facility that was used by a number of users to record the final mix back onto two tracks of the multitrack in sync with the original tracks. This facility has been retained, but now a routing matrix on both remote units allows these inputs to be routed to tape. Up to four I-O boards can be fitted providing 8-channel capability; this will allow interface of VTR machines and Digital Audio Workstations. Sony are also developing the 9-pin RS422 protocol to give some enhanced features—by connecting a Digital Audio Workstation using 9-pin and AES-EBU, it will be possible to control routing functions, record ready, input-repro monitor switching, and transport from a workstation. Sony are currently working closely on this development with a leading UK Digital Audio Workstation manufacturer.

A feature that first appeared on the *PCM 3348* has been included on the *PCM 3324S* as a standard facility. This is the Advance Output

Function designed to compensate for the signal processing delay that occurs when the machine is interfaced to equipment such as a digital console. Although the delay is relatively small (the *Capricorn* console for example has a delay of approximately 0.5ms) it is not ideal, and the machine is able to advance its output by as much as 5ms to ensure perfect sync.

The speed of tape transport is now much faster than the *PCM 3324A*; acceleration and deceleration are five times quicker and maximum wind speed has been increased by 15%. The transport design is similar to the 48-track machine although a new servo has been incorporated.

Other main features include variable crossfade punch-in (16 steps from 1.5ms to 370ms), a time code regeneration option, a 'confidence' monitoring head that provides RAW monitoring, full software alignment including a special head alignment tape and program.

Cosmetically the *PCM 3324S* retains a strong family resemblance; the main differences being a more compact, sleek appearance and a dark grey colour scheme. The price of the entry level machine is comparable with top end analogue multitracks fitted with Dolby *SR*. Compared with Sony's previous digital 24-track machines, the *PCM 3324S* configured with the same facilities works out considerably cheaper plus, of course, it offers a number of previously unavailable standard features. ■

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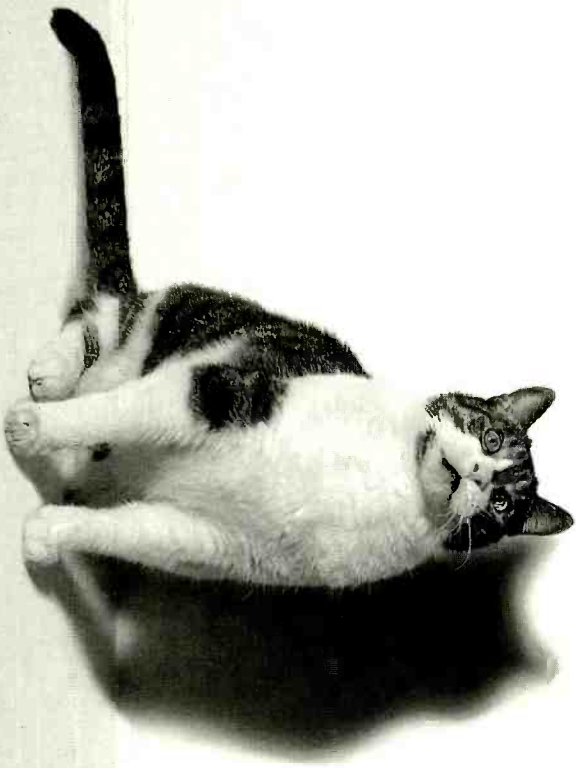
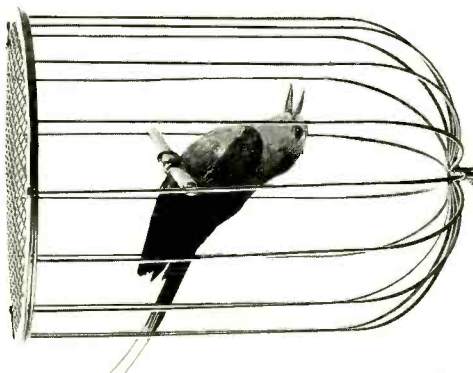
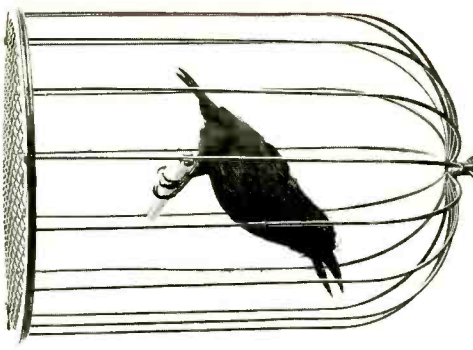
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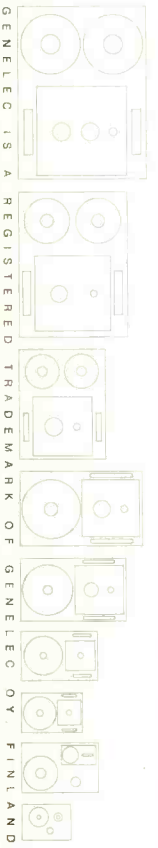
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CONCEPTUAL ERRORS IN MICROPHONE PREAMPLIFICATION

Manuel Huber discusses shortcomings in current mic preamplification circuitry and practices

When analysing existing methods of low-level signal preamplification and taking an unbiased look at the preamplification of microphones and transducers, one realises that some long established methods and principles actually limit the potential performance of the microphone. With the huge sums of money currently being invested in mixing consoles, recorders and outboard equipment, it makes no sense to entertain the limitations of current methods of mic preamplification.

Many different microphones and transducers are available to today's recording engineers and producers. Output signal levels vary from microvolts (μV) up to volts, (from one to one million).

With the methods of microphone preamplification currently in use, the typically tiny output signals from the microphone are forced to travel through considerable lengths of shielded cable, the length of which can be anywhere from a couple of metres to several hundred metres. Not only do these cables present resistance, capacitance and inductance to the circuitry (all of which negatively influence the signal transfer), but the signals themselves are also being subjected to extraneous influences such as RF interference, electromagnetic fields, electronic 'smog' and so on. The lower the signal level passing through these lines, the larger the negative effect of such 'common mode' signals. Such limitations do not have to be accepted.

The present practice of locating the microphone preamplifier dozens of feet away from the microphone, either in a mixing console or a 19-inch rack, clearly needs revision. By amplifying mic signals to the required levels near the microphone, losses can be dramatically reduced.

When this approach is combined with the use of highest accuracy balancing circuits, the signal is transferred to the console both well balanced and at line levels. This technique, properly

implemented, results in pristine musical signal amplification; greatly improved signal transmission from microphone to mixer (or direct to recorder); a dramatic reduction of common mode signals (noise, hum, RF interference); a much better signal-to-noise ratio and improved headroom. The capability of driving lines hundreds of metres long can be included in a reasonably sized housing and the microphone preamplification can be accomplished inside a well-shielded case that rejects hum and RF interferences. With proper circuitry, bandwidth can be improved and signal transmission is optimised. When using proper line drivers it is possible to drastically reduce cable loading effects.

Transformers and loading

To facilitate quick setup and avoid major ground loops, transformers may be used for certain applications (such as PA systems and certain on-stage microphone splitters). In a recording situation these transformers are not essential and it is well known that even the best transformers

fail to provide ultimate performance.

The major disadvantages of transformers are their limited dynamic range, phase errors at low and high frequencies, frequency limitations at low frequencies, higher distortion (which is level dependent because of core saturation), limited common mode rejection and sensitivity to magnetic interferences.

Transformers must therefore be avoided in a precision microphone-transducer preamplifier. One performance aspect that is not given adequate consideration is the fact that all transformers are designed to work optimally only when loaded with a specific load resistance. If this specific load resistance is not maintained linearly throughout the entire frequency range, shocking errors in frequency response and rise time as well as overshooting and ringing can occur.

Fig.1 shows the frequency response of a typical high-quality audio transformer with capacitive load ($\approx 50\text{--}100\text{m}$ of high-quality microphone cable). **Fig.2** shows the square wave response of the transformer in **Fig.1** (note overshoot and ringing). **Fig.3** shows the frequency response of a high-quality audio transformer with no output load (note expanded level scale). And **Fig. 4** ▶

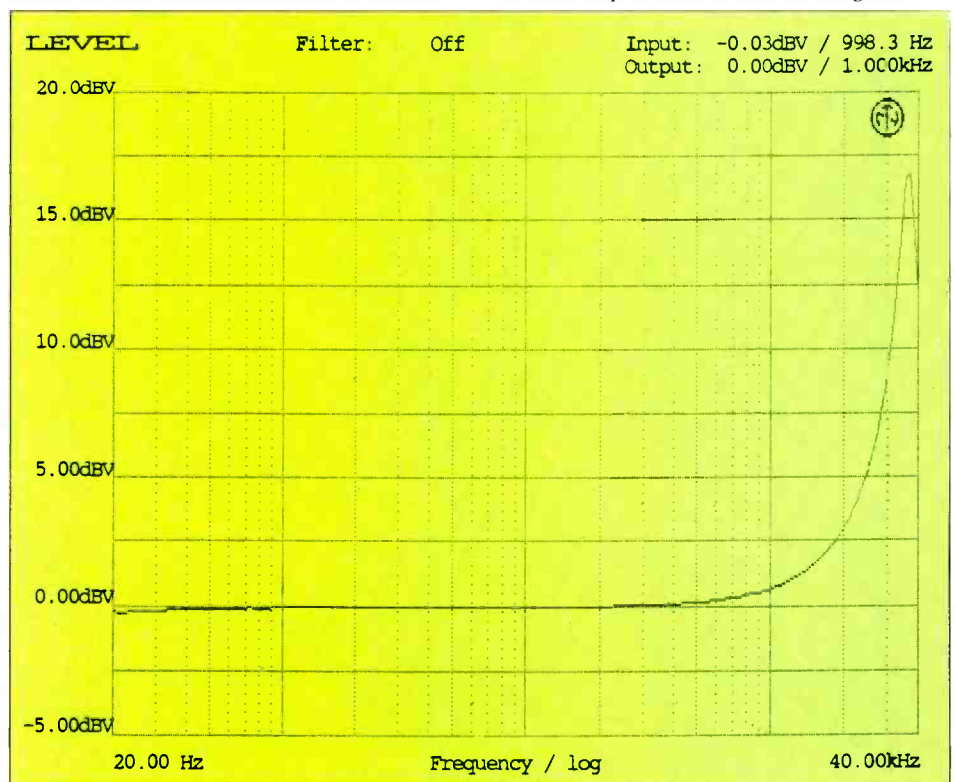


Fig.1: Frequency response of a quality audio transformer with capacitive load

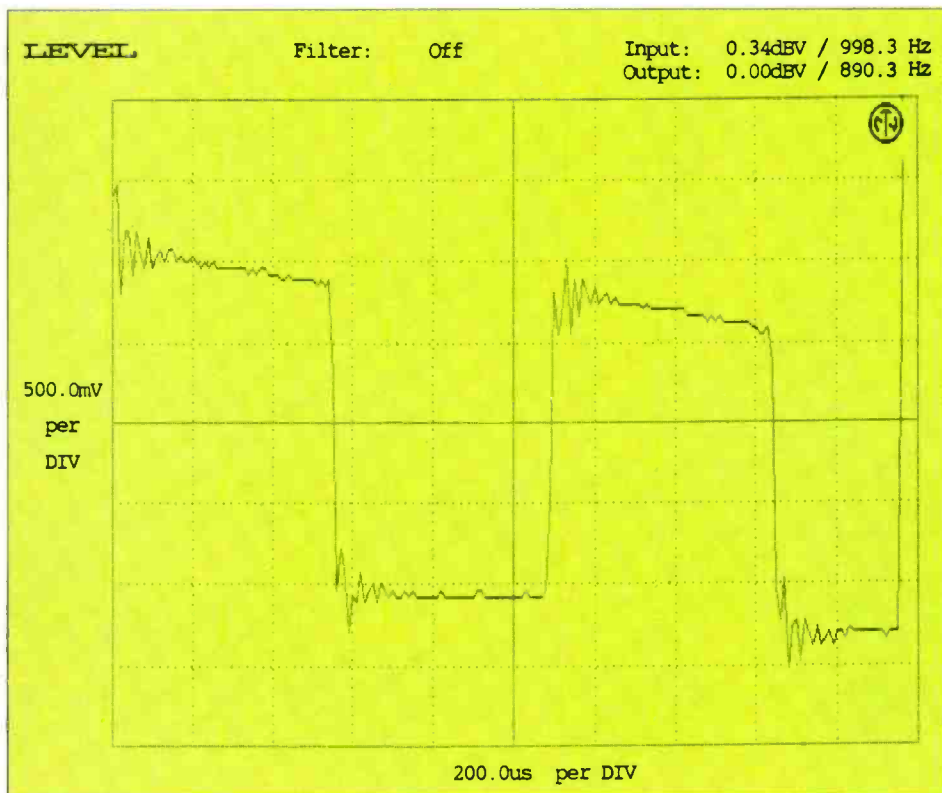


Fig.2: Square wave response of transformer in Fig.1

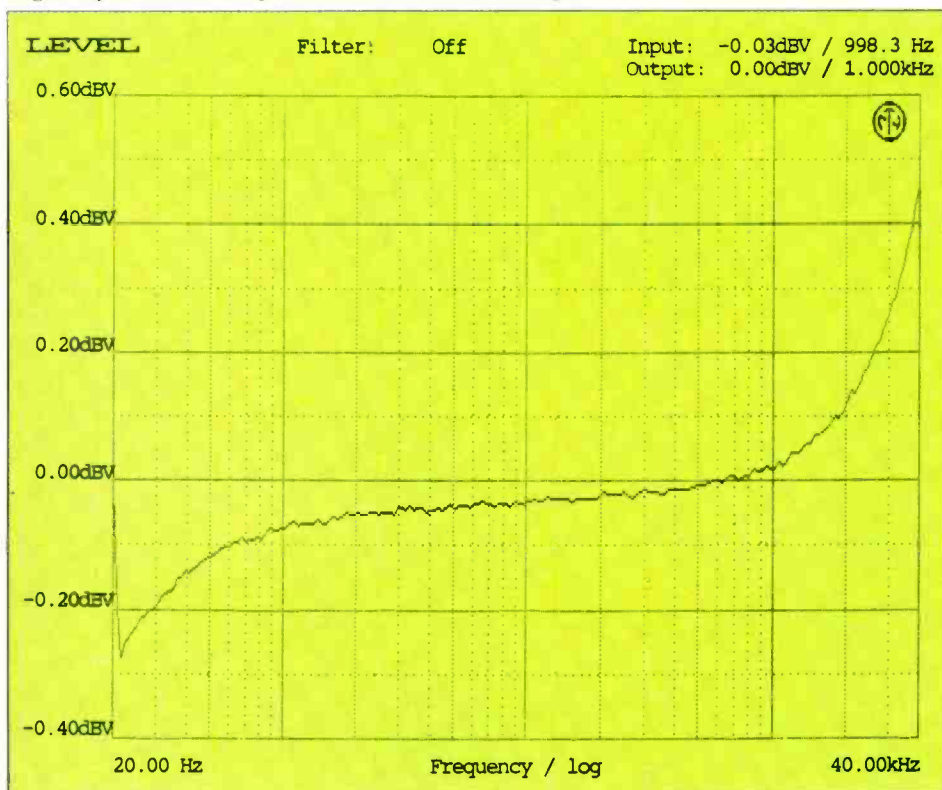


Fig.3: Frequency response of a quality transformer with no output load

shows an audio transformer optimised with 1.5k Ω load achieving its flattest response. Optimal load varies with different audio transformers. Without the possibility of input loading, you cannot hear the true characteristic of the microphone.

