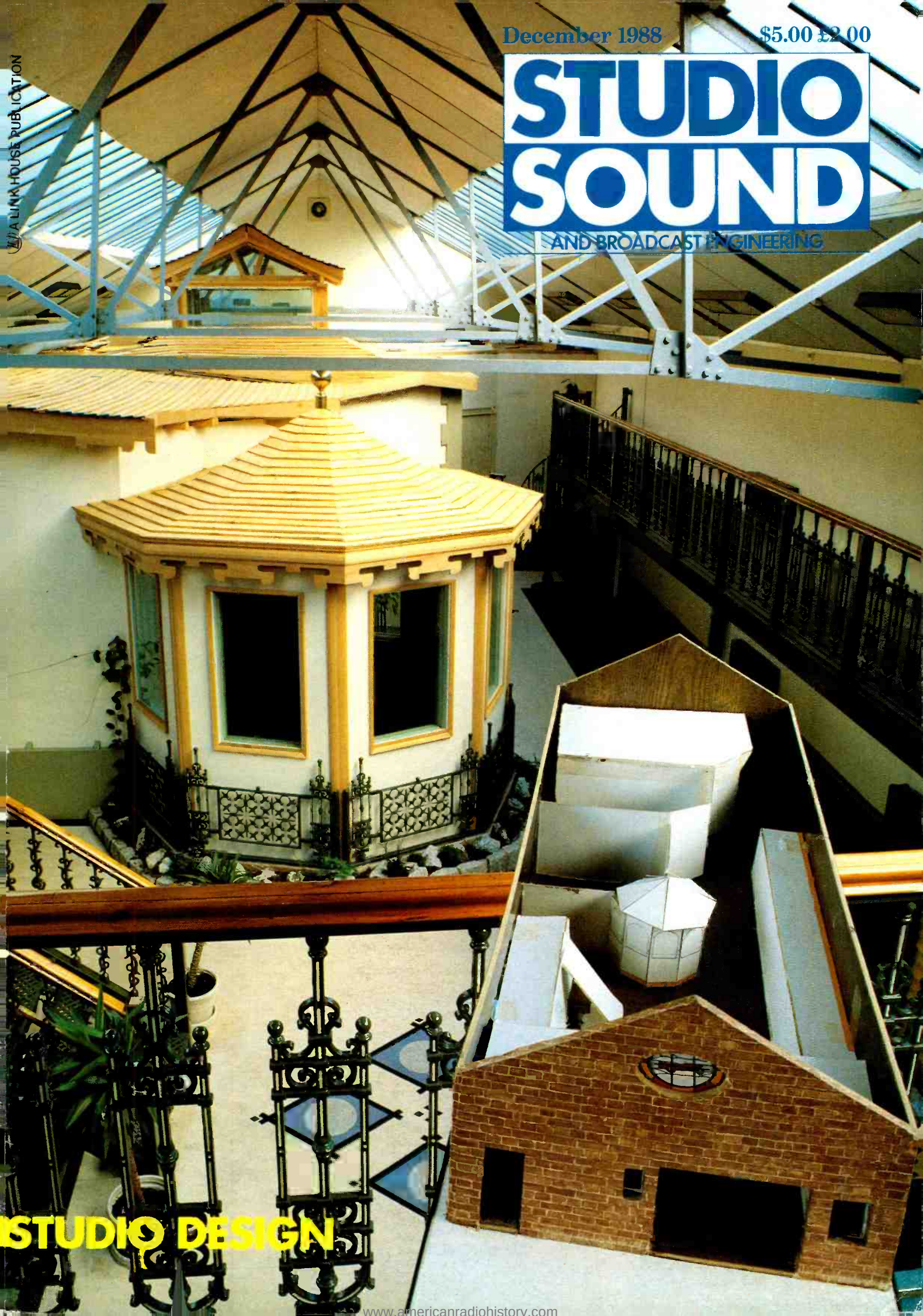
A LINK HOUSE PUBLICATION

December 1988 $5.00 £2.00

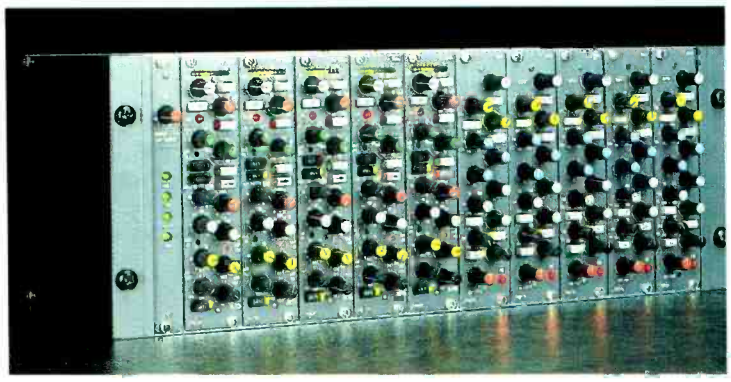
# STUDIO SOUND

AND BROADCAST ENGINEERING



## STUDIO DESIGN

# WHAT'S GOING ON?



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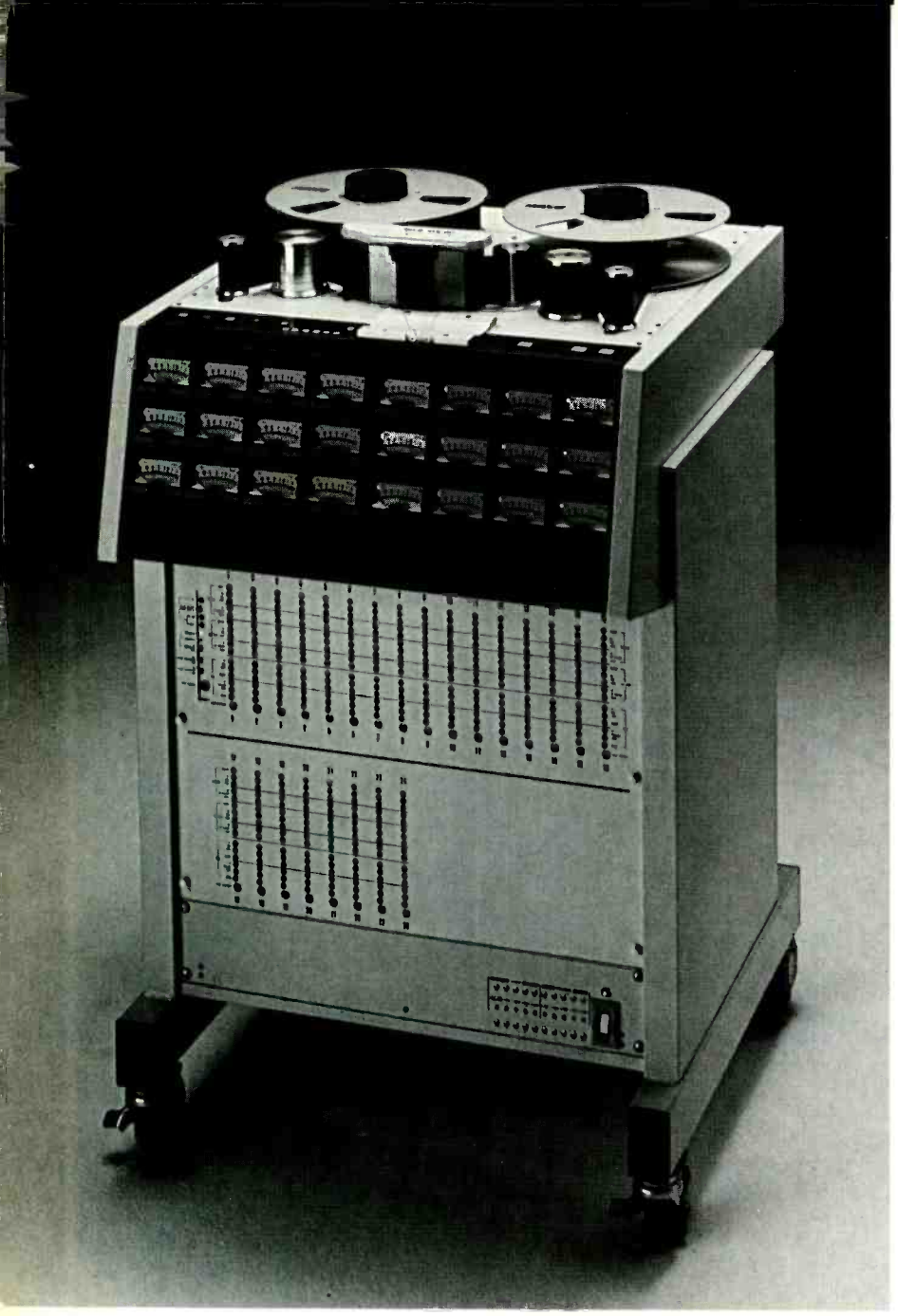
*Olympic Studios' Control Room One*



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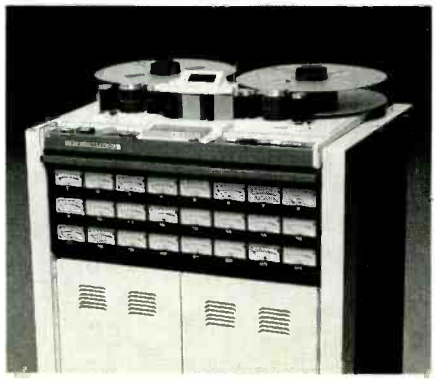

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AND BROADCAST ENGINEERING

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# EDITORIAL

This month's topic is studio design. Writing about design theory is all very well but there are really only a few significantly different design approaches and most of these were developed several years ago. The design theory is then tried out in practice and can be evaluated in the real world. After several rooms have been built using a particular design, the designer will learn from his 'mistakes' and his approach begins to evolve as elements of other theories are integrated. His competitors, who may come from a different direction with initially quite different design approaches, make the same transition and it seems that rooms become more similar in acoustic concepts. The skill of the designer comes in accommodating the client's requirements and the peculiarities of the space available and still achieve the desired acoustic results. Acoustics is never a precise science, far more an imprecise art and the only theories worth expounding are those that can be proven to work.

There is, however, another side to design and that is accommodating the needs of the client in areas other than just acoustic control. In this issue we have chosen to look at two studios we feel are interesting from a design point of view. They are totally different in design, scale and approach but unified by having clients who very much knew what they wanted from their studio and worked closely with the designer to achieve it. As it happens both are situated in Great Britain but that is just a coincidence; they could really have been anywhere.

Also in this issue we have an article on the approach that Fostex have taken to adding SMPTE synchronisation to DAT and its implementation in the *D2* DAT machine that they will shortly be launching. This could be looked at as a second generation machine and is yet another sign of how DAT is becoming a useful professional tool even if the consumer areas remain in stalemate.

I would also like to draw your attention to the first of a three-part series on power amplifiers. Written by Ben Duncan the series will try to bring you fully up-to-date with amplifier technology, from the various operational classes to the proprietary designs that we see being introduced more frequently. The role of the power amplifier has a far greater contribution to the type of sound achieved than it used to be given credit for. This is far more widely recognised these days and so it becomes far more necessary to be aware of the differences between the various designs. Ben is an accomplished designer in his own right and this series is the first time that I have seen this information in print in an accessible, all-encompassing form.

In a round about way we are now back where we came in. A few years ago, the studio designer did exactly that. Then he became involved with the monitors as it became obvious that in heavy duty multitrack monitoring it was not possible to look at monitoring in isolation from the room it was used in. The interest in the monitor grew to encompass the crossover system and then the power amplifiers and the complete monitoring system. Perhaps then a thorough knowledge of power amplifier design is now an integral part of studio design but I will leave to you to decide if this is too tenuous a connection for the sake of a proper end to this piece.

**Keith Spencer-Allen**

**Cover:** The Pink Museum recording studio in Liverpool, UK. Photography by Guy Woodland

## 1 SM48 Dynamic

Perfect for vocalists on the way up. Many of the outstanding performance features, similar appearance, and ruggedness of the world-standard SM58, at a most affordable price. Delivers the famous Shure sound, and features the uniform cardioid polar pattern and distinctively enhanced upper mid-range of the SM58. Rugged, reliable and dependable.

# So you thought Shure only made one vocal mic

## 4 SM7 Dynamic

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## 2 SM85 Condenser

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## 5 SM87 Condenser

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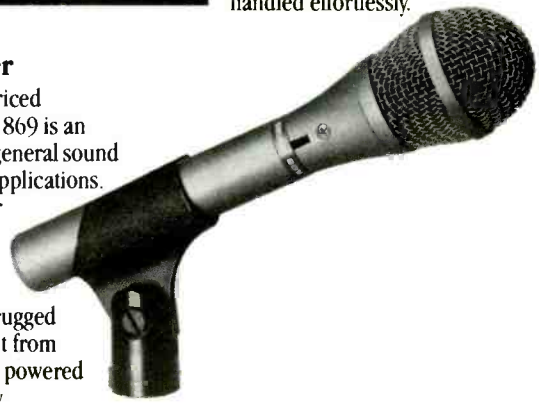
## 3 SM96 Condenser

This vocalist's microphone has features usually found in much more expensive condenser units. Smooth response has a controlled low-end roll-off to correct for proximity effect, and a slight presence rise to enhance vocals. Efficient 3-leg capsule suspension system minimizes handling noise. Optimized output level to control overloading. Steel-shielded against hum and RF pickup. Operates off phantom power, plus the convenience of automatic battery switchover.

## 6 869 Condenser

An economically priced electret condenser mic, the 869 is an outstanding performer for general sound reinforcement and music applications. The 869's controlled upper mid-range presence rise and low frequency roll-off give optimal clarity and crispness to voices. It's as rugged and reliable as you'd expect from Shure and can be phantom powered or uses a 1.5 volt AA battery.



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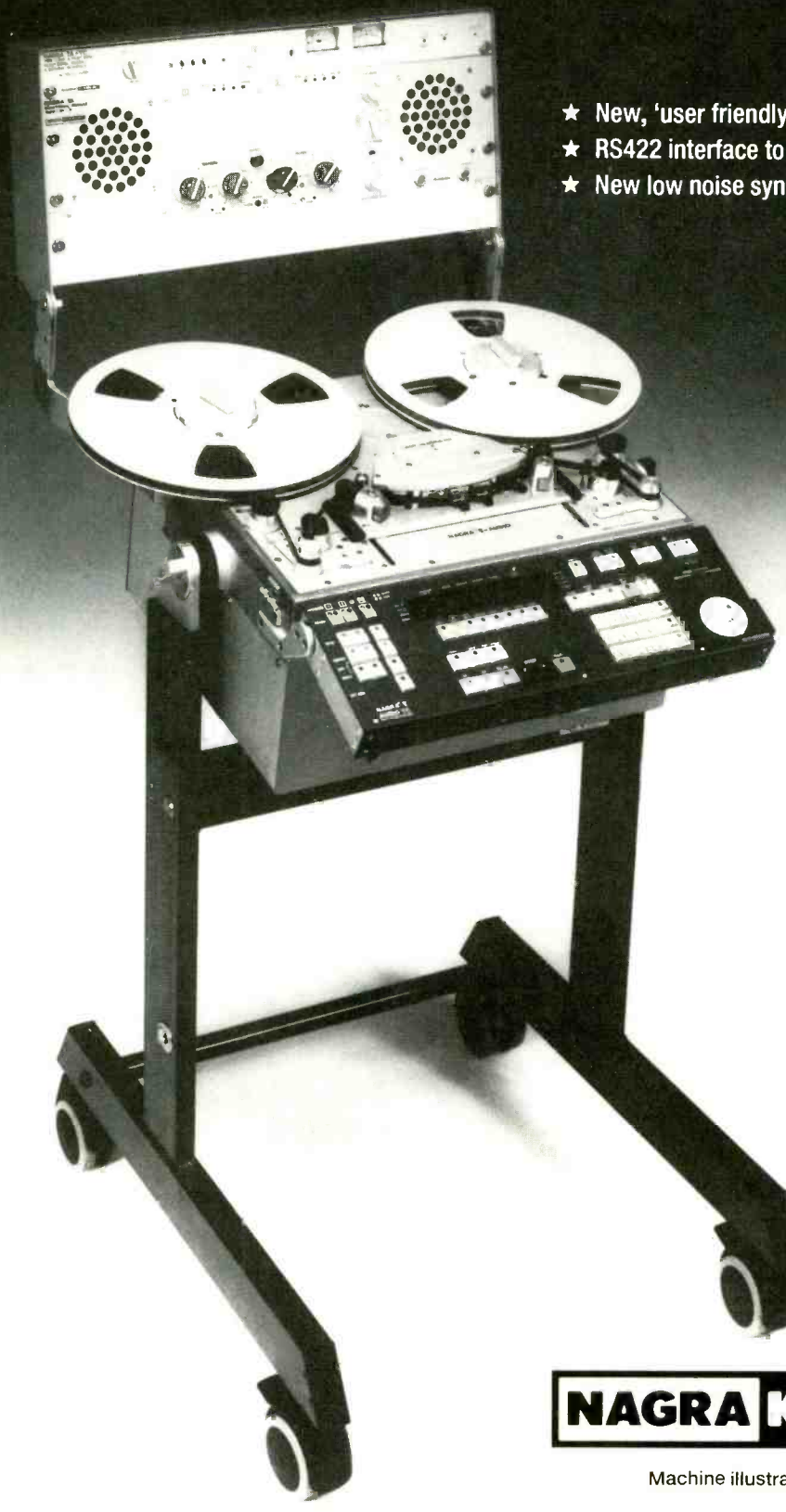

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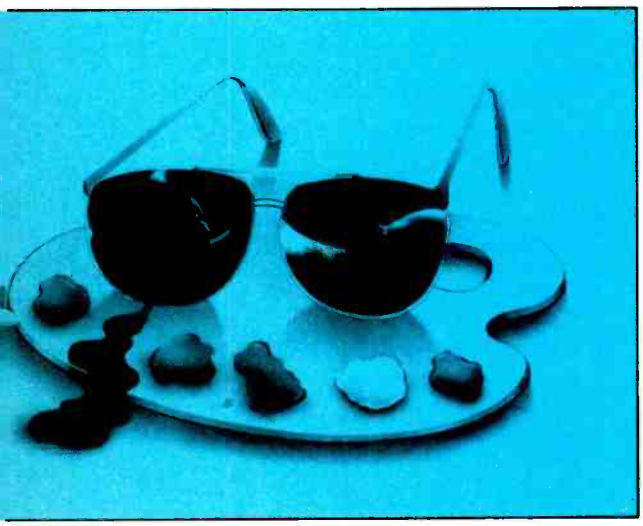

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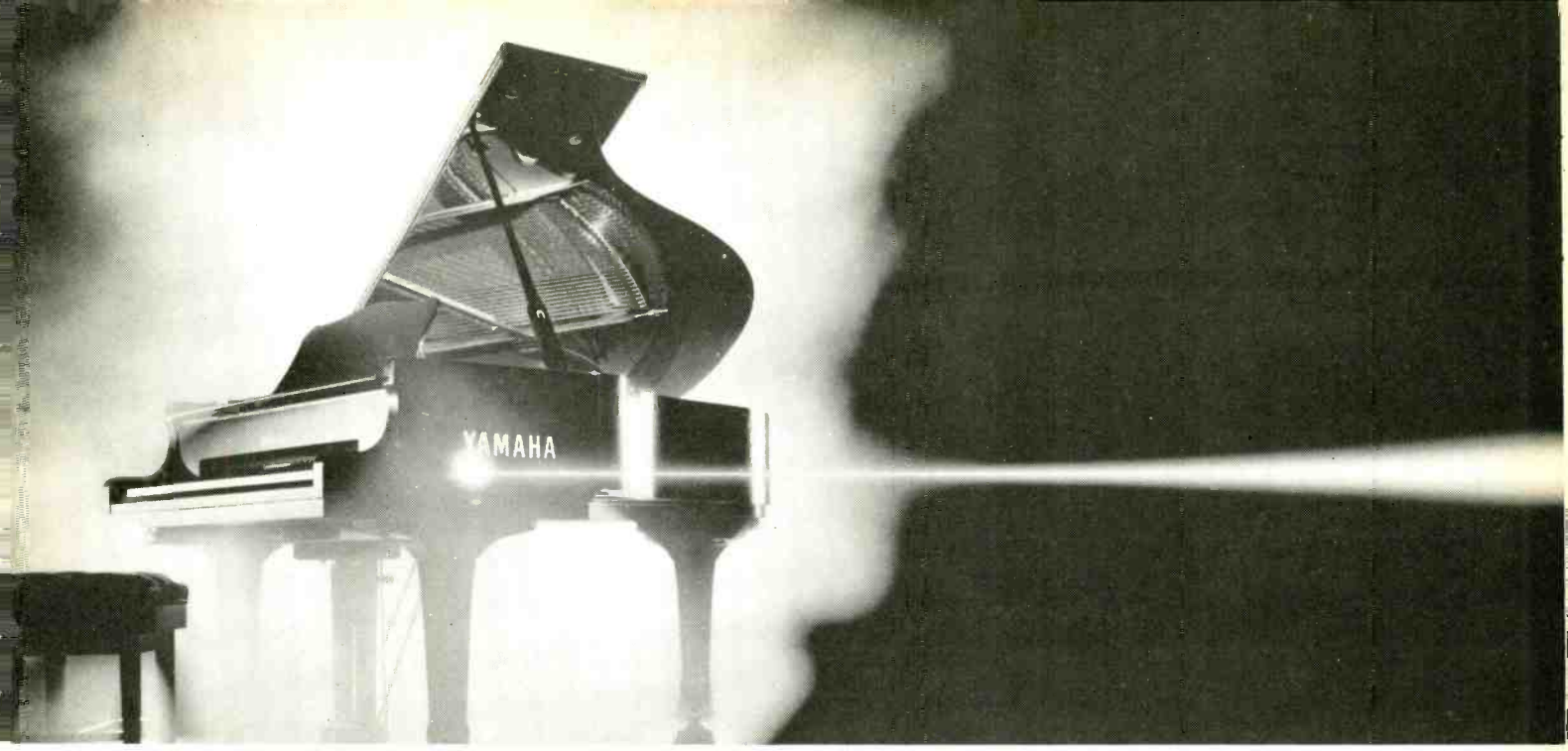


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SS/12/88

# NEWS

## Nimbus increase CD-ROM storage

Nimbus have announced a development in CDs which will ultimately quadruple the amount of data that can be stored on them. The new disc will be able to store 1 million pages of text compared with the 250,000 pages stored by existing CD-ROM discs. It will also, in computer terms, be able to store 6,000 floppy disks compared with the current level of 1,500.

*CD2X* (1.2 Gbyte) disks have already been tested and will be demonstrated in the new year and Nimbus say that this is just a development step to production of the *CD4X* (2.4 Gbyte) quadruple density disk. These high density disks are not intended as a replacement for the established CD whose sales continue to grow but where databases are getting larger and mixed mode CD-ROMs with graphics and sound will outgrow 600 Mbyte discs.

Maxwell Communications acquired a majority shareholding in Nimbus last year as a means of expanding the group's electronic publishing through CD-ROM for storing large quantities of information and disseminating it in an easily accessible form. The initial market for the new disc is seen as commercial and institutional but eventually it is expected to become a practical alternative to the 12 inch video disc and competitively priced with the pre-recorded video cassette.

## Exhibitions and conventions

**January 21st to 25th MIDEM,** Palais des Festivals, Cannes, France. Contact: Peter Rhodes, International Exhibition Organisation Ltd, 4th Floor, 9 Stafford Street, London W1X 3PE, UK. Tel: 01-499 2317.
**February 21st and 22nd** Sound '89, Heathrow Penta Hotel, London, UK. Contact: Sound and Communications Industries Federation, Slough, Berks. Tel: 06286 67633. Fax: 06286 65882.
**March 7th to 10th** 86th AES Convention, Congress Centre, Hamburg (CCH), AM Dammtor, D-2000 Hamburg, West Germany.
**April 28th to May 2nd** NAB, Las Vegas, USA.
**June 7th to 9th** APRS 89, Olympia 2, London UK. Contact: APRS Secretariat. Tel: 0923 772907.
**June 17th to 23rd** ITS Montreux, Switzerland.
**September 18th to 21st** MediaVisie 89, RAI International Exhibition Centre, Amsterdam, The Netherlands. Contact: RAI, Europaplein, 1078 GZ Amsterdam. Tel: (0) 20-549 12 12. Fax: (0) 20-461006.
**October 3rd to 9th** World Broadcasting Symposium, Geneva, Switzerland.
**October 4th to 7th** Broadcast 89, Frankfurt, West Germany.
**November 28th to December 3rd** Sound Expo/China '89, Shanghai Exhibition Centre, Shanghai, China.

1990

**March 30th to April 3rd** NAB, Atlanta, USA.
**May 29th to June 1st** BroadcastAsia, World Trade Centre, Singapore. UK contact: Overseas Exhibition Services Ltd. Tel: 01-487 5831 or 01-935 4672. Fax: 01-935 5637.

## Britannia Row buys Samuelson

Britannia Row have purchased Samuelson Concert Productions complete with their Turbosound *TMS 3*/BSS rentals systems. This complements their existing extensive stock of MSI PA equipment to make the company one of Europe's largest PA rentals company. All Samuelson's engineers will move to Britannia Row.

Further expansion at Britannia Row includes the purchase of the new MSI *MS-10* system for use at the imminent George Benson tour and exclusive UK dealership for Ramsa's *S-840* series consoles.

Recent tour bookings include Belinda Carlisle, Robert Palmer, Cliff Richard, Julian Cope, Earth Wind and Fire, Barbara Dickson, Paul Anka, Simply Red and the Monsters of Rock festivals. Co-director Robbie Williams, who has just completed 15 months as production director for the Pink Floyd tour, is to undertake a similar role on Steve Miller's US tour.

## HHB widen range

HHB Hire & Sales are to expand into the field of broadcast video with their appointment as a systems house for the new Sony Broadcast & Communications Products (UK) group. Products now carried by HHB include Betacam SP recorders, 1 inch C-format VTRs, hi-band U-matic SP recorders and a range of Sony editing equipment.

The company have also been appointed exclusive UK distributors for Audio Kinetics' ESbus audio/video synchroniser.

HHB feel the move into this area is a logical step as many of their customers are already involved in video-related post-production.

Recent system packages for large studio installations have included Olympic, Barnes, London; The Church, London; and The Music Room, Farnham, Surrey.

## Trident Audio acquired

British console manufacturer Trident Audio Developments have been acquired by the Relyon Group plc. Relyon are a long established company in the field of consumer durables and have gradually been diversifying into other areas with the acquisition of video company Photoscan a couple of years ago and Trident in late August.

The previous directors have been retained as consultants but we understand that they are active in other fields. The new managing director is American Bud Brimberg who has a background in parallel industries.

Relyon are investing heavily in Trident enabling the introduction of computerisation to the order and production process and it will continue to run as a separate company within the group. There will be no immediate changes in the product range but increased R&D will lead to further development in many areas including the *Di-An* and the existing product range.

## DMM popularity increases

Over one third of the albums in *Billboard*'s Top Pop Album Chart are now being cut using the Direct Metal Mastering process, say Gotham Audio Corp. Leading US pressing plants and mastering studios are switching more and more production to DMM. The company attribute this to quick turnround and high quality. Initial fears that DMM could increase mastering costs have diminished. With the current poor quality of lacquer and no improvement in sight, multiple recuts are the norm. Because of the robustness of the DMM master, the cost is evened out as fewer masters will be required claim Gotham.

## Courses and seminars

**November 22nd to 24th** Digital Information Exchange, Private Suite, London Zoo. Contact: DIE PO Box 46, London SW6 7BU. Tel: 01-381 1991.

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# NEWS

## Tapeless Studio used in major movies

New England Digital report the use of their *Tapeless Studio* system on the soundtracks of four major films this year. *Bull Durham, Who Framed Roger Rabbit, Young Guns* and *Willow* all made use of the system for sound effects creation, sound design and/or music scoring.

*Synclavier* programmer Stephen Croes and composer Michael Convertino created an elaborate score for *Bull Durham* combining synthesised and sampled sounds with traditional orchestral instruments. In just 11 days they were able to create 16 minutes of electronic underscoring. Forty-five minutes of complex underscoring was produced for *Young Guns* in less than two weeks. The system was used on *Willow* to save repeatedly returning to the studio for editing or replacing sound effects making use of the high-speed, random access editing capabilities. The Duelling Ducks scene from *Who Framed Roger Rabbit* involved cartoon characters playing real pianos. With Liszt's *Hungarian Rhapsody* already entered in the *Synclavier*, the music could be sped up to breakneck tempo without changing the pitch and then precisely edited to accompany the animation's dizzylingly fast 'duck-to-duck' switches. With a special MIDI interface box, the *Synclavier* also triggered the scene's two player pianos.

## Marquee form audio division

The Marquee Organisation have announced the formation of Marquee Audio, formerly known as Entec Audio Sales. Recent expansion and penetration into alternative markets has led to the need for an independent company.

Situated at the Shepperton Studio Centre, Marquee Audio have recently built new offices and a demonstration facility. the new company specialise in supply and installation of PA systems and deals with JBL, H & H, Yamaha, BSS, Martin Audio, Soundcraft, Rane, Denon and Court Acoustics.

## Address changes

• The London Microphone Centre is now known as LMC. The name change coincides with a move to new larger premises in West London, complete with extra warehousing space and demonstration facilities. LMC currently distributes products from Soundcraft, Carver, Harrison, BSS, Klark-Teknik, Drawmer, Yamaha, Studiomaster, Tascam, Fostex and Beyma. The new address is **Unit 10, Acton Vale Industrial Park, Cowley Road, London W3 7QE, UK. Tel: 01-743 4680. Fax: 01-749 9875.**

• **Solid State Logic** of Oxford, UK, has a new telephone number: 0865 842300. Fax: 0865 842118.

• Hinton Instruments have moved from Oxford. Hinton Instruments, Oldford, Nr Frome, Somerset, BA11 2NN, UK. Tel: 0373 51927. Fax: 0373 830679.

## News from the AES

Our lecture season in London started with **Fourier Transforms** by Peter Kraniauskas on Tuesday, November 15th. This will be followed on Monday, December 12th, with a lecture on **Loudspeaker Clusters** by Tony Oates of Shuttlesound.

Subjects to be covered early next year will include BBC Radio Data Transmission, Acoustic Modelling, Mixing Consoles, Design of Pipe Organs, Studio Acoustics and Analogue Digital Converters. Details and dates will appear in due course.

Other major events in the calendar are the **86th Convention in Hamburg** between March 7th and 10th, 1989 and the **87th Convention in New York** from October 19th to 22nd, 1989.

The **1989 British Section Conference** will take place on May 23rd and 24th, and is on the subject of **Planning Sound Reinforcement.**

The AES publishes many books on audio related topics as well as Convention Preprints, Standards, etc, which provide a wealth of technical information. Also two of our members have written books: John Borwick *Loudspeaker and Headphone Handbook* and John Watkinson *The Art of Digital Audio.*

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, UK. Tel: 06286 63725.**

## Agencies

• **Editron** have announced the appointment of additional European distributors: Eastern Video Music, Rome, Italy; R Barth KG, Hamburg, West Germany; Elfa Studio AB, Solnia, Sweden; Studio 38, Paris, France.

• **Apogee Sound Inc** of Petaluma, CA, USA, have appointed seven new distributors for Europe and Australia. They are: Entertainment Services Australia; Paul Farrah Sound, UK; Orthphono Professionale Audio, Italy; Focus Showequipment BV, Netherlands; Sony Espana, Spain; and Audio Rents B-AG, Switzerland.

