

December 1990

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STUDIO SOUND

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STUDIO DESIGN



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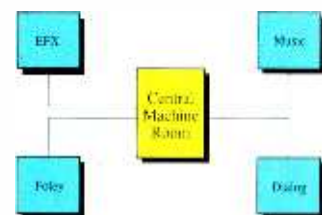
The DSP Option, a 24-bit digital mixer/digital signal processor.

This is not the first time we've introduced a revolutionary new digital audio product today with the promise of a long and profitable future.

As a matter of fact, as the company that started it all, we've made our share of promises. But a look at our track record (at right) shows we've delivered on those promises — and in the process changed the way the industry works. At the same time, customers who bought systems even way back in 1977 have

been able to upgrade every step of the way.

Take, for example, our latest breakthrough, the



With MultiArc™ multiple users user share processing and storage resources from a central machine room

DSP Option. It's a 24-bit, multitasking mixer/digital signal processor that provides 5-band EQ, automated level control, multitrack digital I/O, plus sample rate conversion. And it's compatible with all current Synclavier and PostPro systems.

What's more, the new DSP Option eliminates the Achilles' heel of digital audio: back-up. Loading and saving can occur in the background while you continue working.

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1977
We make history with the introduction of the first digital synthesizer/sequencer — the Synclavier.®

1980
A new Synclavier keyboard design accompanies powerful new features like sound layering and real-time digital effects.

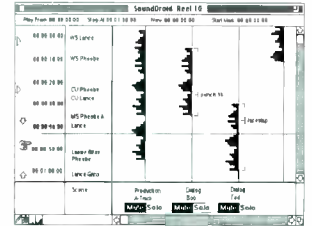
1982
New England Digital introduces the first commercially available disk recorder, Sample-to-Disk.®

1985
Presenting the new polyphonic sampling Synclavier and the first multitrack disk recorder/editor, Direct-to-Disk™ — The Tapeless Studio!®

1988
New England Digital goes Macintosh,® paving the way for new, easy-to-use screens like our own EditView™ and third-party software like SoundDroid.™

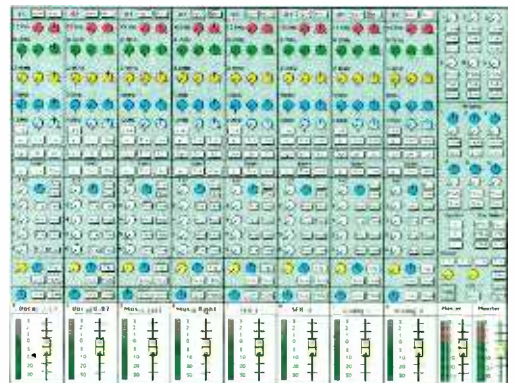
1990
Enhanced with the new DSP Option, today's Synclavier and PostPro™ workstations revolutionize the industry again as multiuser systems.

Our commitment to third-party software development ensures the widest variety of user interfaces. For example, with our EditView window and Lucasfilm's new SoundDroid Audio Editing System, you now have your choice of tape- or film-style editing.



Lucasfilm's SoundDroid is the first in a series of third party user interfaces created for NED.

And here's a look at the future: because the DSP Option incorporates our new MultiArc platform, it provides for a true multiuser system tomorrow, where multiple users will share the same disk and processing resources.



Our AudiMation™ virtual mixer gives you fast, intuitive control over EQ, levels, routing, and other system parameters.

By investing today, you can take advantage of such powerful features as 24-bit signal processing and multitasking. What's more, your investment will be rewarded in the future, as true multiuser operation becomes a profitable reality.

To find out more, send for a complete brochure package on the DSP Option and MultiArc.

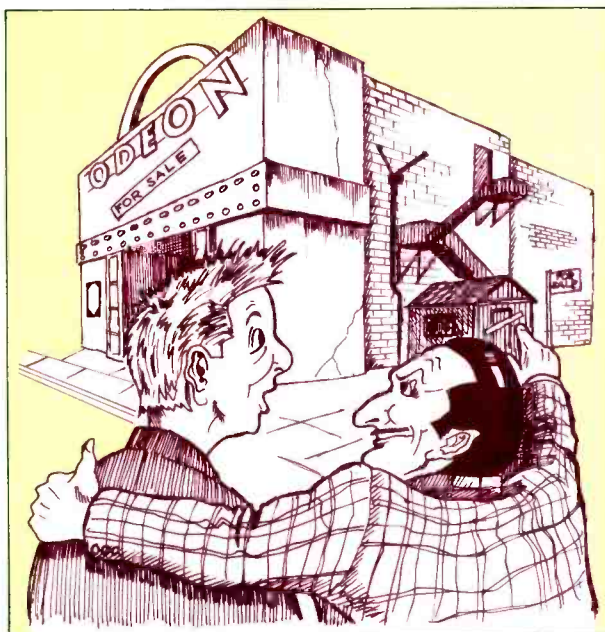


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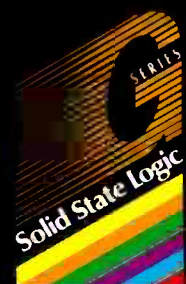
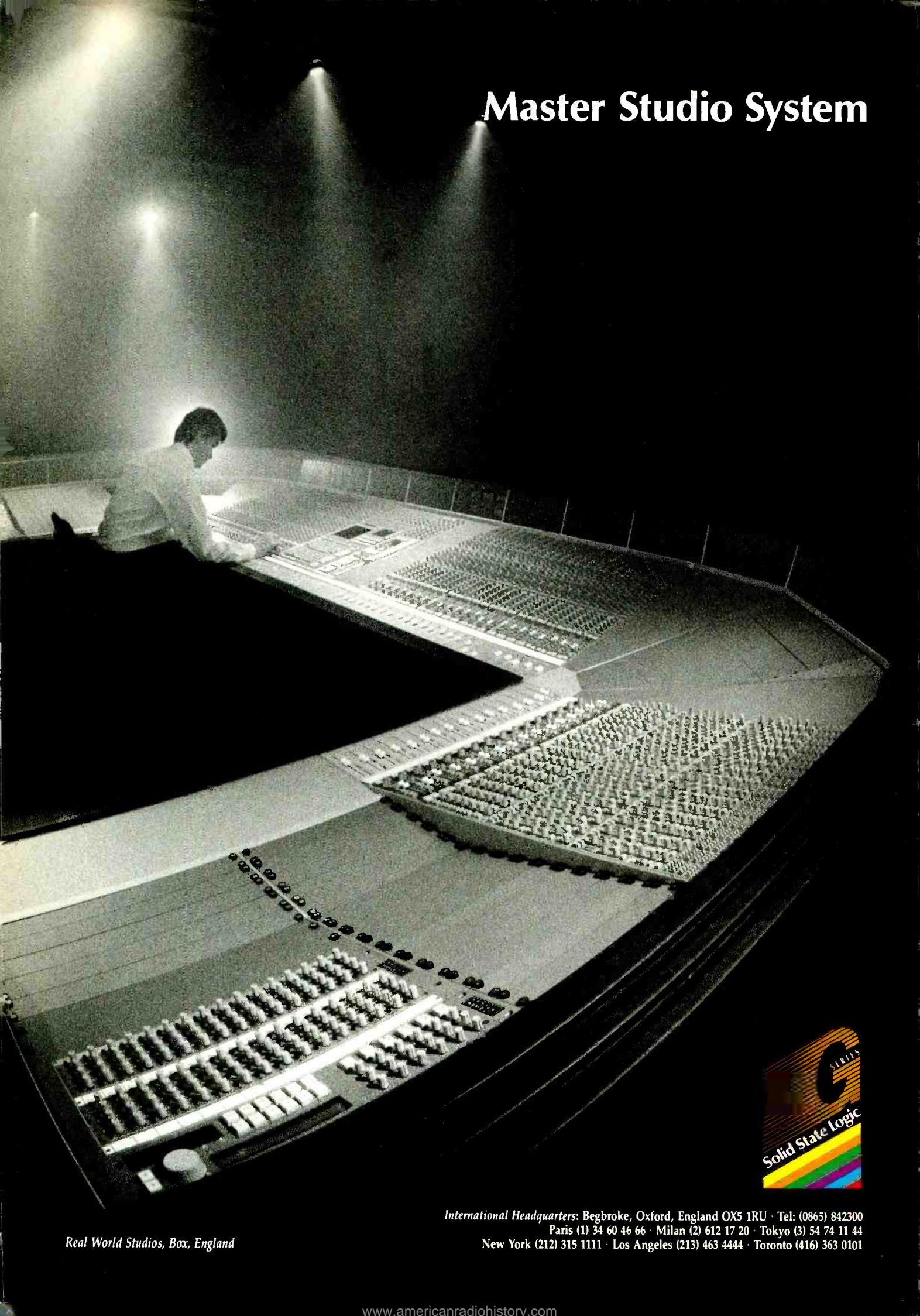
AND BROADCAST ENGINEERING



Consultants—who needs them?

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Master Studio System



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STUDIO SOUND

AND BROADCAST ENGINEERING

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during 1989.

UK: 5,272. Overseas: 13,897.
(ABC audited)



Open thoughts at the close of the year

While writing this column in mid-October, we are being assailed by a procession of business stories—acquisitions and failures. There is much 'sorting out' taking place in the industry and it does not appear to be restricted to within the UK. In such a climate it is not surprising to see a slowing of new studio projects although perhaps, as we are still seeing new openings, either things are not really as bad as they seem or worse is yet to come.

In this issue we look at several sides of design. Sean Davies takes a cautionary look at the practical side of deciding what you want: how to go about finding someone to do it for you and still remain on speaking terms until after the project is completed.

We also commence what we hope will be a series of some importance in the story of the new AIR Studios. AIR's London studios are currently in Central London but they will shortly have to leave. The search for new premises has been happening for many years—there are not many suitable buildings for locating a major multi-studio facility within the centre of London. The new location has been found and some basic work started on conversion but the project is vast and will take quite some time. AIR have been very co-operative in keeping us informed of progress and with their assistance we will follow very closely the problems, difficulties and successes encountered in transferring a studio and reputation between locations.

Barry Fox has taken a look at problems that have come to light with tapes of a certain vintage. Far from necessarily wishing to 'bash' the tape companies, we felt it far more urgent to alert anyone with important tapes of this age to go and check them. If we act soon it should be possible to save most of them but if they deteriorate beyond a certain stage there is nothing that can be done and we may end up losing some valuable recordings. So read and act.

So that is the last issue of 1990 with the '90s proper beginning with 1991 (I am reliably informed). I look forward positively to the next year but without a doubt it is going to be a tough one.

One last thought that has almost nothing to do with any of the above. Most manufacturers of compact discs have adopted the SPARS derived DDD/DAD/AAD type codes for indicating the use of digital and analogue processes within the making of the recording. In general terms the first letter refers to the initial recording process, the second refers to the mixing medium and the third denotes digital mastering. In many ways a DDD rating is misleading as the signal could have been in and out of analogue in the mixing process, with all the possible 'damage' that can entail, and still retain the DDD coding. The last D is also something everybody can claim as, for PQ coding, editing and other mastering processes, the CD master is always in the digital domain—there was not really any alternative.

With the arrival of some of the recordable CD systems, such as that from Kenwood and others about to launch, it is possible to feed an analogue signal into the processor and add the PQ information afterwards or leave the processor to write its own code. In this case does it mean CDs made in this way should really be coded as AAA?

Keith Spencer-Allen

Cover: AIR London's new studio under construction. Photography by
Anthony Butler

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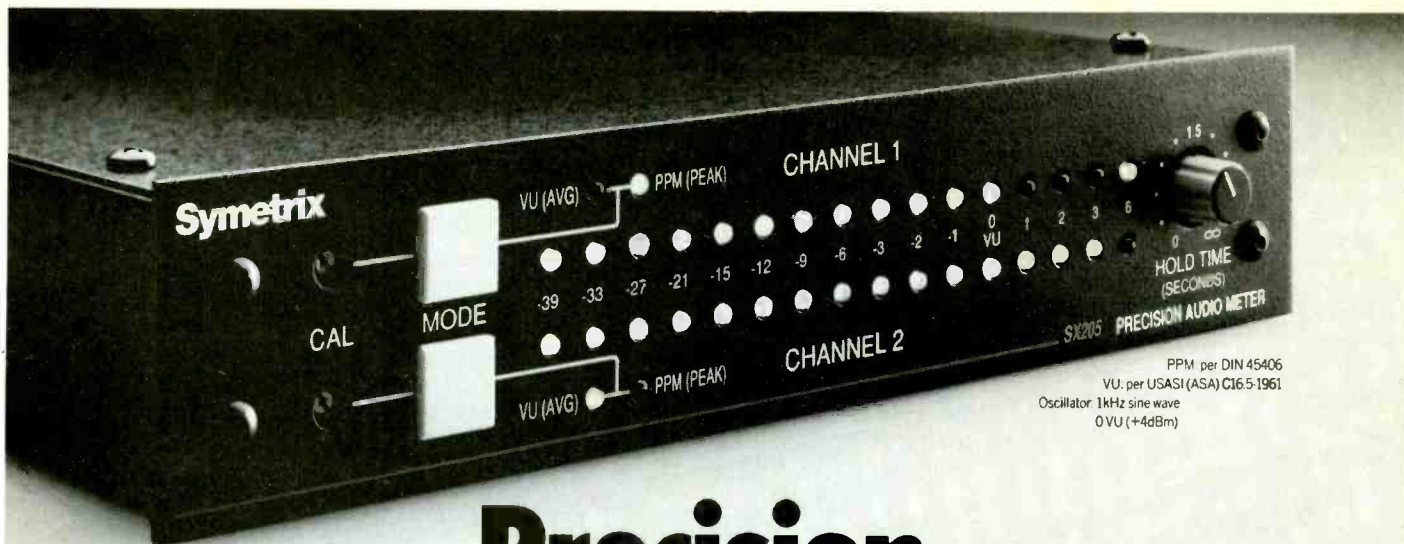
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One thing P Series users do remember about their amps however is the power to price ratio. And always with a smile.

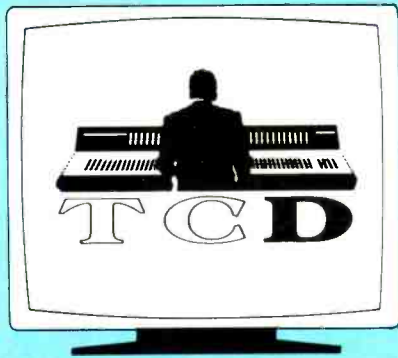
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For further information on the P Series Power Amplifiers, please complete this coupon and send to: Yamaha-Kemble Music (UK) Ltd., MI & Pro Audio Division, Mount Avenue, Blechley, Milton Keynes, MK1 1JE.

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WE SELL KEYBOARDS

Despite our prominence in the pro-audiomarket some people still don't realise we sell keyboards! In fact, our dealerships include **Yamaha, Emu, Roland** pro-audio, **Akai, Korg, Waldorf** and **Casio**, with all popular models in stock (along with staff who know how to use them). Next time you need a keyboard, sampler or expander why not give us a call?

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Korg M1	£850
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Studiomaster 16:16:2	£799
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Studiomaster 24:8:16 Mixdown	£1699
Atari 1040 + Monitor + Creator	£599
Tannoy Little Red Monitors	£399
Korg M1R ex (extra 2 meg)	£899

This is a small selection from our current stock - give us a call and we will be happy to send you a full up-to-date list. All prices exclude VAT.

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If you require any further information on any of the services which we can provide give us a call on 0223 208110 or on the main TCA number 0223 207979 (11 lines) for full details and brochures. The faxpack, which give details of installation facilities, the service department, demonstration facilities, the recording school and the equipment should answer any questions. If you are converting any kind of audio purchase, why not give us a call - you have nothing to lose! We didn't become the largest pro-audio retailer in EUROPE without being the best!

PACKAGES

At Thatched Cottage we have put together a number of packages based upon complete systems, each offering compatible items with substantial discounts (although it is possible to change them within a given package). Whole studio systems are available for 8, 16, and 24 track and we have faxpaks on 4 & 8 recording, MIDI, our Thatched Cottage school and finally financial advice (loan and leasing schemes available). All the details are free - just give us a call.

TCD HOT TECH

Roland S770 the ultimate sampler?
Korg Wavestation - new blockbuster.
Akai A-dam 12 track digital.
Akai DD1000 optical drive recorder.
Casio DA7 DAT.
Akai S1100 sampler
Deck 4 track software for Soundtools
Yamaha TG77 (rack SY77)

TCD SPECIAL OFFERS

Korg M3R	£499
Akai S1000 2 meg expansion boards	£150
Seck 12:8:2 desk	£699
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Alesis Microverb II	£99
Alesis Midiverb III	£175
Drawmer DS201 gates (unbalanced)	£250
EVS1 expander	£259
Akai S950 3/4 mag esp boards	£125
Alesis HR16 drum machine	£199
Yamaha TG55 sample player	£399
Multiverb RT (under half price)	£149
Atari 1040 + monitor + C-Lab Notator	£750
Roland U220	£433
Sound Ideas C-D library	£299
Alesis Quadraverb update chip (extra effects)	£17.99
Roland D50	£694
Alesis Quadraverb inc. update	£275
Casio DA7	£499

Allen & Heath Saber - £3999 + VAT

We have obtained a strictly limited supply of the famous A & H Saber. Each desk is configured 16:16:2 (giving full 32 inputs, all with eq and midi), set within a twenty four input frame allowing future expansion. This world class console has six full sends and is the ideal desk to accompany the Fostex G16 or Tascam MSR16.

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IN BRIEF

Recent agencies include TAC (look at the magnum console), Amek, Neve, Tannoy professional, Focusrite and AMS. We are still waiting for the Yamaha Digital Workstation, but the Akai Adam12 track is selling well (we have deals on fully loaded S1000 + disk drives as well). We can package the Tascam MSR24 1" 24 track with most desks. Computerwise, C-Lab and Cubase are still most popular and the Proteus II full orchestra module is simply stunning.

Recent visitors to our 24 track studios include Ches Hawkes and Nik Kershaw working on a soundtrack for a new film with Roger Daltrey, and several new MIDI courses have been added to the school prospectus. Finally, last month's complete studio installations included Neneh Cherry, David Sylvian, Barry Upton (Brotherhood of Man), LA Mix and Amazon.

ATARI SOUND TOOLS PACKAGE

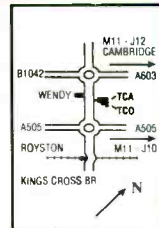
Digidesign Sound Tools for Atari. Atari Mega 4 inc monitor and mouse. DAC 200 meg.R/MHARD Drive (+ interface).
Total package price£3750+VAT

AKAI MG14D - £1799 + VAT

A rack mounted twelve track recorder, with an additional two tracks for synchronisation, the MG14D is a superb quality recording tool. Balanced/unbalanced connections, a full autolocate/remote available, and noise reductions built in, give totally professional quality at an amazing price (autolocate/remote - £299 + VAT).
Limited stocks available.

Sony DTC55ES DAT player - £479 + VAT

Hot on the heels of their industry standard DTC1000ES comes the revolutionary new Sony DTC55ES. With switchable rates of 32khz, 44.1khz and 48khz, coupled with audio, digital and optical inputs and outputs. Unlike other cost-effective DAT recorders on the market the DTC55ES comes complete in a fully rack mounted format, with full track identification and search facilities. At present there is nothing in the market which even begins to compete with its many features and amazing price - £479 + VAT !!



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TCD

THATCHED COTTAGE DIGITAL

Tele-Cine acquire Ultrasound

Tele-Cine will shortly be opening a new digital audio-for-video post facility. The original plans for diversification into audio post-production work have been expanded by the recent acquisition of Drumlight, formerly Ultrasound.

The new facility will be based at Tele-Cine's Charlotte Street premises and will consist of two digital studios, one 24-track and the other based around a hard disk editing system. These studios will work in conjunction with a digital equipment area.

Tele-Cine managing director John Rowland commented, "Audio has sometimes tended to be regarded as of secondary importance during video post-production and transfer. The upgrading of video formats, with the advent of D1, D2 and 'DX' has provided us with the opportunity to meet the clients' growing requirements for digital audio."

David Woolley, Drumlight's

UK MIDI Association

UKMA has now been active for over 6 months during which time it has made appearances at the MIDI Music Show, Atari, APRS and BMF shows. The membership has risen steadily and currently includes Akai, Roland, SSL and Yamaha as well as various publications, retailers and individuals.

MIDI Monitor, the monthly, UKMA newsletter, has grown in size from four to 12 pages and includes sections on MIDI quirks, questions/answers and general MIDI articles. UKMA is soon to become a member of the MIDI Manufacturers Association (MMA). The detailed MIDI Spec and MIDI File Spec are both obtainable from UKMA and annual membership is £34.50. Group membership is £69 and manufacturer/distributor membership is £138.

For more information, contact Vic Lennard on 081-368 3667 or write to: UKMA, 26 Brunswick Park Gardens, New Southgate, London N11 1EJ, UK.

existing managing director and founder will become head of audio; he will be partnered by Barry Day who moves from his present position as VT transfer facilities manager, to head of digital video.

Otari acquire King Instruments

Otari have announced an agreement for the acquisition of the assets and operations of King Instruments. The purchase will make Otari the largest manufacturer of audio and video tape loading machinery in the world. Jack

Soma, president of Otari in the USA, commented, "Otari have been looking for manufacturing capacity in the US, in order to provide freedom from the foreign exchange nightmare and any potential restrictions on imported goods."

No immediate changes to the staff or operation of King are planned but according to Otari, several organisational possibilities are being considered; the King operation may serve as a manufacturing source for Otari worldwide.

This acquisition by Otari follows their takeover, last year, of Sound Workshop and Digital Creations Corporation, New York-based audio mixing console and automation systems manufacturing companies.

Dynaudio Acoustics

Acoustician and monitor designer Andy Munro and Danish loudspeaker manufacturers Dynaudio have joined forces to form a new company, Dynaudio Acoustics. The company has been formed with the purpose of developing and bringing to the world market a new range of professional monitoring and loudspeaker systems.

Dynaudio have been suppliers of high quality hi-fi systems for many years and are OEM suppliers to many leading professional monitor manufacturers. Andy Munro had been using Dynaudio drivers in his designs for about 5 years.

Within the new organisation, all manufacturing, production design and after sales support will be handled by the advanced systems at Dynaudio in Denmark. Market research, marketing, sales and user feedback, will be handled by the London office. Distribution of the systems is to be achieved through a network of 'Licensed Monitor Houses'. Conventional dealers will have access to the products but only the passive systems, which require no setting up or special knowledge. Parties interested in either of these roles, or as distributors, should contact Dynaudio at their London offices. Tel: 071-352 8100.



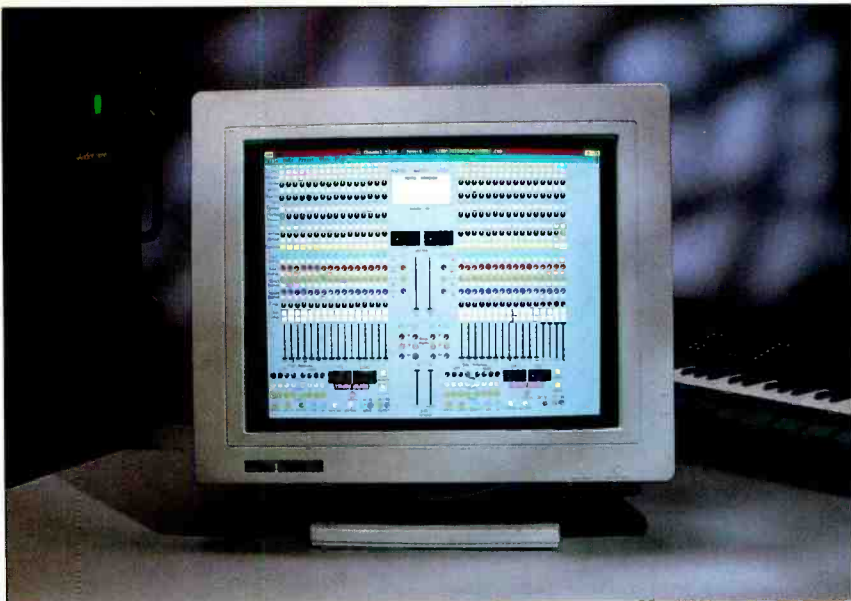
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AKG buy Qusted

At the recent AES exhibition in Los Angeles, AKG Acoustics announced the acquisition of Qusted Monitoring Systems. Roger Qusted will continue to play a major role in Qusted's future expansion.

Qusted founded the company in 1985 for the purpose of custom

designed and built, studio monitors. During the past 5 years QMS have equipped studios in Europe, North America, the Middle and Far East, including USA, Canada, Japan, China, Germany, Italy and over a dozen other countries.



THE AUDIOFRAME DIGITAL PRODUCTION SYSTEM

The AudioFrame digital production system is an extremely powerful and flexible second generation digital workstation that can be configured in a variety of ways to undertake almost any audio operation.

The AudioFrame lends itself to all aspects of audio creation and production. With the audio remaining in digital throughout the system, original sound quality is maintained, no matter how many generations are created.

AudioFrame's internal architecture has a unique high speed 24-bit High Definition Digital Audio Bus, "HDDA". Whatever the audio process - Mixing, Audio Post-production, CD Mastering, Variable Sample Rate Conversion, Music Reproduction, made audio production, the HDDA provides Editing, Sampling and Creator and playback on a wide range of sample rates, flexibility and precision of operation.

Physically, AudioFrame is an industrial standard system configured in a rack mounting that allows a range of construction options. Individual systems to be assembled to a customer's specific requirements, and at a later date quickly and easily altered or expanded. A High Computer with a High definition graphics display completes the system.