The loading requirements of modern microphones vary from about 50 Ω up to around 4k Ω . However, with today's mixing consoles and outboard preamplifiers the input resistance cannot be fine-tuned to the individual requirement of a particular microphone. The input loading impedance is most often fixed. Unless you happen

to have the particular microphone which precisely fits the impedance setting of the mixing console input stage, you will not attain optimal performance. A preamplifier with a fixed impedance is not acceptable where ultimate performance is desired. Because the same microphone will have audibly different characteristics depending on the particular mixing console being used, such input loading differences become readily apparent. It is consequently of highest importance to have the option of matching the load impedance of the preamplifier to the

microphone.

Without this possibility you will not get accurate results or hear the true characteristics of the microphone.

Phantom supply

With few exceptions, most condenser microphones manufactured today rely on phantom powering. While phantom powering is actually not the absolutely best way of supplying the microphone with the required voltages and currents, there are no widely accepted alternatives. So it is important to support the existing 12V and 48V phantom powering standard with the best phantom powering possible.

The capabilities and stability of the phantom supplies built into modern mixing consoles and outboard preamps are generally taken for granted. When the 48V phantom light is on, it is assumed that everything is fine, but this is not always the case. Some consoles have limited phantom current per channel, which (especially with microphones having considerable current demands) makes optimal performance virtually impossible. Furthermore, the phantom of some consoles simply collapses when a large number of condenser mics are to be powered. In other consoles, the phantom supply voltages are not adequately regulated, so when there is a voltage drop on the mains, it can also affect the phantom voltage and result in its collapse. It may not be immediately obvious, but some 'inexplicable' differences in sound quality and performance are attributable to this deficiency.

Inadequate phantom supply results in nonlinearities which normally are not present, such as increased distortion, compression, reduced headroom and so on.

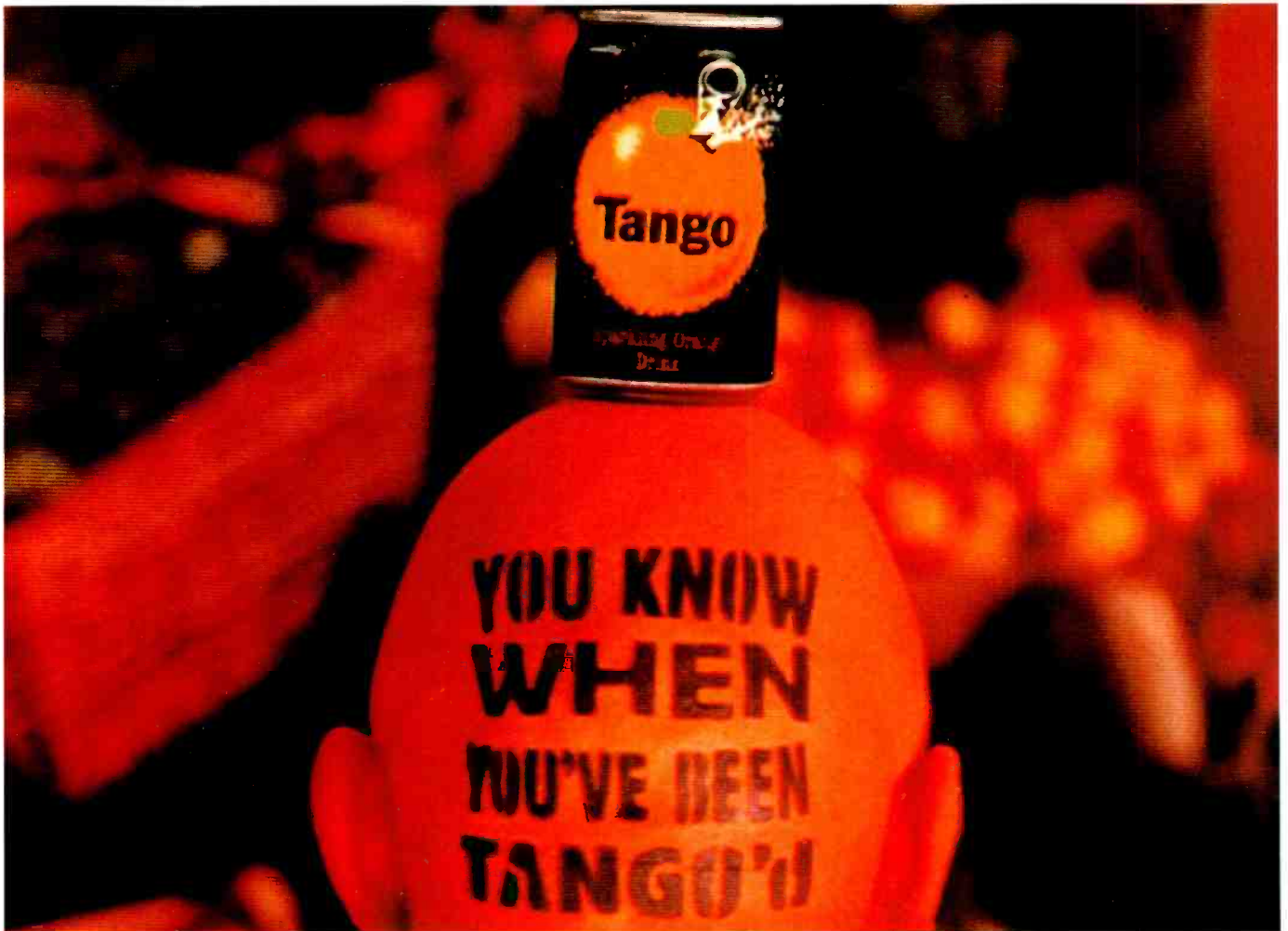
One should additionally be aware of the fact that certain types of microphones actually demand much higher phantom currents than generally acknowledged. These are but a few of the many reasons why the phantom supply to the microphone is so important.

Balancing

With a few exceptions, most high-class microphones are balanced—but not everything that has two signal lines, a shield and XLR connectors can be regarded as being truly balanced. Balancing has several obvious advantages, one of them being the rejection of common mode signals. One measurement that provides a great deal of information on this is the common mode rejection ratio. Common mode signals are unwanted signals that enter both signal lines and are rejected by precision balanced input stages. This rejection capability is indicated in dBs and termed the CMRR.

Quite frequently the microphone preamp input stages leave a lot to be desired. In many typical designs, CMRR values of 30dB–60dB are offered; this is far from sufficient. The CMRR value should be at least 80dB–90dB, not just at one frequency (it is often measured only at 1kHz) but rather at the more crucial frequencies of 50–60Hz and above 10kHz. The CMRR should be a linear as possible over the full audio frequency range.

Optimising the CMRR requires extremely careful fine tuning of the input stage. This, of course, is time consuming and inevitably results in considerably higher production costs. Considering the very high cost of modern mixing consoles, it still comes as a surprise that quite frequently the microphone preamp input stages leave a lot to be desired—either because of cost ▶



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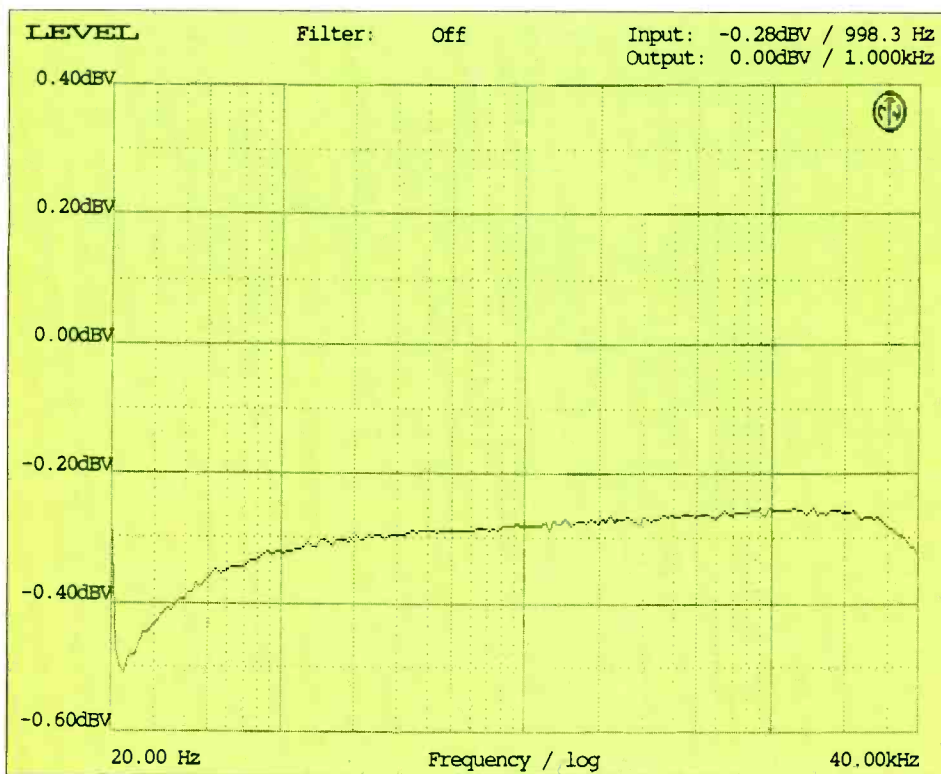


Fig.4: Audio transformer optimised with 1.5k Ω load achieving its flattest response

savings considerations or as a result of ignorance on the part of the designers.

Preamplifier circuitry

Preamplifier circuits are neither optimal nor state-of-the-art. The type of input circuits found in mixing consoles (and similarly so in the currently available outboard preamps) further limit the capabilities of microphone preamplifiers. Most of them are simplistic if not primitive designs, and quite a few still use transformers (which are often not bypassable). In many cases, these consoles incorporate standard circuit designs straight out of the application notes of the IC manufacturer. Almost invariably the manufacturer's application notes contain only basic ideas that need considerable refinement in order to achieve anything near optimum performance. And even the best ICs and operational amplifiers currently available cannot achieve the performance levels that are possible with truly discrete Class A circuits.

Even within the term Class A there are considerable differences in circuitry and performance, consequently, the term is no guarantee of ultimate performance; it simply describes a biasing mode with which you can (but not necessarily will) achieve better results. What really makes the difference is the actual implementation of Class A topology and the other distinct characteristics of the circuitry.

You also have to realise that some important aspects of preamplifier design cannot be quantified using 'standard' measurements—which, more often than not, are static and only use single-frequency measurements. Music has a huge dynamic range, and contains an unlimited number of tonal variations which are constantly changing, making sensible real-world measurements very difficult. However, there are some well-known, general design principles (some of which are largely neglected in most preamplifier circuits): excessive feedback must be

avoided; the active devices and stages should be ultra linear, preferably running in true Class A; and there should actually be no need to use feedback to stabilise and linearise the circuitry. The circuitry should be stable and perform well over the full audio range, without any feedback being applied. It is far better to have a linear stage right from the beginning than to try later to compensate for existing nonlinearities.

Headroom and stability

In many contemporary mixing consoles and microphone preamplifiers, there is inadequate headroom reserve. Bearing in mind the astounding dynamic capabilities of the best microphones, it at once becomes understandable why headroom reserve is so important. In the light of the fact that some microphones have dynamic ranges of 130dB, a microphone preamplifier simply cannot have too much headroom. Many designs are compromised in this respect, and with their limited dynamic range they trade off harsh distortion, aggressiveness and noise for a somewhat lower production cost. In such a crucial application so early in the recording process, is it worth the saving?

Some microphone preamplifiers will be unstable at very low and/or very high gain settings. It is, however, extremely important that the circuitry be absolutely stable over the full range of possible gain settings and with all different types of input sources and output loads. The stability margin must far exceed the usual audio bandwidth of 20kHz.

Instability at high frequencies can produce intermodulation with the higher audio frequencies, resulting in a characteristic change in sound that is not present in the original signal. This is not to say that a 400kHz frequency can be heard, but the resulting intermodulation frequencies lie within the audio band and are perceptible. This is why highest linearity and absolute stability are such crucial requirements.

Along with instability, frequently come limitations in 'real' (not closed loop) bandwidth and rise time. Considerable improvement in these areas is possible through the employment of wide-range audio circuitry that does not require feedback (or at least, not a lot of it). On the other hand, extreme specifications are not required—for instance, slew rates of 1000V/ μ s are not necessary, as the microphones themselves will be incapable of producing signals with such rise times.

Generally speaking the wider the bandwidth, the higher the risk of instability. What is required is an optimal compromise between the various requirements. Designers should be cognisant of the fact that they do not have to design theoretically optimal circuitry which excels in one or two specific aspects. Instead, they need to constantly bear in mind the varying characteristic of both the source and the load (the 'load' consisting not simply of the input impedance of the following stage but also encompassing the cables' and the following stages' capacitance, inductance and resistance).

Line drivers and buffers

Considering that cable lengths of dozens to hundreds of metres may be required in certain applications, it is self evident how important the line driver and buffer circuits are.

