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October 1989

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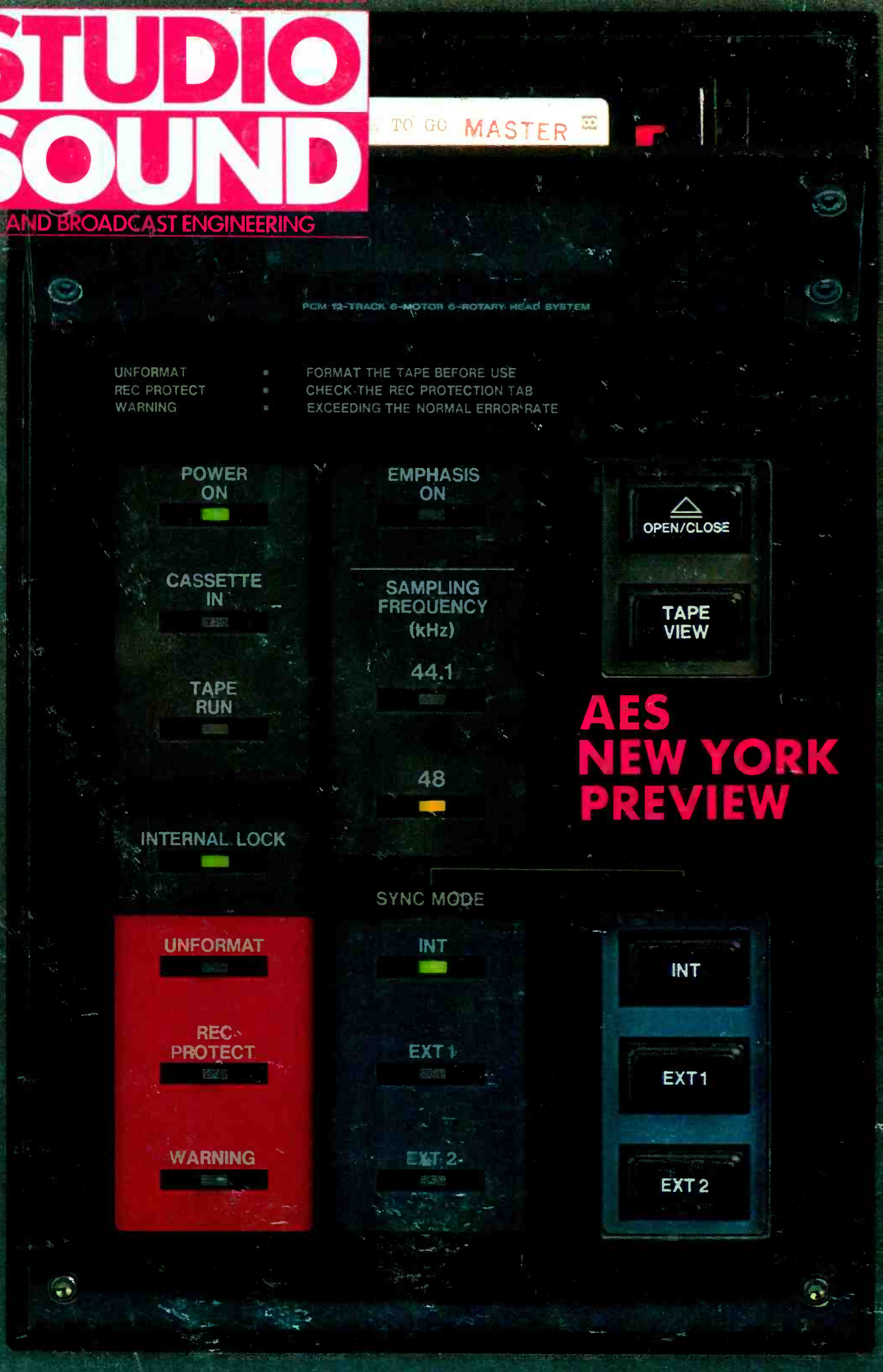
AND BROADCAST ENGINEERING

DR1200



AES NEW YORK PREVIEW

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STUDIO SOUND
AND BROADCAST ENGINEERING

Focusrite's Forté at Master Rock

Editorial: You can't always get what you want. Striking the balance between equipment facilities required now and what future requirements will be. By Keith Spencer-Allen — 5

News: Events, news, moves and comment from inside and outside the industry. Plus contracts and news of an agreement on a formula for the sale of domestic DAT recorders — 13

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Mastering the situation

Whatever format you choose for multitracking, mastering remains the critical link in the chain. So why compromise on the equipment you use? From Sony's complete range of studio and portable R-DAT recorders, or 1630/DMR-2000, to open reel machines like the Mitsubishi X-86, the Otari MTR -12 1/2", the Studer 820/810 (1/2" or center track timecode) or the Revox B77/C270 - for information and advice on all your pro audio needs call us at Music Lab.

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STUDIO SOUND
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Cover: Akai DR1200 transport panel. Photography by Roger Phillips

You can't always get what you want

When considered worldwide, the principal pro-audio event of the year is the US AES Convention. While the European AES Convention is now very strong and may rival the US show in some respects it is nowhere near the scale of the US event. This year the location is New York, in the very centre of Manhattan. As every event takes on some of the feel of its location, this show will be no exception. New York is unique in that in most other locations it is possible to take a break from the Convention to unwind a little by wandering out for a short walk while in New York the atmosphere outside the Hilton seems actually busier and faster than the Convention itself. This year promises to be a good show with much new gear. But will it necessarily be what customers want?

Many times we have touched on the problems of communication between the manufacturer and the end user. The advent of new technologies has made it a necessity that maker and user talk more. It has fallen to the manufacturers and their agents to take on the additional role of teacher, as in many cases it is with them that the knowledge of the possibilities resides. I sense that there is more communication now but a few conversations recently with a wide variety of manufacturers has suggested that life is still complicated.

Hard disk editing/recording systems and digital audio in general are typical problem areas. As the end user learns about a technology he figures out how it might apply to what he wants to do. Unfortunately it appears that the more you learn about a subject, what you want it for also changes. For example I was speaking to manufacturer 'A' who make sophisticated hard disk editing/recording systems and last year was being asked for a simple 2-channel system. 'A' responded to the demand and produced a new set of software and hardware a few months later but by then there was no interest. The demandees were now interested in the larger systems that 'A' had tried to interest them in in the first place.

It would have been useful if manufacturer 'A' had spoken to manufacturer 'B' who makes synchroniser systems. They have a philosophy of listening to feedback and then reinterpreting to avoid the vicious circle—if you built the product exactly as the requests specified no one would want it but unless you present a finished product first you will receive little feedback on it, which is all too late.

Manufacturer 'C' listened to everyone and responded to what was said to the extent that he was stepping outside his area of manufacturing expertise. He went broke.

So if you are attending the New York AES, be careful what you say to manufacturers. And manufacturers listen hard, please.

Have a good show.

Keith Spencer-Allen

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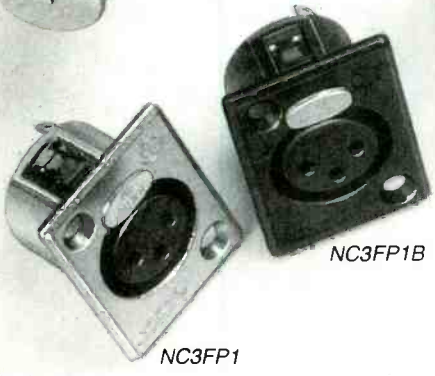

NC3FP1B

NC3FP1

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pair (black & red)
phono plugs
nickle housing
gold contacts

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PCB mount
receptacles for
horizontal fixing,
hard gold plated

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escutcheon
for 'E' series
receptacle

NC3MDL1B

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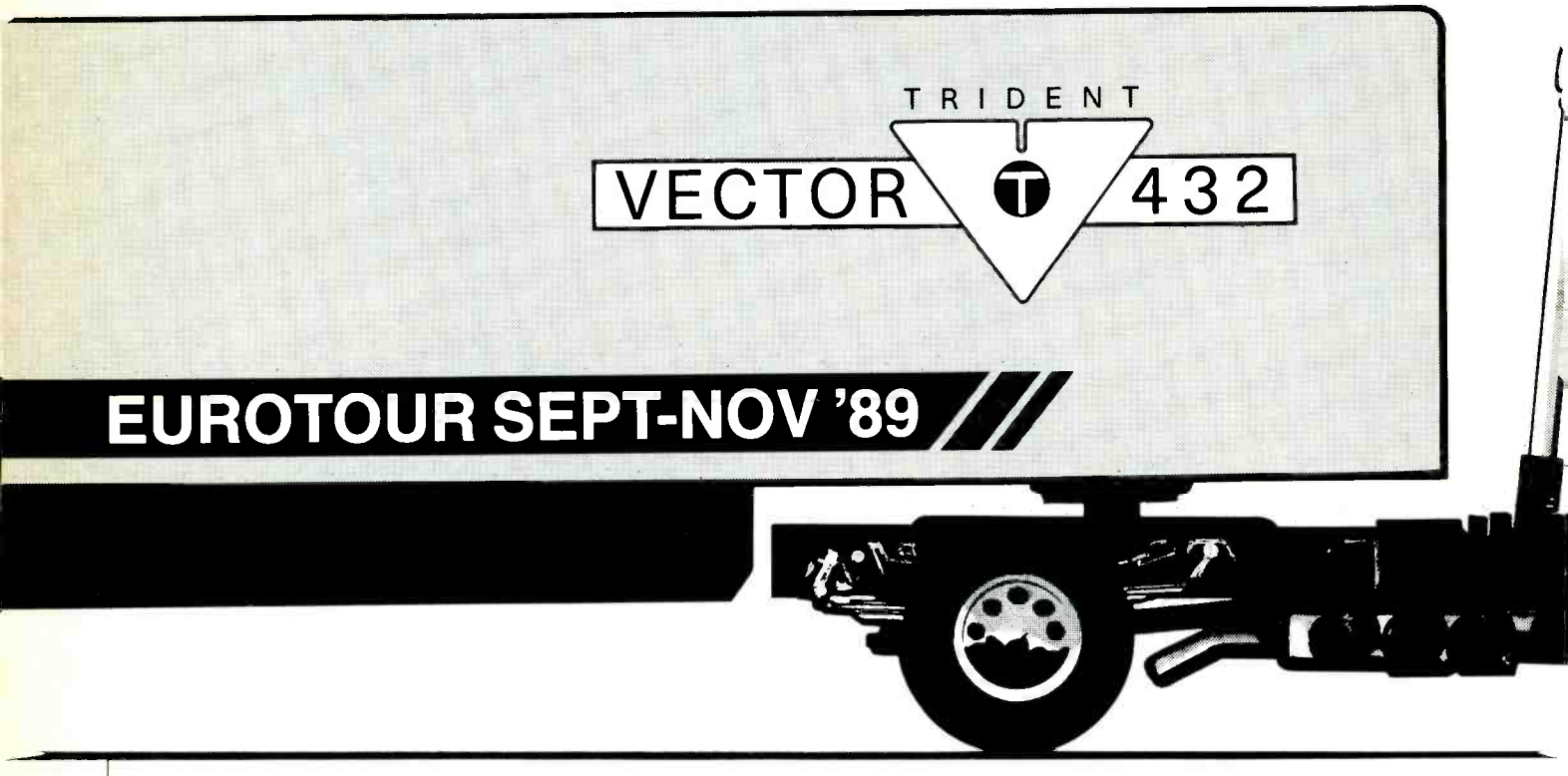
IS TRIDENT GOING TOO FAR?



DATE	VENUE	DATE	VENUE
Sept 23-25	London	Oct 12-16	I.B.T.S. – Milan
26-28	Paris	14-16	W. Berlin
29-30	Brussels	18-20	AES – New York
Oct 1-2	Amsterdam	19-20	Frankfurt
3-4	Hamburg	23-24	Munich
3-6	AUDIO VIDEO PRO '89 – Paris	25-26	Basel
4-7	NORDIC SOUND – Oslo (Dolksjo)	29-30	Rome
7-9	Stockholm	Nov 3-4	Barcelona
10	Gothenburg	6-7	Madrid
11-13	BILLED & LYD – Copenhagen	13-15	London

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Some might think that hauling a studio fitted with Trident's new ***Vector 432*** *mixing console, a digital multi-track and a load of outboard gear throughout Europe is going a bit far. But then they haven't seen the Vector.*

Surely no one would argue that introducing an ***in-line studio control system for audio and audio/video production*** *which sets a new price/performance standard against which all other consoles pale is going too far. How could they?*

Is it going overboard to offer useful standard features like ***four matrixed stereo busses*** *and* ***32 groups****? Or the flexibility of a centre section yielding the unsurpassed signal control of a* ***stereo buss compressor,*** *a* ***broadcast mode*** *for simultaneous stereo and multi-track recording,* ***two dedicated foldback systems*** *selectable from any combination of console sources,* ***an auto talkback with two reverse talkbacks*** *and more?*

Is it over the top to adopt a "system" approach that lets you create a custom console from a menu of available ***options*** *including on-board* ***dynamics****, a choice of fader* ***automation*** *systems,* ***remote patchbays, transformer balancing, bargraph metering, VCA grouping with snapshot recall****, a highly evolved* ***audio follows video*** *interface,* ***stereo modules****, and an* ***integrated machine controller*** *so sophisticated that it locates points on tape by bars and beats (for musicians) as well as time code (or feet and frames) with full midi synchronisation?*

We don't think so. And we certainly don't think it's going too far to offer the sonic perfection of ***+30dB of input and output headroom, 70dB of mic gain*** *with* ***an EIN of better than – 128dB and balanced inputs, outputs and bussing;*** *or the quality and performance of* ***sealed conductive plastic pots*** *intelligently placed in perhaps the most handsome and ergonomically balanced console design yet conceived.*

The Vector pushes the science of console design to its theoretical limit without sacrificing the art of sonic perfection. And perhaps most important, Trident delivers all this at an attainable price. Now that isn't going too far, is it? Even if we are trekking 6,700 miles (10,720 km) through 11 countries in 54 days to prove it.

See for yourself just how far we have gone – and how far console design has come. Check the tour schedule on the left. Then call or fax us (or your nearest dealer) to find out the exact location of our demonstrations in your area. No appointment is necessary, but it would be going too far to expect you to drive around Europe until you found us. Or would it?

TRIDENT VECTOR 432

TRIDENT AUDIO DEVELOPMENTS LTD, RODD ESTATE, GOVETT AVENUE, SHEPPERTON, MIDDX TW17 8AQ, ENGLAND TEL (0) 932-224665 FAX (0) 932-226721
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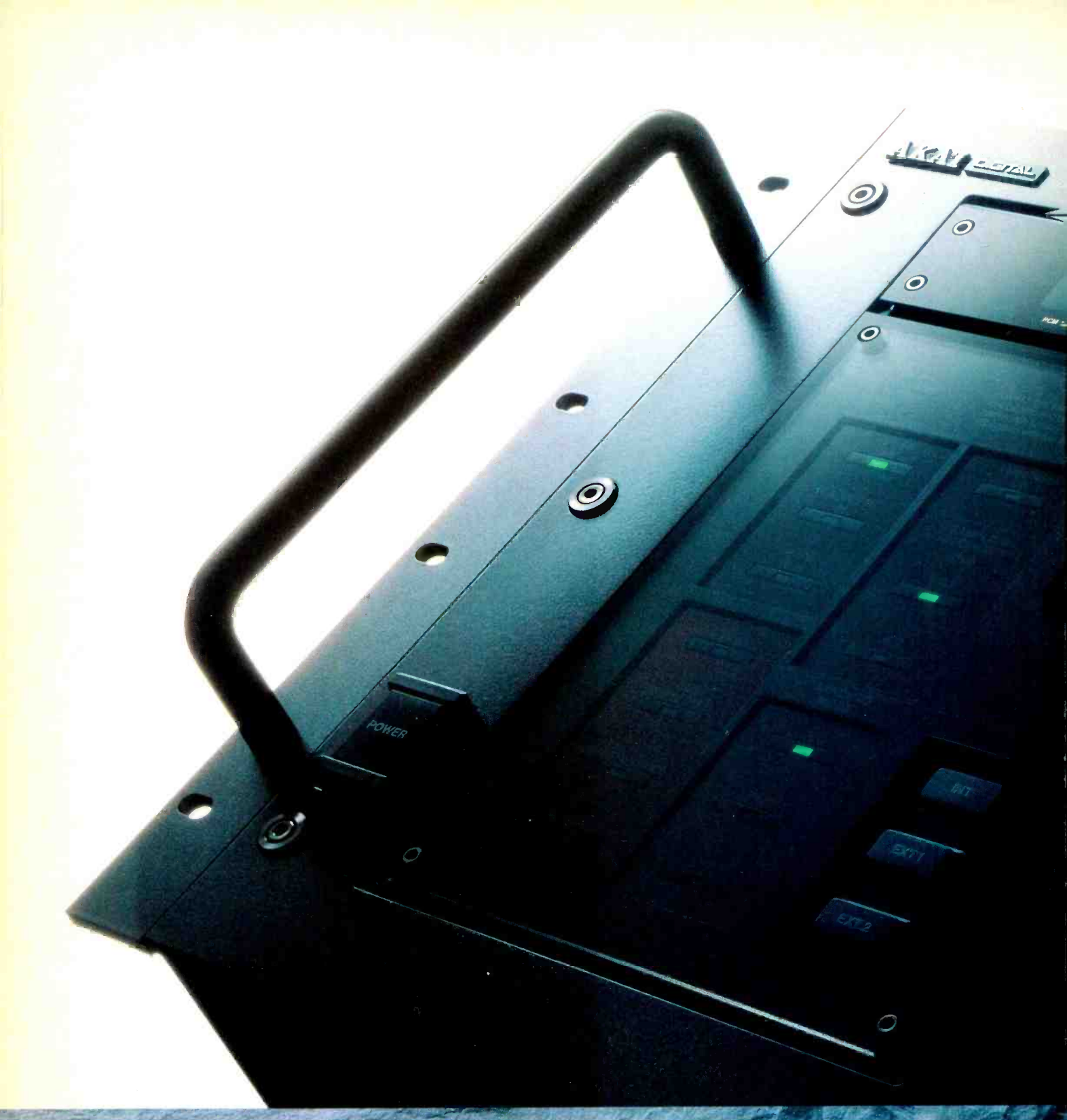

A-D-A

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An appropriate name for a world's first . . . but what A-DAM really stands for is Akai Digital Audio Multi-track format recording system. Comprised of the DR1200 Digital Multi-Track Recorder, DL1200 Programmable Auto-Locator and DM1200 Meter Unit, this advanced system gives studios and individual musicians easy and affordable access to digital 12-track recording using popular 8mm video tapes. It's a technical feat made possible through a unique combination of Akai's three fields of engineering excellence: digital audio, video and multi-track recording.

The A-DAM Recording System combines superb technical specifications like 16-bit quantization, selectable 44.1/48 kHz sampling frequency, powerful error correction capabilities with features for easy operation: digital crossfade, synchronized operation of up to three DR1200 recorders, plus a number of automated operations.

Hundreds of A-DAM systems are already being used worldwide

The A-DAM Recording System from Akai is a simple yet versatile means for creative studio engineers and musicians to explore artistic possibilities – all in the incorruptible digital domain.

DR-1200 DEALERS: HHB, KGM, SOUND CONTROL, SYCO, TSC.

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M1

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- Auto/Manual Peak hold

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MOZART BY AMEK

MOZART by AMEK is a significant step forward for console technology. No other combination of first-class audio signal paths and integrated computer control exists elsewhere, and in such an irresistible price category.

In the past few years the studio environment has become very complex. Not only more tracks, but the introduction of retriggered synths and the use of large amounts of effects has created a need for a console which far exceeds the capabilities of conventional mid-80's products.

MOZART's SUPERTRUE automation system allows real-time and off-line control not only of faders and mutes but of numerous switches per input module. Auxiliary sends, Eq, Insert and other functions can be switched in and out as the mix proceeds; or complex switching operations can be set up and triggered by SMPTE from the Event Sheet. Some of the other events include a complete MIDI-triggering system and a facility for loading user-definable fades between two timecode points, however long or short. The advanced Mix Editor system includes Merge and Splice functions.

MOZART has 32 output busses and up to 16 auxiliary busses according to the choice of input module. All busses are balanced. The console has 12 stereo effects returns and frames are available for 40, 56 or 80 inputs. Equalization and sonic performance are to the standard set by AMEK.

MOZART presents a range of facilities which are unique. It opens a new range of opportunities for the modern recordist to reach the boundaries of his imagination.

AMEK

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

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

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Lansdowne buy UK's first VP console

Lansdowne Studios, part of the Lansdowne group of companies, have ordered a NEVE *VP* audio mixing console, the first to be commissioned in the UK. When it has been installed Lansdowne will be able to offer music recording, Dolby *Stereo* mixing and audio-for-video post-production.

Adrian Kerridge, Chairman of the Lansdowne Group believes the purchase of the *VP* will help shape the future of the recording industry. "Studios must have the technical ability to handle audio production in all its different guises, from music recording to film soundtracks to video post-production. The new Neve *VP* will give us a unique chance to service all these diverse markets with a level of technological competence that is unparalleled in this country."

Neve's £¼ million *VP* console includes complete recall, flying fader automation and full post-production facilities.

Only First for Crest Audio

In the power amplifiers survey (*Studio Sound*, August) we mistakenly coupled First Audio and Britannia Row Sales as the two UK distributors for Crest Audio in the UK. In fact First Audio are exclusive UK distributor and Britannia Row are an appointed main dealer. First Audio, 95 Ditchling Road, Brighton, East Sussex BN1 4SB, UK. Tel: 0273 693610.

Exhibitions and conventions

September 30th to October 1st Scottish Music Show, Glasgow's Scottish Exhibition & Conference Centre. Contact: Music Maker Exhibitions. Tel: 0353 665577.
October 3rd to 9th World Broadcasting Symposium Geneva, Switzerland.
October 18th to 21st AES 87th Convention, New York, USA. Contact: AES, USA. Tel: (212) 661-8528.
October 25th to 28th Broadcast '89, Frankfurt, West Germany.
November 7th to 9th Computer Graphics '89/Desktop CAD '89, Alexandra Palace Exhibition Centre, London. Contact: Katherine Lovatt. Tel: 01-868 4466.
November 7th to 9th, Digital Information Exchange, Private Members Suite, London Zoo. Contact Nick Hopewell-Smith. Tel: 01-381 1991.
November 28th to December 3rd Sound Expo/China '89 Shanghai Exhibition Centre, Shanghai, China.

1990

March 13th to 16th AES 88th Convention, Montreux, Switzerland. Contact: Heather Lane, AES, Europe. Tel: 06286 63725.
March 30th to April 3rd NAB, Atlanta, GA, USA.
April 22nd to 25th Vision and Audio International, Earls Court Exhibition Centre, UK. Tel: 01-776 0709.
September 21st to 25th International Broadcasting Convention, Metropole Conference Centre, Brighton, UK. Contact: IEE Secretariat. Tel: 01-240 1871.

News from the AES

As we leave a glorious summer behind us, we embark on this year's session of British AES evening meetings. There is a broad spectrum of subjects to be covered and more details will be available on each nearer the time. To help future planning the dates, speakers and titles are listed below.