Operation of the AudioFrame is extremely simple, using easy to understand on-screen Windows, keyboard, mouse and a combination of additional external controllers, dependant on the specific application.

AudioFrame's modularity must be considered in both Hardware and Software terms. Software provided with the system consists of five separate elements: a Digital mixer with EQ and reverb, a Hard Disk recorder, an Events processor, an analogue to digital converter and a MIDI Sequencer. All of these software elements can be used simultaneously and interchangeably.

In addition to the Digital Audio Rack, other hardware components include the Studio Control Processor (SCP), a digital processor with up to 30 Meg of RAM, a digital signal processor, a Hard Disk Recorder Module (DRM), and various Hard disk, Tape and Magneto-optical storage options. Input and Output modules include the UDI-4, a Universal Digital Interface which allows 4 channels of I/O for AES, EBU, Sony and Mitsubishi formats. DAC - 8 channel analogue output module, ADC-8 8 channel analogue input module, ADC-2 and 2 channel analogue input module.

The application that AudioFrame is put to will determine the precise combination of hardware modules that are fitted in the DAR and the software elements that are utilised. Some examples of the AudioFrame's uses follow.

AudioFrame as a Digital Mixer. StudioCAD is AudioFrame's dynamic digital Mixer. Superbly presented on screen is a full function digital mixing desk providing real time operation. Full automation of all controls is also possible. The layout of the console control ranges, metering and even colour is user configurable. Each channel has Full

parametric EQ, pan, Auxes and level. A central Stereo digital reverb is also included. The Mixer, which can be expanded up to 64 channels, is stunning in its power and capabilities and is the only comprehensive Digital Mixer of its kind available.

AudioFrame as a Hard Disk Recorder. DRM is AudioFrame's Hard Disk Recorder. The disk recorder provides the engineer with an extremely powerful medium for storing, playing and editing continuous audio - one 600 Meg disk providing 2 track-hours. High density non-destructive multiple track editing is provided. Slip, crossfade and full dynamic scrub facilities are also included. The disk recorder is available in blocks of 4 tracks, which can be switched to record in either 16-bit or 24-bit HDDA mode.

AudioFrame as a Post-production Workstation. The AudioFrame is ideal for sound design and short-form productions such as TV and Radio commercials. EventProcessor. AudioFrame's Edit decision list, used in conjunction with the other elements of AudioFrame provides a perfect post-production centre. AudioFrame comes with an extensive sound library, SoundStore. The Event Processor's powerful MIDI-Foley feature places sound effects from the SoundStore directly into the EDL. Sounds can then be trimmed, replaced, moved, shaped, transposed and mixed, enabling the creation of unique soundtracks.

AudioFrame as a Mastering System. The AudioFrame fitted with the DSP, StudioCAD and UDI-4 card is an ideal Mastering system. A special mixer configuration can be selected to provide all of the features required for digital master preparation. The UDI-4 is configured with two inputs and two outputs and supports multiple digital processing including quality Sample Rate Conversion. Low pass filters and sample rate to be brought in to the system. Analogue master tapes can be performed in the digital domain, so analogue master tapes can be EQed and mixed together. The UDI-4 also provides for future compatibility with next generation digital equipment.

The AudioFrame as a musical Instrument. SoundProcessor is AudioFrame's pling instrument. A powerful audio editing program is also available that can be fitted with a library of MIDI notes, allowing a range of fast, creative audio manipulation to be possible. Visual non-destructive waveform editing and envelope control. The AudioFrame uses a constant sample rate system, without the need for interpolation of samples over a 14 octave range without quantisation distortion or aliasing problems. Up to three sampler cards (48 voices) can be fitted in an AudioFrame rack and each can access the AudioFrame's SoundStore, high speed hard disk based audio storage and retrieval. The Texture Processor is AudioFrame's 32 track 16 channel MIDI based digital Musical composition and control of AudioFrame's main functions can be carried out from the Texture page. The AudioFrame can also be driven from any external MIDI keyboard or sequencer and most people who have played it consider it the worlds best synthesiser.

AudioFrame as a multi-track recorder. As Audio in a Box, it is an extremely cost-effective way of creating a unified recording environment. The control interface of the various elements of an AudioFrame can be utilised, supporting a range of recording, overdubbing, editing and mixing of audio to the highest quality.

Finally, AudioFrame's open-ended architecture provides a future proof growth path to ensure that existing systems will not become outdated by the introduction of new technology.

To see AudioFrame's 8 track disc recorder, full facility digital mixer, HDDA™ 24 bit high definition digital audio, universal digital interface, 16 voice digital sampler and audio event list in action call Stirling on 071 624 6000 to arrange your demonstration.

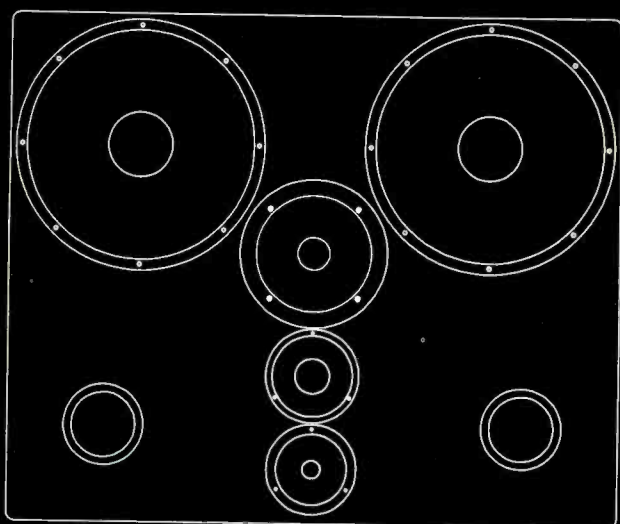
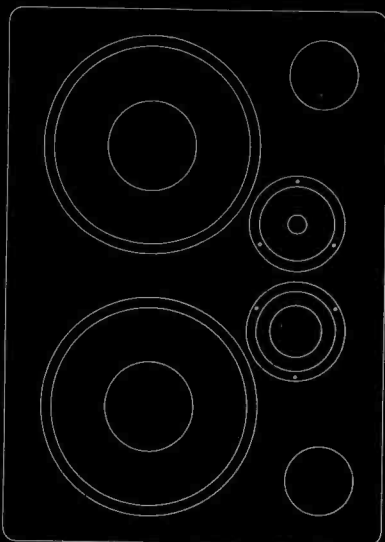
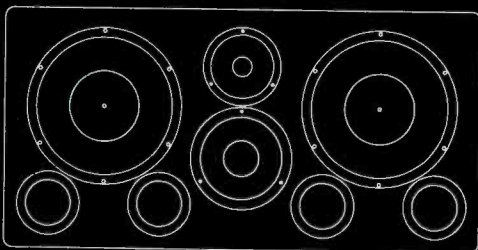
AudioFrame

From

WaveFrame

Distributed by  Stirling

OUR MONITORS



can't speak for themselves...

"We recorded and mixed the Beautiful South's new album on these little M1 nearfield monitors. They really are outrageously accurate, ridiculously loud, and the record's No. 1!"

Mike Hedges
Record Producer

"One of the reasons that people come here is the monitoring. I recall that Polydor called me up to congratulate me once. They had just had 3 separate projects from here, with 3 different engineers, going to 3 different cutting rooms. Every one was cut flat. It was the first time ever, apparently! Do I like my M2s? I couldn't live without them!"

Rod Gammons
Berwick Street Studios

"I use M2s in my own studio and on location. Working with artists like George Michael, Hall and Oates and Living in a Box I need a reference point which is absolute."

Chris Porter
Engineer and Producer

"Our dubbing engineers feel that we have the best audio Post Production facilities in the Network. We use Dynaudio Acoustics M3 systems throughout, and they play a key role in this claim."

Graham Lee
TVS Southampton

"The DA-M4 is simply the best monitoring system that money can buy. It's the first setup I've had where the console doesn't get stacked up with different monitors. People like them so much, they ask me to swap apartments with them! Seriously, though, out of 10 album projects since May, only one has had to be remixed. That's impressive."

Freddy Hansson
Sweet Silence Studios, Copenhagen

dynaudioacoustics

The Studio
13-16 Embankment Gardens
London SW3 4LW
England
Telephone 071-352 8100
Telefax 071-351 0396

B&K record the circles

Following last year's publication of *Circular Evidence*, a study of crop circles by Pat Delgado and Colin Andrews, the BBC joined forces with a special team, known as Crop Watch, to keep tabs on new developments. The team has already made two films on the subject over the past year, and a third, currently in production, is due to be shown later in the autumn on *Daytime UK*.

Produced by Crop Watch's David Morgenstern, the latest programme was shot at the height of media interest during the summer, when 500 crop circles were discovered in a 4 month period. Making the film involved mounting a 24 hour intensive surveillance, using low light cameras of a crop circle in fields

near Bratton Camp, Wiltshire.

During the shooting of the first film, an amount of electronic interference was picked up by the microphones, suggesting reports that crop circles emit a buzz or hum at seemingly random intervals. BBC Sound needed a particularly sensitive microphone to monitor these sounds and enlisted the help of B&K.

B&K provided the BBC with a 4007 omni mic, which has a flat frequency response up to 40 kHz. It appears, however, that crop circles only 'energise' at certain times and during BBC Sound's visit to the fields there was not a hum or a buzz to be heard. Undaunted, Crop Watch will continue to work with B&K to discover the source of the sounds.

Exhibitions and conventions

February 19th to 22nd AES 90th Convention, Palais des Congrès, Paris, France.

April 15th to 18th NAB, Las Vegas, USA.

June 5th to 7th APRS, Olympia 2, London, UK.

June 13th to 18th International Television Symposium, Centre des

Congres, Montreux, Switzerland.

June 25th to 27th Multimedia 91 conference & exhibition, Olympia 2, London, UK.

July 10th to 12th Pro Audio Asia 91, World Trade Centre, Singapore.

September 8th to 11th Light & Sound Show 91, Olympia 2, London, UK.

In brief

● **London Sound Centre's Hilton link:** The London Sound Centre, musical instrument and outboard equipment hire specialists, is to operate from under the corporate umbrella of Hilton Sound. Both companies will keep separate identities and operate their own equipment inventories from different offices.

● **Electro-Voice change name:** Electro-Voice SA have changed their name to Mark IV Audio AG. The company were originally established as the European sales and assembly subsidiary of the American audio products manufacturer Electro-Voice, which was taken over by Mark IV Industries in 1986.

● **tc and Steinberg joint venture:** tc electronic and Steinberg have entered into a joint venture agreement for the production, support and further enhancement of the *Mimix* console automation system. The *Mimix* system hardware will be

produced by tc in Denmark so that their hardware experience can be implemented into the product, while Steinberg will concentrate on enhancements to the software and distribution.

● **Audionics put Hallam on air:** Audionics Ltd, the Sheffield-based broadcast equipment manufacturer and installer, put Hallam FM on-air at the new Meadowhall shopping and leisure centre, which opened in September. Audionics were responsible for the audio system's design, manufacture and installation.

● **Clair and tc agreement:** Clair Bros Audio and tc electronic have signed an agreement concerning their joint development of the *tc 6032* EQ motor fader remote control. tc electronics and their distributors will be the only sales distribution source for the product and Clair Bros have agreed to continue further development and enhancements to the product.

News from the AES

Our next lecture will be held on Tuesday 11th December and will be given by Dr Peter Craven on the subject of **Room and Loudspeaker correction using Digital Equalisation**. "The idea of flattening a loudspeaker response by electronic means is not new, but until recently it has been practical to correct only a few of the grossest features. Digital EQ can give 'ruler flat' speaker responses, and can even cope with the myriad peaks and dips introduced by room reverberation. However, a flatter frequency response does not necessarily result in better sound!

"The talk will explain the technology developed at B&W and will highlight some of the physical and psychoacoustic issues involved in attempting to reduce listening room reverberation by pre-distorting the signal. Progress to date will be demonstrated."

The lecture will be held at the IBA, 70 Brompton Road, London SW3. The IBA is opposite Harrods and Knightsbridge Underground station, between the Nationwide Anglia Building Society and Boots. The evening starts with coffee at 6.30 pm followed by the lecture at

7 pm.

Now is the time to start planning for the next AES European Convention which will be held at the Palais de Congrès in Paris between 19th and 22nd February 1991. With a wealth of Papers, Workshops and Technical Visits and the largest Exhibition of Pro-Audio Equipment to be seen in Europe in 1991, it is the event not to be missed.

The Papers are available from the last AES UK Conference which was on the subject of **Hard Disk Recording**. This brings the number of Proceedings from AES UK Conferences to four. These are **Sound with Pictures** (May 1988), **Sound Reinforcement** (May 1989), **AES/EBU Interface** (Sept 1989) and **Hard Disk Recording** (May 1990). They are priced between £10 and £20 and are available from the address below.

For further details on any of the above or information on joining the AES, please contact: **Heather Lane, AES British Section, Lent Rise Road, Burnham, Slough SL1 7NY. Tel: 0628 663725. Fax: 0628 667002.**

Corrections

- Due to information available to us at the time of writing some recently published distribution information was incorrect.
- US distributors for **Philip Drake Electronics** are Redwood Marketing Inc, PO Box 270007, Nashville, TN 37227-0007, USA. Tel: (615) 254-7400. Fax: (615) 242-5774, and not RTS Systems as given in the September issue.
- UK distributors for **ASC Studio**

Trap products (September) are Hannah International (UK) Ltd, PO Box 355, Cardiff CF2 3XE. Tel: 0222 495868. Fax: 0222 462812.

● Music Lab Sales were given as the UK distributors for **Summit Audio** in the October issue. Their present sole UK distributor is Autograph Sales Ltd, 102 Grafton Road, London NW5 4BA, UK. Tel: 071-485 3749. Fax: 071-485 0681.

Address changes

- Boothroyd Stuart's **Meridian** have moved: Meridian Audio Limited, 13 Clifton Road, Huntingdon, Cambs PE18 7EJ, UK. Tel: 0480 434334.
- The address for new company **Meriden Communications**, recently set up by Elliott Brothers as their sales and marketing division, is 32 Greenwich Market, London SE10 9HZ. Tel: 081-293 0909.
- **TimeLine**, manufacturers of *Lynx* synchroniser systems, have moved to

2401 Dogwood Way, Vista, CA 92083, USA. Tel: (619) 727-3300. Fax: (619) 727-3620.

● **Otari** have moved their UK operation to new larger premises giving them double the space of their old location, and room to expand all areas of their business. Otari UK Ltd, Unit 13, Elder Way, Waterside Drive, Langley, Berks SL3 6EP, UK. Tel: 0753 580777. Fax: 0753 42600.

Contracts

- ABC, one of America's main TV networks, have installed a 48-channel Neve 66 series broadcast console in their soon to be completed TV3 production studio in New York. TV3 has been designed specially as a news-dedicated studio and the 66 will be controlling the audio production for a variety of news and current affairs programmes.
- Anglia Television, UK, has installed a customised 24-channel 66 series broadcast console, bringing the total of Neve desks currently in operation at Anglia to nine.
- Limehouse Television, part of the Trillion group of companies, is to take delivery of a 52-input version of Amek's new broadcast console, the B2520. This is the first order for the new broadcast version of Amek's well established G2520 multitrack console. The new version includes an extra eight stereo subgroup buses in addition to the normal 24 multitrack buses.
- Granada Television have recently taken delivery of another Amek Classic, for their Studio Two in Manchester. The console is equipped with 24-track monitoring and Audio Kinetics' MasterMix II automation.
- AMS have announced the delivery at Television South's Plymouth site of the first combined Logic 1/AudioFile Plus in the UK. TSW are already operational with the combined system in a post-production suite. AMS have announced an order from Thames TV for two 16-output, 8 hr AudioFile Plus systems plus a Logic 1 digital mixing console.
- Bernard Sumner, New Order guitarist, has ordered a 36-input TAC Magnum, which is to be supplied fitted with MIDI muting automation. The console was ordered through Syco, TAC's London-based pro-audio dealer.

- BMG/RCA recording studios is the first US facility to order the CEDAR sound restoration system from CEDAR Audio, Cambridge, UK.

- BBC Radio 2 are installing three SL 5000 M series consoles in a major modernisation of their transmission suites. The consoles have 28 channels and are fitted with SSL's Instant Reset computer system. Also a second SL 5000 M series audio production system has been ordered by North German regional broadcaster Radio Bremen.

- Recent SSL ScreenSound installations in Europe include Manchester-based Framework post-production in the UK and Fahrenheit 601 in Paris, France.

- Soundcraft's French distributors SCV Audio have announced the installation of a 32-input, 24-output 3200 console at JJS Production near Paris, France. The desk has been fitted with Optifile III automation. A major post-production company in the South of France, Sud Atelier Video have just placed an order for a part-filled 24-input, 12-output 3200.

- Molinare have taken delivery of a 40-input Amek Mozart desk, which is to replace their existing Amek M2500. To install the desk a crane was hired which hoisted the Mozart to a substantial height and swung it through the studio window.

- The 1990/91 operatic season at the London Coliseum will feature a specially designed Cadac sound console from Clive Green & Co. The 32-channel desk was commissioned as a long term solution to meet the sound requirements for the wide spectrum of productions staged by the English National Opera.

- EMI Music Publishing have opened a new recording complex in the West End of London comprising a 24-track recording studio and a 16-track pre-production and programming suite. The main studio is equipped with a Soundtracs Quartz desk and Otari

multitrack with various outboard gear.

- American engineers George Massenburg and Alan Sides have each bought Sony PCM-3348 48-track digital audio recorders. Bruce Springsteen has also taken delivery of a Sony PCM-3348 48-track digital audio recorder. The Sony DASH multitrack is being used to record material he is currently working on in A&M Studios, California.

- Sound on Sound Studio in New York, USA, have invested in a Neve VR60 with Flying Faders automation. Secret Recording in Florida have also invested in a Neve 60-input VRP post-production console and a 60-input V series console, both with Flying Faders, and two Mitsubishi X-880 32-channel digital recorders.

- The Saul Zaentz Company Film Center in California have announced the installation of an Otari Premiere console in Stage Two, their newest film mix suite. The Premiere is configured with 136 inputs. LucasArts Entertainment, a newly formed company consisting of former Lucasfilm divisions, have announced the purchase of four new Premiere consoles for their new Skywalker Sound South audio post-production facility in Santa Monica, CA.

- Digital Audio Research have announced the first sales of their new DSP system to Wild Tracks Studios in London. Ten Pin Alley, exclusive producers of all the radio commercial work for UK radio station Severn Sound, is the most recent UK post-production facility to install the SoundStation II digital audio production system. The unit has an 8-channel system. Sintonia, a post-production house in Madrid, have also invested in a SoundStation II system. The unit is 8-channel with TimeWarp and Optical disk storage options.

- Recent NED contracts include a

PostPro SD system to Nippon Television in Japan; a Synclavier 9600 to Speak Easy Studios in Singapore; a PostPro SD system to Belgium's SC Polygone Production Bruxelles; and an 8-track PostPro Video London, UK.

- Castle Sound Studios, near Edinburgh, has become the first studio in Scotland to offer digital multitrack facilities, following the recent purchase of a Mitsubishi X-850 32-track machine.

- Philip Drake Electronics have been awarded a large contract by BBC Television for the design, supply, installation and commissioning of three transmission suites for the Network transmission area serving BBC1 and BBC2.

- The London Tape Company have expanded their duplication capacity following the latest delivery of two Lyrec P2518 slave units.

- BBC Scotland have recently purchased an Amek Mozart for their Edinburgh studios. It will be used in conjunction with a digital audio workstation/multitrack system.

- tc electronic have recently delivered 15 of their 1280 stereo delay lines to PKE Ltd, in Kewdale, Australia, for use as a broadcast telephone obscenity delay. tc electronic have delivered 25 tc 1280 stereo digital delay units to Disney Studios for use in their film/video post-production department.

- Norwegian Broadcasting, NRK, based in Oslo have received delivery of two FRED editing systems from Lyrec.

- The installations department of RG Jones, London, are completing an audio and video system for the five conference rooms in the department of Trade and Industry's new Buckingham Palace Road HQ. Another installation is the new press room at Conservative Party Central Office, which is being fitted with a sound system.

Agencies

- HHB Communications have been appointed UK and Eire distributor of Solid State Logic's Screensound audio-for-video recording and editing system. The company will also be responsible for UK sales of the newly-launched SoundNet digital audio network, designed to work in conjunction with multiple screensounds. HHB Communications, 73-75 Scrubs Lane, London NW10 6QU, UK. Tel: 081-960 2144. Fax: 081-960 1160.

- Harman Audio will now distribute in the UK the Audio Logic range of signal processors made by DOD Corporation in Utah, USA. John Hornby Skewes will continue distributing Digitech, another DOD range. Harman UK, Mill Street, Slough, Berks SL2 5DD, UK. Tel: 0753 76911.

- Levitan Studio supplies in Tel Aviv have been appointed sole distributors for Studio Magnetics recording products in Israel. Levitan Studio, 4 Ben Shemen Street, Tel Aviv 67442, Israel. Tel: (03) 218967.

- Brüel & Kjaer have appointed

Sound Control, based in Belfast, to distribute the 4000 range of microphones throughout Ireland. Sound Control, 45 Dragan Crescent, Duncrue Industrial Estate, Belfast BT3 9JP. N Ireland. Tel: 0232 772491.

- Stirling Audio have secured the sole UK rights to distribute the range of Sonic Maximizers being produced by Californian-based company BBE Sound. Stirling Audio, Kimberley Road, London NW6 7SF, UK. Tel: 071-624 6000.

- Neve have appointed HHB Communications to distribute the

Prism series of dynamics and equaliser modules and the 33609-12 range of limiter compressors.

- The Home Service have announced three more overseas distributors for the Optifile 3D automation system. In Sweden the distributor is Soundtrade AB, Box 3042, 171 03 Solna, Sweden. In Australia GUVT, 19-25 Marsden Street, Camperdown, NSW, Australia. Tel: (02) 550 5488. Fax: (02) 517 1946. In New Zealand Protel Ltd, 13 Kensington Street, PO Box 1073, Wellington, NZ. Tel: (04) 854874. Fax: (04) 842 112.

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Sixgate. Six professional quality noise gates in a single rack unit package. Features include Key Inputs and Sidechain inserts.



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Multi Q. A six channel parametric equalizer, with an exclusive internal patching system that lets the user access up to 6 channels of parametric EQ, either individually or in multiples without the need for patch leads. A unique creative tool for any EQ situation, in one rack unit.

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Mike Rolands Music Service

Tel: 06 174 23433

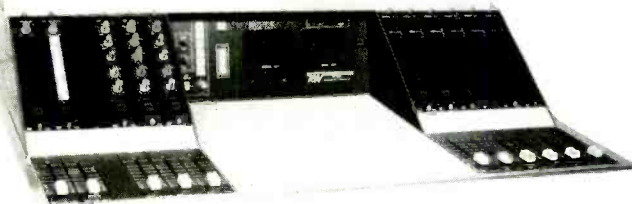
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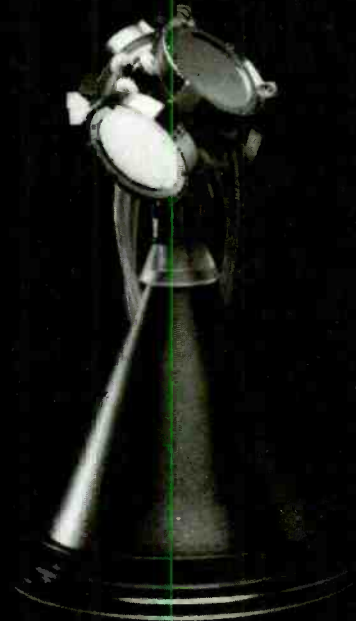
Despite its low cost, the BC1204 is purpose built for broadcast applications. Commonly used facilities are provided as standard with numerous options available for future expansion. Don't be misled into choosing a mass production mixer which will neither suit your needs nor survive in the arduous on-air environment. The BC1204 will reliably serve your broadcast needs for 10-15 years.

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Tel: (0282) 57011 Fax: (0282) 39542

London Office:
The Courtyard,
44 Gloucester Ave, NW1 8JD
Tel: 01 722 3925 Fax: 01 577 3677

Sonic Solutions new systems

Sonic Solutions have launched several new products including a lower cost 2-track system, a multitrack sound-for-picture system, a DSP processor, a CD mastering system and a digital effects processor.

The *Sonic Mini Editor* is designed as an entry level system to the *Sonic System* with the same waveform editing displays but is limited to 2-track editing at 16 bit. The *Mini* is however, expandable and options can be added including background loading and unloading, multitrack editing, machine control, 20 bit editing, varispeed, PQ editing, Mixing Desk option, *NoNoise* system and the ability to work with the Start Lab *CD Maker*.

The *Multi-track And Sound For Picture System* is based on the Mac II computer and includes features from the Sonic CD PreMastering System including waveform editing, realtime signal processing and realtime playback of edit lists. The system will slave to NTSC, PAL, SECAM and film devices with software options for segment editing, looping and time stretch squeeze. *NoNoise* will also be available for background functions. The system can be built up in blocks of four in/outputs with its

own SCSI disk bus allowing seven to 12 virtual disk channels. Sonic Solutions claim the system will support almost any number of channels.

The *CD PreMastering System Version 1.0* adds a number of features such as interfaces for recording two channels to or receiving four from an erasable optical disk; recording, processing and playback of digital audio with any word size between 16 and 24 bits; a varispeed function allowing pitch and time variation as material is loaded to hard disk; and an archiving program for back up or working progress.

The *Sonic FX* digital effects processor is a processing card compatible with the Mac II NuBus with software modules being licensed separately. The software modules will include 31-band graphic equaliser, Designer Reverb, Special FX (flanging, phasing and doppler), Designer Dynamics, and Realtime Squeeze/Stretch.