Most mic driver stages are unable to handle real-world loads very well. There are losses in accuracy directly related to the lengths of the cables. It is quite clear that the higher the voltage and current being sent down the cable, the less chance there is of interference and the negative effects of common mode signals. It is, however, not sufficient to simply amplify the small but pristine microphone signal to high voltages close to the microphone and then send these voltages down the cable.

Keeping in mind the characteristics of the cable (its resistance, capacitance, inductance, transmission factors) and taking into consideration the large variations of the diverse loads which the output circuitry must be able to drive perfectly, it is obviously critical to have a mic preamplifier that both employs extremely stable output buffer circuitry and also has the highest capabilities in the areas of voltage, current and bandwidth. One hundred metres of good-quality microphone cable can present the output stage with an additional resistance of 10 Ω –50 Ω and an added capacitance of 5000pF–20,000pF. Add to this the characteristics of the following input stage (which itself has capacitance, inductance and resistance—all frequency dependent), and it becomes quite clear which capabilities a driving stage is required to have. The buffer must be able to provide very high peak and continuous voltages, and do this with absolute stability while guaranteeing perfect common mode rejection. This is not an easy task and very few existing designs have even half-way acceptable performance in this respect.

Conclusion

There are a number of other aspects of preamplifier design which, though not as easily explained as the ones discussed above, also have a notable influence on performance. But when the above-mentioned areas are optimised, it is quite astounding how the performance of first-class microphones—be they modern or classic models—can be improved. ■



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Hi-8 — THE FORMAT

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proven performance and reliability required in a professional studio.

FRONT PANEL FUNCTIONS

Being designed for the professional studio the DA-88 allows access to all its major functions from the front panel. Location, auto-punch in/out, tape monitor switching, and track/machine delays are

DA-88 EIGHT TRACK DIGITAL RECORDER

all accessible from the front panel without the need for an external remote control. Digital/analogue source switching, remote/local control, varispeed and record frequency select also appear on the front panel, making the DA-88 instantly familiar in use. The shuttle wheel on the DA-88 makes location to a specific point instantly familiar to an engineer used to the "rock and roll" method of tape location.

SYNCHRONISATION AND CONTROL

Multiple DA-88 units can be synchronised together (up to a maximum of sixteen units/128 tracks). The lock-up time of a multi-machine system is typically 2-4 seconds, making a multiple DA-88 appear as a single unit to the operator. Synchronisation of the DA-88 to video is achieved via the optional SY-88 sync card, which offers chase synchronisation, MMC and video editor control capability. Only one SY-88 is required per system. Control of up to six DA-88 recorders, one video recorder (via RS-422) and two analogue recorders (via TASCAM ACC1 & ACC2 ports) can be achieved from the optional RC-848 system controller which also offers comprehensive auto-locate, record function select, and track delay/machine offset control functions.

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DDA Profile at Battery Studios in London

DDA PROFILE

DDA's Profile console is being aimed squarely at the upper level of the medium-range studio market. So far nearly 20 consoles have been sold since its introduction just over a year ago. Major considerations have been to produce an easy to operate, affordable console (UK price approximately £50,000 including automation) which maximises on inputs and facilities in a compact frame (less than eight feet wide).

The console incorporates the 'Splint' concept used in previous DDA designs which effectively results in a split console with some in-line characteristics. Input and monitor channels are identical with the exception that input channels have mic-line amps and gain controls while the monitor has group summing amps, bus trims and group-tape switching. Both modules have full four-band EQ and filter sections, access to ten aux buses, and full routing capabilities, thus the console offers the best of both worlds—the ease of split console working combined with full (unshared) access to all channel functions.

The standard 56-module console provides 32 input channels to the left of its master section and 24 group-monitors to the right, producing a total of 136 possible inputs during mixdown due to the rerouting capability of redundant signal paths.

Signal flow

The Profile's input module can cater for two simultaneous signal paths while the group-monitor module can deal with three. This has been made possible by incorporating a twin function auxiliary section (Aux A) which will either operate as a straightforward stereo aux with level and pan, or as an additional return feeding directly to the mix bus.

In the case of the input module, whichever input (mic or line) has not been selected at the top of the channel can be switched to Aux A and output via its level and pan controls to the mix bus. This provides a useful facility for returning effects and other inputs which do not require EQ or additional signal processing—if the mic input is selected in this manner, its 20dB pad will match it to line level signals.

The group-monitor module includes an extra line input in addition to Bus and Tape: thus Aux A will pick up the non-selected source—either Bus-Tape or Line. A Sub Mix facility is also provided that locally routes the bus output to mix allowing a third path during mixdown; by using the group insert point, effects returns and so on, can be patched-in and controlled from the Bus

Trim pot with odd channels routing to the right and even to the left of the mix bus.

Switching of Bus-Tape monitoring is controlled either globally, or if the master Overdub mode is selected, locally from the TAPE button—it is not possible to monitor Bus and Tape paths simultaneously from a group-monitor module, although the non-selected path could be patched to the Line input and returned to the mix bus via Aux A.

Just as stereo Aux A has a dual function, so the other stereo auxiliary (Aux B) can be switched to send the channel signal to the routing matrix. This provides an extra 12 stereo effects sends, but obviously with only one gain and pan setting per channel. When configured in this way, the main channel path is disconnected from the matrix.

The remaining six mono auxiliary sends are arranged in pairs, in two sections with dual concentric level controls, individual ON-OFF switches and shared PRE-POST switching. The second section either controls Aux 3 & 4 or 5 & 6 depending on local switching—in this way, every channel can send to four mono and two stereo ▶

DDA's Profile console is high on features and low on cost. Patrick Stapley assesses the balancing act

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Our zealous devotion to quality goes beyond sonic subtleties. It also manifests itself in



This crustacean understands grounding better than some manufacturers — so don't be suckered. At D&R, we employ a unique starground system. On each circuit. On each module. On every console.

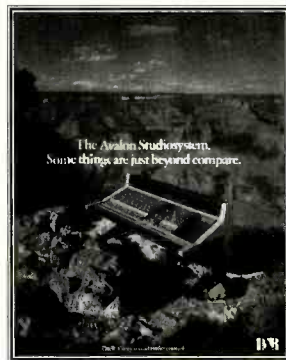
highly tangible ways.

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D&R handcrafts a wide range of mixing consoles for recording, live sound, theatre, post-production and broadcast.

The possibility of making digital recordings on a similar basis to those made with 'budget' analogue multitrack recorders had been a topic of contentious discussion even further back than Alesis' announcement of their intent to build a cheap (by previous digital recording standards) 8-track digital tape machine. The fact that this was to be Alesis' first venture into recording equipment—digital recording at that—ensured that it was greeted with reservation. The delay between that announcement and the arrival of the S-VHS-based *ADAT* eventually came to be regarded by certain manufacturers as a 'spoiling' period during which orders for analogue multitracks slowed in anticipation of the digital alternative. In the run up to the appearance of the prototype *ADAT*, Tascam announced their own Hi-8-based *DA-88*, and following it came a licensing agreement between Alesis and Fostex allowing Tascam's old rival membership to the *ADAT* camp. The whole situation added up to another 'format war' regarding which, if either, machine would become the accepted standard. In professional circles, there were further questions concerning the quality and reliability of this wholly unproven area of recording. Now that both systems are available, and Alesis' *BRC* remote is imminent, it is time to take a look at the machines and their performance.

PIECES OF EIGHT

Alesis ADAT

There can be few people in this business who are unaware of the buzz surrounding the Alesis *ADAT* digital multitrack system and its claimed potential—particularly its use as a multiple-machine multitrack setup. The system will become complete with the forthcoming release of the *BRC Master* (or Big) *Remote Control*; for the purpose of this article I have been working with two *ADAT* machines both with and without the prerelease version of the *BRC*.

The essential design concept of *ADAT* is a simple 8-track digital recorder block, using S-VHS video tape running at three times normal speed. These blocks can be stacked to give up to 128 tracks (16 machines) using single serial data cables to daisy-chain machines, providing sample-accurate synchronisation without sacrificing audio tracks. Conventional routine multitrack operation is possible using nothing more than the simple remote provided with each machine, which can control the whole setup as if it were one big multitrack recorder.

The supplied remote incorporates transport controls, two locators plus a zero locate, that can be reset, together with global monitoring controls and varispeed (+1/-3 semitones). Access to the machines themselves is essential in order to select individual track safe-ready status.

I had a couple of sessions and mixes with this basic system, and they went extremely smoothly, rarely making me aware of any limitations of the format. I almost took it for granted that the audio quality would be excellent, with 64 times oversampling A-Ds and 18-bit D-As, and was not disappointed. The lock between machines is quite remarkable, bearing out the claims made for it; signals recorded across the two machines synchronise exactly on playback, with no phase jitters or stereo image shifts. The monitoring options during track laying and overdubbing mimic precisely those provided by my own

familiar MCI analogue machine, and the whole process was straightforward and intuitive. Basic digital bouncing between machines is provided by means of a single (supplied) optical link, making backups of important work a simple job.

In any multimachine synchronised system, an important consideration is the time taken for the machines to lock together when told to play, and with *ADAT* this lockup time depends on how it is used. If the machines are at the same point when Play is initiated, lockup is complete within a second or two, and this will be the case following a Locate, where the machines park together. A fast wind operation causes the machines to lose their correlation and consequently take longer to lock together, but even then the chasing seems pretty intelligent and delays are not unacceptable. It can occasionally become frustrating when winding back a short distance to check something—if you do not allow enough time for the machines to synchronise you risk missing the very thing you wanted to hear and have to do it again, although this is so common with multimachine systems that most of us are used to allowing for it. A thoughtful design point is the way slave machines mute until locked, avoiding the disorientating varispeeding and hunting heard on some systems.

The *BRC*

Anything more demanding than a straightforward track laying or mixing session will probably require the *BRC*, and it is the addition of this controller that puts the *ADAT* system into the major league. Besides providing full control of up to 16 machines, including track status, the *BRC* offers a vast range of features including comprehensive autolocating facilities, full time code capabilities both as master and as slave, machine offsets, MIDI synchronisation, digital bouncing and delays on individual tracks.

The layout of the *BRC* is extremely logical. Despite its power, this is a unit you could be working with as soon as it was out of the box. ►



Alesis ADAT—over 10,000 systems shipped already

It connects to the Sync In 'D' connector on the first ADAT machine, and additional machines are daisy-chained off the first in the usual way.

This done, the BRC appears to take over as a virtual machine, rather like an ES-Bus controller, to which all the connected ADATs slave; it is not the case that the first ADAT starts and then the others follow it, and the result obviously is a faster start. When using the BRC, the only reason to have the machines even in the same room is to keep an eye on their meters, and even this need can be eliminated with the optional remote meter bridges, which attaches to the BRC.

The track status section gives access to 32 of the possible 128 tracks at a time, and incorporates useful ideas such as an All Safe function, which temporarily takes all tracks out of Ready mode, returning to the previous state when released, All Clear which actually cancels all the readied tracks, and four groups for storing frequently-used sets of tracks.

Two machines
synchronise
exactly on
playback, with no
phase jitters or
stereo image shifts

On location

The Locate functions can handle up to 400 locate positions, organised as 20 songs with 20 points in each. The idea of a Song is central to the BRC's operation—each Song carries with it not only the locate positions and its start point but the entire configuration of the BRC for use with that song. SMPTE offsets, sync ins and outs, tempo maps and track delays can all be instantly recalled just by selecting the relevant Song. The Songs can be named, as can the locate points within them, and there is a telephone-style alphanumeric keypad for entering text, which means that no letter is more than four or five key presses away. There is even a set of commonly-used locator names to choose from—Verse 1, Chorus 2B and so on. Locate points can be captured on the fly or entered and edited manually (to sample accuracy!) and

can, like the main tape position display, be shown in terms of tape time (absolute or relative to the start of the Song), SMPTE time or bars and beats. Points can be positioned exactly at the beginnings of musical sections as there are adjustable pre-roll and post-roll times.

There are three additional locate points, one to use as a scratch pad and two to control the Auto Punch function. These automatically store the locations of any manual punch, after which selecting Auto Punch will repeat the operation, again with sample accuracy. Dropping in and out of Record is virtually undetectable even with steady tones, and there is a choice of four crossfade times for dropping in and out of different types of material. A Rehearsal mode allows punches to be previewed, and combining Auto Punch with the Loop function gives the option of automatically recording successive takes on consecutive tracks for that elusive solo.

A particularly novel use of the locators is in connection with the machine offsets and digital bouncing. Tracks can be bounced from one machine to any tracks elsewhere in the system via the 8-channel optical bus, under the control of the BRC. They can be bounced not only to the same point on the tape (with no processing delays—the bounced version is sample-synchronised to the original) but also to another section simply by offsetting the destination machine. The offset can be programmed in terms of minutes and seconds, but the nice touch is that locate points can be used as the offset reference, so that backing vocals in Chorus 1 can be bounced directly to all the other Choruses without having to use any outboard machines to spin them in and without having to work out any timings.

In use

On occasions such as live concerts where ADAT's capacity of 40 minutes on a tape is not enough, a special offset mode allows continuous recording across two or more machines. The BRC divides the connected machines into two halves, and when Record is initiated the first half start recording while the others rewind to the beginning.

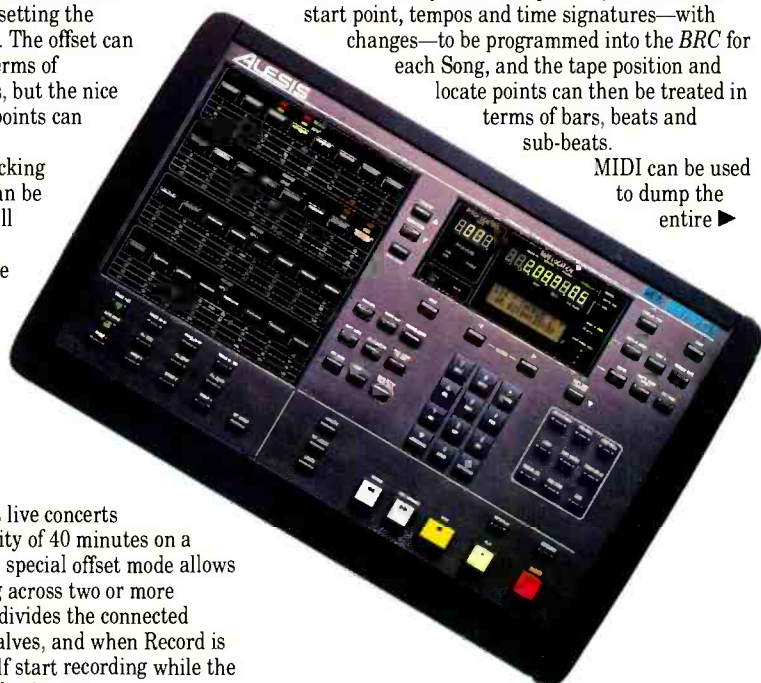
When the tapes in the first machines near the end, the second machines start up, allowing a programmable overlap. When the first machines

stop, their tapes can be ejected and replaced with fresh tapes which will take over automatically when the second set of tapes near their end. This process can be continued indefinitely, and then duplicated on playback giving sample-synchronised seamless joins.