• **Ault Inc** of Minnesota, USA, have appointed Gresham Powerdyne of Salisbury, UK, as agents for their range of industrial quality battery chargers, which are suitable for charging both sealed lead acid and gel cell type batteries of up to 24 V, 40 A hour rating. They are designed for automatic/remote charging of float/standby/continuous operations.

• **Beyma** has appointed LMC as sole UK distributor for their loudspeaker drive units and hi-fi products. LMC will distribute the complete Beyma pro-audio range including drivers, constant-directivity horn flares and chassis loudspeakers.

## People

• **Studer Revox America Inc** have named Tore B Nordahl vice-president and general manager in charge of operations. Nordahl joins SRA from Mitsubishi Pro Audio Group.

• **Applied Research and Technology**, New York, USA, have appointed Jim Bonis national sales and marketing manager. Bonis replaces Peter Beverage who has moved to Kurzweil Music Systems.

• **Harrison Systems Inc** of Nashville, TN, USA, have announced that Tom Irby has joined them as advanced technology product manager. Irby was the former owner of Studio Supply Company and will be responsible for Harrison's *SeriesTen, MR-20* and other audio products.

• **Precision Monolithics Inc,** Santa Clara, CA, USA, have appointed Ron N Dow as staff director of design engineering. Dow joins Precision Monolithics after working at Intersil, Exar and Interdesign. He was one of the founders of Solid State Micro Technology for Music which was recently aquired by PMI.

• Maggie Shale has been appointed sales and marketing manager by **TotalSystems.**

• **Loudspeaker Technology Ltd** of Glos, UK, have appointed three new members of staff. Richard Kimpton takes charge of monitor production and Alan Speake becomes production manager. Speake recently worked with Robin Townsend, restoring GP Bugattis. Ray Ellaby, engineering director, now concentrates on developing new products.

• **PRECO Ltd,** UK-based audio and broadcast equipment distributors have announced that Tony Crockett has joined the company as sales and marketing engineer. He brings with him several years experience in professional audio particularly in the areas of precision test and measurement.

# TEN REASONS WHY AMS AUDIOFILE™ SHOULD BE YOUR CHOICE OF DIGITAL AUDIO DISC SYSTEM

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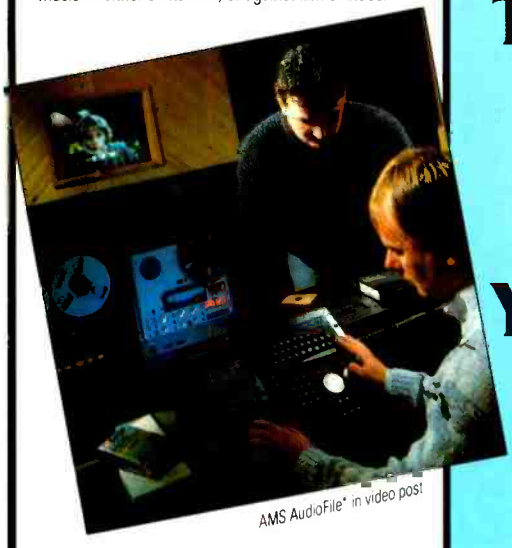

AMS AudioFile* in video post

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Not only can AudioFile talk digitally to a host of audio tape machines – including multitracks, Sony 701/601 recorders and R-DAT machines – its inbuilt synchroniser can control a selection of video machines from MII right down to low-band video players (including jog and shuttle).

## 5. CONTROLLABLE BY EXTERNAL VIDEO EDIT CONTROLLERS

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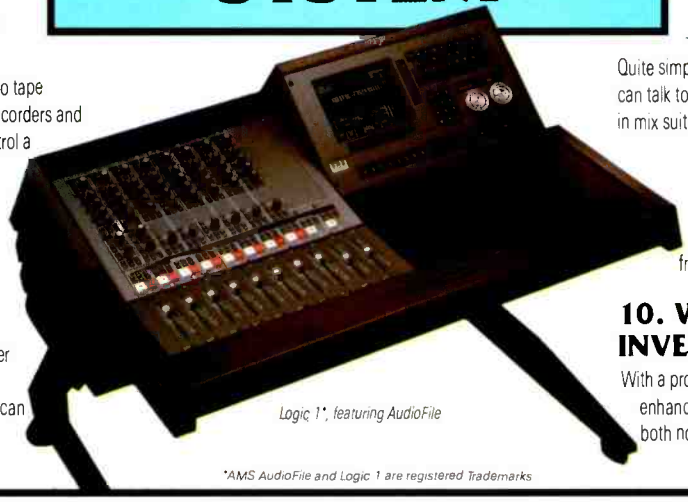

Logic 1*, featuring AudioFile

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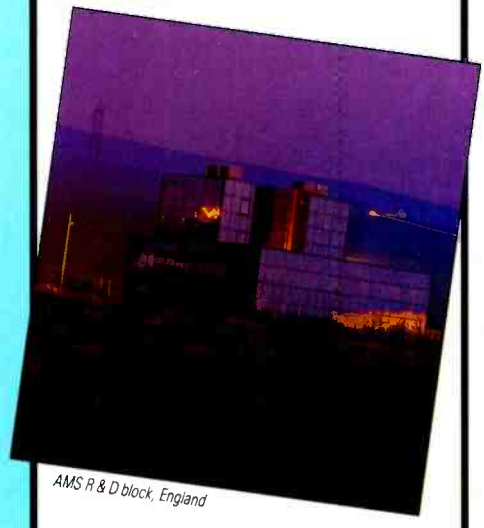
Whilst certain systems offer cumbersome or expensive back-up, AMS AudioFile continues to successfully use inexpensive digital audio tape recorders.

## 7. LOGIC 1

Over four years of R & D now means any AMS AudioFile user will have the choice of working with a stand alone AudioFile, or adding a totally dynamically automated digital mixing console – Logic 1 – to his system.

## 8. DIGITAL AUDIO NETWORKING

Whilst other audio disc manufacturers are working hard to try and incorporate as many features in their systems as AMS AudioFile



AMS R & D block, England

– AMS are introducing networking.

Quite simply, several AudioFiles in edit, dub or track-lay suites can talk to each other as well as to Logic 1's integral AudioFiles in mix suites.

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A new product from AMS. Edit 1 is a digital audio mixer which can work with analogue or digital audio from VTR's, as well as AMS AudioFile.

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**Demo systems available in the USA:** New York, Chicago, Los Angeles, Miami, Atlanta, Seattle – for details contact AMS Industries Inc, Seattle.

The Queen's Award for Export Achievement to Edendeck Ltd 1984/85 and AMS Industries plc 1986. In July 1985 Edendeck Ltd became AMS Industries plc

# NEWS

## Turnkey Shop open for business

The Turnkey Shop has officially opened at new premises in Charing Cross Road, London. It is located in the centre of London's musical mile, round the corner from 'Tin Pan Alley'.

The Turnkey Shop offers Fostex, Tascam, Soundcraft and Seck audio products, a varied choice of loudspeakers, studio monitors, effects equipment and sychroniser systems. Demonstration facilities allow buyers to get hands-on experience of the equipment.

Also available are cables, microphones, books, manuals, magazines and other accessories. The shop also has a 'Second User' equipment exchange. New England Digital have their European headquarters downstairs plus full demonstration facilities for all their products.

The Turnkey Shop, 114-116 Charing Cross Road, London WC2H 0DT, UK. Tel: 01-379 6566.

## *In brief*

●**Maynard International** in Berkshire, UK, havé opened a Sony equipped DAT production facility, which will run alongside its existing audio cassette duplication plant. Plant capacity is initially 7,000 units/month with plans to triple that figure by the addition of a winding facility.

●**Sony** have introduced a dedicated professional tape van operating in the London area. The object is to provide dealers and major customers with fast service supply of professional video and audio tape products.

●**Sawmills** recording studio in Cornwall have added a 12 ton yacht to its R'n'R facilities. Visiting bands are offered a number of options including ocean sailing, anchorage off the Cornish coast, river trip taking in a number of public houses or a fishing trip. The boat is fitted with scuba gear and windsurfers.

●**Villa Studio** is a recently-opened recording facility on the East Coast of England. Featuring an Andy Munro studio design there is a 32-channel Soundtracs recording console, Fostex synchroniser for video work and a full complement of keyboards/samplers, computers and outboard effects.

●The US East and West Coast offices of **Associated Production Music** have been consolidated into one expanded West Coast Office at 6255 Sunset Boulevard, Suite 820, Los Angeles, CA 90028.

●**Carlin Recorded Music Library** has recently been set up by Nick Farries, Paul Kinane and Sue Lowe (formerly of Chappell Music) who will release a number of compact discs. The company is situated at 14 New Burlington Street, London W1. Tel: 01-734 3251. Fax: 01-439 2391.

● **Berwick Street Studios** earlier this year changed hands and new owners, producer Rod Gammons and wife Helen, have rebuilt the facility with a Windmill Munro Associates design including the new *Series 2 Jade* monitors. Extensive keyboard and outboard effect equipment has been incorporated to provide keyboard recording without incurring the cost of extra hire.

● B J Auditorium Design have recently been contracted to develop a visitor's centre in Nottingham, UK, dedicated to Robin Hood. The sound system will be totally digital and will be the first 'ride system' in the world to make use of the technology. The work will be completed by May 1989.

● The **New England Digital** *Synclavier* digital audio system has been given a place of honour in West Berlin's Museum for Musical Instruments.

# Contracts

● Japanese distributor for **TimeLine,** Electori, have been awarded contracts to supply *Lynx* post-production systems to LaserDisc Co Ltd (a subsidiary of Pioneer), Azabu Plaza and Toei Kagaku Akasaka Video Center (TOVIC). The first deliveries of the *Lynx* keyboard control units in the US went to the West Coast at Intersound in LA and AME in Burbank, CA.

● **Kinsey Fitzgerald Associates** have been appointed to construct a third studio for the Strongroom. The electronics installation will be carried out by Alan Cundell and Simon Quill of Electronics for Music; interior design by Jamie Reid.

● **Eastlake** have been commissioned to design a new control room for Geral Gouriet, owner of Paradise Studios, which is to become a private facility for the composer's own use. The studio will be for production of film and television music.

● Basement Studios have recently received their third **Trident** mixing console, a series *80C*, supplied by Pro-Britro. They have also supplied **Sonosax** *SX-S* mixing consoles to HTV and Scottish Television as well as *SX-PRs* to Tim White and David Lane. **Westlake** *BBSM-12* monitors have been supplied to Tape Gallery, Square One Studio, Charlotte Street, Amazon and Padded Cell as well as producer Alan Midgely.

● **Studiomaster** took advantage of the Michael Jackson Tour's visit to the UK to demonstrate the *IDPI* to keyboard players Rory Kaplan and Greg Phillinganes who both use Studiomaster series *IIs* (and who are both planning to expand their boards with eight further inputs). Kaplan is also taking delivery of a 32/26/24/2 series *2* for his home studio in California. Other noteworthy Studiomaster contracts have included three *Session Mix* 8/2 consoles supplied by CCT in Dublin for commentaries on the Olympic Games to be submixed for broadcast in Ireland.

● **Total Audio Concepts** have confirmed orders for two *SR9000* live sound super consoles, to be supplied to the People's Republic of China. The consoles have been sold to Guang Dong TV in Canton, the largest broadcasting company in Southern China. The *SR9000s* are both 42/16/2 VCA group versions, and will be used for monitoring and recording.

●Le Studio, Morin Heights, Quebec, Canada, have purchased a **Solid State Logic** *G series* console. It is a 56-channel, *Total Recall* model with eight custom ordered stereo VCA faders. These will be used as automated returns for the rack of eight Focusrite *110* equalisers now in use at Le Studio.

● A **Soundcraft** *200B* console has been installed at ByVideo Inc, Sunnyvale, CA, USA, for video post-production. Tapestry Productions in New York have also installed a *200B* for broadcast production, VPP and master recording/mixdown applications. AC Post Audio Group, located in Agawam, Mass, USA, have purchased a Soundcraft *TS12* automation system to work with their *TS12* console. It will be used for VPP and master recording. A Soundcraft *6000* console, destined for master recording and mixdown work, has been bought by Nickel Recording of Hartford, Connecticut, USA.

● **Harrison Systems Inc** has completed a 19-console order for the Voice of America Studio Renovation Project. The consoles were specially designed by Harrison to VOA's specifications but incorporate features and technology of Harrison's *790* series broadcast console.

● A 48-input version of **Soundtracs'** *ERIC* production console has been bought by Société Francais de Production in Paris, for live production and transmission of one of France's most popular TV shows *Champs Elysées*. The television variety show has its own production facility, which was previously served by OB vehicles. Recent alterations to the premises have allowed a new studio to be built on the site, where the *ERIC* has been installed.

● **Loudspeaker Technology Ltd** of Glos, UK, have recently supplied *SCM200s* with *EC23* crossover to the BBC's Transcription Recording Unit, Boogie Sound Studio in Hamburg, West Germany and the Skylight Suite, Wapping, London. Smaller monitors have also been supplied to James Guthrie, Mike Rutherford of Genesis, the Church studio and Brian Masterson at Windmill Lane, Dublin.

● Virgin-owned Olympic Studios in London have installed a **Mitsubishi Pro Audio** *X-850* digital multitrack recorder. The machine will be shared by the three studios at the Townhouse, the studio at Townhouse Three and the residential facility at The Manor.

● **Neve Electronics** have received an order to re-equip ORF's regional radio centres in Linz, Salzberg, Innsbruck and Dornbirn in Austria. Neve will supply 16 consoles from their new *66 Series*, which is a digitally-controlled analogue system with instant total reset on all switch functions and on input gain controls.

● Titan SC in Belgium have supplied the first **Studio Magnetics** *AR2400* 24-track recorder in Europe to Musiclab Studio in Brussels. The first *Omega* 32-track recorder has been supplied to Ebony Studios in Yorks, UK.

# NEWS

## BPI annual trade figures

The BPI have published UK trade delivery figures for the 12 month period ending June 1988, with a total value of £560m.

The results show a stable annualised rate of growth at approximately 20%. Vinyl singles and LP volumes were slightly down across the year (62m and 53m against the previous 12 monthly figures of 64m and 53.4m) while cassettes showed a small increase of 3% (75.6m against 73.1m). The only significant growth is now coming from compact disc, both singles and albums (now 22.3m against last year's June figure of 12.8m).

The pre-recorded cassette market now appears stable at around 75m units per annum with significantly increased value as average trade prices have gone up 16%. Well paced expansion of the CD market indicates that by the end of 1988 total volume will be between 27 and 28 million units, the current annual rate of uptake being 22.3 million units.

## IAC rush to fit Sky Channel complex

Industrial Acoustics Company have been awarded a £3 million contract to build the internal structures of the new Sky TV studio complex at Osterley, Middlesex, UK. And they only have 79 days in which to do it.

Starting on September 5th, IAC began building 48 of the 52 transmission-related rooms using a modular acoustic prefabricated system of their own design and manufacture. Similar systems are already in use in six UK studios and are widely used in Europe and the USA. Such a system is particularly useful given the need for speed of construction.

The studios stand on the outer edges of Heathrow flight paths. To reach the BBC standard specified, IAC is using high mass panels of thicker than normal steel sheet face, with horizontal stiffening to act as a membrane absorber. An additional 30 mm of mineral wool will be used and the panel roof will be covered with a further 200 mm to correct reverberation in the roof void from exterior noise.

Subject to the successful launch of Ariane 4 and operation of Astra, Sky Channel plans to go live on February 1st, 1989.

## B&K in the search for realism

CBS Masterworks are currently recording Tchaikovsky's *1812 Overture* with the London Symphony Orchestra and the Philharmonia Chorus. In order to achieve authenticity, engineers will be visiting an antique cannon enthusiast in South Bend, IN, USA, where they will use Bruel & Kjaer series *4000* microphones to capture the sound of cannons firing.

After this they will be joining up with the USSR's sole record company, Melodiya, to record authentic Russian bells, which will also be featured on the overture recording.

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# NEWS

## Akai sampler products and reverb

Akai have added several new sampling products to their range following on from the recent launch of the *S-1000*. The *S-950* is the successor to the *S-900* with a similar basic specification but with many updates and new features. The basic memory is 750k and is expandable to 2.25 Mbyte. The sampling rate has been increased to 48 kHz giving an audio bandwidth of 19.2 kHz. The maximum number of samples has been increased to 99 as has the number of keygroups and the maximum number of programs is 198. A load-whilst-playing facility has been added and the *S-950* can load all *S-900* and *S-1000* disks into memory. Double speed MIDI has been used for increasing communication speed for sample dumping or visual editing via computer. The disk drive can be activated via MIDI for program selection. Options include a dual purpose Atari/Supra hard disk interface, a CD and R-DAT interface, and a 48 kHz digital input.

Two new specialised versions of the *S-1000* have also been added. The *S-1000PB* is a playback-only version of the *S-1000* sampler with no provision for recording or editing of samples but has program editing and MIDI functions. Designed to appeal to multiple users. The second is the *S-1000HD*, which is an *S-1000* with a 40 Mbyte hard disk drive included. All *S-1000* options can be used as well as external hard disk interface.

*S-1000* options have also been introduced in the form of the *EXM-005* 2 Mbyte expansion memory board of which three can be added; the *IB-102* hard disk interface for the Atari/Supra; the *IB-103* SCSI hard disk interface and the *IB-104* digital interface. There is also now a sound library available by the disk.

The *AR-900* is a dedicated stereo digital reverb unit that features a custom-made chip with a sampling rate of 46.875 kHz and also includes a dual 7-band EQ and dual 7-band spectrum analyser. There are eight preset modes, 12 factory presets and 79 user programs. An output level indicator is provided and a wireless remote is supplied as standard.

**Akai Electric Co Ltd, Tokyo, Japan.**
**UK:** Akai Professional, Haslemere Heathrow Estate, Silver Jubilee Way, Parkway, Hounslow, Middlesex TW4 6NQ. Tel: 01-897 6388.
**USA:** Akai Professional Products, PO Box 2344, Fort Worth, TX 76113. Tel: (817) 336-5114.

## 360 Systems MIDI patcher

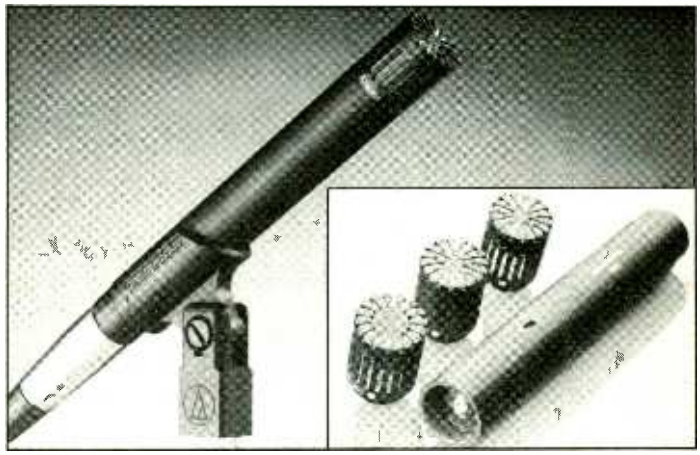
360 Systems have introduced an 8×8 MIDI routing matrix called the *MIDI Patcher*. Designed to allow centralised control of MIDI systems, up to 100 individual routing configurations and patch maps can be programmed by the user for storage in a non-volatile memory. Program changes may be made from a controller keyboard, MIDI footpedal, remote patch transmitter or via front panel controls. All routing and patch assignments are displayed on large LEDs.

**360 Systems, 18740 Oxnard Street, Tarzana, CA 91356, USA. Tel: (818) 342-3127.**


## Audio-Technica modular mics

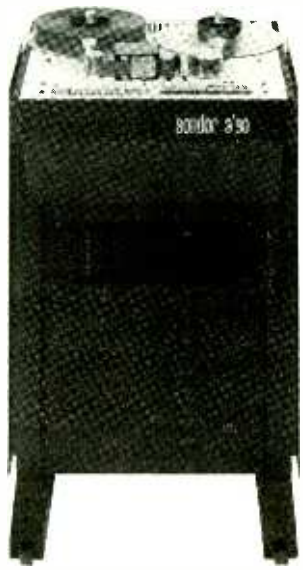
Audio-Technica have introduced a new modular series of microphones, which they describe as having been designed for low self-noise and high output. The design is transformerless and externally polarised 48 V phantom power with a range of three interchangeable capsules. The capsules are the *AT4051* cardioid, the *AT4049* omnidirectional and the *AT4053* hypercardioid. Apparently their responses have been tailored so there is a minimal effect on the sonic character when capsules are changed. General specifications quoted include a frequency response of 20 Hz to 20 kHz; 144 dB SPL (1% THD). An optional capsule output attenuator is available giving up to 159 dB SPL handling. Standard features include an integral 80 Hz highpass filter, foam windscreen and a black low reflective chrome finish.

**UK:** Audilec Distribution Ltd, 6 Hornsby Square, Southfield Ind Park, Laindon West, Essex SS15 6SD. Tel: 0268 419198.
**USA:** Audio-Technica US Inc, 1221 Commerce Drive, Stow, OH 44224. Tel: (216) 686-2600.



## Sondor a'90

The *a'90* is the latest addition to the Sondor range of Perfotone Machines magnetic film recorders. Entirely manufactured in 19 inch modules, the *a'90* is available as a Sondor flatbed console or in 19 inch racks with two units fitting in a single rack. The transport accepts 16 and 35 mm film with automatic changeover of all parameters. There are pre-aligned head assemblies for 16 standards. The *a'90* has direct sync capability up to 30 times normal speed; standard bi-phase signal interlock; master or slave capability and with 1, 2, 3, 4, 6 and 8 tracks standard. Transport uses a pinchroller to ensure best performance and a new torque control system is pulsecode driven and is claimed to guarantee constant tape tension in all modes.




**Sondor Willy Hungerbuhler AG, Gewerbezentrum, CH-8702, Zollikon, Zurich, Switzerland. Tel: (0)1 391.80.90.**

## Software updates

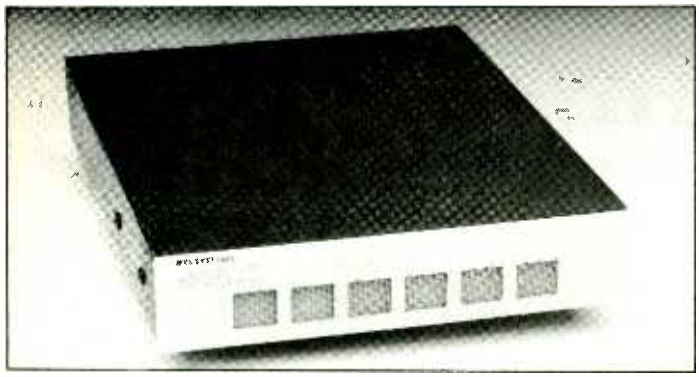
- **E-mu:** *Revision 1.21* for the *EIII* adds new features including digital effects such as digital delay and ping pong modes, a scrub wheel for moving about in sample data, Stack Mode to trigger up to 16 channels from one key, enhancements to the sequencer and MIDI/SMPTE implementation. This upgrade is available free to registered *EIII* owners.
- **New England Digital:** *Release 0* the new *Mac II*-based workstation gives greater frequency resolution and accuracy to the *Synclavier*'s stereo sampling capability; other sampling enhancements include a new zero-line editing display and multiple crossfade times of up to 6.5 s.

# NEWS

## RTS modular loudspeaker

The *MSA325* modular loudspeaker is a full range rackmountable speaker. It is 1U high and one half rack width so it is possible to place a pair in a standard EIA 19 inch space. A pair of mounting ears are provided with each unit. Originally designed to be used with equipment from the RTS range, it can be used in any application where space is tight. The small dimensions are achieved by using a very thin 4×8 inch high compliance transducer mounted at an angle within the wooden enclosure. Maximum power handling capability is 10 W.

**RTS Systems Inc, 1100 West Chestnut Street, Burbank, CA 91506, USA. Tel: (818) 843-7022.**
**UK:** Future Film Developments, 114 Wardour Street, London W1A 3DG. Tel: 01-434 3344.



## NED High Res workstation

New England Digital have recently introduced a high resolution graphics workstation to form a new control unit for the *Synclavier* digital audio system and the *Direct-to-Disk* digital recorder family. Based around a customised Apple *Macintosh II* and a proprietary video graphics card, the workstation can drive up to two high resolution 19 inch colour monitors and features a track ball allowing realtime scrubbing and scanning of digital audio material. The advantages of the new system include superior graphics power and speed of operation. NED is offering owners of the existing Pericom terminal the original purchase price as a trade-in towards the new workstation.

*Direct-to-Disk* users can now record at 100 kHz on all available inputs simultaneously with a new hardware upgrade using oversampling A/D converters designed in partnership with Analogic Corporation. New options are also available for the *Synclavier* and *Direct-to-Disk* note/event sequencer enabling users to make velocity and duration scale changes on any of the sequencer's 200 tracks. For the *Direct-to-Disk* system, cut and paste edits can now be performed from pre-programmed function keys on the terminal and the track ball allows fast location of in/out points. A new hardware option, the GPI board, lets transport and motion be controlled from any appropriate mixing console.

**New England Digital, 49 North Main Street, White River Junction, VT 05001, USA. Tel: (802) 295-5800.**
**UK:** Harman (Audio) UK, 114-116 Charing Cross Road, London WC2H 0DT. Tel: 01-379 6566.

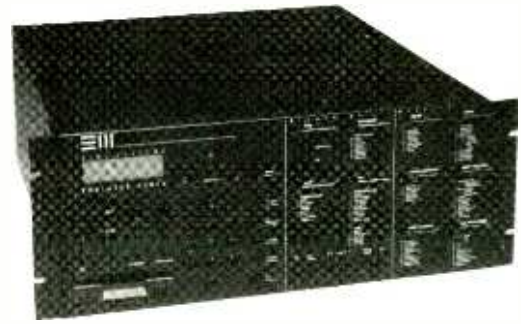
## E-mu expands Emulator III

E-mu Systems have a range of new products for the *Emulator III* Digital Sound Production System. The *EIII Rack* packages all the features of the *EIII* in a standard rackmount format and will be available with 4 or 8 Mbytes of RAM. The *HD300* is a 300 Mbyte rackmountable hard disk storage system for the *EIII* that communicates over an SCSI interface. The *HD300* will load a complete 4 Mbyte bank of 16 bit sound in under 9 s and comes with 10 banks of factory programmed *EIII* sound.

A range of new sounds have also been added for the *EIII* including stereo steel drums, stereo French horns, stereo synth combo, flauto bonita (flute), vintage synths and ambient dance club. Sounds are sold by the 4 Mbyte bank.

Existing *EIII* registered owners will receive the *EIII* Tutorial, an advanced applications guide to the system, with a range of topics including sampling, sequencing, interfacing, preset templates and applications notes. This *Tutorial* will be regularly updated.

**E-mu Systems Inc, 1600 Green Hills Road, Scotts Valley, CA 95066, USA. Tel: (408) 438-1921.**
**UK:** Syco Systems, 20 Conduit Place, London W2. Tel: 01-724 2451.



## Musicomp digital products

Musicomp have announced two new products. A 2-channel sampling rate frequency converter, the *GRC 0202*, is available either for use with the *GTI 0202* to provide input/outputs of all formats or as a standalone unit with specific input/outputs. Conversion is linear interpolation and all 16 bits are handled with internal words of 20 bits.

The second product is the *MIS 3248B*, a digital format converter capable of handling 48 tracks. This is an addition to the existing range. The 24/32 converters are still available and can be upgraded at a later date to 48-track if required.

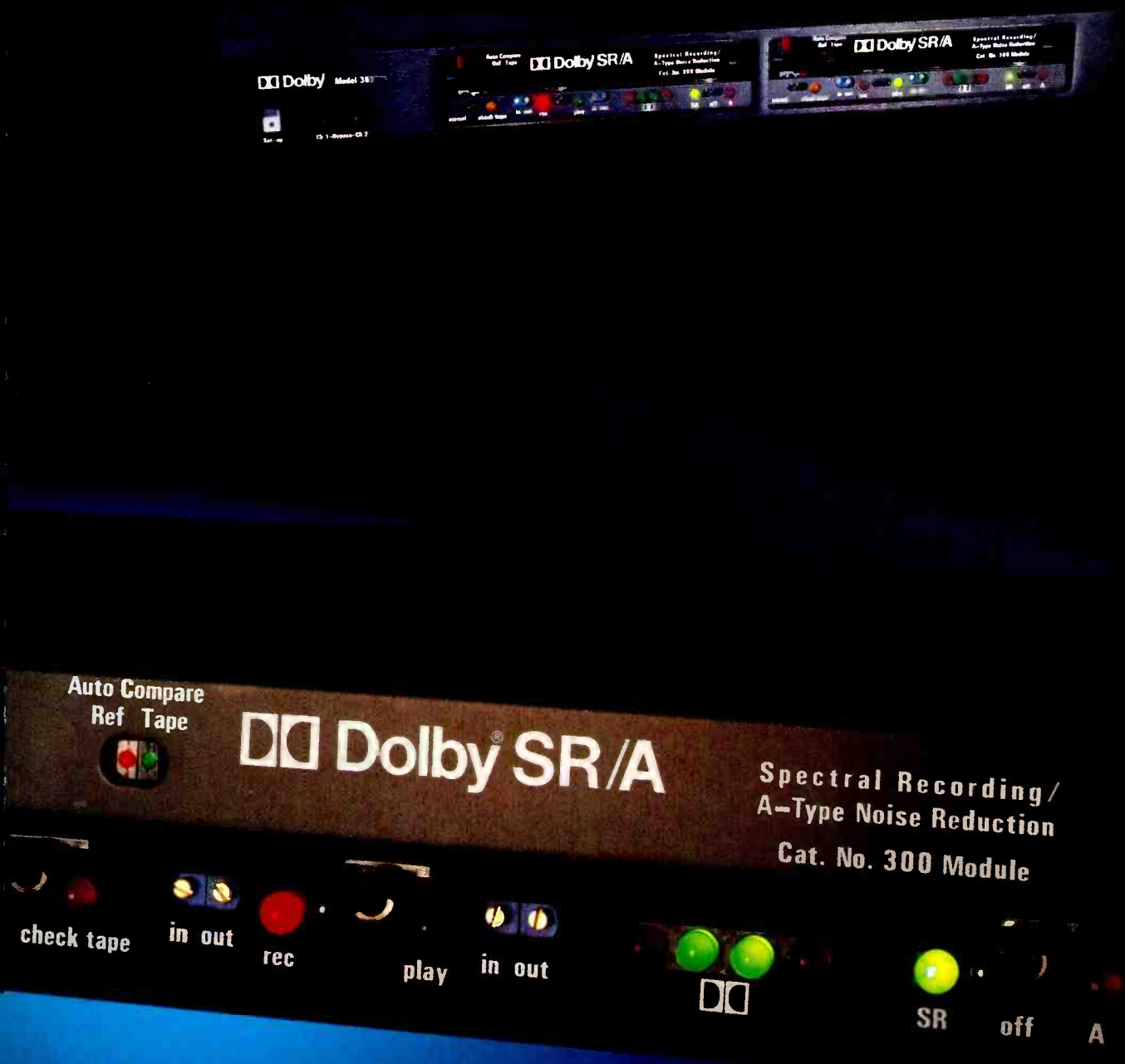
**Musicomp, 3 Petley Road, London W6 9SU, UK. Tel: 01-386 8019.**

## Beyer Tour Group mics

BeyerDynamic have introduced a new series of microphones known as the *Tour Group* series. These mics are designed for live band use and all feature extra strong reinforced steel baskets and are finished in a non-reflective matt black. The series includes some new mics such as the *MCE80TG* and the *MCE81TG* as well as some from the standard Beyer ranges such as the *M88, M380* and *M300*, which are distinguishable from the standard versions due to the *Tour Group* series features.