Sonic Solutions, 6115 California Street, San Francisco, CA 94121. Tel: (415) 751-8666.

UK: FWO Bauch, Borehamwood, UK. Tel: 081-953 0091.

Feltway active monitors

Feltway is a new Swiss company designing and manufacturing active monitors. Currently there are three models in the range all with a

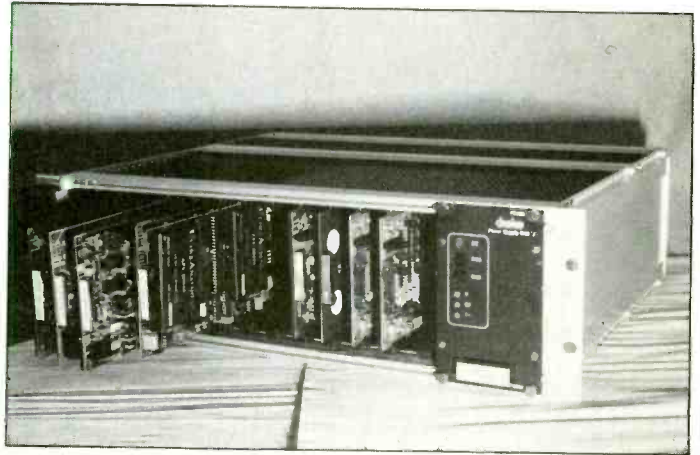
similar design—all are 3-way active systems.

The electronics for each monitor are contained in a box mounted on the rear and this may be removed from the unit for service or maintenance. The smallest in the range, the *83*, has an 8 inch LF unit and a 52 Hz lower limit; the *103* with a 10 inch LF unit and a lower limit of 39 Hz, and the *103E* is a variant on the *103* with a front mounted port that extends the LF response to 31 Hz.

Cabinets are built from a honeycomb material that is derived from aircraft construction and is very light and rigid. All the models are available with Gel Coat (a clear finish over the honeycomb structure) or Carbone (black piano lacquer).

Feltway claim specifications 107 dB SPL at 1 m and crossover frequencies of 350 Hz and 2.7 kHz on all models. A range of accessories are under development for different mounting requirements and fixings.

Feltway SA, Ch du Stand 18, 1026 Echandens, Switzerland. Tel: 21 702 42 94. Fax: 21 702 42 94.



Drake digital converters

Philip Drake Electronics have introduced a range of digital converters within their 9000 Eurocards series. The *PD 9365* Analogue Audio Parallel Digital Board is a stereo A/D converter based around the UltraAnalog *AFE 20048* processor. Audio is sampled at 128x normal sampling frequency (48 kHz) and forms 20 bit digital output. There are no user adjustable controls although jumper links do allow changing of the sampling frequency to 44.1 kHz.

The *PD 9356* is a 24 bit parallel to EBU digital converter. It has two distribution outputs, a synchronisation input and access to status, user and validity bits. The front of the card has LED indication of DC power on and a switch to select signal reference to output.

The last of the three cards is the *PD 9367* AES/EBU to stereo analogue audio converter. This converts 20 bit digital audio to analogue balanced output. There are four LEDs to indicate operating state—power on, input signal presence, signal error and signal close to failure. The unit is normally supplied with 48 kHz sampling rate although 44.1 kHz is available as an option. All three of the cards fit within the Drake *PD 9000* series Eurocard frames.

Philip Drake Electronics Ltd, The Hydeway, Welwyn Garden City, Herts AL7 3UQ, UK. Tel: 0707 333 866.

USA: Redwood Marketing Inc, PO Box 270007, Nashville, TN 37227-0007. Tel: (615) 254-7400.

Aphex Dominator II

The *Aphex Dominator II* is a stereo multiband limiter that has been designed to cover a wide variety of applications in recording, broadcast, mastering and post-production with the unit being available in two models—the *720* for general use and the *723* for broadcast and transmission applications. The unit is designed for minimum audibility of the limiting actions and therefore greater loudness.

Features include a trimmable peak ceiling over a 34 dB range, switchable crossover frequencies and an automatic limit threshold function.

The *723* has either 50 or 75 μ s pre-emphasis after the input circuitry and before the limiters and switchable de-emphasis, after the

final limit but before the output stage. When the de-emphasis circuit is switched in, the programme signal remains flat below the threshold and follows the curve as input rises above the threshold.

Aphex have also released the *Mac 801M* software option for the model *800* Studio Clock. This provides complete control of all functions and includes extensive Tempo M editing features, desk accessory and a MIDI manager on a single disk.

Aphex Systems, 11068 Randall Street, Sun Valley, CA 91352, USA. Tel: (818) 767-2929.

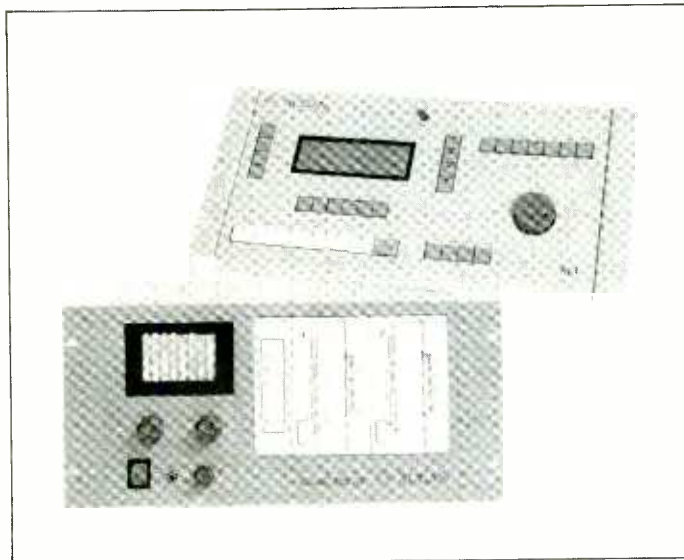
UK: Sound Technology plc, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR. Tel: 0462 480000. Fax: 0462 480800.



Augan optical recorders

New Dutch company Augan Instruments launched a complete range of optical disk recorder/editors during the recent LA AES. Currently there are five different models each with facilities tailored for a particular application. All the models are based around a rackmount unit containing one or two optical disk drives and maybe a hard disk depending on the applications. Each unit also has the same remote control panel that handles all the system functions.

Models available include *Go-oP 204P* 4-channel production recorder/editor, the *Go-oP 208AV* 8-channel optical recorder for A/V applications, *Go-oP 208C* 8-channel optical system for jingles, *Go-oP 204S* 4-channel system for commercials and the *Go-oP 204N* 4-channel system for



news applications. Each of the systems can be expanded with a wide range of options for printers, monitor screens, other drives and jukebox stores, etc.

Augan Instruments BV,
Wilhelminastraat 31, 6881 LH
Velp, The Netherlands. Tel: 85
648966.

Toa speakers

Toa's new line of 'Engineered Sound' loudspeakers includes five components, a wide range of loudspeaker systems and three versions of mounting hardware.

The component line consists of 18 inch and 15 inch ultra-linear woofers (*HLS-46UL2-8* and *HLS-38UL-8*), 1.4 inch and 1 inch compression drivers (*HFD-651-8/16* and *HFD-353*) and a 90x40 supertweeter (*HT-371-8/16*).

The loudspeaker line includes two subwoofers (*SW-46S-UL2* and *SW-46W-UL2*), a 3-way flying system (*SF-30*), a 3-way arrayable system (*SF-60*), a two-cabinet electronically controlled system (*SR-F1* and *SR-L1*) and the *F-500/F-600* 2-way systems.

UK: Toa Electronics Ltd, Brentwood, Essex. Tel: 0277 233882.
USA: Toa Electronics Inc, South San Francisco, CA. Tel: (415) 588-2538.



Dynamic Processing Has Reached A New Peak.

The name Klark-Teknik has always been synonymous with audio technology at its highest level. Innovative engineering combined with quality components ensure products of outstanding musical purity and durability.

Now, that same commitment has been brought to dynamic processing. With the new Series 500.

The DN500 is the only two-channel compressor/limiter/expander that lets you use its processing functions in any combination — with full function variable knee compression, independent peak limiting and clipping. Plus a variable ratio expander/gate for total dynamic control.

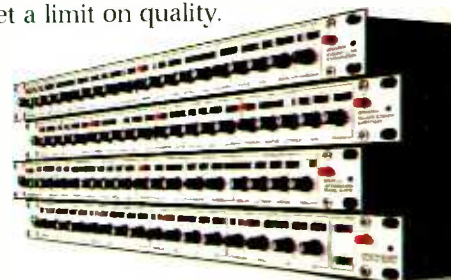
Most importantly, it delivers all the clean, quiet sound quality and reliability you'd expect from Klark-Teknik.

The same high standards are common to all Series 500 products — from the compact DN504 Quad Compressor/Limiter, to the flexible DN510 Dual MIDI Noise Gate and DN514 Quad Auto Gate.

If you're looking for the ultimate in dynamic processing, visit your local Klark-Teknik dealer and find out more about the Series 500. Because at Klark-Teknik, we never set a limit on quality.



Klark-Teknik Research Limited
Klark Industrial Park, Walter Nash Road
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Tel: 0582 741515
Fax: 0582 745371
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200 Sea Lane, Farmingdale
NY 11735, USA
Tel: (516) 249-3860
Fax: (516) 420-1863
Klark-Teknik (Singapore) Pte Limited
7500A Beach Road, 05-305 The Plaza
Singapore 0719
Tel: 293 9736
Fax: 293 9738





Audio Precision Portable One

Audio Precision have announced the addition of a portable audio test set known as the *Portable One*. This is a 2-channel design with full stereo measurement capability as well as dual bargraph displays. The unit has 12 different measurement functions that are selected by pushing a button. Audio Precision say that performance has not been

compromised for size and that it is also suitable for high quality benchtop measurements. A captive protective cover for the front panel is also available.

Audio Precision, PO Box 2209, Beaverton, OR 97075-3070, USA.
Tel: (503) 627-0832.

UK: SSE Marketing, Unit 2, 10 William Road, London NW1 3EN.

In brief

- **tc electronic's TC1280** stereo audio delay line has been updated to display delay settings in frames as well as feet, metres or seconds.
- **AMS** have announced the first update for the *AudioFile Plus*—the ability to have eight simultaneous inputs and 16 outputs. They have further announced a reduction in price of *AudioFile Plus* systems with storage capacity of 4, 6 and 8 hours as a result of reductions in the cost of Winchester storage.
- **Studio Magnetics** have launched a 2 inch full track replay alignment tape containing the three commonly used EQ standards on a single reel of Ampex 456. The tape contains all the standard test tones with the most needed being 90 secs long. Studio Magnetics (UK) Ltd, Unit 4 Radfords Field Industrial Estate, Maesbury Road, Oswestry, Shrops SY10 0HA, UK. Tel: 0691 670193.
- **UK company TSC** have developed an Akai compatible 8 Mbyte memory

board for the *S1000/1100* samplers. Up to four boards can be installed in each machine giving a maximum memory of 32 Mbyte. The card is the *TSC8* and TSC will allow a trade in on redundant 2 Mbyte boards. TSC, 9 Hatton Street, London NW8 8PR, UK. Tel: 071-258 3454.

- **JBL** have added a new smaller model to the *Control* series of speakers. The *Control Micro* is based around a single 4½ inch driver unit offering a claimed output of 60 W and a frequency range of 100 Hz to 18 kHz. The cabinet is made from acoustically damped polymer and is magnetically shielded. The *Micro* is available in black and white finishes with optional wall and ceiling mounting fixtures.

JBL Professional, 8500 Balboa Boulevard, Northridge, CA 91329.
Tel: (818) 893-8411.

UK: JBL/Harman, 1b Mill Street, Slough SL2 5DD. Tel: 0753 76911.



The Eventide range is now so good it's moved some to tears.



Whereas many of today's most popular signal processors are of Eastern origin, there's one name that stands out from the crowd. The name is Eventide. American innovation and design flair have been combined to create Eventide's H3000 Ultra-Harmonizer range — an answer to any audio professional's prayer.

First up, there's the H3000SE that gives you pitch shift, reverb, delay and other time-based effects — all with exemplary 16-bit audio quality. Spin the control wheel, choose one of 200 presets, change a few parameters — and

HHB COMMUNICATIONS LIMITED, 73-75 SCRUBS LANE, LONDON NW10 6QU

Tascam M-3700 consoles

Tascam have launched the M-3700 series of consoles, an automated console based on the established M-3500 series of multitrack recording systems. The automation allows control of fader levels, channel, monitor and aux mutes, and EQ on/off.

The system operates in a choice of two modes—realtime and snapshot. In realtime the automation operates against SMPTE/EBU timecode (timecode generator included), MIDI timecode or MIDI clock. Modes for Write, Update, Read and Manual modes can be independently selected for each channel and group while in the Write mode the user can specify faders only, switches only or both. It is also possible to bypass the fader VCAs. The snapshot automation mode allows the storage of all fader levels and switch status as a single snapshot with capacity for 99 memories.

The snapshots can be recalled via



numeric keys, footswitch or MIDI program change with the transition time between changing fader settings being variable from 0 to 25 secs.

All the hardware and software for the automation is held within the M-3700. The system uses 256 k of RAM for memory with a 3½ inch floppy disk drive for storing automation data. Each disk can hold six titles of realtime data with alphanumeric titling done by a rotary dial. Data from the faders and switches are available at the MIDI Out socket for use with external graphic displays with the proper software although there are no plans to produce such a unit.

TEAC Corp. 4-15-30, Shimorenjaku, Mitaka-Shi, Tokyo 181, Japan. Tel: 0422 45-7741.
UK: TEAC, 5 Marlin House, The Croyley Centre, Watford, Herts WD1 8YA. Tel: 0923 225235. Fax: 0923 36290.

USA: TEAC Corporation of America, 7733 Telegraph Road, Montebello, CA 90640. Tel: (213) 726-0303.

you've got the effect you've been looking for. As soon as you try any Ultra-Harmonizer, you'll notice that it doesn't sound like any other effects processor. The effects are inspiring, different, creative.

Or try the H3000S. The sounds all feature the same sparkling audio quality as the H3000SE. 48 of them are taken up by the remarkable Steve Vai Preset Collection, perhaps the best starting point any musician could imagine.

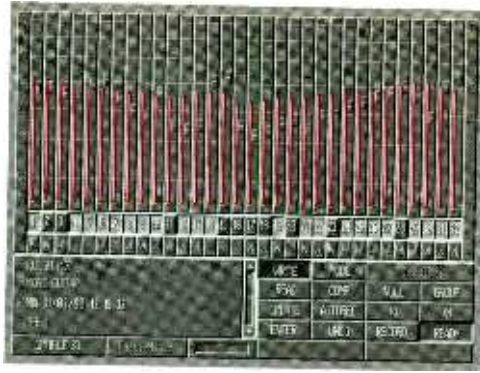
Many broadcasters choose the H3000B. It provides an impressive palette of ready-to-use treatments and sound effects to dramatically enhance any on-air presentation.

While we're on the subject of broadcast applications, take a look at the BD-980 stereo profanity delay – a unit that takes the stress out of running phone-ins and live radio shows.

HHB can quickly transform your H3000, giving it the features of any other model in the range.

We could go on to talk about the H3000 series' versatile MIDI implementation, the informative LCD display and the ease of programme editing – but that might be rubbing salt into other people's wounds. So call HHB for a demonstration, and you'll understand why there are a few tears being shed in the East.





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 Sweden : Soundtrade AB - (08) 730 04 00 • Spain : Rafael Campos Royo - (03) 675 50 11
 Singapore: Swee Lee Co. - 336 78 86 • UK : Studio Timeline - 081 994 44 33
 Venezuela : Acoustilab - (02) 987 48 45 • W.Germany : Mega Audio - (067) 21 26 36



Zeta Mirror 6

Heralded by many in the know as the last word in MIDI guitar controllers, Zeta's *Mirror 6* gets about as close as any manufacturer has to squeezing the most down the 5-pin DIN while compromising the player's technique the least. Based around a rather pleasant fully featured and functional solid bodied electric and available in two versions—the *Standard* with EMG *Select* pickups and the *Deluxe* with EMGs and Kahler trem—the *Mirror 6* combines fret scanning and pitch extraction with picked envelope triggering. Consequently the company claims a 1 ms MIDI trigger time and response is certainly consistent throughout the neck.

The guitar is connected by multipin to a 1U controller unit, which in turn communicates via MIDI to a synth. The controller can also blend the guitar pickup output with that of the synth and this surfaces on the guitar front in the shape of a pot. Other controls include a 3-way selector for optimising scanner performance for chord, lead or neck tapping styles. The beauty of the arrangement is the level of custom adjustment that is available to the player allowing very fine tapering of sensitivity and

response across MIDI for an individual's technique. This results in a guitar controller that feels as if it's in control.

MIDI modes supported are Multiple Mono and Poly, the former putting some constraints on the type of synth that can run with the Zeta. Essentially the company have set about installing as full a MIDI implementation as can be found on a guitar controller—and they all work. A brief mention of some of the highlights would have to include the use of the whammy bar and a soft-knob on the guitar front as MIDI continuous controllers, the ability to place a phantom capo and still play below it, the alternate tuning of each string's synth and the sheer speed and ease with which the whole system responds.

Guitarists who over the years have lost interest in the quest for a MIDI guitar controller because of the inadequate and downright bizarre nature of the systems on offer could have reason to celebrate. The *Mirror 6* works.

Zeta Music Systems, 2230 Livingstone Street, Oakland, CA 94606, USA. Tel: (415) 261-1702.
UK: Harbour Town Distribution, 71 Thornton Road, Manchester M14 7NU. Tel: 061-225 5647.

Roland Studio M

Roland's *MV30 Studio M* combines a 30-note eight-part multitimbral RS-PCM sound source with a 16-track sequencer in a small powerful, yet eminently accessible package. Eight tracks of the sequencer, which is operated by tape transport type controls, are dedicated to the internal sounds leaving the rest free for external synths. Data can be edited, including system, and the unit's 3½ inch storage is standard MIDI file compatible. Internal sounds can be added via ROM card and treated by

built-in effects. Interestingly, the *MV30* allows the user to alter the levels, pan connected synths via front panel sliders and store these movements into memory along with the sequence data. The system is enhanced by the inclusion of a large LCD with associated alphanumerical keypad and dedicated function buttons. Capacity is 50,000 steps with ¼ resolution.

UK: Roland, West Cross Centre, Brentford, Middx TW8 9EZ. Tel: 081-847 1528.

USA: Roland Corp, 7200 Dominion Circle, Los Angeles, CA 90040. Tel: (213) 685-5141.

Akai S1100

As a development of the *S1000* stereo sampler, Akai have announced the *S1100* with built-in SMPTE reader/generator and cue list programming. The unit, which is outwardly very similar to the *S1000*, contains a realtime DSP and will, with the release of Version 2.0 software, be capable of recording direct to 650 Mbyte magneto optical disk.

Sampling is 16 bit linear, phase

locked stereo at 44.1 and 22.05 kHz with standard memory of 2 Mbyte expandable to 32 Mbyte. SCSI port is standard as is a digital port and the *S1100* comes with built in digital effects for reverb, chorus, pitch shift and delay storable in 50 presets.

UK: Akai Professional, Middx. Tel: 081-897 6388.

USA: Akai Professional, Fort Worth, Texas. Tel: (817) 336-5114.

Studio Sound's Music News is compiled by Zenon Schoepe

Software

• **C-Lab's *Creator/Notator* Version 3.0** is out. The manuals have been completely rewritten and include a cross-referenced index. New *Creator* features include an interactive editor called Hyper Edit, an enhanced RMG page with fader groupings and Adaptive Groove, which recognises rhythmical structures and auto corrects accordingly. A Macro function permits complex mouse movements to be replaced by a keystroke.

Notator enhancements include Page preview for viewing and editing pages prior to printout, a disk of down-loadable fonts, cue notes, diatonic insert, MIDI meaning of accents and staccato, and tuplets.

• **Version 2.0 software for Roland's *S770* sampler** offers improved sample wave editing and digital processing capabilities, expanded stereo resampling options, greater file sorting and management efficiency, eight individual outputs and increased operating ease.

• **Steinberg's *Cubase* Version 2.0** features an Interactive Phrase Synthesiser, which allows different versions of existing music to be

created. A complete score can now be printed, the order of parts can be changed in score edit and the display auto quantise function has been improved. Rests can now be deleted, enharmonic shift is possible, scroll bars change the active staff in Score Edit, program and volume columns are available in the Track List and the sequencer now features an improved analytic quantise function. Updated replacement documentation completes the package.

New for Yamaha's *SY77* synth is Steinberg's *Synthworks SY77* editor/librarian, which features a *DX7/TX7/DX7II/TX81Z* sound translator for transferring sounds into *SY77* equivalents. The graphics orientated package operates with pull down menus, includes a sequencer, MIDI rechannelisation, micro tune editor, an on-screen keyboard and several methods of data entry. Disks are interchangeable between Atari and *SY77* drives.

• **JL Cooper** have released a remote editor/librarian for the *Synapse* MIDI patchbay/processor, which permits naming of inputs, outputs and presets. Routing is controlled via pop-up menus and all *Synapse* functions, such as filtering, zoning, transposing and patch mapping, are accessible.

CONSULTANTS WHO NEEDS THEM?

Before Mr Gorbachev started the second Russian Revolution there was (and perhaps still is) a group of people known as Kremlin Watchers, whose task was to read between the lines of the reports in *Pravda* or the communiques of party conferences. All of these, to the uninitiated, contained the same bland statements that in effect meant everything that had been done in the past was good and the future would be even better. A careful study of the choice of words and phrasing would reveal, however, the victories and defeats of the various groupings in the party caucus.

We have some of the same in our own press, a 'full and frank exchange of views' means a blazing row with no possibility of agreement on anything, 'a close watch will be kept on the matter' means it will be forgotten immediately.

In the recording world when we read a report of a studio and the manager says 'we did our own acoustic design and we got Fred Smith of FS Acoustics to do the fine tuning and we're really happy with the result' we should read, 'we did our own acoustic design to save money, but it was a total disaster, so we asked Fred Smith to help us out. He said we should rip it all out and start from scratch, but we couldn't afford to, so after a lot of pleading he did the best he could. If we make enough money we hope to be able to tackle it properly in about 2 years.'

There are also the unreported feelings of Fred Smith, "I wish my name wasn't associated with this job, it was a rescue mission but it filled in some time between decent studio contracts."

It is unfortunately true that studio construction or reconstruction projects often do not run as smoothly as they could, costs get out of control and schedules become meaningless, with the final result sometimes falling short of expectations.

Suppose you have decided to build a studio, or perhaps you already have one and you want to refurbish it. The first decision is whether to do it

Sean Davies points out some pitfalls of studio design

all yourself or to take professional advice. It amazes me how many people decide to be their own acoustic designer. Is it really likely that someone who hasn't studied the subject and has never done it before is going to get it right first time? Would you design your own motor car including suspension, brakes and steering and then drive it without having anything checked by a professional?

Of course, any room with a microphone in it can be called a studio and any room with a pair of speakers is a control room but they will be bitches to work in unless luck and chance combine to give a passable sound. A good studio design will immediately show itself by the relaxed feel when working in it, the ease with which you

can get a good sound and the feeling of confidence that a mix made in the control room will sound good anywhere. Such characteristics are reducible to reverberation patterns, angles of surfaces, treatment materials, etc, but it takes a lot of accumulated experience to be able to predict the behaviour of a design, and it is this intangible commodity that a client pays for when he consults an acoustic designer.

In case you are thinking this is a PR exercise on behalf of acoustic designers I will readily admit that recording studio design is a very young discipline and we are still not at the top of the learning curve. Also, the needs of the recording engineer are changing rapidly. For instance there are many control rooms big enough for the engineer and two or three other people but you will find two synthesisers wedged between the back of the desk and the monitor speakers. Again, since the introduction of digital recording and domestic CDs the presence of tape mechanisms, cooling fans, etc, in the control room raises the noise floor above that of a quiet

domestic room: the record buyer can hear more than the engineer. Part of the problem is that a building, or an internal construction will be expected to last for 7 to 10 years as opposed to the mixing desk/tape machine, which might be replaced in 4 to 8 years.

Classic acoustic design relating to concert halls and large auditoriums has little relevance to recording studios, you cannot scale down the dimensions of, say, the Grosse

Musikvereinshalle in Vienna and expect a good studio because the wavelengths of sound do not scale down.

Electronically produced music, whether from an instrument or a computer can produce very high energy levels from about 30 Hz upwards: you might take a look at the spec sheets of general purpose acoustic treatment materials—they nearly all stop at 125 Hz. All this means that studio designers have had to develop a new branch of acoustics with new rules and new materials.



Two extreme examples of building suitability are cinemas, which are ideal. While at the other end of the scale, there is a wood clad building . . .

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HEAR AGAIN The Koss Studio Pro's

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◀ PRO/4AA

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PRO/450 ▶

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KOSS

HW International, 3-5 Eden Grove, London N7 8EQ. Tel: 01-607 2717

To: HW International, 3-5 Eden Grove, London N7 8EQ. Please send me full details on Koss Studio Pro Headphones.

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Name _____ Address _____ Post Code _____

Choosing the building

So you want a studio built: you may already have a building, either owned or leased, or you may be looking for one, or you may have a piece of land and be prepared to build from the ground up. This last option is the most cost effective in the long term because every pound you spend is going where you want it, ie you are not adapting a building designed for another purpose. However, the high initial cost of building from scratch removes it from the options list for many people. If you are adapting an existing building you don't want to spend too much money making it suitable for housing a studio. This money comes out of the total budget so reduces the amount available for equipment, etc. Two extreme examples of building suitability are cinemas, ideal because they are solidly built, have no windows to be blocked up or overglazed, have a large unobstructed area and generous ceiling height and usually a very solid floor, which can take heavy loading, and at the

other end of the scale, is a woodclad building with many windows, steel roof trusses supporting a corrugated iron or similar lightweight industrial roofing and a timber floor on domestic-type joists over a cellar. Acoustic isolation in this last building is virtually non-existent, so whatever you pay in purchase or rental is really only getting you a piece of land but probably without the freedom to build what you really want.