When it comes to synchronisation, Alesis seem to have thought of everything. The clock for the audio can be synchronised to an external 48kHz clock—from, for instance, Alesis's AES-EBU-SPDIF interface—or to composite video or SMPTE frames. The whole machine can be slaved to incoming SMPTE—any format—and chases reasonably quickly considering its wind speed, which is hardly in the DAT league. I found it preferable to use the ADAT system as the master; because of the BRC's 'virtual machine' role it spits out code as soon as you press PLAY so that the other slaved equipment can be chasing while the ADAT machines start up rather than having to wait for them to lock first. It should be noted that the BRC reads and generates time code directly referenced to its own highly accurate internal sync code, eliminating the need to stripe an audio track with code.

The BRC also delivers MIDI synchronisation, either as MIDI Time Code or as MIDI clocks. In the clock mode the BRC's Tempo Map feature is used to directly drive a sequencer; this allows a start point, tempos and time signatures—with changes—to be programmed into the BRC for each Song, and the tape position and locate points can then be treated in terms of bars, beats and sub-beats.

MIDI can be used to dump the entire ▶



Alesis BRC—the big remote control

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configuration of the *BRC* via SysEx to an external device, although the setup can also be saved direct to tape in a 2-minute header area allocated during formatting. This means that all the configuration information for a session—syncs, offsets, locate positions (with names) and the rest—can be quickly reloaded when work resumes. This is only necessary if other work has taken place in the meantime, as the *BRC* setup sits in non-volatile RAM.

Another novel feature is the facility to add independent delays to any number of tracks, up to 170ms in 0.1ms increments, potentially useful for altering feel or creating effects.

In use, the *BRC* is a triumph of thoughtful design. For all its capabilities, nothing is ever more than a few keystrokes away, keys are all dedicated, with integral LEDs for toggled functions, and messages and prompts are clear and helpful. Setting up consists only of plugging together the 9-pin sync leads and fibre-optic digital bus; the system automatically assigns ID numbers to the slave *ADATs* and from there on the whole assembly becomes one big machine as far as the user is concerned. A big plus in my book is the huge, brightly coloured, illuminated transport controls—no chance of losing or confusing them. The other controls are logically laid out and grouped into sensible sets of associated functions, and the displays are clearly readable. I felt at ease with the *BRC* almost immediately, and was soon doing quite elaborate things with time code and a slaved Fostex *D-20*, which all worked flawlessly.

Options and connections

The main option at present is by *BRC*, but still to come is the digital interface providing the usual stereo buses complete with clock connections. With the *BRC*, no further add-ons are required to give full time code implementation, although the stand-alone machine cannot be synchronised with other equipment without third-party add-ons. The forthcoming Fostex version should have synchronisation on board while at the same time being fully compatible with the Alesis system—an

Alesis machine in multiple stack will be transparently replaceable with a Fostex machine.

Connections on the machine comprise 9-pin D connectors for sync in and out—daisy-chaining machines—and for the optional meter bridge, together with optical digital connectors, 1/4-inch jacks for unbalanced -10dBm operation and EDAC multiways for +4dBm balanced. There are also footswitch jacks for punch in-outs and the Little Remote supplied with each machine. The *BRC* has 1/4-inch jacks for time code. BNCs for video and word sync, and MIDI ports.

Conclusion

It is clear from Alesis' own literature that as much thought has gone into the technical aspects of *ADAT* as the operational ones. Alesis are, quite rightly, very concerned about robustness of data and compatibility between machines, and indeed I had no trouble on either score. The build quality, which one might have expected to be the corner they had to cut, appears to be extremely high. The transport, contrary to rumour, looks to be a rugged professional unit, and the only sacrifices to the price tag seem to be the very modest cosmetics (on the machines—the *BRC* looks quite smart) and the use of an EDAC for the balanced +4dBm analogue I-Os.

With third-party complementary products already available and many more in the pipeline, including Fostex's fully *BRC*-compatible machine, *ADAT* must stand a good chance of becoming established as an industry standard right across the board. Its price makes it affordable in the home studio while the *BRC* fits it for use in full-blown professional facilities. There will be those who believe that at that price it cannot be much more than a toy, but this is decidedly not the case; *ADAT* will give anything on the market a run for its money. I would buy a system tomorrow if I could. ■

Dave Foister

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● ALESIS ADAT

▼ DOWNSIDE

Three locate points on stand-alone machine; slow wind speeds; no shuttle, although Cue-Review is provided

▲ UPSIDE

Simplicity of connection and operation; solid reassuringly large construction; comprehensive, intuitive control via *BRC*; good range of interfaces to outside world; excellent sound quality; attention to detail in construction and provision of facilities.

Tascam DA-88

So much speculation has surrounded the capabilities of Tascam's new digital 8-track, tape-based multitrack and its merits *vis-a-vis* the Alesis *ADAT* that there has been a danger that the real significance of these machines would be overshadowed. Industry observers will not easily remember a time when the launch of new products created such a groundswell of interest which was so closely followed by cynicism which questioned the feasibility of the products, their actual existence, the viability of their chosen (tape) media, their reliability and ability to deliver.

The traditional rivalry that such a head-to-head scenario generates has been characterised this time around by its intensity and no doubt this will fester that much better with Fostex' declared support for the *ADAT*. It is hardly surprising, however, as the signs indicate that both parties consider the stakes to be enormous, and that their machines have huge market potential. The fun of it is that neither side will know the outcome for ▶



Tascam's use of 8mm tape heralds another format war

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TABLE

	TASCAM DA-88	ADAT
Tape Format	Hi-8	S-VHS
Pitch Variation	±6%	+1semi -3semi
Max Record Time	108min (NTSC) 114min (PAL/SECAM)	40min*
Max No of Units	16	16
Max Tracks	128	128
Tape Speed	15.8mm/s	95.76mm/s
Rewind Time	80s	100s
Simultaneous Remote Acc	48 tracks	32 tracks
Heads	4	4
Sample Rate	44.1 & 48kHz	40.36-50kHz
A-D Conversion	1-bit 64x Delta-Sigma o/s	16-bit linear 64 x Delta-Sigma o/s
D-A Conversion	18-bit linear 8x o/s	18-bit linear
Frequency Response	20Hz-20kHz	20Hz-20kHz
Dynamic Range	>92dB	>92dB
Channel Separation	better than 90dB at 1kHz	better than 90dB at 1kHz
Crossfade Time	10ms-90ms (10ms steps)	10ms, 21.33ms, 32ms, 42.76ms
Tape Width	8mm	0.5inch
Track Width	50% wider than DAT	100 microns write; 30 microns read
Sync Track	helical control track	analogue longitudinal control & helical timing markers
		* Single Cassette

some time yet and neither seem prepared to accept the eventuality that the two may even be able to co-exist.

With the arrival of the Tascam pretty much on time, users are in the very fortunate position of having a choice between machines that outwardly offer similar features, price and performance but which, on closer inspection, reveal significant operational differences.

On spec

The DA-88 runs at 44.1kHz and 48kHz, has 16-bit linear, 64 times oversampled Delta Sigma A-Ds and 18-bit linear eight times oversampled D-As. Error correction is double RSC with a quoted frequency response of 20Hz-20kHz ±0.5dB, a dynamic range in excess of 92dB, THD less than 0.007% and more than 90dB channel separation at 1kHz. It employs a 40mm diameter head drum revolving at 2000rpm working with a Hi-8 8mm metal particle tape running at 16mm/s. Audio is recorded referenced to a control track which manifests itself in the DA-88's display as Absolute Time and can either be recorded in advance as part of a real-time format process, or recorded simultaneously with audio at the desired sampling frequency. Formatting digital tape is a drag but it is part of open-reel digital culture and amounts to a bearable way of working. Recording audio while formatting does have the drawback of peppering the tape with Absolute Time zero and beyond points because every time formatting is initiated, the Absolute Time reference kicks-off from zero. While this gives the machine no operational problems, it does mean location and making sense of a mixed tape is more difficult for the user.

There is no means of picking up and extending a Control track in the manner of a DASH machine, although to all intents and purposes this should not be a problem. However, it is possible to change track record status while simultaneously formatting. It is pleasing to note that operation of the DA-88 is similar to that of an analogue machine. Points to note are the ability to put tracks in record from Record Ready status by holding down RECORD and PLAY, by striking RECORD while in Play with tracks in Record ready status or by striking individual track record buttons once the machine is in the traditional Record Standby mode with tape running. Exiting Record is even

more flexible, with any transport key strike aside from the RECORD button rendering the machine safe and this includes the JOG SHUTTLE switch. Thus by setting the jog wheel into reverse or forward search, a single key press shoots the machine out of Record and into Cue mode to audition the last pass or find the next section of audio. The quality of shuttle audio is surprisingly cohesive with none of the raggedness encountered on many DAT machines, and the dial very quickly becomes indispensable. Cueing becomes accurate once the response of the dial is mastered and in all cases and modes the PLAY button press to audio start time is respectably brisk. However, the cue volume in Shuttle is a tad quiet and while I appreciate that high output fast cueing audio is objectionable, a little more level would not have gone amiss.

The transport works quickly and efficiently and transfers tape off the heads in all modes except Shuttle. Fast forward and rewind functions have two speeds—fast and very fast—with the kickdown coming in after a few seconds of fast winding speed. Absolute Time is flashed during all wind modes to give an indication of where the tape is, and there is a reassuring intelligence to the transport that slows winding speed towards the end of a rewind.

With all the talk about the fragility of digital tape media, this is the sort of tape handling that will be appreciated by sceptics. Entering Play from any wind mode is fast with no churning of mechanical parts or waiting for the machine to catch up with you. Also of note is the DA-88's operational noise, the small cassette and well insulated, tank-like outer shell reduces transport noise to an acceptable level in all but the most violent wind speeds. What is reassuring is the consistency of what transport noise there is—each function is accompanied by a specific sound without unexpected clunks, whirs or momentary silences. This tells me that the DA-88 is good at what it does.

Running in

Within a few hours of running the DA-88 the user will certainly question the need for very long tapes. The economics of buying a 90-minute Hi-8 cassette, which equate to an available recording time of more than 110 minutes, while attractive,

poses problems. The transport will comfortably go end-to-end in under two minutes but the sheer length of audio available becomes logistically cumbersome to handle in much the same way as three-and-a-half spliced rolls of 30ips 2-inch would be unmanageable even if the air conditioning could handle the gas turbines required to move the stuff around. The speed of the wind and the length of the tape makes cold start point isolation as haphazard as finding a middle eight on an identless 2-hour DAT. We need more information in the subcodes.

Long recording times will, however, be appreciated for live and archiving work but general sessions will no doubt prefer to concentrate on the 37 minutes provided by a 30-minute Hi-8 tape. Matters are not helped by the provision of just two memory locations, even though they are entered by a single key press and can be displayed on the LED display by scrolling with the DISPLAY button.

The RC-848 remote provides a generous 99 locations, but a little memory is a good thing with the DA-88 and the skill of deploying pen and paper, mental recall and using the two memories creatively develops naturally.

The ±6% varispeed is wonderful. Activated on a dedicated button, the slew rate up or down to the preprogrammed amount is smooth and fast and certainly as good as your average analogue machine. While the range may not seem excessive, it is incremented in 0.1% steps and can, of course, be used in Play and Record.

Analogies to analogue machines end with some of the advanced features that are expected of a digital machine. Track slipping taps into a useful 150ms of delay per track. Once set it stays in memory even when a different tape is loaded or the machine is turned off, which could be

The quality of shuttle audio is surprisingly cohesive with none of the raggedness encountered on many DAT machines

unfortunate. Perhaps more importantly, the DA-88 by virtue of running to its own control track permits automated punch-in and outs. This is achieved by selecting the track to be doctored, activating Rehearsal mode, running tape, hitting the RECORD button at the in point (stored in Memory 1) and PLAY button at the out point (Memory 2). The DA-88 then presents the operator with a repeatable drop-in or out sequence with input-tape switching, five or more seconds of pre-roll and a fixed three seconds of post-roll around in and out points that can be fine tuned using the up-down increment buttons.

To commit to tape, the REHEARSAL button is ►

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pressed again followed by PLAY and you can do it for real, safe in the knowledge that if the player gets it wrong you can try again.

As in everything else on the DA-88, repeated drop-in and outs are silent and glitchless—you simply do not have to worry about it. Crossfade time defaults to 10ms but is variable in 10ms steps from 10ms–90ms and is adjustable using the increment buttons and the display. As you would expect, there is also no tape creeping and the machine cycled happily during lunch breaks. I tried my damndest to break this machine—not for any particularly malicious reason, but because I, like many others, have become a little wary of cheap digital marvels that purport to have professional applications. I ran the review model constantly throughout the period it was in my care and in that time I expected it to survive everything from the aforementioned marathon cycling to repeated automated drop-in and outs, vicious and lengthy shuttling, stacks of recording including periods when I physically rocked the machine (it is very stable), plus attempted

transport abuse which included pulling the plug on it when it was going flat out. My enthusiasm was soon replaced by respect; in all instances the DA-88 saw me coming. Mix and matching sample rates in format recording elicits only a brief error LED flash at around the change over point.

Sonically the DA-88 cannot be faulted—it is clean as a whistle.

Options and connections

Much has been made of daisy-chaining multiple machines (to a total of 16 units—128 tracks—interconnected by multipin cables without an external synchroniser). Offsets can be entered per machine with frame accuracy. The front panel CHASE button and associated LED is explained. Provision is also made for attaching an extension metering unit. Word sync inputs and outputs are supplied but an SY-88 synchroniser board gives an all standards time code reader-generator along

with an RS422 port.