1989

October 10th
Annual Dinner
November 14th
Room Acoustic Simulation
Richard Small
December 12th
Noise Pollution
Ken Dibble

1990

January 9th
Satellite Distribution of Audio
Chris Hibbert
February 13th
Digital Audio in the TV Studio
Paul Evans
March 20th
To be Announced
April 10th
Amplifier Differences
Paul Miller
May 8th
DAT Timecode
Sony
June 12th
Active Acoustics
Philip Newell
July 10th
The Audio Scene
Barry Fox

The first event is the Annual Dinner being held on Tuesday October 10th at the Queen Elizabeth II Conference Centre. Those of you who have been to one of our previous dinners will know that the opportunity to meet old friends and make new ones and the quality of the food and wine makes for a most enjoyable evening.

Following this is the **87th AES Convention** to be held in New York between October 18th and 21st. (Please note alteration to the originally published date.) As usual this should be the major event of the pro-audio calendar.

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: 0628 663725. Fax: 0628 667002.**

Security for tc

It has been decided by John and Kim Rishoej, the founders of tc electronic, that the company must go limited to ensure their future security in the world marketplace. Heavy investment has been secured for the new tc electronic of Denmark A/S.

The company was started 13 years ago after John and Kim decided to construct their own commercially available effects. Manufacturing began in the attic of their family home and distribution was initially from the back of a Morris Minor car. The company now has distribution offices in 17 countries including the UK, Germany, the USA and Japan.

To all intents and purposes the only thing that will have changed at tc electronic as a result of turning into a limited company will be the name suffix, I/S to A/S.

In brief

• Audio Developments have recently taken over the production and sales of the **Rebis** *200* series of modules. More information from Audio Developments, Hall Lane, Walsall Wood, Walsall, West Midlands WS9 9AU, UK. Tel: 0543 375351.

• At a recent meeting of the AES in London, Nick Indermaur, digital design group leader of **Data Conversion Systems** (DCS) gave a presentation on the *DCS 900* A/D converter. The topics discussed included the pros and cons of conventional converter architectures, the reasons for selecting an over-sampling architecture in the *DCS 900*, a discussion on the design of digital filters and details of the *DCS 900*s analogue circuitry.

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Agencies

● **Digital Audio Research**, Surrey, UK, have appointed distributors in the US and Hong Kong.

Everything Audio, 2721 West Burbank Blvd, Burbank, CA 91505, USA. Tel: (818) 842-4175. Fax: (818) 953-2908.

SG Audio, 445 West Erie, Suite 201, Chicago, IL 60610, USA. Tel: (312) 266-1901.

Jolly Sound Ltd, Room 1214-1215, Hunghom Comm Centre 37-39, Ma Tau Wei Road, Kowloon, Hong Kong. Tel: (852) 2 620 2025.

● Plasmec Systems are now sole distributor for the *40-A* **Dorrough** loudness monitor. Plasmec Systems, Weydon Lane, Farnham, Surrey GU9 8QL, UK. Tel: 0252 721236. Fax: 0252 721718.

● **Klark-Teknik**, UK, have established a new subsidiary company in Singapore to market and distribute their products throughout the Asian countries.

● **Soundcraft Electronics**, UK, have announced a new distributor for their products in Denmark. Keld Sorensen, Audionord A/S, Vester Allee 7, DK-8000, Aahus, Denmark. Tel: (45) 6 193499. Fax: (45) 6 128142.

● **Amek** have appointed Sonotechnique as exclusive distributors for Canada. Sonotechnique, 2885 Rue Bates, Suite 300, Montreal, Canada. Tel: (514) 739-3368. Fax: (514) 739-8739.

● Norwegian audio and video specialists **Sandar Electronics** have appointed Plasmec Systems as their exclusive UK distributors. Plasmec have also signed an exclusive distribution agreement with **360 Systems** of California to introduce their audio routing switchers into the UK studio and broadcast markets.

People

● **Soundcraft Electronics** have announced the appointment of Jon Ridel as studio sales manager. Ridel comes from Harman Studio Systems.

● **Focusrite** have announced the appointment of Jon Kennett as sales executive with responsibility for promoting the *ISA* range in the UK. Focusrite have also announced the appointment of Crispin Herod-Taylor as project manager. Herod-Taylor was a project engineer at SSL.

● **Valley International**, Nashville, TN, have appointed Jorgen Ravn sales director. Ravn was previously a regional sales manager at dbx.

Address changes

● **Klotz UK Ltd** are now located at Unit 9, Penn Street, near Amersham, Bucks HP7 9PT, UK. Tel: 0494 716891. Fax: 0494 713787.

In brief

● Former US studio owner and manager, Steve Bramberg has announced the opening of **Studio Support Services**, a new business for the referral, representation, consultation, studio time brokerage and production co-ordination service aimed at filling the various needs of the audio production industry in New York. Studio Support Services will refer and represent studios, musicians, engineers, producers, maintenance technicians and supply studios with personnel. More information from Studio Support Services, 15 Sintsink Drive West, Port Washington, New York 11050, USA. Tel: (516) 767-3295.

● Russian pop star Alla Pugatjova has recently become the first Soviet recording artist to be awarded **Ampex** Recording Media Corporation's Golden Reel Award.

Contracts

● The **Mitsubishi Pro Audio Group** have sold *X-880* 32-track digital recorders to three Milan-based Italian studios; Morning Studio in Carimate Castle; Nuovo Fonit Cetra, music to picture studio; and Water Melon Studios, a rock and pop facility.

● BBC Television have purchased a five machine **Soundmaster** *Synchro* audio editing control system, as part of the refurbishment of their *Sypher* suite at the London Television Centre.

● Recent worldwide **DDA** sales include *DCM232*s to the French Institut National de L'Audiovisuel through distributor Regiscene; Albert's Recording in Australia through distributor Syncrotech; Shanghai Television through Far East distributor Studer Revox Hong Kong and the University of Saloniki in Greece through Greek distributor Sound Control. Duran Duran's Andy Taylor has installed a DDA *D* series in his private studio through UK distributor Stirling Audio who are now presenting the *D* series console in packages containing the Akai *DR1200* digital multitrack recorder.

● Real World Studios, Bath, UK, have recently bought two **BSS** *DPR-402* compressor/de-essers and *DPR-502* MIDI noise gates; Powerplant Studios, London, have also added the BSS *402* and *502*; The BBC's Maida Vale five music studio complex have 20 channels of the new *AR-416* 4-channel active DI units available as tie-line interfaces for instrument feeds to the console. Other major UK studios recently buying the BSS *DPR-402* include Videosonics, PWL and RAK.

● **Soundtracs** recent *In-Line* console sales include Hoyts Jumbuck, Brisbane, Australia, a video production house; Radio 2 MMM-FM, Australia, supplied by Amber Technology; and Roy Hay of Culture Club's studio in California, USA, supplied by Samson Technologies, New York.

● **Amek**, UK, have announced orders for their *Mozart* console from Revolution Studios, Cheadle, UK; a private studio in Woking, UK; Strongroom Studios, London; and from Amek's Spanish dealer Fading SA. Sales of the *Angela* console include Korner Productions, London; MCA Publishing, Nashville, USA; S&R Studios, Hong Kong; and Joensa Estuadios, Caracas, Venezuela.

● **B&B Systems**, California, USA, a systems and facility design and engineering company have announced recent projects that include a new, multi-format duplication facility for Multimedia Services in Hollywood, CA; two Telecine suites, quality check room, audio sweetening room, dubbing facilities and tape vault for Lorimar-Telepictures, Los Angeles; and the redesign and move of International Video Entertainments post-production facility from Newbury Park to Van Nuys, California.

● The Sound House of Forth Street, Edinburgh is the first Scottish studio to install an **Audio Kinetics** *ESbus* machine control and synchronisation system.

● The Garden Studio, London, are replacing their present console with an **SSL** *4064G* with Total Recall, installing **Quested** monitoring and a large amount of outboard equipment. The control room is being redesigned to house the new equipment.

● **Harris, Grant Associates**, the UK-based acoustic and studio design consultancy have recently completed the re-fit of Studios Four and Five, and Control Room Five at the BBC and are now working on Floating Earth, a specialist CD mastering and editing facility in West London that includes two fully-equipped digital editing suites. Recently won contracts include The Brewery Complex in Frankfurt, and Sound Studio 'N' in Koln, West Germany.

● Recent **Soundcraft** contracts include two series *6000* consoles, a 32/16 frame to Powercord PA in Leeds and a 32/16 to Rocyn PA in Dyfed, Wales; a series *500* console to the Sunderland Empire, through Farrahs; a series *200 B* for the London Arena stadium as part of a portable PA facility installed by Philips; and 16-channel series *200* BVE console to TV2 Communications in Northampton; and an 8-channel console to the Inland Revenue in-house video production unit.

● Advision Studios, London, have bought a **Lexicon** *Opus* digital post-production system for their mobile studio.

● Video London Sound Studios, London, have chosen a custom 32-input **Amek** *Classic* console equipped with GML moving fader automation for its fourth studio.

● The London Tape Company have recently taken delivery of a **Lyrec** *P4419* loopmaster, *P2518* double slave units, a *TR55-MM* mastermaker and a Lyrec *TR55-QC* quality control machine.

● CB Electronics, UK, have recently completed the design and installation of two film music studios and two film dubbing theatres for Mosfilm in Moscow, incorporating two *4000* and two *5000* series **SSL** consoles.

● Shuttlesound, UK, have supplied six separate sound systems for King Abdullah's Mosque in Jordan. The **Altec Lansing** systems comprised horns, drivers and bass bins driven by Altec's *9444-A* amplifiers and processed by Altec, Furman and Audio Digital delays.

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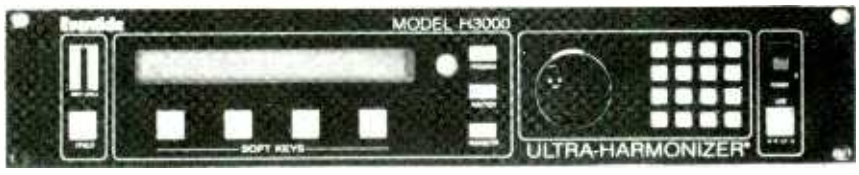
Just a few words to describe the Eventide H3000 from HHB.

'ALIENS'; 'AMBIENCE'; '"A" MINOR CHORUS'; 'ANTI-AMBIENCE'; 'AVANTE-GARDE'; 'BASS SHIFT', 'BIG SNARE'; 'BIG SWEEP'; 'BIZZARRAMONIZER'; 'BRIGHT ROOM'; 'CANNONS'; 'CANYON', 'CIRCLES', 'DARK ROOM'; 'DEATH FLANGE', 'DISCRETE-VERB'; 'DRUM PROCESSOR', 'DUAL H910S'; 'DUAL EFFECT'; 'EXPLODING 'VERB'; 'FAT SLAP'; 'FLANGE & REVERB'; 'FLANGER', 'GATED REVERB'; 'GENERIC HALL'; 'GLITCH SHIFT'; 'H949 DELAY/PITCH SHIFTING', 'HUMP-VERB'; 'JUST 3RD & 5TH'; 'JUST 4TH & 6TH'; 'LOCKER ROOM'; 'MICROPITCHSHIFT'; 'MICROPITCH-SLAP'; 'MIDI 3 ON 2'; 'MIDI PEDALSWEEP', 'MIDIPLEX'; 'MODWHEEL REVERB'; 'MULTI-FLANGE'; 'MUSIC SHIFT'; 'PITCH QUANTIZE'; 'RANDOM GATE'; 'REVERSE GATE'; 'RICH CHORUS'; 'RICH PLATE'; 'ROCK'N ROLL'; 'SCARY MOVIE'; 'SHIMMERISH', 'SLAP/ MICRO-PITCH'; 'SMALL ROOM'; 'SPACEFLANGE'; 'SWEEPRIGHT'; 'THICK LOOP'; 'THIRD & FIFTH'; 'THIRD & OCTAVE'; 'TONAL ROOM'; 'TWELVE STRING'; 'VOICE SHIFT'; 'WARM HALL'; PLUS 'AIRPORT PAGE'; 'ALVIN MAX'; 'AUTOPANNER'; THE CHIPMUNK'; 'AUTO-ECHO'; 'CB'; 'CHORUS'; 'BACKWARDS'; 'CAVE 'CUZZIN IT'; 'CYLONS'; 'DRAGWAY 80'; 'FADE TO DREAM'; 'FLYING SAUCERS'; 'GREGORIAN CHANT'; 'GREMLINS'; 'HELLOVER8'; 'JAVA THE HUN'; 'LOWPASS FILTERS'; 'MAGIC', 'MANY PITCHES'; 'MARTIANS'; 'MEGAPHONE'; 'MORE ALIENS', 'NEW HOUSE', 'OKSY ELEVEN'; 'PLANET ZORGON'; 'PSYCHO-PANNER'; 'SHAKY'; 'SIMPLE DELAY'; 'SISSY'; 'STADIUM'; 'STEAM BATH', 'ST PETERS CATHEDRAL'; 'STUTTER', 'STUTTER DUAL'; 'STUTTER RANDOM', 'STUTTER UP'; 'STUTTER DOWN'; 'STUTTER UP/DOWN'; 'SWEET FLANGE'; 'TELEPHONE'; 'THREE OF ME'; 'THREE ON TWO'; TIME WARP'; 'TRAFFIC REPORT'; 'TV IN NEXT ROOM'; 'UNDERWATER'; 'WAH WAH', 'WARPED 45'; 'WARPED UP'; NOT TO MENTION 15 EFFECTS THAT REQUIRE NO INPUT SIGNAL: 'A 440'; 'ALERT'; 'BOINGY BUZZ'; 'DOORBELL'; 'JET'; 'JETTISON'; 'LASER ECHO'; 'PLUCK'; 'SIREN'; 'SONAR'; 'STEREO COPTER'; 'TANK ATTACK'; 'THUNDER', 'UFO'; 'WAVE' AND WIND STORM



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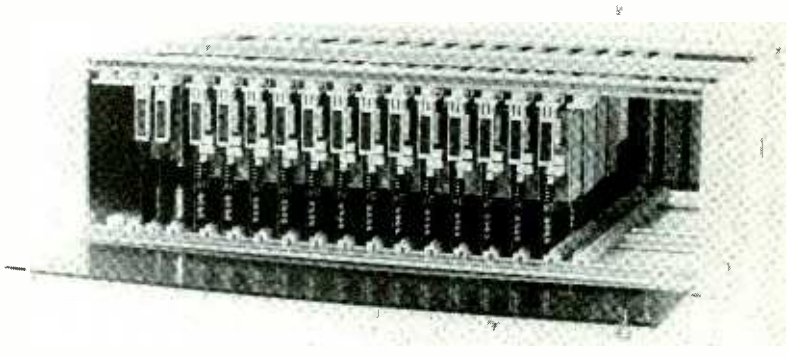

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DAT players sale agreement reached

After nearly three years of often acrimonious negotiation, the Japanese and European electronics companies and the record industry have agreed a formula for the sale of domestic digital audio tape recorders.

A Memorandum of Understanding (MOU) signed by all parties to the last round table meeting in Athens, and now ratified by the RIAA and IFPI, leaves no doubt that the record companies have seen, and read, the writing on the wall. If they do not say yes to DAT, they face CD-R (recordable CD), which is a far worse threat.

The MOU is between 12 Japanese electronics companies (including Matsushita, Sony, NEC, Pioneer and Mitsubishi), three European companies (Philips, Thomson and Grundig) and the two record industry trade bodies, the International Federation of the Phonographic Industry (IFPI) and Recording Industry Association of America (RIAA). The document lays ground rules for new technology called Serial Copy Management System (SCMS) to limit the number of copies DAT recorders can make. It calls for legislation to enshrine the technical standards in law and thereby prevent electronics companies from Taiwan and Korea selling DAT recorders, which contain no circuitry to limit copying, ie double DAT decks.

In return for the largely illusory benefits of SCMS, the record industry abandons its untenable policy of trying to block the sale of DAT unless the recorders are technically crippled to prevent digital recording or blank tapes carry a 'meaningful' tax to compensate the record companies for claimed loss of revenue through unauthorised music copying.

The MOU is also peppered with disclaimers, eg even talking about systems for automating copyright remuneration "would not constitute acceptance by the hardware industry of the principle of royalties".

Although the three European electronics companies have been willing to "acknowledge the principle of royalties (on blank tapes) and will not oppose efforts by the recording industry to secure legislation to implement such royalties", the Japanese companies refuse to put their names to this and say only that they "acknowledge that the recording industry places extreme importance on the issue of royalties as remuneration for copying".

To paper over this large crack, the memorandum confirms that all parties "agree that the adoption of technical standards shall not be relied upon as a basis for supporting or opposing royalties".

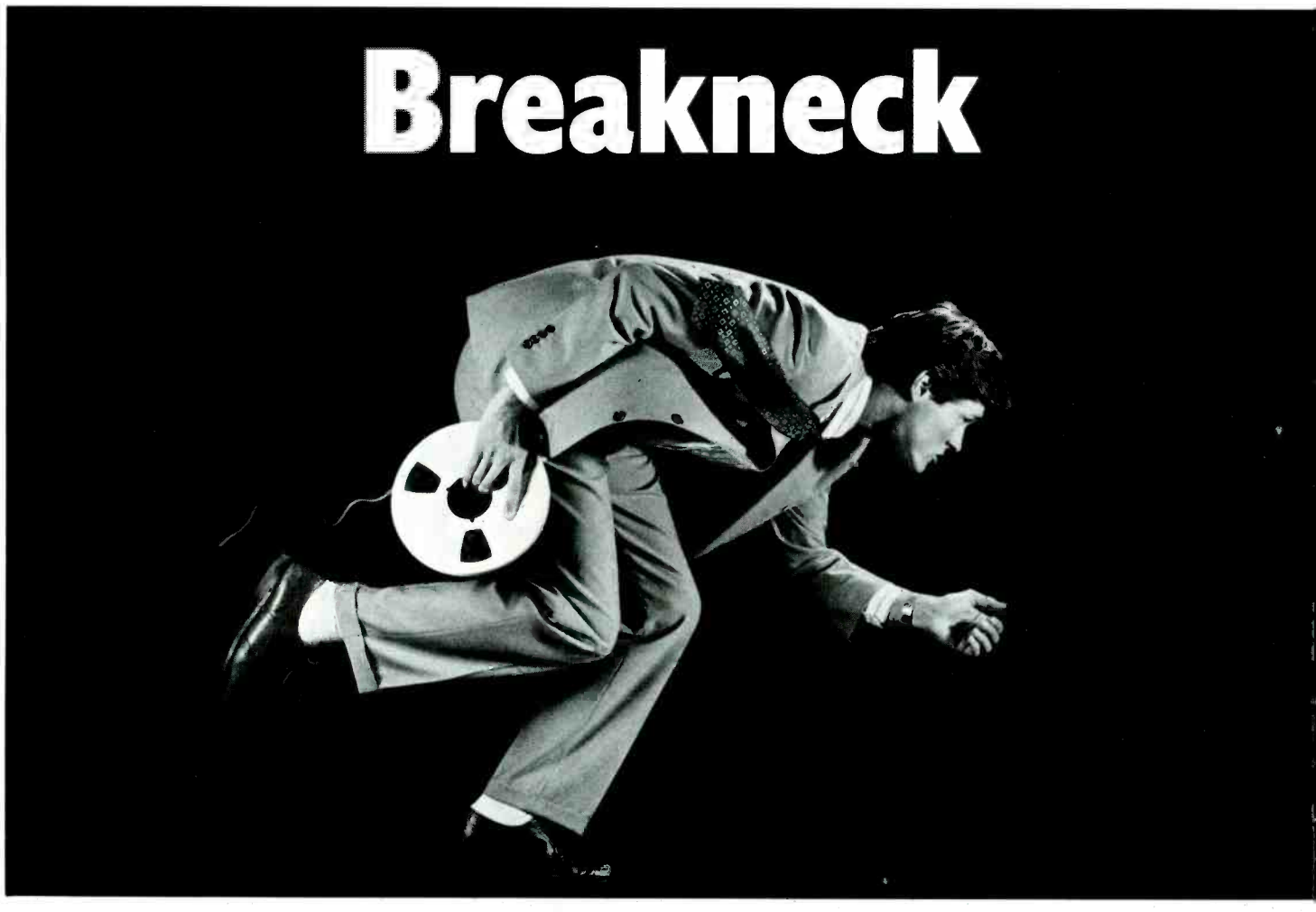
It has to be said that the record industry's about-face on DAT coincides with the death of Nesuhi Ertegun, chairman of the IFPI and the most stubborn crusader against DAT.

According to industry protocol, the IFPI was left waiting for the RIAA to ratify the MOU agreed at Athens in June. The RIAA planned to debate the issue at its main board meeting in October. Ertegun died on July 15th.

After leaks to the press about the MOU, the RIAA gave premature ratification and the IFPI co-ordinated a world release by all concerned on July 28th. All the industry bodies, and participating companies, put out identical statements on the same day.

It is clear that a deal was struck on recordable disc; the electronics companies would put a hold on CD-R if the record companies stopped sniping at DAT.

But proof of any such deal would put industry leaders at risk of jail sentences under America's Draconian anti-trust laws that prevent cartel operation. Hence the background



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notes put out by the Electronic Industries Association and Recording Industry Association of America, are at pains to tell the world that, *a*) "the only respect in which this memorandum has any force or validity is the obligation to support the agreed recommendations to governments and to plan further meetings addressing possible future recommendations to governments," and *b*) all parties agree "to work together to convene another joint working group of interested companies to discuss recordable and erasable CDs (CD-R and CD-E) at such time as the technology is at an appropriate stage of development".

In other words CD-R can now get bogged down in committees until the industry has had a chance to see how DAT sells.

The EIA and RIAA have agreed to ask the US Congress to consider legislation to reinforce the MOU. The IFPI will seek government action elsewhere, for instance on a European Community wide basis. This will stop companies from, for instance, Taiwan and Korea who were not party to the MOU, flouting what was agreed.

There is also vague talk of "refining the SCMS system in the analogue domain" and "exploring the feasibility of a technical mechanism for alternative systems of private copying remuneration in future digital recording devices".

This leaves the door open for any system that can identify an analogue recording as copyright music, by burying an inaudible label in the waveform.

The IFPI and EMI tested a modification of *Copycode* that put a notch in the waveform, and added low level digital code words. Not surprisingly they found that the code was audible.

Other ideas for automated identification are in the pipeline but these rely on intelligence built into the recorder. They work on the principle that every music recording has a characteristic spectral pattern that can be memorised and checked against music to be identified. Although advertisers could check broadcasts this way by analysing broadcast signals and cross checking the spectrum with stored memory patterns, it is clearly impractical to build check circuits into domestic equipment.

Background technical notes on SCMS clearly and unambiguously confirm that the system only controls the digital copying of digital copies and allows "any original pre-recorded work, as well as other material, to be copied indefinitely onto different blank DAT tapes". These notes have not been widely distributed.

Whereas all domestic DAT machines sold in Japan, and as grey imports in the UK, are deliberately designed not to record digital code at 44.1 kHz—and are thus unable to dub digitally from CDs—the new generation of DAT decks now blessed by the MOU will dub at 44.1 kHz.

SCMS, like the *Solocopy* system first proposed by Philips in April '87 but scorned by the IFPI because it was still hoping for a tighter block on copying through *Copycode*, adds a code word to the digital data stream when it makes a recording. This code limits further digital dubbing.