**Eugen Beyer Elektrotechnische Fabrik GmbH, D-7100 Heilbronn, West Germany. Tel: 071 31 617-0.**
**UK:** BeyerDynamic, Unit 14, Cliffe Industrial Estate, Lewes, Sussex BN8 6JL. Tel: 0273 479411.
**USA:** BeyerDynamic Inc, 5-05 Burns Avenue, Hicksville, NY 11801. Tel: (516) 935-8000.

# Introducing the Model 363.




## Dolby SR Spectral Recording and A-type noise reduction in one switchable, two channel unit.

Dolby Laboratories Inc., 100 Potrero Avenue, San Francisco, CA 94103-4813. Phone 415-558-0200. Telex 34409. Facsimile 415-863-1373. 346 Clapham Road, London SW9 9AP. Phone 01-720-1111. Telex 919109. Facsimile 01-720-4118. 


# DAT. Whoever said it woul

*With portable recorders now available, the DAT format can fulfil its promise as the digital two-track standard for any professional audio application.*

*Europe's leading pro-audio centre now stocks the full range of Sony DAT recording technology. Not only is HHB the leading independent distributor for Sony Broadcast professional audio products, but the company has been officially appointed the first independent pro-audio distributor of Sony's 'consumer' DAT recorders, the DTC 1000ES and the remarkable carry-anywhere device, the TCD-D10. This guarantees full service support and Sony spares back-up.*

*The stunning and compact TCD-D10 is supplied with a full range of accessories including carrying case, power unit, battery, battery charger and stereo microphone. The recorder even offers remote control recording functions. The DTC 1000ES is already an HHB best-seller, providing superb digital quality at a highly competitive*


# d never get off the ground?

*price. For DAT performance with professional facilities, the Sony PCM 2500 carries a full range of digital inputs and outputs, including SDIF 2 and AES/EBU for recording at sampling rates of 44.1kHz as well as 48kHz.*

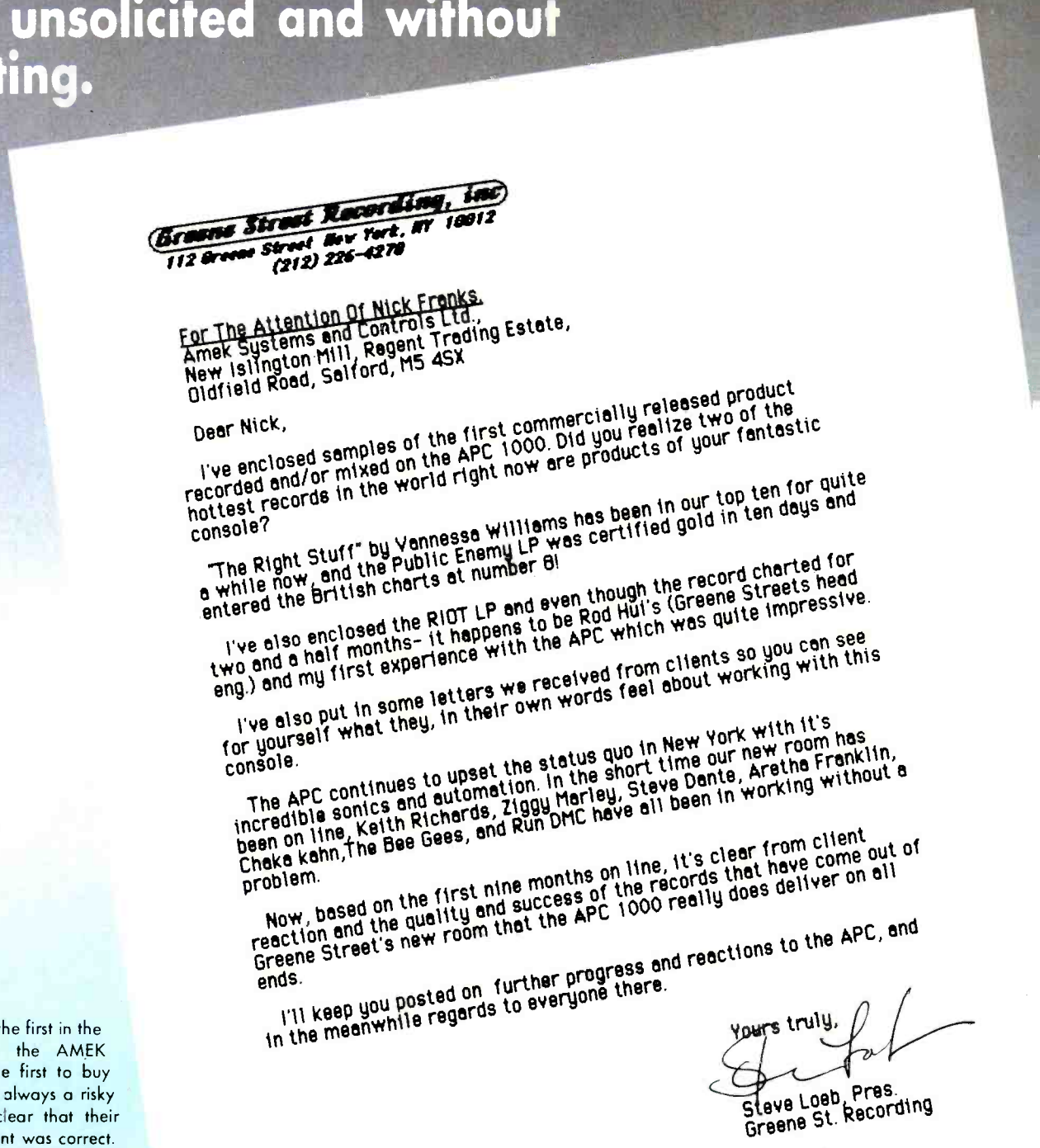

*For fully professional recording on the move, the PCM 2000 heralds a new digital era – at a stroke. Sturdy design and built-in time code facilities are backed by two times oversampling in record and twin A to D and D to A conversion.*


*Put simply, the PCM 2000 sets new standards in digital recording performance. Period.*

*Of course, you don't have to take our word for it. Why not pay a visit to the Scrubs Lane demonstration facility and meet 'The Sony DAT Family' in person. Alternatively, call 01-960 2144 and ask for our new brochure. With the extra benefit of large stocks of DAT tape at new low prices, the HHB DAT experience is something you cannot afford to miss.*

HHB HIRE & SALES, 73-75 SCRUBS LANE LONDON NW10 6QU PHONE 01-960 2144 TELEX 923393 FAX 01-960 1160.

# This letter was recently received by AMEK, unsolicited and without prompting.



Greene Street Recording, Inc
112 Greene Street New York, NY 10012
(212) 226-4270

For The Attention Of Nick Franks.
Amek Systems and Controls Ltd.,
New Islington Mill, Regent Trading Estate,
Oldfield Road, Salford, M5 4SX

Dear Nick,

I've enclosed samples of the first commercially released product recorded and/or mixed on the APC 1000. Did you realize two of the hottest records in the world right now are products of your fantastic console?

"The Right Stuff" by Vannessa Williams has been in our top ten for quite a while now, and the Public Enemy LP was certified gold in ten days and entered the British charts at number 8!

I've also enclosed the RIOT LP and even though the record charted for two and a half months- it happens to be Rod Hui's (Greene Streets head eng.) and my first experience with the APC which was quite impressive.

I've also put in some letters we received from clients so you can see for yourself what they, in their own words feel about working with this console.

The APC continues to upset the status quo in New York with it's incredible sonics and automation. In the short time our new room has been on line, Keith Richards, Ziggy Marley, Steve Dante, Aretha Franklin, Chaka kahn, The Bee Gees, and Run DMC have all been in working without a problem.

Now, based on the first nine months on line, it's clear from client reaction and the quality and success of the records that have come out of Greene Street's new room that the APC 1000 really does deliver on all ends.

I'll keep you posted on further progress and reactions to the APC, and in the meanwhile regards to everyone there.

Yours truly,

Steve Loeb, Pres.
Greene St. Recording

Greene Street were the first in the world to purchase the AMEK APC1000. To be the first to buy "new technology" is always a risky business, but it is clear that their commercial judgement was correct.

The list of APC100C owners is now growing fast as more people become aware of the creative and commercial possibilities from this powerful tool.

Contact us now and find out more about what we can do for you.

AMEK APC 1000

Head Office, Factory and Sales: Amek Systems and Controls Limited, New Islington Mill, Regent Trading Estate. Oldfield Road, Salford M5 4SX, England. Telephone: 061-834 6747. Telex: 668127 AMEK G. Fax: 061-834 0593.

AMEK/TAC US Operations: 10815 Burbank Blvd, North Hollywood, CA 91601. Telephone: 818/508 9788. Fax: 818/508 8619

London Office: AMEK at HHB, 73-75 Scrubs Lane, London NW10 6QU.Telephone: 01-960 2144

# NEWS

## Ampetronic Minimix mixer

Ampetronics *Minimix* is a very compact miniature 6/2 mixer providing six channels each with 2-band EQ, mic and line inputs, input gain control, panpot and rotary fader, together with an aux send and return. Additional mono and headphone outputs are available, and LED level meters are provided. A separate power supply is included and a rackmounting kit is also available. Ampetronic see it as finding use as a sub-mixer, particularly for keyboards and drums.

**Ampetronic Ltd, Nathanael House, 21-23 High Street, Bassingham, Lincoln LN5 9JZ, UK. Tel: 0522 858118. Fax: 0522 858034.**


## Maplin Electronics power amplifier kit

A new addition to the range of electronic kits produced by Maplin Electronics is a 1 kW MOSFET power amplifier. Comprised of four module kits, the complete amplifier incorporates a monitor module providing short circuit protection and is designed to retail at about a quarter of the price of comparable ready-made products.

**Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR, UK. Tel: 0702 554161.**

## VRS data magnetic media eraser

VRS Data Ltd have added to their range of magnetic tape bulk erasers an inexpensive desktop model designed to erase magnetic tape or film on reels up to 16 inches diameter and up to 2 inches wide. It will also deal with most commonly available cassettes, cartridges and floppy disks.

**VRS Data Ltd, Bentley Hall, Blacknest, Alton, Hants GU34 4PU, UK. Tel: 0420 23364. Fax: 0420 23669.**

## Coax connectors

Coax Connectors have introduced a coaxial connector Between Series Adaptor Kit. This consists of sets of male and female mating halves that can be coupled together to form many different combinations from any of the following types: SMA, BNC, TNC, N, UHF and Mini UHF. Additional types such as F, Euro TV, RCA Phono and MUSA can also be added to the kit. The connectors are nickel-plated with PTFE insulations and gold-plated contacts and come in a zipper case complete with two spanners.

**Coax Connectors, 1&3 Sandycombe Centre, Sandycombe Road, Richmond, Surrey TW9 2EP, UK. Tel: 01-948 7047. Fax: 01-948 2125.**

## Pro Co Sound interface boxes

Music Lab has taken on UK distribution of two ranges of audio interface units manufactured by Pro Co Sound of Michigan. The *Monoface* range consists of seven compact interfaces for stage and studio use, including DI boxes for 'standard' and 'audio-visual' use, microphone splitters and a combiner, and headphone splitters. The *Multiface* range comprises multichannel units, including multiple DI boxes, balancing/isolation boxes, microphone splitters and monitor speaker switchers. Neutrik connectors are used throughout and the *Multiface* range is supplied with detachable rackmount ears.

**Pro Co Sound Inc, 135 East Kalamazoo Avenue, Kalamazoo, MI 49007, USA. Tel: (616) 388-9675.**
**UK:** Music Lab Sales, 72-74 Eversholt Street, London NW1 1BY. Tel: 01-388 5392.

## Audico 200-9 cassette tape length verifier

The Audico *200-9* timer/rewinder/exerciser gives a fast readout, in minutes and seconds, of the playing time of a cassette; a C60 is timed in less than 20 seconds. It has two independent cassette transports, or 'stations', which can be used as rapid rewinders, rewinding 400 C60s per hour. The second station also functions as an exerciser, soak testing shells and mechanisms to determine quality.

**Audico Inc, 219 Crossen Avenue, Elk Grove, IL 60007, USA. Tel: (312) 640-0030.**

## Trace Elliot VR 350 amplifier

Trace Elliot have produced a rackmounting power amp version of the recently launched *VA350* valve amplifier head. The main difference in the rack version is that it does not include the solid state *GP11* preamp used in the *VA350*, although a flat response preamp is incorporated and the unit is covered by a three year warranty.

**Trace Elliot, Unit 7, 49 Braintree Road, Witham, Essex CM8 2BZ, UK. Tel: 0376 517237. Fax: 0376 518527.**

## Volt chassis loudspeakers

Volt Loudspeakers have supplied details of a range of drive units covering a wide cross-section of pro-audio requirements including PA systems, keyboard monitors, and bass and guitar cabinets. Of particular interest are those suggested for studio monitors including three bass/midrange units handling continuous power levels from 125 to 250 W. Extremely detailed specifications are provided, including a full set of Thiele-Small parameters for each driver, making it comparatively simple for these units to be incorporated in custom systems.

**Volt Loudspeakers Ltd, Benlow Works, Silverdale Road, Hayes, Middx UB3 3BW, UK. Tel: 01-573 4260.**

# A Good Reason To Call RTS When You're In The Business Of Recording On Tape.


Our Model 927 Programmable Reference Tone Generator adds a new dimension to tape recording quality assurance.

Operating in a *stereo* mode, it is user programmable with discrete tones, pink noise, noise reduction tones, phase check, stereo I.D. and more.

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**PERU**
CARSA PROFESIONAL
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Phone: 321510

**SOUTH AFRICA**
PRO SOUND
Johannesburg
Phone: 337-6556-9

**SWEDEN**
INTERSONICSYSTEM AB
Stockholm
Phone: 744-58-50

**SWITZERLAND**
GOTHAM AG
Regensdorf
Phone: 840-01-44

**RTS SYSTEMS**

# NEWS

## AES educational foundation 1988 winners

Five people have been named as recipients of an educational grant from the Audio Engineering Society. Robert Maher is a PhD student at the University of Illinois in a program of electrical engineering and audio signal processing. Kenneth Blair is studying for a Master's degree in music recording at the University of Surrey, England. Pablo Espinoso is studying for a Master's degree in Physics/Audio Technology at the American University. Robert Rapley is enrolled in the Master of Music degree program in music and sound recording at McGill University, Montreal. Eric Schuyt is enrolled in the Master of Music Engineering program at the University of Miami School of Music.

## Installations

- A **Mitsubishi** *Westar* mixing console has been installed at Evolution Studios, Toronto, Canada, to integrate with their *X-850* 32-channel digital recorder.
- Forge Recording Studios, Valley Forge, PA, have installed **Sony** CD pre-mastering and digital equipment. The studio can now offer a complete recording and CD mastering service.
- New York Audio Productions have completed renovation of their new Manhattan studio with the installation of a 16-input **TAC** *Scorpion* desk. **Drawmer** *DS 201* gates and **Yamaha** *Q2031* equalisers have also been added.
- Magno Sound and Video, New York City, have purchased a **Sony** *MXP-3000* console for advanced audio for video post-production.
- **Miami Sound Studio** have installed a full service MIDI room featuring E-mu *EMAX*, Roland *S-50*, Yamaha *DX-7*, Apple *Macintosh Plus*, Casio and Siel. The room can be directly connected to the 24-track system.
- An **NED** *Synclavier* digital audio system has been incorporated into the production and on-air operations at Gannett's KIIS-FM radio station, Los Angeles, CA.

## Personnel

- Nancy Stevens has become an account executive at **One Pass**, San Francisco, CA. Stevens was previously an independent producer/director and has worked with ABC, MTV, Showtime, USA Cable and KQED.
- Nicholas Edwards and Robert Essert have become associates of **Artec Consultants** of New York because of their long involvement with the company. Artec provide arts development, threatre planning and acoustics consulting services.
- **PMI** (Production Masters Inc) have named Bruce E Reid general manager of their Phoenix, AZ, plant. Before joining PMI Reid was president and general manager of Producers Video Corp, Baltimore, MD.

Chris Loewer becomes a computer editor at PMI's Pittsburgh plant. Loewer was previously a director at WKBW-TV, Buffalo.

- **Spectrum Systems Design**, Portland, OR, have announced two new appointments. Dick Starr becomes a sales rep and Matthew Tonjes a maintenance technician.

## Hollywood Bowl sound system renovated

Just 10 weeks prior to the season opening, Charles M Salter Associates of San Francisco, CA, completed the initial phase renovation of the Hollywood Bowl's new sound system. Principal consultants Elizabeth A Cohen and David R Schwind assembled a design team and provided a 'fast-track' design within four weeks.

Design objectives included: acoustic imaging to allow audiences to form a spatial impression and hear the position of orchestra members; uniform sound for almost 18,000 seats; and greater dynamics, loudness and transparency.

Three discrete microphone channels are linked to left, centre and right loudspeaker arrays. The existing side and distributed speakers were left in place to provide a surround effect to simulate concert hall acoustics.

Early acoustic measurements led to the conclusion that fewer loudspeakers would lead to better sound. The new system eliminates the interference effects of the former system. The system takes advantage of techniques used in the broadcast industry for synthesising stereo TV sound.

Other special design features include a stereo crossfeed, which feeds sound to box seats along the sides via the far speaker channel. To improve bass response, four subwoofers were added to reproduce frequencies down to 30 Hz.

## Village Recorders remodel Studio D

A 60-channel Neve *V* series mixing console with *Necam 96* automation was the centre of a major upgrading of Studio D at Village Recorders, Los Angeles, CA. Tape machines are by Studer and include *A800* 24-track and *ATR-101* ½ and ¼ inch 2-tracks.

The main monitors are Village custom-designed and use JBL and TAD components. These are bi-amped 3-way and powered by McIntosh and BGW *750C* amplifiers.

The studio is used mainly for tracking, overdubs, mixdown, video scoring and sweetening. A variety of acoustic environments is available in the large main room and there are two isolation booths.

ABC's fall promotion campaign was the first session to take place in the new studio followed by guitarist Stanley Jordan and Dream So Real.

## NAB produce test CD

As a follow-up to their test record, the NAB are now offering a test CD. This will contain many of the more common test signals for measurement of frequency response, harmonic and IM distortion, as well as many specialised broadcast test signals.

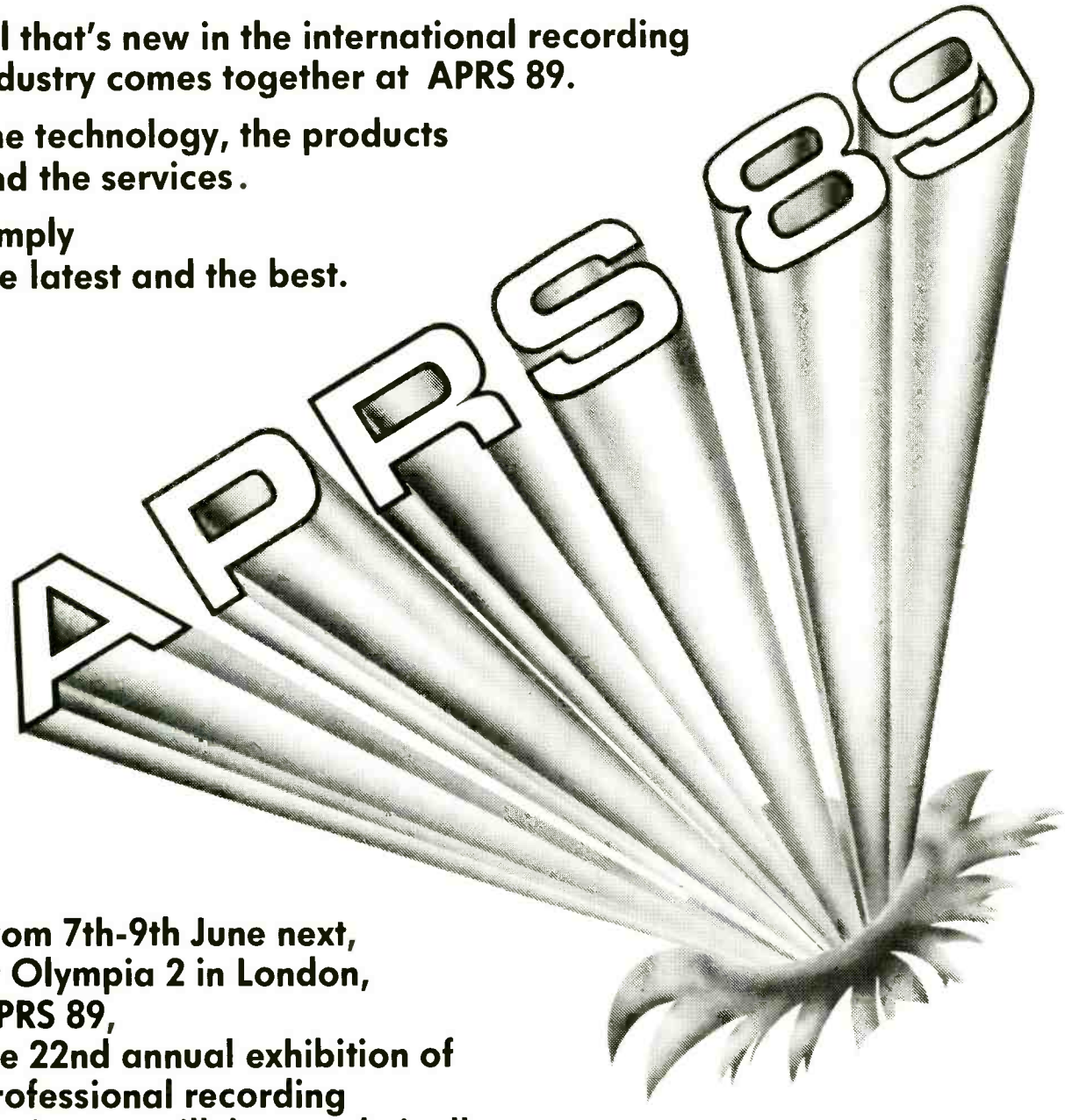
For further information contact Stanley Salek, tel (202) 429-5391.

# *BE THERE!*

**All that's new in the international recording industry comes together at APRS 89.**

**The technology, the products and the services.**

**Simply the latest and the best.**




**From 7th-9th June next, at Olympia 2 in London, APRS 89, the 22nd annual exhibition of professional recording equipment will draw technically qualified visitors from around the world.**

**There's no show like it . . . *BE THERE!***

For more information please contact the organisers:
Association of Professional Recording Studios Ltd,
163A High St, Rickmansworth, WD3 1AY,
England. Tel: (0923) 772907 Fax: (0923) 773079.

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the professional recording association

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# Our greatest hits

There's only one way to build a great reputation. And that's to do it consistently, hit after hit.

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Ampex Magnetic Tape Division, Acre Road, Reading, Berkshire RG2 0QR England (0734) 875200

# Unbelievable!


Sony has created what many thought was pure fantasy ... 48 channels of digital audio on half-inch tape. The use of the latest VLSI developments and the most advanced head technologies have not only made this possible, they have provided a host of features that are out of this world.

There's only one company that could have gone so far – so fast!

SONY

## The PCM-3348, a generation ahead.

**Sony Broadcast Ltd.**
Belgrave House, Basing View, Basingstoke, Hampshire RG21 2LA, United Kingdom
Telephone (0256) 55 0 11, International +44 256 55 0 11, Telex 85 84 24, Fax G2/G3 (0256) 47 45 85

# G

## FILE

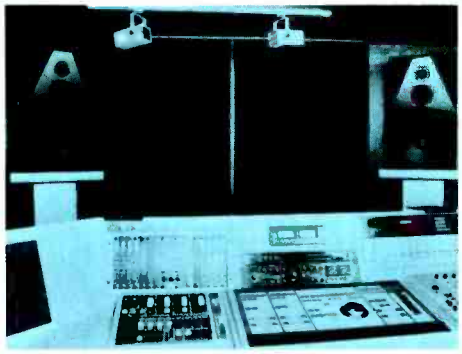
## DATABASE

## GENELEC

### SYSTEM: 1024B

Large triamp active monitor. 115db SPL per pair, 32Hz to 20KHz response. Completely integrated system for precise monitoring in medium sized control rooms.

### STATEMENT: TAPE ONE



We first heard these speakers at Masterworks in New York and we really had to try them out. Scenic Sounds put them in, the engineers loved them so thirty-six hours later, we bought them.

### SYSTEM: S30

Compact tri-amp active monitor. 105db SPL per pair, 43Hz to 20Kz response. Fully integrated and protected. Standard and Nearfield versions available for small control rooms, mobiles and console mounted applications.

### STATEMENT: BATTERY STUDIOS

For our new CD editing suite we needed detail without fatigue. The GENELECS did this so well that we bought an additional pair for our transfer room.

### DISTRIBUTION

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Unit 2 10 William Road
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Tel 01-387 1262

# ROYAL BRITAIN BY IMAGINATION

## *Tim Frost looks at this audio-visual journey through Britain's Royal history*

On the press day, Kings, Queens and Princes crowded the bar and the photographers worked hard for their pictures. The Royal Britain 'exhibition' in London's Barbican opened with a flourish of PR activity. A large slice of theatreland's personalities, pressed into service as royals of the past 1,200 years, posed for the paparazi.

Behind the scenes not an inch of tape was in sight. The original soundtrack, recorded at one of the country's least famous 24-track SSL studios, was being continuously accessed from over two dozen CD and videodisc players.

This new extravaganza has transformed a redundant site at the Barbican into a walk through history of the British monarchy. It is the latest of the permanent audio-visual experiences to be installed in the UK tourist scene.

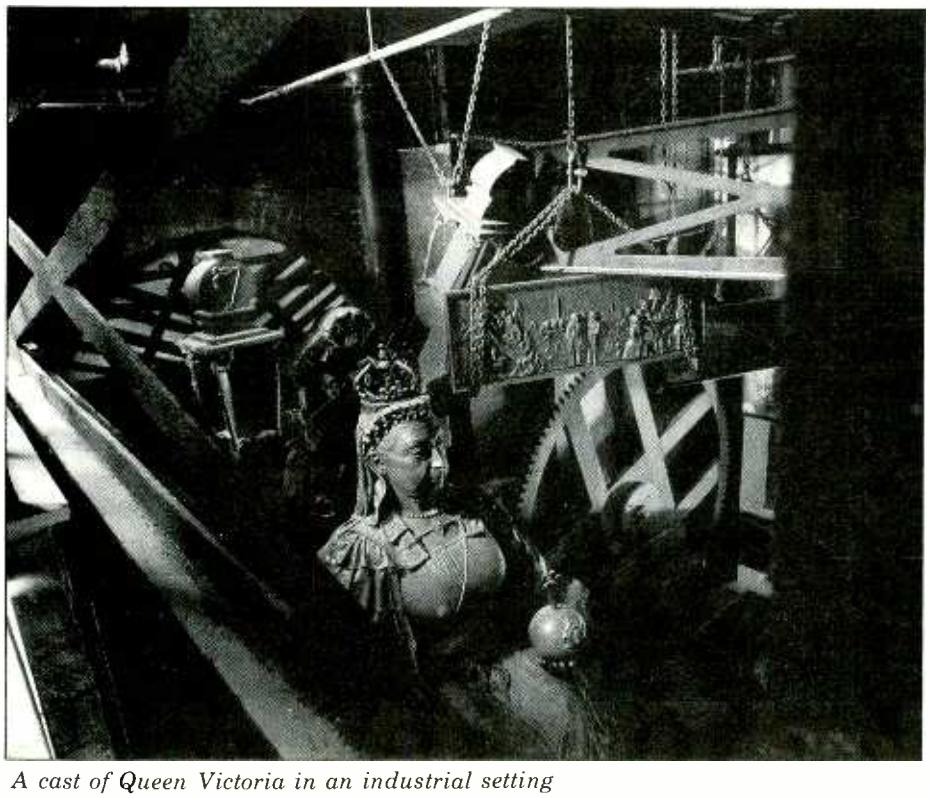
The whole of the show was put together by Imagination, a prospering London organisation that normally produces large scale corporate presentations for the likes of Ford and Lloyds. Creating major product launches with budgets that would make a West End producer weep, Imagination have set up a sophisticated in-house facility to meet most of their own audio production needs. Deep within their central London offices is one of the few 24-track SSL/Dolby *SR* studios that turn away A&R men. The studio is busy enough recording and mixing the original soundtracks that feature largely in Imagination's productions. To Julian Scott, head of audio, the in-house facility allows an integrated approach to the sound production. Scott can get involved at each stage of the project, from original concept to final presentation.

Royal Britain is Imagination's first move into the permanent exhibition market and it generated a certain amount of back-to-basics thinking.

The show is designed as a walk through corridor with 25 A/V zones each depicting a Royal era from the pre-Christian tribes to the current Royal Family. Each zone has a soundtrack and associated visuals that last between 30 seconds and a couple of minutes.

There is no technical tradition for this sort of show. Multitrack recorders, cassette and cartridge machines, videodisc or solid state systems have all been employed in this kind of spectacle. For Imagination's large scale corporate presentations, Julian uses multitrack tape, balancing the show live. For the one- or two-day presentations, with all the material unfolding in a long sequence, tape is ideal.

In the permanent presentation, with a multitude of sections doing different things at different times, tape is really unsuitable. Running short sections 10 hours a day, seven days a week, stretches tape to its limits (sorry). The tape wears, the head wears and the constant shuttling puts a major strain on the best of transports. And, of course, this is an industry of maximum use and minimum servicing. Head cleaning at irregular intervals is rated as sophisticated support.



*A cast of Queen Victoria in an industrial setting*

Cost effective alternatives to tape are available to the A/V market. Both videodisc and solid state systems are well established. Videodisc is often used for high quality, repetitive video playback and in interactive video, where the disc player is used with a dedicated computer or PC.

Companies like Philips and Microvitec are well established in short run disc production and costs are relatively low. The initial plan was to use videodisc throughout as a 4-track playback system. Sound would be recorded normally on the disc's audio channels and also PCM-encoded on the video sector. The videodisc player is simply treated as an alternative to a *1630* or *F1*.

This technique has not been tried before and the test disc turned out to be a complete failure. The FM audio was fine but the digital was corrupted by data overwritten by the videodisc's control system.

Scott recalled his disappointment, "We could have looked for ways round the problem but time was pressing and there were no guarantees of a solution. We looked at the other technologies available. We had contracted Electrosonic to supply the control hardware and computer software to drive the show. They had already developed a solid state system, which is running in venues like Beaulieu."

Solid state storage is not uncommon in the A/V and presentation business. For short messages this technology offers software control, with no wear and relatively low cost. These systems have been developed primarily for messages either in public areas or for phone use where the 6k bandwidth and moderate noise floor is perfectly adequate.

The minimum specification for this show was to be 15 kHz bandwidth and a −60 dB noise floor. Electrosonic, who are one of the largest A/V hardware and software manufacturers, responded by developing an upgraded version of their *Soundstore* system, taking the bandwidth to 12 kHz. But in listening tests, the engineering and production team were still concerned that the performance was not up to the standard required.

Scott had already thought about CD for non-sync background music and effects use. It wasn't considered for the program system because of the high perceived software costs and limited range of controllable players.

"We hadn't looked into the idea of using CD as the main system because we thought the disc prices were geared up to large production runs. It turned out that the short-run costs were nowhere near as high as we imagined."

With CD production capacity now exceeding demand it is possible to get cost effective short-runs within a tight timeframe. Approaching Disctronic, Scott was able to get a fast turnround deal on a package of 50 discs for well under £1,000.

The hardware problem resolved itself with the release of the new Studer CD player. Apart from being very solidly built, the *B226* has an RS232 interface, which largely matches the videodisc interface. Electrosonic were easily able to modify their *5003* interface to drive it. The only major difference, in practice, being the very slow data transfer rate of the Studer interface.