These options account for presence of the front panel Clock LEDs and button. Additionally card slots provide optional AES-EBU, SPDIF and SDIF2 interfaces. Standard digital connection between DA-88s for cloning is presented on a multipin and analogue inputs and outputs are available on unbalanced RCA sockets in addition to balanced multipins. Two types of remote are available: the basic RC-808, which duplicates the front panel controls, and the grander RC-848.

The latter provides transport control and individual track arming for six DA-88s, an Absolute Time and locate display for the 99 location points, a keypad, LCD and associated dedicated buttons for many of the more advanced functions. It also has an RS422 port which means it can control external hardware. I look forward to getting to grips with a brace of DA-88s and the advanced remote in the near future.

Conclusion

It all stinks of over-engineering. There is something almost sinister and indestructible about the DA-88 and I am not just referring to build quality, but to the sheer unstoppable of the concept of the machine. Look the DA-88 in the face and you see an inevitability to its widespread adoption.

An 8-track analogue machine simply cannot fight on the same turf as the DA-88 and its 'stackability' surely must question the longer-term survival of wider gauge analogue multitracks as well. This machine cannot be ignored, it is not going to go away and that is perhaps the hardest thing to accept about it. The shape of recording is changing because of boxes like this, and there are likely to be advantages to getting in on the ground floor with this sort of technology. I have absolutely no reservations about the DA-88. ■

Zenon Schoepe

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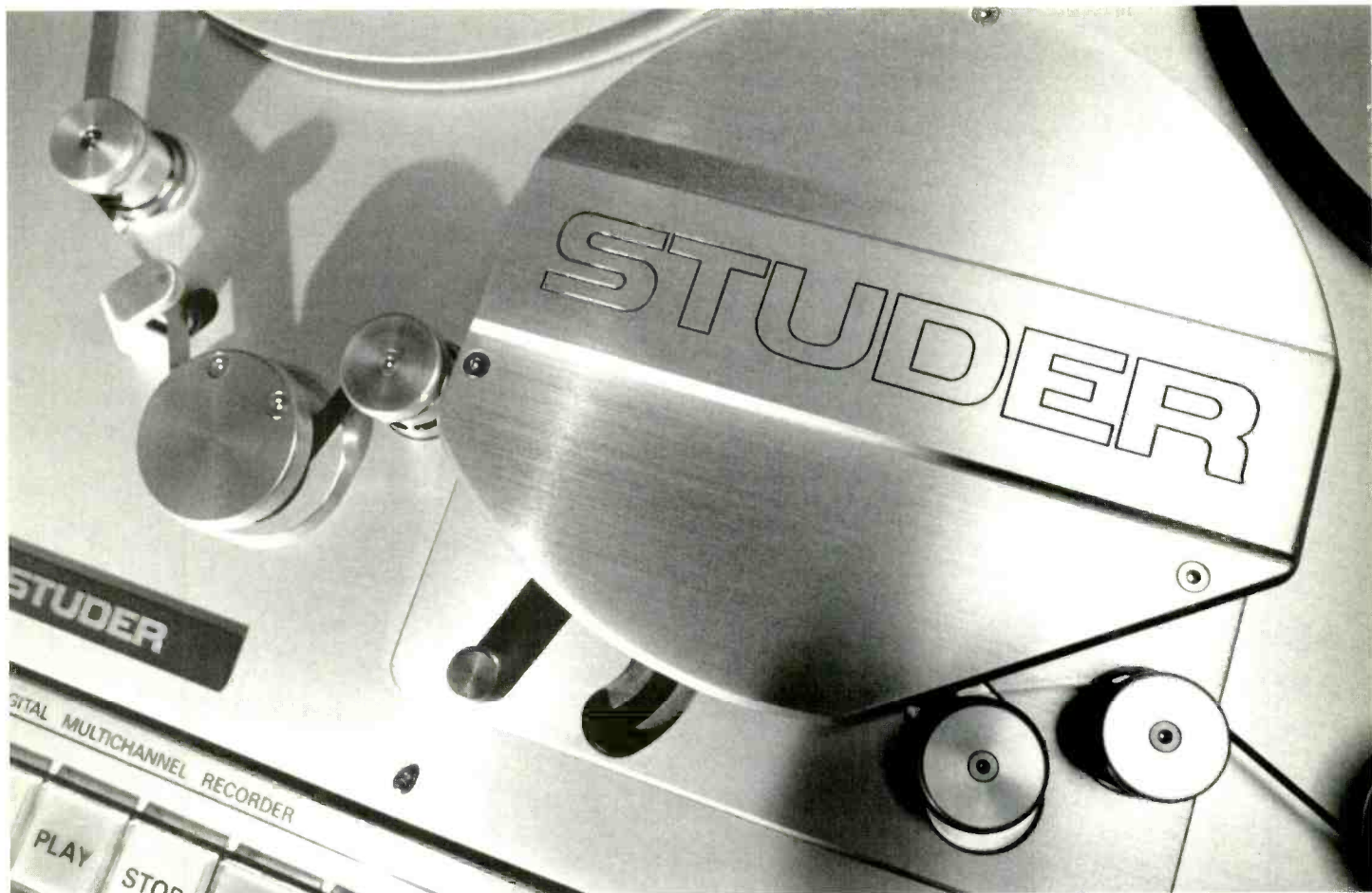
● TASCAM DA-88

▼ **DOWNSIDE**

Only two locate points; (Tascam could have taken the initiative and implemented some form of DAT-style indexing particularly as the recording times available are seriously long); shuttle audio output level is a little on the low side.

▲ **UPSIDE**

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Every cloud has a silver lining, at least for some people. 'Magnetic recording... an endangered species... only a matter of time... stock deterioration poses a serious threat to our recorded heritage... many companies are finding that when they attempt to remaster, their vintage tapes will not play back because of severe shedding, binder failure and the ravages of time...'

I quote from publicity material sent out by IDT, Innovative Development Technology Inc. of Riviera Beach, Florida. IDT describe themselves as, 'The only company that can safely recover your tapes and restore your peace of mind! At IDT we specialise in the art of magnetic tape recovery. This has led to developing the revolutionary and unique XT process that allows deteriorating master tape to be successfully transferred onto a new, safe working copy.'

Sounds familiar, I thought, and asked IDT whether I was right in thinking that the XT process was originally developed by Agfa. My memory was that Agfa had commercialised the heat treatment of tapes which have gone sticky through the effect of moisture in the air on the base and binder combinations which tape companies were using a decade or so ago, before they realised how unstable they were in humid conditions. Ampex offer a similar service, but more as a favour to users of Ampex tape who find it has gone sticky.

Robin Gilbert, Sales and Marketing Director of IDT, confirms that it was indeed Agfa who developed the XT process. 'Pursuing tape restoration did not, however, align with Agfa's corporate goals, since the company's main purpose was to manufacture recording tape rather than to restore it. Moreover Agfa's Magnetic Tape Division was acquired by BASF in 1991 and no longer exists as a separate entity'.

Having had some dealings with Agfa over the years, I am neither too surprised nor too sorry. The company's crowning achievement was to run a technical seminar, just as the sticky tape story was breaking, and limit invitations to those who could prove they were on a magazine payroll. This rule excluded most specialist writers, self included, and left Agfa hosting a mix which included non-technical office assistants who fancied a few days out of the office.

In late 1989 IDT, a privately owned corporation, bought exclusive use of the XT process. According to Gilbert, 'IDT's engineering staff has made significant improvements, including the application of automation'. IDT's publicity literature confirms the fears I expressed when I first started writing about the sticky tape syndrome a few years ago.

No-one from the tape companies had told me about the problem. I had heard about it from engineers, and I pressed the tape companies, particularly Ampex and Agfa, for information. It was only then that both companies admitted difficulties, claiming that most other brands of tape were similarly at risk. I predicted at the time that sticky tape syndrome would become a major scandal. The attitude of the tape companies was along the lines of, 'We thought everybody knew'.

Of course they did not, any more than anyone talking to or from a cellular phone knew that their

Barry Fox

Recovering from sticky tape and getting a better picture of *Photo CD*

conversation, perhaps giving confidential information such as credit card numbers, can be picked up by anyone in the vicinity with a scanning radio costing under £200. They know now, of course, because of the so-called 'Squidgy Tapes'. Engineers know now about squidgy tape of course, but only because of the press, and some luckless people have seen old tapes gum up their machines.

It is the same game played by government departments. Embarrassing information is not kept secret, it is just not publicised—and anyone who asks about it is given the run-around unless they already have so much information that the only way out is to come clean.

In IDT's own words, 'In archives across the country, countless masters, priceless recordings and valuable information stored on magnetic tapes are suffering from irreparable damage of stock deterioration, binder failure, severe shedding, the ravages of time. This poses a serious threat to our recorded heritage—a risk too great to take'.

Pictures released by IDT show extensive damage after a tape mastered in 1978 was played. 'Your tapes?', ask IDT.

IDT claim to have saved 'countless recordings that would otherwise have been lost to deterioration, shedding and sticking', and says that 'the surge of remastering that has accompanied the growing popularity of compact disc led many recording companies to the realisation that quite a few of their original masters are nearly useless'.

Among their clients IDT name ABC Broadcasting, Gloria Estefan's Crescent Moon Studios, Cornell University and Voice of God Recordings. Voice of God, established in 1981 to circulate recorded sermon messages around the world, found in 1991 that its library of tapes was experiencing 'severe shedding and stock deterioration'. VOG's tape duplication supervisor described the deterioration as 'so severe that duplication was almost impossible'. IDT came to the rescue with the XT heat treatment.

As with the Ampex treatment, tapes are baked in an oven and then copied onto a digital master,

The attitude of the tape companies was along the lines of, 'We thought everybody knew'

hopefully using more stable chemicals. The original, unstable, tape can then be junked. Good luck to IDT for spotting a market opportunity in these recessionary times, and exploiting it. But what an extraordinary indictment on the tape manufacturers. For many years they sold the recording industry vast quantities of tape which later proved so unstable that there is now a thriving industry in recovering recordings from those tapes before, to quote IDT, 'they become as extinct as the carrier pigeon'.

Kodak have now come up with some clearer answers on recordable CD. First, on the question of patent licences, Kodak say that Philips will act as keeper of a pool of patents which covers all aspects of CD-R technology as standardised by the new Orange Book. The pool contains patents on recorders as well as blank media, owned by Philips and Sony, as well as Taiyo. Philips will issue one-stop licences. So far no licences have been granted, but the manufacturers of discs and recorders have been led to believe that this will happen as soon as the last legal details have been ironed out.

On pricing, I had asked Kodak how the company justifies its UK price of £17.50 + VAT (£20.56) for a blank write-once disc intended for use on Kodak's *PCD Writer 200* (£3,995 + VAT) to store digital audio, data, text or images, when Kodak charges only £4.99 including VAT for a blank *Photo CD* which appears to be physically exactly the same. I quote Kodak: 'When a consumer takes 36 photographic images to a Kodak *Photo CD* centre, he pays £17 for their transfer to disk. Because the disc can hold at least 100 images, the consumer can go back with further films, and each additional transfer of 36 images costs £12'.

This, say Kodak, is how we arrive at the £5 figure attributed to the blank *Photo CD* disc. In fact this rewrites history. Before moving into the sale of blank audio CDs, Kodak had clearly quoted the price of a blank *Photo CD* as £4.99.

The key to all this is Kodak's explanation that, 'the apparent low cost of these disks supplied to photo finishers is part of Kodak's marketing strategy to stimulate the take-up of *Photo CD* technology in the consumer market place'.

In plain English, this means that the £5 price for a blank *Photo CD* is a lost-leader. Kodak are selling PCD blanks at below cost price, because at real cost pricing levels, *Photo CD* would have even less chance of taking off as a consumer product than it already has.

Clearly Kodak are already worried that *Photo CD* may not catch on as a consumer product. The company has just changed PR agencies in the hope that this will somehow magically make the product fly. More likely pigs will fly. *Photo CD*, just like DAT, looks destined to end up a professional product at a consumer price. Someone's head should roll over this mistake.

Pricing blank audio CDs at four times the price of a blank *Photo CD* (which differs only in the pregrooving time code) gives a good clue to how much money Kodak are spending on trying to make *Photo CD* a consumer product. ■

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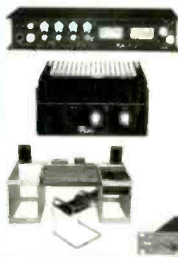
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Running a recording studio at any level of the music business has never been easy, but recent developments (in the US and elsewhere) have called into question some of the more basic habits evident in the 1990s recording studio—calling much of it ‘pollution’. Now, it may be true in the broadest sense that studios do not generate pollution but ‘internal’ studio pollution is another story entirely. Four aspects of studio operation in the 1990s have come under particular scrutiny.

The first is computers and computerised systems. Computers are arguably the most important recording and administrative tool currently in use. The computer has long been attacked as a source of possible damage to the human body. The dangers of excessive computer usage are well documented: damage to wrists and musculature have been accepted as a consequence of continuous use and are preventable. Less easily addressable is the problem of exposure to electromagnetic radiation from CRT monitors. Recently, these have become part of the controversy brewing over possible injury from such energy sources as high-tension power lines and transformers. Most, if not all, computer manufacturers recommend a minimum distance of 30 inches or about 75 centimetres from the screen to the face of the viewer. Keeping this distance proves difficult in practice’.

Some social scientists suggest that the very presence of a computer represents a time and energy succubus! According to a recent management survey, the 1990s may well cost the American business community \$140bn per year in wasted management time—that is, employees may spend as much as four hours a day with their desktop and portable computers (and other hi-tech accessories) engaged in tasks such as entering redundant data into databases and spreadsheets. The study expressed fears that this is representative of exercises that get in the way of real decision making and concluded by asking how much more effective decision making could be if that time were devoted to intelligent thought and discussion instead of devotion to computer applications that are ‘massaged’ to meet whatever directions seem most expeditious.

It isn’t completely clear whether these concerns mirror the real impact of computers in the technical areas of studio recording, but many owners and managers have recently complained of losing their freedom and flexibility to spreadsheets and reports. One studio owner commented ‘I work for a slave driver—my computer! All my productive time seems to be going to the business of pumping numbers through the computer’.