Technically the system is quite simple. The DAT recorder looks for any digital copyright protection codes, for instance the anti-copy flags, which can be incorporated in the Q subcode words of the CD bit stream. If these code words are there, it makes one (or more) *first* generation digital copies. But if the codes are there, or if the digital source cannot be identified, the DAT recorder writes an identification code '1, 0' on the tape. Any other DAT recorder registers this code and refuses to copy the digital signal, ie refuses to make a *2nd* generation digital copy.

If the material being copied is from an identifiable source and not copyright protected (eg a digital microphone of the future) the recorder will write '0, 0' in the digital subcode channel on tape. This code does not limit future copying.

When music is recorded via the analogue inputs, the recorder has no way of knowing whether it is copyright protected or not. So it writes a code '1, 1' on tape. When a first digital-to-digital copy is made, this code is rewritten on the copy as '1, 0' thereby preventing any further digital dubbing of the copy.

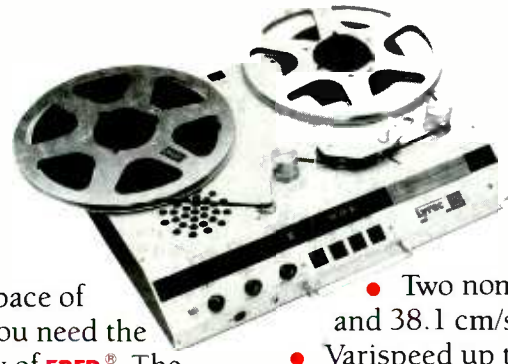
Early opinion is that the major Japanese electronics companies will not push DAT until there are clear signs from the record companies that they will back a launch with significant quantities of pre-recorded software. As duplication equipment is thin on the ground, this will be slower than many people expect.

Philips point out that regardless of software availability, DAT recorders with 44.1 kHz record capability and SCMS computer control firmware will not be ready for sale in bulk until next spring—which suggests a consolidated launch in autumn 1990. Polygram say they will not release DAT software until SCMS has been written into law and the principle of a levy has been accepted.

Philips quote nearly £1,000 per deck. Some Japanese talk of about £750, others look down to £500. One thing is certain. DAT will not be a 'bag of sweets' market.□

Barry Fox

Breakthrough



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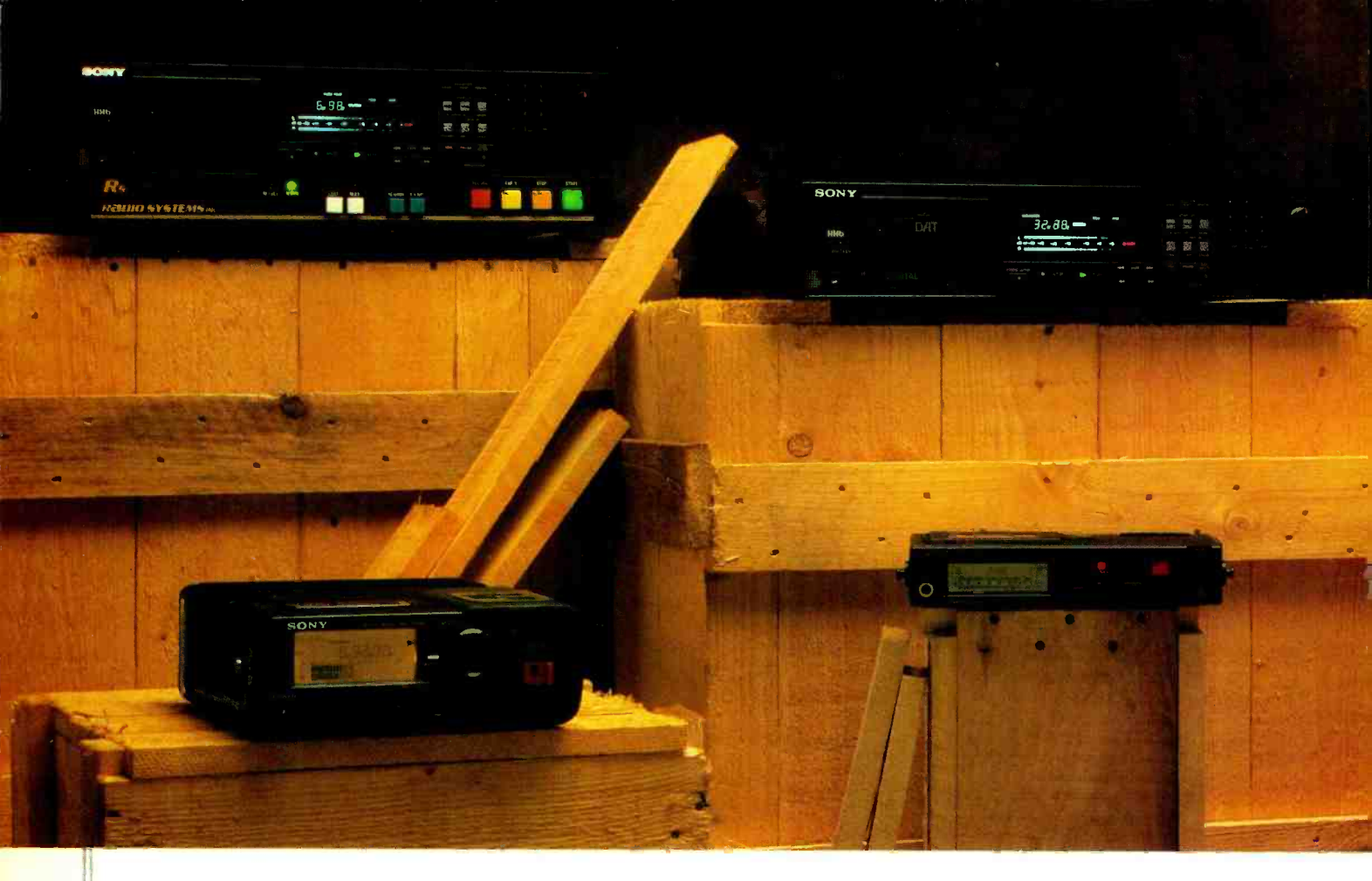

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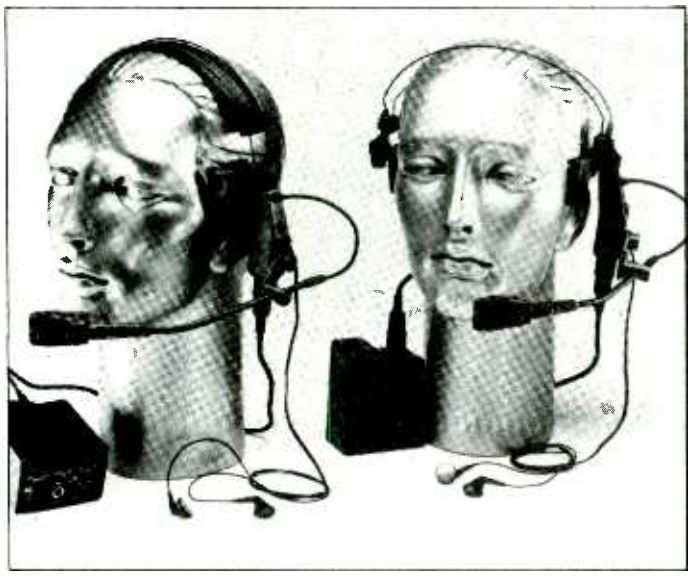
Furman 230 V conditioning/lighting module

New versions of the Power Conditioner/Light Modules from Furman are for use with 230 VAC power. The *PL-8-E* and *PL-PLUS-E* are designed to fit in the top of equipment racks to provide lighting and clean power with a master switch for the rack. The lights use standard low voltage bulbs and slide out from the rack. They have separate on/off and brightness controls. Power conditioning is provided in the form of spike suppressors and RFI filters, and then the power is routed through a circuit breaker to 10 rear panel IEC-320 mains outlets. The *PL-PLUS-E* version adds a colour-coded bargraph voltage monitor and extra RFI filtering.

Furman Sound Inc, 30 Rich Street, Greenbae, CA 94904, USA. Tel: (415) 927-1225.
UK: Shuttlesound, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-871 0966.



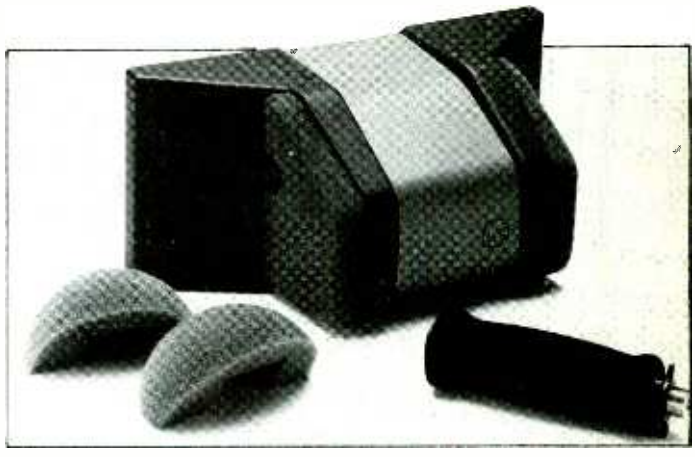
TOA HY headset mics

Two new headset mics from TOA are the *HY-3* and *HY-4* with built-in headphone monitoring. They are described as high quality electret types with a cardioid pattern and a smooth extended frequency response. There is a latching cough switch and a red LED for 'live' mic status. The mic element can pivot overhead or swivel away from the mouth. A stereo headphone amp is included so wearers can mix their own mic signal with the line level mix sent from the mixing console.

The difference between the two models is the design of the headband.

A beltpack provides operating power, mixing and monitoring functions. The mic element can be powered from phantom power via an internal voltage regulation system for low noise, or by two AA batteries that operate the headphone amplifier. The headset can be set to operate from either left or right side.

TOA Electric Co Ltd, Kobe, Japan.
UK: TOA Electronics Ltd, Hutton Industrial Estate, Tallon Road, Brentwood, Essex CM13 1TG. Tel: 0277 233882.
USA: TOA Electronics Inc, 601 Gateway Boulevard, South San Francisco, CA 94080. Tel: (415) 588-2538.



Crown SASS-P microphone

Crown have a new stereo condenser microphone based on *PZM* technology. The *SASS-P* Stereo Ambient Sampling System is configured in a near co-incident array with two PZM mics mounted on boundaries that make each mic directional. A foam barrier separates the capsules with the intention of reducing chance acoustic crosstalk causing phase cancellations when outputs are combined in mono. Crown say the mic outputs of the mic produce well focused natural stereo imaging and that the spacing between the capsules measures the same size as a human head.

The mic's outer shell of moulded plastic is finished in satin black and charcoal grey. Power requirements are 12-48 VDC phantom power or from two internal 9 V batteries. It weighs 17 oz and dimensions are approx 5 inches high and 11½ inches across.

The *SASS-P* comes with carrying case, swivel mount, black windscreen, twin auxiliary foam wind protectors, a hand grip and stand adapters. There is also a version known as the *SASS-B* built as a stereo boundary mount for Bruel & Kjaer *4003/4006* microphones where very low noise is required.

Crown International Inc, 1718 W Mishawaka Road, Elkhart, IN 46517, USA. Tel: (219) 294-8000.
UK: (as Amcron) HHB Communications Ltd, 73-75 Scrubs Lane, London NW10 6QU. Tel: 01-960 2144.
UK: Shuttlesound Ltd, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-871 0966.

Peavey Autograph

The *Autograph* is a MIDI programmable 28-band graphic equaliser with a built-in realtime analyser and pink noise source (−10 dB). The 1U rackmount unit has balanced and unbalanced inputs.

The *Autograph* has several distinct functions and can be used as a standard graphic equaliser with ±12 or 6 dB resolution, a programmable equaliser where curves can be stored in 128 memory locations or as an analyser with auto-EQ. In addition, it can receive MIDI commands to change settings and be controlled by a MIDI Librarian or computer.

As well as the 28 ISO filter bands, the equaliser features a switchable subsonic filter (18 dB/octave below 40 Hz) and microphone filters to turn microphones into 'flat' measuring microphones. A standard monitor response curve is also provided.

The controls are limited to six dedicated function buttons together with up/down—left/right cursor buttons, two soft keys and power and bypass switches. A 2×40 LCD display with adjustable angle of view is also provided.

A variety of displays is available and the RTA functions allow the use of discrete or multiple 'samples' in order to create the desired overall EQ setting. Curves already in memory can be compared and new settings can be made by adding existing curves together.

Peavey Electronics Corp, 711 A Street, Meridian, MS 39301, USA. Tel: (601) 483-3565.
UK: Peavey Electronics (UK) Ltd, Hatton House, Hunters Road, Weldon North Industrial Estate, Corby, Northants NN17 1JE. Tel: 0536 205520.

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Lab Gruppen SPL-2

Lab Gruppen produce a range of high quality power amplifiers for studio monitoring and sound reinforcement and this has been joined by the *SPL-2* Speaker Processor/Limiter.

The *SPL-2* is configured as a stereo 2-way processing unit for loudspeaker systems with the following features: 24 dB/octave Linkwitz-Riley crossover network; programme-controlled filters; bass and treble equalisation; protection limiters; loudness compensation and delay lines (up to 3 ms) on each output. A special feature of the *SPL-2* is that it can be used with both active and passive systems, the different bands being mixed together to provide a full range output for the latter. Each band has mute and phase reverse switches with the low section featuring a loudness control and the high section a treble equalisation control (eg for CD horns).

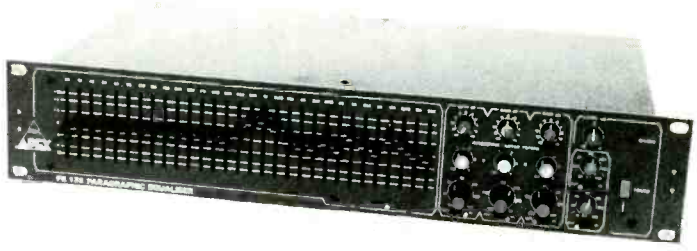
Two crossover boards are available, the *SPL-2B* (80 to 750 Hz) and the *SPL-2* (500 Hz to 4.8 kHz). A 3-way version—the *SPL-3*—can be configured using *SPL-2B/2* boards. The *SPL-3* also features low and high mid shelving equalisation as well as treble EQ.

Lab Gruppen, Lilla Verkstadsgatan 7, S-434 42 Kungsbacka, Sweden. Tel: 300 168 23. Fax: 300 142 46.

Rolec Mini-bloc amplifier

Rolec's compact mono block amplifier is claimed to withstand the rigours of OB and location work. The construction is an extruded aluminium casing with connections on balanced *XLR*-type inputs and 4 mm output sockets to take banana plugs. There is also a *B* version with male *XLR* inputs and female *XLR* outputs. The amplifier is supplied with a mounting kit for attaching to any monitor cabinet and has been supplied to the BBC for use with *LS3/5As*.

Rolec, Unit 210, Belgravia Works, Marlborough Road, London N19 4NF, UK. Tel: 01-281 4776.



Apex Paragraphic equaliser

Apex is a new Belgian company specialising in sound processing equipment. Their first product is the *PE 133* paragraphic equaliser—a 30-band graphic combined with a 3-band parametric section and high- and lowpass filters.

The graphic section provides ±12 dB of gain at ISO frequencies. The parametric section has fully adjustable gain, frequency and Q for each band. The filter design allows the creation of broader boost than cut curves allowing creation of very narrow notches with a claimed range typically down to −45 dB (gain up to +15 dB). All filter and parametric bands are individually switchable in/out. Inputs are electronically balanced with a balanced floating output stage with special parallel amplifier circuitry to increase the output current capability. An output transformer is retrofittable. Overall gain of the *PE 133* is ±6 dB and all potential overload points are LED monitored.

Apex NV, Zangerheidestraat 6A, 3751 Munsterbilzen, Belgium. Tel: 011-41.73.32.

In brief

● **Neutrik** have released the *PROFI* professional RCA (phono) plug. Available with gold or nickel finish, the *PROFI* features gold-plated contacts, a special mechanism that allows the earth (or ground) contact to be made first when connecting cables (thus avoiding bangs and thumps) and the ability to accept cable diameters of 3 to 6.5 mm (or 8.5 mm without strain relief grommet).

● **API** announce preliminary information on a new console—the All Discrete In-line Recording Console. Configurations up to 96 inputs with 48-track assignments, three stereo buses and 10 aux sends per module are all provided for. The input and monitor sections are identical. The GML series *2000* Automation Environment is fitted as standard with the GML moving fader system plus control of switching for large fader mutes, EQ in/out, filter in/out, small fader mutes, dynamics in/out and send mutes, all within ¼-frame accuracy. The remaining I/O switches plus track assignments will be resettable within one SMPTE frame. Two consoles have already been sold.

Australian Monitor AM1200 quad amplifier

The *AM1200* quad amplifier is configured as two stereo MOSFET amplifiers, where each pair can be used in bridge mode. Each channel is rated at 200 WRMS into 8 Ω or 300 W into 4 Ω with bridge specifications of 2×700 W into 8 Ω or 800 W into 4 Ω. The amplifier can be used in 2-, 3- and 4-channel configurations to cover a wide range of applications.

Features of the *AM1200* include extruded chassis construction, detented input attenuators, balanced inputs, dual two-speed fans, extensive protection circuitry, custom transformer with dual high current supplies and full status LEDs.

Australian Monitor Pty Ltd, 53 College Street, Gladesville, NSW, Australia 2111. Tel: 2 816 3544. Fax: 2 817 4303.

USA: c/o Grafton Sound USA, PO Box 351, Marina Del Rey, CA 90292.

Crest amplifiers

Crest Audio have introduced two new models to each of their *Professional* and *FA* series of amplifiers.

The *4801* and *6001* are electrically identical to the *7001* and *8001* but with less power. Features common to both amplifiers include IGM impedance sensing, auto-ramp signal control, RMS clip limiting and balanced inputs. Construction of the 2U chassis is completely modular and the amplifiers will drive into 8, 4 and 2 Ω loads.

The cost effective *FA* series has been joined by the *FA1201* and *FA901*. Both models feature 2U chassis and modular construction, detented input attenuators, accessory module sockets and status indicator LEDs. The amplifiers will drive into 2 Ω loads with maximum power outputs of 680 W/channel into 2 Ω and 440 W/channel into 2 Ω respectively.

Crest Audio Inc, 150 Florence Avenue, Hawthorne, NJ 07506, USA. Tel: (201) 423-1300. Fax: (201) 423-2977.

UK: Crest Audio (UK) Ltd, PO Box 36, Royston, Herts SG8 7RQ. Tel: 076 382465.

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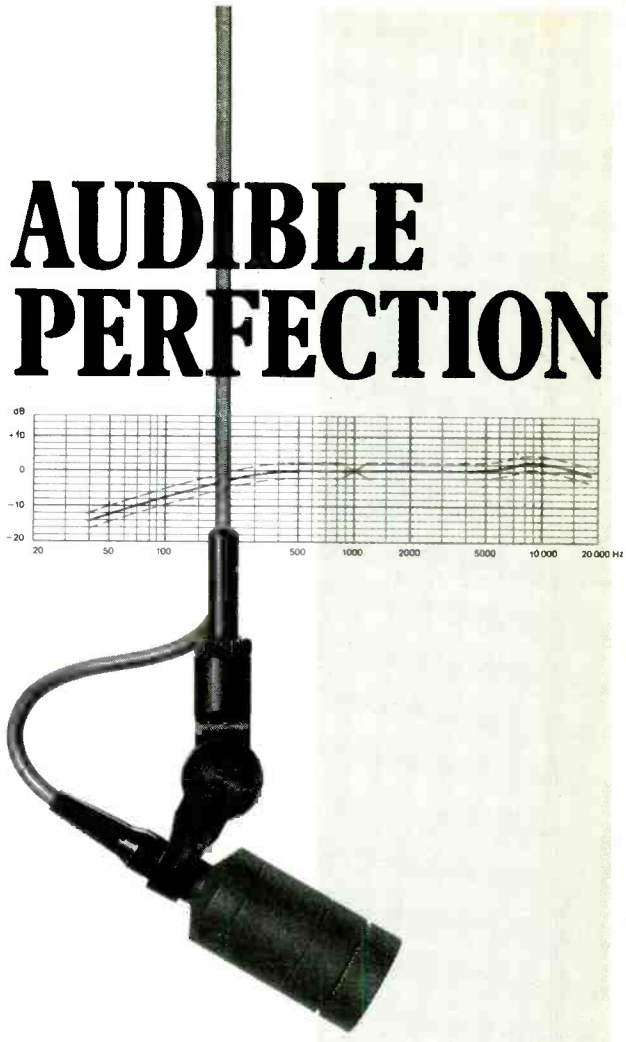

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Harmonia Mundi digital modules

Harmonia Mundi Acustica have added three new modules to their digital audio processing system. *Redither* is designed to add dither after digital processing to reduce the effects of quantisation distortion and optimise audio quality on conversion from 24 bit (the processing) to 16 bit for external interface.

The second module is an analogue-to-digital converter, which HMA describe as an ideal replacement for other converters of lesser quality. The design uses Apogee anti-aliasing filters and 2x oversampling. Resolution is 18 bit with a selectable 16 bit mode and users can switch between 44.1 and 48 kHz sampling rate as well as a highpass filter for DC offset cancellation. The module accepts stereo line level and mic level together with a switchable phantom power supply. Input level metering is provided and levels are adjustable. The module is 1U, 19 in rackmounting with a standard AES/EBU output, and has two free slots for standard HMA modules.

Rehearsal is designed for post-production where a section of audio has to be repeated many times and the rewind time of a tape machine is a slowing factor. The module can store 10 seconds of 2-channel programme at 16 bit/48 hKz, which can be expanded to 20 or 40 seconds in mono. Once recorded material can be repeated continuously with fully adjustable stop and start points and there are a number of other replay facilities including half-speed playback. All program functions are software-controlled by a remote module of the *bw102D* control desk.

Harmonia Mundi Acustica GmbH, In den Sigristmatten 6, D-7800 Freiburg, West Germany. Tel: 0761 49 15 06.

UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091.

USA: Gotham Audio Corp, New York. Tel: (212) 765-3410; West Coast (818) 785-2211.

AMS TimeFlex

AMS have added two new features to *Version 8* software for the *AudioFile*. TimeFlex can lengthen or shorten recordings (cues) for a required time slot without changing pitch. This is a realtime function that automatically calculates the required processing. Reel Rocking—the jog wheel facility that simulates the effect of tape moving over a play tape head—is now possible from the Assembly window. It has previously been available in the Source and Edit windows for precision editing in later stages of production but this will aid preparation of cues. This release will be free to all *Version 8* users.

Report from ITS

This short report on audio at the 16th International Television Symposium largely parallels the NAB Notes (*Studio Sound*, July 1989) but contains more recent information.

Held in Montreux, Switzerland, during June 17th to 22nd, the ITS was attended by over 20,000 visitors and exhibitors. It was evident that, in spite of certain improvements to the Centre of Congres, Montreux may be a good holiday town but is certainly not a place for large exhibitions and conventions.

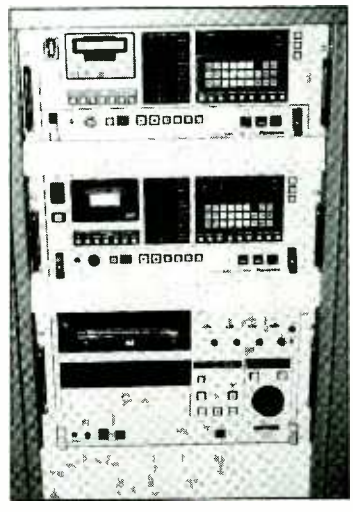
Many exhibitors (including the Swiss) are more than ready for a change of venue and it will be interesting to chart the level of success of the Broadcast show at Palexpo in Geneva during October. Palexpo is a purpose-built exhibition complex situated right next to the motorway, Geneva airport and the railway station.