In parallel to developing the hardware side, the Imagination team were putting together the soundtrack for the 25 zones. As with the majority of Imagination's production, the music is a commissioned score. Film and TV composer, Mark

# ROYAL BRITAIN BY IMAGINATION

Emney has worked with Scott on several other projects. He was brought in to compose and arrange the music for all the zones.

Opting for musical styles contemporary to the period of each zone, the instrumentation list reads like an early instrument catalogue. Hurdy gurdys, viols and sackbutts sat side-by-side with more conventional orchestral instrumentation.

Most of the studio recording was done in the Imagination suite, with only the string sections being recorded outside, at CTS. The main studio is one of three facilities within the Imagination offices. A 'radio' studio and voiceover room are both kept fairly busy with the type of productions that are Imagination's bread and butter.

The most unusual feature of this Eastlake studio is the absence of commercial customers. Imagination's studio listing is restricted to the SSL user list. They are not APRS members and don't promote themselves as a commercial facility.

"The SSL user list generated a lot of enquiries from A&R men asking what studio time deals we were offering. Being in central London with 24-track/*SR* we are a well-equipped, attractive facility but it is important to us to keep the studio free for our own projects. As we develop a presentation, the work has to continue at our own pace, which means using the studio at times that suit us, and it is not unusual to get last minute changes to a large production.

"Recently we had a client with a major corporate show scheduled for the Sunday. They came up with some major changes on the Friday night. It would be nearly impossible to book musicians and a good studio at that sort of notice."

In fact, the studio is commercially viable. It is treated as a separate cost centre within Imagination. Booking its time internally to the end customer, it shows a working profit at the end of the year.

The *SL 6000 E* was chosen because of its facilities and ease of use. Scott reckoned that the automation would have been rarely employed to its full advantage so didn't justify the cost.

Dolby *SR* was a logical addition to the hardware as it allowed a reliable and consistent improvement to the audio quality.

"We first used *SR* over two years ago for a car launch. I went on to install one of the earliest 24-track units to improve the multitrack performance. Now that Molinare, Complete Video and a lot of other video production houses have *SR*, life is becoming easier for transferring tapes.

"I do use a lot of PCM for stereo work. For high quality 4-track work we've locked PCM/Beta players together by recording timecode on the linear tracks. But, at the moment, I'm not even thinking about multitrack digital equipment."

The Royal Britain studio work was recorded on the *MTR90* using a straight wire approach. Minimal EQ and no compression or limiting.

There was a fair amount of location recording involved for musical sequences and background atmospheres. The plainsong section, performed at Worcester Cathedral, and the open air brass band arrangements for the Victoria zone, were recorded on a mix of Nagra/*SR* and PCM equipment. Scott uses a Seck desk, which, with carefully set levels, works well for location recordings.

All the sections including the voiceovers were collated into a single Dolby *SR* master. This is not a traditional final stereo mix. In some zones two CDs run simultaneously with commentary overlaying the background music. For these zones the music and commentary are placed as separate sequences.

The balance takes into account the rather difficult replay circumstances, which can wreak havoc with a good studio mix. The relative levels of music, effects and commentary can change radically bringing some elements forward and making others almost inaudible. The Rogers *LS3/5As* have been installed in the Barbican venue as the primary speakers and so the master tape was also monitored on these, to reduce the problems of a deviating playback.

The budget has allowed for a total of four discs. The first was the trial disc to check the viability of the system. The next two are the A and B master discs currently in use on the show.

The final disc will be cut later. It will contain any remixes that are thought necessary after the show has been running for a while. Scott is monitoring the replay in the exhibition under a wide range of conditions, keeping a wary ear out for comments from the customers.

Tape One were given the job of transferring the tape to a *1630* CD master. Scott went to Tape One because of their all-digital facility.

*Sound producer and engineer Julian Scott and composer Mark Emney at Imagination's main studio*

"From the stereo mix onwards, I wanted to stay digital and keep the quality as high as possible.

"The *AudioFile* has the capability of working the soundtracks into an exact time slot. So all the looping of background music and effects could be done within the *AudioFile* without an additional generation copy."

*The City of Sheffield Youth Brass Band during a location recording*

One of the most complex features of this kind of show is the integration of all the visual cues, effects and audio cues. The *AudioFile*'s ability to get a track to fill a time slot down to a fraction of a second is a major benefit to the A/V producer.

The two discs carry the sound segments for all the zones. Each of the Studers access just the track that relates to its own zone. Using the Electrosonic software, each of the PC *XT* computers control three to four zones. The RS232 feeds goes to the interfaces of all the outboard equipment—slide projectors, motors, lighting, film and the CDs. The timings for each cue are read from the computer's internal clock, which keeps everything together. The *B226*s are given instructions from the program to search for the relevant track start time and pause until required. The end of the track is calculated from the computer's clock rather than trying to read from disc. With the slow baud rate, by the time all the data had gone back and forth the track would have seriously overrun.

While there is no requirement for close synchronisation between the zones, the playtime accuracy of compact disc is good enough to track sound effects to visual cues. The continuous background sounds for some zones are also derived from disc. A gentle fade in/fade out disguises the short break as the disc resets.

The only sound not coming off disc of some sort, is in the Living Image talking head of Elizabeth I. Using 16 mm film projected on to a dummy head and the sound, noticeably, comes off film. Ironically, if the system is poor to start with, there are very few ways of fixing it up. Effective noise reduction systems rely on a fairly good basic performance level as a starting point.

There are three videodisc players integrated into the system, used more conventionally than originally planned. Of the two video zones, one, the Family Firm is silent. Not to waste any spare capacity, the audio outputs are fed off two other areas including the heavily musical Finale zone. The video disc for this was cut from a pair of U-matic masters, one for the video and the other being the audio, PCM encoded. Again, this is something new. There is not much demand for digital soundtracks in training videos.

At the launch some noise had crept into this sequence. There are various theories why, most of them centring on human rather than equipment error. Philips are recutting the disc, which will most likely cure the problem.

Certainly the whole project works and works well. Whether or not the customer appreciates all this technology and effort, it's the overall production values that make it satisfying.□

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# DESIGN: THE PINK MUSEUM

*The conversion of this former motor museum was not straightforward, but the result was a rather unusual studio. Report by Janet Angus*

There are many surprising facts in life: that New York is nearer to London than Los Angeles; that glass is made from sand; and that until early this year there was not a 24-track studio within the centre of one of the most important cities in the world for popular music.

The Pink Museum is an unusual name for an unusual facility. On entering the studio you are confronted by wrought ironwork and ornate carpentry that gives the place the ambience of a Buddhist temple in China. The delicate perfume emanating from the jasmine and other exotic flower beds only adds to the illusion. But it's not the East at all, Near or Far. If anything it is north: Liverpool.

The studio's owner, Hambi Haralambous previously owned a small 4- and later 16-track recording set-up called the Pink Studio, which he started with his advance when he signed to Virgin as Hambi and the Dance, back in 1981. As he says, this arrangement worked well because "the album didn't really take off but I've still got a studio".

In an area where there isn't exactly an abundance of recording facilities, even the Pink Studio was thriving with many famous-name bands using it for demo and B-side work. Haralambous wanted to offer them facilities that would make them stay. Well, not only has he got his dream studio but he has also got his customers; the first few months saw the arrival of the Christians, Liverpool Football Club, Aswad, China Crisis, Echo and the Bunnymen... the list goes on.

Quite apart from anything else the location is perfect. Liverpool is still the birthplace of many artists and bands but these days, rather than head for London, they stay Liverpool-based and many live very near to the studio. Even when not working they will often drop in for coffee or you may bump into them outside the studio in Lark Lane. This is the 'Covent Garden' of Liverpool. The Lane is packed with restaurants of every conceivable cuisine as well as record and music shops, wine bars and pubs. It has its advantages for young bands from outside the area too because they will soon get into the local scene just by socialising in the Lane when not recording.

So much for the sociological reasons for working at Pink Museum. What about the musical and technical ones? Haralambous had a longstanding association with designer Phil Newell whose varied past includes a period as a director of Virgin's holding company, which is where the two first met. When Haralambous decided on the new facility he sought Newell's advice.

Two sites were considered: a Victorian fire station with stables for the horses and a lot of character, and a motor museum. Not only was the Lark Lane Motor Museum packed with vintage cars, it also featured yards of ornate wrought ironwork and for Haralambous and Newell it was love at first sight. In fact, so impatient were they that they were crawling around under the cars with tape measures and strips of masking tape working out the layout, long before the museum's owners had a chance to clear out.

Newell is something of an idealist; aesthetics being of primary concern: "I'm a designer not a business man." He is not too artistic to be aware of budgets, however, but on this occasion it was Haralambous whose heart ruled his head and took him down potentially hazardous avenues, causing a few financiers to frown with concern. There is no denying that the end result has been worth every penny but the gamble caused a certain amount of friction.

The budget was initially very carefully worked out and structured. It was decided that the building had so much character it would be a waste to simply fill it from wall to wall with isolated recording rooms. "The building asked for space somehow," explains Newell. "It seemed criminal to tear down the wrought ironwork. What's best? Something unique or just another studio?"

The 3,000 ft$^2$ building had a balcony running along one side and one end wall, with a wrought iron balustrade. It was unanimously agreed that this should remain. It provides a relaxation and kitchen area away from the pressure of the studio. The roof has glass panels running the length of the building and consequently the interior is virtually like a greenhouse. Hence the abundance of indoor gardens that lend a very special atmosphere.

Sitting in the balcony looking down at where the studio would be they agreed that it should be an interesting view—not just a big box-like construction. Just quite how interesting it would turn out to be, Newell did not realise. After all, they did not have unlimited resources, however, he made the mistake of leaving the project for a few days to do a site visit in Spain. During his absence Haralambous' imagination ran riot.

"The architecture in Liverpool is really very interesting. A lot of the houses round here were built around the 1870s to 1900 and when we were doing the rooms I started looking at all the roofs in Liverpool and found a fantastic new world I had never noticed before—all sorts of turrets and embellishments."

Before anyone could stop him he had organised the site carpenters to construct an atrium over the main studio area and a pagoda-style roof over the vocal booth and Newell arrived back to a *fait accompli*.

"I knew how expensive it was going to be to do those rooms," remembers Newell, "and I don't think Hambi realised the complexity of doing roofs like that. When I came back he had put up the structure and had used half the materials allocated for other things and a lot of carpentry time. So I had to wash my hands of the budget at that point! Those roofs were an epic—it couldn't possibly be done within the original budget but Hambi decided he would find the money somehow. So I dropped into a consultancy role, which in fact allowed me more flexibility. I would keep designing as long as he kept turning up with the money to do it."

Another bone of contention was the vast quantity of sunlight Haralambous hankered after.

"I had eight panes of glass in appropriate places in the original design. Any studio design has to be a compromise between sound isolation, internal reflections and the amount of daylight you can have. Hambi was so locked into sunlight, with mirror-lined tunnels to direct it into places it wouldn't normally go, that in the end there were 43 panes of glass and it was like a pin cushion. It was a difficult job."

They weren't in disagreement all the time: "I'm not dictatorial, although I know Hambi thinks I

am. I spent 1971 to 1981 travelling with mobiles. And I had to come back with good recordings from wildly different acoustic conditions. You learn the hard way what works and what doesn't. A studio is a very personal thing. The owner's likes and dislikes are not necessarily mine. It has to be a studio they like, which is right for them. My biggest task is to advise what new ideas could be included and point out the pitfalls when something quite definitely is not going to work."

For his part Haralambous concedes a certain stubbornness but without remorse: "I used to stand here in the evenings when they had gone and try to take it in. Yes I was a pain in the arse to them I know but I'm glad I was because I got what I wanted. All the guys had a good

understanding of what Phil was after; they were very sympathetic to the whole project. That's how I got them to do the roofs while Phil was away!"

What Haralambous wanted was a completely different interior design. When one of the builders outlined bricks and tongued and grooved timber on the control room walls the result was an almighty row. "I couldn't stand that. Then they wanted to shove up some odd bits of granite on the wall so I spent a week designing a granite motif on the wall." This motif was to be carried throughout the building. Implemented on doors and furniture, crafted personally by Haralambous from pieces of coloured linoleum.

"They all laughed at me and said it would look stupid but it doesn't."

Another pet hate of Haralambous' was the traditional method of hanging wall fabric by stapling and fixing it to wooden battens. "You end up with bits of wood all over the place. We used strips of fabric to hide the seams instead of bits of wood."

The wood had to be different too: "Usually everybody uses bits of wood with knots in it. I didn't want it to be like that at all. All the wood that showed had to be hardwood and I wanted a light wood that wasn't yellow or brown."

Wooden wall and ceiling cladding is machined obishi, which has been left in its natural state—no

stain or varnish required. The flooring under the desk and in the separate machine room is maple. Wooden door surrounds are rag-rolled pine and silver birch as are the monitor speaker surrounds, the effects racks, the trims on the mixing console and the nearfield speaker stands on the desk. Everywhere there are wooden mouldings that subtly add to the overall ornate design.

The main studio area lies beneath the atrium ceiling and features more corner mouldings as well as sunshine in the morning and late afternoon. The floor is blue/grey carpet and the ceiling is dressed in pleated oyster pink fabric. Lighting is by oyster shell wall-mounted lamps. A door in the corner reveals a microphones store and amp room.

The drum room is through sliding glass doors and features a maple floor and Portuguese granite walls. Newell already has something of a reputation in drum room design with the Virgin-owned studios. The Spanish project was completed shortly before Pink Museum had been put together with a new type of local granite. Newell: "The drum room in Spain achieved a totally unique evenness of reflections, especially in the top end. Before I had used sandstone and yorkstone but this granite was very unusual. The room was incredibly successful and I took a chance on the Pink Museum to see if we could reproduce the same characteristics. There are no resonances in the room; it gives a very even reverberation."

Once again Haralambous decided to be stubborn about having a window. He wanted the drummer to be able to see the stained glass window in the front outside wall while he was playing. Newell resisted. Finally, the night before they began work on the granite he said: "If you can get hold of a porthole by tomorrow morning I suppose you can have one."

"So I did," says Haralambous. He also persuaded the builders to use a little artistic flair in mounting the granite rather than simply sticking it up ad hoc.

The vocal booth is in what was originally planned as a 'bandstand' design and ended up more like a Chinese pagoda. Once again the ceiling inside is dressed in pleated fabric and the lower walls Swedish beech with pine detail and mouldings. Upper walls are rag-rolled plaster. The artist can choose whether to see and be seen from the control room by selecting his position. Drums have been recorded in this section of the studio as it opens up into the drum room and quite a good sound is achieved by simply using the granite room for ambience.

The leftover granite was used to construct the flower beds which run down the side of the studio rooms.

Haralambous was no less dogmatic when it came to selecting equipment. "I knew I wanted a big desk and knew it should be a Neve. I was put in touch with a Peter Duncan who was selling off some original Neve consoles and I rang him up and said I would buy this console." He didn't even see it.

'This' is a 36-channel console custom built for EMI in Holland where it had undergone a considerable series of modifications. "And there was no manual. We didn't know where any of the routing went or anything. We managed to get hold of an ex-maintenance man, Peter Bol, who was good enough to come over here for a week. Without him it would have taken us a month to sort everything out!"


Why was Neve the right choice? Haralambous wanted a desk known for its quality of audio and EQ. "This studio has been designed for people to come for a couple of months and then, if they want to, they can go into a studio, which costs them £1,500 a day to mix; or if they want to stay here they can do that too. You can mix on a Neve console you know."

Newell's equipment recommendations included MCI tape recorders, particularly as Pink Museum is keen to attract American work.

"Phil told us that MCI and Neve is a good combination. I have never understood how people buy everything they want, and new. They obviously have to charge a fortune to recoup it. We will build up our equipment list as we go along. I felt that getting the control room right was very important. It is much more important to get the environment and control room acoustics right. Anything else can be changed—tape

# DESIGN: THE PINK MUSEUM

machines can be upgraded and you can gradually increase your rates as you develop your reputation. You shouldn't let the equipment take priority over the rooms and I think a lot of studios do; they become to preoccupied with the equipment."

Pink Museum has an MCI *JH24* 24-track and Ampex *AG440C* stereo tape machine, Reflexion Arts *OTO234* monitors, and outboard equipment including tc electronics sampler/delay, Lexicon *PCM70*, Eventide *Harmonizer*, two Yamaha *SPX90*s, Ursa Major *Space Station*, AKG reverb, Bel *BF20* flanger, Stage Accompany programmable parametric equalisers, dbx *160* compressor and valve equalisers, two pairs of Drawmer noise gates, one pair of BSS gates and Valley People *DynaMite* processor.

"We trusted Phil to do the acoustics and the monitoring," Haralambous says philosophically. "People are never happy with the monitoring are they? But our clients seem generally very happy with the room." In fact when Aswad were in they asked if they could buy it!

Pink Museum held their grand opening party on March 22nd this year.

"The Christians were booked in first and when they finished it was Liverpool Football Club. And then it went quiet. I couldn't understand it. We didn't find out until the end of May when one of the cleaners wanted the telephone number to call in sick, that British Telecom had made our lines ex-directory. So we sorted that out and then we got the bookings. Things just seemd to pick up after that, as soon as people could get hold of the number."

Of the other studios in the area Haralambous only recognises Amazon as being on a par and feels that its location is sufficiently far away (10 miles) to not be competition at all.

"There is a lot of work in Liverpool for us both. In fact we could probably have another studio. Liverpool has a population of less than 0.5 million and yet there are 1300 bands. There is a great music scene here. The Christians, It's Immaterial, Echo and the Bunnymen, Black—they all live round here. It is the most successful city in the world for throwing up talent, right back to the '60s and the start of The Beatles. A Flock of Seagulls, Dead or Alive, Frankie Goes to Hollywood."

Obviously Pink Museum want to cater for their local market but they also hope to attract a more international clientele. The best way is to make sure you run your studio efficiently.

"Every time somebody comes in and has a good time, that's a future booking. We try to give a special rate to local bands who are not signed if we ever have any time. I've found that always pays off. If you help a band when they have got no money, when they do become successful they will come back.

"I'm beginning to get bored when a band is here for a whole month. I would like another studio—not just for me but to work with young bands and develop them more slowly. Unless record companies invest money in bands when they are younger they are never going to get anything different. They are going to have to think about promoting things in a different way. Nowadays you have to spend £75,000 on a band in advances, studio time, videos—it costs a fortune. I think people will think about getting back to more basic things."

Pink Museum's own record company Pink Pop is already working on some new acts and they are currently negotiating a deal with a major record company to develop some young bands for them.

Although parts of Liverpool are poverty stricken and run down, the area around the Pink Museum was once the home of merchant shipping and has its roots in the late 18th and 19th centuries. Many of the large houses are being renovated and the architecture is quite splendid. At the end of Lark Lane is the huge Sefton Park with its lakes, palm house and gardens as well as an imposing hotel where you can spend a very comfortable night for only £20 including English breakfast. And what's more you can walk to the studio.

Although a city, Liverpool does not give the impression of bustle and noise you cannot help but feel in London. As for studio pressures, because they are able to offer more competitive rates, Haralambous feels a Liverpool facility can only offer advantages. "You don't have to go to London when you can do everything here. I could have moved to London but I would have hated it. There are a lot of musicians in the area who don't want to be away from their families when they are recording; they spend enough time away when they are touring."

Sitting up in his balcony surveying the elaborate studio structure, Haralambous remarks that it looks like a little village. It does: "I like the environment," he says, "it's so peaceful."□

**The Pink Museum, 1 Hesketh Street, Liverpool L17 8XJ, UK. Tel: 051 727 7557/0435.**

# BEFORE: AFTER:

## 12 BIT

| | |
|---|---|
| Resolution: | 12 Bit |
| Noise Level: | -86 dBV |
| Sampling Time: | 11.7 sec. @ 16 kHz Bandwidth |
| Bandwidth: | 80Hz - 16 kHz (-3dB) |
| Linearity: | 20 dB @ 80Hz-16kHz |

## 16 BIT

| | |
|---|---|
| Resolution: | 16 Bit |
| Noise Level: | -101 dBV |
| Sampling Time: | 11.7 sec. @ 18kHz Bandwidth |
| Bandwidth: | 18Hz - 18 kHz (-3dB) |
| Linearity: | 7 dB @ 18Hz-18kHz |

In a studio, 12-bit samplers are often just not good enough. The sampler that was a studio standard when you bought it a few years ago isn't up to what you or your clients demand.

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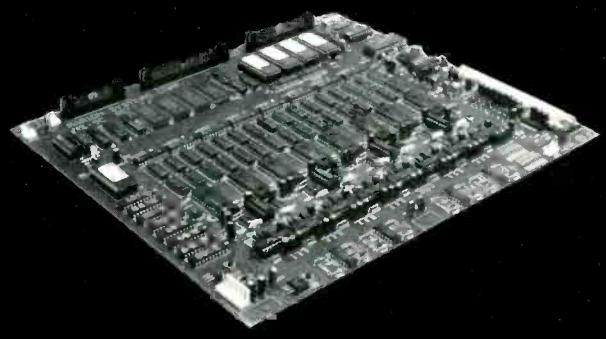

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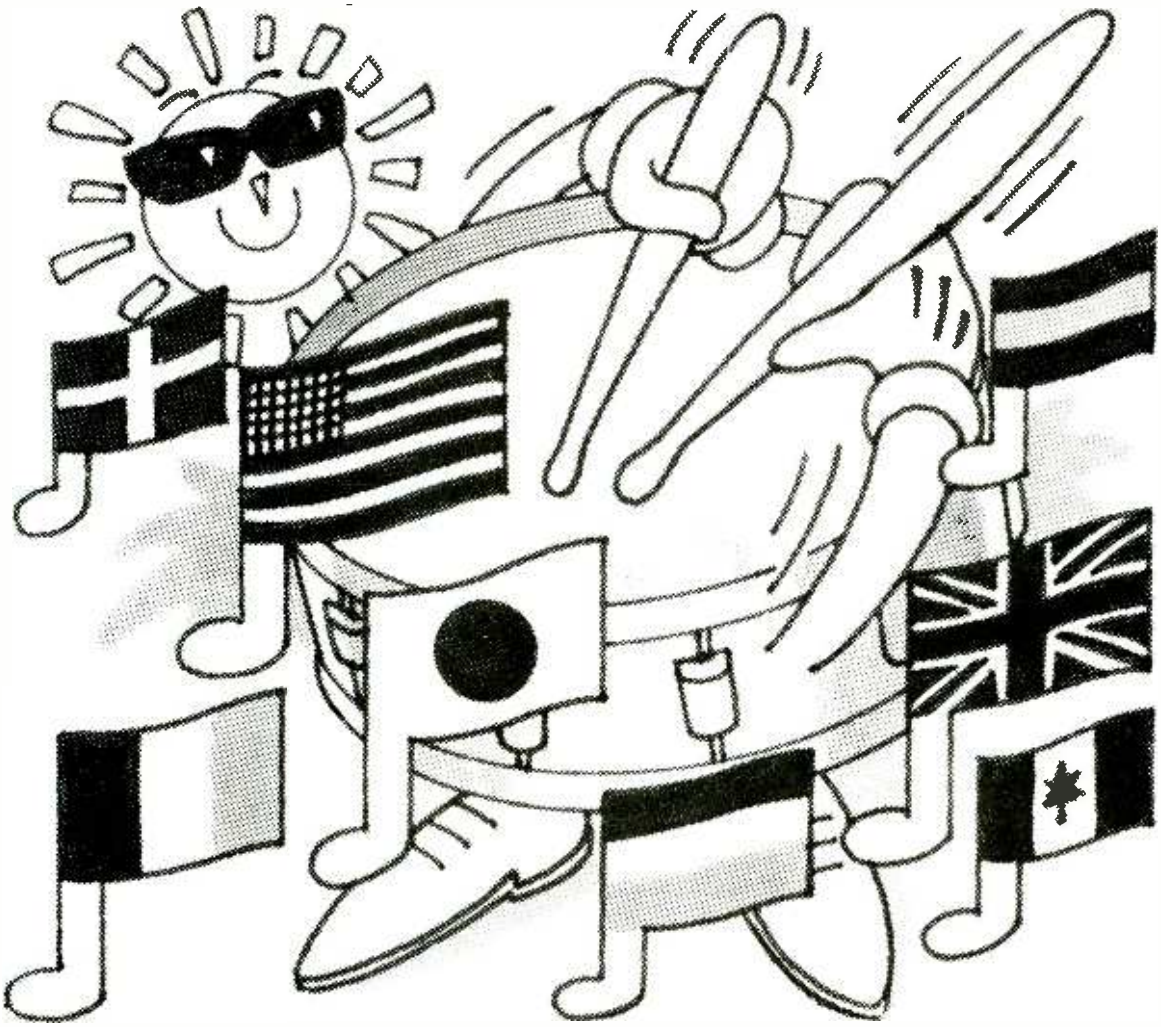

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D

# DESIGN: OLYMPIC

## *A major London facility which has experienced an extensive renovation programme. Report by Janet Angus*

Olympic studios was a legend within the British studio scene—the location of the recording of many of the classic rock albums of the '60s and '70s including such names as The Rolling Stones, Jimi Hendrix, Led Zeppelin and the Eagles. The studio is housed in a former variety theatre in Barnes, south London. During the early days of cinema the theatre was given over to the new medium and later became a film studio before finally metamorphosing into its recording studio manifestation. The main facility housed three studios with a fourth located some few miles across town. Much of the reputation of the studio was due to its large Studio One, which attracted much large orchestral-type recording work and was one of the mainstays of the London film recording scene along with Anvil, CTS and Abbey Road. It therefore came as something as a shock when it was announced that the studio had been bought by the Virgin group. After all, orchestral-type work had not exactly been their forte in the past.

Apart from the fact that Virgin success has been built on the rock music industry, and therefore their interest in such a facility was a surprise, they already owned The Manor and the four Townhouse recording studios. Some would have thought they had quite enough rooms for their needs. Part of the package was the Olympic studio in Chelsea which Virgin closed down and sold off. This left them with the Barnes building which, having bought it at the end of 1986, they operated in its natural state until March the following year. At the time of purchase they had actually intended to do very little to the studio as their main priority was to preserve the Olympic legend.

Things weren't that simple. Because of the building's history, the studio layout was not the most auspicious with a great deal of wasted space. And in spite of the legend, Studio One's control room was not of an adequate size. Chief engineer Alan Douglas explained that on considering the building properly there was room enough to build three fair sized recording studios and it simply did not make sound sense to leave things as they were. "So we ended up pulling everything out."

In order to enlarge the control room it had to encroach on the studio area and compensation for this was made by raising the roof in order to retain the room volume. In fact, major structural work took place including excavation of the basement. Although Virgin had always had a vague idea what the studio was going to cost when they bought it, it became a much bigger project than anyone had anticipated. But Douglas is remorseless:

"I think they are beautiful studios and it has been a success; that's the main thing."

When Townhouse Four was reworked by Sam Toyoshima, Virgin had been looking for an 'alternative' design for some time. So successful was the project that Toyoshima was once again appointed for the Olympic project. As before, the Japanese designer's ideas and plans were interpreted and executed by Eastlake Audio in the UK.

Douglas explains that Townhouse Four simply felt right and when Toyoshima presented his conceptual ideas for Olympic, there was no doubt that they would be implemented.

"Although using one designer for all our rooms may make it seem that there is less contrast between the room superficially, all of them are different in their sound and feel. Sam is very good at that. We went to look at Sam's rooms in the first place because we wanted something different. I suppose somewhere like Sarm West looks dramatic but you have to be able to live in a studio. Sam's rooms are calm. We want a design that will stand up to a number of years. Sam will always look at it fresh and with new ideas."

The Virgin team was also impressed by the standard and intricacy of the studio finishes they saw in other Toyoshima designs and confess to doubts that an English building team would work to such high standards. "But David Hawkins of Eastlake was confident and after he did Townhouse Four, so were we."

The mammoth project took almost a year to complete as floors had to be floated and the building restructured to cope with the enormous loads incurred in a construction of this size. The resulting three studios are totally different sizes although the Toyoshima touch is consistent and clear. The main acoustically unusual feature is the implementation of reversible acoustic cylinders in all studio walls. These semi-circular bits of wood have been hollowed out and filled with trapping so that by spinning them round you can dampen the rooms down. Douglas had seen these in some of Toyoshima's Japanese rooms.

A second variable acoustic feature is the ceiling construction in the famous Studio One. They wanted to achieve as much volume as possible here in order to get a long RT but without losing the density of a small stone room; retaining the

*Studio Two*

possibility of creating a locally more modern ambient sound while keeping the overall ambience of the room. The ceiling has a max height of 25 ft and can be lowered right down to the floor if required, in 15 sections. These 'baffles' (they are not baffles at all but the term was adopted during construction and has stuck) are built on a steel framework and the detailing of their construction and mechanical assembly fell to Eastlake. As David Hawkins says: "At ⅔ of a ton each you have to take something like that seriously! If one of those fell on the London Symphony Orchestra you would hear about it for days." Olympic's insurance company feel the same way and require the construction to be re-examined every six months for safety.

Although the room is finished rather

# DESIGN: OLYMPIC

conservatively entirely in wood, Toyoshima's use of the material is unusual. The wood itself in Studio One is American cherry, while the flooring is a mixture of five different types of mahogany. In each of the rear corners of the room there is an isolation room, the glass doors of which slide away completely, opening the area up to create one large recording room.

Another Japanese idea has been incorporated on the microphone panels whereby an LED indicates a microphone plugged in elsewhere.

The room's former film use has not been neglected, with new projection equipment installed. The projection room is above the control room and because it need not be as large, there is also a balcony over the control room. "We use it a lot for placing microphones," says Douglas, "and I suppose if you had a musician that nobody liked, you could stick him up there."

Leading off the studio and to one side of the control room there is what was intended as a producer's office with telephone point, etc, but which has been used more often as a vocal booth.

Studio Two is downstairs and was responsible for the need to excavate the basement. Finished in Canadian maple, this is again a large room with two isolation booths which open right up. Once again there is an abundance of acoustic cylinders, and the room in fact has a considerably shorter reverb time. The middle back area has the wall finished in Welsh slate, which has also been used under the control room window. Douglas explained that they had always gone for a room which was as workably live as possible on the premise that you can always dampen it down. Variable acoustics have also become a priority.

Studio Three is back up on the first floor, next door to Studio One and is intended principally for mixing although it has an associated live recording studio. Its slate floor and stone walls make it pretty lively and the ubiquitous acoustic cylinders have a markedly more dramatic effect in here. Because of its first floor location the weight of a room such as this caused a few headaches. Genuine stone was too heavy and a composite was used in its place. However, when studio manager Barbara Jeffries saw it she took an instant dislike to it and ordered it to be removed.

Considering this to be rather drastic and expensive, David Hawkins approached a theatre scenery painter and set designer to paint the rock and make it look more realistic! This was also the only room where they managed to achieve any daylight and they are very pleased with the two windows which allow the sun to stream in. (*Ed*)

All three control rooms are of more or less similar design.

"The whole thing is such a compromise," said Douglas, "but essentially we wanted to make them as large as practicable, comfortable—nobody will want to work in a room if it isn't comfortable—and it must sound good. As for requirements of digital recording, I think all our rooms are perfectly adequate without making any special concessions in the design. We have always had a high degree of soundproofing and the ambient noise level in all control rooms is perfectly adequate. The main new thing which we have here at Olympic is separate machine rooms."

The ceilings in all rooms are amazingly intricate and complex. They necessitated making up of profiles, ribbed with plywood, the finished shape of the ceiling being sculpted in plywood and then assembled in a softwood frame with the finished ceiling geometry installed underneath that. Studio Two's ceiling is similar to an inverse wooden boat. David Hawkins enjoyed the challenge of working out how to do these cost effectively and efficiently on site.