Many studio proprietors also complain of monthly number crunching required by their banks in order to prevent foreclosure of loans. The owner continued, ‘I have to produce these spreadsheets monthly to keep the “nervous nellyes” at the bank from pulling my credit.’ For those whose studio operation is at the behest of another, the need to satisfy the corporate ‘bean counters’ is just as intense. Even the personal or project studio owner seeking to claim a home office and small business deduction must produce and enter volumes of data

Martin Polon

Our US columnist asks: ‘if rock ‘n’ roll ain’t pollution, what is polluting rock ‘n’ roll studios?’

to satisfy the Internal Revenue Service.

The second area of environmental concern is equally vexing for it is even more central to studio operations than the computer. Aural pollution due to excessive monitoring levels in the studio has been identified and detailed significantly in the past, in the pages of this and other similar publications worldwide. Now in the US, due to the changed priorities of the Democratic Bill and the enforcement of Occupational Safety and Health Administration (OSHA) rules and legislation is expected to treble. The efforts of musician activists in and out of the orchestra pit have also polarised many in the music community on sound pressure level issues. The findings of several researchers that classical musicians can suffer hearing loss and tinnitus from extended exposure to orchestral music which matches the experience of ‘popular’ musicians has caused further examination of monitoring levels. Musicians’ unions have expressed interest in these issues and possess the power to move the controversy from the acoustics lab to the negotiation table. A similar phenomenon has occurred within the European Community, where the process of harmonising industrial safety issues has mandated acceptable sound level exposure at levels too low to be practical on both sides of the Atlantic. One mixer of some note has been very public about walking out of the control room during a session if others raise the

The findings of several researchers show that Classical musicians can suffer hearing loss and tinnitus from extended exposure to orchestral music which matches the experience of popular musicians

monitoring level in the room above his preference. But the figure used in most governmental enforcement programs centres on a far too low 90dB(A) and the issue will not just go away from the concerns of studio operators.

The third problem facing the studio operator trying to keep his or her ‘plant’ healthy is that of cigarette smoke. At first glance, this has been viewed as both a non-issue and as a matter of personal choice. To some extent, the owner or manager of a studio who smokes has frequently expressed more tolerance for others who also partake, than those in management who do not indulge in the weed. There has developed a sizable body of evidence over the years that smoking clearly is injurious to the operation and maintenance of multitrack recorders, video recorders and magnetic storage media where particulate and other airborne deposits play havoc with magnetic heads and mechanisms of all kinds. For that reason, smoking is frequently forbidden in technical areas. A recent decision by the Environmental Protection Agency (EPA), an arm of the United States government, has declared exposure to passive smoke even more undesirable. One studio owner who smokes like the proverbial chimney commented that ‘my employees had been treating me as though I had leprosy. Since the EPA decision, they regard me as a leper with the HIV virus’. Further involvement of the OSHA agency is also expected to regulate smoking in the workplace. The studio operator has to take a position that is fair to all of his or her employees that also does not create a position of risk for either the studio or its non-smoking staff. It is interesting to note that an estimated that 50% of all US companies in the electronic entertainment industry already virtually ban smoking in their facilities. Current government action will raise the figure significantly.

The final area of concern involves devices that have become as much a part of studio operations over the last three years as the conventional telephone has for the last 50 years. The cellular telephone has become a natural accessory for the studio industry—as much for its trendiness as for its utility. Nothing has made a comparable social statement for agents, lawyers, A&R executives or the other assorted ‘suits’ who hang around studios and sessions as the personal portable cellular phone. Why else would one whip out a pocket phone to make a call in a control room with five phones on the wall? Possible pick-up of RF output by the audio chain aside, the real concern raised through the news media and by concerned neurologists and brain surgeons is of malignancies in the brain cause by continued use of the portable phones. Although this only effects personal cellularity, the scare has prompted the cellular industry in the US to issue reflex denials. As there is no scientific proof that a danger does not exist, for the time being the issue is in limbo.

If there is a bottom line here, it is that in all four cases—monitors, monitoring, smoking and cellularity—the decision to use, or not to use, rests as much with the users of the studio as with studio management. A bit of shared responsibility one might say. ■

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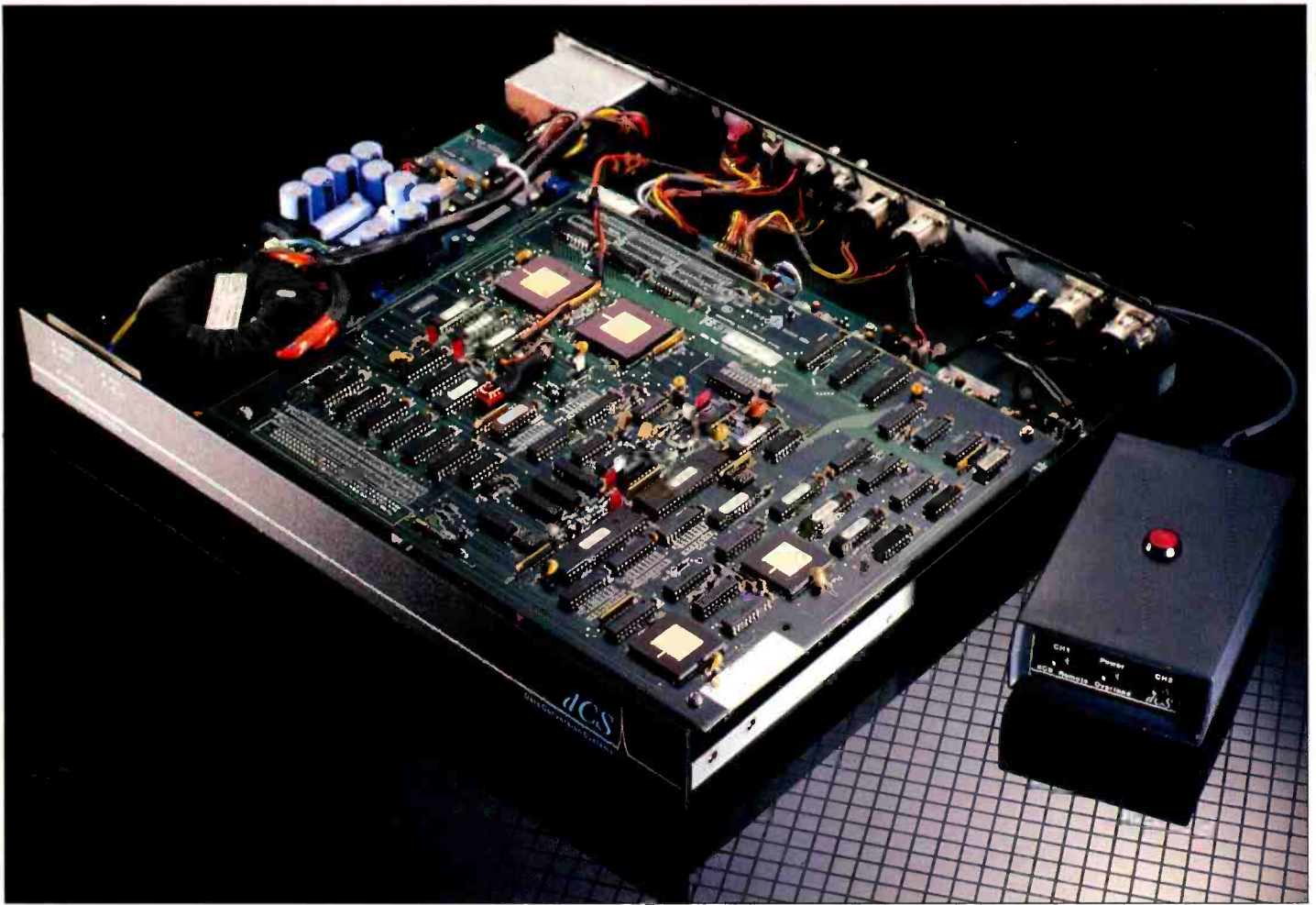
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Open for criticism—the dCS 900B

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The dCS 900B is housed in a black, single unit high rackmounting enclosure. It appears to be a large box for an item which is 'only an A-D convertor', but inside are a lot of electronics. There is no fan, and no ventilation slots—so no noise and no internal dust. Construction is sturdy, but rear support is recommended for rackmounting applications.

All connections are rear-panel mounted and are

as listed in the manufacturer's specification. There are only five user controls on the box. On the rear are the sampling rate selection switch (48kHz or 44.1kHz), word length switch (16, 18 or 24 bits), and channel 1 and 2 sensitivity multitrurn screwdriver presets. Alternative sampling rates can be provided, but only two can be made available within the unit. The word length switch allows the noise shaping, dither and so on, to be altered to optimise performance with differing word lengths. Sensitivity is adjustable over a range from +14dBu to +26dBu for full scale modulation, as specified.

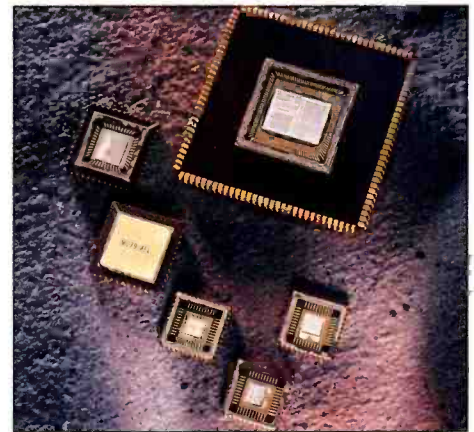
One switch under the unit selects either the upper or lower of two main voltages. The voltages provided vary according to country. Power enters through a filtered IEC socket, switch and fuse assembly. Safety matters are adequately provided for. Once rackmounted, none of these user controls are easily accessible.

The front panel is blank except for a few LEDs to indicate sampling rate, master-slave status, and overload.

The rear panel contains a Remote connector, which can be used to connect an optional small remote control box with two overload LEDs, and a power indicator, and a reset switch on the top. On the main unit, overload indication is momentary, being held for about one second. On the remote box, overload indicators are latched; a poke of the

reset button will clear them. dCS state that overload detection is very comprehensive. Our experience confirms this. With various waveforms, we found a headroom of from 0.1dB to 2dB was necessary between nominal output levels from the test set and the detection of overload relative to a single sine wave input.

The box itself is well constructed, being simply made of steel, with aluminium front panel. Lots of screws keep everything well held together. Internally, there are three large PCBs, covering ▶



Chip detail of the 900B

MANUFACTURER'S SPECIFICATION

Signal-Noise Ratio	105dB, 0 to 20kHz bandwidth
Spurious Levels	Full scale input -100dBFS -20dB input -112dBFS -40dB input -120dBFS -50dB input -125dBFS below -50dB <-125dBFS typ -130dBFS
Common Mode Rejection Ratio	>90dB at 50Hz
Mains Hum	<-120dB
Group Delay	<1msec
Frequency Response	-1dB, 1Hz to 20kHz, 48kHz and 47.952kHz sampling -1dB, 1Hz to 18kHz, 44.1 and 44.056kHz sampling -1dB, 1Hz to 13.33kHz, 32kHz sampling
Analogue Inputs	Level for full scale 14dBu for FS min 26dBu for FS max >46dBu
Impedance	Damage Level Differential > 10kΩ Common mode > 2kΩ
Connector	XLR-3, female, pin 2 hot
Digital Outputs	250Ω line Sensitivity from 1 volt to 10 volts, pk-pk Damage Level 50 volts, pk-pk Connector XLR-3 female, AES/EBU SDIF-2 word clock Connector BNC male
Output Interface Specifications	AES-EBU 110Ω line out SDIF-2 Z load > 50Ω Time skew <100nsecs re: wordclock in-out Connectors Ch1—BNC Ch2—BNC Wordclock out—BNC
SPDIF	75Ω on RCA phono connector
Sampling Frequencies	48 kHz and 44.1 kHz standard 47.952, 44.05, and 32 kHz optional Any two may be installed.
Sampling Frequency accuracy	Master mode ±10ppm as shipped, ±10ppm/year, ±15ppm over temperature range Slave Mode ±300ppm about nominal frequency, lock in time <30sec
Dimensions	44 x 430 x 390 mm (H x W x D), 1 u 19-inch rackmounting
Weight	7 kg
Power Supply	120/240V (UK version), 100/220 V (Japan version), 110/230 V (rest of world) -45W

most of the internal area twice. All interconnections are by plug and socket, so servicing is easy. Two of the PCBs are fully legended, while the third is not. The transformer is toroidal and appears to be well secured.

Oversampling A-D convertors

The dCS 900B is a 128 times oversampling noise shaping convertor. This means that it samples the input signal 128 times more often than the designated sampling rate. The theory of digital convertor design includes a principle called The Nyquist Criterion. This says that in order to perfectly reconstruct an analogue input signal, it must be sampled at least twice the highest

frequency of interest. So, in order to get a 20kHz bandwidth, a minimum sampling rate of 40kHz is required. However, if frequencies higher than 20kHz are input, then they will reflect backwards into the digitised signal. Thus, a 2kHz input signal would appear in the digitised result at 19kHz. This is called aliasing, and to prevent it anti-aliasing filters are inserted to remove the signals above the Nyquist frequency. To avoid limiting bandwidth unnecessarily, the filters are very sharp but even so, a small gap must be left for the filter to act between the wanted frequencies and unwanted frequencies. From this requirement and matters to do with sampling rates used in television, total audio data storage requirements and so on, are derived our present standard sampling frequencies of 44.1kHz and 48kHz.

The sharp filters, while getting rid of aliasing products, have at least one serious side effect. As the signal frequencies near the filter cutoff point, they are delayed. Thus, if the input signal has a composite waveform containing 1kHz and 20kHz exactly in phase on entering the filter; when the signal comes out of the filter the 20kHz part will have been delayed with respect to the 1kHz part. The wave shape will change, and some people can hear the result.

One way around this problem is to sample at a higher frequency than is absolutely necessary. This is called oversampling. If the oversampling frequency is very high—such as on the dCS convertor, then the input filter can be very simple, cheap and stable. This is because it must only cut off frequencies at 128 times 48kHz, or 6.144MHz. Since the filter slope is small, almost no delay will occur. However, no-one wants to increase the amount of audio data stored by 128 times, so later on the effective sampling rate must be reduced. This is called decimation, and is like shifting a binary decimal point. In this process, a nearly ideal and very stable digital filter can be designed to simulate the required anti-aliasing filter, but with many fewer side effects. The phase shift through such a filter can be nearly linear—meaning that the frequencies passing through the filter stay in time with each other.