The major theme of the symposium was, of course, television with HDTV systems one of the principal talking points. However, reflecting a growing awareness of audio among the vision people the symposium did have more audio in evidence this year.

Digital is still a popular subject and, as far as many TV people are concerned, is the only way to get decent sound—particularly if U-matic audio is your only reference.

DAT is now making a strong showing and hard on the heels of the Fostex professional machine is the new range from **Panasonic** and the *Stelladat* from **Stellavox**.

Panasonic had a fully working DAT studio set up with two *AU-RD5050* studio recorders, an *AU-RA501* editing controller and an *MII* VTR. The *AU-RD5040* portable recorder was also on show.



Professional DAT from Panasonic

Aimed directly at the professional audio/video market, the Panasonic range falls within comparable analogue prices for studio equipment and brings DAT editing and synchronisation to a format based upon the NHK proposed timecode standard.

Stellavox showed their prototype professional DAT recorder and this will include a variety of input options. The *Stelladat* includes timecode to the NKH standard and is physically the same size as its analogue reel-to-reel counterpart but with half the weight. Production is scheduled for the first quarter of 1990.

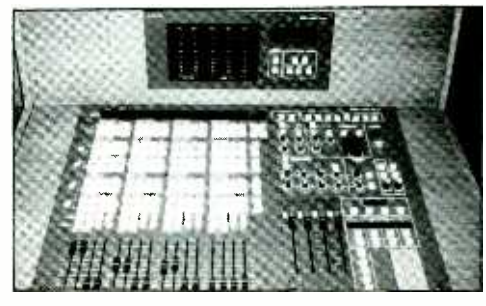
Nagra Kudelski have not been idle either and elicited considerable interest with their presentation of a pre-prototype rotary head digital recorder using ¼ inch tape, the *Nagra D*.

The final version will be the size of a Nagra *IV* and will provide two or four tracks of digital audio with 20 bit word length at 48 kHz. The machine also has four extra bits of auxiliary data together with one analogue cue track (PWM) and a timecode track.

ANT Nachrichtentechnik have been showing their prototype digital console for some time now but Montreux saw a console frame design that looks beyond the world of IRT studios.

ANT have also developed new modules for the console and these include a remote controlled microphone preamplifier with four switchable inputs and two independent outputs, a digital peak reading meter with either spot or bargraph display, an assignable motorised linear fader module and an assignable channel control module.

Over in the separate HDVS (1125) pavilion, **Sony** were very discreetly showing a prototype digital console in a 16/4 format. Each channel features a comprehensive routing matrix that can be recalled as required and a central control section with HP and LP filters, 4-band parametric equaliser and dynamics section that can be programmed for each channel. Console setups can be programmed as required and recalled automatically or manually and though the console has been designed with post-production suites in mind, it would be eminently suitable for applications such as theatre sound.



Sony prototype digital console

Other items of interest were a new professional CD player from EMT, the *981*, which features ergonomic controls, highly flexible monitoring and control capabilities, and is very suitable for integration into automated programming systems.

Studer released the *A779* professional small mixer (a pro version of the Revox *C279*) and the timecode version of the *A807*—good news for many studios.

The traditional rivalry between sound and vision would at last appear to be weakening as both sides realise that component is vitally important to the final product. The 16th Symposium was interesting in that digital audio was much in evidence and that the audio quality on large television stands was actually good. This in itself is a tremendous step forward from the often appalling sound of three or four years ago and bodes well for the future.

Terry Nelson

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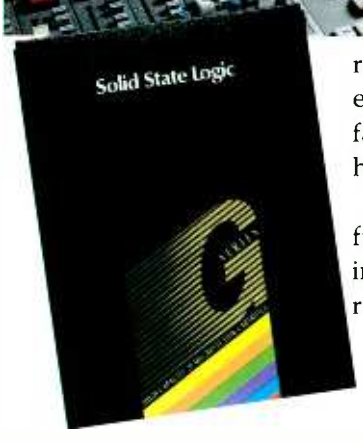
"No one will ever buy a console with a television in it"

Visitor to AES, 1977

It is hard to believe that a modest VDU could attract much attention. Today, even effects processors use visual displays. Why have they become so necessary?

Quite simply, the greater the number of functions in a system, the more flexibility there must be in showing its status. In the recording studio the central piece of creative hardware is the console. To unlock its full potential, Solid State Logic gave engineers digital control of its facilities. The VDU was a side effect of this plan.



In the intervening years our designs were enhanced, incorporating the suggestions of the many leading studios who had adopted our system. Ultimately, the G Series Master Studio System evolved.

G Series offers the fastest execution of complex commands by storing the entire operating program in 2Mbytes of on-board RAM. Its removable Data Cartridges preserve mobility of data, without the capacity limitations of floppy disks. Each cartridge holds 20Mbytes of removable RAM–the equivalent of 80 floppy disks.

Because G Series software represents over ten years of evolution in some of the busiest recording studios in the world, it incorporates an unparalleled degree of user experience. Advanced facilities like Selective Rollback and Group Set make mixing faster. Rapid comparison can be made between mixes. Large or complex mixes can be handled effortlessly on or off-line.

Throughout, SSL has preserved compatibility with earlier systems, creating a functional standard for the industry. By providing a realistic upgrade path, the investment of studio owners has also been protected. Most importantly, G Series remains at the forefront of audio production technology.

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Peavey DPM-3

The *DPM-3* is a Digital Phase Modulation synthesiser featuring software-produced synthesis allowing future update. The architecture is based around six programmable computers (two 8 bit, one 16 bit, three 24 bit) with 27 MHz voice data processing rates.

It has a present capacity of up to 16 voices in a polyphonic/multitimbral configuration and up to 32 digital PCM wavetable oscillators. The use of software for voice generation opens up many possibilities not available with hardware-based synthesisers.

Other features include two digital multi-effects processors with flexible routing, a 9-track MIDI Composition sequencer (eight instrument and one percussion) with a capacity of 20,000 notes and storage/retrieval facilities via a memory 'Cache Card' or internal 720 kbyte floppy disk. There are 100 internal memory locations (200 on memory card) for voice data plus 110 drum patches and five drum 'kits'. An optional assignable dual footswitch controller is also available.

Peavey Electronics Corp, 711 A Street, Meridian, MS 39301, USA. Tel: (601) 483-3565. Fax: (601) 484-4278.

UK: Peavey Electronics (UK) Ltd, Hatton House, Hunters Road, Weldon North Industrial Estate, Corby, Northants NN17 1JE. Tel: 0536 205520.

Europe: Peavey Europe Corp, Gildenweg 16, 3334 KC Zwijndrecht, Holland. Tel: (078) 10 00 44. Fax: (078) 10 01 45.

Fretless IBM-PC software

Sequence 1000 and the *Use-Fool* Editor/Librarians comprise a new software series for IBM *PC* compatible computers.

Sequence 1000 features Record, Playback and Edit modes and a variety of screen pages. Record facilities include 1,000 tracks, direct-to-disk, realtime or step-by-step recording, loop recording (Patterns), multichannel/multitrack recording, selectable MIDI events filters, punch in/punch out between two memories, a large range of time signatures; and record and playback at any point in songs.

Playback facilities include 10 locate positions between two memory points, MIDI volume and pan controls, three types of synchronisation (internal sync, MIDI clock sync, FSK sync), tracks can be soloed, transposed, looped and quantised.

Edit mode features a step-by-step Edit Grill with commands such as insert, delete, move, copy, change, velocity and length; individual MIDI events editing, track editing, programmable tempo and time signature changes; Patterns (loops) inserted in tracks or created from tracks; 'tape recorder transport controls' activated by a mouse or computer keyboard; the saving of Desktop configuration and scrolling menus for Songs, Patterns and Banks of Patterns (32).

The *Use-Fool* series of Editor/Librarians covers the Yamaha *DX7, DX7 II* and *TX81Z*, and the Roland *D-50, D-10, D-20, D-110* and *MT-32*.

Features are full graphic envelope editing, built-in sequencer, scrolling menus for voices and voicebanks, display and editing of all synthesiser parameters, copy of parameters from one voice to another and a 3-D analysis display for the *DX7*.

Fretless International, 3 rue Gabriel Laumain, 75010 Paris, France. Tel: (1) 42 46 28 03.

Intelligent Music M software

Intelligent Music have released the *M* MIDI software for the Commodore *Amiga* computer (*500* with 1 Mbyte memory, *1000, 2000*). A major feature is that *M* functions in realtime, allowing quick decisions when changing parameters.

Features of the *M* software include: *Amiga* sound generation plus full MIDI implementation; a Pattern Editor (with or without MIDI); a composing function for creating variations on recorded sequences; a Conducting Grid for synchronising changes between different musical variables; a Snapshot facility for instant storage and recall of groups of settings; global changes in MIDI commands such as velocity, note density, etc; independent MIDI channels for each Pattern; Record and Insert modes to interpret information from a MIDI keyboard; an Input Control System for performing program functions from a MIDI keyboard; MIDI-Sync in/out for synchronisation with external devices; MIDI File compatibility with other MIDI performance and notation software; support of the *Amiga* multi-tasking environment.

Intelligent Music, 116 North Lake Avenue, Albany, NY 12206, USA. Tel: (518) 434-4110.

C-Lab Explorer M1 library/editor

C-Lab have introduced the *Explorer M1* library and editor for the Atari *ST* series computers.

Designed for the Korg *M1* workstation, the *Explorer* allows for the management of extensive sound banks. Pages include: Sound Attribute for easy sorting and spotting of various sound categories; Copy, Swap and Clipboard for easy working with large libraries; *M1* Mode where all the data from the *M1* is loaded into the computer and can be edited coherently; Combination Manager, which facilitates a simultaneous overview of programs and combinations and allows assignment of timbres and other important functions to be carried out without using the editor; Sequencer Edit; Combination Edit; Effect Edit; Drum Edit, which allows the simultaneous editing of four drum kits.

C-Lab, Postfach 700 303, 2000 Hamburg 70, West Germany.

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

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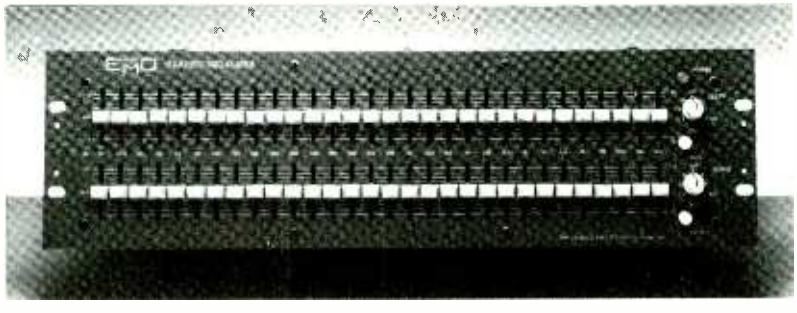

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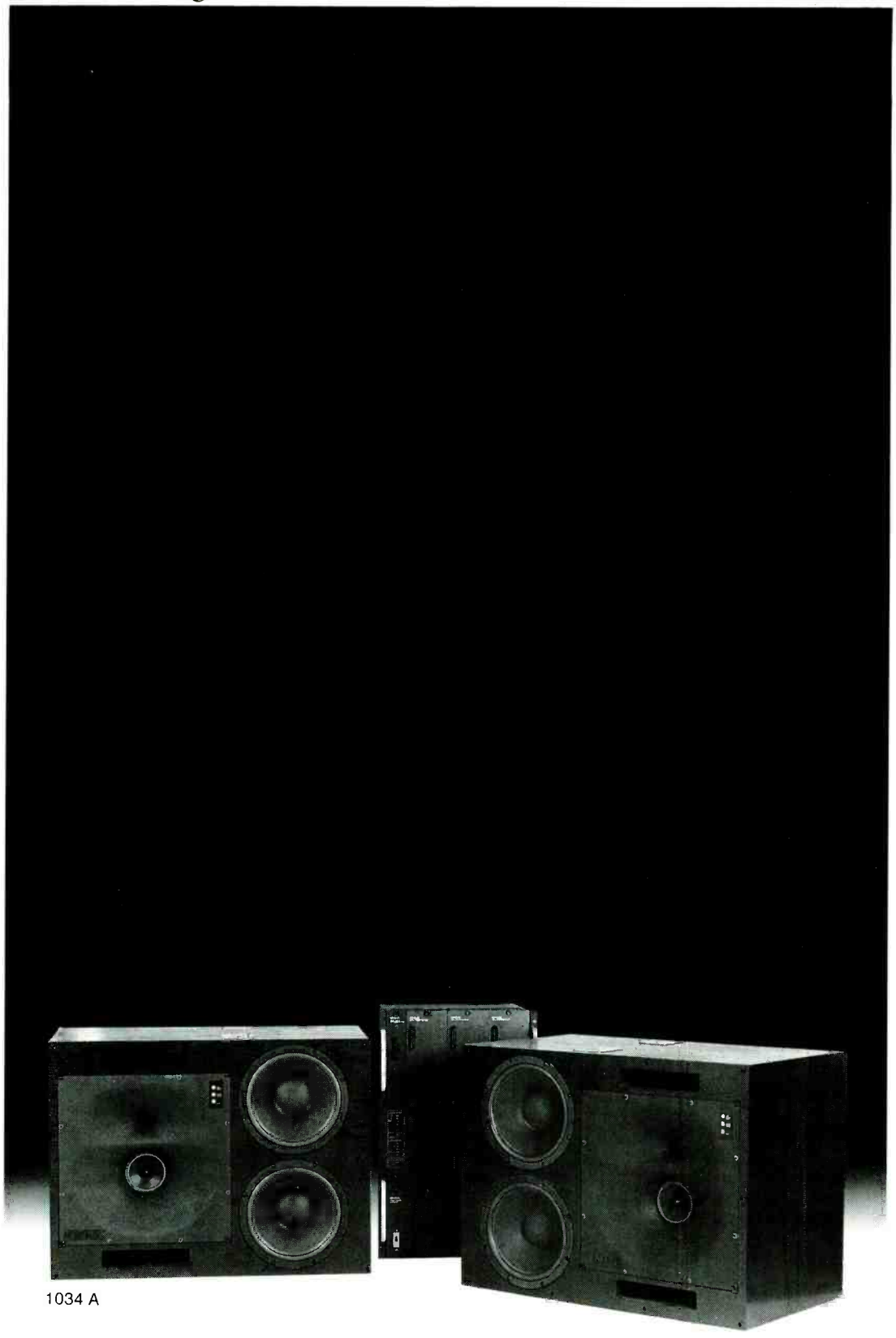

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Letter: VCAs investigated

Dear Sir, We are pleased to have been included in your article 'VCAs Investigated'. However, I regret to report that, through no fault on the part of Mr Duncan, *Studio Sound* or ourselves, and owing to a massive failure in communications, we were only informed of Mr Duncan's request for a brief background on our company and our *MTA 1537* VCA IC at the last minute, and we never received, either his request for sample circuits for evaluation or a preview copy of his article for comment, as was provided to other manufacturers. This has resulted in some technical and historical errata which we wish to address.

On the technical side, the article does not reflect our most current application data which has been in print for at least two years. The circuit shown as figure 3c in our data manual uses the *MTA 1537* to realise at least a 6 to 14 dB improvement in dynamic range over *any* previous Class A emitter-driven VCA or VCAtt realisation, depending on the control range used (including those claiming to be " 'approximately 10 times better' than the next best available VCA 'in all measurable aspects' ") as well as substantially lower distortion.

In this circuit, the *MTA 1537* is operated entirely in the 'current' mode as a pure cascode, which effectively eliminates any slew limitation, whatsoever. The outputs from the gain cell are fed directly to the summing junctions of the following op-amps. Any bandwidth limitation in this circuit is imposed solely by the choice of op-amps, since the unity gain bandwidth (f_t) of the transistors in the IC is 210 MHz. To be more specific, the *MTA 1537* has been successfully used in production circuits at frequencies up to 10 MHz in high speed audio tape duplication and video equipment. The reader is referred to our application manual for more detailed information.

Referring to Mr Duncan's note that our part requires no 'symmetry' trim pot, this quality is inherent in a well laid out Class A VCA IC. The internal mechanisms that require this trim in a Class B VCA require a 'DC shift' or 'control feedthrough' trim in a Class A VCA such as the *MTA 1537*. Maximum residual DC shift in these devices is generally specified after trimming, since the user would have no control over mismatches and offsets from the external components (op-amps and resistors) which drive the VCA IC, itself.

A less understood design problem unique to VCAs is the fact that critical transistor groups within the circuit must remain matched, thermally and otherwise, over the entire control range of the device. Failure to do so would manifest itself as a signal and/or thermally dependent DC baseline shift in a device such as ours. In a poorly behaved Class B circuit, the 'symmetry' adjust becomes valid only for a very limited range of control voltage, input level and even input frequency. As a manufacturer of VCA ICs we are keenly aware of the implications of transistor geometries and layout. We believe that the known quality, as well as the quantity, of our customers' products speaks to a history of signal and thermal stability in the *MTA 1537*

I have sent this data to Mr Duncan along with additional notes on the implications of control feedthrough (DC shift) and special thermal considerations relating to VCAs, which may prove useful at a later time.

Historically, circuits using the *MTA 1537* (not just the IC, itself) were designed and patented by myself and David Baskind working through B&B audio, Mr Baskind's company of that time, *prior* to our association with Aphex. (See the listing of VCA patents at the end of the article in the August issue plus British and foreign patents issued.)

Thank you for allowing us this opportunity to comment on Mr Duncan's article. To this we wish to add our compliments to Mr Duncan for the quality and integrity of his research and, lastly, our sincere thanks to Hill Audio Ltd for providing Mr Duncan with data and a working production circuit in our stead.

Unfortunately, we do not have representation in the UK at this time. Parties interested in our products should contact us directly at our offices in the USA.

Yours faithfully, Harvey Rubens, VCA Associates, 7131 Owensmouth B87, Canoga Park, CA 91303, USA. Tel: (818) 704 9202.

SECOND HAND CONSOLES

1.	SSL 4056 G 40 fitted with RH Patch, 12 months old. This console is as new (not a retro 'E'). Total recall available. Available immediately	£135,000.00
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5.	MCI 636 36 input with extended EQ. 8 returns patchbay with 160 lie lines bargraphs JI 150 Auto, in very good shape	£24,000.00
6.	Neve 8128 32 input console with penthouse. No automation. 6 years old in 'as new' condition. Available immediately	£29,500.00
7.	Harrison MR2 36 input console fitted with A/K Mastermix in good order. Available immediately	£29,500.00
8.	Soundcraft TS24 56 input with patch stand and PSU. 3/4 years old. Available immediately	£24,500.00
9.	Soundcraft 6000 40/16 patchbay ex demo. This console is described ex/demo as new	£9,500.00
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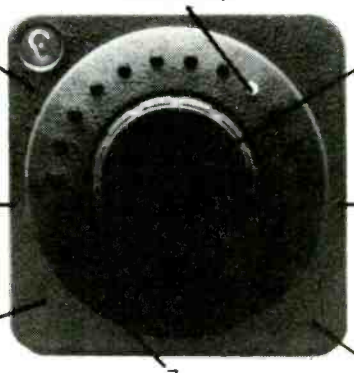

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NOMIS

Janet Angus visits a recently redesigned and expanded studio complex in London

When David Panton took over the Nomis Complex in 1981 it comprised eight rehearsal studios housed in a former dairy in West London. In addition to these he built nine offices, which were then occupied by music-related companies such as Adam & the Ants, Haircut 100 managements and Bravado Merchandising. What was missing was a studio. This year saw the fulfilment of that ambition with the opening of Britain's first Hidley-designed 20 Hz control room at Nomis.

It had never been just a rehearsal facility: an association with Turbosound led to R&D taking place on site as well as providing rehearsing bands with the new *TMS* range of speakers. As larger acts demanded bigger rooms (people such as Tina Turner and Wham) Studios A and B were set up in order to allow bands to realistically demo their touring sets. David Bowie, AC/DC, INXS and George Michael were now typical of the clientele and it was becoming increasingly obvious that a first class recording facility within the complex could only be a good thing.

Panton had met Hidley early on and subsequently been in discussion with him for a number of years. Alternative suggestions such as the installation of a mobile recording truck in the loading bay were soon abandoned in favour of breaking new ground.

"Nomis aims to be the best in reherasal studios," explains Jimmy Potter, artist liaison and PR man. "We considered a middle market 24-track setup but really there was not much point in doing that. It made a lot more sense to have a real top of the range facility designed to accommodate our top end clients who are very serious musicians requiring a very serious recording environment.

"Hidley was talking about the effect CD was going to have eight years ago, long before the players were available in the shops. He explained to our managing director David Panton his philosophy of monitoring systems and control rooms and how he had set about designing a room to complement the CD. It was quite plain to him that CD and DAT were going to take precedence over everything else and we saw no point in doing what had been done before; we might just as well lead the way."

It wasn't quite as simple as that. The Nomis team travelled to France and the USA to look at and listen to other Hidley rooms and their associated Kinoshita monitoring systems including Studio des Dames (Paris) and Masterfonics (Nashville). The rooms were found to be slightly different in their nature although there was continuity in sound quality. The object at Nomis was to create a similar room but tailored to English taste—which apparently meant more comfort. It seems the UK client requires more pampering. Hidley apparently raised an eyebrow when quizzed about the absence of a sofa in his initial plan.

Hidley's 20 Hz room concept came from a feeling that existing room designs did not cater for the full frequency spectrum of today's musical instruments and recording equipment. With electronic keyboards down to 20 Hz and below, microphones on the studio floor down to 10 Hz, and improved LF specifications in many other areas, it was apparent that a re-think was in order.

The performance criterion of such a room Hidley defines as follows: sonic neutrality; acoustical isolation; perimeter room dimensions, which accommodate the wave path length required for the production of the fundamentals of the lowest frequency generated by the room; 'acoustically invisible' air conditioning; light fittings should not be optically obtrusive or electronically interfere with audio circuits in the room; electrical installation should be filtered, isolated, regulated and distributed; and finally, equipment choice should consider the detrimental effect of large physical presence in the room (ie consoles with rigid backs extending to the floor are more acoustically detrimental, the angle of a console's top face plays a direct part in the splash reflection into a producer or engineer's face). In other words Hidley feels great attention to detail is required.

According to Hidley the choice of the main room monitor system, the amplifier and its hook-up wire can make or break the overall project sonically. "The room can sound no better than the complete monitoring system." An integrated monitor-and-sonically-neutral-room design results in the removal of the traditional two-speaker box source of sound. The music is perceived as coming toward you forward from the monitor wall, giving the impression of a three-dimensional picture standing in front of you with an impressive depth of sound. The other benefit of this system is that there is no need to monitor at high levels.

Having said that, Potter decided to play a rousing passage from Tchaikovsky's *1812 Overture* at considerably high level during which the cannons very nearly caused heart attacks in spite of familiarity with the piece.