These structures also feature complicated lighting. Studios One and Two have high frequency fluorescent lighting, which is made fairly discreet by the use of sophisticated eyelash baffles to diffuse the light. David Hawkins explains: "We used high frequency fluorescent light fittings which have only recently become available because they are dimmable to about 20%. Therefore you can cater for classical players who need 550 lumins to read the dots and equally you can turn it down to let rock musicians work in a more comfortable environment. We did the research on those—the only alternative would have been quartz halogen tubes which don't last nearly as long and use up a lot of energy. High frequency fluorescents will run for 1000s of hours (we calculate two years) so you don't have to keep sending someone up scaffolding every few weeks to change the bulbs."

All three studios are equipped with Solid State Logic *SL 4000 G* series consoles. The largest 64-channel is in Studio Two, while One and Three have 56-channel versions. Although Douglas stresses that they are very happy with the consoles, "they sound much better and the EQ sounds nicer although it is not as flexible—I must admit I actually quite liked the old EQ" at the time there really was not much of a choice to be made.

"We postponed placing the orders until the last minute and did a lot of market research. At the time, 80% of work at the Townhouse was mixing and so we asked as many people as we could and only one said that they would consider mixing on something other than SSL. Look at our position: we were opening three new studios and possibly doing a lot of mixing. Because of the *Total Recall* and the automation system, we had to go with SSL. It would have been nice to have some choice—some other manufacturers would do well to address the problem of automation. There are some great consoles around for recording and I'm really astounded that nobody else has addressed the problem. Apart from that the ergonomics of the SSL are great; it is very simple to operate. To be honest, at the moment SSL wins hands down."

Monitoring is similarly uniform, as indeed is most of the equipment. "If you give people different gear it always causes problems. They come and say 'I'm paying the same money as him and he's got this,' so you say yes, but you've got that instead: 'I don't want that I want what he's got'. Whatever you give people they want something else so as far as possible we give everyone the same and those sorts of problems don't arise."

The monitors are in fact Westlake *HR1*s which were also installed in the Toyoshima-designed Townhouse Four control room.

"We have Questeds in Townhouse Three," said

*Studio One*

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Douglas, "but for very large control rooms and the SPL that some of our clients require, we have no choice but to have a pressure driver/horn system. Whereas a softdome system might sound very nice at lower levels, by the time it gets up to the high levels that our clients seem to favour they feel are distorting like mad. I understand why some people hate horn systems but equally there are people who don't like softdome, and you need to make a decision and maintain continuity in a studio complex like this. We made our choice."

Monitor power amplifiers are *PSA2*s with *PSA2* or Quads on the small speakers. "Which amplifiers you have on your mini speakers invokes very strong feelings you know," says Douglas vaguely irreverently.

Since Townhouse studios all have Studer *A800* multitracks, it was only natural to continue the Studer tradition, this time choosing the new *A820*s. Douglas feels that they sound very clean and punchy—possibly better than the *A800*s, and although there have been some teething problems he accepts the inevitability of such things with new technology, particularly with the ever-increasing amount of software control.

There are two Sony *PCM3324* and one Mitsubishi *X850* digital multitrack machines which are 'floating' between the three studios. Other tape machines include two Ampex *ATR100* ¼ and ½ inch, and a Studer *A810* 2-track in each room, plus a Revox CD player, Aiwa cassette decks and a Sony *PCM2500* DAT machine. The outboard effects are arranged underneath custom producer's tables behind the engineering position. These include EMT plate and digital reverb, AMS *RMX16* reverb, two *DMX80*s and *Chorus Controller*, Lexicon *224XL*, *480L* and *PCM70*, Yamaha *REV1* and *REV5*, Yamaha *SPX90* and two *SPX90* MkIIs, two Roland *SDE3000*s, Eventide *949* and *910 Harmonizers*, AMS *Flanger*, A&D *Panscan*, two Aphex *Compellors*, two dbx *263X* de-essers, three Drawmer *Dual Gates* and an *M500*, Teletronix *LA2A*, two UREI *1176*s, and two *LA4*s, Valley People *DynaMite* and *415* de-esser, two Bel *BD80S*s and Roland *Dimension D*. Equalisers include Focusrite stereo input module, Klein & Hummel and Orban stereo parametrics.

In Studio One there is additional equipment for working to film: two Kinetron 16/35mm projectors, Westrex master motion controller, two Westrex *ST6016* recorders and two Westrex *ST6006* playback machines all 35mm 6-/4-/3-track or 16mm 2-track.

There is a Steinway concert grand piano in Studio One and a Bosendorfer in Studio Two.

Although Eastlake would more commonly be implementing their own studio designs, David Hawkins nevertheless found this particular project worthwhile and rewarding.

"We were presented with Toyoshima's conceptuals which were delicate Japanese drawings on a scale of 1:50! And from that we put the nuts and bolts together as economically and efficiently as possible. In acoustical terms his ideas of variable acoustic elements are interesting and visually quite spectacular. When you look at other European and American studios with wood panelling you can see that Sam Toyoshima does bring a fresh design approach.

"Working from an undetailed plan and section for each studio provided us with plenty of scope for our own input and in terms of job satisfaction for me and everybody working on the project as well as making a return, it was a thoroughly satisfactory job."

Virgin's next step is going to be the refurbishment of The Manor and Townhouse One. Douglas feels rather defensive although the Virgin success story hardly needs defending.

"Radical departures in terms of studio design are best left to other people," he says although they were the first Europeans to go for a Japanese design. "We could probably be more adventurous but we do what we do well. We have to appeal to as big a cross-section of clients as possible. There is no point in us building a programming room because (a) we probably wouldn't be very good at it, and (b) for very similar costs you can build a 48-track studio. To some extent you have to stick to what you know."

He does admit to a certain nervous disposition during the mammoth Olympic build. "You can't help wondering whether you are doing the right thing. If we were in any other business, a company this size would be under the constant watch of a financial director and we would certainly not be spending these huge amounts of money based purely on gut feeling. We had no hard evidence that the studios would work. But they do. We're very successful and at the end of the day that's all that counts.

"I just love our studios. And I think everyone else who works here does too and it makes a difference. If your staff are unhappy the client feels uncomfortable. We think our studios are special and we would like to keep them that way."□

**Olympic Studios, 117 Church Road, Barnes, London SW13 9HL, UK. Tel: 01-748 7961. Fax: 01-748 3067.**

# DESIGN: OLYMPIC

*Control Room Two*

*Control Room One*

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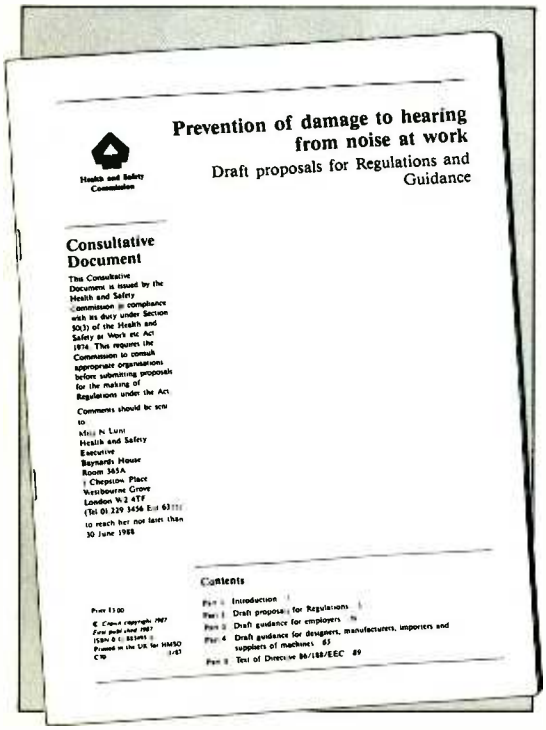
# VOLUME CONTROLS PENDING

*European regulations concerning sound levels will soon be in force and will affect studios and live performances. Ken Dibble discusses the implications.*

The volume levels experienced at rock music concerts and used in many studio control rooms have long been an emotive and contentious issue, with performers, sound engineers and the majority of their audiences demanding ever higher volume levels whilst the authorities, convinced that we are all going deaf, seek constraints in order to protect us from our own folly. Interestingly, the plight of the horn player sitting amidst a symphony orchestra during a performance of the Tchaikovsky *1812 Overture* does not conjure up quite such fervour or attract the same level of attention, even though the sound levels are little different.

Over the years there have been many rumblings on the subject of volume constraint—especially in the discotheque and live concert arenas where the licensing of a venue is frequently conditional upon compliance with some noise control procedure or an approved code of practice.


Prevention of damage to hearing from noise at work

Draft proposals for Regulations and Guidance

Health and Safety Commission

Consultative Document

This Consultative Document is issued by the Health and Safety Commission in compliance with its duty under Section 50(3) of the Health and Safety at Work etc Act 1974. This requires the Commission to consult appropriate organisations before submitting proposals for the making of Regulations under the Act.

Comments should be sent to

Miss N Lunt
Health and Safety Executive
Baynards House
Room 365A
1 Chepstow Place
Westbourne Grove
London W2 4TF
(Tel 01 229 3456 Ext 63)

to reach her not later than 30 June 1988.

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Part 2 Draft proposals for Regulations
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Part 4 Draft guidance for designers, manufacturers, importers and suppliers of machinery
Part 5 Text of Directive 86/188/EEC

This time, however, it is going to happen for real. At what level, under what circumstances and for how long may be issues still open to debate, but on **January 1st 1990,** for the first time, **legally enforceable regulation of volume levels** will be with us—and will apply **throughout Europe.**

## Background

I suppose that the first serious attempt to regulate entertainment volume levels came from Leeds City Council when, in 1976, a volume limit of 90 dB(A) was imposed as a condition of licence on every discotheque, nightclub and live venue unfortunate enough to fall within the Leeds area. The move caused a furore at the time and the regulation was only rescinded in the face of determined opposition by some of the major venue operators and threats of crippling legal action. The new restrictions, however, are to take the form of legally enforceable regulations to be enacted under the provisions of Section 2 of the 1974 Health and Safety at Work Act.

## The 1974 Act

Section 2 places an obligation on every employer to: "...ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees." And under Sub-clause 2(e) thereof to ensure: "the provision and maintenance of a working environment for his employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards facilities and arrangements for their welfare at work."

For the purposes of enforcement, the exposure of employees to excessively loud sounds (termed 'noise' by the authorities), is considered to be injurious to health and therefore to contravene the Act. Until now, however, the definition of what constitutes excessive noise exposure has rested with a voluntary code of practice introduced by the Department of Employment in 1972 entitled 'Code of Practice for Reducing the Exposure of Employed Persons to Noise' which, because of its unmistakable bright yellow cover, has become affectionately known as the 'Yellow Peril'.

Despite its Code of Practice status, many successful prosecutions have been brought by Her Majesty's Health and Safety Inspectorate under the provisions of the 1974 Act using the Yellow Peril as the base line. Hitherto, however, although these existing legislative provisions could well have been applied to other occupations—and occasionally this has in fact happened—they have for various reasons been primarily directed towards noisy industry and as a result great strides have been made in changing the attitude of employers to noise and in reducing the levels of noise in many working environments.

## Expanding the scope

Since 1982 the EEC Advisory Committee on Safety, Hygiene and Health Protection at Work have been deliberating this matter with the result that Council Directive 86/188/EEC, of May 12th 1986, requires all EEC member states to introduce harmonised legislation to protect workers from the risks related to exposure to noise at work by January 1st 1990. In essence the EEC requirements are not dissimilar to those of the Yellow Peril and in the UK, compliance with the Directive will take the form of compulsory Regulations to the 1974 Act, to be known as the 'Prevention of Damage to Hearing from Noise at Work Regulations'. Draft Regulations were published in late 1987 for public comment, the closing date for response was June 30th 1988, and towards the end of next year we shall see the final document.

Once enacted the Regulations will apply to all employees, trainees, and to the self-employed, whilst at work, whatever form that 'work' might take. Entertainment is specifically mentioned as an area outside traditional industry which is expected to fall within the scope of the new legislation and the Health and Safety Inspectorate are almost certain to take a similar line in respect to employment in the recording and broadcast industries.

## The essence of the Regulations

Firstly, the noise level is measured in dB LAeq. This is a unit of noise exposure and is an integration of decibels with time—in this instance an eight hour working day.

The EEC Directive sets a First Action Level at 85 dB LAeq and a Second Action Level at 90 dB LAeq.

When an employee is likely to be exposed to sound at or above the First Action Level the employer will be required to have an assessment of the exposure level carried out 'by a competent person'. In practical terms this means bringing in a specialist with the necessary instrumentation to actually measure the dB LAeq value, assess the results and advise on the means available for reducing the exposure to a minimum practicable level. If the measured value is found to be above the First Action Level but below the Second, the employee will be required to: (1) Make arrangements for the safe keeping of the assessment records; (2) Reduce the risk of hearing

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"It really is extremely flexible and, even though I am not very well versed in using complicated consoles, I feel quite happy with everything and understand all the functions, of which I must say there are a great number. I challenge anyone to find something it can't do in a complex mix situation."

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# VOLUME CONTROLS PENDING

## $LA_{eq}$ and $L_{EP,d}$

The term $LA_{eq}$ is a measure of A-weighted noise levels integrated with time, ie an average of the decibel value occurring over a prescribed period. The time period can be assigned any value from one minute to several hours according to particular needs.

$L_{EP,d}$ is defined in the EEC Directive as a unit of 'daily personal noise exposure of a worker' and is, in effect, the same as an $LA_{eq}$ value assigned a time period of eight hours.

As the period of exposure is increased, so the permissible decibel value will decrease. Conversely, as the period is decreased, so the decibel value will increase as below.

| Period | Average SPL | $L_{EP,d}$ |
|---|---|---|
| 12 hr | 88.5 dB(A) | =90 dB(A) |
| 8 hr | 90 dB(A) | =90 dB(A) |
| 6 hr | 91.5 dB(A) | =90 dB(A) |
| 4 hr | 93 dB(A) | =90 dB(A) |
| 2 hr | 96 dB(A) | =90 dB(A) |
| 1 hr | 99 dB(A) | =90 dB(A) |
| 30 min | 102 dB(A) | =90 dB(A) |
| 15 min | 105 dB(A) | =90 dB(A) |

damage to the 'lowest level reasonably practicable'; (3) Make hearing protectors available on request; (4) Provide the employee with instruction and training on the risk of hearing damage and the steps available to minimise that risk; (5) Ensure that the employee is aware of his or her obligations under the Regulations to properly use and maintain anything provided to reduce the level of exposure.

If the measured value is found to be above the Second Action Level, then the employee must be provided with hearing protectors and will be required to use them.

Failure to comply will lead to prosecution by Her Majesty's Factory Inspectorate and will leave an employer open to damages claims from past and present employees should a future hearing deficiency be shown to be in any way attributable to the working environment. So take a deep breath and consider the implications.

## *Who will be affected?*

Taking typical monitoring levels of between 100 dB(A) and 110 dB(A) and live performance levels of a similar order it is clear that anyone involved in the action in live performance, recording or broadcast is bound to come above the First Action Level and probably above the Second. The Regulations will therefore affect musicians, producers, engineers and technical operators, lighting technicians, stage hands and road crew, house staff, security, management, all down the line.

Now what about the practicality of compliance? Whoever saw an artiste performing on stage wearing hearing protectors? How on earth can a musician—in a rock band or in a symphony orchestra, on stage or in the studio—work, when they can't hear the foldback, playback, producer's or engineer's talkback, their own instrument, or even each other because they are wearing ear-plugs? How can a producer or engineer do a tastefully balanced mix wearing hearing protection or alternatively, at a monitoring level below 85 dB(A) when the playback level in the local discotheque will be over 100 dB(A)? Clearly the whole notion is impractical.

## *The underlying concern*

Research into the effects of exposure to loud sound has been going on for many years and of particular relevance is a study carried out by Professor W. Burns and Dr D W Robinson in the late 1960s. The results of this were published by HMSO in 1970 and formed the basis of the 'Yellow Peril' recommendations and, in effect, provide the basis of the new EEC Directive. The research, however, is based entirely on noise associated with industrial processes and on expectations of hearing loss over a 40-year working life. So whilst there may be a sound basis for the introduction of regulatory legislation in an industrial environment, the case for including 'music' within the term 'noise' is not so clear.

Tests carried out in America prior to 1976 involving almost 300 professional musicians and regular rock concert or discotheque attendees, some of which were spread over a 7½-year period with the same subjects, showed little or no hearing defects. In another study, carried out by J L Fletcher of the National Institute for Occupational Hygiene and Health, for the US Department of Health, Education & Welfare in 1972 involving a study of 400 normal hearing subjects, 100 rock musicians and 100 rock concert attendees, produced the conclusion: "...knowing the levels and durations of exposure these persons receive in that pastime it is almost unbelievable that no clearly observable (hearing) losses could be found."

Note the element of surprise in that statement. Everyone, it seems, hearing the talk of 50 kW here and 100 kW somewhere else, immediately concludes that we must all be going deaf, and is surprised when research fails to confirm the expectation. Surely there is a fundamental difference between a 'noise' which is produced as the undesirable by-product of some other process and 'music' which is the painstaking and dedicated end product of a highly developed art form and technological process. The Concise Oxford Dictionary gives the following definition of 'noise': "Loud outcry, clamour, shouting, din of voices and movements; any sound—especially loud or harsh or undesirable one."

And for 'music': "Art of combining sounds with a view to beauty of form and expression of emotion;...pleasant sound...".

These two definitions are surely mutually exclusive, yet here we are facing a proposal that the entire music industry is to be included within the scope of new Noise at Work legislation which is based on the noise exposure patterns of traditional industry!

## *A study project*

It was because of the horrendous ramifications of the Draft Regulations on the discotheque and club industry that The Sound Practice was commissioned by the British Entertainment & Dancing Association (BEDA) to prepare a report to the Health and Safety Commission on behalf of the Industry in response to the Draft Regulations at the public comment stage.

One of the basic problems faced by this industry is that whilst for many traditional industries there exist fairly good records of typical noise levels generated by certain types of machine or by specific industrial processes, this is not the case for the entertainment industry. The starting point had to be to survey a cross-section of representative venues to find out what the 'noise' levels actually were at the various workstations. A dozen representative venues in various geographical locations were selected and the sound level on the dance floor, behind bars, in the lounges and restaurants and in the DJ console monitored. Additionally, selected staff members were equipped with personal noise data loggers to monitor the actual 'noise' exposure levels as typical staff went about their normal nightly duties. Using a staff questionnaire we were also able to get some idea of the average age of persons working in this industry, typical length of service, work patterns and other relevant data. It was altogether a very interesting, if somewhat exhausting project which produced some worthwhile data, most of which is now contained in an industry report to the Health and Safety Commission in response to the Draft Regulation proposals.

By way of a very brief summary of its contents, having made the point that there appears to be but scant evidence to support the inclusion of the music industry within the scope of the regulations anyway, and there is little or no correlation between the exposure to industrial noise for 40 hours each working week over a 40-year working life and the typical exposure durations to be found in this industry, the Report shows that given certain exemptions and a spirit of co-operation from the HSC Inspectorate, it would be possible to bring the club and discotheque industry largely within the Second Action level requirements in all but a few instances. But the matter is far from settled and discussion will be continuing for some time yet.

## *The way forward*

Perhaps now is the time for other interested parties—APRS and APEHC for example—to either become involved in the process in order that a cohesive industry approach can be made on the back of the BEDA initiative, or else to get their own act together before it is too late. January 1990 is only 14 months away!□

Ken Dibble is the principal of The Sound Practice independent consultancy in acoustics, noise control and audio engineering. He is an established author and reviewer for the technical press and is a member of the CBI Noise Working Party and the Entertainment Noise Working Party of the Noise Council. He is a Member of the Institute of Acoustics, the Acoustical Society of America and the Audio Engineering Society and a Fellow of the Institute of Sound and Communication Engineers.

As an ex '60s pop group guitarist and former mobile disco operator, and with more than a decade of experience as a concert sound engineer, another decade as a leading consultant and still a practising musician, Ken considers that his roots are firmly planted at ground level.

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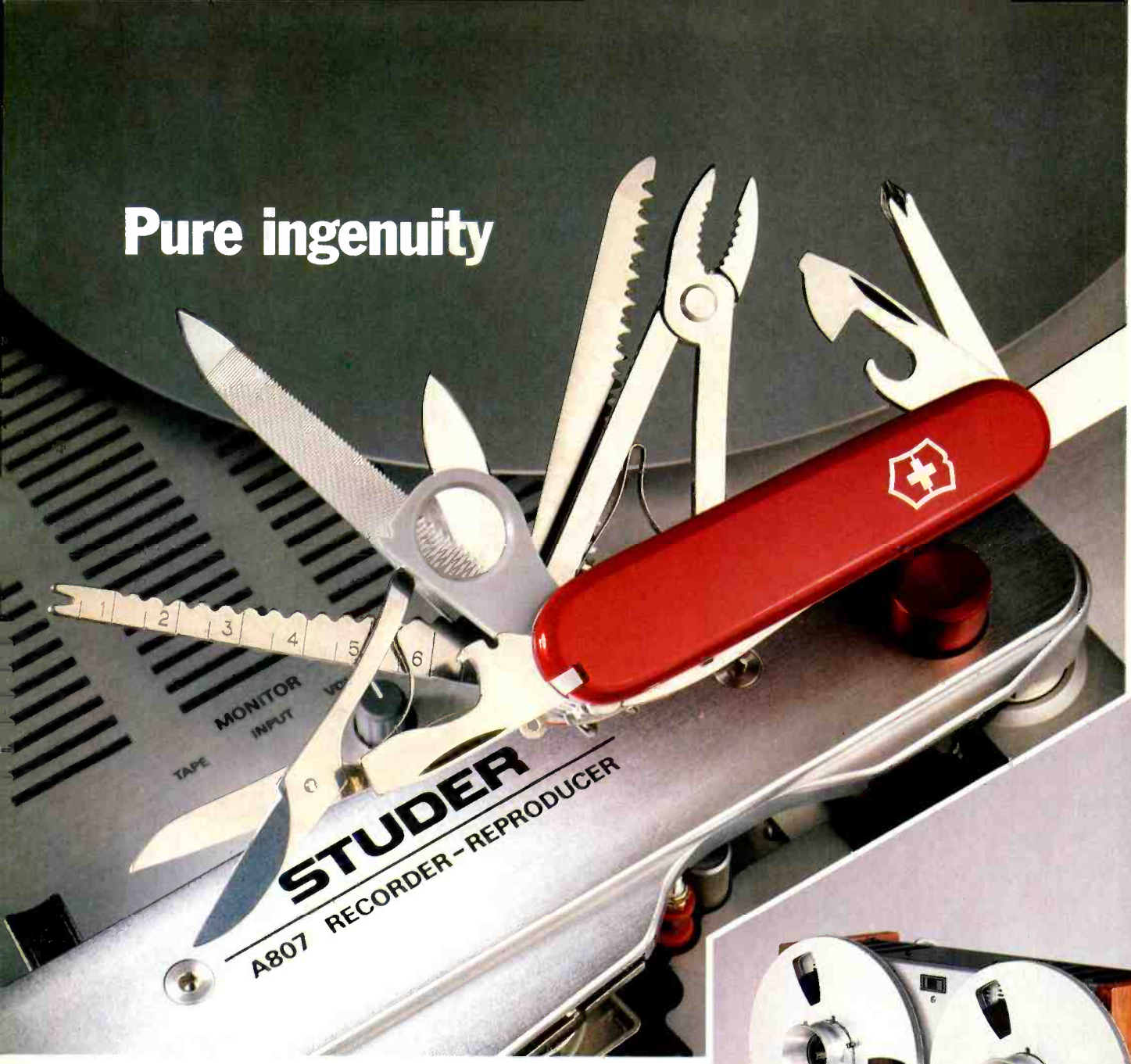


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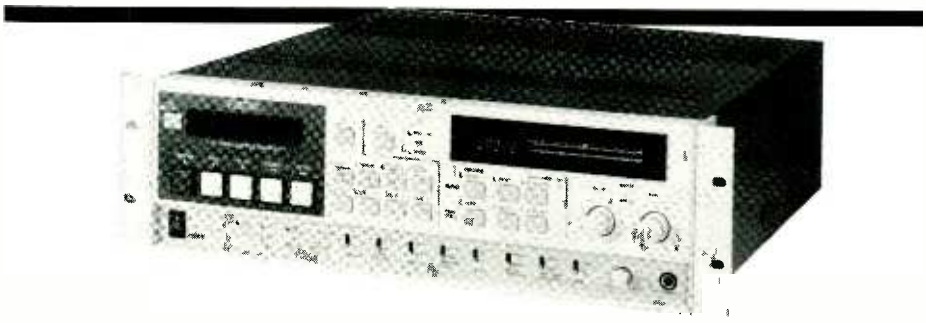
# SYNCHRONISING R-DAT

*Richard Wear of Harman Studio Systems introduces the Fostex D2 digital master recorder, the first R-DAT machine that can be synchronised via SMPTE/EBU timecode*



It has always been expected that digital audio would one day be a complete replacement for analogue tape. So far, there has not been a digital format able to offer all the features of reel-to-reel analogue—by now a highly developed recording medium—at the same sort of price. Few would disagree that 16-bit digital is the superior format for sound quality but for many applications, ¼ inch analogue produces satisfactory audio, and has a flexibility in areas such as editing and synchronising that R-DAT, as yet, lacks.

Since its introduction, the R-DAT format has been seen to be a promising format for professional use. Certainly, for use with audio-only programme material, it is ideal but the trend is now for increasing numbers of multimedia productions, where sound must work hand-in-hand with picture, and audio-only multimachine environments. These situations require that the audio recorder can be synchronised but so far, R-DAT has not had this capability.

It was the intention of Fostex to produce a digital recorder that would not only equal the capabilities of quality ¼ inch analogue machines but have additional functions as well as digital's superior audio performance.

It has been felt that R-DAT is a consumer format that is creeping its way up to professional levels. Fostex see R-DAT as the logical format for synchronisable 2-channel digital audio, and the Fostex *D2* digital master recorder will be a fully featured professional quality digital stereo recorder. This will reflect in the price, which will be comparable with a mid-price analogue machine. The Fostex *D2* will be suitable for use in any situation where audio must be synchronised to video, or to other audio machines.

## *Synchronising method*

The first design requirement was that synchronisation be via SMPTE/EBU timecode. This is standard in the analogue domain, therefore any new machine has to conform. The R-DAT format, as introduced, has its own timecode, which Fostex examined to see whether it could be adapted to SMPTE/EBU requirements. R-DAT timecode contains the following information:

- A-TIME: indicating the absolute time from the beginning of the tape
- R-TIME: indicating the running time from the start of the recording
- P-TIME: indicating the time from the start of each programme

This code, although ideally suitable for consumer use, does not link easily to SMPTE/EBU timecode. The frame rate of R-DAT is 33.3 frames per second. To link this to SMPTE/EBU frame rates (24, 25, 29.97 and 30 f/s) would require a complex converter.

Also, R-DAT's intrinsic timecode lacks a clock component, which is necessary for any synchroniser to keep a continuous check on the state of sync between two machines. There is no provision for user bits in the R-DAT code.

Having rejected R-DAT's own code, it would seem logical to look at the possibility of using SMPTE/EBU timecode direct. Indeed the Sony *PCM-2000* can record SMPTE/EBU code on an auxiliary analogue track but unfortunately cannot be synchronised to it. (It could be used for on-site timecode recording, for later transfer.)

**Fig 1** shows tape usage in the R-DAT format. Digital data is recorded by heads mounted on a rotating drum scanning across the tape, as in a video recorder. Each scan lays down digital audio plus essential control data. The main data area is used for the digital audio. On either side of this is a small area used for the ATF (Automatic Track Finding) signal, which enables the rotary heads to lock on to the correct trajectory across the tape. At each end of the scan is a section devoted to subcode information. Outside the area occupied by digital data, there are two analogue tracks, which at first sight would seem to be the ideal place to record SMPTE/EBU timecode.

It is possible to record timecode on the analogue tracks but there are several problems. A video recorder can use timecode recorded on its audio tracks because the audio and video are reproduced in sync. This is not the case with R-DAT as there is a lag of about 60 ms, during which the digital audio is processed. If this problem is not insoluble, the next one is.

Tape speed, in the R-DAT format, is 8.15 mm/s. This is slower than the most tape-economical dictation recorder. The recorded wavelength of NTSC code (30 f/s) would be 1.7 microns. To maintain interchangeability of the R-DAT cassettes between different machines would mean that the tolerance of head positioning would have to be an accuracy of better than that figure. At this slow speed there would also be dropout and bit jitter problems due to tape edge deformation. The final problem is that even if code could be recorded and reproduced satisfactorily at normal play speed, there would be little chance of reading it at the 100× play speed winding rates possible on the format (at these speeds, production of tach pulses would be impossible as any tach roller would be unable to keep accurate enough contact with the tape).

In view of the above, the analogue tracks were rejected as a method of recording SMPTE/EBU timecode.

## *Subcode*

The subcode area of the tape is where information such as start codes, track number and timing are normally recorded. Recording data within the subcode area has certain advantages:

- Subcode data maintains exact synchronisation with the digital audio
- The reliability of the data reproduced is high
- Data can be read at 100× high-speed search.

Not all the available subcode data area has been allocated for use, so Fostex decided to use a vacant subcode address to record SMPTE/EBU data.

An important point to remember is that SMPTE/EBU code consists of 80 bits of information for each frame. These 80 bits, when recorded on analogue tape (audio or video) are modulated into a recordable form. R-DAT, being a digital format, can record the 80 bits/f directly as digital bits, suitably encoded for error correction and ease of retrieval. It does not convert

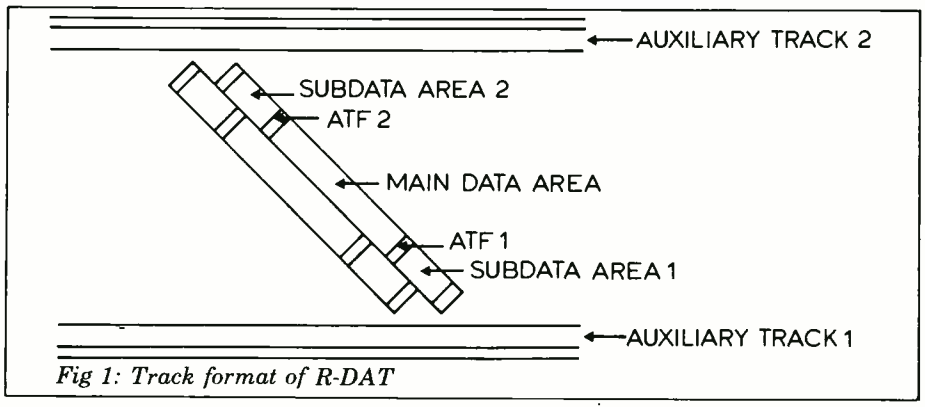



*Fig 1: Track format of R-DAT*

# SYNCHRONISING R-DAT

## *Preliminary specification*

**Error correction:** Double-encoded Reed Solomon Code
**Tape speed:** 8.15 mm/s
**Rewind/Fast forward time:** Approx 80 s with 120 min cassette
**Sampling frequency:** 44.1 kHz/48 kHz switchable
**Quantisation:** 16 bit linear
**Dynamic range:** >90 dB (emphasis at 1 kHz)
**Frequency response:** 20 Hz to 20 kHz
**Total harmonic distortion:** Less than 0.05%
**Wow and flutter:** Below measurable limit
**Crosstalk:** Better than −80 dB
**Line in/out:** *XLR* connectors
  **Input impedance:** 20 kΩ balanced
  **Maximum input level:** +28 dBm
  **Output:** Nominal level +4 dBm balanced
**Digital input/output:** AES/EBU format
**Timecode in/out:** SMPTE/EBU format, *XLR* connectors
  **Input impedance:** 20 kΩ balanced
  **Nominal input level:** +4 dBm
  **Nominal output level:** +4 dBm balanced
**Ext sync input:** BNC, TTL level
**Remote:** 20-pin connector for Fostex *4030*
**Serial port:** RS-422
**Power supply:** 100/220/240 VAC 50/60 Hz, 60 W
**Dimensions:** (whd) 19×6×18½ in/482×150×472 mm
**Weight:** Approx 33 lb/15 kg

modulated SMPTE/EBU into digital audio and record that. That would take up as much space as one channel of the audio programme.