This is the best time to bring in your acoustic consultant, right at the beginning. Most consultants will give one local visit free but don't expect him to view several properties at no charge, you are after all using his expertise and time.

Selecting consultants

OK first things first. If you are a producer and/or musician you will probably visit quite a few studios and you will know the type that suits you

best. It shouldn't be difficult to find out who designed your favourite. You probably know one or two freelance engineers and you can elicit their opinions on which studios they like to work in. Don't bother to ask a studio owner or manager if he's happy with his studio's design: who would admit to having bad acoustics?

This is the point to get one thing clear, the most important aspect of a studio design is the acoustic performance. This may seem like stating the obvious, but it is easy for the client to get carried away with decor, the reception area, the recreational facilities, etc. These are important but if any of them take priority over the acoustics then there will be a lot of impressed visitors who will not re-book.

Now for the most important single question in studio building, do you have a clear idea of what you want? It doesn't matter if you don't, provided you tell your designer and allow time for discussion and sketch plans. A certain recipe for trouble is to give the designer a close deadline allied with a tight budget, then after work has started, come out with a dreaded line such as 'I think maybe we should make the isolation booth a bit bigger,' or 'I think we'll put a programming suite on top of it next year,' or even 'I've decided to go for another eight inputs on the desk, which means it won't fit in the control room.'

Our industry is known for the laid back way we do business but this can cause havoc where bricks and mortar are concerned and the client thought he was getting something different from what he sees. Obviously, you will at the very least want some idea what the finished job will look like, and here comes one of the first common problems: most designers will have plan and elevation drawings prepared to normal building requirements, eg site survey, existing structure, new works (at a scale of 1:100 or 1:50) and detail sections at 1:20. If you are not familiar with architects' drawings then it may be difficult to visualise the final appearance of the project. Ask for a set of perspectives, they will cost a bit more but you can get a much better idea of the feel of the place.

Do you need an architect? Isn't the designer already an architect? The answer to the second question is probably no. In spite of the long and rigorous training an architect has to undergo, they are unlikely to have been given more than the classic concert hall acoustic theory already referred to plus acoustics of dwelling places and offices.

If the project involves no more than the internal reconstruction of an existing studio, or making a studio in a suitably prepared building, then you probably don't need an architect. However, if structural work is involved, planning permission required, or the studio is to be in a listed building, then I strongly suggest you employ one. There are two main advantages: 1) fully qualified architect with 'RIBA' after his name is able to take out an insurance policy with unlimited liability—no one else can do this; local authorities are used to dealing with architects so planning permission, etc, should go more smoothly. If your project is outside the UK but you are using a British-based designer, then a local architect is invaluable for sorting out the necessary statutory work, let alone producing a building specification in the builders' own language.

Here arises a potential problem area: architectural courses do not include humility in the syllabus, although some students learn it themselves. Neither is this quality always found in acoustic designers. The architect may feel they spent a lot of years and hard work to get a

Do You Know these terms?

Monitor — a reference loudspeaker system for the mixing and mastering of recorded music.

Standard — a reference from which qualitative judgements can be made.

Tracks — (noun) channels on a multi-track recorder (verb) accurately reproduces the audio qualities of another transducer.

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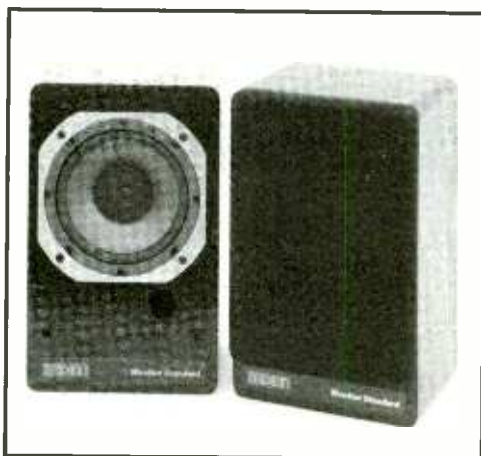
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recognised professional qualification and are not going to play second fiddle to some knob-twiddling hippy who thinks he invented sound. While the designer feels it is an acoustic project and is not going to surrender control to someone whose knowledge of acoustics stops at Sabine's formula, however many letters he's got after his name.

If, as the client, you already have an architect in mind, sound him out on his attitude to working as part of a team with a designer. Very often an acoustic designer will already have established a good working relationship with an architect so the conflict would not arise.

Planning permission

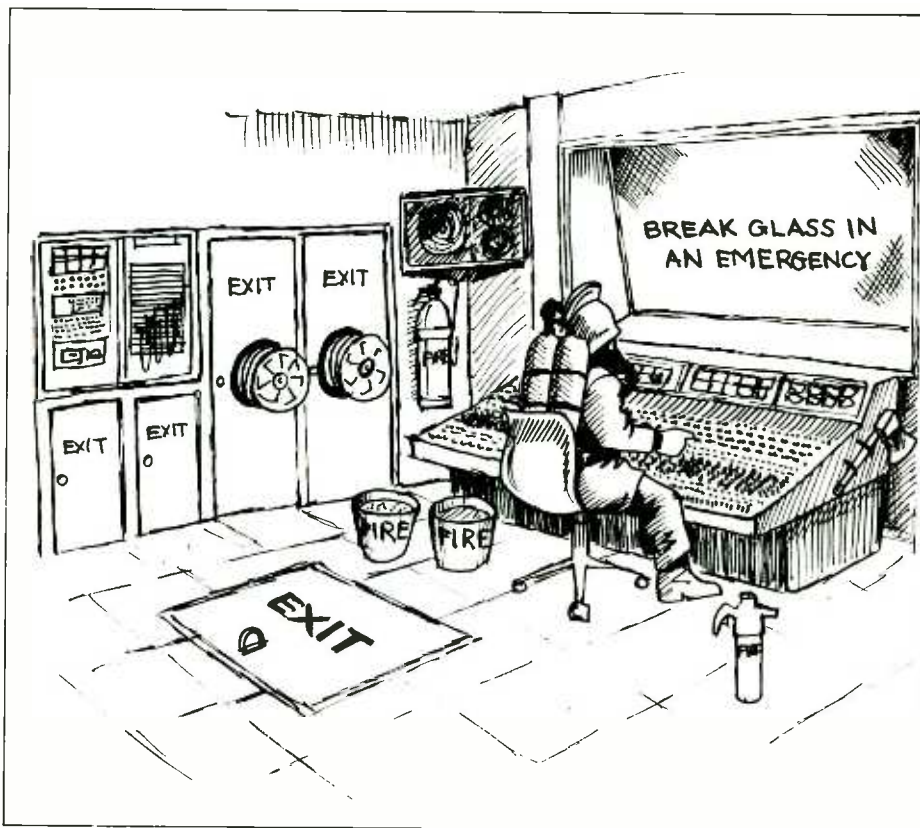
'Statutory Requirements'. What are these? As far

as Britain is concerned there are four main areas: planning permission; building control; change of use; fire regulations. This is not a definitive statement, just an outline guide. Electrical installations are also covered by statutory requirements but if you employ a competent firm of electricians they will take care of these.

Do you need planning permission? Perhaps. Suppose you are a musician and you want to put a piano in a room in your house so that you can write music and/or practice, you do not need planning permission, or any other permission for that matter. Maybe the piano is electric, perhaps a synth, and maybe you also have a tape machine and a mixing desk. Still OK. So you get some musician friends in to help finish off some tracks, still OK as long as they don't make too much noise. Now suppose your friends like your place and ask 'Can we come in and do some things ourselves? We'll fix up some kind of money, or maybe you'd like some points on the album.' Not OK, it is now a commercial studio, and you need planning permission.

There was a time when the term 'Recording Studio' was like a red rag to a bull when it came to some councils. Nowadays things are a bit more reasonable. The main concern that the planning committee will have is whether the proposed studio will cause a nuisance to neighbours and/or damage the environment. A good set of drawings, together with adequate information about steps taken to soundproof the building(s) and answers to such questions as how much traffic would be generated and what parking facilities would be created will help. The council would also circulate your neighbours with a questionnaire. It's better that they should know about your plans beforehand, so get to know them and reassure them.

If the project involves structural work (eg knocking out a floor, putting up new supports for internal walls, floors, etc) then you will need



Part of the problem is the belief that once you have contacted the Fire Officer you will be forced to provide many exit doors, steel staircases, smoke detectors and a bucket of sand in every toilet

building control approval. This is given by the District Surveyor. He is only interested in the safety of the proposed works, plus some other factors such as any changes to drain runs or such. A set of drawings supported by the calculations of a qualified structural engineer will be what he wants, and provided these are in order there should be no problem in getting approval. In any case, safety is in your interest as well, isn't it?

Suppose you are taking over a commercial building, maybe a shop or offices. You shouldn't need planning permission because it is already a commercial property but you may need permission to change its use. There may be some difficulty if you want to convert a shop as some councils don't like blocked off windows in a row of shops but there should not be much difficulty otherwise.

In spite of the low popularity of self immolation it's amazing how many people would rather put up with a death trap than check on the fire regulations. Part of the problem is the belief that once you have contacted the Fire Officer you will be forced to provide four exit doors in each room, five steel staircases to the next three buildings, a smoke detector system that sets off high pressure sprinklers every time somebody lights up a cigarette and, of course, a bucket of sand in every toilet. Not all of this is true. Even the Fire Brigade admit that the Fire Regulations are 'a bit complicated' but the basic points are: if you are running a commercial business you are legally bound to provide adequate means of escape for those using the building (or part of it) in case of fire, also to provide adequate means of fighting a fire. (Fire Precautions Act, Section 9A.) This obligation covers both employees and customers. In addition a Fire Certificate is required if there are more than 20 people in the building or more than 10 people on any floor other than the ground floor. Your local Fire Prevention Officer is himself under a legal obligation to give you (or your agent such as the designer) free advice, also to

recommend the least costly way of meeting the requirements.

Budgeting

What will it cost and how can you be sure it really will be the cost, not half of it?

So often a prospective client will come along and say 'I want to build a studio, I've got a budget of £/\$x,000'. Well, OK, you've got to start somewhere but the client's budget figure is usually based on how much he can borrow less the cost of the gear he has already decided on. The only proper way to estimate the cost of a studio project is to do the design, then get a quantity surveyor's or a builder's estimate. The designer may be able to give an idea based on previous jobs but there are so many variables that each design has to be treated individually. As a client, don't take

designer's off-the-cuff figure as a binding estimate.

As far as a notional budget is concerned, deciding the figure beforehand and making that the absolute limit, is like going into a showroom and saying to the salesman 'I have a budget of £1,000, I want a new car.' Or to quote a colleague, 'he's trying to build a studio for what it doesn't cost.'

Unfortunately, some designers feel they should try to do the job within the client's unrealistic budget because if they don't, someone else will do an admittedly bodged job, but get another name on his client list and the attendant publicity.

Perhaps the biggest single cost factor in the early stages is the decision whether or not to float the structure. This means building a room within a room, so that there is no solid connection between the studio (or control room) and the outside world. Floating is the only sure way of preventing the low frequencies from travelling into adjacent buildings. If your studio is to be situated near residential buildings it is almost essential to float it, unless the monitor speaker power is severely restricted. If you are considering speech recording, or quiet acoustic instruments, then you will need to float in order to keep disturbances out, unless it is in a very quiet rural area.

There are two main ways of costing a job: design and build; competitive tender.

In the first, the client gets an all-inclusive figure from the designer, which covers all design work, drawings and the construction down to surface finishes. It may also include power wiring and sometimes audio wiring.

In the second approach the designer quotes for the design work and a full set of working drawings, with possibly a Bill of Quantities (this is a breakdown of the work into stages with man-hours and materials laid out) produced by a quantity surveyor, who may also be asked to put an estimated figure against each stage. Copies of

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the Bill of Quantities (without the estimates!) are then given to as many builders as the client wants to consider for the job, and the builder will return the document with his estimates. If a quote is either way up or way down in the QS's estimate you can see where the builder is cutting corners or loading it a bit too much.

Although the competitive tender is a standard method in the building industry, studio construction is a very specialised form of building, and a builder new to the work may be a bit frightened by the odd angles of walls and ceilings, and the awkward collisions of surfaces, etc, so he may quote a bit high to cover himself. It may be better to allow the designer to suggest a building firm familiar with studio work.

From the client's point of view the design and build format is convenient. There's only one backside to kick and the buck cannot be passed. For a new building from the ground up it has advantages but my own view (which may not be shared by other designers) is that on the conversion type of job there can arise a conflict of interest. There are always unexpected snags on a conversion, the original drawings (if any) may not be accurate, or the original builders may not have kept to them. A simple looking thing like a drain pipe where it wasn't expected, or a doorway that has to be moved can cause £500 to £1,000 extra expense. If the designer is also the main contractor and the client has driven a hard bargain on the overall price, then the extra expense has to come from somewhere, either the designer's fees or the constructional cost. There is thus a temptation to ease up on part of the building spec to preserve what was probably not a wonderful margin in the first place.

If you need to make money from your studio, then you will obviously hope to see it full as much of the time as possible, so don't skimp on the air conditioning. A split system (where the air handling unit with the fan is in the room) may be cheaper to install but if work has to stop while a noisy unit clears the air your studio will get a very tacky image, however good the gear and acoustics.

From the designer's point of view there are certain types of job that are best avoided. If the prospective client makes a big deal of the kudos and wonderful publicity that will result from the project, he probably hasn't got the money to pay the first invoice. If a client says 'I've done the design myself but I'd just like you to cast an eye over my drawings' he's trying to get a design job for one day's pay. If he's an overnight star who wants his own studio, insist on meeting his manager and/or accountant to see if anybody is controlling his spending, or he's likely to run out of money halfway through the project.

Schedules

Naturally, every client wants the studio up and running in the shortest possible time. If money has been borrowed then the interest is already being charged before the builders arrive. Very often, this aspect of financial planning is overlooked, or 'guesstimated' without reference to a designer or builder. The result is a cash flow crisis before the studio opens. It is also one of the causes of a client saying to the designer 'it has to be finished by this date'. With due respect, that's a very stupid way to approach a job. Unless the client is a qualified designer, draughtsman and builder, how can he judge if his imperative timescale is practical? There will be variables on each job that can affect the timescale, such as

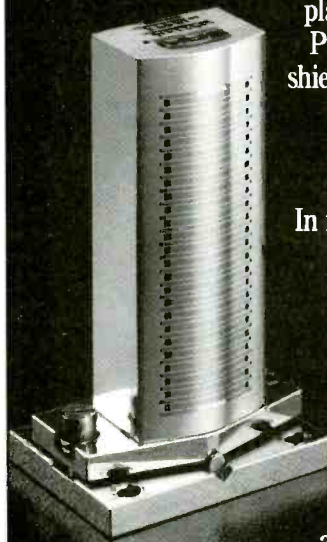
access to the site (parking restrictions), a place for a skip, delivery times on specialised materials, arrangements for demolition of existing structures (maybe there is another studio in the building and you don't want to have to close it down, or perhaps the waste from the demolition has to be bagged and carried offsite to minimise dust and dirt in the rest of the building).

Here, then is a suggested procedure for a smooth-running project: 1) once you have decided you want to build a studio, choose a designer. 2) set aside enough money to pay the designer to investigate buildings and/or produce a feasibility study or outline sketch plan, 3) get a rough figure for the constructional costs plus all other fees, add a bit for contingency (say 15%), get a rough idea of the timescale involved, allow the designer and/or architect to sound out the situation re statutory requirements, 4) get your accountant to draw up a plan separating working capital from constructional costs and allowing for stage

payments as agreed with the designer/builders, 5) once the financial package is agreed, get down to the detail design matters with the designer. Remember that if there is a long delay in getting your finance arranged the designer or chosen builder might have had to take on another job, they also have bills to pay. You can avoid this by putting them on a retainer.

All that I've said can be summed up in one word: enthusiasm. A good acoustic designer (like a good recording engineer) is obsessed with getting a better sound and it would be nice if the bills got paid meanwhile. If everybody on a studio job feels that there is a real interest in getting a good result then both the quality and speed of work will benefit. If, on the other hand, the client tries to be clever and save a few pounds by being tricky, or changing his mind after the job has started, then both designer and workforce will be anxious to get off the job as soon as possible with inevitable consequences. □

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NOISE LEVELS LIVING WITH THE REGULATIONS

UK recording studios have functioned since January 1990 under the Health & Safety at Work legislation's restrictions on noise levels over time. Our articles earlier this year reasoned that levels under the EEC directive were set too low. In this article Stephen Court of Court Acoustics looks at the neurological and psychoacoustic aspects of sound levels and why nothing is as straightforward as it once seemed

Any attempt to legislate over sound levels is hazardous, if only that, unlike industrial sounds, music is so subjective. There are no established measurement parameters, simply because music is aperiodic and transient. More to the point, measured sound is very different from perceived sound.

Audio spectrum analysis has shown us that what the microphone interprets is quite different from what our ears interpret, and although we still have a lot to learn about our ear/brain system, several factors confound any real attempt to establish guide parameters in sound levels.

In order to appreciate just how we hear these sounds, it is important to understand how the hearing mechanism works. Sound waves arriving at the outer ear are converted by the tympanic membrane—the eardrum—to mechanical energy, which passes on to the bony stirrup mechanism in the middle ear. The bone structure in the middle

ear then passes the mechanical information through the oval window in the cochlea, where the basilar membrane through a matrix of hair cells, converts the mechanical energy into electrical information for passing to the brain.

The basilar membrane is the acoustic equivalent of the retina. Instead of rod and cone cells converting photon energy into electrical impulses, the minute and delicate hair cells act as transducers converting acoustic energy or vibration into electrical impulses. As well as passing information to the upper (intelligent) and lower (reactive) centres of the brain, they also connect to the hypothalamus in the brain stem. This is a very important connection since it not only allows sound to control our emotions and responses, but due to the efferent nerves (feedback) from all parts of the brain to the ear, it also gives us control over how we react to sounds.

These hair cells, respond to the frequency and amplitude of sound and like the rest of our nerve

cells, and unlike all our body cells, do not regenerate once they are damaged or destroyed. Prolonged exposure to high sound pressure levels damages these delicate hair cells, and causes a temporary threshold shift in our hearing. Continued exposure to high sound levels destroys the hair cells providing a permanent threshold shift, that is permanent hearing damage.

Over the past 20 years several attempts have been made to establish a maximum sound pressure level to prevent hearing damage. The ceiling has varied from 80 dB to 95 dB depending on which local or government authority was undertaking the tests, and generally, the maximum safe limit has been on the conservative side, one assumes in order to cover those instigating the final figures.

For every official paper on restricting noise levels, there are just as many consultants and noise specialists who have based their work almost entirely on subjective measurements with conventional sound level equipment. There are countless references in medical and professional journals where virtually no reference is made to the nature of the noise in terms of its structure and our response to it.

The newest paper issued by the Health and Safety Executive established these levels as 85 dBA over a normal working period, with maximums of 90 dBA.

The problem with all these figures is that they are obtained under laboratory conditions using conventional sound pressure level measuring equipment.

The latter usually comprise calibration microphones read with moving coil meters, which lack the sophistication of the hearing mechanism, and ballistically are quite different from our ears. Especially, the meters used in assessing hearing levels, have a finite rise time, and give no indication of the nature of the sound they are measuring. A sinusoidal waveform—a pure tone—reads virtually the same as squarewave or complex musical waveform and yet to the ear these are very different signals.

Fig 1 shows three different Automatic Volume Control systems (AVCs). The first, the tensor tympani, is an 'electro-mechanical' device, which alters the compliance of the eardrum. As sound levels increase, the TT reflex reduces the compliance of the eardrum and so reduces its sensitivity to sound. Although its rise time is finite, it can often be heard as a 'popping' in the ear under high sound level conditions.

The second AVC mechanism is the stapedius reflex. This is a very interesting form of gain control as it appears to be frequency conscious. The vibrating stapedius rests on the oval window of the cochlea. Its displacement is proportional to the amplitude of the incoming sound, and is greater at low frequencies since there is more energy at the lower end of the spectrum.

As the sound level or amount of low frequency information increases, in order to prevent over-displacement of the oval window, the stapes 'twists' on its axis thus reducing the effective sound transmission into the cochlea. This works perfectly well on natural sounds since the balance of level between low, mid and high frequencies is virtually constant. This balance is explained later but in man-made sounds where the relative levels of bass, mid range and high frequencies are very different from natural sounds, these automatic gain controls can be defeated. For example, if the bass content from broad band signals is removed or the mid range content is disproportionately high, the stapedius reflex is 'fooled' into thinking the overall sound level has been reduced. This is

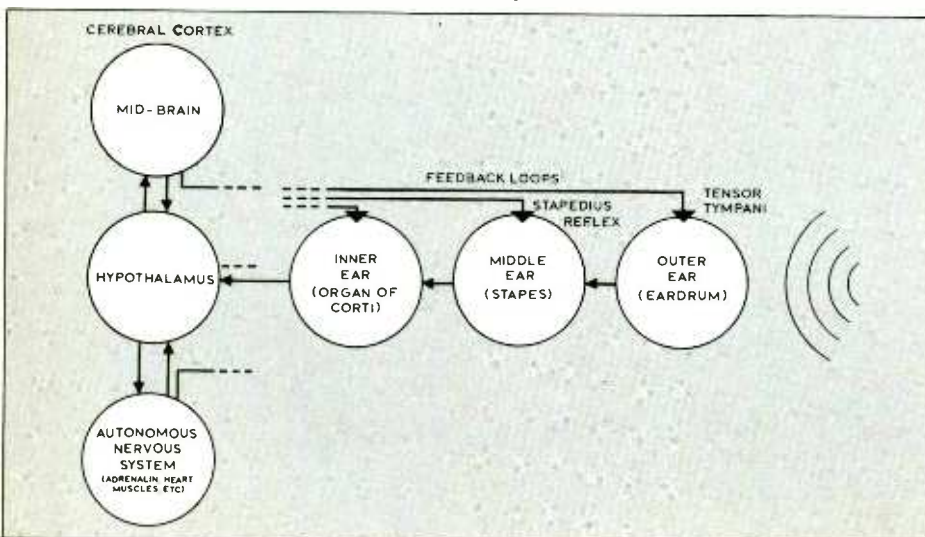


FIG 1: Hearing schematic

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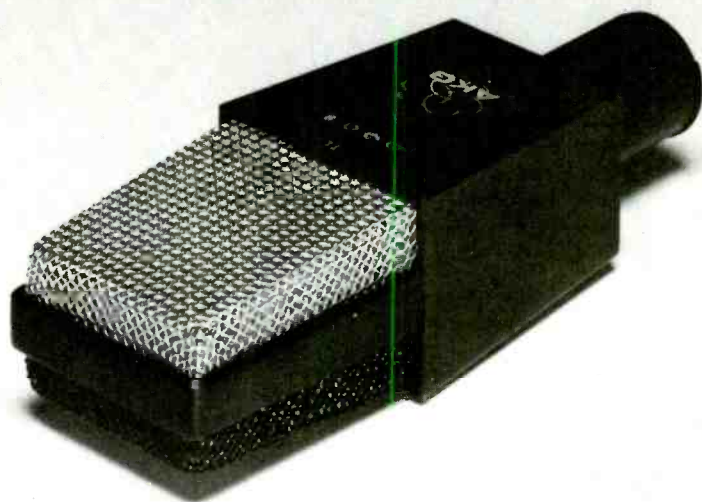
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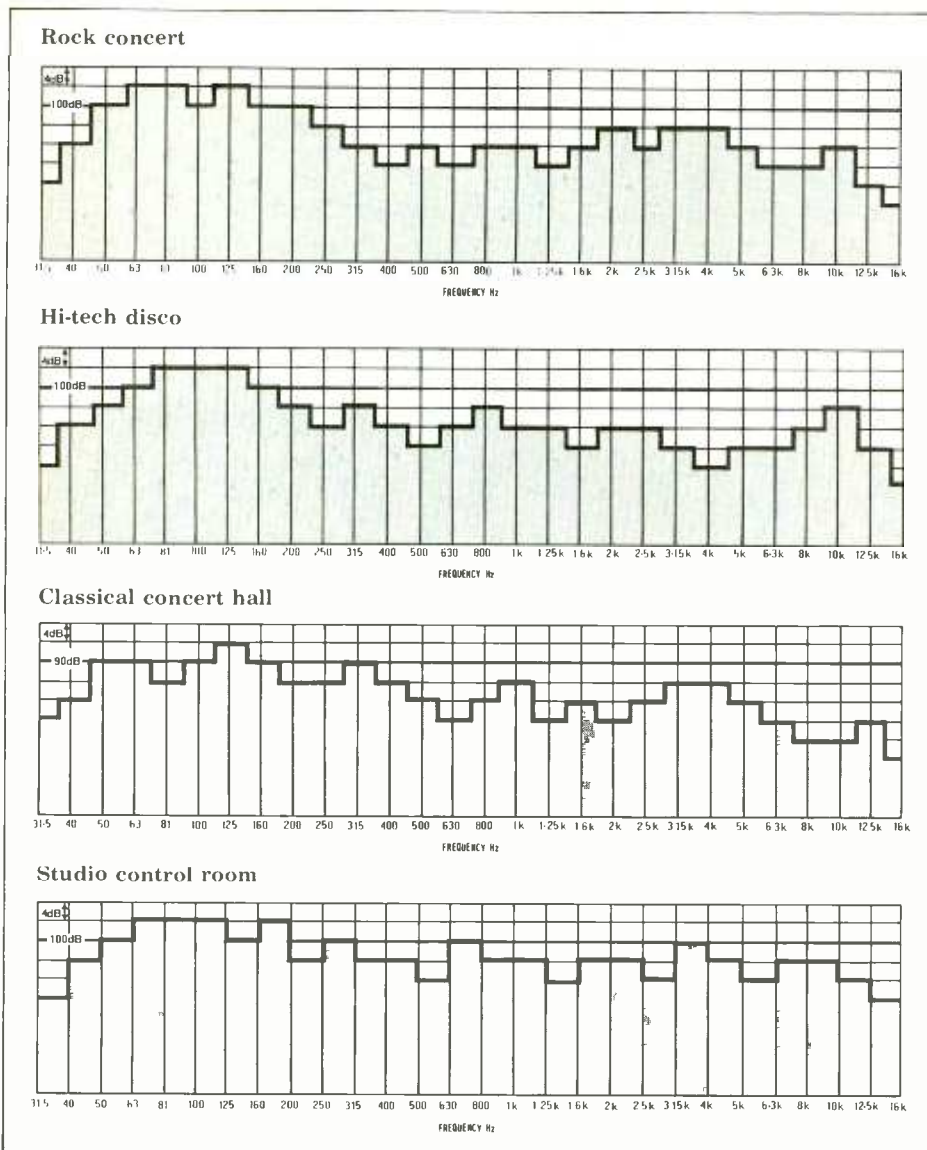


FIG 2: Measurement comparisons using calibration mics in various environments over a 1 hour period

very obvious in discotheques for example, where the loudspeakers have insufficient low frequency performance, such as small or ceiling-mounted enclosures. Since the excitement in music is caused mainly by the low frequency content, absence of sufficient bass from inadequate loudspeakers is compensated by the disc jockey simply turning up the volume until sufficient bass is obtained. At which time the mid range is overdriven into very high distortion and the combination of excessive mid range energy and high distortion levels in the midband have the effect of defeating most of the ear's natural automatic gain controls, causing a severe overload of the auditory system.