The system is designed by Kinoshita—*RM-7V* 20 Hz monitors, powered by FM Acoustics *FM1000* power amplifiers and mounted in concrete in the monitor wall. "There seems to be a rumour that the monitors are too far away from the desk. People come in and say they have heard that the room is too big. But in fact the monitors don't feel a great distance away because the whole room has become the monitors. It is not just a wall with speakers in it. You can hear a true stereo image the entire length of the desk and actually more or less anywhere in the room."

FM *Forceline* cable was used in the monitoring system and

Control room

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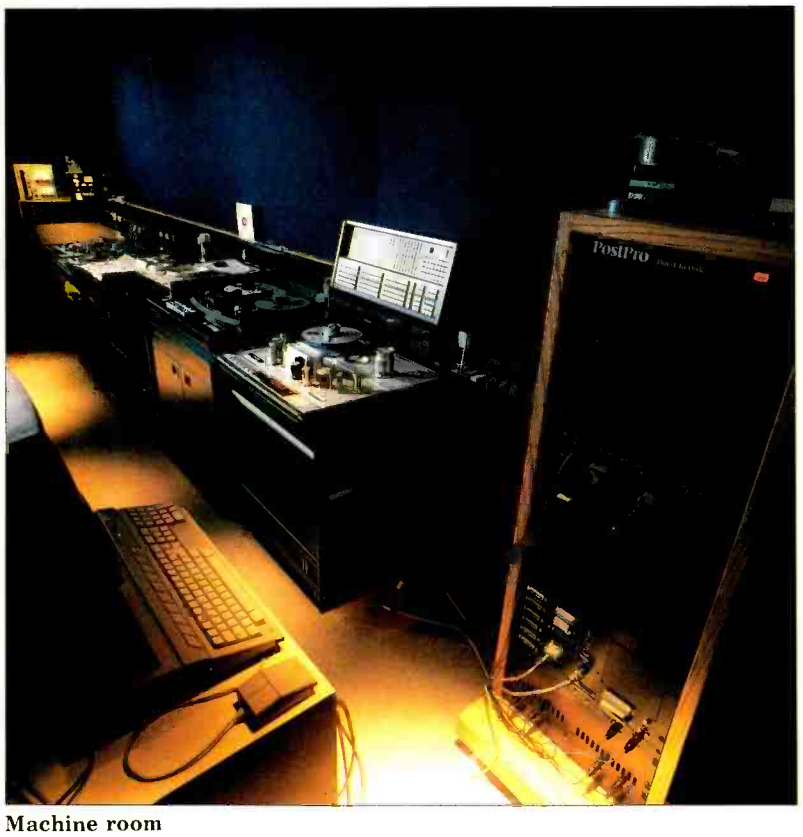
One of Nomis' larger rehearsal rooms

Mogami oxygen-free cable implemented throughout the rest of the installation. Roger Hayler, maintenance engineer: "It doesn't actually work out much more expensive. It is very easy to work with and the result is that we have a room which people are saying sounds better than other rooms with similar equipment. I don't know why it is but overall there is something sonically better about the room."

The studio installation comprises three Faraday cages—machine room, control room and studio—to screen from radio interference. The major and glaringly obvious problem, however, was the fact that there are six rehearsal rooms within the building belting the decibels out all day long. In the end it proved necessary to physically cut the building in half to isolate the recording area. When building had been completed several heavy metal bands were invited in to do their worst, which unfortunately proved a little more than anticipated. Situated on the first floor at the back of the building it was found that total isolation was not possible without drastic measures. A few heart beats were skipped the day the cutting took place, with visions of the whole complex collapsing around their ears. No doubt Hidley was confident and, having plugged the gap with rubber, silence reigned.



Machine room

Hayler explains how they worked with Hidley to achieve a mutually acceptable end: "We had very definite ideas about what equipment we wanted and how it should be laid out while Hidley pushed the acoustic point of view. We worked with him to get a usable system. The actual room is bigger than the visible 28×21 ft. The back wall extends 4 ft further back and the true ceiling height is 18 ft. You need a very large room as a starting point for a 20 Hz design. There are hanging boards behind acoustically transparent-fabric on the walls. Light fittings are recessed in order to avoid protruding into the acoustic of the room and they are guaranteed rattle-free".

There is a good deal of light oak incorporated in the room, particularly on the floor area, and this was chosen after ceremonial high-heel testing by a female member of staff. "There were some really nice woods but they wouldn't have lasted very long with flightcases, etc, being dragged around on them".

Acoustically transparent 'Nomis blue' fabric is implemented throughout the design with a fetching yellow stripe running at waist level round the room. As Potter points out, the beauty of this is that although it looks 'the business' this year, fashions change and when the time comes it is a simple matter to change the colour of the fabrics and swiftly and economically transform the aesthetics of the rooms.

The 'Nomis blue' ubiquitous sofa is centred along the rear wall behind the console. On either side there are equipment recesses. Further equipment is housed in custom built 'wing' consoles built onto either end of the 64-channel *SSL 4000 G* series mixing console with *Total Recall* and programmable EQ. The console wings are at a 70° angle, which acoustically and visually complements the wall and ceiling designs. Four *Focusrite* pre amp/EQ modules are built into the desk, enabling direct patching of mic signals to the multitrack. Two channels of *Focusrite* EQ and two dynamics channels are provided in the outboard complement. There is a great deal of equipment located around the room but as it is spread out and the room is so large it is not immediately apparent. According to Hayler this was a deliberate move to avoid being too imposing: "There is a lot of equipment in the machine room, too, which makes this a very clutter-free room".

After monitors and console were chosen, the big recording medium dilemma came. The final choice included not only Mitsubishi *X880* digital multitrack, Studer *A820* 24-track analogue, two Studer *A820* mastering machines with Dolby *A* and *SR* but also the first NED 8-channel *Direct-to-Disk* system installed in a UK bookable music studio. This enables the expedient execution of electronic track bouncing, editing and overdubbing in the absence of the constraints of magnetic tape. The usual DAT and *F1* ancillary systems are also provided. Studio synchronisation is provided by an Adams-Smith *2600* series three-machine sychroniser linked into the SSL *G* series computer via an SSL synchroniser interface.

"The *Direct-to-Disk* system cuts recording time down," enthuses Potter, "and coming in early is very good for budgets."

Hayler takes up the story. "We looked at available systems and their existing software. This one not only had a multitrack function but it had very advanced software. It is the equivalent of a multitrack and a 2-track system all in one, with a lot less running about. It also works in measures and bars as opposed to timecode which makes it immediately more accessible to music people."

The machine room runs along one side of the control room, measuring 24×7 ft. Very long and thin it will accommodate up to four multitracks, three 2-track machines and the NED *Direct-to-Disk* system.

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◁ accommodate a video projection point just in front of the desk. Thus all aspects of audio work may be catered for from pure music through to film and video.

The recording area measures 33×18 ft and features sliding mirrors on the back wall with which the acoustics may be altered. A great deal of light oak and blue fabric are incorporated in this unevenly shaped room with its sloping ceiling and angled walls. The floor is wooden as are the majority of the finishes in its associated isolation room. Large *Standeasy* acoustic screens have been covered in the Nomis blue fabric to match the room.

"Clients using the rehearsal rooms tend to set up their gear and are playing together all day long, which means that the sound isolation here had to be a lot more stringent than in a more usual situation," commented Hayler. "The control room has an NR of 20 and the studio is similar. The air conditioning must be very quiet in here. The room was not designed with a specific RT in mind; rather it is a space for putting a microphone in—a tool for recording with various zones, which would all give a different response, so a figure would be meaningless."

Rehearsal room at Nomis

Four rehearsal rooms were sacrificed to the new recording suite, including a large room located beneath the studio. "We just couldn't keep it," Potter reflects, "but we have made it into an artists' lounge so we weren't sucking our teeth and crying a lot." Accessed via a private staircase this is designed to cater for all a band's needs and comprises a large lounge with TV, video and satellite as well as *en suite* kitchen, two showers/bathrooms and a production office.

Bearing in mind their intention to offer a complete service to their clients Nomis decided to tie-line their two large rehearsal rooms to the studio. This serves several purposes: not only are live albums possible but it is quite useful for a band to be able to record its touring set prior to actually implementing it, picking up any potential problems.

Access to all this is via large goods lifts making movement swift and uncomplicated. Although built as a dairy, the building has proved to offer enormous benefits to a complex of this nature. It did, however, present its problems to the studio builders; 18 in thick walls and sloping floors led to 2½ years of building and demolishing by the Hidley construction team.

The new studio is the latest addition to a versatile complex that offers complete back-up of all facilities including offices for short- or long-term leasing, fax and secretarial services, limousines, catering (there is a large restaurant on site), trucking and equipment storage.

An artist may arrive at Nomis with an idea, write, arrange, rehearse in a small studio; demo in the 16-track demo/programming suite; routine the band and record via tie lines to the control room; master and mix; and finally rehearse for a tour. There are facilities to hire in all backline equipment requirements as well as organise tour managers, crew and trucking.

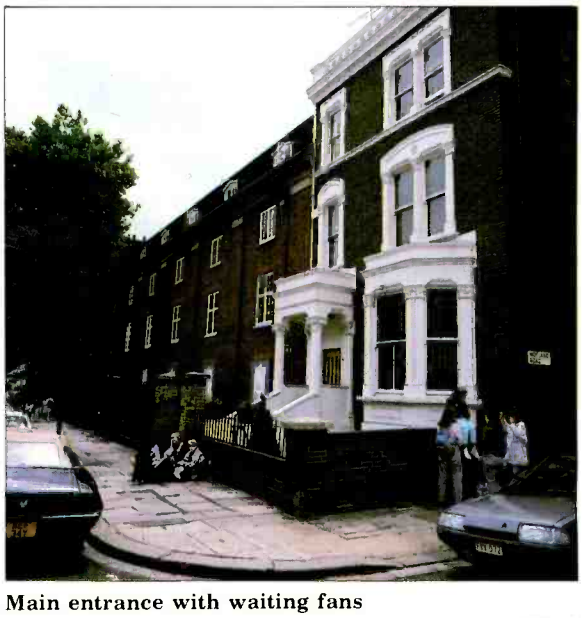
Accommodation is arranged either at a very attractive rate at the nearby Kensington Hilton, or in one of two large Kensington flats belonging to Nomis with porterage and security provided.

Apart from these facilities one of Nomis' major assets is its central London location. Virtually every major UK record company lies within a three mile radius. The fact that the rehearsal rooms are used for band showcases means that A&R people are frequent visitors and have therefore built up a relationship with the place already. As Potter observes, "A good recording studio is very beneficial to A&R men, especially around the corner from their offices."

The rates for the new studio are £1,500/day. Says Potter: "There are absolutely no extras. A lot of recording studios are getting into trouble like that. This way the record company knows exactly where it stands and can budget accordingly. Equally, with our longstanding relationships with A&R through the rehearsal rooms we know all the scams—there's no pulling the wool over our eyes, so I feel confident that we won't get dragged into the price warring and playing-off of studios against each other, which some facilities find themselves caught up in."

Bookings are made through studio manager Julie Murrell, the first of which included an album by Japanese band Blue Angel; track mixing for *Giant* with Terry Thomas and Nigel Green, as well as Squeeze with producer Eric Thorngren and Tom Lord Alge mixing Bros' new album. Obviously popular with the clients, this first UK 20 Hz room may well prove the catalyst for many more.

Nomis Complex, 45-53 Sinclair Road, London W14 0NS, UK. Tel: 01-602 6351.□



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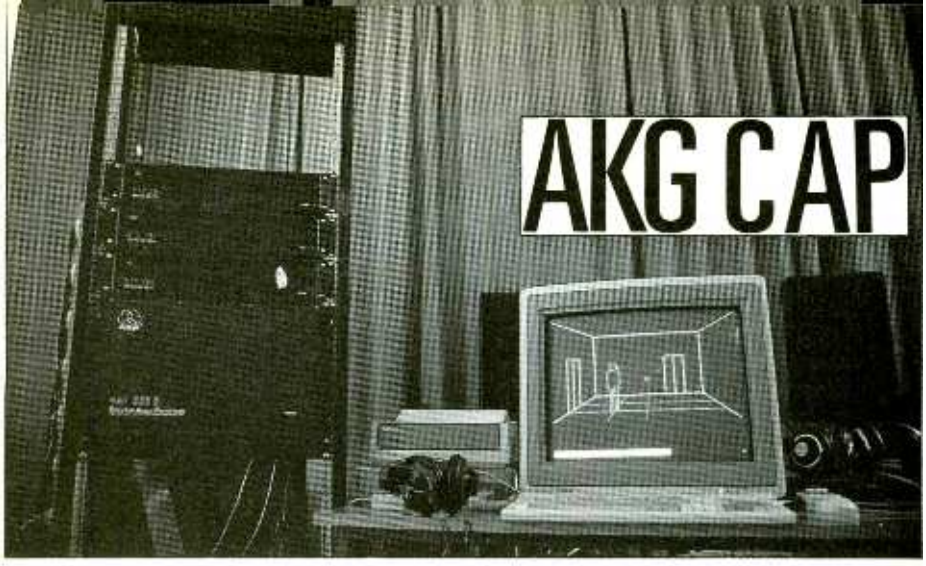


Andrew Von Gamm takes a look at AKG's Creative Audio Processor

The *Creative Audio Processor* is an audio computer that can be programmed to perform almost any task in a recording studio except record. Like any computer, it is just boxes of electronics, a keyboard and a monitor, and at the moment, the *CAP* can simulate rooms, be a digital mixer, analyse signal paths and can send eight sound sources to eight speaker groups.

The *CAP* comprises four parts:

- The central processing unit, which performs all the multiplication, addition and delay operations using a 32-bit floating point format
- The host computer, which generates the control code for the processing unit and provides the user interfaces of keyboard, mouse and monitor
- The host interface, which transmits the control code from the host computer to the processing unit
- The audio interface, ie AD/DA, using sampling rates of 50, 48, or 44.1 kHz and here the data format is 16-bit with a 3-bit block floating point

When it is switched on, the *CAP* asks for a password and having received one, gives the user a list of hardware at his disposal. The *CAP* then tests all its components for any possible malfunctions. For a larger version of the *CAP* this self-test can take over a minute. Apparently the test mode can be used to routinely test other equipment; to receive such a status report of all wired-in equipment after switching on, would be a very useful function indeed.

Once the *CAP* is ready for use, the desired software is loaded into the host computer on a floppy disk. The software can be written in assembler but it is more usual to have it in H-P Basic, which is very easy to use. For example, H-P Basic does not need a dimension for strings of up to 18 letters and, when in edit or list, the H-P 'wipes' from the middle, so finding a random spot in a program can take a few seconds and programming should prove fairly simple.

Present software

The mixer: The original idea of the *CAP* was to solve the spot mic problem, ie to find a way to prevent a sound source 'zooming in' on the listener when a spot mic overrides a stereo pair and destroys the stereo image. The mixer software reflects this concept. In the 8-channel binaural version distances to the listener are expressed in milliseconds rather than feet or metres.

In this software, the altering of any one parameter can be done with the keyboard although using the mouse would perhaps have been easier. The function to be altered is framed in red and a new value is typed in. Panning can either be in real binaural stereo or in old-fashioned 2-channel mono. An A/B comparison between two complete settings can be performed at the touch of a button. There is no switchover click because the volume ducks down for a few milliseconds as you go from one setting to another. This works well enough to be used as an effect in itself in much the same way as an autopan; the difference being that whole changes of filtering and binaural positioning can be effected.

The 'mixer' shows what would appear to be an analogue desk but instead of panpots, two little heads are shown per channel. The top one is a head shown from the top and a red arrow can be rotated through 360°. The sound source would then appear from that angle. The *CAP* calculates not only the time delay between each ear for every angle and the delay time for any given distance, it also calculates the frequency response for any given angle. The lower head gives the vertical angle and functions in the same way as its horizontal brother.

Below the distance display, which is given in milliseconds, there is a mouse-driven fader.

Changing the colours of any given display is simplicity itself. I went for a pretty combination of pink and white on a blue background and this could be done in seconds by altering two variables in the Basic program of the host computer.

The status of the individual channels can be displayed, giving the channel number, the distance as a function of time, the volume to the left and right ear and any comments that one may wish to add.

The floor plan: This software provides a space of variable size that can have walls made of any substance placed around the listener. Sound sources can be placed about the room with the mouse. By drawing walls or baffles in front or behind the sound sources, various acoustic environments such as cars, kitchens, telephone boxes, or huge walls can be built. A sound can be made to appear from another room by placing walls about the listener so that the sound path is indirect.

The menu to the right of the floor plan is also operated with the mouse. Some of the functions that the menu has to offer are:

- Set Main: the main mic or head is set with the mouse to a suitable spot
- Set Spot: up to 32 difference sound sources can be set
- Set Wall: in the version available at the moment, only three walls can be set. That does not sound like enough but it is surprising how many acoustic environments can be created with just those three walls
- Rotate Main: this turns the main mic or head
- Head Select: no two heads or mics are alike. This option gives one the chance to hear through different mics or even different heads. By putting on headphones and using an analysis of another head, one can hear using another man's ears. (I listened to some music using different 'ears'. It was interesting to find out just how very different one person's hearing is from another's. I was able to compare Persterer's hearing with that of one of his colleagues and with the way one hears using a dummy head. The dummy head sounded dull and the audio did not seem to come from one definite position when compared with human ears.)
- Wall Select: although over 200 wall surfaces are available on floppy disk, the program offers only four: infinite absorber, infinite reflector, wood and carpet.

Room simulation: This would seem to be the software poor relation. The picture on the screen looks interesting enough but the results are in no way as interesting as those of the other programs. The idea is similar to the Floor Plan but the picture is three-dimensional and heights above ground can be altered.

Unlike the Floor Plan, positions can be altered in realtime by using the mouse. Unfortunately, this happens in increments so 'digital-jumps', better known as the 'zipper-effect', are very pronounced. Another disadvantage of this program is that the walls are all infinite reflectors.

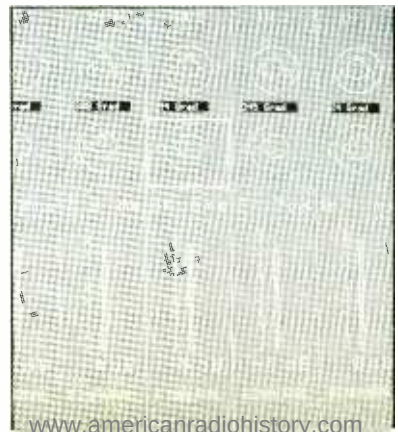
Filter manager: It is fundamental to the concept of the *CAP* that it can not only copy any filter but can create any new filter imaginable. A new filter can be copied by entering its characteristics either numerically on the keyboard or by drawing it with the mouse.

By copying a curve and then altering it, one has a very powerful tool. For example, a speaker's response can be displayed and then, within a given range, creating an exact mirror image centring about the original response is just a one-button operation. In this way, a perfectly flat signal path all the way from the microphone to the speaker is possible.

The filtering is, of course, fully arithmetic and therefore subject to no phase problems.

The Filter Manager is more than a fancy equaliser as it can tell the user just about everything he could want to know about a signal and make an A/B comparison with any other signal. Slew-rate, amplitude response and group delay can be displayed and compared on-screen either one to another or with other signals. Using ▷

Colour, form, scale—the CAP is what you program it to be.



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Blood, sweat and tears.

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◁ this program, one begins to 'see' signals and pieces of equipment in new ways. For example, by comparing a dummy head with a real head, one begins to understand why the lack of hair, real skin, shoulders, etc can lead to imprecise positioning and a duller sound.

Speaker manager: The Speaker Manager program was specially developed for the Institute for Broadcasting Technology in Munich for their R&D into HDTV and possible sound systems that would give the larger screen a 'bigger' and more realistic sound, rather than just left/right stereo. But, like all the *CAP* software, what was intended to be just a single application solution has turned into a powerful tool for a whole variety of uses.

With the Speaker Manager eight sound sources can be allocated to eight speakers. Like all the software discussed so far, this allocation takes account for time delay and the filtering effect of a sound coming from one direction or the other. That means that a sound can be made to appear to come from somewhere where there is no speaker, for example, from behind a speaker.

Moving a sound source is done with a mouse using a graphic display of the speaker arrangement. One sound source at a time can be picked out from the menu. When the source is ready to be moved, it turns blue but, although these movements can be made in realtime, they still happen in small digital jumps.

The Speaker Manager also gives a status report on all eight speakers for distance in metres and angle to the listener. Status reports are also available for percentages of energy being sent to each speaker system, volume levels, and the delay times for each sound source to each speaker system.

Conclusion

Because the *CAP* is a computer and not a piece of equipment in the conventional sense of the word, it does not 'do' anything; just like any computer, the user has to tell it to 'be' a mixing desk or a set of filters or whatever.

The *CAP* is not much to look at. Again, like all computers, it is just a keyboard, a screen and a rack full of electronics. In its largest version, it will accept 32 inputs and process up to 32 outputs. There is not much software at the moment and what there is, is fairly similar. The original idea was to solve the spot mic problem and the available software does this better than any other system that I know of. Not only does it calculate the time delay factor for any given distance but it also calculates the filter characteristic for any given angle from left to right, front to rear and up and down.

I found using the *CAP* very easy, though I must admit, I had its creator at my side to show me every step along the way, however, the program seemed to be easier to use than the average word processor.

Moving a sound source with the mouse in realtime did give me digital jumps but I was assured that creating smooth, continuous movements was the next software development. To do this, the host computer, the *HP 9000 series 300*, will have to be replaced by its faster and larger brother, the *series 360*.

The software is fully accessible to the user. Indeed, AKG want users to extend the range of available software and adapt existing programs. The most useful program I found to be the Filter Manager and the Mixer. I was able to try out the 8-channel version of the Mixer and its ability to perform a complete reset in 10 ms without any click or jump was impressive. The 32/32 must be quite a toy!

The *CAP* costs money. The customer who is looking for the largest and most powerful version, will probably not see much change out of $300,000 once he has bought his host computer and a VDU large enough to display all the information that the *CAP* can deliver. But his processor opens up the fields of digital audio processing and real psychoacoustic sound placement. There is nothing else like it on the market today.□

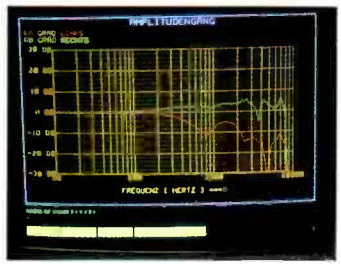
Alex Persterer profile

Alex Persterer joined AKG straight from the Graz Technical University in 1984 and has been there ever since. Developing the *CAP* has only been the first step in his career. As part of his studies, he also learnt to play the classical guitar, which he says has helped him to look at technical problems from different standpoints. He is definitely not the usual dry technical 'type'.

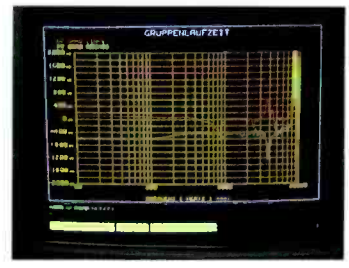
Alex Persterer is already packing his toothbrush for Moscow, where he will be acting as technical adviser as the *CAP* is due to be taken into space by the Russians in the winter of '91/'92 to test the problems of orientation and the location of sounds under the effect of weightlessness. Interestingly enough, of the 15 experiments that the Austrian 'cosmonaut' will be performing the *CAP* will be the only one that is financed by private industry.

In March of this year, Persterer's home university of Graz honoured him with the title of Doctor for his work in 'realising a high-powered system for the processing of digital audio signals'.