Recording SMPTE/EBU data in the subcode area is not without problems of its own. The frame period of R-DAT is 30 ms (33.3 f/s). The frame period of SMPTE/EBU code varies between 33.3 ms and 41.7 ms depending on whether it is NTSC, drop frame, PAL/SECAM or film. All these frame periods are longer than the R-DAT frame period. SMPTE/EBU code cannot be recorded on R-DAT on a frame-for-frame basis, without using a frame converter, which would increase the cost considerably.

In addition to timing information, modulated SMPTE/EBU code contains the clock information necessary to maintain a constant link between synchronised machines. R-DAT will need to output this modulated code at its precise frequency and with the correct phase relationship between code and audio. This means that however the SMPTE/EBU data is encoded into the subcode of R-DAT, it must contain timing and clock information.

The frame period problem is solved by recording a complete 80-bit batch of timecode data on each R-DAT frame. Since this contains information to cover a time period longer than the R-DAT frame, there will be redundant timecode information recorded. This redundant information is stripped off on replay so that the output is a continuous stream of modulated data.

In high-speed search mode, data can only be read out intermittently but the overlapping of data allows timecode to be fully reconstituted.

The phase difference between the recorded timecode data and the digital audio is also encoded so that the resulting output of modulated SMPTE/EBU code maintains its precise relationship with the audio.

Although the Fostex *D2* can record digital audio and timecode, it maintains full compatibility with the existing R-DAT format. There is no conflict, either way, between tapes recorded on non-timecode R-DAT machines—professional or consumer—and the Fostex system, and vice-versa.

## *The machine itself*

As stated earlier, the intention was to produce a recorder that could perform all the functions of a fully-specified analogue machine. As well as SMPTE/EBU timecode with chase facility, there are features such as off-tape monitoring, punch in/out, pitch control and the capability of synchronising to video syncs and the word syncs of other digital equipment.

The *D2* has four heads, instead of the normal two in R-DAT, which offers an off-tape monitoring possibility. In theory, this should not be necessary as the sound quality of digitised audio does not change as a result of being written on to tape. Often, the confidence factor is important and a recording monitored off-tape can be known to be free of errors or dropouts (or otherwise).

In conventional R-DAT recorders, subcode data can be re-recorded independently of the audio. The head design of the *D2* allows timecode to be regenerated if necessary. This may be required because the timecode originally supplied to the *D2* was faulty. Regeneration takes place in one operation. The faulty timecode is read out and sent to a separate timecode regenerator. Good code is fed back in and recorded on the same space of tape that code was played back from a quarter of a head-drum rotation earlier. To regenerate timecode on a centre-track analogue stereo machine would mean losing one channel of audio.

One interesting aspect of the timecode facility would be to allow a number of *D2* units to act as a multitrack recorder. For instance, five *D2*s and a suitable synchroniser could make up a 10-track digital recorder with intrinsic track slipping capability (similar to the mag film recorders in a post-production studio) at reasonable cost.

Although the technique of recording SMPTE/EBU timecode in the subcode regions of R-DAT is at the moment unique to Fostex, it is hoped that the introduction of the *D2* digital master recorder will lead to this method being used by other manufacturers.

Interchangeability of tapes between R-DAT machines of different manufacturers is essential. When this is achieved, synchronisable R-DAT will become the major 2-track professional digital recording format.□

**Reference:** AES Preprint 2589 (E-1) 1988, 'Timecode in subdata area of R-DAT', H Yamazaki, T Ketori, T Morita, S Okazawa, H Nogima and Y Abe

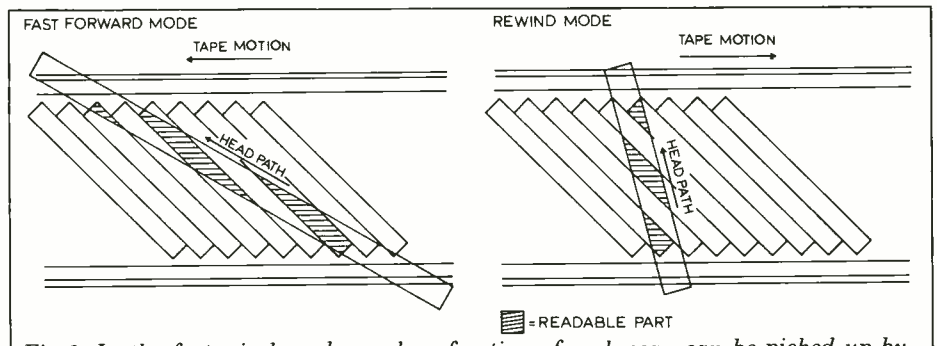



*Fig 2: In the fast wind modes, only a fraction of each scan can be picked up by the heads. Since the timecode data overlaps to a certain extent it is possible to reconstruct completely, timecode from portions of different scans*

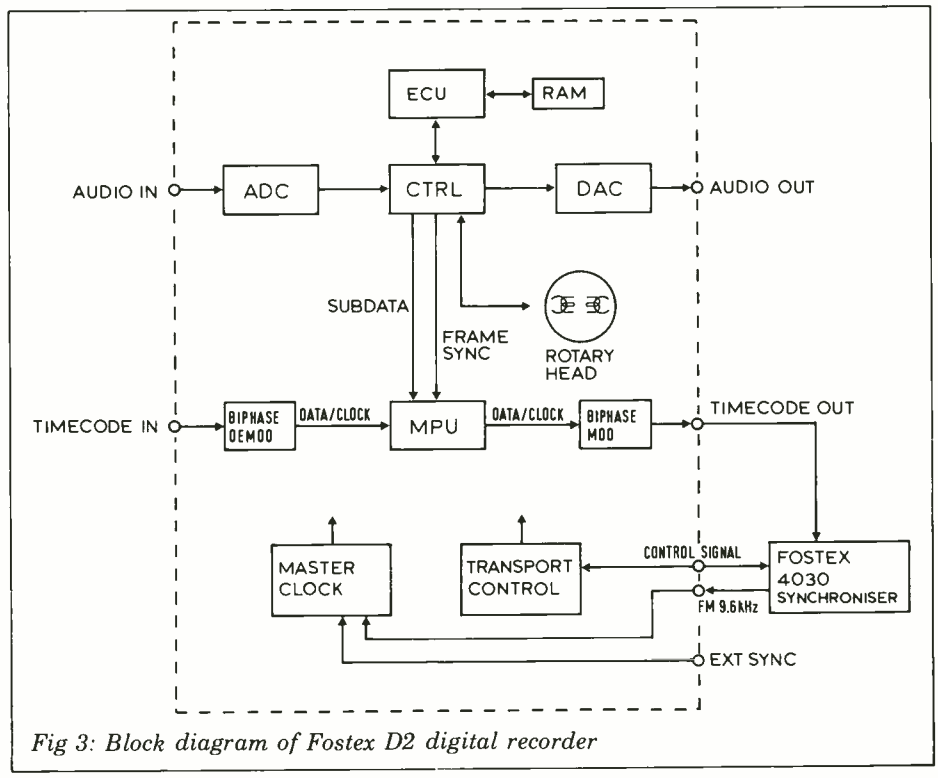



*Fig 3: Block diagram of Fostex D2 digital recorder*

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| Distortion, – side chains switched out, V.C.A. in circuit:- | |
| Typically | 0dBu Input 1KHz 0.002% |
| | +10dBu Input " 0.005% |
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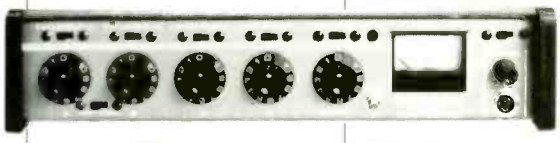

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# WHICH AMPLIFIER TECHNOLOGY? PART ONE

*Ben Duncan charts the A-Z of power amplifiers. Are the new breeds really more efficient? Come to think of it, what are the new breeds?*

On the face of it, power amplifiers are among the simplest equipment in the pro-audio chain. Signal enters a black box and, provided the signal emerging from the other end has enough current and voltage capability to drive a real loudspeaker with an accurate enlargement of the incoming signal, what else is there to worry about? If amplifier design were that clear cut, surely logic dictates that a handful of companies with the greatest resources would dominate the market?

In the UK alone, the potential amplifier purchaser has over 190 models to choose from, distributed by over 45 manufacturers and importers. The vast majority are 2-channel ('stereo') rackmounting units. Even within a restricted range of power rating, say 350 to 450 W, there are more than 50 competing models to choose from. Though none is perfect, few (if any) are truly useless. Some are burdened more or less by controls and indicators of varying utility.

**TABLE 1**
**22 VITAL AMPLIFIER STATISTICS FOR PRO-AUDIO BUYERS**

**Raw engineering data**
1 Mean time between failure
2 Physical dimensions, eg rack 'U' occupied
3 Weight
4 Power in $W_{av}$ plotted 2 to 8 Ω
5 Power bandwidth plotted 2 to 8 Ω
6 Power conversion efficiency, %, $V_s$, % output

**Safety features**
7 Thermal protection: °C and response time
8 DC output protection: DC threshold and speed
9 Input DC blocking: ⩾ 63 V
10 Input RF filtration—plot of response > 20 kHz
11 AC line voltage limits—global sag and surge
12 Maximum peak current draw off line

**Meaningful audio qualities**
13 Slew limit and rise time
14 THD plotted 2 to 8 Ω, 20 Hz to 20 kHz
15 THD plotted −0.5, −10, −20 dBW, 20 Hz to 20 kHz
16 IMD plotted −0.5, −10, −20 dBW
17 Input impedance at all gain settings
18 Input impedance in bal/unbal configuration
19 Phase response plotted 2 to 8 Ω, 20 Hz to 20 kHz
20 SNR plotted in dBVR, 20 Hz to 20 kHz
21 Crosstalk plotted in dBVR, 20 Hz to 20 kHz
22 Plot of dynamic V-I capability

**Caution:** this is not an exhaustive specification!

**TABLE 2**
**THE EFFECTS OF TEMPERATURE RISE ON AMPLIFIER LONGEVITY**
1 Degradation of electrolytic capacitors (over 3 to 8 years)
2 Erosion of the Safe Operating Area (SOA) of bi-polar semiconductors
3 High temperatures coupled with cyclic changes reduce the Mean Time Between Failures (MTBF)

All claim 'pro-audio' specifications but while there are over 20 meaningful and readily measurable parameters to inspect (**Table 1**), few amplifiers are documented as extensively as the 50p (30¢) IC op-amps many contain. To make matters worse, the majority of makers remain keen to convince their audience that theirs is the most accurate, most unblowable amplifier ever. Somewhere, sometime history has proved every one of them wrong.

Today, there is dawning awareness among even the most conservative manufacturers of how much current is needed to drive a real loudspeaker, the benefits of effective heat exchanges and why the appearance of +60 V DC on the output terminals is unpopular with users. Since 1980, the widespread introduction of metal film resistors; vastly improved transformer cores and electrolytic capacitors; faster and beefier output transistors (notably power MOSFETs); and the labyrinthine but 'smarter' circuit topologies drawn from IC op-amp techniques, have all helped to improve the longevity, sonic quality and explicit audio specifications of modern designs.

## A new direction

Yet for the past 25 years, the majority of pro-audio power amplifiers have been no more than restatements or refinements of the direct-coupled, class A-B circuit topology pioneered in the early '60s by Linn, Tobey, Bailey and others, and originally charted in semiconductor manufacturers' application notes, beginning with RCA and GE. This species of technology isn't very efficient. Typically, less than 50% of the power consumed is converted into audio. On the surface, this is between 1½ and 250 times more efficient than the speakers they drive. As long as electricity is cheap, or power levels are low (as in many studios), a little inefficiency shouldn't matter. Or should it?

What distinguishes a small but increasing number of power amplifiers today is enhanced efficiency. Now the principal product of *in*efficiency in power amplifiers is waste heat. Because in general, it is the effects of high temperatures that make amplifiers the most unreliable part of pro-audio electronics chain (**Table 2**), there's a potential benefit to all kinds of pro users if a given amount of audio power can be achieved with less hot air.

The knock-on effects of amplifier inefficiency (salesmen please note) is a more pressing matter for large-scale PA systems, especially the touring variety, and wherever high power is specified, not for masochistic purposes but for the sake of headroom. Leaving aside the cost of the juice (and the size of generator) needed to power upwards of 150 kW, the sheer weight and bulk of hundreds of kW of amplification adds as much as 20% to the capital and installation cost in the first place. Should the running costs of fuel, truck space and rigging labour resulting from the profligate size, weight and power consumption of 1960s amplifier technology be allowed to penalise the future viability of honest PA rental?

Bombarded on all sides by new applications for digital technology, the average sound engineer is nursing learning curves by the dozen. Among all this activity, it's easy to lose sight of developments in downtown analogue territory. This series sets out to describe and compare the principal amplifier families in a historical perspective, highlighting their main features and tradeoffs—with an emphasis on chalking up their efficiency.

## Class A

Thirty years ago, the very first transistor power amplifiers operated in class A. By itself, class A indicates a continuous conduction cycle, ie 360°. For symmetrical clip, the output stage is arranged to 'tick over' at 50% of its rated maximum output current (**Fig 1**). Efficiency approaches 50% but only in the most developed examples of this genre, either the push-pull variety (**Fig 2**) or with an active collector load (**Fig 3**). Even then, this is only true under fairly concocted circumstances; namely, when the output is delivering a continuous sinewave at full power into a particular *optimum* speaker impedance.

For real programme, efficiency is less than 50% considering the PMR and asymmetric nature of music and speech. And, excepting transformer-coupled outputs, the speaker 'ohmage' at which class A output power and efficiency peak is the impedance the manufacturer has decided best suits his amplifier, not your speaker. Above or below the optimum load impedance, efficiency falls off to 25% or less. Worse, with no signal present, efficiency approaches an all time low of 0%, while *twice* the rated output power is discharged from the amplifier in the form of heat (ouch!). The efficiency of class A is so poor, it's even avoided in the line-level stages, especially those based on IC op-amps.

Even for the modest power demands of studio monitoring, substantial heatsinking is required, surrounded by commensurately heavy and costly metalwork. For this reason, the commercial realisation of high power class A amplification is restricted (you guessed) to '4-figure' hi-fi. For example, Krell's *KMA-100* produces 100/400 W/channel into 8/2 Ω, retails at $6000, occupies over 5U and weighs 70 lb (32 kg). The thermal implications of using class A amplifiers in a large scale PA system hardly need spelling out. In a 50 kW rig, it would mean an average 95 kW of static heat generation, not falling below 50 kW on signal peaks.

Beyond this, class A has (among its adherents) a reputation for unrivalled audio quality. 'Audiophiles' cite the cheerful simplicity of class A circuitry and its basic linearity. Inherent distortion products are small and principally benign; and crossover distortion of any kind is absent by design. A more convincing reason is that (even without a regulated supply), the constant current drawn off the power supply keeps garbage off the supply rails, removing the potential for interaction between high and low level stages. When the power supply is shared

between two channels, it also dramatically reduces interchannel crosstalk. So much is audible in the studio but less so in a big crowd.

Because class A circuitry runs at fairly steady high temperature, MTBF (Mean Time Between Failure) is potentially in advance of other amplifier classes, where component temperatures typically cycle more widely. Within reason, steady high temperatures also enhance the performance of electrolytic capacitors and semiconductors. In particular, it can act to swamp out the effects of thermal modulation, a source of 'dynamic' distortion, which plagues many class A-B amplifiers. Summing up, class A is the benchmark against which the sonic quality and ecology of more advanced power amplifier topologies can be set.

## Abbreviations and technical definitions

*Combined power:* W/channel×2 into the lowest rated impedance: a measure of an amplifier's power density

*dBVR:* dBs referred to full RMS output voltage

*dBWR:* dBs referred to full power into lowest rated impedance

*PMR:* peak to mean ratio, ie Crest factor

*wpc:* full power average (RMS) W/channel into the stated impedance; presumes a 2-channel amplifier

# Bias modulation

There is a development of class A amplification, one which redeems efficiency enough to make it less than a thoroughly anti-social technique for high power amplification. With *Sliding Bias* schemes, the signal voltage is arranged to modulate the quiescent current, so it can be kept to moderate levels when signal drive is small or absent. When signal is present, the bias increases to keep ahead of the instantaneous signal current. Overall, sliding the bias theoretically halves normal class A dissipation for a given power rating.

At the beginning of this decade, *Super-Class A*, a variant on sliding bias was sold to the public by oriental hi-fi manufacturers (notably Pioneer) as a sonic snake oil, one which would cure the ills of conventional class A-B amplifiers. These ideas appear to have originated from a stateside maker of OTT domestic amplifiers, and from a Plessey Patent[1], which lapsed in 1979.

Just one pro power amplifier family uses sliding bias, and not surprisingly it has outlasted and predates the fashions of domestic hi-fi—where is super-class A today? Malcolm Hill's *DX* series has been around in various guises for close on 17 years. Looking at the simplified circuit in **Fig** 4, the input signal is fed directly into a small power amplifier, which has a small voltage gain, but sufficient output current capability to drive a low impedance. In turn, its output is fed into a 1:1+1 transformer, which provides isolated bi-phase drive, in series with each output transistor's bias chain. The transformer-coupled drive looks idiosyncratic today. It's there to prevent the chain destruction that plagues direct-coupled amplifiers with bi-polar output transistors and also keeps stray DC voltages out of the output stage.

In common with all subsequent diagrams, the output transistors are shown singly for simplicity; in practice they are tandem-paralleled, of course. With nil signal, they are biased (like most class A-B amplifiers) to around 25 mA. For inputs above −40 dBVR, the bias current increases in proportion to the output signal voltage, up to a maximum of 1 A. This is a practical limit, above which the signal current oversteps the bias, for high drive levels into low impedances. Nonetheless, the output is still (arguably) operating in class A, since both 'halves' of the output are substantially conducting at all times.

Efficiency is a respectable 64% at best. Like a standard class A amplifier, it runs coolest when driven hard. On the other hand, efficiency isn't 'tuned' to a specific load impedance. Instead, it is inversely dependent on the speaker impedance, because the bias depends on the output signal's voltage, not current. Without a speaker connected, efficiency drops (rather hypothetically) to 5%. The same is true of low level drive (eg −15 dBWR) into high impedances (eg 15 Ω). Figures aside, history presents a broad measure of the essential similarities in efficiency and hence power density, between class A-B amplification and sliding-bias class A. When Hill's *DX 700* was introduced in 1978, it produced a combined output of 1500 W into 2 Ω from an enclosure just 2U high. For a long time, there wasn't a class A-B amplifier that could approach it.

# Introduction to class A-B (née B)

The class B category of operation is the starting point for the vast majority of power amplifiers made over the past 20 years, including most models with proprietary circuit topologies. On its own, class B operation indicates an active device (ie output transistor), which conducts over 180°. In other words, for only half a sinewave cycle. Painful! For audio, class B necessarily implies push-pull operation. As in **Fig 3**, the output devices are arranged in opposing pairs, or conjugate 'halves', but each half conducts no more than every other ½-cycle. The concept is attractive, because with one half being totally out of conduction for every other half sinewave cycle, the net dissipation in the two halves is bound to be less than that in a comparable push-pull output operating in class A, where both halves are dissipating waste heat all the time. Going by the textbooks, pure class B efficiency can theoretically approach (but never exceed) 78½%, a 156% improvement on class A's best efforts. In everyday figures, every 500 W of class A-B power produces at least 137 W of waste heat.

Unadorned class B operation is anathema to pure sound. Discontinuities in the signal waveform around 0 V arise because the output transistors in each half (whether they're the bi-polar or field effect variety) need to see and input voltage above a certain threshold (namely $V_{BE}$ or $V_{GS}$) to operate in their active region. Complex transfer curvatures of the kind shown in Fig 5 (A/B/C/D) result in a predominance of high, odd-order harmonics. The unpleasant sonic effect of the discontinuity is notorious as *crossover distortion*. It is universally overcome by biasing the output devices into their active region. Negative feedback assists tidying up but is no panacea; after all, linear circuit analysis commonly begins with the presumption that

FIG 1 VOLTAGE, CURRENT AND POWER RELATIONSHIPS IN CLASS A POWER AMPLIFIERS

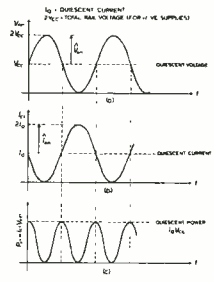


FIG 2 CLASS A OUTPUT STAGE WITH ACTIVE COLLECTOR LOAD

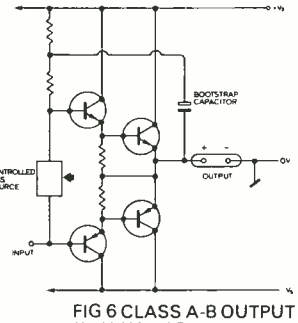



FIG 3 CLASS A OUTPUT STAGE PUSH-PULL CONFIGURATION

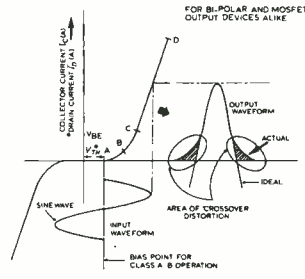



FIG 4 HILL DX SERIES SLIDING-BIAS OUTPUT SCHEME (SIMPLIFIED)

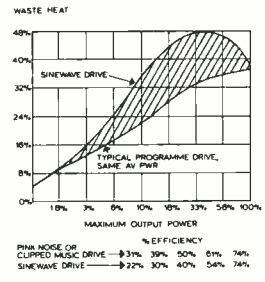



FIG 5 CROSSOVER DISTORTION IN CLASS A-B AMPLIFIERS

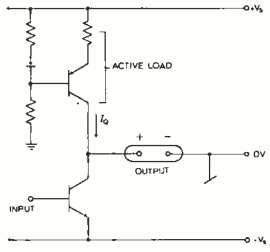



FIG 6 CLASS A-B OUTPUT STAGE (ELEMENTARY VERSION)

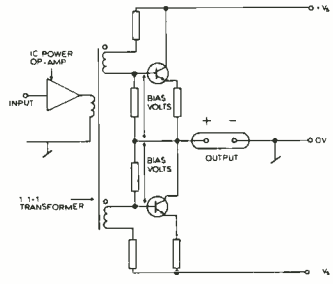
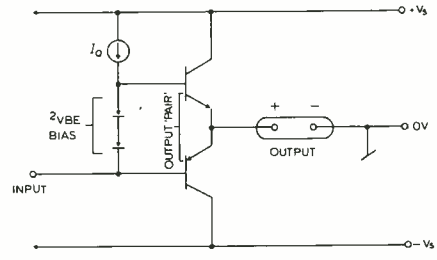



FIG 7 CLASS A-B EFFICIENCY



# WHICH AMPLIFIER TECHNOLOGY?

transistors are biased far enough into their active region to exhibit a useful degree of transconductance.

In practice, biasing (**Fig 6**) means 'spreading the legs' with $nV_{BE}$, and sending a small DC current through both halves of the output, leading in effect to class A operation for small output signals. So much accounts for the modern label 'A-B', defined as having a conduction angle beyond 180° but less than 270°. A-$B_1$ and A-$B_2$ are subvariants with different bias levels. In amplifiers containing bi-polar output transistors, the quiescent current needed to overcome rising distortion at low levels is small, at between 15 and 60 mA.

## *Value for money in class A-B*

**Fig 7** charts typical waste heat (as a percentage of output power) and efficiency statistics against percentage output power, for sinewaves and for varying kinds of music drive of the same average (RMS) power. Music drive appears more efficient, because above about −8 dBVR, the peaks are being clipped, which lessens heat dissipation. The envelope curve also encompasses small differences in efficiency arising from different output stage topologies. When driven at their rated maximum power, class A-B amplifiers are plausibly efficient at 74%, compared to 78% predicted by first-order theory. The graph also clearly shows that sinewave testing at about one third of full power is the acutest bench test of a class A-B amplifier's heat dissipation capability.

Out in the real world, the amount of waste heat varies as widely. It approaches 50% when a monitoring or PA amplifier is driven with heavily compressed or hard limited programme averaging −3 dBWR. Without compression, normal programme's average (RMS) power is nearer 10% to 15% of the instantaneous output. Then when a class A-B amp is driven just short of clip by an uncompressed recording in the studio, waste heat falls off to between 20% and 35% of rated output. Glowing amplifiers are the penalty for squeezing maximum volume into a recording or performance.

Hitherto, class A-B's opponents have focused almost exclusively on sonic quality in comparison to class A stages. With bi-polar transistors, it's well-known that the biasing required to 'tune out' crossover distortion is critically dependent on temperature.

Excess bias is as bad as too little. The desired bias voltage is commonly developed either with diodes or with a small signal transistor configured as a $V_{BE}$ multiplier. Then assuming all the semiconductors are silicon, the biasing element has the potential to track the output device's 2.2 mV/°C change in $V_{BE}$. Alas, so much presumes that instantaneous changes in output devices' junction temperature are *directly* experienced by the biasing components. At best, they're loosely coupled to the heatsink, so there's a time lag together with a shortfall in the peak temperature sensed. This leaves the output stage over, then under-biased, during and after loud passages. The overall scene is fairly complex, since the preceding tiers of driver transistors are equally subject to thermal modulation, and with smaller junctions, their transient thermal response is different again. The fact is that circuit developments aimed at overcoming the devious facets of crossover distortion are still being postulated, more than a quarter of a century after the problem was first recognised.□

In part two, Ben Duncan looks at more recent developments applied to class A-B amplification, including MOSFETs, Current Dumping and the Bridged-Bridge.

**References**


1 Peter Blomley: 'A new approach to class B amplifier design', *Wireless World*, Feb & Mar 1971

**Further reading**

J Carruthers: 'Power amplifier efficiencies', *Wireless World*, June 1973

Barry Fox: 'Nothing new in amp design?' *Hi-fi News & Record Review*, Jun & Jul 1981

D S Gibbs: 'Class A-B amplifier distortion', *Wireless World*, Aug 1970

J G Graeme: *Operational amplifiers—design and applications*, chapter 3, McGraw Hill, 1971

J Linsley Hood: 'Class A-B audio amplifier with reduced thermal dissipation', *Wireless World*, Jul 1970

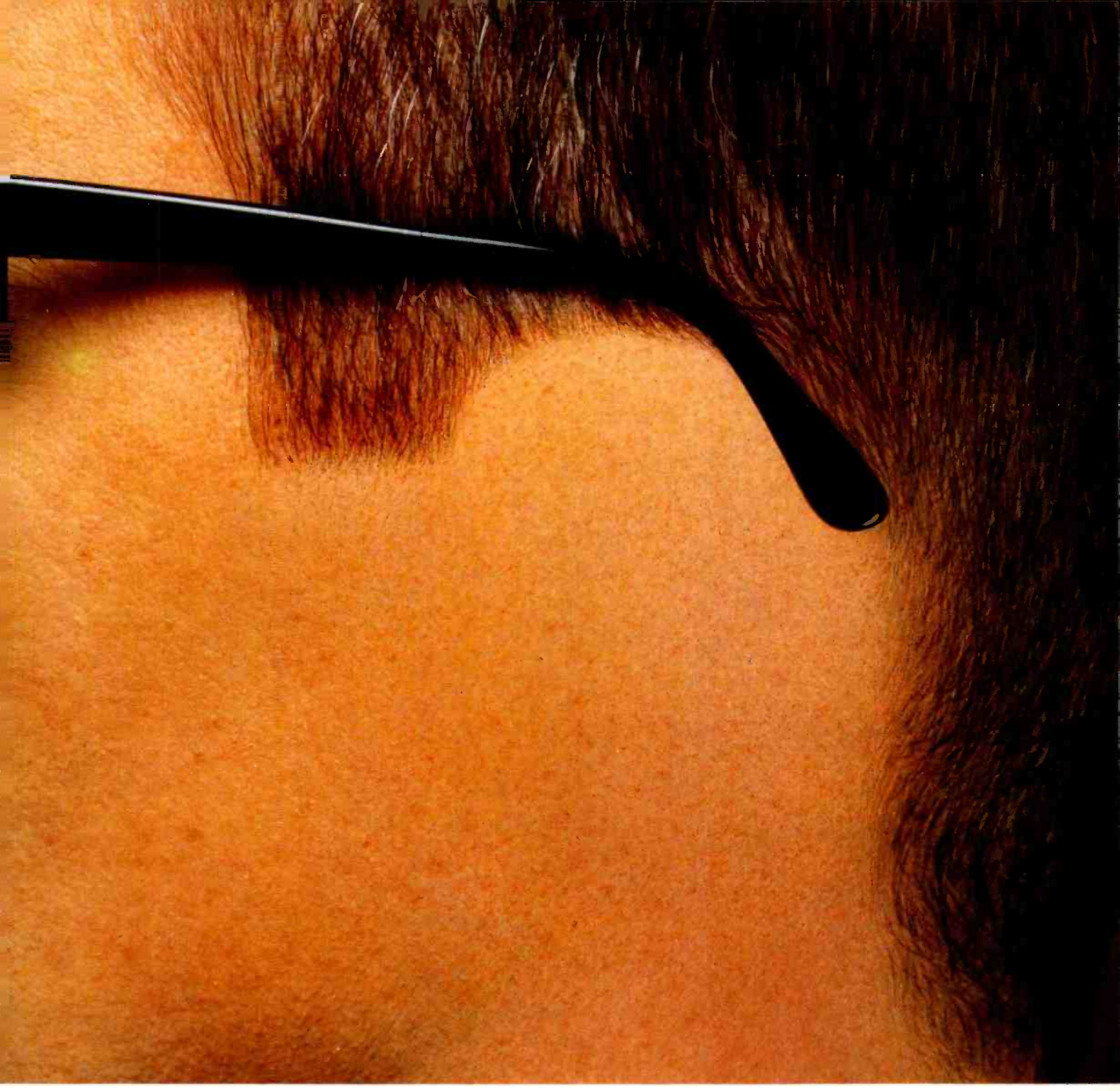
E Margan: 'Crossover distortion in class B amplifiers', *Wireless World*, Jul 1987

J Mead: *ProSound News Europe*, Amplifier Seminar, Aug 1988

L Nelson-Jones: 'Minimum standing current in class A', *Wireless World* Sep 1969

S Tanaka: 'New biasing circuit for class B operation', *J.AES*, March 1981

P L Taylor: 'Audio power amplifier', *Wireless World*, Jun 1973



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# MARTIN POLON'S PERSPECTIVE

It seems appropriate as we near the end of another year, to pay a kind of homage to an old friend now on its last legs in the more advanced countries on our planet. The LP will not be with us very much longer in the Western World. After years of long and valuable service, the record companies have decided that one of the reasons people are not buying CDs and CD players by the hundreds of thousands, is the competition from the poor old LP record. So the reasoning goes if you can kill off the LP record, you will help the CD.