Our ears' automatic gain control systems are collectively known as the Acoustic Reflex. It is a very complex apparatus and there are many papers on its workings in neurological and psychoacoustic texts. From this article's point of view, its particular quality is that it is essentially a broadband device intended for natural sounds. It functions least of all on narrow band, mid range, fast transient sounds. The presence of such sounds is very common in electronically generated or amplified music, in badly designed sound systems, or sound systems driven beyond their capability into distortion. It is far more important to pay attention to these details rather than the measured sound pressure level *per se*.

Experience and field tests show that prolonged listening to narrow band/distorted sounds promotes listening fatigue and temporary threshold shift more than natural sounds or high quality reproduced sounds. It is, therefore, safe to say that physically (not socially) uncomfortable music is synonymous with hearing damage.

In which case, according to the measurements and tests, the 'danger' level or Infra Reflex Threshold, is some 15 to 25 dB lower on poor quality/unmusical sound, than it is on high quality sound be it popular or classical music.

This 'Infra Reflex' effect where the threshold of our Acoustic Reflex is considerably lower on narrow band sounds, is adequately demonstrated when playing music on a transistor radio with a theoretical SPL maximum of 88 dB (1 W amplifier with 88 dB efficient speaker) and observing how much louder it is subjectively than the same music on a hi-fi system whose theoretical maximum SPL is 115 dB (100 W amplifier with a 96 dB speaker).

It means that the threshold of feeling is considerably lower on narrow band/high distortion signals. An excellent example is radio 'phone in' programmes. If the FM tuner/amplifier is set to give maximum comfortable sound level on the broadcaster's voice, ie through studio microphones *et al*, the caller's voice via the telephone line not only appears to be much louder but is extremely

uncomfortable physically, even though the peak programme level is exactly the same, and therefore the SPL is the same on both voices.

Similar problems have also been found on other sound sources, where the midband SPL and distortion is high. Police motorcyclists were found to be suffering from varying degrees of temporary threshold shift. The problem was isolated to the re-entrant type loudhailers used on their motorcycles. Even though the measured SPL by standard laboratory apparatus was not particularly high, the combination of speech, ie midband information, and extremely high distortion levels associated with this type of speaker, showed that absolute sound levels were not the only factor in contributing to hearing damage.

In more detailed articles, where spectrum analysers have been used rather than SPL meters, as previously mentioned, there is practically no difference between the two.

Fig 2 shows the outputs of calibration microphones averaged over 1 hour in the respective venues of a rock concert, a hi-tech discotheque, a classical concert hall and a studio control room. Apart from the emphasis on vocals, ie mid range at the rock concert, the results are remarkably similar. That is, they show very little measured difference despite their acoustic difference conceptually—specifically the effect they have on our hearing.

Attempts to impugn on medical grounds rock concerts, discotheques or any other kind of musical venue, are further confounded by Fig 3, which shows the output of the same analyser microphone, averaged over 1 hour in Windsor High Street. According to these SPL measurements, traffic wardens and street workers are subjected to the same noise levels as rock fans.

Fig 4 shows the reading taken from a typical low quality discotheque comprising four small ceiling-mounted speakers with 12 inch drivers in undersized cabinets, and low cost compression drivers. This venue, of all those measured, despite being the lowest broadband SPL measured, was by far the most uncomfortable and was in fact quite painful, resulting in severe listening fatigue and temporary threshold shift. If my hypothesis is correct, this type of venue is far more likely to cause hearing problems than the others, even though the measured sound level is lower.

Obviously high level music that we like is considerably less aggravating than music we don't but it is more complex than that. We also appear to have some form of 'gain selection' in our hearing. Medical and neurological text books show that we know little of exactly how this process works. There is a process in our vision termed 'surround inhibition' where peripheral images are dampened to enhance focal images. A similar effect takes place in our hearing which we call the 'cocktail party effect', where we can hear our own name over the general hubbub of a party. Essentially, surround inhibition allows us to analyse frequency and amplitude variations more closely. We also appear to have the ability to control, to some extent, listening parameters.

In communications we call it 'receiver desensitising', where the back contacts of a morse key are used to pad down the receiving aerial circuit during the dot and dash transmission to avoid overloading the receiver front end. It's not a Marconi patent, because bats have used it effectively for millions of years. During the transmission of their echo sounding pulses, bones in the middle ear, are dampened down by a muscle, deafening the bat for a few milliseconds



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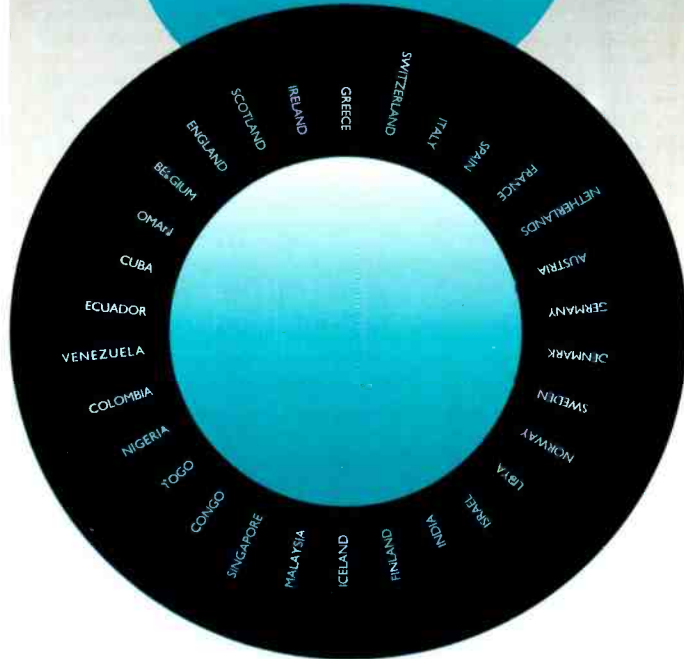
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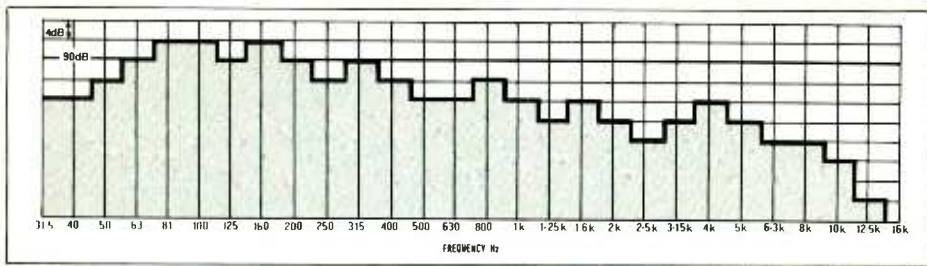


FIG 3: Windsor High Street

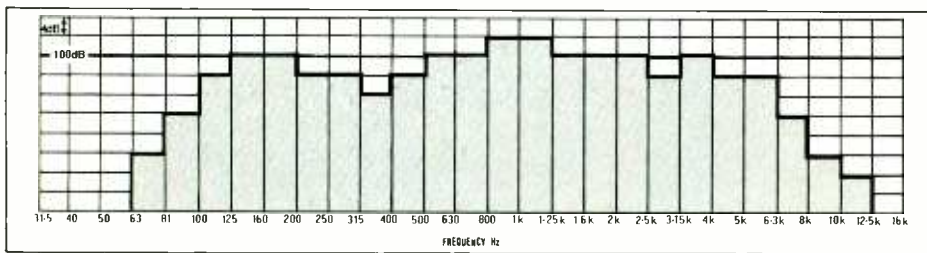


FIG 4: Low quality mobile disco

duration of the echo pulse.

Just like the tensor tympani, it is a subconscious and involuntary act but there does appear to be some control over the system. After a shoot for example, the loaders invariably complain of earache more than the people actually firing the guns, just as musicians complain less than the people around them, although they are nearer to the sound source.

The obvious conclusion is that those instigating the noise are more used to it but field measurements show that we are less prone to hearing problems in an environment under our own control.

To fully understand why modern sounds can cause these problems, it is necessary to look at natural sounds and analyse their difference. Basically, the sound spectrum is divided into three regions. Mid frequencies—to which our ears are most sensitive—are primarily used for communication. High frequencies, which are considerably lower in level naturally, allow us to analyse different kinds of sounds by their harmonic content, give us a better sense of direction due to increased phase shift between the ears at high frequencies, and generally contain the 'quality' of sound as opposed to the 'intelligence' of sounds at mid frequencies. Low frequency sounds are primarily danger signals—stomping feet, landslides, etc, and hence the direct stimulation by low frequencies of the heart and adrenalin glands. This 'fight or flight' reflex is common to man and all animals. Hi-fi enthusiasts may have observed this phenomenon when playing Saint Saens Organ Symphony at high level, and how, at the onset of the pedal notes, the cat flies out of the room. We use it to great effect in music and without bass in music there is little stimulation.

There is an even greater difference between natural and man-made sounds. Ironically, in almost all references to high sound levels, a pneumatic drill is invariably quoted as the maxim for high sound levels. In fact, on broadband SPL measurements, a pneumatic drill is not so loud as it appears: generating white noise over the same bandwidth and at the same level as a drill is not subjectively very loud. However, more detailed analysis of the drill shows that the majority of noise comes from the metal plates striking each other on each half cycle of the drill. They cause a very fast rise-time transient just like distortion in a compression driver, which defeats our acoustic reflex.

Almost all natural sounds have a 'slow

envelope', ie slow attack, some degree of sustain and slow decay. Increases of sound level, no matter how great, can be followed by the ear's automatic gain controls; in addition there are efferent and inhibitory nerves running between the upper and lower centres of the brain and our ear mechanisms. These 'negative feedback loops' perform the same way as they do in amplifiers, ie they both reduce and stabilise the system gain. These feedback nerves are variable and control our ear's gain and response to different sounds.

As with all feedback systems, they have a finite rise time and signals with sharp transients can defeat all our natural volume controls. Making us jump with a sudden rise in heartbeat is a short term result of sudden transient sounds for which we have not prepared ourselves.

Man-made sounds are not only full of transients that can be considerably faster than that of the rise time of the ear's protection mechanism but high distortion levels particularly from amplifier/speaker combinations can generate transients well in excess of the measured SPL from those sounds. In real terms, classical music contains 'slow envelope' sounds from acoustic instruments and SPLs of 100 dBA are not only harmless, they are invigorating. The same levels in a recording studio where the acoustic conditions are controlled and the monitors are hopefully broadband devices with considerable headroom can also be tolerated for some duration as the distortion levels are low.

At the clipping point of the driving amplifiers, however, where loss of feedback occurs, oscillograms made in control rooms, show once again the high level transients that cause listening fatigue and eventually threshold shift. It is interesting to note that several attempts have been made over the years to illustrate hearing damage in recording engineers due to high SPLs in the control room but measurements have in fact shown that in most cases, the engineer's hearing actually improves with his experience.

Inadequate monitoring systems combined with continued high level monitoring, however, have been shown to cause threshold shift even under these well controlled conditions.

In discotheques and live events, where typically the amplifier/speaker combinations are generally lower quality, extremely high distortion levels are found and 100 dBA under these conditions can cause considerably more hearing damage than the same sound levels encountered in natural and controlled sound environments.

It is this which makes the measurement of absolute SPLs a very difficult task. On overdriven

loudspeaker systems, especially those containing compression drivers—which represent around 98% of high powered speakers and which are particularly prone to high distortion levels—we know from experience that transient overloads are painful to the ear, and it is established that the threshold of feeling is around 130 dB, with the threshold of pain in the order of 140 dB. Yet with laboratory measuring sound level meters, we are only reading pressure levels in the order of 100 dBA suggesting that very fast transients which are defeating our ears' automatic gain controls, are effectively around 130 to 140 dB.

This apparent error margin makes accurate assessment of sound levels almost impossible to measure with conventional equipment, and certainly impossible to legislate for, unless the nature of the sound is taken into account at the time of measurement.

The latest addition to man-made sounds is the personal stereo system, which is potentially even more hazardous. The acceleration of the bones in the outer and middle ear is obviously proportional to the frequency of those sounds as well as their intensity. As previously discussed, the relative level of high frequency information is low compared to mid range and low frequency sounds, in addition, a large portion of high frequency energy is lost due to the high mass of loudspeaker diaphragms, and finally as it travels through the ether, by molecular air absorption.

In the case of personal stereos, with headphones, their excellent high frequency performance is directly coupled to the ear, where a clipped waveform or even an unclipped squarewave, can present high energy wavefronts in the form of very fast rise time transients. These can impart accelerations on the outer and middle ear bone structure several hundred times more than 'natural' sounds. Measured in hundreds of Gs at the middle ear, the effect on hearing is not so much a short term problem but since we all lose our ability to perceive high frequencies with age due to stiffening of the outer and middle ear structures, excessive stimulation by high level headphone listening can cause a rapid deterioration of this sensitive mechanism resulting in premature high frequency loss.

As with all these phenomena, the effect may not immediately be obvious but once deterioration has taken place, the effect is irreversible.

Temporary and permanent threshold shift in the inner ear is also more prone to occur at high frequencies, so the problems are compounded with personal stereos.

In conclusion, this is a very complex subject, which even after years of research still requires considerable investigation. It is obviously safe to say that any prolonged exposure to high sound levels must be avoided but it is equally important to establish exactly the nature of the sounds being measured, and the way in which the sounds are being reproduced. Not only must the type of sound be analysed in terms of sound pressure level but in terms of frequency, bandwidth, distortion and transient content, all of which cannot be read on conventional sound level meters, and without which any attempt to establish a maximum permitted level is not only without real meaning, but is impractical and unlikely to be executed with any degree of observance. □

Acknowledgements

My sincere thanks for their criticism and advice on matters medical over the last 10 years of my research into this subject to consultant neurologists Bill Gibson of the National Hospital London and Harold Ludman of Kings College Hospital London

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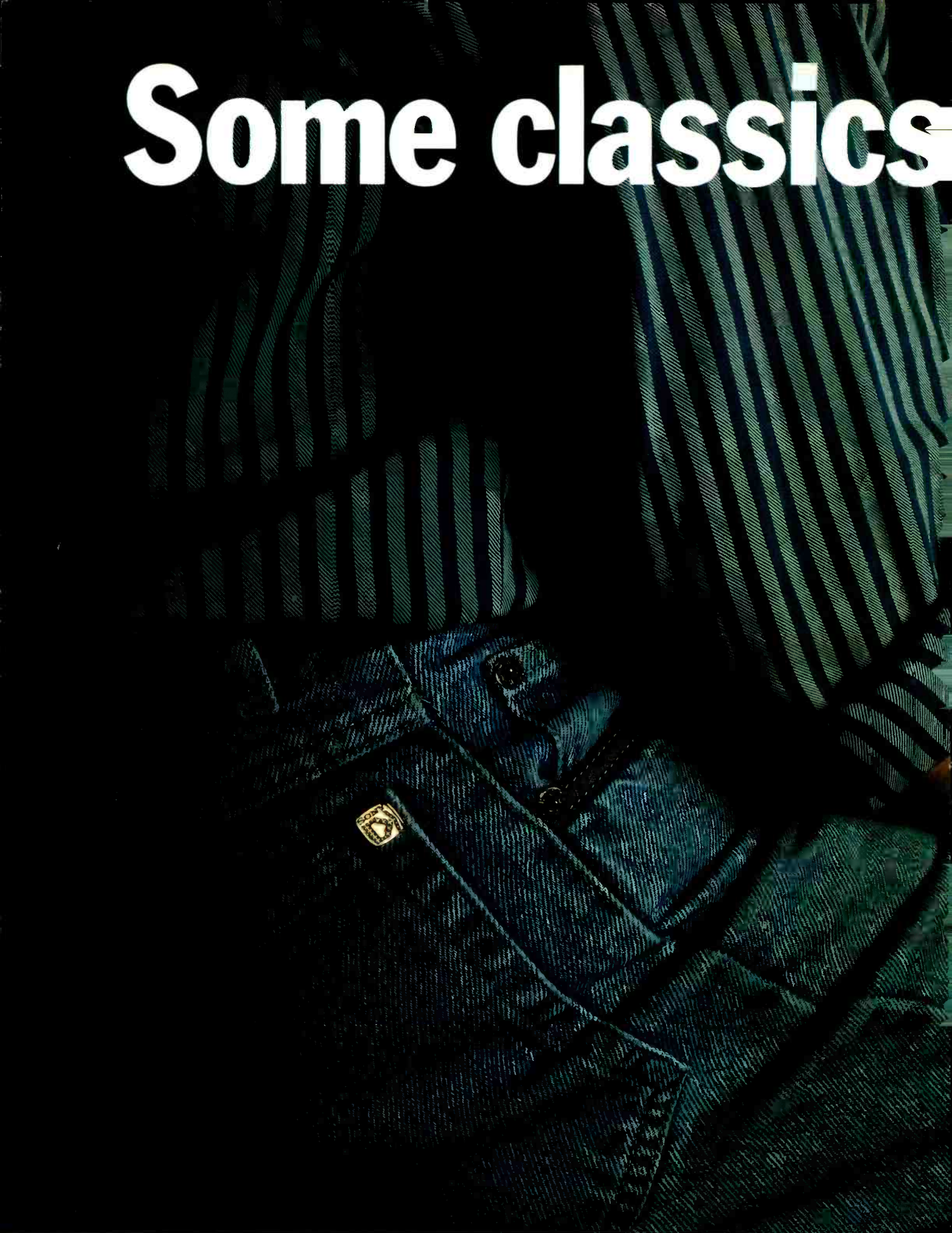
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AIR MOVEMENTS

This month sees the start of a special series that will document the entire move of one of the world's most famous recording studios, AIR London. David Mellor starts by talking to AIR's Dave Harries and Malcolm Atkin about the reasons and rewards of the impending move

Twenty-one years may sound like a long time when you first take out a lease on recording studio accommodation but if business booms the time will come when the lease expires. You will then be faced with either renewing the lease at considerable cost or

being pushed out onto the streets. For 21 years AIR Studios have been located in the Burton Group's building on the north-east corner of Oxford Circus, London, alongside leaseholders such as the Post Office, Burger King and others. Now that the various leases have expired and



After 5 years of searching Lyndhurst Hall was felt to be ideal premises for the new recording studio. An impressive building dating back to the 1890s, it originally belonged to the Congregational Church and is a Grade II listed building with 20,000 ft² of floor space



Burtens have decided they want the entire building for their own use, AIR and everyone else, unless Burton change their mind, will be forced to leave. There is no option for any of them to stay although some, including AIR, are still trading under short term licences.

Resisting any temptation to bury their heads in the sand, AIR started to look around for new premises 5 years ago. The most obvious place to start was close to home—London's West End. This was at a time when it was still viable to have a studio in the heart of Central London but, as other studio owners have found out in the last couple of years, the West End is not a comfortable place to be when rents and traffic congestion seem to be on an exponential increase. So it was decided to look further afield, even—as it happened—as far as Bray in Berkshire. The requirements of a first rate recording studio make finding likely premises difficult, with the need for ease of access, a quiet location, high ceilings and pleasant surroundings (one likely place in Wimbledon was rejected because it was next to a scrap metal merchant). Dave Harries and Malcolm Atkin made the usual rounds of estate agents and one of the places that came up was Lyndhurst Hall in Hampstead. Harries and Atkin initially went up for a quick look and, as Malcolm Atkin says, "We had been looking for 5 years. When Dave and I saw it, we said it was right within 2 or 3 minutes of walking through the door."

Lyndhurst Hall is an impressive building dating back to the 1890s. It was designed by Alfred Waterhouse, who was also responsible for the Natural History Museum, and is a Grade II listed building. The original owners of the Hall were the Congregational Church (later the United Reform Church) who probably found it an ideal building for their purpose. Dave Harries also asserts that Waterhouse knew a thing or two about designing buildings in which to set up recording studios, so well does it fit AIR's plans.

Listed building status is often seen by owners and would-be developers as a curse because it inhibits the way in which buildings can be adapted for business purposes. But in this case, the Grade II listing was to AIR's advantage because it had prevented the place being turned into flats or offices during the 10 or 12 years it had more or less been lying fallow since the Church's departure. Interested parties in Lyndhurst's listed status included Camden Council, English Heritage and the Victorian Society, any of which could have thrown a fairly sizable spanner into the works, had they wished, to hold up AIR's proposed acquisition but it turned out that using the building as a studio will keep the exterior and principal internal features of the building in a condition very close to the original design.

Perhaps the most important feature of Lyndhurst Hall is that Air were able to buy the freehold of the building and not tie themselves into another search for premises in however many years time. The initial costs of financing are, of course, quite high but, as Harries points, out, "In the long term it's by far the best proposition because if we had built here 21 years ago we would still be here and living for next to nothing."

Atkin also appreciates the location, saying that Hampstead is one of the nicest, most pleasant areas of London. Of course, Lyndhurst Hall has other advantages such as 20,000 ft² of floor space including a 5,000 ft² hall at the front for orchestral recording, two 1,800 ft² areas at the rear, which will eventually make "beautiful"

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tracking rooms, and plenty of other space for mix rooms, offices and accommodation for clients.

The only problem is that like most large buildings in London, it is taller than it is broad. "It costs more to build a studio on top of a studio than it does to build a studio next to a studio," says Atkin. "because you don't have the planet, which is rather heavy, to short out the bass end. You have to do it with expensive concrete building foundations if you are doing it vertically."

Atkin accepts that it would be impossible to find the same amount of space in London all on the same level and is bracing himself for some pretty heavy construction work to come.

Was there anything Atkin felt he would be leaving behind in the move?

"The aggravation of the West End and the aggravation of trying to get there. In the last 2 or 3 years we know we have lost work because we are too far into the middle of town, because there's nowhere to park now that the Denver Clamps are here with us. Look at the West End this year: Advision has gone, the Marquee, PRT, Odyssey, Audio One. There are only CBS and ourselves left, of the large studios, in the West End. When we go next year CBS will be on their own. The whole thing's devolving. You have to get out of the middle of London. Pop stars won't use public transport, so you have got to supply parking, which is something we haven't got (at Oxford Circus). There's a lot of free parking there (at Lyndhurst). There'll be less wear and tear on the staff in the mornings than trying to get into the middle of London.

So what about Air's plans for the future?

Harries: "The plans at this stage are really to move Air's facilities to this building, to get larger control rooms and provide more facilities and residential accommodation. Air has a fairly international clientele, particularly American and Japanese and we feel that if we can give them the same as we have got now and better, plus some accommodation and car parking—and up here in Hampstead it's a nice spot for them to come—I reckon we should be able to increase our slice of the market for that sort of clientele, which is what we like because there are always big names and big producers and we cater to them a lot."