Moving walls: various walls and sound sources (channels) can be moved around the listener. The walls can be made from any material

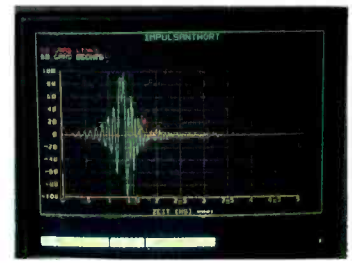


Frequency response

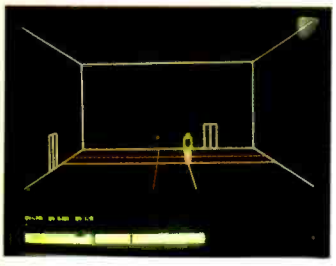


Group delay

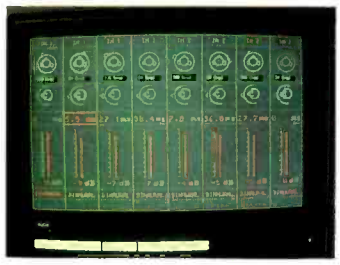
The CAP in use as an analyser with a dummy head at 60°



Impulse response (slew rate)



Room simulation: Yellow axes give listener position; red give sound source position. Height, positions and scale of room can be altered with a mouse. The doors give an idea of room size and cannot be opened



The mixer: up to 32 channels, shown here are eight binaural channels. The function framed, in this case distance to listener expressed as a function of time, is ready to be altered

Speaker manager: several sound sources can be moved between up to eight separate speakers. The blob at the bottom is the listener, numbers one to four are the speakers. The red circles are set and the blue one is ready to be moved with the mouse

Right: status report

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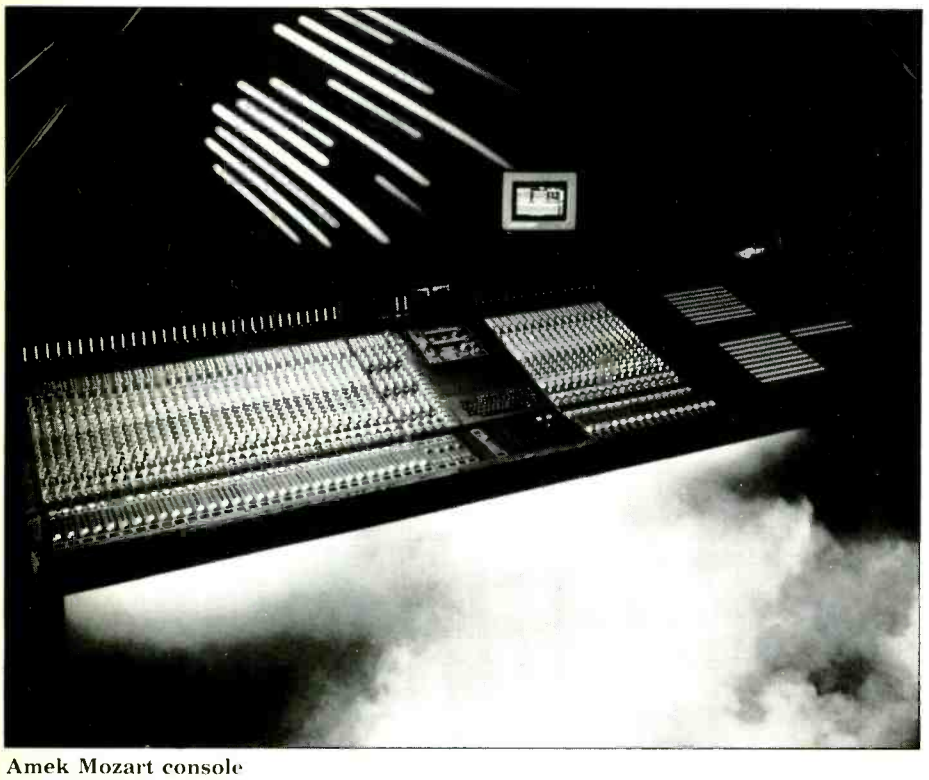
AES PREVIEW

The 87th Convention of the Audio Engineering Society will be held at the Hilton Hotel and Sheraton Centre, New York during October 18th to 21st, 1989. As usual the Convention will consist of a wide range of technical papers with an associated exhibition. We have compiled this preview from details available to us at the time of writing

A

• **A B International:** range of power amplifiers and sound reinforcement equipment. • **ACO Pacific:** several ranges of measurement and music recording condenser microphones. • **Acoustic Design Group:** photographs and drawings of completed studio design projects, as well as drawings of current projects. • **Adams-Smith:** will be exhibiting, among other products, the model *2600* A/V audio editing system and its features including full list management for MIDI operations, varispeed synchronisation, and mixed frame rate synchronising and editing; and the new *Zeta Three B* synchroniser. • **Adamson Acoustic Design:** their range of concert loudspeaker systems including the *MH 225/B-218F* incorporating the Acoustic Waveguide theory. • **ADX Systems:** their *Turboblock* Chase Synchroniser system with latest updates. • **AEG:** tape duplication equipment. • **AGFA:** full range of audio, video and duplicating tape and cassette products. • **AKG Acoustics:** the full range of mics, headphones and processing equipment. New will be the *DSE7000* RAM-based digital workstation. • **Alesis:** full range of digital signal processing, analogue processors, compact mixing console and MIDI-based products. • **Allen and Heath:** introducing an advanced version of its *SC* series of consoles, featuring a Matrix Group module as well as new input modules. Existing products include the *Saber* and *Sigma* series of 16 and 24 bus recording consoles: and the *Scepter* rack mixer. • **Alpha Audio:** latest updates and facilities for the *BOSS* post-production system as well as acoustics materials from the acoustics division. • **Altec Lansing:** featuring the new *A700* loudspeaker system; the *A700 XLF* low frequency system designed to extend the *A700* to 43 Hz; and the new *9442A* dual-channel power amplifier. • **Amber Electro Design:** automated audio measurement systems. • **Amek/TAC:** the new *Mozart* console featuring an all-input approach with identical channels accepting any type of input. The console is available with 40-, 56- and 80-input frame sizes and 32 mix buses. It features an automation system developed with Steinberg. Established products include the *APC1000* with inclusion of Synchronous Reset software package allowing SMPTE timecode control of console and MIDI events; the *G2520*; the *Classic*; the *Angela*; and the *BCII* broadcast console. TAC are showing products including six versions of the *Bullet* range of consoles, five of which are new; the *Scorpion* range of consoles—now called *Scorpion II* after an update; *Matchless II*—a new 24-bus in-line recording console; and the *SR9000* Live Sound Superconsole. • **American Helix:** details of their compact disc production and manufacturing services. • **Ampex:** full line of professional audio tape products including *456* Grand Master, *467* digital open reel and cassettes and *478* low print tape. The new *472* series of studio mastering cassettes will be shown as well as the new *467* DAT products featuring the *DATpak*. • **AMS:** new features for the *AudioFile* hard disk recorder/editor—*TimeFlex* time compression/expansion software, the enhanced *TimeFlex* unit with machine control interface and Reel Rocking, a jog wheel facility now operative in more windows. Also new for AES is the *ST250* stereo mic and control unit. The Virtual Console system will be shown in two standard formats. Existing products on display include the *Logic 1* digital mixing console, the *RMX 16* digital reverb unit and the *Soundfield* surround sound mic. • **Analog Devices:** no information available. • **Analog Digital Synergy:** featuring the *Synergy One* digital in-line mixing console. • **Apex Machine Company:** new semi and fully automatic high speed Rotoscreen Machine. This system can automatically feed, print and UV dry audio cassettes, video cassettes, R-DAT cassettes, Norcelo boxes, jewel boxes and compact disc at production speeds up to 100 parts per minute. Also on show are the updated *CA-15* on-cassette printer; *CA-30* on-cassette printer; and the *Tapex* plate making machine. • **Aphex Systems:** full ▷



Amek Mozart console

Adams-Smith model 2600 A/V audio editing system

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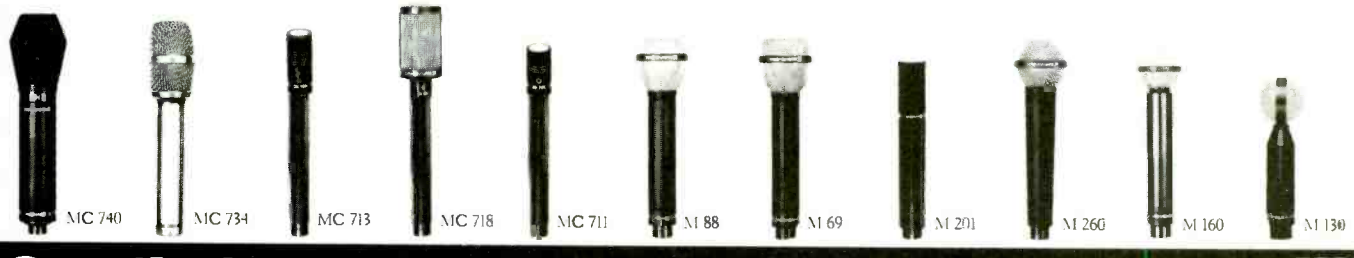

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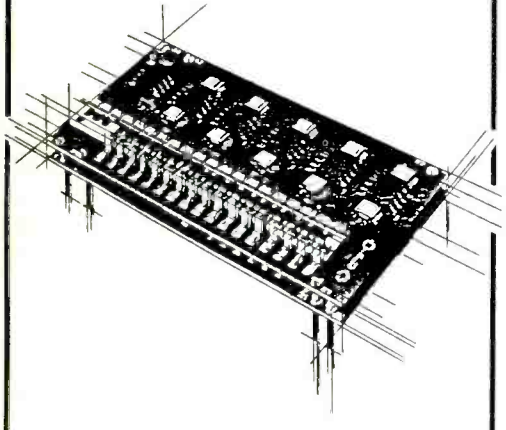

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Audio-Technica ATM25 kick drum microphone

range of audio processing equipment and interfaces. • **API Audio Products:** launching the new All Discrete In-Line Recording Console. The new console allows configurations of up to 96 inputs. It provides 48-track assigns and three stereo buses, with 10 aux sends per module. The console will also feature the GML series *2000* Automation Environment as standard. • **Apogee Electronics:** ranges of retrofit filters and digital upgrade kits. • **Apogee Sound:** full range of loudspeaker products including the new *AE-4* single-amped loudspeaker system designed for music and speech applications. • **APRS:** Association of Professional Recording Studios—British trade organisation with details of UK industry and manufacturers. • **Ariel:** range of PC-related digital products for measurement, DSP, and audio recording. • **ART:** *380* super effects processor allowing combinations of nine effects simultaneously; *370 multiverb EXT* sampler/reverb/pitch transposer; *360 multiverb II* multiple effects/pitch transposer; and models *340* and *350 HD* series equalisers. • **Ashly Audio:** wide range of signal processing equipment and power amplifiers. • **Audio Accessories:** range of jackplugs, sockets and cords, plus range of pre-wired audio patch panels, either standard or custom built. • **Audio Animation:** showing *The Muse* fully digital automated console designed for CD mastering and digital tape preparation. • **Audio Control Industrial:** no information available. • **Audio Digital:** featuring the *PAD-300/18* an 18-bit delay system for alignment and synchronisation. • **Audio Intervisual Design/Sanken:** new products from Sanken including the *COS-12* 'tube'-type lavalier microphone; and the *COS-11* 'flat'-type lavalier microphone. There will be a selection of other products represented by AID in their dealership capacity. • **Audio Kinetics:** *Reflex* automation package providing 8-channel mono/stereo VCA cards, which can be retrofitted to any console; and the recently introduced *MasterMix II* providing control on the fader and 'MixPad' controller. Existing products include the *ES 1.11* synchroniser, *ES SSU* event controller, *ES Penta 5* machine controller and *ES Eclipse* 16 machine controller. • **Audio Precision:** *System One* automated test system with latest software/hardware updates. • **Audio Technology:** no information available. • **Audio Video Consultants:** Tapematic range of duplicating equipment including tape loading, packaging and testing equipment. • **Audio-Technica US:** new products include *ATM25*, a wide-range moving coil dynamic microphone with a hypercardioid pickup pattern; *CP8506* 48 V 4-channel microphone power supply which provides 48 VDC phantom power for up to four microphones; and ATW *1031/1032* hand-held wireless microphones. • **Audiotechniques:** Tube-Tech signal processors and products of their own manufacture. Also, as UK company's Data Conversion Systems East Coast US distributor, Audiotechniques will be featuring the DCS *900* A/D converter and their latest product, a new D/A converter, developed as a complementary unit to the *900* ADC. This is DCS's first appearance at a US AES show. • **Australian Monitor (Pty):** range of power amplifiers. • **AVR-Audio Video Research:** no information available.

B

• **BASF:** full range of magnetic tape products including DAT, analogue audio tape, loopbin mastering tape, duplication tapes and the range of calibration tapes and cassettes. • **Berklee College of Music:** details of the degree/diploma courses offered in music business and technology studies. • **Beyer Dynamic:** introducing the new *TG-X* line of microphones featuring four models, the *TG-X 180, 280, 480* and *580*. Established products include the *Tourgroup* range of microphones designed for live concert use. • **BGW Systems:** range of power amplifiers. • **Bose:** demonstrating the *Sound System* family of sound system design tools. • **Brainstorm Electronics:** featured new products will be the *VP-90* variable speed oscillator and the *TD-24* tach/dir converter and established products the *TB-4 Communicator*; the *JHM-2* multi-box; the ▷

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Tim Butler, *Chicago Recording Company*, Chicago.

''To be fair to AMS I must have been AudioFile's biggest sceptic and it took me a long time to decide to purchase my first system. I now own three AudioFiles and for anyone who knows me, that more than speaks for itself.''
Dennis Weinrich, *Videosonics*, London.

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Andy Hilton, *Hilton Sound*, London.

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Steve Cook, *Magmasters*, London.

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Bill Marino, *Sync Sound*, New York.

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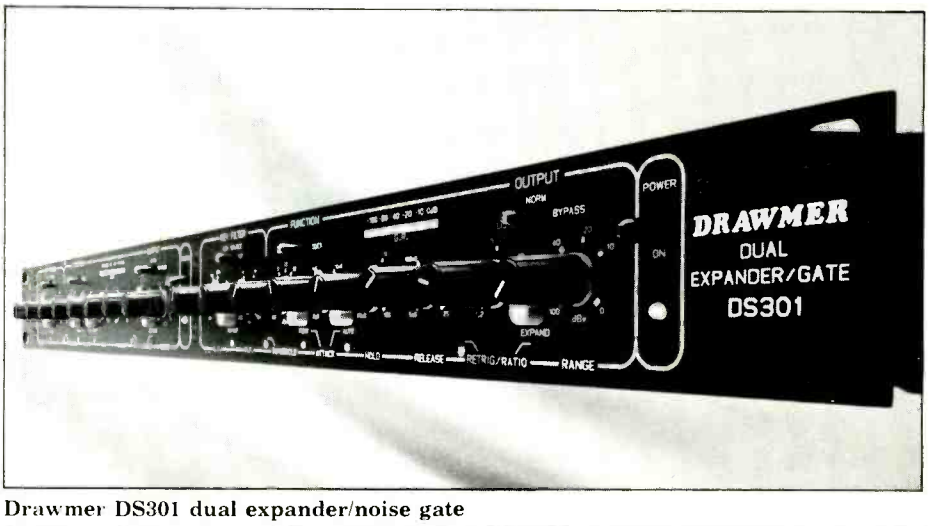
Beyer Dynamic's TG-X line of microphones

TBS-4 switch; and the *SR-1* timecode reshaper. • **Broadcast Electronics:** range of cartridge machines; stereo generators; and FM exciters. • **Bruel & Kjaer:** first showing of their new cardioid mic *4012* and portable R-DAT recording set. The *4012* is a pre-polarised condenser microphone with a cardioid directional pattern powered from the B&K power supply *2812*. Established products on display are the *4011* cardioid mic; the series *4000* omnidirectional mics; the grid *0777* black nose cone; and the *3529* and *3530* stereo microphones sets. • **BSS:** frequency dividers *MCS200* and *FDS360*, the *DPR402* compressor/de-esser, the *DPR502* MIDI controllable noise gate, and the *AR* series of DI boxes, lead and phase checkers. New for AES will be the *AR416*, a 4-channel 1U rackmount mains powered DI box and the *DPR504* 4-channel noise gate.

C

• **Canare Cable:** wide range of cable products.

• **Carver:** their range of power amplifiers and other pro products. • **Cipher Digital:** range of synchroniser and timecode-related products. • **Clarity:** exhibiting the Clarity *XLV*, an interface for automating signal processors. • **Community Light & Sound:** range of sound reinforcement equipment. • **Concept Design:** products for the cassette duplicator. • **Connectronics:** wide variety of cable reels and range of patchbays, stagelink systems and assemblies. Also the complete range of cables and ancillary hardware for pro-audio, music and broadcast applications. • **Countryman Associates:** the *Isomax* headset microphone, which will operate with most wireless systems on the market; the *TVH* lavalier microphone; the Isomax *IV* podium microphone; and the Isomax *II* high gain microphone designed to be hung from a 50 ft cable. • **Crest Audio:** full range of power amplifiers. • **Crown International:** examples of their wide range of microphones and amplifiers. • **CST Manufacturing & Sales:** cassette duplication products including labelling and printing equipment. ▷



Drawmer DS301 dual expander/noise gate

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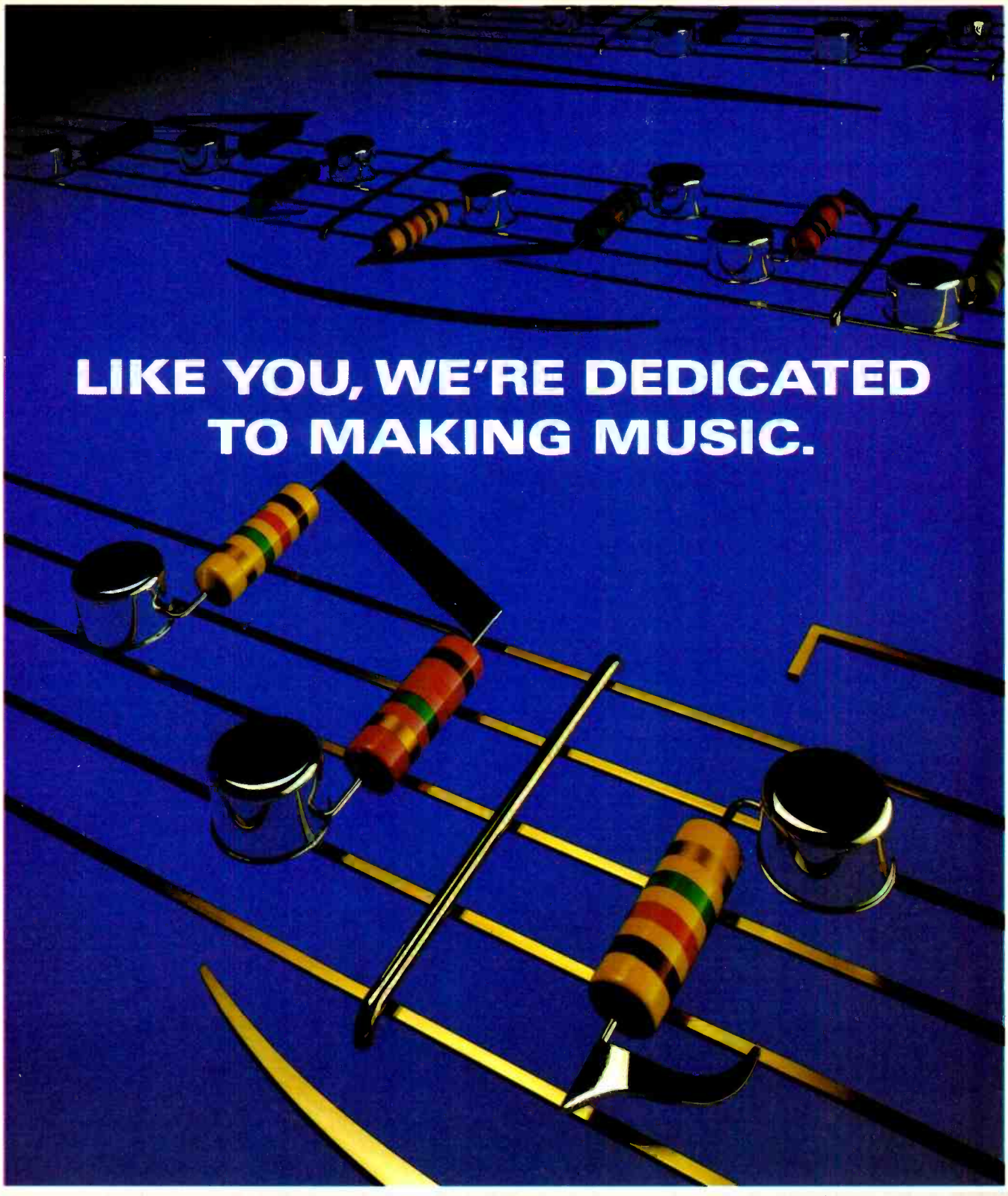

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Dorrough Electronics model 1200 stereo signal test set

D

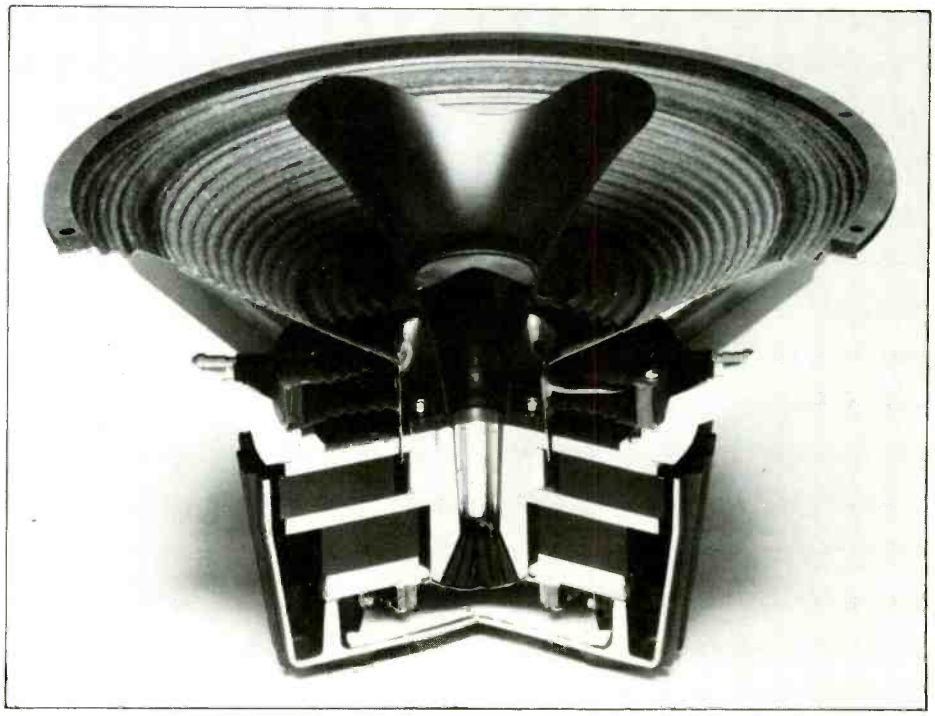
• **DDA:** full range of mixing consoles, crossover systems and modules, like the new series introduced at last year's AES Convention, that expand the capabilities of the *Q* series consoles. • **DIC Digital:** full ranges of DAT and 8 mm tape cassettes. • **DigiDesign:** *Macintosh*-based recording, editing and processing systems with hardware and software. Featured will be *Sound Tools*. • **Digital Audio Research:** demonstrating the *SoundStation II* digital audio editing and production with a 16-channel version. New software includes *WordFit*, Automatic dialogue synchronisation software, which can automatically edit one dialogue track to synchronise exactly with another guide track and *Stereo TimeWarp* which enables the lengthening or shortening of programme material without pitch change. • **Digital Audio Technology:** featured will be the *Stelladat* professional portable DAT recorder. • **Digital Dynamics:** no information available. • **Diless:** a duplex intercom system, *ProCom*. • **DOD Electronics:** signal processing products from Audio Logic and DigiTech. • **Dolby Laboratories:** noise reduction and film sound processing products for music recording, film, TV post-production, cassette duplication and transmission systems. • **Dorrough Electronics:** range of level measurement products including the model *1200* stereo signal test set. • **Drawmer Distribution:** new *DS301* dual expander/noise gate with auto attack, peak attack and balanced inputs and outputs. Existing products include the recently introduced *DF320* universal noise filter; *DS201* dual noise gate; *LX20* dual compressor/expander; *LA12* distribution amp. *M500* dynamics processor. • **Duplitronics:** no information available. • **Dwight Cavendish Company:** range of audio and video duplication systems.