Since this piece should end up in the December issue of this esteemed and valuable publication (note for editor: it is Christmas bonus time), it seemed appropriate to tell our story of the LP's demise around a simple parable with some lovable and not-so-lovable characters. With extraordinary apologies to Charles Dickens and to anyone else who ever loved *A Christmas Carol.*

*'A lot of the most loved Christmas music hasn't even been re-released on CD from LPs. The record companies are focusing on the 13 to 21 year old market and ignoring the maturing baby boomers. How much music is there for the 30 to 50 crowd?'*

It was one of those winter days when it felt so good to be alive. The snow crunched hard under Eby Scrooge's feet. The sun shone with a ferocity rarely felt on a winter's day. The English village glistened with the beauty of winter. The snow on the trees and on just about everything was still clean from last night's fall, so it felt more like Christmas than anyone could possibly imagine. Yet Eby Scrooge was miserable. He hated seeing all these people happy in their preparations for Christmas. Not enough of them would be out buying music as gifts. The record business and the audio business were in the doldrums. He had just made a deposit at the bank but it was not the kind of deposit that he liked to make. He could remember the time when Scrooge's Records and Tapes had been a gold mine. He thought of his clerk, Bobby Cratchit and he began to fume. His timing was good since he had just turned into the entrance for Scrooge's and could see Cratchit eating a sandwich at the checkout counter.

"How dare you take time off to eat a sandwich?" bellowed Scrooge.

"Mmmpph. I can't talk with my mouth full." Cratchit stuffed down the rest of his sandwich. "Mr Scrooge, I only took an extra 10 minutes off yesterday to look for Christmas presents for the children. Was that so bad? And the store is empty."

"Bahhh! Humbug!" bellowed Scrooge. "Do you know how insulted I was when you came in with a bag of LPs full of Christmas music for children, from somebody else's shop? I suppose you'll want to have Christmas Day off like you do every year? Well I'll have you know that I was thinking of having a Christmas Day jumble sale to get rid of all of those dreadful LP records that are taking up so much shelf space."

"Oh, Mr Scrooge," lamented Cratchit. "I am certain your LP records will sell out in a normal way. Besides, there are still hundreds of millions of LP record players in use in the world today. We have one. That is why I went looking for those Christmas songs on LP. They have not been released on CD. How can the record companies be so sure that killing off the LP is the right thing to do? And as for Sunday, I did promise the children and my wife."

"They know their business, those one's in London that run the record companies. They will make the right moves. And as for the Sunday sale, I'll run it myself if I decide to do it tomorrow morning," Scrooge reflected briefly, "It's getting late. These days the people don't buy much Christmas music."

"How could they, Mister Scrooge," whined Cratchit. "The record companies don't have an accessible 10,000 title catalogue like they did with the LP. A lot of the most loved Christmas music hasn't even been re-released on CD from LPs. Not everybody wants to come in here to buy Bon Amis or Eddie Machete and the Switchblades. The record companies are focusing on the 13 to 21 year old market and ignoring the majority population bulge of the maturing baby boomers. How much music is there for the 30 to 50 crowd?"

"If people want your damnable LP records so badly, why don't they buy them here?" Scrooge interrogated his assistant.

"Because they are buying them elsewhere. Your stock is so depleted no one could be sure of finding anything. Sure the record companies are phasing them out but you don't even want to give LPs a little bit of space. And they built your business for you. That's all you had for all of those years. LPs and 45s. And I'll tell you something else, Mr Scrooge, these people are buying their LPs on television. They are purchasing the Mitch Miller and Frank Sinatra and '50s oldies and Beethoven classics and so on and so forth via mail order. Stuff you don't carry because the CD boys haven't released it or it's hard to order. I know how many times I try to special order a CD and it comes back 'Out of Stock'. The CDs are pressed in runs and it seems that the kind of in-depth stock we used to access is history," sighed Cratchit.

"Let's close up at 5pm and head for home. I want to be off the street before all this Christmas stuff starts to happen. As for you, you can have the day off tomorrow but I'll make you work on St Valentine's Day when we will have a sale on CD-C discs. 'C' for Colour. We will sell only those romantic records that generate loving colour displays on the TV screen," Scrooge grimaced.

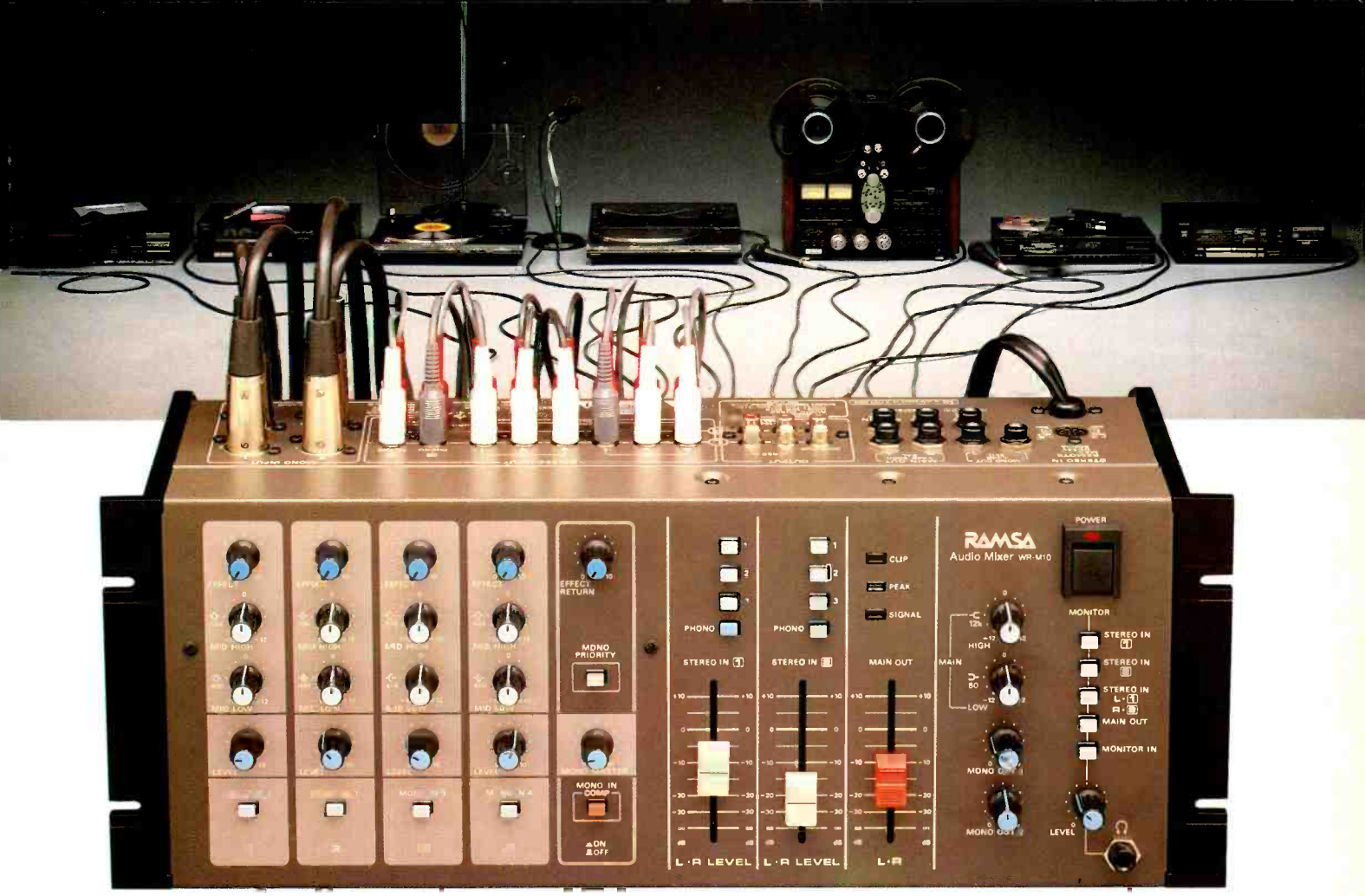
Scrooge locked up. Cratchit headed off to shop and home, warm in the comfort of the pleasure he anticipated with his loved ones. Eby Scrooge trundled slowly towards his flat. He stopped at the Rainbow Gourmeteria for a take-away dinner. He dodged several snowballs thrown by small boys and reached his humble abode. An odd thing happened while he was at the door. His door knocker appeared to assume a visage, that of Elvis Presley. The visage moaned, "Don't be cruel, you poor hearted fool."

Scrooge settled into his apartment, ready to enjoy an entire night of Randolph Scott westerns on the festival being run on Television 2. He devoured his dinner and sat glued to the TV tube. He was suddenly alarmed by the hideous sound of chains rattling outside his door. Thinking it might be his neighbour Slimnicki, who frequently got into trouble while practising Harry Houdini's old escape tricks, he opened the door. In walked Jake Marley, Scrooge's old partner in the record store.

"I'm glad you opened the door," said Marley. "It's so painful to try and walk through the door if you haven't got the trick down pat. The chains stick. I'm such a clutz."

Scrooge reacted with alarm. "You must be a bit of the Kiwi-fruit and venison croissant I had for dinner. You are nothing more than indigestion. Perhaps a spot of mustard I put on top of the croissant."

"Why did you have to mention food? Especially yuppie food. You knew I had chronic heartburn. I'm getting sick. And would you know, I still can't find a decent salt beef sandwich in London. Nobody knows how anymore. Nobody cares. The salt beef should be kept in barrels for. . .ahhh, enough. I just came to tell you to mend your ways before it's too late. And, oh yes, there will be three other spirits here to help you understand. Audio Christmas Past, Audio Christmas Present and Audio Christmas Future." Scrooge looked puzzled. Marley continued, "As for me, as if you should care, I'm going to New York to haunt Mayor Koch. It's a job; somebody has to do it. At

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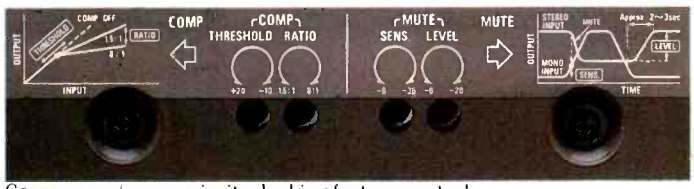


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## MARTIN POLON'S PERSPECTIVE

least they have decent delicatessens there." With that, Marley trudged out, clutching his heartburn.

Just after midnight, the window facing the street spun open and the spirit of Audio Christmas Past entered. It was Elvis Presley, in his mid fifties, with 50 pounds of extra weight and glasses. He looked like a used-car salesman from Cleveland.

"King. King, is that you. You look...sort of...like...a...used car salesman from Cleveland," Scrooge was incredulous. "I can't believe it."

"Believe it. It is I, Scrooge Baby. I got to find something to do with all my spare time. Grab my tassles and we shall look back at the rocking past." Elvis pointed to his oversized white suede jacket with tassles. Scrooge looked at Elvis's blue suede shoes, flinched at the colour combination (Elvis was always such an awful dresser), obeyed and they were off.

Audio Christmas Past was a happy place. Marley and Scrooge's Record Place was humming with activity. The store was thronged with customers buying LP records as gifts and for Christmas music. There was even a special display with holiday music. Young Eby Scrooge was talking to several teenage girls and pointing to an Elvis cut-out. There were LP records of all kinds—classical, rock and roll, country, jazz, dixieland, children's, movie scores, etc. It was as happy a scene as one could wish for.

The King turned to Scrooge. "Scrooge, old boy, you and Marley made a pretty penny with those LP records. And you were happy, then. Really happy."

Scrooge replied. "Yes, we surely did and we surely were." Before he could finish his statement, he was back in his apartment. "Oh, don't bring me back so soon." But the visit was over.

At the stroke of two o'clock, Scrooge was startled by the appearance of Nipper as the spirit of Audio Christmas Present.

"I cannot believe my eyes," cried out Scrooge. "It has been so hard for me to get anything to do," Nipper said. "I finally had to stop staring at that lousy horn. My neck got so badly twisted. I have to see a chiropractor twice a week now. Anyway, I thought I would show you what is happening in one part of the world where they are taking perfectly good LP records and destroying them. The LP is history as far as the record companies are concerned. Grab my tail, gently, gently and we shall take a ride."

Scrooge did as he was told and soon ended up overlooking a vast municipal dump. A large bulldozer was running back and forth, over and over a veritable sea of LP records without jackets. The records were being bulldozed into rubble. A dump truck was unloading even more records from its rear. "Who is doing this?" Scrooge asked his guide. Nipper could only shrug. In so doing, Scrooge was placed back at his home.

At the chiming of four, Scrooge was joined by a ghastly apparition clad only in sack cloth. Scrooge enquired, "Are you my guide to the future?" The apparition only nodded and gestured to Scrooge to grab a piece of the fabric. Scrooge was whisked away.

Audio Christmas Future was frightening. Scrooge's Records and Tapes had been replaced by a women's underwear company. 'Power Lift Manufacturing' the sign said on the door. 'Home of the Rawhide Brassiere. Herd Em Up, Head Em Out, Rawhide.' It was so embarrassing. "Is this all that came of my efforts?" Scrooge moaned tearfully. The apparition shrugged. "What happened to the CD?" Scrooge asked.

The apparition pointed as Scrooge was whisked to yet another place. The spirit carried Scrooge over a scene of devastation. What had been part of the Little Chomley Home For The Overweight, was now just an empty shell. Something had blown the roof off and some of the walls out. "What happened?" Scrooge asked the spirit, horrified.

"CD-Vibro," came back the answer. "CD players with a special output for vibro-massage chairs. The sound generated by the CD would modulate your chair. You would lay back and get a soothing massage if you chose classical music or a more active one with pop music." The spirit gesticulated. "It was the *1812* that did it. At the end. They had hooked up all the chairs in the solarium. Invited the old fat folks in for the concert. Critics had tried to warn the record companies to turn down the cannons by 6 dB. Just 6 dB but they wouldn't listen." Scrooge turned away.

The apparition carried Scrooge back to his home town and chanted. "There is no music here. Your store is gone. All the other stores are gone. The public couldn't deal with CD, CD-3, CD-Colour, CD-Graphics, CD-Interactive, CD-MIDI, CD-ROM, CD-Video, CD-etc, CD-etc. After the LPs disappeared from the scene, there was a new format every three years. Digital Audio Tape (DAT), recording optical disk, ROM chip—they just kept on coming. If only there had been something familiar for those who were slow to change or could not afford it."

"Oh, spirit, what can I do to change the course of the future?" pleaded Scrooge. The spirit only pointed to the desolate town without music and Scrooge found himself falling towards it at a sizable speed. He woke up the next morning, Christmas morning, on his own bed. You know the rest. He bought Tiny Tim his own LP record player, had a large turkey breast stuffed with turkey and lingonberry mousse plus sweet potato souffle with minced red pepper delivered to the Cratchits.

Scrooge began the project of having his store carry the biggest and best stock of LP records in the area. He even began to carry the output of small record companies and foreign pressings. The store received a new name and Scrooge a new partner as Elvis Presley came on board. 'King and Eby's Music Nook', the sign said. Bob Cratchit was made general manager and given a profit sharing plan. Tiny Tim was brought in to stock the heavy metal section. And no man could say that anyone honoured the LP at Christmas better than Eby Scrooge.

Needless to say, the above parody was a way to have a little fun with a topic that should have been taken much more seriously by the members of the audio and record industry. It seems to make sense to keep a format that will continue to generate sales for the industry well into the next century. With nearly 100% saturation in the consumer marketplace, the LP format still has viable commercial life vis-a-vis the CD with its saturation percentage in the low teens. It seems to make sense to ease consumers from the LP into the CD rather than drastically pulling the LP rug out from under them. It also seems to make sense not to discard the LP format on the general issue of quality. Recent work with laser tracking of LP grooves promises to deliver near digital quality with no groove wall wear. And, for that 25% of the population in the Western World who has not struck it rich and subsides near the poverty line, the LP still offers an acceptable source of musical entertainment.

It does seem that these factors are not being considered because basic bottom line profit issues are. The profit for all concerned—the record company, the dealer, etc, is roughly twice as great for the CD as it is for the LP. Also, until recently the LP was generating more than twice as many returns as the CD. Lessened quality control at some CD facilities has been increasing that return rate recently. And there is, as we have previously indicated, some feeling among record company types that the number of LP records sold directly subtracts from the number of CD records to be sold.

But the course of progress does seem to be irreversible here. It is clear that the LP will soldier on in third world and iron curtain countries for some time. It will not soldier on in the Western World. The LP is dying; it will just take a long time to do so. To paraphrase Don McLean's much beloved classic paean to the music, "Bye, Bye, Miss American Pie. Took the Chevy to the Levee but the Levee was dry. Good old boys drinking whisky and rye. That will be the day that the LP music died."□

# BARRY FOX'S BUSINESS

During November Michael Webber staged a jazz concert at the Purcell Room on London's South Bank with no amplification whatsoever. If the Purcell Room experment works out, Webber will try a similar concert in the larger Queen Elizabeth Hall next year.

This reminder was prompted by several visits to the JVC Jazz Festival concerts in London and New York. The New York concerts were spread between several halls; the London events were all at the Royal Festival Hall.

I was in New York interviewing Avery Fisher, the audio pioneer who sold his company and used the money to rebuild the acoustically disastrous Philharmonic Hall at the Lincoln Center, which now bears his name. As the concerts I saw at the Avery Fisher Hall featured the electric rock band of Miles Davis and electric blues band of B B King, high level amplification was obligatory. So there was no way of judging the acoustics other than by applause. But on just one occasion, apparently by mistake, one of the musicians played mouth harp without any amplification, and it filled the hall as clear as a bell.

Ella Fitzgerald played the recently refurbished Carnegie Hall, with a piano trio. Amplification was again obligatory (especially because Ella has recently been very ill) but it wasn't oppressive, and the sound of the hall still rang through, especially on applause.

At the New York Town Hall, which has a lovely live acoustic, a concert of piano trios was completely, utterly ruined by blockbuster over-amplification. Like others, I left early.

In London a generally fine set of JVC concerts at the Festival Hall culminated in a performance by British pianist George Shearing, on extended holiday from America in the Cotswolds.

"No man should work too hard if he has the health and strength to stay in bed," explains Shearing.

Playing with just string bass accompaniment, his piano was covered with two mics. Although the sound system was turned down, near the front of the hall we heard a mix of sound; the glorious live sound from Shearing's grand, roughened at the edges by a quiet sandpaper sound from the speakers. Why? The system had sounded fine on other nights when cranked up to rock levels.

How many engineers, when designing or buying high power amplification, consider how it will sound when turned down to very low level? All too often equipment that sounds good at blitz volume, buzzes loudly in the background while roughening foreground sound at low gain.

All I know is that I would have gladly paid extra to hear just the sound of Shearing's piano Since when has a solo grand been unable to fill the Festival Hall?

Michael Webber may be the one to find out. It's worth bearing in mind that Webber is also responsible, through English Heritage, for the open air concerts held through what is laughably known as the British summer, at Kenwood in North London. For more years than anyone can remember, the live sound of the orchestra in the Kenwood concert bowl shell has been boosted by speakers hidden in the trees. R G Jones has long had the sound reinforcement contract and Webber expects only a few letters of complaint after each concert. Most of the audience don't know there is any electronic aid.

The last night of this year's season only showed its electronic pedigree when the organ in Malcolm Arnold's Concerto Opus 47 started to sound horribly distorted. Rather than direct-inject, the organist was playing through speakers at the back of the shell, which were then covered by PA microphones. The sound of the on-stage speakers has to be kept low, to avoid drowning out the orchestra, so the mic level has to be kept high, which means that background noise as well as any distortion is cranked up.

Michael Webber has an ambivalent attitude towards the weather. If it is wet and cold, then only around 3,000 people turn up. The speaker system can be run at low level but the concert risks running at a loss. If the weather is good, then the audience trebles and the sound level must go up if those at the rear are to have any chance of hearing. Inevitably this makes people in the deck chairs at the front only too well aware that they are hearing something other than live sound.

Many years ago Sir Clive Sinclair, then Clive Sinclair, sold hi-fi systems. Although neat and innovative, it was pretty unreliable gear. Most innovative, and most unreliable, was a switching amplifier. These were very efficient, until they blew up.

Conventional linear amplifiers use the input music signal to modulate the flow of DC electricity through transistors. Over half the DC is converted into heat and wasted. In a switched amplifier, the transistors do not vary the DC smoothly. Instead they turn it on and off sharply, like a light switch. So the output is a series of electrical pulses that vary in size depending on the strength of the input signal. If the transistors switch very rapidly, the pulses are very small, and they merge together into an accurate but greatly amplified replica of the original signal.

The technique is known as Pulse Width modulation. In a PWM amplifier very little electricity is wasted as heat. But, as Sinclair found out, the circuit is likely to self-destruct.

Around 10 years ago Sony announced a PWM amplifier, and demonstrated it in London. But the amp was never sold because it switched at 500 kHz. The loudspeaker cables functioned as an aerial to radiate powerful signals in a band exclusively allocated all round the world for marine distress and safety calls!

Recently, two companies, both by coincidence from the Massachusetts area, announced new switching amplifiers. Copley Controls sells what is arguably the most powerful amplifier system in the world. Although designed to drive industrial equipment it is doubtless only a question of time before the audio industry latches on.

The Copley amplifier was designed by Richard Burwen, of noise gate fame. It costs $18,000, switches at 80 kHz and can generate 36 kW of output power while dissipating only 1,500 W as heat. If 30 of these amps were ganged together they would generate a megawatt of power, which mimics whatever low level signal is fed to the input.

The output signal can be used to drive a motor to shake a test bed, power the magnets used in a medical magnetic resonance machine, steer the beam in an X-ray lithography unit for making microchips, scan a proton beam over a cancer tumour or pump pulses of power into a spot welding machine. The system is already being used to feed data pulses into a sonar transducer, which transmits a 5 Hz sound signal under water from San Diego to Hawaii. People living near Wembley Stadium can only hope no-one brings in a stack of Copleys for next year's concert season.

The other firm in the switching business is Bose. The *Acoustimass* is designed to produce a very loud sound from a small cabinet in clubs, discos and concert halls. Bose charge around £4,000 for a 400 W system. Because the amplifier is 90% efficient, it generates so little waste heat that it can be built into the same cabinet as the speakers.

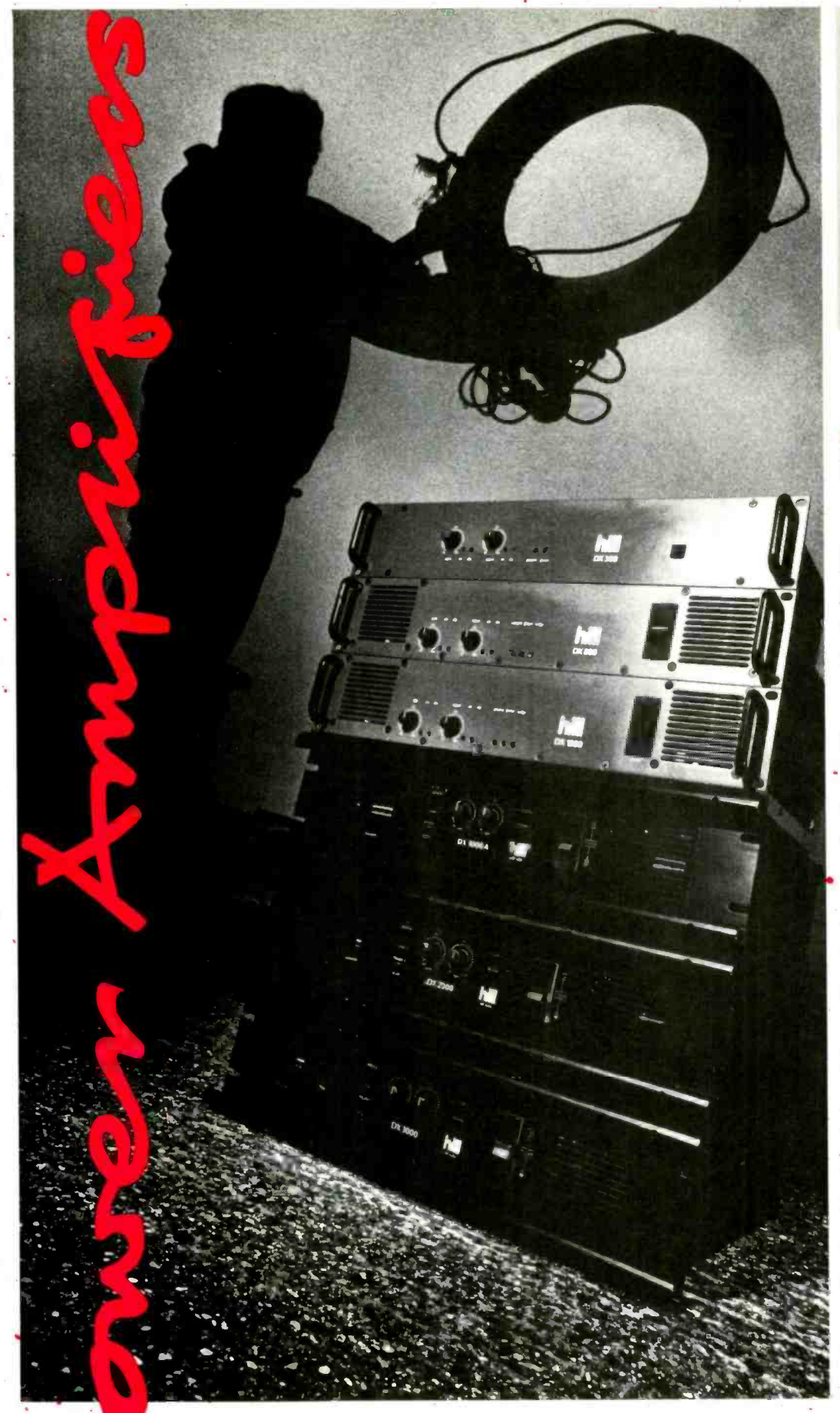
Combining the loudspeaker and amplifier not only saves space but makes the system self-cooling. As the diaphragm of the loudspeaker moves, to pump air, it also circulates air inside the cabinet and round the amplifier.

I wish I could offer some more technical details on how the Bose amplifier works but the company is being mysteriously uncommunicative. There is vague talk of a carrier at 15 MHz and 100 kHz sampling. Quite simply no-one inside Bose UK can get a sensible answer out of Bose's head office in America.

This may be because the Massachusetts engineers are smart enough to know that they have a potential problem of radio interference on their hands. Or it may be just another example of lack of communication between Bose in America and Bose UK.

While pretending that Britain and Europe are important markets, Bose's American head office still does not consider it worthwhile sending over a knowledgeable engineer when a new product is launched. The British take questions, pass them back to Mass and get only silence or a knee-jerk 'it's secret' response.

Being translated, the reply 'it's secret' from an American company all too often means 'I haven't got time to waste on limey questions'. The pity is that on the occasions that I have visited Bose in the USA, I have always found head man Amar Bose courteous, patient and frank. Some of the marketing middle managers in Massachusetts could learn a lot from their boss.

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# ROPEWALK

## *Patrick Stapley spins a yarn about a Dublin digital studio*

The old Regal cinema is situated about two miles from the centre of Dublin in an area called Ringsend. It has a double claim to fame—it was built as Ireland's first cinema and it now houses the country's first digital studio.

Ropewalk is the newest studio to appear in Dublin having only been open for a few weeks on my late summer's visit. It is the brainchild of Peter Williams who is an ex-director of perhaps Ireland's most famous studio—Windmill Lane. Williams comes from a background of computer systems design, which, allied with his musical abilities, led him into Fairlight programming: he was responsible for the Fairlight on U2's album *The Joshua Tree*. He also set up a 16-track facility before joining Windmill Lane. Williams has the reputation of being a 'keyboard maniac' and Windmill Lane's Studio Three, which is a computer music facility, bears this out. It is quite surprising then to find that his new venture caters very much for 'real' instruments.

"I didn't want to create another Windmill Three with wall-to-wall keyboards, so I designed a multi-purpose recording facility with varying acoustics."

What is not so surprising is his commitment to digital and the inclusion of a full Mitsubishi package consisting of an *X850, X86 HS* and the *Westar 8000* console. Why had he gone for Mitsubishi?

"I chose Mitsubishi against Sony for two reasons. Firstly, I don't hear any change in the recorded sound with the Mitsubishi but with the Sony the playback sounds sharper. Saying that it sounds 'digital' is the kind of comment I abhor, but it happens to be the case. Secondly, I like having 32 tracks on one machine, which is enough for most things. The *Westar* desk was the obvious choice because of its low noise floor and also it's quick to work on, which is essential for freelance engineers. I've always found SSLs a bit fussy with a lot of functions that nobody needs, the *Westar* is much more compact. I also think it sounds very good."

The studio took about a year to come together with a lot of time spent experimenting and fine tuning. Williams has no qualms about pulling things down if he believes an improvement can be made, and he quoted various examples of ripped up floors and demolished walls. One aspect that required special attention was the soundproofing, as Ropewalk shares the building with some other businesses. To be precise—a bakery, a photographic studio, a seamstress and a carpenter's workshop. The answer was a great deal of concrete, and having nipped upstairs to hear the chippies at work, I can safely say it works extremely well!

The studio, kitchen and bathroom areas are crammed into the ground floor, taking up the space that would have occupied the old booking hall through to the back few rows of the stalls. There are a couple of small basement areas used as an office and a TV lounge.

The studio consists of a six-sided control room with a slightly raised machine room at the back, and three wraparound recording areas. To the left of the engineer is a small tiled vocal/guitar booth, in front is a high ceilinged live room and to the right a dead room. Each area has a connecting door, and entry from the control room is via the booth. The only disadvantage here is that a reasonable amount of space has to be kept clear to allow for access. Visual contact is excellent both between individual rooms and into the control room.

The live room is the largest of the three with a floor area of 365 $ft^2$ and a height of 18 ft. It's a mass of angled, reflective surfaces with nothing in parallel; even the oak flooring is irregular, rising up to meet the walls in a couple of corners. It has the uncanny effect of producing an acoustic that sounds much bigger than its physical size and there are future plans to build in a variable damping system. The overall effect is reminiscent of a church, and to add to this religious atmosphere, a church window can be projected on to the back wall. As I was reminded, "This is Ireland, you know!"

Walking from this environment into the dead room is quite a shock to the ears, as suddenly all the reverb vanishes. This room has a floor area a little under half that of the live room's and a much lower ceiling. It has been treated with three specific acoustic materials—Rockwool, Revac and a spray-on mineral fibre. Revac is a bitumen rubber material that acts as a bass absorber and is used in both the walls and the ceiling. Above the ceiling is an 8 ft void, which has been sprayed with 8 inches of the mineral fibre, making it an effective anechoic chamber. The end result is an acoustic with every bit of life sucked out of it.

Each of the three recording areas has its own set of lines including MIDI. Foldback can either be conventional or the

# ROPEWALK

artist can mix his own using the 8-way Nemesis *X 1000* system. There is also provision for the artist to talkback directly to the control room, via the PFL speaker in the console. High impedance, no loss jack sockets are wired into each room being ideal for itinerant guitarists.

Microphones available are B & K cardioids, AKG *414 ULS*, Neumann *TLM 170* and *U89*, Electro-Voice *PL 20*, Shure *SM 58* and *59*, Sennheiser *MD 421*, Beyer *M88N* and Crown *PZM 30 FS*. There is a choice of headphones between Beyer *DT 100* and Sennheiser *414 SL*.

The control room, by modern day standards, is not vast, 345 $ft^2$, but due to a sensibly positioned outboard rack and the separate machine room, it doesn't feel cramped or cluttered.

The room itself was designed away from the traditional compression formula to achieve a more even sound—what Williams calls, 'a living room acoustic'. Its treatment was similar to that used in the dead room but much less severe, so retaining a degree of liveness.