Atkin: "Certainly we have got ideas of looking to areas of the business that we haven't covered here (at Oxford Circus). Put it this way, we are not sticking to rock 'n' roll." □

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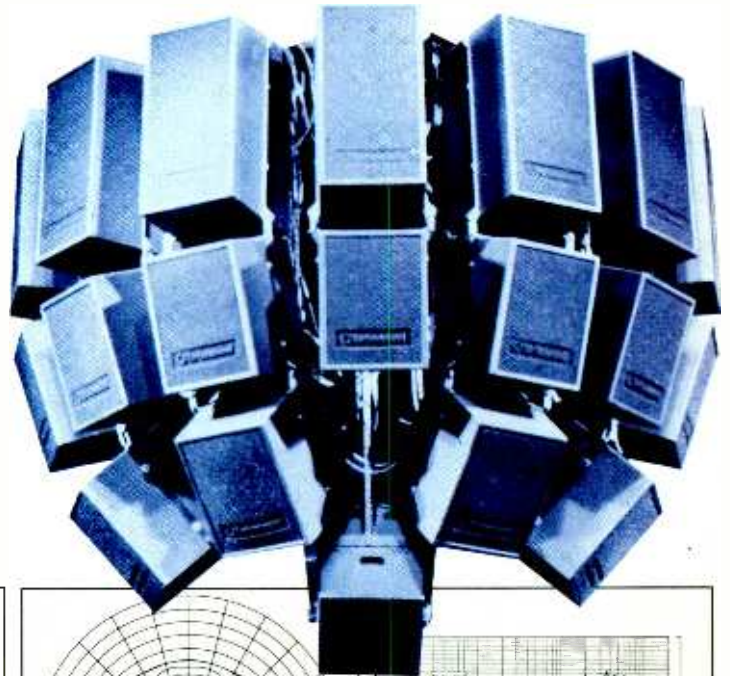
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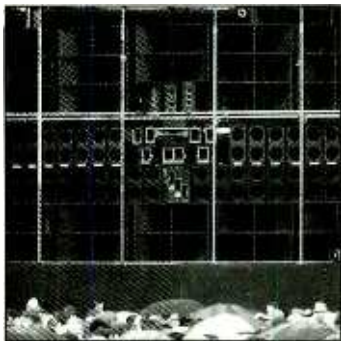
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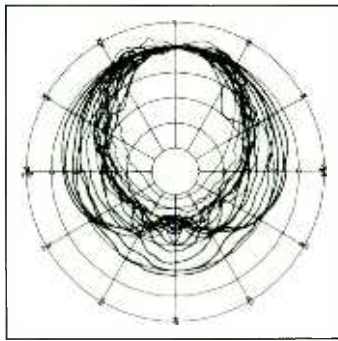
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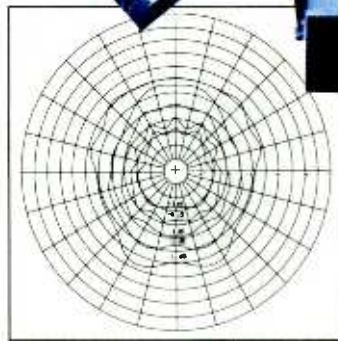
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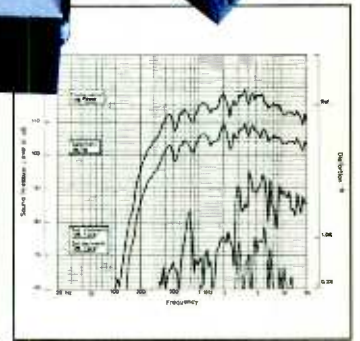
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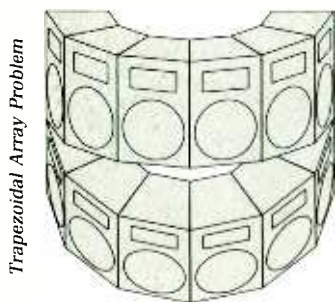
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*Turbosound Patent Information: Australia: 515, 535 Canada: 1,076,033 Japan: X113424/77 UK: 1,592,246 & 1,598,310 U.S.: 4,215,761 & RE 32,183 West Germany P2742610/2 Other patents pending.

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Intersonic AB tel. 08-7445850. SWITZERLAND: RTG Akustik AG tel. 061-231912. TURKEY: Omer Trade & Representation tel. 90(4)-1380296. UK: SSE
Marketing tel. 071-387 1262. USA: Quest Marketing tel. 617-964 9466. WEST GERMANY: Audio Export Georg Neumann & Co. GmbH tel. 07131-62470.

A cursory glance at the French recording scene concludes that most work is centred around Paris and, as in Britain, the only other top line studios are dotted about the countryside. One such studio that is making definite overtures to the international market is Studio Polygone based in Toulouse in the South of France. The owner Jacques Bally has been planning such an onslaught for a couple of years, and feels he now has the equipment, personnel and right professional approach to attract top international acts.

Studio Polygone is in Blagnac, a suburb of Toulouse, 5 minutes from Toulouse international airport. The studio was purpose built 3 years ago in the Avenue du Parc and backs onto the Blagnac public park. Polygone is a three-studio complex, which now offers residential status after the council allowed them to build a small villa in the park adjacent to the studio's entrance.

Toulouse is seen in France as the second recording centre behind Paris. Indeed, in parts it does look like the capital, especially with its river walkways and riverboat restaurants. Toulouse itself is a burgeoning hi-tech society. Already known for the building of half of Concorde, the city is now the centre for aerospace research in France as well as a forerunner in the robotics and communications industries. The city centre is very lively and should offer more than enough entertainment for 'party-animal' Polygone clients.

Polygone have seen all the big French acts pass through their doors and are now recognised as one of the best studios in France. Jacques Bally, however, has raised his sights towards the UK and US markets. To prepare himself and his studio for such new and demanding clients he set out to improve the studios' standards technically and professionally. Part of that improvement centres around the new Neve VR console with *Flying Faders* automation installed in Studio One. Bally has also addressed the language problem by employing a native Briton, Laurie Owens, to promote the studio, from Polygone, in the UK and the US. Owens feels that having a friendly English voice on the other end of the phone when UK or US clients call gives them a certain amount of comfort and confidence. In fact all the Polygone staff speak English to one degree or another, another promotional plus for the studio.

The residential villa is also there with international acts in mind. The clearance for the building plans did take a while to come through as the villa sits in the middle of the public park.

POLYGONE

If you're a French recording studio that has won awards for your hit making ability in the French recording market, do you really need to look abroad for clients? Julian Mitchell reports on a Toulouse studio that has, and is already attracting top UK producers

But once approved the building was quickly up and features six various sized fully air conditioned rooms, a well stocked bar staffed by an enthusiastic and very good villa manager Jean-Christophe, and last but not least a swimming pool.

The old days

Bally was born and raised around Toulouse but moved to Paris to learn about music recording. In 1975, by his own admission, he felt homesick and came back to Toulouse to try to start his own studio. The next few years he progressed from 4-track, through 8-track, 16-track and finally 24-track. In those years he produced a lot of music but had a lot of failures. One incident



Control Room Two



Control Room One

that showed Bally was on the right road, however, was when he was approached by Pink Floyd!

Somehow, his studio had come to the attention of EMI in the UK when the Floyd were looking for somewhere different to record. They phoned Bally and much to their surprise, and his chagrin, he had to refuse their booking. The fact was that his studio was a converted garage and it was already as much as he could do to placate his neighbours when they wanted to watch TV while he was recording downstairs. Unfortunately EMI thought he was playing hard to get and persuaded EMI France to find out why this madman didn't want the best studio booking he had ever had. Unfortunately, then, Bally wasn't ready for acts like Pink Floyd.

In 1986 Bally had settled in a 24-track studio in the centre of Toulouse (a studio he still owns and runs mainly for local acts) and had acquired an SSL console and two Sony 3324 digital multitracks. But the need for expansion beckoned and he found out about a leisure complex that was being built in Blagnac with some extra available space. Actually about 1,000 ft², which for the next year became the centre of weekly meetings between architect, builder and owner and was finally turned over to studio designer Tom Hidley to work on the control rooms. He chose Hidley mainly because: "he seemed to have more definite ideas about what was needed than the other people available".

Avenue du Parc

The planning for the studio took a year and the actual building just 7 months. Architecturally the studio bears a passing resemblance to Metropolis studios in London with its tangled gangways and mezzanine floors. You walk down some steps from the car park towards a large glass entrance, which would make the reception unbearably hot in the summer months if it weren't for the excellent air conditioning. To the right of the entrance and up is a well-used sun terrace, which gets the sun all day long and can offer clients a place to eat, sunbathe and play table tennis. The reception area itself is hidden from view from the outside by an opaque glass brick wall, a clever design feature to give the reception privacy and mood. Once inside there are steps immediately in front of you that go up to a bar/restaurant area and offices. On reception level the area is strewn with large tropical plants embedded in what appeared to be solid concrete mounds and floor-to-ceiling mirrors. The initial impression is a relaxing one as the lighting is kept quite low.

Polygone has resident engineers, assistant engineers and a full-time maintenance staff. If there is a disadvantage to living and working in the South of France it's getting parts and equipment quickly. The maintenance staff have tried to get

round this problem by stockpiling, and even if they need a part, say for the Neve or the SSL, it will only take a day maybe 2 to arrive. Outboard equipment needed by clients is hired from Hilton Sound in Paris and the agreement seems to work well.

Recording areas

Studio One is to the left of reception and has its own artist relaxation area just outside the main doors with the usual trappings of satellite TV, video and lush leather sofas. The studio's recording area is quite large, 150 m², enough room for a medium sized orchestra. The room is quite live as a result of a stripped wood design in different colours on the floor and walls. The colours only graduate from black to light brown and so don't intrude too much. There is also an adjoining room for overdubs and isolation purposes. The control room is a Hidley design and features the usual Kinoshita monitors with FM Acoustic amplifiers (although these may be swapped for the new JDF amplifiers).

Studio One also features the new Neve VR console with *Flying Faders* automation, and the pick from two Sony 3324 digital multitrack machines and two Studer A800 24-tracks. The VR replaces a Neve V60 *Necam 96-2* desk that now sits in a corner of the recording area waiting for a new owner. The new Neve opens all kind of doors for the studio. Now they can mix there, something that clients were not happy doing on the *Necam* system. Before the VR Polygone was known for having a track laying room, Studio One and a track laying/mix room with the SSL in Studio Two. Polygone have also now entered the post-production world with the new Neve and are investing in new projection screens and video projectors.

Studio Two is on the other side of the reception area and again has its own relaxation area with TV, video and games machine. The control room is roughly the same size as in Studio One but with an SSL E series 4048 desk with *Total Recall* and automation. Kinoshita monitors again and various racked outboard. The recording area is smaller than in Studio One at 80 m² but has the same stripped wood feature and doesn't seem so live.

Studio Three is opposite Two's main door and is basically a programming room with no particular acoustic treatment. Here Polygone offer a 64-voice *Synclavier* and various MIDI equipment and keyboards.

The fourth recording area in the Polygone complex is not owned by the studio at all, but shared with the council. It's a large theatre that is part of the original cultural complex that was there before Polygone was built. The studio can offer the use of the theatre as part of or as a whole package. Technically

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DIGITAL AUDIO RESEARCH



The Medici Equalizer

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The Medici Equalizer is manufactured in the UK by AMEK

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Medici

AMEK

Polygone have been forward thinking and audio and video lines run to both consoles from backstage. Bally cites the theatre as one of the things that puts Polygone apart from other studios. Bally: "There is a lot of interest in recording in the theatre. I feel that live recording is becoming popular again, especially in France. Bands sometimes come from Paris just to record here live."

Synchronising all the available multitracks allows a possible 96 tracks for a live situation. The stage seems big enough to deal with a full orchestra and accompanying chorus. Polygone get preferential treatment where bookings are concerned and getting to the stage area from the studios couldn't be easier: open one door in Studio One's relaxation area and you're backstage.

International studio

Possible equipment upgrades to the studios to keep up with the idea of appealing to an international clientele would be a G series SSL desk. Bally agrees that the move up to the G series would be beneficial to him but it's not going to happen. The reason is ostensibly a noble one, Bally, who himself started his career as a musician in Toulouse, still has a great affinity with the struggling bands of the area. It's one reason why he keeps the studio on in the centre of Toulouse, but he intends keeping the E series for the time being, "If I were to buy the G series I would have to raise the daily rate, at the moment we're still getting local bands booking that room, with the raised rate that would start disappearing. I don't want that."

Really it's not that unselfish as Bally still produces many of the bands himself and so has a keen interest in their future. On the question of studio rates you talk to either Jacques Bally or Laurie Owens. The rates do seem competitive even if you put the price of a 90 minute plane trip from London to Toulouse into the equation.

If you take as your criteria for a top international studio

things like highly trained and helpful staff, internationally recognised equipment, close international travel links and an environment that encourages creativity, then Studio Polygone passes the test. If the success of Studio Miraval in the '80s is anything to go by then Polygone should have the ingredients to imitate them in the '90s.

Studio Polygone, 4 Avenue du Parc, 31700 Blagnac, France. Tel: 61 30 44 45.

Equipment list

One	Two
Console Neve VR with <i>Flying Faders</i>	SSL 4048 with E series computer
Recorders 2xSony 3324; Studer A80 ¼ inch, PCM F1, Sony DAT	2xStuder A800 24-track, A80 ½ inch, ¼ inch; Sony PCM F1, Sony DAT
Monitors Kinoshita; Yamaha NS10; FM Acoustics amps	As Studio One
Reverb Lexicon 480L; Yamaha REV7, REV5, SPX90II	Lexicon 480L; EMT 240; AMS RMX 16; Yamaha REV5, REV7, SPX90II
Outboard AMS; Drawmer; Roland; Bel	Includes two TubeTech EQs
Microphones Sanken; Neumann; AKG; Shure; Schoeps; Sony; E-V	As Studio One
Design Tom Hidley	Tom Hidley
Studio Three is a 25 m ² programming room	
Programming suite with 16-voice <i>Synclavier</i> and extensive samples library Various keyboards and computers.	

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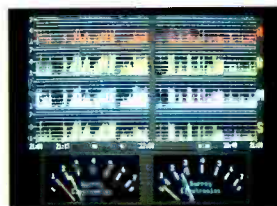
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UNTOUCHED SCREEN PHOTOS

TAPE LIFE: AN ERA OF CONCERN

How safe are your masters? Barry Fox investigates reports of instability among archived audio tapes

Do you know what condition your old tapes are in? Are you prepared for the fact that some master tapes from a 10 year period, between the mid '70s and mid '80s, may well be disintegrating in storage?

If you are up to speed on all this, do you regularly check all stored tapes, to find out which ones are showing problems so you can put them through a restoration process and copy the programme material onto new reels?

Or do you just cross your fingers and hope that the tape you pull out of store for re-issue on CD doesn't shed goeey binder that gums up the tape transport, and eventually slows the machine to a dead stop?

Or does the whole idea of disintegrating tape come as a new and nasty shock?

It is hardly surprising that tape degradation is a subject tape companies would rather not discuss. When pushed, some claim that their product is immune and it is only their rivals who suffer.

Others admit to the problem, with varying degrees of frankness. There is vague talk of coating formulations being changed on environmental grounds, without adequate thought

given to chemical stability.

Those who are frank have a neat way of inferring that tape degradation is something all good engineers already know about and if they are not taking precautions then they have only themselves to blame if tapes degrade past the point of recovery.

Distinguishing folklore from fact is like swimming through treacle. But it is vital because the security of literally hundreds of thousands of master tapes is in question. The facts suggest a can of worms the recording industry cannot afford to ignore.

Recording tape is made by gluing particles of magnetic iron oxide pigment onto one side of a thin base film, using organic binder. The other side is back-coated with electrically conductive material. This leaks away the electrostatic charges that build up when tape is wound fast through a recorder and also prevents scratching of the polyester film.

Tape chemists aim for a binder that tightly retains the coatings, but remains flexible and does not release any sticky material.

Tapes sometimes shed oxide, especially if stored in hot, dry conditions and different makes of tape behave quite differently.

SSVC (Services Sound and Vision Corporation), which incorporates the British Forces Broadcasting Service, records radio programmes in London for distribution around the world on open-reel tape.

The engineers at BFBS use BASF and Agfa tape and they find that the Agfa material, even when new, sheds considerably more brown oxide than BASF's.

The cure is easy. Clean the heads and guide rollers. For BFBS, the problem is now academic, anyway. The radio station is just on the point of switching to distribution by VHS FM stereo hi-fi video cassette instead of open-reel audio.

The problem now emerging is far more serious than this. It comes from breakdown of the binder, which creates a sticky material.

Perhaps it is not by chance that Japanese tape company Taiyo Yuden, makers of That's tape and write-once recordable CDs, currently run adverts in the music industry press warning: 'Record your CDs on the wrong tape and you'll find yourself in a sticky situation.'

As the adverts appear in US-based *Billboard*, which has always taken a hard line against home taping, Taiyo's advice can surely not be an exhortation to copy CDs onto cassettes. . .

Baked pancakes

The first signs of binder-shedding were seen in the mid '70s when Sony changed their narrow gauge open-reel video tape formulation from iron oxide to chromium dioxide. The tapes became sticky after storage. As the video industry soon moved from narrow gauge to U-matic cassettes, the practical consequences were limited.

But audio engineers are now finding that some of the tapes made by Ampex at around the same time are shedding in the same way. The consequences here are much more worrying. David Bennett, an independent recording engineer and producer specialising in jazz recordings, discovered the problem earlier this year. He found that six reels of Ampex 6.3 mm (¼ inch) 406 and 407 tape stuck and juddered in his replay machine, making a mechanical screeching noise, which impinged on the audio signal coming from the tape.

Ampex UK told Bennett, when he phoned for advice, that the company already knew of the problem and had developed a technique for baking the tape in an environmental oven.

When I phoned Ampex, in the early autumn, as a 'worried punter', I was told the same thing. Sticky tape, Ampex told me, could be baked for up to 6 days at graded temperatures up to 50°C. After baking, the tape must be wound very slowly through a recorder several times to free any sticking turns. After the recorder and tape have been wiped clean the tape runs smoothly again. But Ampex warned me that the treatment is only temporary. The recording must be copied onto a new reel within a few weeks of treatment.

Ampex UK also told me that the company had not yet finalised a policy on whether to charge for the treatment. The lab oven is not large enough to cope with a flood of orders, anyway.

Another independent recording engineer, Tony Faulkner, warns against the risk of baking tape: "Tape is like wine, you should not let the temperature go up or down. Heat can cause print-through.

"The irony," notes Faulkner, "is that the Ampex tape box carries the warning 'Store in a cool, dry place'."

In technical literature released to the recording industry, 3M warns against exposure of tape to 'even moderate temperature'.

Studio engineers have always been advised not to use or store tape in extremes of temperature or humidity. 3M advises that an environment comfortable for engineers is ideal for tape.

Bennett did not dare risk baking. He laboriously cleaned each reel of tape with Canus 2.22, a fluid used to clean and lubricate cinema movie film. It worked well enough to make a copy tape.

Bennett talked with studio engineer David Wright and learned that he had recently encountered a mixed reel of ¼ inch tape, of which only some sections stuck. Wright believes all the sticky sections were of Ampex tape. He cured the problem by attaching strips of cleaning tape to the guide rollers of the recorder and lightly coating them with silicon grease.

Sticking also affects the 50 mm (2 inch) master tape made by Ampex for multitrack recorders. *Studio Sound's* editor recently tried to play some Ampex 50 mm tapes he had recorded in the late '70s. He got the same screeching noise, "like chalk on a board", and the recorder ran slower and slower as the tape shed sticky gunge onto the drive mechanism. As we go to press we learn that Alan Parsons has had to have 12 reels baked.

Engineer Nick Griffiths faced even worse problems when he was hired by Roger Waters to

Sticky tape could be baked for up to 6 days at graded temperatures up to 50°C. After baking, the tape must be wound very slowly through a recorder several times to free any sticking turns. But the treatment is only temporary. . .

direct the use of recorded sound for the live performance of *The Wall* in Berlin. Although the audience heard live sound, the musicians had to recreate the original recorded sound. They wore headphones and listened to a clicktrack that synchronised their cues and playing.

Griffiths had to build the clicktrack from the original master tapes of *The Wall* made by Pink Floyd. He collected 56 reels of 50 mm master tape from various studios and record company vaults. Immediately he found that the recorder was running slower and slower, with the sound blemished by appalling wow. The recorder then stopped running. Griffiths tried another machine. And a third. Each ground to a halt as brown glue from the tape created excessive stiction.

Griffiths contacted Ampex's engineers who again admitted that they knew of the problem and had already developed the baking rescue operation. Griffiths sent all 56 reels for baking and was gratefully able to finish the Berlin job.

Common ingredients

Ampex is now telling worried callers that other tapes, as well as their own, are at risk. One folklore theory going the rounds is that several tape plants were all using the same binder, derived from whale oil, and it is now changing chemical structure. Ampex's main competitors strenuously deny any problem on a similar scale. But evidence mounts that all is not quite as rosy as the corporate fronts suggest.

Joe Clerkin, sales and marketing manager for 3M's professional audio tape division in the UK, first thought that 3M *Scotch* tape was completely in the clear: "We know of no instance where customers have found any such problems," Clerkin told me in September. "Remember that in the late '70s 3M was very strong in the professional audio market, making both analogue and digital recorders as well as tape for them. We were neck-and-neck with Ampex so you would think that someone would by now have been onto us, especially as many record companies are now going back to their original masters for re-release on CD. But we have heard absolutely nothing."

To his credit, Clerkin pursued the matter with 3M in the US and came back with the qualification: "3M has had a few cases of sticky tape in the US."

Several people told me of 'Agfa's problem'. Ampex dropped broad hints, too. I had certainly never been alerted to it by Agfa (although, to be honest, they have seldom alerted me to anything at all, even good news) but when I put the straight question, Agfa guardedly admitted that it made a batch of tape that shed magnetic oxide—even when brand new.

"These problems were restricted to a small production period and have been corrected," says Werner Singhoff, head of Agfa's magnetic tape technical centre in Munich. Although the incident was not widely publicised, it seems that Agfa did try to call back tape from the faulty batch.

Later, I began to get the distinct impression Agfa was giving me the runaround and that there was a lot more the company wasn't telling.

Meanwhile BASF, the German company that made the first tapes in the '30s, advised that tapes should be stable for 50 years and categorically denied that any of their own tapes were shedding. But BASF's technical director Wilhelm Andriessen added, "Quite a lot of valuable recordings have unfortunately been

made on tapes which were chemically unstable.

"Sticky oxide shedding has always been an indicator of instability," says Andriessen. "Test methods back in the '60s were good enough to detect this. But some people did not use them."

Volatile mixture

Tape chemistry is a black art; an odd mix of chemistry and cookery but with ingredients that will often be poisonous or at least a pollution risk. Batches of raw materials may vary, so the factory chemists must continually adjust the process to compensate and maintain consistency of the final

product.

Contrary to some rumours, the base films used to make tape do not appear to affect stability.

Very early tape makers experimented with paper as a base. By the '50s tri-acetate, as used for photographic film, had become the industry standard. Polyester was introduced in the late '50s by 3M. Manufacturers were using acetate for professional tapes at least until the mid '60s. BASF, primarily a chemical company and thus with access to chemical technologies ahead of competitors, started using PVC (PolyVinylChloride) as early as 1940 when BASF was still part of the IG Farben group. EMI also used PVC. Agfa never used PVC for professional



Fig 1 & 2: Before and after shots of a guide showing deposit from back coating



Fig 3: Scraped from the guide, the deposit is hard and shiny



Fig 4: Damage to the back coat caused when guide deposit bonded tape to guide

About the pictures

To produce these pictures we took two reels of 2 inch tape (Ampex 406) that had been stored under average conditions—recorded between 1977/78 and then stored on shelving that maintains a temperature a few degrees under room temperature and is constant all year round.

The first tape was placed tail out on the tape machine having been left with the box open to reach control room temperature for 2 hours before playing. Having been put into fast wind a whining sound became quite audible that changed in pitch from a lowish note to a screeching 'chalk-on-blackboard' sound with the fast wind speed slowing. When it reached the head, the tape tension was taken off and the tape pulled away from the heads and guides revealing a very hard black deposit on the guides in contact with the back of the tape. This is shown in before and after shots in Figs 1 and 2. This deposit is nothing like an ordinary oxide such as might be found in normal cleaning, being hard and shiny when cool. Scrapings are shown on the finger Fig 3. The deposit is also difficult to clean off.

When put into play the tape made the same whining sound and slowly ground to a halt in under 10 seconds, refusing to play without being cleaned again, only to play for a further 10 seconds. This tape was then removed from the machine and the second tape tried. This reel was not quite so bad about making noises in fast wind although it did during the last quarter of the reel. When the tape reached the head, the tape was not removed but left under tension for a short period. The tape was then put into play but it would not move at all.

Investigation found that the deposit on the guide nearest the feed reel had

cooled and welded the back coat of the tape to the guide. This made the mark across the tape seen in Fig 4. With care and frequent cleaning this second tape could be played satisfactorily.

Keith Spencer-Allen

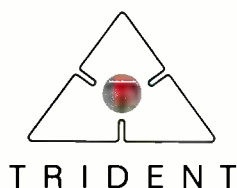
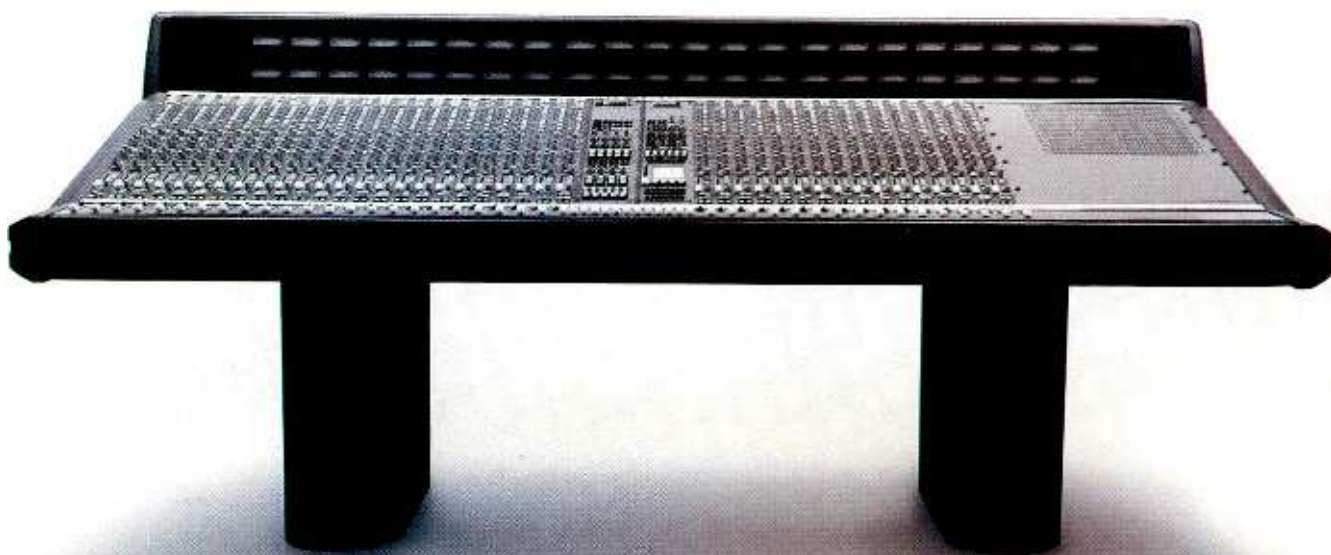
We would very much like to thank Jigsaw Studios for letting us make both of their otherwise pristine JH16s (16 and 24-track) very dirty in the name of research for these illustrations

Technology Embraces Art.