Overall, the conversion process takes time. In the case of the dCS 900B, the specified time—called group delay—is less than 1ms, but all frequencies are delayed equally and so arrive together. Measurements confirm dCS specification for delay and phase linearity.

Input performance and frequency response

Common mode rejection ratio is confirmed as better than 100dB up to 300Hz, then decreasing linearly to 50dB at 10kHz. This is an acceptable performance. Input impedance is almost exactly 10kΩ with gain range as specified.

The resulting frequency response across the audio band is better than specified, being less than 0.1dB down at 10Hz, and -0.43dB at 20kHz. Fig. 1 shows the effect of the anti-aliasing filter system, demonstrating the smoothness of pass-band response, and well controlled 100dB reduction of aliasing frequencies.

Additional bits

The race is on among digital audio manufacturers to increase the resolution or number of bits in each sample of digital audio. The present AES standard allows for up to 24 bits per sample, while convertor manufacturers' claim between 16 and 21-bit resolution. Many of the 18 to 20-bit convertors we have seen use an auto-ranging technique of some kind to give the additional bits. For example, they may place a 16-bit convertor inside a 3-bit gain loop (18dB gain range step). The input signal is measured and gain automatically set to bring the level to approximately full range on the 16-bit convertor. This convertor does its job and the gain condition plus converted level are combined to give 19 bits of data. One effect of this technique is that the ranging of the gain loop pushes the noise level up and down in steps, and effect which on occasion can be audibly noticeable—particularly to hi-fi buffs listening to wide dynamic range material at high level. ▶

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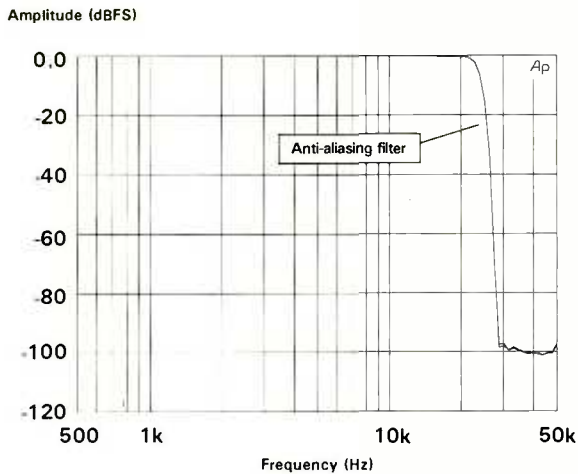


Fig.1: Analogue to digital frequency response. Left channel shown, right channel similar. Output level is referenced to 1kHz full scale output. Input level for FS set at +26dBu

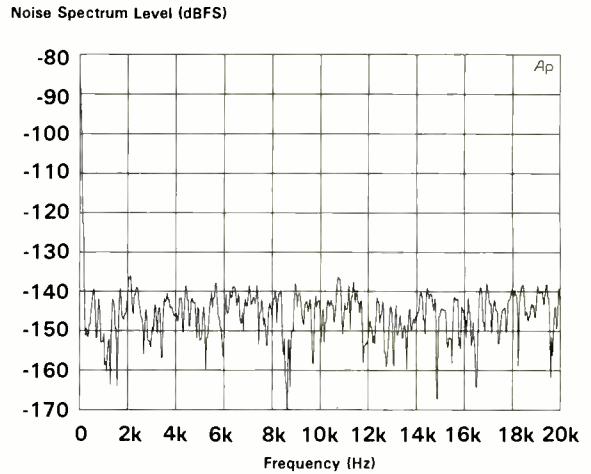


Fig.2: Noise spectrum. Reference level is 0.1dB below max. output level. Inputs are terminated in 50Ω, channel 1 shown. Noise is smooth, with no detail, an exceptional performance



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dCS claim not use this technique, but use another proprietary one which they believe is better. The basic, large signal dynamic range is said to be better than 100dB (equivalent to about 17 to 18-bit resolution), but at low levels it is supposed to increase to about 115dB (about 19 to 20-bit effective resolution). In addition, they claim that the resulting noise is weighted to make it less audible than white noise would be. Fig. 2 shows the noise spectrum for a no signal input. All noise components are about 140dB below full scale. To check on any very low level tones in the signal we averaged 64 of these measurements to reduce the random noise level and could find nothing—a truly exceptional performance. FFT-type spectrum levels must be read with care, since the apparent level is partly determined by the number of FFT samples, and the resulting bandwidth of each 'bin'. When the measurements in Fig. 2 are equated to a broadband audio measurement, the result would be about -112dB RMS, giving nearly the specified dynamic range of 115dB. This performance is the best we have measured on and A-D convertor to date.

The modulation noise test undertaken for this product uses a new technique available on the Audio Precision System One, using a number of test tones (in this case 31). The test uses FFT techniques and has the effect of separating distortion products and noise components into separate FFT bins. The resulting noise can therefore be found by find the total RMS value of the noise bins. This test was repeated at each of ten generator amplitudes ranging from just below full scale to -100dBFS. The result in Fig. 3 shows both the low level of noise, and limited modulation of the noise as generator frequency is altered. There is evidence here of some power line fundamental, and a tone at 800Hz which we hadn't time to investigate further, but even so this is an excellent result.

Likewise the result of the quantisation distortion test in Fig. 4 is good. At signal levels below -20dBFS, the quantisation distortion is about 8dB lower than the previous best Apogee AD500. There is a visible glitch in the curve at about -16dBFS, but the noise is still well down, and inaudible since it will be masked by the signal 75dB higher.

Linearity

Linearity is the ability of a convertor to accurately match the level changes of the input signal. Since

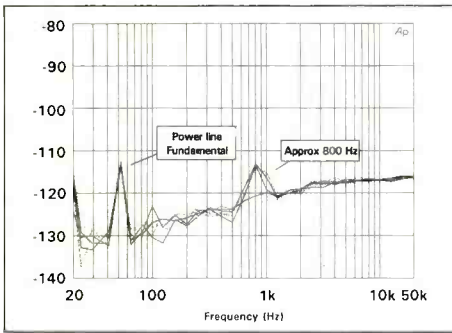


Fig.3: Modulation noise versus frequency, using the Audio Precision fastest 'empty bin' measurement technique. Generator amplitude is ranged between 0 and -100dBFS at 31 simultaneous frequencies but only the residual noise is measured

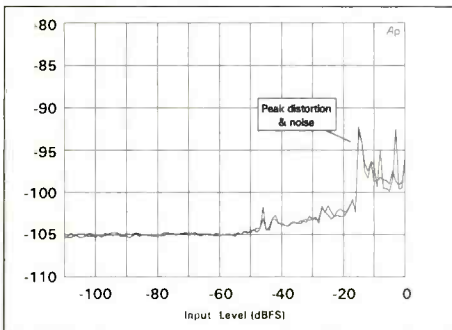


Fig.4: Quantisation distortion. Input and distortion level are referenced to the full scale level. Analogue input to digital output. Both channels are similar. Peak distortion is 75dB below the signal generating it

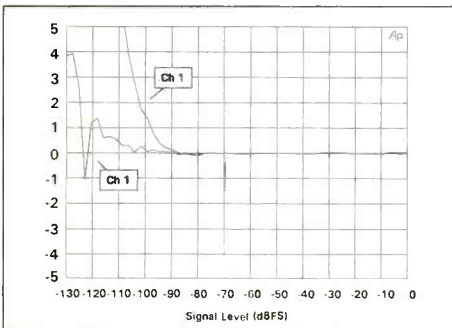



Fig.5: Linearity error, 225Hz. Input Signal. The graph shows the deviation from a linear input-output gain relationship. The input level is referenced to the full scale input. Channel 1 is good, but channel 2 is superb

digitisation is naturally stepwise, the step size (set by the number of bits of convertor resolution) and the step accuracy are important—particularly for lower level signals. A kind of audible granularity can result if linearity is bad. The dCS design attempts to optimise linearity—providing an active 24 bits—even though there are absolute limits on the real convertor dynamic range and absolute accuracy which are less than this. Our standard linearity test displays linearity well below the broadband noise level, and in some circumstance people can hear this. Fig. 5 shows the result of a linearity test, which is very impressive on channel 2, where the unit remains linear down to -120dBFS, once again the best we have seen. But channel 1 is not as good, beginning serious deviation at -100dBFS. Still, even that is better than typical 16 to 17-bit convertors. Letting the unit cool off made no difference to the ►

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Boxing clever—the dCS 900B with case

measured linearity results.

At this point we tried reducing the output word length from 24 bits to 16 bits to see if any difference could be noted. The result was that channel 1 began to lose linearity 10dB earlier than before, while channel 2 was unaffected.

Distortion

dCS have also sought to minimise the generation of spurious distortion products over the whole range of amplitudes and frequencies. THD+N with an input signal at -1dBFS measures 0.0015% or less across the whole frequency range, again an excellent performance.

Twin-tone and multitone distortion tests also showed little except the wanted signals.

Crosstalk and channel matching

A look at crosstalk reveals that it is -80dB at 20kHz, decreasing to below -100 at mid-band frequencies and lower. This is also excellent, and is never going to cause a problem. In addition, every measurement we made comparing the two channels for amplitude or phase revealed that they are so nearly identical as to be not worth putting in a graph.

Summary

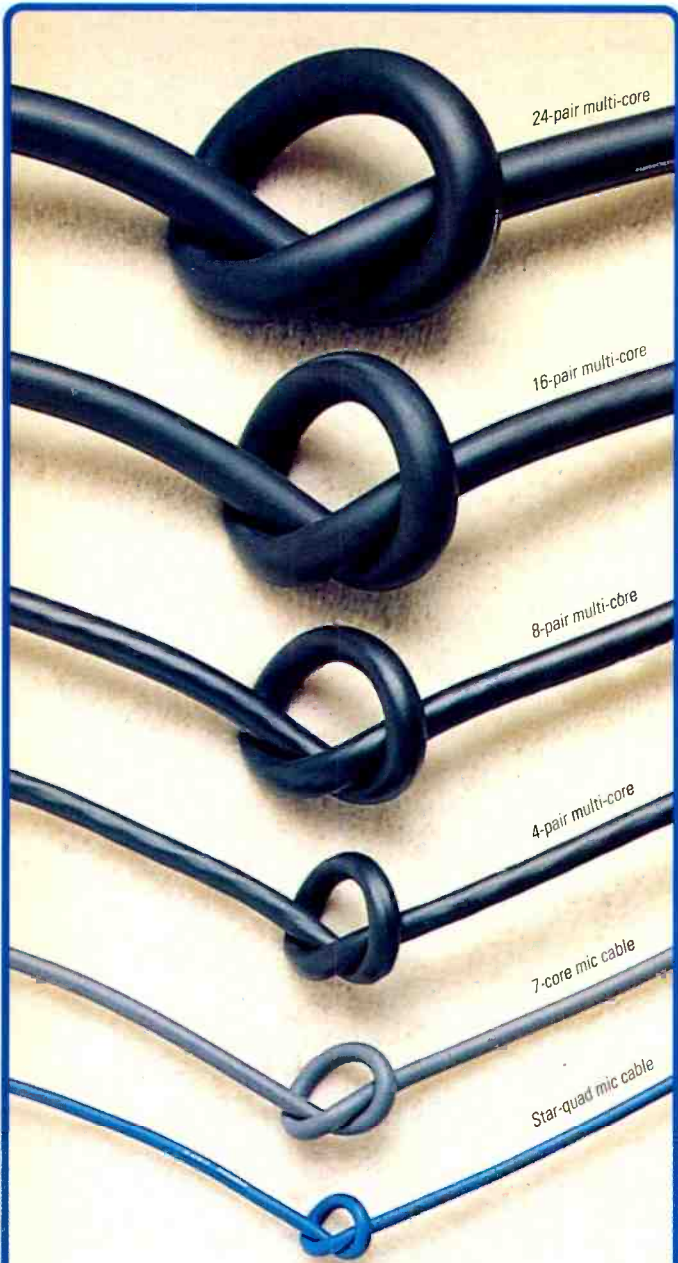
It was difficult to devise a sensible listening test

for the dCS 900B, as it only has analogue inputs and digital outputs—placing it at the mercy of the D-A convertors for both source material and output amplification. Therefore, I will not attempt on the sound quality. Suffice to say that the dCS 900B has a good following among classical recording engineers, the very people whose programme material would reveal the deficiencies the dCS set out to overcome. The only questions which we would ask are, why should the two channels differ so much in their low level linearity—and which is the norm?