E

• **EAW:** full range of loudspeaker systems for live sound applications. • **Emilar:** range of speaker drive units. • **Euphonix:** *Crescendo aido* mixing system with onboard computer automation. • **Eventide:** full range of sound processing equipment. Featured will be the *H3000 Ultra-Harmonizer* which has the ability to create musical harmony.

F

• **Fane Acoustics:** speaker drive units and complete systems. • **FM Acoustics:** new products include the new *FM 1000-1* monophonic high power amplifier, which is the successor to the *FM 1000*; the new *FM 801A* precision power amplifier, the successor to the *FM 801*. Also new are the *Forcelines 3, 5* and *7* audio cable; the *FM 236/4* linear phase electronic crossover; the *FM 214* precision balanced line driver and the *FM 216* precision line level interface. • **Focusrite Audio Engineering:** featuring the *ISA* range of equalisers, dynamics units, remote microphone amplifiers and a bay from the existing music recording consoles. There will also be pre-release details of a further development of the console to ▷



Gauss 3588 coaxial loudspeaker

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◁ be launched next year. • **Fostex:** new products include the *2016* line mixer; a moving fader automation system with a standalone bank of 16 motorised faders that can read SMPTE or MIDI commands. This automation can be used with any make of mixer as it patches across the individual channel send/receive jacks; the *4020* event controller, a 999 programmable event controller; a high fidelity underwater communications system; MidiRemote software for the Fostex *R8* and *MTC-1* combination, which allows full control of the *R8* via *Macintosh* or Atari computers; *RM1000* nearfield monitors; and the full range of Fostex existing products. • **Full Sail Center for the Recording Arts:** full details of the new Full Sail complex in Winterpark, FL, USA and music technology/recording courses held there.

G

• **Gauss:** range of speakers including a new product the *3588* coaxial loudspeaker rated for handling 200 WRMS and featuring a cosh horn designed using Gauss's Computer Aided Time Spectrometry (CATS). • **Gefen Systems:** *TrackWriter/ADR*, a new software package for IBM-compatible computers, which enables the user to spot and perform ADR; the *TrackPlanner*, a cue sheet film-style software package using VITC/LTC timecode to track, plan and print sound effect cue sheets, with an interface to import and print cue sheets generated from the AMS *AudioFile*; the *M&E Organizer System* Version *3.0* is database software for sound effects and production libraries; and 18 new CDs from the BBC sound effects library. • **Gentner Electronics:** patch panels, audio distribution equipment, and telephone interfaces. • **Ghielmetti:** audio and video routing systems. • **GML:** the GML console automation system with latest hardware and software including the series *2000 Operating Environment*. • **Goldline:** entire range of products including 10-band ⅓-octave realtime analysers, crossovers, gates, limiters, oscillator/frequency counter/dB meter and audio test sets. • **Gotham Audio:** examples from the wide range of products that they distribute including Neumann, EMT, Ferrograph, Teldec, Harmonia Mundi, Audio Developments, K&H, etc. • **Groupe Andre Perry Software:** no information available.

H

• **H L Dalis Inc/Dalis Industrial Electronics:** no information available. • **Harrison (GLW Enterprises):** full range of consoles including *Series Ten*. • **Heino Ilsemann:** labelling, sorting, packaging and foil wrapping machines for audio cassettes, video cassettes and packages and handling systems for CDs. • **HM Electronics:** complete range of wireless microphones; cabled and wireless intercoms and a new product—the *RW760* universal interface unit. • **Hybrid Arts:** featuring *ADAP II* hard disk based recording system. • **Hybrid Cases/FM Tubecraft:** range of flight cases and stands.

I

• **IMC/AKAI Professional/AKAI Digital:** established products include *DR-1200* digital multitrack recording system; Akai digital patchbay; *S-1000* 16-bit stereo sampler with new *Timestretch* software. • **Industrial Strength**

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The Shure SM98 is a tiny condenser mic that outperforms larger, more expensive units. It has been hailed as the best small microphone available. Now, a broad range of accessories—several unique—tailor the SM98 to a host of problem-solving applications:

Actual size

NEW

Supercardioid polar modifier

Far more than an "accessory", this unique unit makes the SM98 two microphones in one! It changes the pickup pattern from standard cardioid to a symmetrical supercardioid pattern *without* significantly changing the SM98's desirable frequency response.

Hanging adapter

Permits hanging the SM98 at a nearly ideal 45-degree downward angle. Excellent for choirs and vocal groups.

NEW

"Keen Clamps"

Acclaimed by pro musicians as the best solution for miking saxophones and brass instruments. Mounts the SM98 (or other) microphones directly on the bell for freedom of movement. Won't damage the instrument.

Pop filter kit

Dual function: reduces breath noises while protecting the SM98 against theft with a locking collar. Pop filter and locking collar may also be used independently.

Drum mount

Flexible gooseneck and adjustable height angle allows the drummer to mount an SM98 on virtually any drum rim and position it to suit his particular style. Professional black matte finish.

18-inch gooseneck

Mounts like a standard gooseneck—just plug in—requires no additional wiring. An excellent choice for meeting rooms, podiums, pulpits—anywhere a top quality unobtrusive microphone is required.

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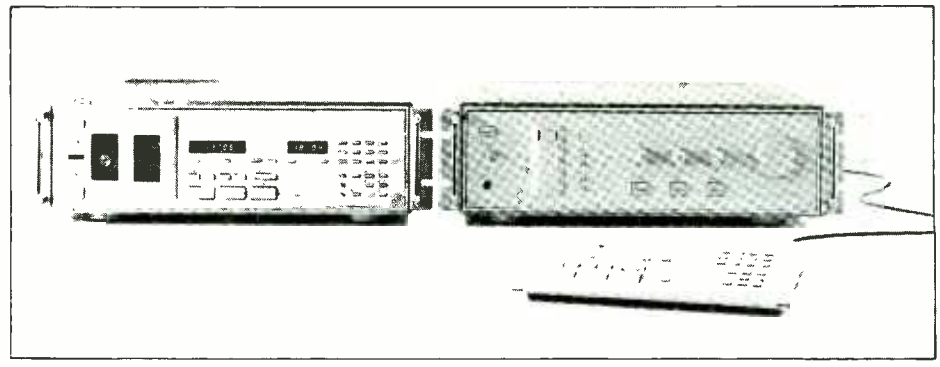
◁ **Industries:** display includes their ranges of electronic crossovers, parametric equalisers, power amps and PA mixers. • **Innovative Electronics Designs:** detail of their computer controlled audio systems designs for convention centres, airports and other large installations. • **IVIE:** will be displaying the *RT-60* software for the portable Ivie *PC-40* Realtime Analyser. The *RT-60* allows the user to measure for all 10 octave bands or all 30 ⅓-octave bands simultaneously; and the *PC-40 to PC* software for the Realtime Analyser. • **Intersonics:** no information available.

J

• **Jaffee Acoustics:** no information available. • **Japan America Electronics:** digital recording and processing equipment for duplication, mastering and rental. Professional, portable and consumer models. • **JBL Professional/ Soundcraft:** new JBL products; the 12 inch loudspeaker *2206H*, the 15 inch *2226* and the 18 inch model *2241* incorporating Vented Gap Cooling technology. The Vented Gap Cooling process pumps air through the magnetic gap and directly over and around the voice coil to provide immediate heat transfer and reduction in operating temperature. Also new is the next generation of JBL's *Concert* series; a new *Concert* series of diffraction floor monitors; and the *4688 TCB* sub-woofer system. Established products include JBL's full range of speakers and components. • **JRF Magnetic Sciences:** range of direct replacement magnetic heads for ¼ inch mastering, recording and broadcast equipment. • **JVC Professional Products Company:** digital mastering system, digital audio mixer, digital audio editor and peripheral digital audio equipment.

K

• **King Instruments:** cassette loading products including their model *2797* dual supply audio cassette loader; and model *2500* dual supply VHS video cassette loader. • **Klark Teknik Electronics:** existing products including the series *500* dynamics, a quad compressor/limiter, a dual compressor/limiter, an advanced dual gate and a quad auto gate, each in only 1U of rack space; series *700* digital delay lines; the *DN780* digital reverberation system; and the *DN60* realtime spectrum analyser. Klark-Teknik will also be showing the latest Midas *XL2* auditorium console designed for OB vehicles, broadcast, theatres and auditoriums. As sole UK and US distributor for Milab microphones, Klark-Teknik will be displaying the full range of condenser mics. • **Klipsch & Assoc:** speaker systems including the new *KP-600* system, a modular design for custom tailoring of the polar response. • **Korg:** examples of their range of synthesisers and signal processing equipment.



Nakamichi 1000 DAT machine

L

• **Lester Audio Laboratories:** no information available. • **Lexicon:** full range of products includes *PCM-70* digital effects processor, the new *LXP-5* multi-effects processor with over 100 preset and user programmable memories, the *480L* effects system, and *Opus* audio production system.

M

• **Marshall Electronics:** range of rackmount effects processors and the Quantec range of products. • **Marshall Electronics (Mogami):** high quality audio cables. • **Martin America/Martin Audio:** PA systems and accompanying processing electronics. • **Martin Audio Video:** selection of products from range distributed. • **Meyer Sound Laboratories:** a new product—the *HD-1* high definition recording monitor designed specifically for nearfield monitoring. • **Middle Atlantic Products:** no information available. • **Minim Electronics:** range of presenter clocks, studio clock systems and Ambisonic decoding equipment. • **Milab:** latest addition to their microphone range is the *VM-44*, which features a transformerless preamplifier and comes with cardioid capsule in its basic version. • **Mitsubishi/Neve:** Mitsubishi will be showing, for the first time at AES New York, the *X-880* 32-track digital recorder and the *CS-1* chase synchroniser. Established products will be *X-86HS* 2-track digital recorder; *X-400* 16-track digital recorder; *X-E2* digital editor; *X-850* 32-track digital recorder; and *X-86* 2-track digital recorder. • **Mix Publications:** US pro-audio magazine. • **Monster Cable Products:** new products including *Light Speed 12*, a fibre optic digital cable; *Prolink* musician instrument cable; *Prolink Rock* musician instrument cable; and *Prolink Player* instrument cable. • **Motorola Semiconductor Products:** ranges of processing ICs.

Milab VM-44 microphone

N

• **Nagra Magnetics:** the *Nagra D* prototype digital recorder, the *NTA 3TC* timecode machine and other Nagra tape recorders. • **Nakamichi:** for the first time at AES, the *1000* DAT player. • **Neutrik:** range of patchbays, test sets, connectors and modules. • **Neve:** showing for the first time the *VR* series console with *Flying Faders* automation. The *VR* can store console settings and recall these under computer control. Also on display will be *DTC-2* for compact disc preparation. Neve are US distributors for Mitsubishi. • **New England Digital:** digital workstations and *Direct-To-Disk* hard disk recording system in all its various versions. • **Novation:** new console, the *Alpha* launched at the APRS this year. *Alpha* is an assignable digitally-controlled analogue console with 999 snapshots and total dynamic automation.

O

• **Orban:** new products include the *290Rx*, which combines two complementary audio restoration ▷

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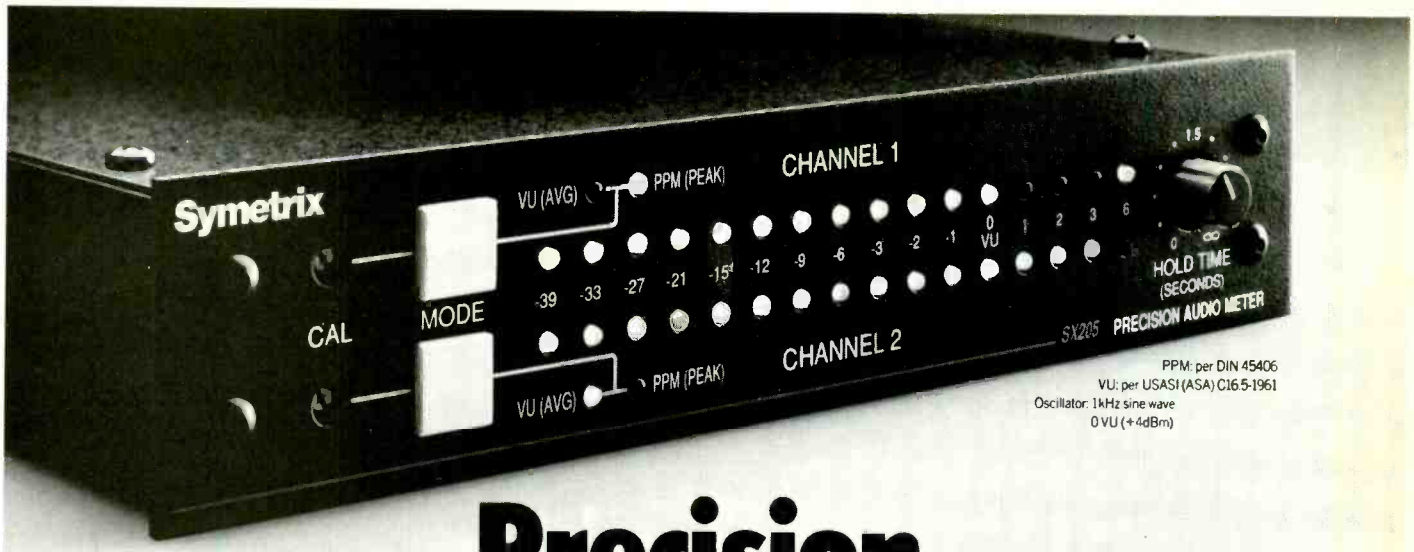

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P

• **Panasonic:** DAT products and pro-CD players, and the Ramsa line of pro-audio products. • **Peavey Electronics:** wide range of signal processing, amplification, routing systems, mixing consoles and microphones. • **Penny & Giles:** featured will be the motorised studio fader as well as their complete range of studio faders and other audio/video controls. They will also show Mosses and Mitchell jack sockets and jackfields. • **Philip Drake:** range of communication products for the broadcast industry, including the *6000* and *8000* series modular intercom systems. • **Precision Devices:** will use AES New York for their US launch. Precision Devices are a UK company set up two years ago primarily to produce loudspeakers for PA company Turbosound. They will be exhibiting their range of loudspeakers chassis, which comprise three models; 15 inch, 18 inch and 21 inch. • **Pro Co Sound:** multichannel patchbay systems, a wide range of interface boxes, mic splitters and a mic combiner, an audio visual interface, DI boxes, stereo headphone junction boxes and a wide range of cables. • **Professional Audio Systems:** range of studio monitoring systems. • **Professional Sound:** no information available. • **Publison:**

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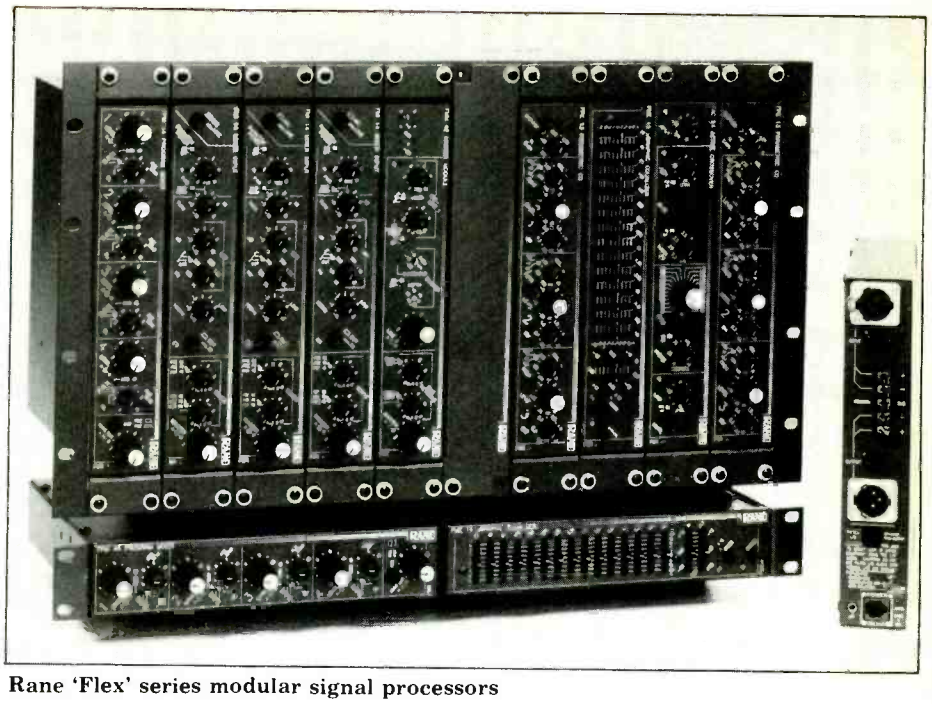
first showing of the *Infernal Workstation 4000*, a hard disk based recording/editing system, which is also able to synchronise recorded materials with video or audio machines and provides synchronised effects such as pitch-change and reverb.

Q

● **QSC Audio Products:** complete line of professional 2-channel power amplifiers, plug-in accessories including isolation transformers, precision attenuators, active limiters and crossovers. ● **Quested Monitoring:** new models on show will be the 4-way active *HM412*, the 2-way passive *H108* nearfield, and the 3-way passive *H210*. Quested will also have photographs of recent acoustic design projects.

R

● **Ramware Designs:** no information available. ● **Rane:** launching the *HR* format with a new line of products called the *Flex* series modular signal processors. Each module is a self-contained processing function, which can be mounted vertically or horizontally in a standard 19 inch rack. ● **Renkus-Heinz:** range of sound reinforcement systems. ● **Roland:** introducing their *S-770* digital sampler featuring a 16-bit linear digital data sampling format. Standard memory is 2 Mbytes of RAM, expandable to 16 Mbytes to provide up to 90 secs of stereo sampling at 48 kHz. Established products include the *R-880* digital reverb unit and the *E-660* digital parametric equaliser. ● **RPG Diffusor Systems:** display includes the Complete Acoustical Treatment System and The Wall broad bandwidth full spectrum diffusor. ● **RTS Systems:** intercom systems and peripheral equipment.



Rane 'Flex' series modular signal processors

S

● **Saki Magnetics:** line of long life ferrite heads for Ampex, MCI, Otari, Scully, Sony and Studer tape machines. ● **Sam Ash Professional:** no information available. ● **Schmid Telecommunications:** broadcast test equipment. ● **Schoeps/Posthorn Recordings:** *Colette* series of Schoeps studio condenser microphones, a modular mic system with 16 capsules of different directional patterns and frequency response curves. ● **Selco Sifam:** comprehensive range of Sifam vu and ppm meters plus low cost audio ▷