There was a time when these words were seldom used together. The disciplines necessary to produce *art* had little patience for technology. *Today* the union is prerequisite. With this fusion in mind, Trident engineers set out to combine vintage sonics with adaptable studio integration and control.

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There are no professional trade figures comparable to those pooled by the tape companies for domestic audio and video sales. But the European market is steady at around \$60 million a year. Over a 10 year period that makes an awful lot of suspect tape in the vaults

tape and switched directly from acetate to polyester around 1960.

Some manufacturers were wary of polyester because it tended to stretch rather than break cleanly; whereas a break can be repaired easily, there is little that can be done with stretched tape. Brutal braking on early tape machines made this an important consideration.

After improvements in 'tensilising', ie strengthening, BASF started to use polyester for professional tapes around 1970. Some companies were even then still using acetate for 'economy' tapes. Neither polyester, PVC nor acetate base films, have shown any real problems with aging. Very early tapes are, in general, still in good condition. Agfa recently collected tapes from broadcast archives dating back to the early '60s and found them in good condition. Tapes from the mid '40s have also survived well.

Virtually all modern professional audio tapes now use polyester as a base film. Cassette tapes, as well as video tapes, have always used polyester.

Justin Underwood, Ampex UK's product manager, has been helping people, like Nick Griffiths, who have tapes that stick. He says he is surprised that anyone is surprised because the matter has been well documented and aired at industry seminars, since around 1978.

Says Underwood, "No-one in the tape industry wants to talk about unpleasant topics like degrading tape, they want to talk about good things. Ampex have been talking about it for 10 years. We have bitten the bullet."

Just add water

"For practical purposes you can ignore degradation of the polyester base film," continues Underwood, believing the root cause of the problem to be a chemical reaction between the binder used to stick the coating to the polyester and water in the atmosphere, accelerated by the lubricants added to make the tape run smoothly. "People used to use all kinds of formulations for tape binders, such as PVC and acrylic. Some were very water-resistant but mechanically they were

not very good. If the tape stretched, they would fall off. So by the mid '70s most tape manufacturers had changed to polyurethane. Unfortunately, you can then get hydrolysis: the polyurethane gets zapped by water and releases an acid. You then get gummy residues on the tape, which resemble heavy oils. They are nasty and gooey and in extreme cases will make your recorder come to a grinding halt."

Every tape company uses its own proprietary lubricants. Long ago whale oil was used. Now they are fatty acids. The lubricants tend to exude with time. This normally has a benign effect but it can compound hydrolysis.

"We have been looking at this for the last 7 or 8 years," says Underwood. "You can have two tapes that have had a virtually identical existence, and lived on the same shelf, but for some reason one is breaking down faster than its twin.

"We have scrutinised our manufacturing records to try and find out why this should be and come up with theories but all have proved groundless.

"One thing is clear, in practice. Back-coated tapes survive better, they breathe better. But there is no theoretical basis for this."

Underwood is adamant that it is not just Ampex tapes that are affected, and not just professional tapes either. Any tapes made with polyurethane binder, and without modern stabilisers, are at risk. But analogue audio tapes are at greater risk than digital audio or video tapes. This is because these tapes use a cobalt-doped oxide coating.

"Yes, every tape made may have only a 10 year life," acknowledges Underwood, emphasising the word *may*, "but some seem to lead a charmed life. I wish we knew why.

"We still use polyurethane but since around 1981 there has been a steady improvement in the stabilisers used in the mix.

"We live in a perishable world," says Underwood. "The way to keep tapes, is cool and dry, at around 40% relative humidity and at a temperature of around 20°C. People don't realise it but the UK has a high humidity, often up to 85%. In these conditions things can come unstuck over time, I'm afraid."

The baking process does not reverse degradation. It drives off solvents and excess lubricant so the tape can be played. The tape thus becomes copyable but only for a month or so.

Once the tape has lost more than 30% of its binder, recovery becomes much more difficult. The high frequencies, which record in the top layer of the coating, go first.

"Other tapes behave in much the same way as ours," says Underwood. "So far we have always been able to rescue anything sent us. We haven't lost one yet."

The Ampex diagnosis points to a risk period of around 10 years, between the mid '70s, when polyurethane was first used as a binder, and the mid '80s when stabilisers had improved.

After talking with Justin Underwood I went back to Ampex's competitors, and to tape users, and asked more questions.

Little by little, with some Agfa spokespeople 'unavailable' and others reluctant to be named, Agfa amplified on its 'problems'. Difficulties arose, I was told, only with a batch of tape made by Agfa around 3 years ago after a change of chemical mix, due to pollution control in Germany. After 18 months, Agfa started getting reports of a white powder on the tape surface, as the tape shed coating (nothing like the brown dust shedding of which SSSVC complains). Agfa says it identified the batches and will clean and copy any faulty tapes that turn up, using a

process called XT, at its laboratories in Germany and the US.

Home made

BASF, inventors of tape but first and foremost a chemical company, note that some firms began to use polyurethane as a binder from as early as 1962. But BASF did not, preferring to use their own 'home made' mixes. The company quietly sells these binders to other companies, too.

Wilhelm Andriessen acknowledges that "dramatic progress" has been made in polyurethane binders and that they are now "excellent". But BASF believes that some early polyurethane-bound tapes may suffer aging.

Significantly BASF confirm that even today the company do not use polyurethane binder for their professional audio tapes.

The National Sound Archive works closely with the BBC on the preservation of old tapes. Like many radio stations, they use tapes made by Racal-Zonal. Neither uses Ampex tape and neither has encountered sticky binder shedding. But the BBC did hit trouble with two batches of Agfa 468 (from 1986/87), which started to shed white powder.

The BBC says that Agfa was helpful over notifying users, and gave free replacement reels. But some reels are still turning up and shedding white powder.

Although Agfa, like Ampex, has been willing to talk reasonably frankly, either to troubled customers or to the industry at seminars, and has answered specific questions put by people who know what specific questions to ask, neither company seems to have made any real effort to alert the industry at large. Realistically, how many working engineers know about, and go to, archiving seminars?

In response to my persistent queries Agfa said their PR agency would send me information on the XT restoration process. When this information finally arrived, after a despatch delay of 2 weeks, it turned out to be a short, undated text on preserving programmes in magnetic tape archives. In it Agfa talks vaguely about 'problems' with old tape being caused mainly by improper handling, and only guardedly admits 'in a few cases faulty production conditions could not be excluded'.

Ingredients will often be poisonous or at least a pollution risk. Batches of raw materials may vary so factory chemists must continually adjust the process to compensate and maintain consistency of the final product

This is why, the information sheet continues, 'Agfa has developed a process for retrieval of the recording from such affected tapes'.

The Agfa retrieval process is only vaguely described, as relying on a combination of mechanical cleaning and thermal treatment to regenerate the binder or lubricants. Agfa claims that the magnetic signal is not influenced by this process, so the programme material can be copied onto a new tape.

Agfa says the treatment has to be done under carefully controlled conditions to prevent damage or deformation of the tape and that this is 'the reason for a relatively restrictive description'. Perhaps this also means it is regarded as a proprietary process.

Significantly, Agfa's information sheet did not even identify the process by name as XT and makes no mention of the specific problems encountered with specific batches of Agfa tape. It is all very general. So I asked Agfa and the Agfa PR agency for an urgent fill-in on when the statement had been released—and to whom.

It took another 3 weeks for Agfa's PR in Germany to own up that the odd little document had been written 'exclusively' for me, and released only to me—hardly the way to alert tape users to potential problems!

The general picture to emerge is thus one of all tape from the polyurethane era being at risk but so far only Ampex and Agfa provably affected,

'Sticky shed syndrome—tips on saving your damaged master tapes', told how Fantasy had built their own oven, to bake tapes.

Reassuringly, the explanation of tape degradation caused by polyurethane hydrolysis given to de Lancie by Steve Smith of Ampex, in the US, ties in with the explanations I had quite independently been given by Justin Underwood of Ampex in the UK. de Lancie also refers to a forum hosted by Agfa in April 1989, at which Agfa apparently offered to recover engineers' tape for a cost of between \$280 and \$350 a roll. For some people at least, tape degradation looks like becoming a profitable business.

The extent of the degradation problem is impossible to gauge. No studio or record company can possibly keep on checking every stored tape, on an ongoing basis. Ken Townsend is in charge of all EMI's recording services, worldwide, and is based at Abbey Road studios in London. In the UK alone EMI has 280,000 reels of tape. Like most recording studios EMI used mainly Ampex 50 mm tape for multitrack analogue recording.

EMI have since 1979, been storing all their finished stereo master tapes on digital cassettes, and re-issuing them on CD without reference to the original, unedited, multitrack masters. Quite simply EMI do not know, and cannot know, which tapes to check and cannot keep checking them all. Townsend is now starting on a worldwide research programme, to try to establish what

The extent of the degradation problem is impossible to gauge. No studio or record company can possibly check every stored tape on an ongoing basis. In the UK alone EMI has 280,000 reels

with Ampex the worst hit but least pro-active in volunteering information. Or, as a British Government Ministry spokesman once told me when I was following up a story likely to cause official embarrassment: "It's not a secret, we just haven't told anyone."

Large slice

Agfa's share in the tape market is in fact small and the company are now being bought by BASF. Ampex's strength in the professional audio market creates much greater cause for concern.

Ampex make all their own tape at a factory in Opelika in Alabama, USA, and have long been the market leader in professional audio. Ampex's own advertisements list engineers who have made gold albums on *Grand Master 456*, and claim 'More engineers go gold on Ampex than all other tapes put together.'

There are no professional trade figures comparable to those pooled by the tape companies for domestic audio and video sales. But the European market is steady at around \$60 million a year. And Ampex have a share of around 40%. Worldwide, Ampex very probably sell more professional audio tape than all their competitors put together.

Over a 10 year period that makes an awful lot of suspect tape in the vaults.

It was only after researching this article, that I saw a piece in the May 1990 issue of US magazine *Mix* written by Philip de Lancie, mastering engineer at Fantasy Studios in Berkeley, California. Lancie's article, entitled

restoration of EMI's archive is necessary.

Bill Foster, of the APRS, says the Association is waiting to see if members now make formal representations. "Obviously we don't want to dig up the drains if it's just an isolated problem," says Foster, "but we want members to check their archives and let us know what they find."

If any one conclusion comes out of this whole sorry mess, it is that the tape companies now have a clear duty to their customers. That duty is to come clean and publicise potential problems, not just chew them over at archive group seminars. That way everyone with a large store of tapes at risk knows what to check for, when to do it and what remedial action to take when necessary. If engineers know how real the risks are, they will take more notice of the standard advice routinely offered by tape companies on storage conditions, especially humidity.

Recording studios and record companies that believe they have carefully stored tape according to the advice previously offered as instructions on the tape packaging, will surely also want to establish who is to pay for recovery and who is liable for compensation if valuable programme material cannot be recovered.

Alan Parsons is already urging that the matter of liability be sorted out without delay. David Bennett says he was distressed at the way Ampex reacted to the news of his plight, reminding him that with a Gulf War we could all be dead before our tapes degrade.

Tony Faulkner asks the all-important question: "Who have Ampex told about this? I have used a lot of Ampex tape and they certainly haven't warned me or anyone I know of." □

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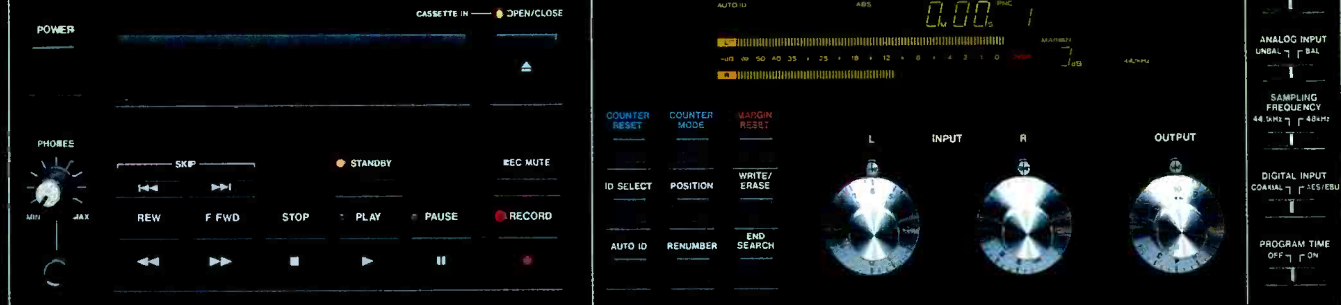
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I am very pleased to report that Philips honoured a past promise to talk frankly about DCC, the new digital audio cassette, as soon as a formal announcement had been made. The announcement, made at the beginning of October, came after 9 months of speculation. It was largely ignored by the national press, because the short statement said little and the record companies, which are supposedly supporting DCC along with Philips and Polygram (EMI, BMG RCA and WEA) as usual failed to do a business-like job of communicating past the music press.

Also, at the time of the announcement, the only hardware company to commit to DCC was Tandy Radio Shack. TRS has never been taken seriously in the hi-fi world, seldom communicates with the specialist press and lost virtually all credibility as an innovator following the unfulfilled loudmouth promise of the *Thor* recordable CD system.

As late as mid September Matsushita was planning a joint announcement with Philips on DCC. Sony was interested too. But hardly surprisingly the Japanese government trade body MITI was unhappy about any new system that could pull the rug from under DAT. So Philips went it alone. And CBS, owned by Sony, of course, remained the only record company to stay on the touchline.

The new cassette will be the same size as a conventional audio cassette but is likely to be styled quite differently, with a closed top and sliding tape cover. The tape inside the cassette will be the same as the video tape sold in bulk to duplicators of VHS video cassettes, with a coating of chromium dioxide.

A hi-fi DCC deck, which when the system is launched in 1992 will initially cost around \$500 or \$600, will play back conventional analogue cassettes or the new digital cassettes and record in either format. Later there will be cheaper models, portables and in-car units.

The DCC deck will have a conventional stereo pair of heads for analogue recording and playback, and in addition a solid state head for digital recording. This head is divided into 16 very narrow segments, spread across the width of the tape. Each head segment is itself divided into two parts: a magneto-resistive circuit, which senses magnetic patterns on the tape for playback; and a magneto-inductive circuit, which creates a magnetic field for recording.

Although the cassette follows the traditional format of recording on one half of the tape width in one direction and then on the other half in the other direction, DCC is not a flip-over format. The system has been designed from day one as an auto-reverse format, to give faster access.

The 16 head segments lay down, and play back from, 16 very narrow tracks spread across the tape width, eight for each stereo pair. Tape speed remains the same at 4.75 cm/s, to provide the same playing time as an analogue cassette.

Previous attempts at recording digital stereo on a compact cassette have either compromised audio quality or sacrificed playing time by increasing tape speed, or relied on more, narrower heads which lay down tape tracks that are, in practice, too narrow to play back reliably.

Barry Fox

Digital audio cassette launch; Kenwood write once CD

Instead of using linear PCM, DCC relies on a new coding technique, called Precision Adaptive Sub-band Coding (PASC), which has been developed over the last couple of years mainly as a method of broadcasting digital stereo over conventional radio channels for Digital Audio Broadcasting (DAB).

The PASC processor samples the signal at the standard frequencies for DAT, 32 kHz, 44.1 kHz and 48 kHz, and then analyses the content of the sound, right across the frequency range. Where signals are audible to human ears, precise coding is used. Where signals are likely to be inaudible, less precise coding, with fewer bits, is used. In some respects this compares with the analogue processing used by Dolby SR.

Philips have been working on PASC since the '80s, and the breakthrough, which makes DCC possible, is a new generation of VLSI (Very Large Scale Integration) chips, which can now do in realtime what it previously took computers hours to achieve. As a yardstick, in the '80s it took 8 hours to analyse and code 20 seconds of mono sound, using a VAX minicomputer. PASC can work in realtime for stereo. The launch date, 1992, is based mainly on chip availability. The talk about DCC being based on conventional cassette technology has in this respect been confusing and misleading.

Philips claim that the PASC system on which DCC relies can provide coding equivalent to 18 bit PCM, which is 2 bits (12 dB) better than CD or DAT. In fact, says Philips, DCC gives a dynamic range of 110 dB.

Interestingly, although DCC works at all the DAT frequencies, analogue signals will be converted into 44.1 kHz digital signals, not 48 kHz as for conventional DAT. Sampling at the higher frequency wastes valuable coding space on inaudible sounds. Better, says Philips, to use all available bits on audible sound.

Philips has for several years been working with Polygram at Baarn in Holland. Eindhoven develops a coding system, the music people at Baarn try listening to it, make criticisms and suggestions, which Eindhoven then takes into account.

Philips promises sound quality 'equivalent to that of compact disc' from DCC. The next step must be for Philips to demonstrate a DCC prototype to engineers outside Polygram and to the hi-fi press, along the lines of the early demonstrations of CD player prototypes.

Philips claim the DCC signal can be copied and duplicated at high speed, just like analogue cassettes, eg at 64x speed. This claim will also

need proving if the industry is to put R-DAT on ice as a pre-recorded music format.

DCC will have copy protection 'of SCMS type' to prevent the digital copying/cloning of tape copies. But SCMS does nothing to stop people copying the same CD onto a series of tapes. Philips have talked to the record companies about modifying SCMS to write a copy-stop flag into the DCC original after it has been copied once, thereby preventing any further digital copying on any other tape.

But adoption of this would pull the rug from the record industry's case for a tax on blank tape.

Philips has without doubt done a very good job of selling DCC to the record companies. They, along with the Japanese electronics companies and in-car audio industry, have been flying to Eindhoven for briefing sessions at which Philips shows charts of music cassette sales, the high cost of DAT mechanisms and tapes compared to the low cost of DCC, the difficulty of duplicating DAT cassettes at high speed compared to the ease of duplicating DCC, the risk of pilferage with small DAT cassettes and the general philosophy that DCC kicks an existing technology into the 21st century.

Philips have capitalised on the fact that the record companies do not want another completely new format.

But dare the record companies pin faith on a format that is not due before 1992 when domestic R-DAT recorders are already reaching the shops for around £550, and probably soon £500?

Kenwood, previously known as Trio in the UK before a trademark wrangle with the food mixer people was resolved in 1987, have now launched a recordable CD system. Kenwood's CD-WO (Write Once) is similar in concept to the Taiyo Yuden/Sony/Start Lab/Sonic Solutions system and the Yamaha/Fuji/Gotham system, both previously reported. But there is one important difference.

Whereas the Start and Gotham Write Once systems are unambiguously aimed at the professional user, eg radio stations and recording studios, Kenwood is ambivalent over CD-WO. Is this just muddled thinking or a straw in the wind? Judge for yourself.

CD-WO, say, Kenwood "has considerable implications for use in both the professional recording and computer industries". The cost is high—£12,900 plus a personal computer—and Kenwood suggests that it will be ideal for CD-ROM software manufacturers and publishing companies as well as broadcast stations and recording studios.

But on the front page of their press publicity, Kenwood also say: "Following the numerous false starts of the Digital Audio Tape recording system, recordable CD has been anticipated in Europe for some time. Following the Japanese launch last month, significant industry interest has already been generated and a buoyant new market is expected to build over the next few years."

This kind of talk makes the professional launch of CD-WO look like a toe in the water for domestic sales of a cheaper system. □

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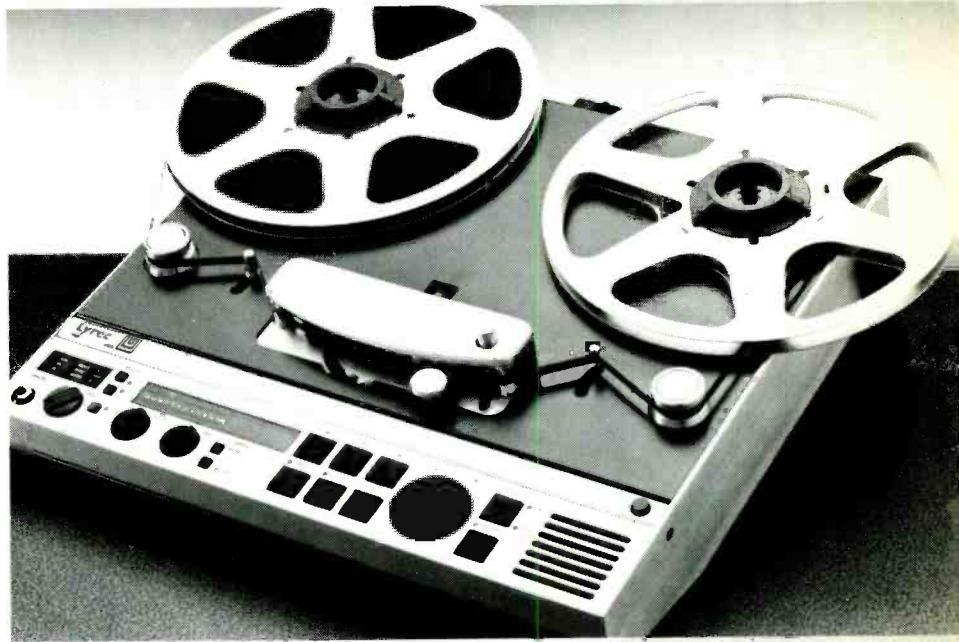


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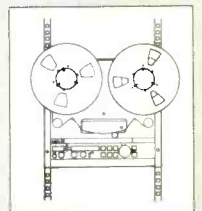
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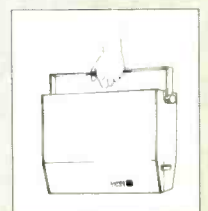
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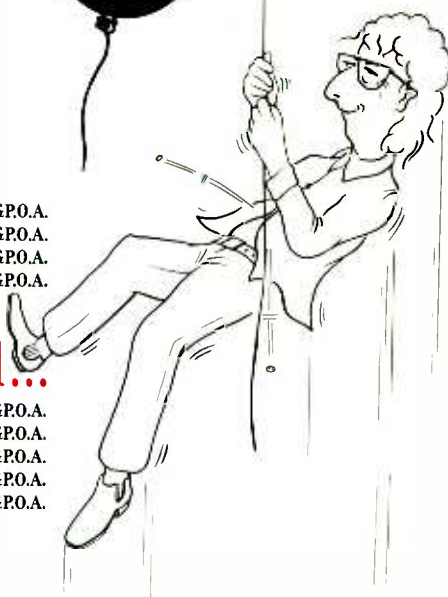
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PRO-DAT PRACTICALITY

Some of the digital trends and opinions aired at the AES Convention in Los Angeles discussed by Francis Rumsey

Now that the recent glut of conventions has passed, there is a small breathing space in which pause for thought would be a good thing; time to collect some ideas about the direction audio will take during the last decade of the century. Collected principally, then, from material gathered in Los Angeles at the recent AES Convention, here are some ideas to ponder over, and which might form the basis for further discussion, particularly concerning the role of DAT in the face of other digital recording formats.

It is time to be very rigorous in our assessment of DAT as a major professional 2-track tape format of the future, since very soon there will be many more so-called 'professional' DAT machines arriving from a large number of manufacturers, and the professional user will find it hard to distinguish between them. What does the term 'professional' mean when used in conjunction with DAT? Does it mean that the device has XLR sockets, AES/EBU interfaces, timecode and an external sync interface, or should it mean more than that? Certainly Sony's Roger Lagadec believes that it should be more, since, among other things, he said at the AES DAT workshop that Sony's professional DAT machines would be nothing like the professionalised consumer transports seen to date. He implied that the transports and construction would be built specifically for professional use but that the user would have to realise that such things would put up the cost of machines. More remarkably, he stated that he saw no reason why DAT should not

completely replace 1/4 inch analogue tape: something of a phase reversal in his attitude when compared with that of a year or so ago, which suggests that Sony (or at least a part of Sony) has great plans for the format. The recent announcement by Philips of a consumer digital cassette format to rival DAT, in the form of machines costing only £250, must be putting the wind up Mount Fuji, and perhaps the only way to recoup the massive investment in DAT development is to repack it as a professional format.

Certainly if DAT is to fulfil this rôle in the market it will need to overcome some of the serious worries people were expressing in discussions at the Los Angeles Convention. Clearly, many potential users have a fundamental worry that a format designed originally for consumer use should not even be considered as a serious contender for a long term professional format. Kudelski (father of the Nagra) clearly holds this view, since he is introducing a digital tape machine with a new format all of its own, the *Nagra-D*, intended to address just this worry. Whatever the original intention for a format, it is how real machines perform in practice that matters, and here also there is divided opinion. In the DAT workshop there were reports from audio engineers who had worked on major film and video productions, and many claimed that they always used an analogue Nagra backup when shooting in the field, even when DAT was being run as the primary audio format. This was, they said, because they simply couldn't risk the

possibility of a single drop-out, with a mute on replay.