Our assessment of the dCS 900B is that it accomplishes its goal. All aspects mentioned in the manual which were targets of the design team have been implemented better than other similar products we have tested to date. Operation is simple, there simply isn't any required. Where other products try to accomplish several tasks with one box, the dCS 900B goes for one thing—high audio performance—and hits it. The question is, if you are a recording engineer, will your customers notice the difference that a £2,600 (UK price) A-D convertor makes? For the esoteric hi-fi crowd, I am sure it will. For potentially historic recordings, will anything but the best do? For the rest of us—maybe we will want wait for semiconductor technology to catch up with the dCS crowd. ■

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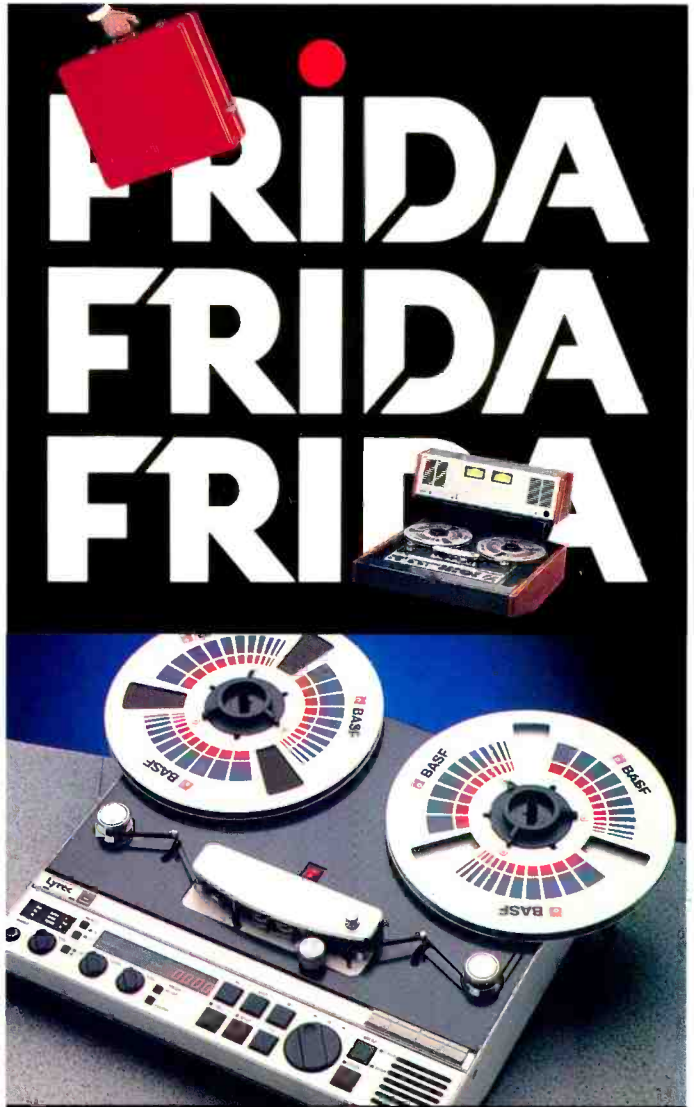
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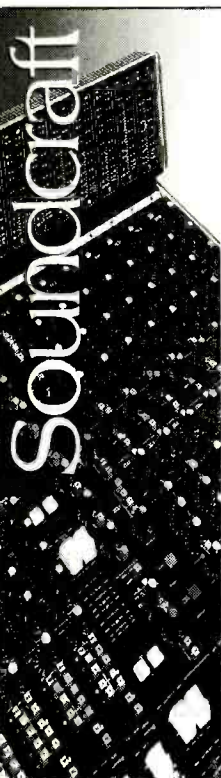
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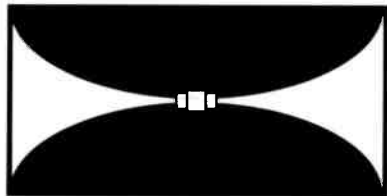
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ADVERTISERS INDEX

AD System.....	34
Audio Design.....	34
AMS/Neve.....	39
AMEK.....	IBC
AMG.....	48
AKG.....	53
APRS.....	70
Aphex.....	OBG
Audio Technica.....	10
Behringer.....	31
BSS.....	35
Digi Design.....	6 & 7
D&B.....	18 & 50
Danish Pro Audio.....	23
DCS.....	38
DAR.....	32
EAW.....	26
Future Film Developments.....	29
Fairlight.....	47
Groove Tubes.....	27
Genelec.....	36
HHB.....	12, 13, 21, 36
Klark Technic.....	Gatefold
Lexicon.....	24, 65
Larking Audio.....	62
Lyrec.....	71
Magomni.....	71
Neumann.....	42
Peavy.....	45
Pearl.....	29
Soundcraft.....	IFC
SSL.....	4
Sony.....	11
Studio Audio Video.....	14
Stirling.....	28, 64
Seem.....	23
Soundtracs.....	29
Shure Bros.....	55
Studer.....	59
Surrey.....	66
Sennheiser.....	67
SPL.....	68
Schoeps.....	69
Teac/Tascam.....	41
TC Electronics.....	57

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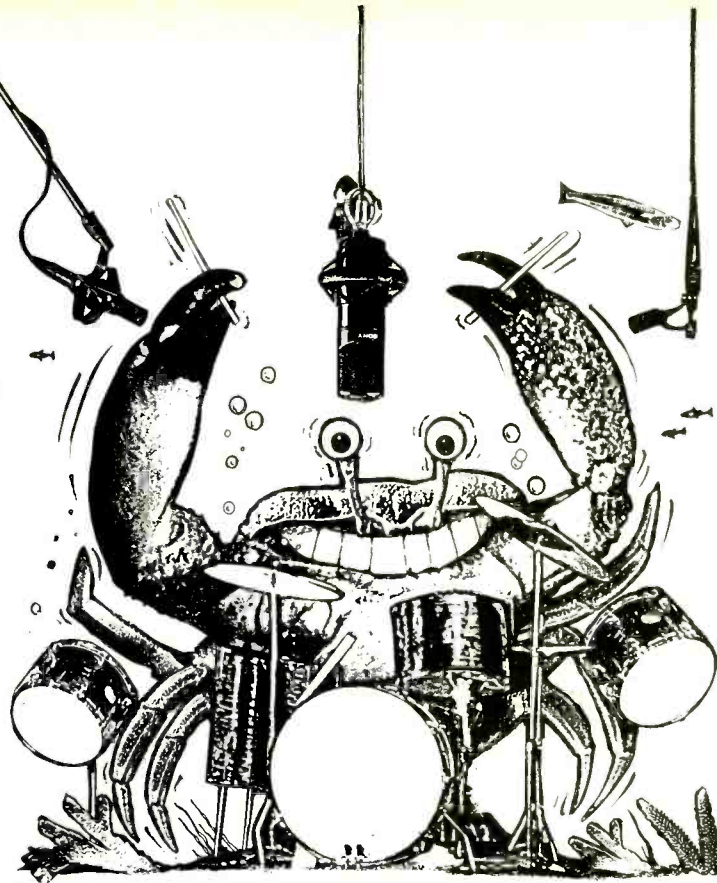
This month's column will look more closely at the uses of three reference CDs in assessing a working or listening environment. The discs listed below are not the only CDs you can use for this purpose, however, these discs have content that it is worth discussing more fully.

First is *The Sheffield Drum Record / The Sheffield Track Record* (Sheffield Lab CD-14/20). This is a CD version of two discs cut direct vinyl in the early 1980s by Sheffield Lab and engineered by Bill Schnee. This CD is made from a 2-track analogue reference tape made on the same session.

It is *The Drum Record* that is most useful: here we have two sets of drum improvisations from Jim Keltner and Ron Tutt lasting between six and seven minutes each. Recording techniques were quite simple—a pair of overheads about two feet above the kit with a third mic in front of the bass drum. The sound of the two kits differ considerably with player, tuning and drum manufacturer. Tutt's snare was tuned for recording with a fourth mic on it.

Here are two clean, unprocessed drum tracks with plenty of low-end energy, attack, tonality and clear stereo imagery. Once you are familiar with the track sounds, they can reveal a great deal about a monitoring system and the surrounding acoustic. Just set the level to a realistic volume and listen. Can you hear all the nuances that are definitely recorded? Is the stereo image 'interconnected' or is it just left-right? Can you hear the direct sound from the monitors or are acoustic reflections from the room degrading their performance? Stand close to one of the monitors and gradually walk back to the operating position. Are there changes other than those you would expect? Switching between large and small nearfields, can you hear that degree of detail on the nearfields to the extent that you can neglect the main monitors? Or are the nearfields more accurate than the main system?

Drum tracks may not give the complete answer to monitoring evaluation but they do leave the system response quite exposed. In many cases this disc has given me more information about a system than any of the others. The simplicity of the recording technique means that there is a uniformity over the kit sounds that would not be present with close miking. It is like having a



Keith Spencer-Allen

Establishing a sound reference in an unfamiliar environment

world-class drummer at your command.

My second CD choice is entitled *Anechoic Orchestral Music Recording* (Denon PG-6006) and it is probably the worst-sounding classical recording ever, but intentionally so. The achievement of this recording is to capture the 75-piece Osaka Philharmonic Orchestra in a virtually anechoic environment. The musicians making the recording had to wear headphones with a 2-second artificial reverb added. The first 26 minutes of this disc are the anechoic sound of the orchestra working through eight varied classical pieces, totally devoid of any form of reverberation. This section was a 2-mic stereo recording and there is a very good image perspective on the orchestra.

Pieces such as this (completely dry) are useful when monitoring in a non-studio situation. You may have to quickly assess the acoustic conditions within a room where you will be needing the make subjective balance judgments. A complex but anechoically recorded piece provides a clear indication of the effect of the room ambience on the monitored sound—the better the recording sounds, the worse the room reverb. This is clearly a more accurate assessment than clapping your hands around the room as the signal emulates from the speakers exactly as it will when you are working.

This disc is not always an effective test, however, as the monitoring level

has an effect here. This disc is very good for getting the room under control—moving the monitors or other equipment and adding sound absorber until you feel that you have a monitoring environment that is at least partially under control. There are, of course, better ways to achieve this but none are as easy as carrying a few CDs with you.

The *Studio Reference Disc* (Prosonus SRD) is full of useful material including the widest selection of test tones, noise and reference materials. However, for the purpose of monitoring evaluation there are a number of tests that I might draw on if I really cannot get to grips with a monitoring situation. If you had some test gear along, then almost all of this disc could be used but let us assume that we are still in the situation of just the CD, the CD player and our ears.

Track 51 contains the Listening Environment Diagnostic Tests (LEDR) developed by the Northwestern University. This is a set of computer-generated, psychoacoustic test bands where a cabasa sound is used to trace three paths between the monitors. There are no level differences between the left and right channels, but for the accurate reproduction of the correct path, numerous factors in the complete signal chain have to be in place. In one case the sound just moves to about six feet above the monitor and stops on each side

individually. Then there is 'up and over' between the monitors and also movements in the lateral plane.

I had the use of a reel-to-reel version of this test for a while, and it was possible to test from the tape machine to the listening position and identify the effect of even minute changes in the signal path.

However, as movement of the sound source is a psychoacoustic effect, some listeners are unable to sense this effect; for them this test is of little value. (This test can also be found on Chesky Records *Jazz Sampler Volume 1*).

Track 52 is a speaker phase (polarity) check. In most such tests this is a voice test, which in most cases is sufficient. This test is a piano track and is likely to show less obvious speaker polarity problems, such as an inversion in one band on one side of a monitor.

I have to say that not all of these tests are used each time. They are, however, a useful diagnostic tool if I am required to work in a particular situation that does not seem completely natural. If you know some of the problems present then it is easier to come to terms with them.

The real test has to be taking tapes from the session back into a situation with which you are familiar. All the deviations from the norm are all clearly obvious, and it then becomes far easier to compensate when you go back into the recording situation.

For some, the best place to evaluate a mix is the car system; it depends where you do most of your listening. One LA studio acknowledges this as a major factor for their clients and has installed (quite legally) a low-power FM radio transmitter so that you can drive around the vicinity of the studio block while listening to your mix—possibly the ultimate in making you feel at home with the results of your recording environment.

As a footnote to discussing these reference CDs, I have just received a copy of *Sound Check*, a CD collection of test and measurement bands, instrumental and music tracks, some spectacular sound effects and some general utility items. It has been compiled from experience by record producer Alan Parsons with sound designer-consultant Stephen Court. As yet I have not had the chance to fully evaluate it, but it looks like a useful source of reference—it will be more fully explored in a later issue of *Studio Sound*. ■

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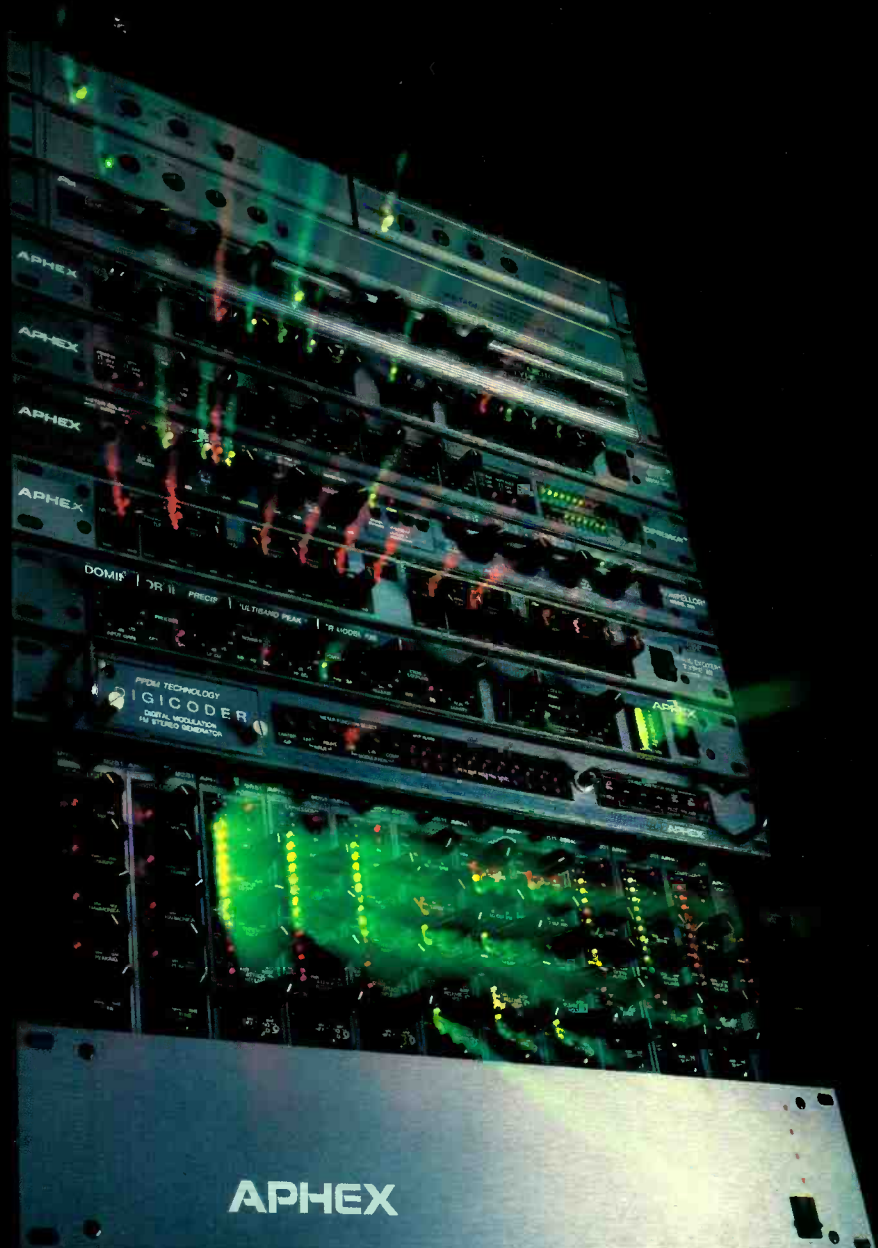
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