Due to the visual contact with the recording areas and machine room, there are a lot of large glass surfaces surrounding the room. My impression was that this would cause all kinds of reflective problems but through some clever angling and general tuning, there seems to be little to worry about.

One thing that is unusual is that all the monitoring is nearfield, with a choice between Yamaha *NS 10*, Acoustic Energy *AE1* and Westlake *BBSM 12*. The Westlake speakers are huge and look unwieldy so close to the desk but that is the way they are intended to work. Again, this is Peter Williams' decision.

"I've never felt instantly happy with large built in speakers, whereas nearfield monitoring gives a much more natural 'hi-fi' kind of balance eliminating a lot of the room effects. The Westlakes have a much better bass response than the two smaller monitors, so they give a good indication of what's going on in the low end."

The two smaller speakers are driven by Quad *520* amps, the Westlakes are powered by an 800 W BGW *GTB* amp.

The *Westar* console has been fitted with TBA (Tape Based Automation), which is a hard disk system providing control for faders and mutes. An ingenious idea, yet to be put to the test, is to reflect the VDU display on to a suspended piece of glass in front of the console—like a newsreader's autocue. The display would only be visible to someone seated at the mixer and would completely disappear when viewed from the recording areas.

Outboard equipment comprises the Lexicon *480L* (which was the only one in Ireland at the time of writing) and *PCM 70*, Yamaha *REV5*, TC *2290* with 8 secs and a fast trigger, dbx *166*, UREI *1178*, BSS *DPR 502* comp/lim/de-ess, Summit *TL 100A* valve limiter, Drawmer gates, BSS *DPR 502* midigates, Symetrix open-ended stereo noise reduction, Galien & Krugger preamp, Nomad *Axeman* and *Bassman*, and on order is an Eventide *UltraHarmonizer*.

The studio also offers a Sony DAT machine, an Adams-Smith *Zeta 3* synchroniser, and a Nakamichi *MR1* cassette machine, which is the only analogue machine in the facility. The studio has been prewired for analogue and video requirements, and Dublin provides a good 24 hour hire service supplying most things.

How is digital recording regarded by Irish artists? "Digital doesn't seem to be a huge selling point yet in this country, some bands just don't think their music justifies it and are quite happy sticking to analogue technology. So locally the studio is pushing the fact that its a brand new facility with state-of-the-art equipment with round the clock technical back up. As far as the UK and USA are concerned, we will be promoting the studio as a competively priced digital facility with no hidden extras."

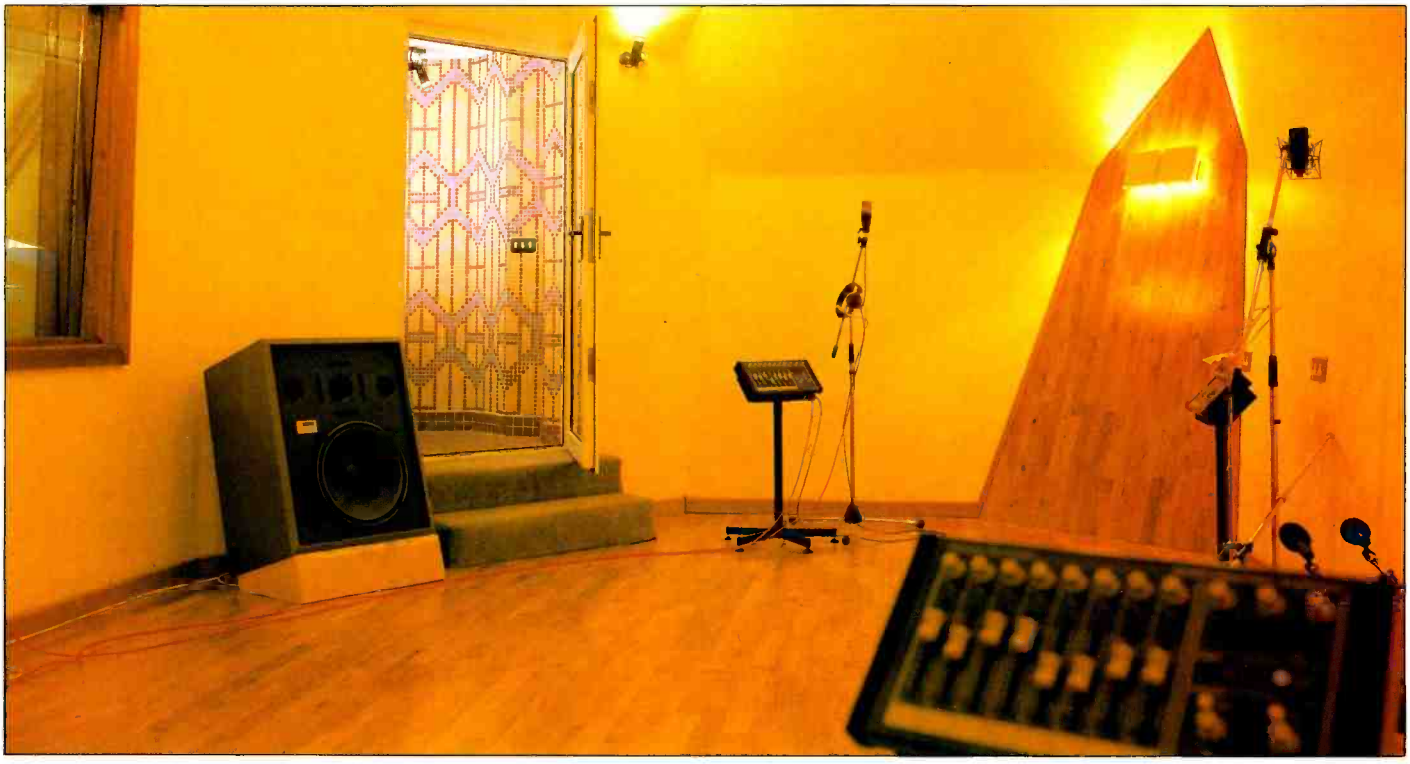
The small staff at Ropewalk are friendly and enthusiastic. The technical people all have some past connection with Peter Williams, and there is definitely the will to succeed about the place.

Expansion is perhaps not the first thing to think about when a studio has just been completed but already the dead room is about to be extended, adding an ambient area, which will include a piano. There are also plans to build a 'Crystal Room', which would have a tunable musical acoustic. But perhaps the most exciting idea of all is to develop the upstairs area, which still retains the top half of the old auditorium with its curved ornate ceiling and original projection rooms; it's tailor-made for a film scoring studio.

Expansion or not Ropewalk already offers a comprehensive facility, and with flights from London taking an hour and costing very little this could be a very interesting alternative.

Finally I had to ask someone the burning question that had been bothering me all day: why is the studio called Ropewalk? The answer lies in a long straight road, just around the corner, which was used many years ago for laying out and treading hessian for rope manufacture.□

**Ropewalk Studios, Regal House, Fitzwilliam Street, Ringsend, Dublin 4, Eire. Tel: Dublin 609628.**



# REVIEW

## *A user report on the Lexicon 480L digital effects system by Patrick Stapley*

In recent years the market has been flooded with cheap multi-effects units and as a result, sales of some of the more expensive signal processors have been diminishing. Lexicon have responded to this by introducing the *480L* as their top of the range digital effects system. It is not only considerably cheaper than the *224XL*, but effectively it's two units in one.

The *480L*, as far as the user is concerned, looks and operates like the *224XL*; the familiar *LARC* controller being the focal point. Programs are still organised in Banks, with user programs being stored in Registers. What has changed is the addition of a data cartridge for storing and downloading user programs. The programs themselves all comprise newly written software and cover a comprehensive range of signal processing. The system has been designed with digital use very much in mind, and there is also thorough provision made for MIDI.

## *Operation*

The *480L* can be configured to operate in one of four different modes: Cascade, Stereo Split, Mono Split, or Single. Cascade receives a stereo signal, which is processed twice by outputting one program directly into another. Stereo Split allows the signal to be sent to two programs simultaneously, while providing separate stereo outputs. Mono Split behaves like two independent units with mono inputs and stereo outputs. Single is used for certain programs, like stereo sampling, where a great deal of processing power is required and consequently an additional program is unable to run. When two programs are being used the *480L* distinguishes them as, 'Machine A' and 'Machine B'. Each is accessible through a single *LARC*, with the Mach button toggling between programs. There is a *LARC 2* connector at the back of the unit, so it's possible to have two *LARC*s with a program set-up on each. I was surprised, though, just how easy it was working with one *LARC*: due to the display giving a clear indication of which Machine has been selected as well as program details, there was no confusion over which program was currently under control. Another case for having two, would be if the *480L* were shared between separate control rooms but I would feel slightly uneasy knowing that the engineer next door could interfere with my settings. The *LARC 2* connector can also be used to connect directly to a *224XL*, thus providing a total of three programs that can be controlled by one *LARC*, in this event the programs are referred to as Machines 1A, 1B, and 2. The *224XL* does not acquire any new capabilities through this link-up.

The configuration I found most useful, for general multitrack work, was Mono Split. Although one sacrifices the stereo input, it gives the greatest flexibility, and during recording I found it particularly handy having one program set-up as a monitor reverb, while using the other to try out and record different effects. The four configurations are accessed by switching to Control Mode, page 1, where slider 2 will move through the choices. The Control Mode has a total of five pages and is also responsible for altering the sampling rate between 48k and 44.1k, changing the clock source from internal to external, switching between analogue and digital inputs, controlling various functions connected with the moving/copying/deleting/protecting/naming of registers, and controlling MIDI functions. All these functions are implemented using the Page button and sliders once the control mode has been entered.

As with the *224XL* modified programs are stored in Registers. There are 10 Banks each containing 10 Registers: Banks 1-5 are internal, Banks 6-10 are stored on the cartridge. One formatted, 64k, non-volatile cartridge is supplied with the unit, and subsequent cartridges must be formatted by the user. The cartridge was put through some temperature tests to see if extreme heat or cold conditions would affect its memory: there were no problems. The cartridge offers a much better storage facility than the previous method of dumping to cassette, and is a lot quicker to use.

The preset programs are contained in nine Banks, and each Bank holds a maximum of 10 presets. Program loading is carried out as before using the Bank, Program and numerical buttons. Likewise parameters are arranged in Pages and are edited with the six sliders.

## *Reverb programs*

The reverb programs are arranged in the first four Banks: Halls, Rooms, Wild Spaces and Plates. They use one of two algorithms, which differ in their treatment of reverberation density and consequently it is important to pick a program with the correct algorithm for one's needs, before editing parameters. There are four pages of parameters.

A good way to begin building a suitable reverb is to locate a program that is close to what you have imagined and use it as the basis. The first change to make might be to adjust the Size and this will give a read out in metres, being approximately equal to the longest dimension of the ambient space. The Size control directly affects two other parameters, RT Mid and Spread. RT Mid sets the reverb time for the mid frequencies but it also changes the RT at the bass end. This is because bass RT is calculated as a multiple of the RT Mid value, ie if the RT Mid were 2 s and the Bass Multiply parameter were set to 1.5, then the reverb time for the low end would be 3 s. As a rule a good natural sounding reverb will have a Bass Multiply value of 1.5 or less. Spread controls the duration of the initial part of the reverb: low settings produce a quick build-up with little sustain, and high settings create a more gradual rise time with longer sustain. Spread is closely associated with Shape, which controls the contour of the reverberation envelope. A way of thinking of these controls, is to make an analogy with a synthesiser and imagine Shape as the attack control with Spread determining the length of the attack.

In many cases a simple adjustment in Size is all that is needed to 'sit' the reverb into the music, whether it be a large hall or a small room, but there are a number of other parameters that can

# REVIEW

be changed. HF Cut Off sets the frequency at which a 6 dB/octave lowpass filter comes into play; Predelay will delay the onset of reverb up to a maximum setting of 510 ms; Crossover determines the transitional frequency for Low and Mid RTs; Pre-echoes have adjustable delays and levels; Diffusion controls the build-up of initial echo density and is used in close connection with Pre-echoes; RT HF Cut sets the frequency above which the sound, excluding any Pre-echoes, decays at a quicker rate; Decay optimisation—which consists of two modes: Reverb and Effect—changes the way a program behaves in relation to input levels, with the intention of producing a more natural sounding decay. Effect also disconnects the link between Spread and Size and is used to produce some interesting alternative reverbs like those found in the Wild Spaces programs.

Lexicon's philosophy on pre-echoes is quite interesting and they refer to it as, 'The Early Reflection Myth'. They qualify this by pointing out that most reverb units create early reflections by simply introducing delayed versions of the source. In a real hall, due to its complex shape, the reflections are smoothed or diffused, with their time and frequencies being altered. Also, different instruments will produce their own characteristic result, rather than all sharing the same treatment. In other words there is a great deal more subtlety than was perhaps originally imagined and, interestingly enough, some of the best halls for recording in, produce early reflections that are hard to distinguish as discrete pre-echoes. For this reason the *480L* programs that use pre-echoes, incorporate them as diffused clusters. Even so, Lexicon recommend that pre-echoes should be treated with a certain degree of caution.

Two programs that provide a good example of the effect of early reflections are, Large Hall and Large + Stage. Both programs are identical except for the introduction of six pre-echoes in Large + Stage. These pre-echoes are designed to emulate the reflections caused by the stage area, thus switching between programs moves the musicians from the middle of the hall and on to the stage. The effect of the pre-echoes is to give an initial feeling of definition, and when one visualises the concept, the results are very realistic. Medium and Small Halls also have preset Stage programs. Other programs in this Bank include Large and Small Church, which produce a 'darker' sound than the Hall programs with longer RT values. There is a Jazz Hall, which provides a nice bright, small sounding hall and Auto Park, which has a slow build up, long sustain, slow decay and lots of hard reflections—putting a snare drum through it is reminiscent of slamming the exit door in an underground car park!

The Room programs begin with Music Club, which is the largest and sounds like a smaller, more dampened version of Jazz Hall. There are then four Rooms, decreasing in size from 19 m to 4 m. These are followed by the brighter but less tight sounding Wooden Rooms, which are based on an interior made from thin wooden panelling. Two sizes of Chamber are provided, and the last program, Small & Bright, produces a very present, up front sound, which can be useful in putting something at the forefront of a mix.

Plates consist of a Bank of five programs, of which A Plate is a good all rounder. There is a plate designed specifically for snare, with a couple of pre-echoes built in at 110 ms and 152 ms, this along with its extremely bright characteristic, makes snare drums literally 'sizzle'. The three other presets sound as their names suggest: Small, Thin, and Fat.

The remaining Bank of reverb programs contains a selection of presets built around reverb effects. Brick Wall and Buckram are similar programs each having an inverse and gated characteristic, which are useful for adding fullness without getting too much in the way. Big Bottom, on the other hand, as one might expect is quite obtrusive, and accentuates the bass RT producing a boomy effect. 10W-40 and 20W-50 are meant to simulate the inside of oil drums, and they sound short, dull and dense; 20W-50, in Lexicon's words, is meant to represent a more aggressive oil drum. Metallica is a large full sounding reverb with lots of hard echoes, which has been designed with heavy metal bands in mind. Silica Beads gives a shimmering effect, which can be interesting if used sparingly. Inside Out creates an inverse reverb, which worked especially well on percussion. Ricochet bounces an echo from left to right in a large reverberant space. Varoom is a dense reverb within which there is a lot of stereo movement.

## *Effects programs*

Bank 5 contains programs that create effects based around delays. It is the variation of these delays that is fundamental in producing sounds like phasing/flanging and multitap echoes. There are a maximum of 40 voices derived from the input, which can be manipulated in various ways. The delay of each voice can be set collectively with the Length parameter: the value being the Length setting (ms) divided by the number of voices that are being used. The Wander control can then be used to set-up a random delay

response, whereby the delays increase and decrease in relation to one another, with the Wander range being set either in microseconds or milliseconds. The Spin parameter controls the rate of Wander, and the fewer voices used the faster the speed. Slope is a linear parameter that sets the level of the delays over time: with lower settings it produces a natural decay, with higher settings the decay is inverted producing backward effects. Feedback is provided with level and delay controls enabling the re-fed signal to be heard later in the effect. Like the reverb programs there are Predelay and Diffusion parameters. There is also an Input Delay, which is used, in conjunction with the Wet/Dry Mix slider, to delay the input against the effect, this can create some interesting 'preview'-type effects, where the effect is heard before the source, but the source will, of course, become delayed in relation to the track. A highpass 12 dB/octave filter is provided on each input.

The presets provide a good cross-sectional range of effects, some of which are quite complex. Illusion is a modulating, phasey program with panning, which can be used to produce pseudo stereo; it can also add an interesting spatial quality to mixes if used sparingly. Surfin' is another phasey program that gives the effect of the sound moving around in circles. Vocal Whispers is one of the programs mentioned earlier that uses Input Delay to put the effect before the source; it is intended for use with vocals and consists of a number of delays. Doubler produces a phasey, thick double tracking. Back Slap gives a slap back effect with an inverse characteristic. Rebound also produces an inverse effect using a steady build-up of close delays, which have themselves been predelayed. Elinar seems, as the manual suggests, to have a bit of everything and it produced a fat sound with phasing and widening properties. Sudden Stop sounds like a course, grainy, gated room. In The Past uses diffused voices over 500 ms with an inverse Slope, the source is delayed to appear at the end of the build up, thus producing an effect not dissimilar to backwards reverb. Tremolo L & R gives a stereo tremolo effect like an autopanner, with the Spin slider controlling the speed.

## *Sampling*

The sampling programs are contained in two Banks: Bank 6 is for general use, and Bank 7 is designed for drums. The difference between these programs is the way the sample starts, either with a 5 ms fade up time, or a hard start in the case of drums. Depending on the program the sample can be: mono, stereo, various lengths, played backwards, or pitch changed. The maximum sampling time, when the unit is set to 48k, is 5.2 s in mono and 2.6 s in stereo. However, there is an option available, called SME sampling, which provides 24 s of mono, and 12 s of stereo with a reverse playback capability.

Some of the display buttons, at the bottom of the sliders, are used to record and play samples. Once a sample has been recorded using an appropriate program, it will be edited, for forward play, using the Head Trim and Forward Time sliders. This edited version can then be triggered manually or automatically. For automatic triggering, a threshold is set against the input level and, in the case of mono programs, this will be from the left input only. The trigger time is impressively fast, with a delay of only 80 μs. The sample can be set up to repeat continuously or any number of times up to 50, and retriggering can be prevented for specified time or for the length of the sample.

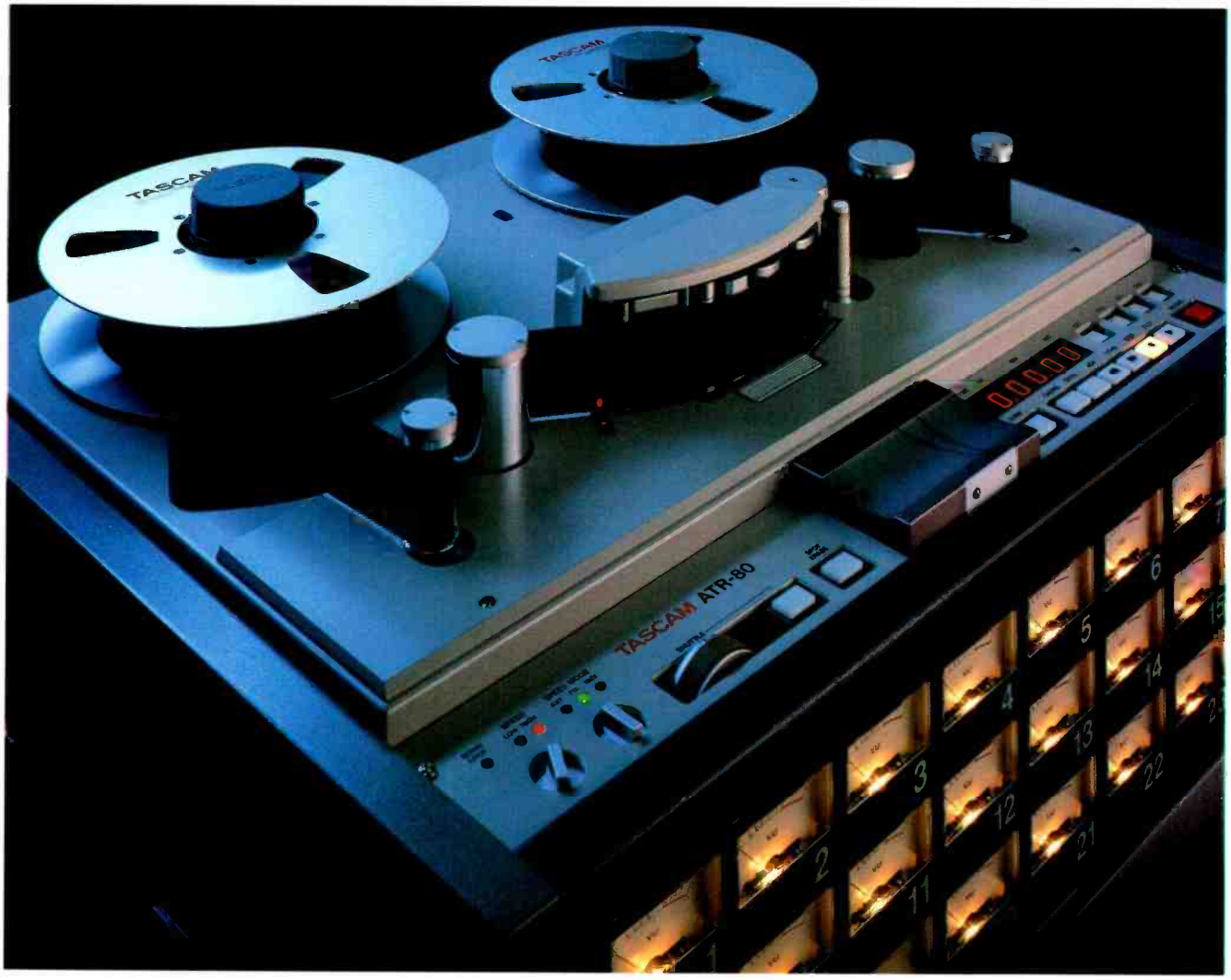
Samples recorded using the Forward/Reverse program are edited with the Tail Trim and Reverse Time sliders. The sample will then play backwards but it is possible to incorporate the forward playback as well. To do this the Play Order slider is used to offset the start time for each direction: at one extreme the sampler plays backwards first and then forwards, at the other extreme it does the opposite, if the slider is in a middle position both directions are played back simultaneously. The levels for forward and reverse playback are individually adjustable.

The Rate Changer program allows the sample to be sped up to just below an octave, or slowed down by three octaves. Like the Forward/Reverse program it samples a maximum of 1.3 s.

The longer mono and stereo programs require a great deal of processing power to run, and consequently the *480L* must be switched to Single configuration before they can be used. With the *480L*'s sampling rate switched to 44.1k, the recording time of samples will increase slightly but this will also have an effect on the overall quality. The A/B between source and sampled signals at 48k is excellent, with no appreciable audible degradation.

## *The doppler*

Bank 8 contains two programs giving the doppler effect—Doppler 1 and Bandwagon. Both programs pan the sound from left to right with the appropriate level and pitch changes. Bandwagon is slower and gives a greater feeling of distance than Doppler 1. The parameters allow control of the speed, distance, degree of pitch shift, rate of level change, speed of pitch shift against amplitude, and the type of triggering of the effect. Triggering can either be manual or automatic but in both cases the effect is triggered after the start of the incoming signal. This lapse is proportional to the time it takes the sound to reach the

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listener from its starting point. Getting the effect to occur at exactly the right moment takes a bit of practice and after each automatic trigger the effect has to be rearmed. However, the results are very convincing and should be useful wherever this kind of visual effect is required.

## So what else?

The last Bank is the odd man out in that the programs located there are not based around any one algorithm or particular type of effect. In fact it offers quite a diverse selection of processing.

The In Out program connects the input to the output and acts as a system bypass control. The Twin Delay is a stereo delay incorporating comprehensive feedback and panning controls, each side going up to 1.33 s in 80 μs steps. Stereo Adjust has been designed for use in *1610/1630* mastering where adjustments can be made within the digital domain to left and right levels, basic EQ and spatial enhancement of the low frequencies. If more comprehensive EQ is required, there are mono and stereo Parametric equaliser programs, which offer four full range mono bands, and two full range stereo bands on each side, with bell/shelf selection, and adjustable Q. The Osc program provides a digitally generated oscillator. Pitch Chorus produces a dual chorus effect based around pitch change. 1% Up 1% Down is a dual pitch shifter that has been flattened and sharpened by 1%, with a small amount of delay added to each side. 3% Down is a more extreme single pitch shifter (which has now disappeared from the latest software). Half Steps is a pitch effect program where delay, feedback and a flattened minor 2nd create a descending scale. All the pitch shifting programs have a range from an octave below to a major 7th above normal pitch, with access to positive and negative feedback, delay, etc.

As you can see, there is an enormous amount the *480L* will do, including functions that take it out of the recording studio and into the post-production room. For example, if the unit is connected directly to a *1630*, via the unit's digital I/O, and set to Cascade, the Twin Delay program can act as a disc cutting delay line, while adding on Parametric EQ or the Stereo Adjust program. Registers can then be used to store settings between tracks and it even gives the mastering engineer the seldom used facility of reverb. Another interesting possibility, using the Cascade configuration, is time squeeze and stretch, whereby a sample, which has been sped up or slowed down, is fed through the pitch shifter and returned to normal pitch.

## MIDI

The *480L* responds to MIDI in three basic ways. Firstly, programs or registers are selectable with MIDI program change numbers, and these numbers can be allocated to specific programs rather than having a fixed relationship. Secondly, up to 10 parameters on a single program can be dynamically-controlled using controls such as, pitch benders and mod wheels, or MIDI events, like last note played and last velocity. Thirdly program events, like sample record and doppler play, are triggerable from selected notes. When using the dynamic MIDI facility, the controller is scaled positively or negatively (+200% to −200%), so increasing or decreasing the parameter by a set degree. One controller is able to operate a number of parameters, all with different scaling, resulting in some unusual effects. MIDI patch information will be stored in a register along with other parameter details for future use and, if a sequencer is being used, MIDI data can be recorded allowing the *480L* to become automated. MIDI In, Thru, and Out connectors are provided, although at present Out is not being used. Another connector that is currently unused is the *DE9* automation connector which has been fitted for future computer control.

## Conclusion

If you have used the *224XL* and liked it, I think you will be more than pleased with the *480L*. Operationally the two are very similar, and a *224XL* user will instantly feel at home working the *480L*. The idea of having one *LARC* to control two programs is a good one, and it has the added advantage of keeping desktop clutter to a minimum. The memory cartridge proved to be easy and quick to use while appearing to be quite robust. The different configurations, variety of programs and amount of parameters available, all add up to making the *480L* an extremely versatile piece of equipment. As far as the sound quality is concerned, I found it to be excellent both from the point of view of program content and noise. Provisions made for direct digital connection and control, are features that are going to become increasingly useful as time goes on.

Bearing in mind the facilities, quality and cost, I have no hesitation in recommending the *480L* very highly.□

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**TRUTH:** A lot of monitors "color" their sound. They don't deliver truly flat response. Their technology is full of compromises. Their components are from a variety of sources, and not designed to precisely integrate with each other.
**CONSEQUENCES:** Bad mixes. Re-mixes. Having to "trash" an entire session. Or worst of all, no mixes because clients simply don't come back.

**TRUTH:** JBL eliminates these consequences by achieving a new "truth" in sound: JBL's remarkable new 4400 Series. The design, size, and materials have been specifically tailored to each monitor's function. For example, the 2-way 4406 6" Monitor is ideally designed for console or close-in listening. While the 2-way 8" 4408 is ideal for broadcast applications. The 3-way 10" 4410 Monitor captures maximum spatial detail at greater listening distances. And the 3-way 12" 4412 Monitor is mounted with a tight-cluster arrangement for close-in monitoring.
**CONSEQUENCES:** "Universal" monitors, those not specifically designed for a precise application or environment, invariably compromise technology, with inferior sound the result.

**TRUTH:** JBL's 4400 Series Studio Monitors achieve a new "truth" in sound with an extended high frequency response that remains effortlessly smooth through the critical 3,000 to 20,000 Hz range. And even extends beyond audibility to 27 kHz, reducing phase shift within the audible band for a more open and natural sound. The 4400 Series' incomparable high end clarity is the result of JBL's use of pure titanium for its unique ribbed-dome tweeter and diamond surround, capable of withstanding forces surpassing a phenomenal 1000 G's.
**CONSEQUENCES:** When pushed hard, most tweeters simply fail. Transient detail blurs, and the material itself deforms and breaks down. Other materials can't take the stress, and crack under pressure.

**TRUTH:** The Frequency Dividing Network in each 4400 Series monitor allows optimum transitions between drivers in both amplitude and phase. The precisely calibrated reference controls let you adjust for personal preferences, room variations, and specific equalization.
**CONSEQUENCES:** When the interaction between drivers is not carefully orchestrated, the results can be edgy, indistinctive, or simply "false" sound.

**TRUTH:** All 4400 Studio Monitors feature JBL's exclusive Symmetrical Field Geometry magnetic structure, which dramatically reduces second harmonic distortion, and is key in producing the 4400's deep, powerful, clean bass.
**CONSEQUENCES:** Conventional magnetic structures utilize non-symmetrical magnetic fields, which add significantly to distortion due to a nonlinear pull on the voice coil.

**TRUTH:** 4400 Series monitors also feature special low diffraction grill frame designs, which reduce time delay distortion. Extra-large voice coils and ultra-rigid cast frames result in both mechanical and thermal stability under heavy professional use.
**CONSEQUENCES:** For reasons of economics, monitors will often use stamped rather than cast frames, resulting in both mechanical distortion and power compression.

**TRUTH:** The JBL 4400 Studio Monitor Series captures the full dynamic range, extended high frequency, and precise character of your sound as no other monitors in the business. Experience the 4400 Series Studio Monitors at your JBL dealer's today.
**CONSEQUENCES:** You'll never know the "truth" until you do.

JBL

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8500 Balboa Boulevard
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For a 16 or 24 track studio owner, the future looks very good.

With MIDI systems and digital outboard, you can already achieve extremely sophisticated productions.

But it's very hard to find a recording console to match that standard, without spending a small fortune.

That's why we've developed the new Series 6000. An evolutionary design that demonstrates how far Soundcraft are thinking ahead.

Behind the classic layout is a revelation in performance and facilities.

For a start, it's equipped with enough buses and routing options to make adventurous production a pleasure, rather than a chore.

It's a full 16 or 24 bus console, plus six auxiliary sends per channel. Each of the tape returns has EQ, which with its 'split' format naturally means they'll double as extra inputs.

We've also provided each input with push-button routing, EQ by-pass and programmable electronic muting that gives you none of the clicks ordinary switches produce.

There's even true solo-in-place, sadly lacking on many more expensive desks.

But it's the 6000's sonic performance which really puts the competition in the shade.

Take our revolutionary input design: 2dB to 70dB gain without a pad, with nearly unmeasurable distortion, crosstalk and noise.

Our new grounding system yields superb hum immunity and a routing isolation of 110dB (1kHz), and our active panpot comes close to theoretical perfection, improving on our competitors' performance by a full 25dB.

So nothing will change your sound, except our acclaimed, four-band sweep EQ.

In a word, purity.

And with options including 16 to 44 channels, a stereo input module and built-in patchbay, you'll find it an affordable slice of progress. No matter what budget you're working to.

The Series 6000 is simply the most comprehensive production console in its class.

Call us today for full information, and the address of your nearest dealer.

Soundcraft
6000

# If only more expensive desks performed as well.


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