In retrospect, it is this factor that is possibly the single most serious obstacle to digital audio in any format has to jump before it is widely accepted. DAT has made digital audio reasonably priced, it can be synchronised, it can be edited and the sound quality is good, but people are still scared stiff of drop-outs. Are they justified? A recent test by Panasonic showed that a DAT tape, which had been played over a thousand times in one place, still did not drop out but some users in the workshop were claiming only four playings before a drop-out. Clearly somebody must be wrong, with such enormously differing claims, mustn't they...?

Manufacturers' representatives and service engineers made it very clear that DAT machines were like any other tape machine and that they needed to be aligned and cleaned correctly. But how many people align and clean their DAT machines? The audio world is perhaps under a false impression that maintenance and cleanliness is a thing of the past with anything digital.

It is not common, in fact it is almost unheard of, for the manual that comes with any DAT machine to recommend the use of any form of test tape, alignment jig or test equipment for regular maintenance of the transport. Comparatively, the manual that comes with most professional analogue tape recorders has a large section on alignment, and test tapes are widely available. This is because most DAT machines to date have been consumer and not pro, and it is not standard practice to issue alignment instructions with consumer machines. Even so, it will be interesting to see just what is suggested in pro-machine manuals, and whether any important alignments will be a task that a normal user could perform.

Just what are these alignments anyway? It is very difficult to get at the transport of a DAT machine, and certainly not as easy as tweaking the azimuth on an analogue machine in order to replay a dodgy tape from another studio. How do you get dodgy DAT tapes to play? How do you compensate for tapes from other people's badly-aligned machines? How do you cope in a market where half the machines are consumer and half professional? Does it matter? Clearly the manufacturers need to educate us, but are they sure themselves?

If drop-outs in digital recordings are feared more than anything else, and this is definitely the impression gained from talking around, what can be done to alleviate the fears? Two things immediately spring to mind. Firstly, all professional DAT machines, studio and portable alike, should have four heads, not two, and they shouldn't be allowed to be called professional otherwise. This would allow off-tape monitoring while recording—known as confidence replay—and would at least give the operator the comfort of knowing that a recording was 'alright leaving him'. The *Fostex D-20* pioneered this approach. Secondly, a means must be found of allowing digital audio to degrade more gracefully in the face of increasing replay errors. If the sound quality could be made gradually worse as errors got more frequent then perhaps people would find digital recorders more acceptable. A third point worth considering is a means of adjusting the equivalent of tracking in order to make possible the replay of tapes recorded on bent or badly-aligned machines.

Analogue recorders lose high frequencies as the heads get dirty or when the replay head is out of azimuth, and the sound quality gets a little unstable or lumpy if playing over a slightly



Nagra-D digital recorder—open reel with rotary heads

patchy bit of tape, but typical digital replay tends to have a characteristic similar to a cliff-edge where the sound is there one moment and not the next. Granted there is a grey zone where many systems begin to interpolate rather than correct perfectly, and this results in a gentler degradation when compared with the choice between total correction or muting (again resulting in a loss of HF if interpolation is prolonged). But we need to take the masking process one or two steps further. This function could be made switchable, so that for mastering purposes it would be possible to revert to the 'correct-or-mute' strategy but in many real operational circumstances users would prefer a means of getting the tape to play rather than not play, in order to rescue, for example, the one good take that the famous actor did before he left for Hong Kong. People liked the 'Playback Muting Off' function on Sony *PCM-F1* and *701* for this very reason, because it allowed them to replay over major errors and hear the effect of the error, rather than muting. If the audible effect of the error could now be made more subtle, then engineers could choose how to cover the momentary loss of sound quality in post-production, hoping that the producer might be momentarily distracted! This is not so much to support the adoption of fudges as a rule but to acknowledge the existence of potentially disastrous situations in professional recording,

The audio world is perhaps under a false impression that maintenance and cleanliness is a thing of the past with anything digital

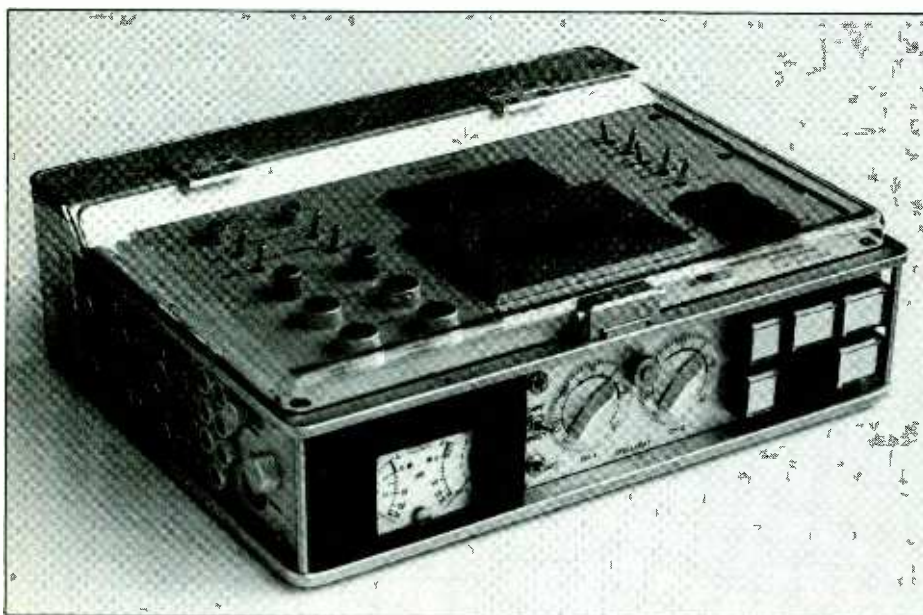
It is not common for the manual that comes with any DAT machine to recommend the use of any test equipment for regular maintenance of the transport

is an open-reel machine with rotary heads and the format was designed specifically for professional use. You would be looking at parting with around £12,000 for such a machine. Stellavox, on the other hand, the alternative to Nagra in Swiss-made excellence for portable analogue tape recorders, has gone down the DAT route with the *StellaDAT*. The *StellaDAT* has four heads, timecode, sync ports, 'climate control', is claimed to be operable in very severe environments and is also waterproof. It comes with a number of mixer

Furthermore, the Nagra allows for four channels of audio, which matches well with the four channels available on digital video recorders.

Clearly, in the potential war between DAT and *Nagra-D* it will be a matter of 'you pays your money . . .', but the question exists as to whether many professionals will 'pay their money' for DAT and then complain because it's not quite as future-proof as they expected. Sony and others may be regretting the day they ever introduced DAT, since it is possibly too good for consumers and perhaps not the format they would have designed for professionals. There is no doubt, even so, that DAT is an extremely good and useful thing, and in terms of value for money it cannot be beaten. It is also a world standard, if such a thing exists. Like the *PCM-F1* before it, DAT makes digital audio available to a wider range of users but, also like the *PCM-F1* it should not be seen as a universally-applicable professional recording system.

If DAT is going to be such a large feature of Sony's 2-track professional audio line-up in the next few years, as Dr Lagadec appears to believe at the moment, where does this leave the DASH format and the *PCM-1630*? The *1630* format is certainly steam technology when compared with DAT but has fostered a wealth of experience and a wide adoption as the CD mastering format. It also works moderately well but is probably no less prone to drop-outs than DAT. Users have found tape types that work well and they stick to these. Similarly, certain DAT tapes are more reliable than others. The 2-track DASH format was never as widely adopted by broadcasters as it might have been and although there is a steady but slow stream of sales, it could not be said that 2-track DASH has 'taken off'. Perhaps, then, DAT will form the basis of professional 2-track recording from Sony and DASH will be the mainstay of multitrack recording. Quite how Sony will cope with the question of 20 bit or 4-track recording will be interesting to watch, since it will probably have to introduce a new format. You could lay good money on the fact that it won't be using the *Nagra-D* format.



Stellavox *StellaDAT* professional portable DAT machine

where thousands of pounds may be at stake. It cannot be beyond the wit of manufacturers to achieve this and it is possible that it might sell a lot more machines to wary operators.

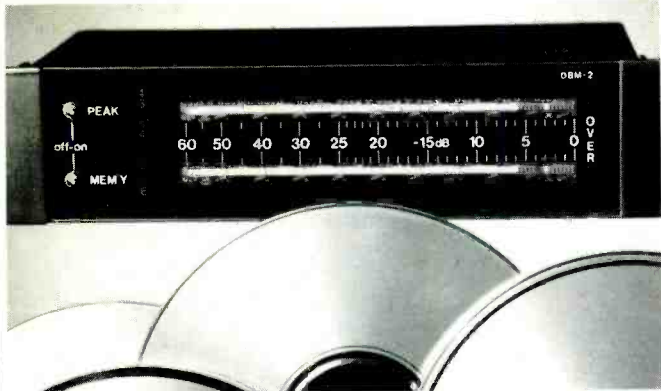
On the positive side for DAT, one operator who had recently toured some very inhospitable parts of the globe for National Geographic with a Sony portable DAT machine claimed not to have experienced a single drop-out over the length of his tour, in high humidity and temperatures. He pointed out that a circumcision operation in the Serengeti was not a take he would like to have to ask for again and that this proved his faith in DAT as a professional medium! The question is, was he lucky, or could such a claim be made repeatedly over a thousand trips to the Serengeti?

Mr Kudelski is clearly a very clever man. He has designed a portable digital tape recorder, which aims to replace the analogue Nagra as the machine of choice for ultra-reliable field operations in inhospitable climates. The *Nagra-D*

options on board and the usual portable features such as battery powering, phantom power for mics and so on. There is an interesting difference between *Nagra-D* and DAT, and that is that the Nagra format allows for 20 bits of audio data per sample, whereas DAT only allows for 16. This may become important in a professional world now obsessed by resolution over 16 bits.

On the positive side, one operator who had recently toured some inhospitable parts of the globe with a Sony portable DAT machine claimed not to have experienced a single drop-out in high humidity and temperatures

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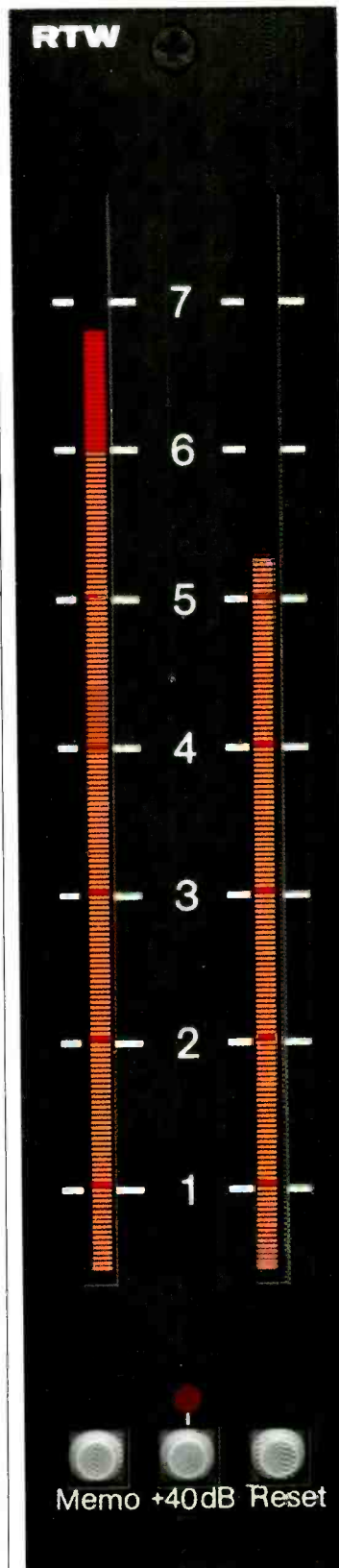
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DASS-100 from Digital Audio Research

Moving to other subjects, it is worth noting the sudden increase of interest in synchronisation of digital audio signals. This is partly due to the AES issue of draft recommendations for synchronisation but also is because more and more people are using digital audio systems with video, or in large networks with other digital audio equipment. At the AES Convention it was clear that there is enormous confusion among users over the principles of signal synchronisation, since it is not a subject with which analogue audio engineers have needed to be particularly familiar. Most engineers have at least a passing acquaintance with timecode synchronisation of transports but what we are talking about here is the business of ensuring that all signals are locked to a common reference, such that 48 kHz in one part of a system is exactly the same as 48 kHz in another part of the system, and also that there is a common and fixed relationship between the video master clock, the timecode master clock and the audio master clock. In passing, it should be pointed out also that there is a vital need for a stable master clock to be used as a reference for retiming 'jitter-bugged' audio data before conversion, since this is the root of many people's complaints regarding the sound quality of digital audio after it has been transferred between consumer and professional systems, or to a high quality converter. The sound quality of a digital system can only ever be as good as the timing accuracy of data entering the D/A converter.

Video establishments have had to contend with the need for careful synchronisation almost ever since video began and reference inputs are a standard feature of all professional video equipment but digital audio equipment comes with a wide variety of different sync inputs and sometimes with none at all. Audio engineers are not familiar with the principles of centrally-distributed sync signals or genlock. They also have to deal with a number of possible timecode types and sampling rates. In the all-digital studio, all equipment would run at the same sampling rate and each device would be locked to a sync source (in the form of an AES/EBU audio signal) generated either by a standalone sync pulse generator or by, say, a digital mixer in a single-studio setup. Asynchronous signals would normally have to be synchronised to the reference before they could be combined with other signals

or recorded and thus we shall begin to see more of digital audio signal synchronisers, such as DAR's recent DASS-100.

Digital audio operators need to be aware that timecode to be striped onto digital tapes must be locked to the same sync reference as the digital audio recorder. This can present problems since although most timecode generators have video sync inputs they don't have AES/EBU sync inputs.

If the audio recorder has a video sync input then it is possible to use video sync to lock timecode generator and audio recorder. Also, if a digital audio tape is to be post-striped with timecode, a means is required of ensuring that the timecode generator is locked to the sampling rate of the tape recorder, in order that the post-striped code does not drift in relation to the audio. It seems most sensible for a timecode generator to be an integral feature of all professional digital recorders, which would normally be locked to the sampling rate. The sampling rate would then in turn be locked to whatever sync reference the machine was presented with. Although asynchronous timecode has its uses for rescuing disaster tapes, it should not be the norm.

On a final note, it is good to be able to report that at last someone is working towards a standard interchange format for sound files on optical disk. A conversation with Ted Smith, technical director of WaveFrame, indicated that a group of interested parties is working on a file format that would allow sound files to be transported between systems, provided that the disk drive used in each system was capable of reading the disk concerned. Such an interchange format would be similar to the various interchange formats that exist for the exchange of text between different word-processing packages, in that it would carry most of the salient information for the file such as the number of channels, the sampling rate, and so forth. It is unlikely that it would be possible for much realtime editing to be done from such interchange files but it would allow sound files to be copied into the native format of the system in question, after which the usual operations would be feasible. Smith also pointed out that limited EDL (Edit Decision List) information might also be interchangeable, although one suspects that this might be a hard task, given the range of possibilities. □

At the AES Convention it was clear that there is enormous confusion among users over the principles of signal synchronisation since it is not a subject with which analogue audio engineers have needed to be particularly familiar

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Martin Polon

Stereo television— an American phenomenon? asks our US columnist

Jack had been anticipating the awards show for some time. The sound consultant was a top professional; known worldwide as being number one in his field. The mix engineer was a friend, with the finest credentials. Jack had been inside the remote truck. A virtual audio techno-star. It had been driven in from LA for the show. Las Vegas, Nevada—almost the showbiz capital of the world—at least for this kind of musical event. Jack's excitement and anticipation was betrayed by his preparations.

In the living room, the brand new audio control receiver was ready to roll! The audio feed was taken from a 13 inch TV monitor with dedicated left and right MTS stereo feeds. The unit was made specifically to serve as much as an audio tuner, as well as a superb TV display. This feed went into the 120 W/channel receiver, which would decode the surround logic for centre and rear audio. The large bookshelf speakers were from a major maker and well thought of in the annals of the hi-fi trade press. The same maker provided the small bookshelf speakers used for the surround sound. The centre-channel feed was fed into another power amplifier and thence to the subwoofer. Speaker placement was ideal. So was seating, as Jack had laboriously muscled the two sofas into place. The video projector was ready

and the new screen and cable connection gave a peerless picture.

In the kitchen, Jack laboured over the munchies. He was especially proud of his smoked bluefish pâté. His secret recipe emphasised fresh cooked bluefish as well as the smoked kind, to reduce excess saltiness. The turkey chilli had been cooked for hours. The addition of unsweetened chocolate in the form of cocoa powder had given the concoction a dark rich earthiness. And the spinach and clam dip was the best he had ever made—nestling inside a hollowed out rye bread loaf.

His friends seated around the living room, Jack felt vindicated. His station had pioneered stereo TV in his town. It had cost some money and at first, Jack felt that he had been the butt of several jokes. But now, all the work had paid off and Jack's stature as station manager was enhanced. The awards programme started and all was well.

Or was it. Susan had noticed it first: "The left side sounds funny."

Leave it to my wife, Jack thought as he began to perspire. Indeed, it was clear that the relationship between left and right was not as it should be. Subtle, a sort of a phasing sound going in and out. His guests said nothing, straining with politeness. The hum was not subtle and settled in every time the performers wore a white shirt or dress. The subwoofer was especially impressive with the hum. But, at least the hum was not there all the time and 15 minutes in, it stopped. It was replaced by an intermittent kind of whooshing sound from the rear surround speakers.

The very low-level whistle began about 30 minutes into the show and stayed for the rest of the hour. Jack thought it might be some kind of parasitic note. Last but not least, was the total loss of the picture for the last 5 minutes of the show. Jack went into the bedroom, returned with

his shotgun and had to be restrained from blowing his TV stereo setup out of the water.

With apologies to all those out there in the United States who have enjoyed TV stereo flawlessly, the above 'fairy tale' is a virtual replay of an evening I spent with 'Jack'. The point here is that the basic provision of audio to accompany television programming is much improved in the United States but the prospect of truly dramatic stereophony and surround sharing the home environment with the visual elements of television has not been achieved and, in fact, is still far from reality for most viewers. There are a number of current problems that might be discussed one by one to illuminate the current state of audio affairs in TV in the US.

- A lack of consistent phase discipline and phase technology throughout the production, distribution and transmission systems contaminates the North American television industry today. Despite the repeated telling of ribald stories of failure by broadcasters, over repeated glasses of Tennessee sipping whiskey at NAB conventions, the consistent and reliable transmission services provided by the American Telephone and Telegraph Company kept the broadcast industry 'honest' in terms of phase relationships. The splitting up of the Bell System continues to bring us a 'leaner and meaner', 'Ma Bell' but as the old lady kicks off her black dress for a Paris look and has indeed become a world competitor, some of the benefits of 'mom and apple pie' are missed. Signals had to conform to published standards that every subsidiary operating company of 'Mother Bell' treated as the Bible. There was only one way to do things and there were no exceptions. Signals entered the telephone system through standardised and telco-supplied repeating coils and left the telco system in the same way.

OFTEN HEARD...



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Many of the complaints about the transmission by 'Mother' centred on the quantity of service rather than the quality. Frequency response and distortion limits were 'dollar' decisions based on broadcaster economics. At any rate, whatever the limitations of 'telco', the rigid discipline of standard phase relationships through common equipment and wiring practices created nationwide conformation. It may not have worked all the time but at least it was more predictable than today, where professional audio equipment makers and the industry still cannot agree on the correct wiring of pins 2 and 3 on input and output Cannon connectors on equipment.

Today, the lack of predictable dependability throughout the chain of programme production, network or syndicated distribution, and local station transmission has cost the broadcast industry the simplicity of conventional stereo. Programme producers and network managers fear phase cancellation as a real menace. If, in fact, it is a menace that occurs very rarely—it is felt to be a snafu that can be ill-tolerated since it could cost millions of viewers their audio if it happened in the wrong place at the wrong time. This virtually condemns any stereo programme to be without voice tracks, since any cancellation of L into R or *vice versa* could cost the viewer 'the voices' if in stereo and that is what the monaural as well as the stereo viewer ultimately pays for.

This 'unwritten standard' for mono dialogue has cost the home viewer much of the potential impact of stereo TV. Most feel that in the current transmission environment, little choice exists for other options. It must be noted again that phase problems like large spiders in basements, do not exist everywhere. Such difficulties probably constitute only about 1% of the connection points in the nationwide system and only then under a certain combination of circumstances.

- A lack of new audio equipment at all points

along the production, distribution and station audio chain complicates the phase problem indicated above and remains a source of noise, distortion, hum and reduced dynamic range. Everybody insists that waiting for digital products is the only sensible response and existing equipment will just have to soldier on a little bit longer. Many of the problems associated with vintage audio gear centre around transformers. It is not unusual for programme audio to have passed through 40 to 50 transformers per audio channel.

Another common problem area historically, for audio recording and reproduction in television has

audio tracks still get mangled during video recording.

Whatever the audio ill, consider the complexity of the typical audio chain for an average television programme broadcast in the US:

Original recording—microphone pickup, portable audio (Nagra) recorder

Post transfer—limiter, film (mag stripe) or audio tape recorder

Post-production—console with equalisers and volume levellers, film (mag stripe) or audio tape recorder, limiter, video tape recorder

Network transmission—video tape recorder, console, switcher, limiter, satellite uplink

Truly dramatic stereophony and surround sharing the home environment with the visual elements of TV has not been achieved and is far from reality

been the video tape recorder. The dearth of distortion-free, full-response audio signal handling on all the generations of the 2 inch and on the early 1 inch machines has been solved. The advent of digital video tape recorders (DVTR) such as the D-1 and D-2, has provided many operators with an exceptional method for combining high quality audio with picture. The industry has also made great strides in equipping many of the large number of C-format 1 inch machines with Dolby and/or other technology noise reduction cards to improve audio response. The new small format ½ inch machines, like the Betacam SP series and the M-II products, offer greatly improved audio capability with PCM-like recording formats. The S-VHS system has also been upgraded to full digital audio capability for affordable composite studio work. And DAT recorders with timecode capability offer similar utility as well.

But the cost of replacement or upgrading is still a stumbling block at many stations and decent

Satellite—transponder input, transponder output
Station transmission—satellite downlink, control console, switcher, limiter, microwave link
Station transmitter site—microwave link, limiter, television transmitter aural exciter input

As you can see, the possibilities of signal degradation in the analogue domain are increased in small or large jumps by each new device introduced into the total chain. Ideally, needless to say, all these devices should have only the insertion effect of a straight wire but as the saying goes, 'Not in this life!' Even the coming of partial digitisation has not solved the problem. Consider that some experts have been quite outspoken about the use of portable DAT for original sound recording and digital tape recorders and digital hard disk recorders in post-production. It is suggested by these worthies that digital merely adds the summing error of as many as half a dozen A/D conversions. As long as we must return to analogue buses, so their theory



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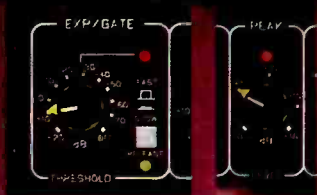
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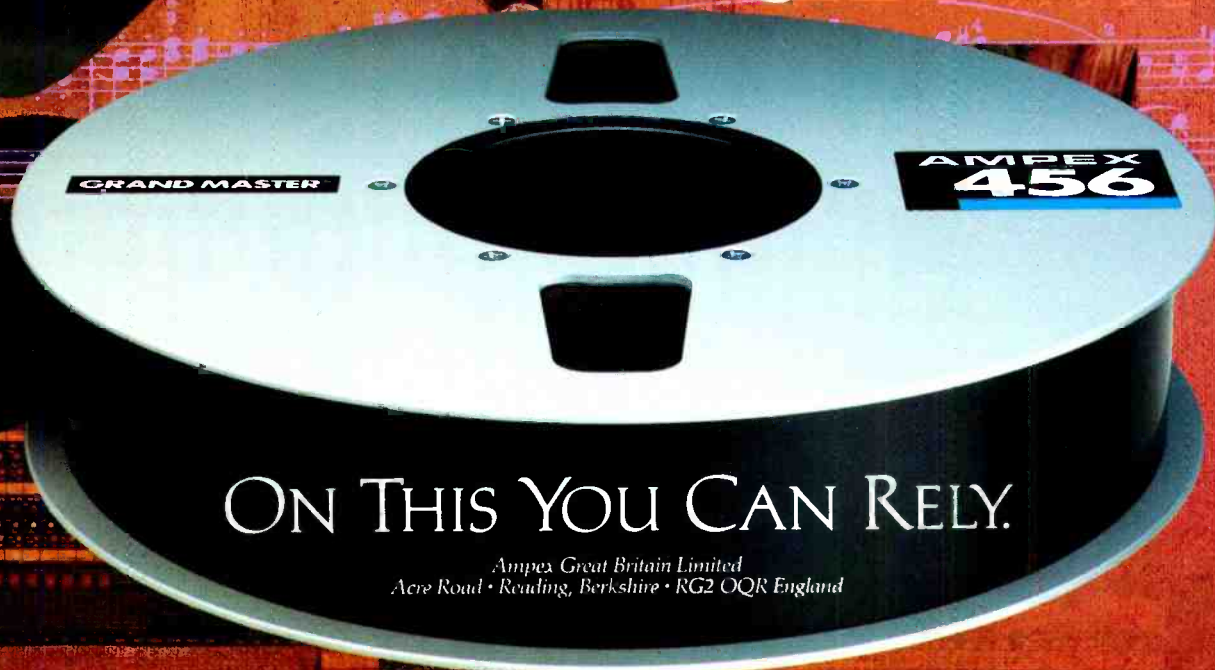
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