THE OTHERS

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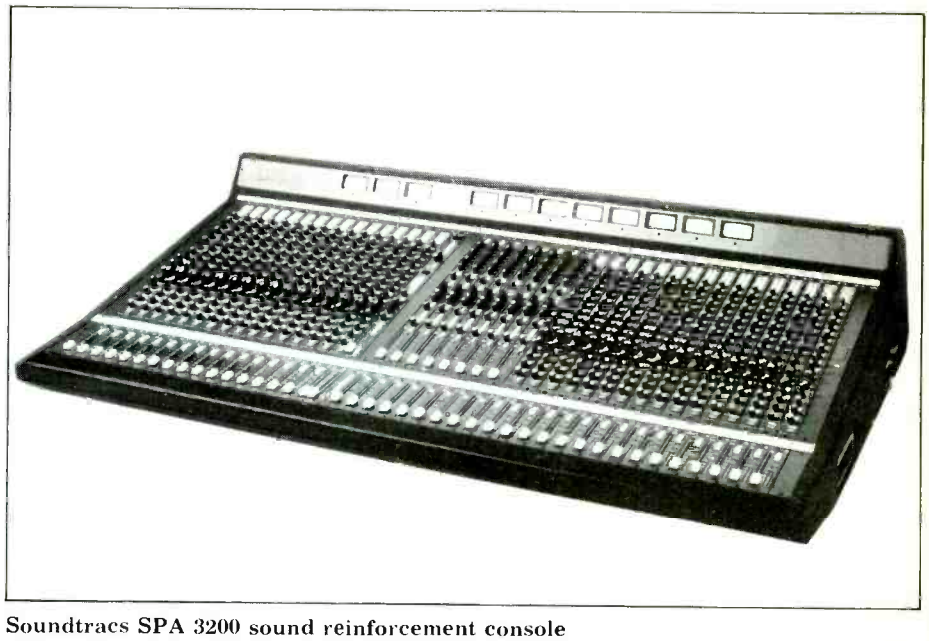
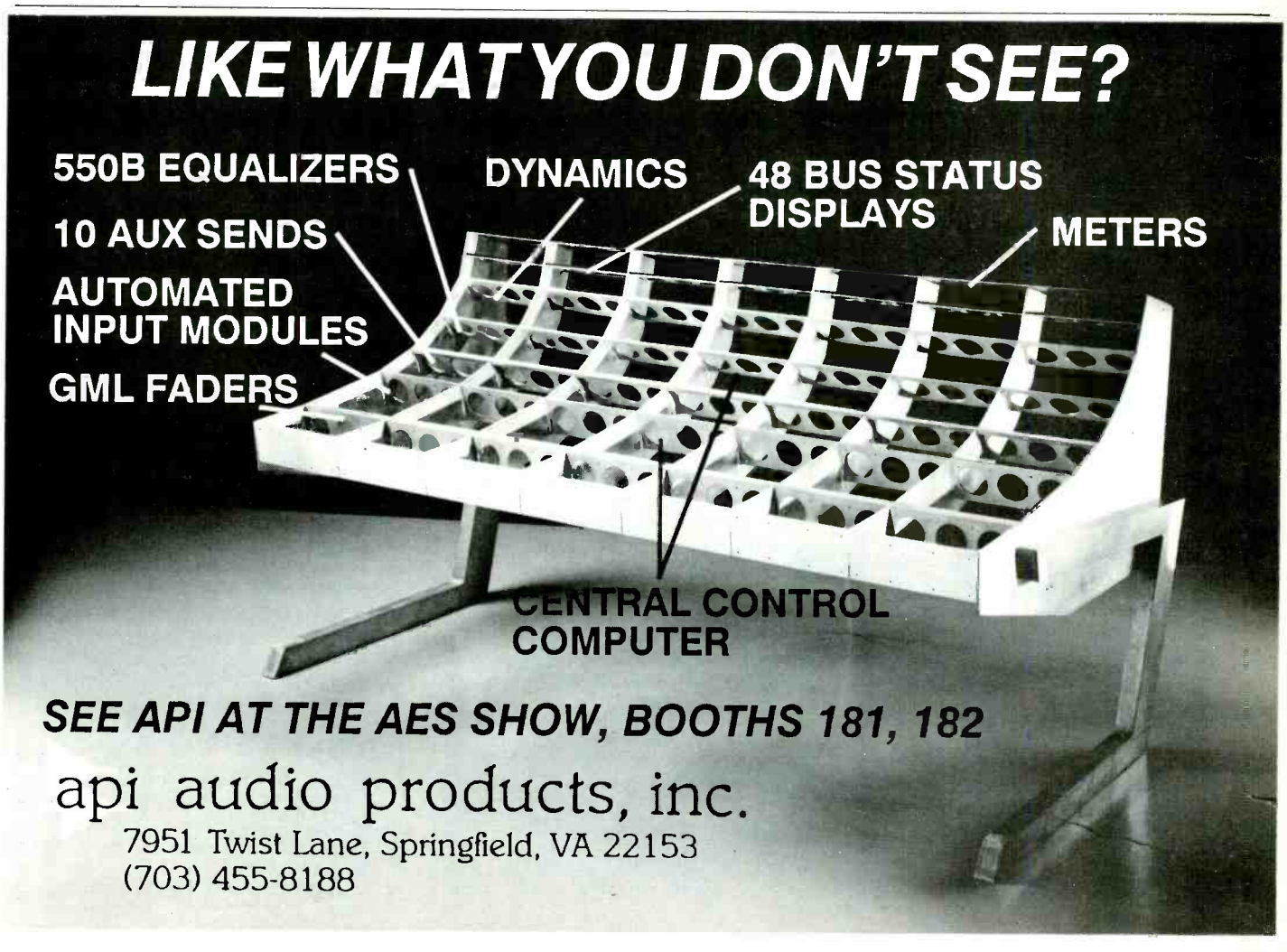
◁ level meters and other panel products including control knobs. Selco will also announce their designer's guide for control knobs, which was created to help design engineers select the style, type and size of control knob that best meets their needs. • **Sellmark Electronic Services:** range of conductive plastic audio track, and motorised faders with integral conductive plastic audio track. • **Sennheiser Electronics:** full range of condenser microphones, pre-polarised condenser microphones, wireless mic systems for any number of channels, headphones, headsets, infra-red systems and mobile mixing consoles. • **Sescom:** wide range of interface and ancillary products. • **Shure:** new *Beta* series dynamic microphones; new *L* series wireless mic systems; *AMS (Automatic Microphone System)*, a voice-activated mixing system designed for permanent installations; the *FP* series of portable audio mixers; and the full range of *SM* series professional microphones. In their demonstration room Shure will be demonstrating their stereo surround encoding production process. • **Solid State Logic:** demonstrations of the *SL4000 G* series master studio system and *G* series studio computer system operating in tandem with the *01* digital production system. Other products on display are the *SL 5000 M* series audio production system; *ScreenSound* digital audio editing, mixing and recording system; *Logic FX G383* dual mic amplifier and *Logic FX G384* quad/stereo compressor; *G* series Lynx synchroniser controller; and the *apt-X 100* digital audio compression system. • **Sony:** displaying the full range of analogue and digital sound recording and processing products. • **Soundcraft/JBL Professional:** Soundcraft will be showing their *3200* console featuring complete noise gates with external key and sidechain capability on each input, including monitor inputs. The split configuration offers up to 36 inputs with 32 bus routing; the *6000* console, with integral automation, features dynamic fader movement, mute and solo recorded and played back with ¼-frame SMPTE resolution offering up to 64 channels of audio; established products include the *TS12* and *8000* consoles. • **Sound Engineer & Producer:** UK pro-audio magazine. • **Sound Ideas:** current sound effects library including the new Hollywood collection. • **Soundmaster USA:** Integrated Audio Editing System with the new addition of Random Access Digital Audio. The Soundmaster System combines electronic audio editing, machine control, random access digital editing and direct to disk digital audio recording into one integrated system. • **Soundspheres:** no information available. • **Soundtracs/Samson:** Soundtracs will be showing four new products for AES New York, including the *In-line* 24 bus ▷



Soundtracs SPA 3200 sound reinforcement console



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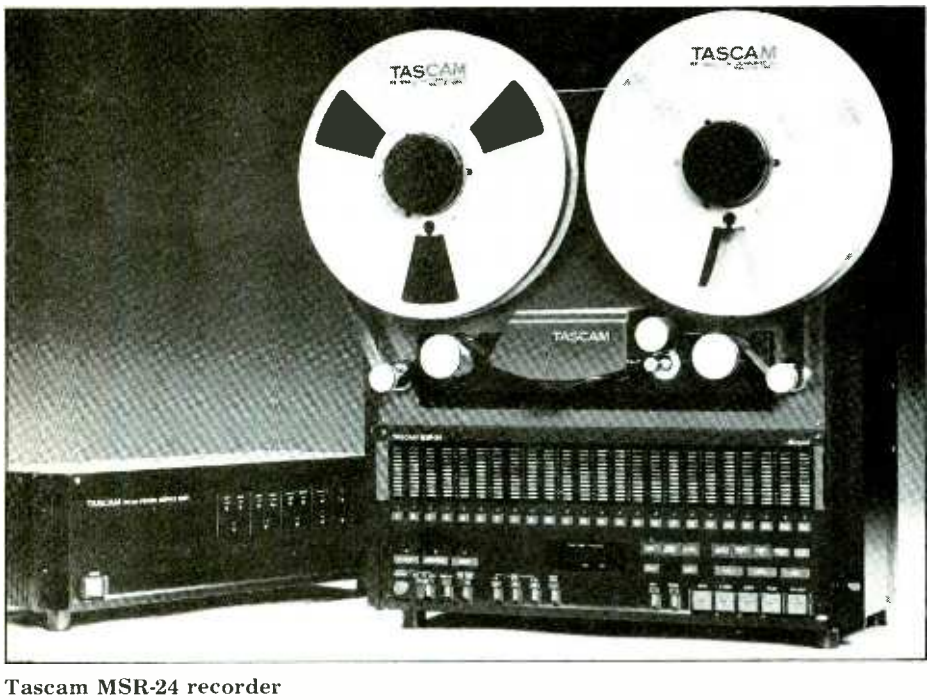
Studer A827-24 multichannel analogue recorder

◁ recording console; a 40-channel version of the SPA console aimed at sound reinforcement companies and rental companies; the *FMB* series broadcast mixer; and the *AFV Controller*, an audio-follows-video controller. Established products include *Tracmix* fader automation; selected consoles from the *FM* Series; the *MX 32* sound reinforcement console: and the *PC Midi 24* console. Samson will be introducing the *MR-1 Micro-Receiver*, which can be operated with any of Samson's hand held or belt-pack transmitters. The *MR-1* is powered by a 9 V battery for 10 hours use. • **SPARS:** the Society of Professional Audio Recording Studios will provide literature and information on their activities. • **Spatial Sound:** the *SP-1* spatial sound processor, a MIDI-controllable automated panner for spatial movements in stereo and surround sound systems with up to eight speakers. • **Steinway:** featuring piano technology products. • **Stewart Electronics:** range of DI boxes, phantom supplies, headphone distribution amplifiers and preamplifiers. • **Strand Magnetics:** *V-O* VHS videocassette shells and *B-O* Beta videocassette shells. • **Studer/Revox:** will be exhibiting new products to AES New York including the *A827-24* multichannel recorder,



Tascam MSR-24 recorder

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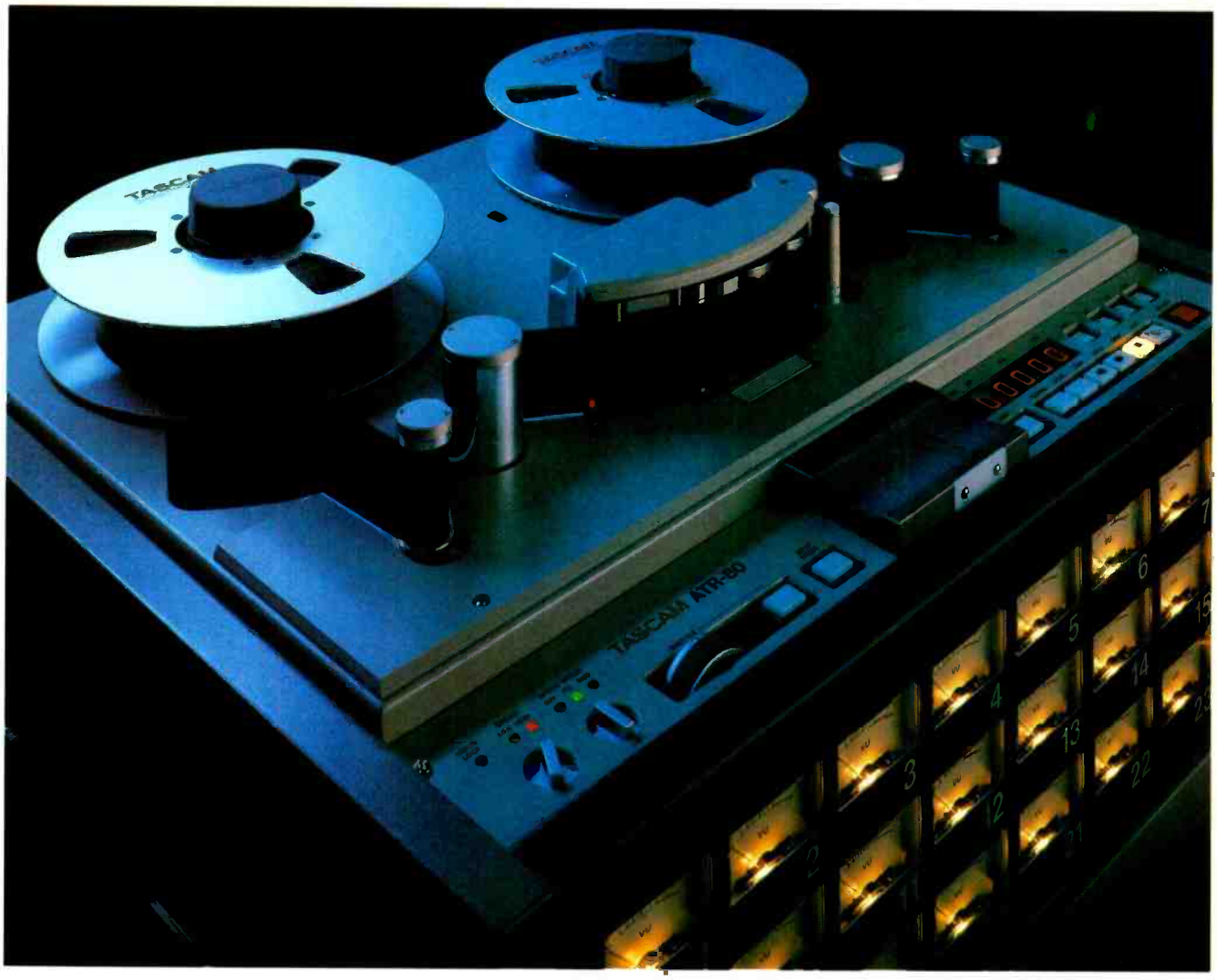

THE VERY LATEST TECHNOLOGY IN 24 TRACK RECORDING IS GOING TO COST YOU LITTLE MORE THAN A FEW MISCONCEPTIONS

You may think you know which 24 track recorder gives you the most advanced technology and design. However, you're probably in for a surprise.

It's the TASCAM ATR-80.

The ATR-80 is an engineer's dream. It has features that make track-laying and mastering faster and easier than it's ever been in a 2-inch 24 track format.

Just look at the speed. Unique samarium-cobalt magnets in the ATR-80 motors produce immense torque at the capstan and allow the reels to shuttle at a lightning 380 ips. Synchronising to video, the lockup time is limited only by your other equipment.

With our 30 years' experience in the design and manufacture of our own unique heads behind it, the ATR-80 achieves superb sonic performance. Full playback response in both the repro and sync heads allows track bouncing operations with no loss in sound quality. Special circuitry provides for transparent punch-ins and completely gapless and seamless edits.

There's only so much of the ATR-80 that can be described in features. To fully appreciate the excellence of this machine you must lay your hands on the controls. That's when you will sense the craftsmanship and quality of its design. The transparency and accuracy of its sound. The power, speed and the smoothness of the transport.

Try the TASCAM ATR-80 – all that it will cost you are your misconceptions.

You won't miss these one little bit.

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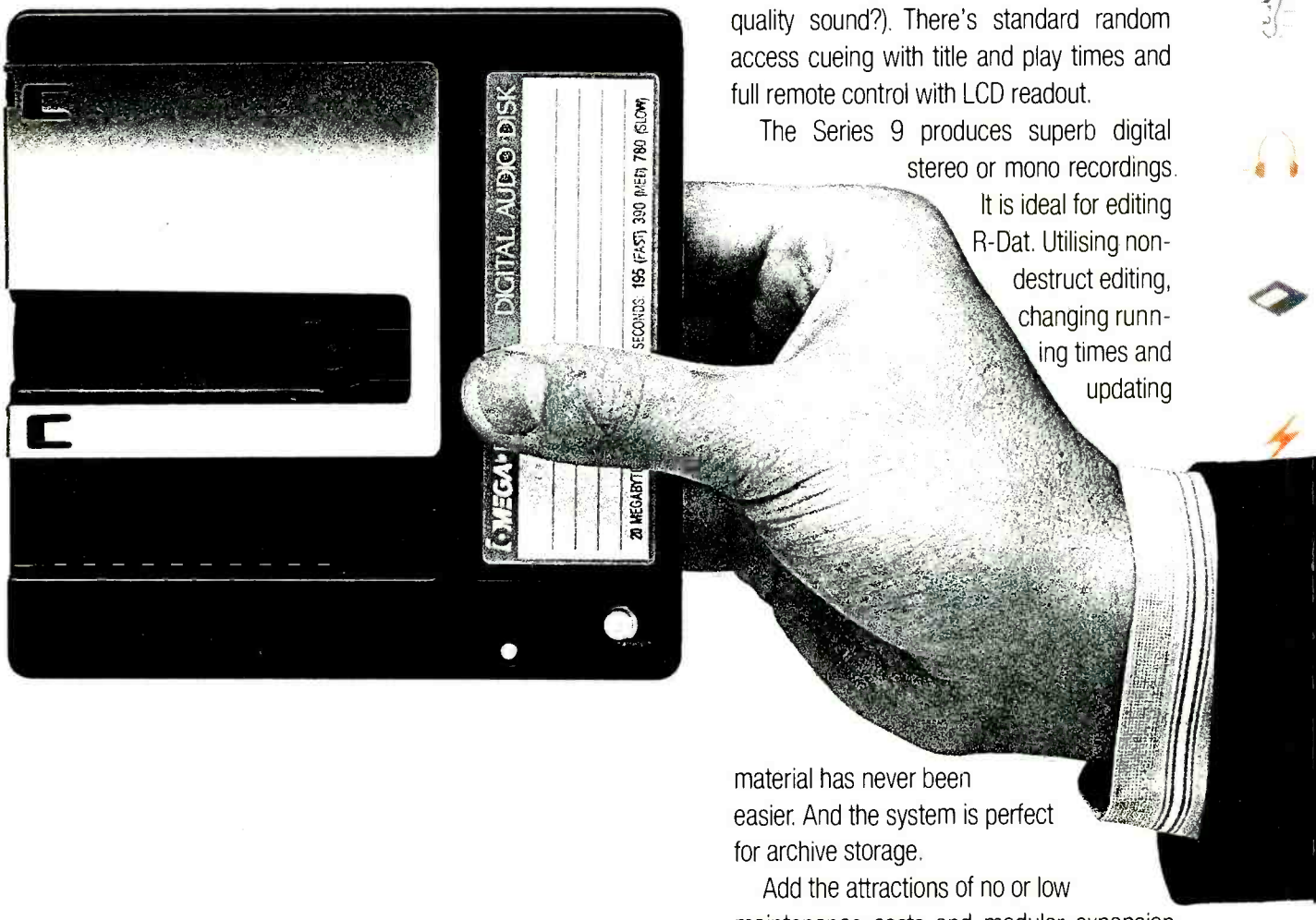

material has never been easier. And the system is perfect for archive storage.

Add the attractions of no or low maintenance costs and modular expansion and you know you can't go wrong. Contact us now and we'll soon help you get serious about Series 9.

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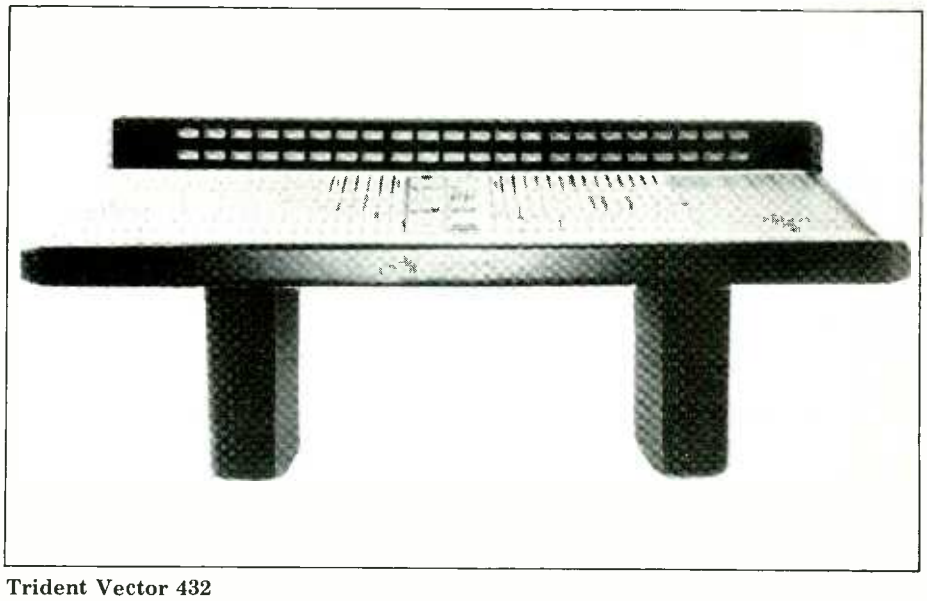
◁ based on the *A820-24*; the *A729* CD system controller; the *A807 2/2 TC VUK* professional tape recorder with SMPTE centre-track timecode; the *A723* active studio monitor; the *A779* compact mixing console featuring six input channels, VCA faders and three stereo master outputs; and the *C270-TC* 2-channel recorder with centre-track timecode. • **Studio Magazine:** pro-audio news magazine. • **Success Speciality Sales:** no information available. • **Swire Magnetics PPD:** no information available. • **Symetrix:** noise reduction system, headphone amplifiers, microphone amplifiers and parametric equalisers.

T

• **Tannoy:** *Super Gold Monitor* range, along with the *TP1* and the first international showing of the *NFM-8*. Tannoy will also be giving away four pairs of studio reference monitors on subsequent AES days. • **Tascam:** new 1 inch 24-track recorder *MSR-24*. Derived from the *MSR-16*, the *MSR-24* features switchable 15/7½ in/s tape speeds, a full tension-servo transport control, dump and manual edit capability and a serial port for external control via computer and a parallel port for control via a synchroniser. • **Techron:** the Techron audio analysing system. • **Telex Communications:** complete range of wireless microphones including diversity types, intercom systems, broadcast series headsets and wireless mics for camera use. • **3M/Professional Audio-Video Products:** full range of magnetic tape products for broadcast. • **360 Systems:** no information available. • **Timeline:** will be showing a new product—the *Lynx/SSL Interface*, which allows the SSL studio computer to talk directly to ATRs, VTRs and film equipment through the *Lynx* system. Established products include the *Lynx* keyboard control unit; and the *Lynx* system supervisor. • **Tom Hidley Design:** details of recent and current studio design products. • **Trident Audio:** will be demonstrating, for the first time anywhere, their new console *Vector 432*, an in-line system incorporating an integral automation computer. The *Vector* has been designed for audio and audio/video fixed and mobile installations and features four matrixed stereo buses, 32 groups, 16 off-line editable automate groups addressing channel, monitor and aux mutes in any combination, and a centre section including a broadcast mode for simultaneous stereo and multitrack outputting. The integral machine controller can locate using musical notation, cue points and SMPTE timecode with full MIDI synchronisation. Also new for AES is the automated channel dynamics system (compressor,

TimeLine Lynx keyboard control unit



Trident Vector 432

Is this the most cost-effective 24-track in the world?

We think so.

We also think that anyone contemplating entry-level 24-track should take this machine very seriously. After all, the only competition consists either of a pair of semi-pro recorders running in sync, or some dubious second-user dinosaur which will cost the same to maintain as it did to buy. A choice between compromised quality, or someone else's problem child.

Not much of a choice, is it?

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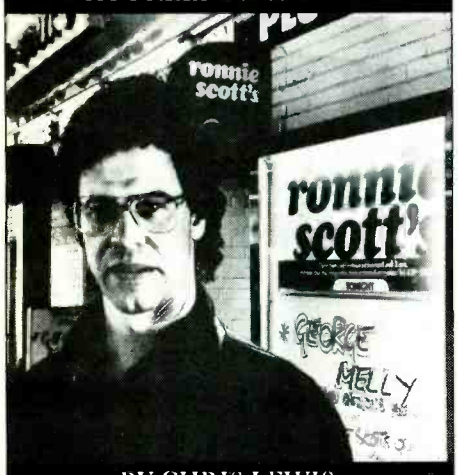
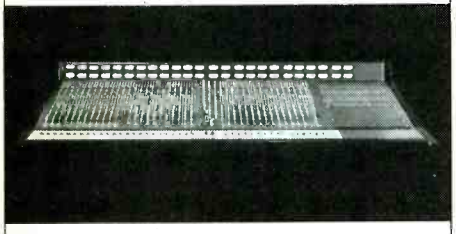


BY CHRIS LEWIS,
CHIEF ENGINEER,
RONNIE SCOTT'S

"When you're recording live jazz, you need a quiet desk and this is one of the quietest on the market. It's also nice to know that even with a mixer of this quality, the chief designer is only a 'phone call away"



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Turbosound direct-radiating loudspeaker enclosures

limiter, gate, expander, ducker all with external keying) fitted to the *DI-AN* along with the studio automation computer designed for use with the *Vector* console. The series *80CX* will debut, which features 10 auxiliary buses (two stereo pairs and six mono) on each channel strip and eight aux buses (two stereo and four mono) on each monitor strip, each independently switchable pre/post. In addition Trident have added a solo couple feature, which links the channel and monitor solos together in remix mode. • **Turbosound:** introducing the *TXD-560* direct-radiating loudspeaker enclosures including models *TXD-520, TXD-530, TXD-580* and also a low-bass enclosure. Also new for AES New York is *TSW-121*, sub-bass enclosure.

U

• **UltraAnalog:** range of A/D and D/A converters.

W

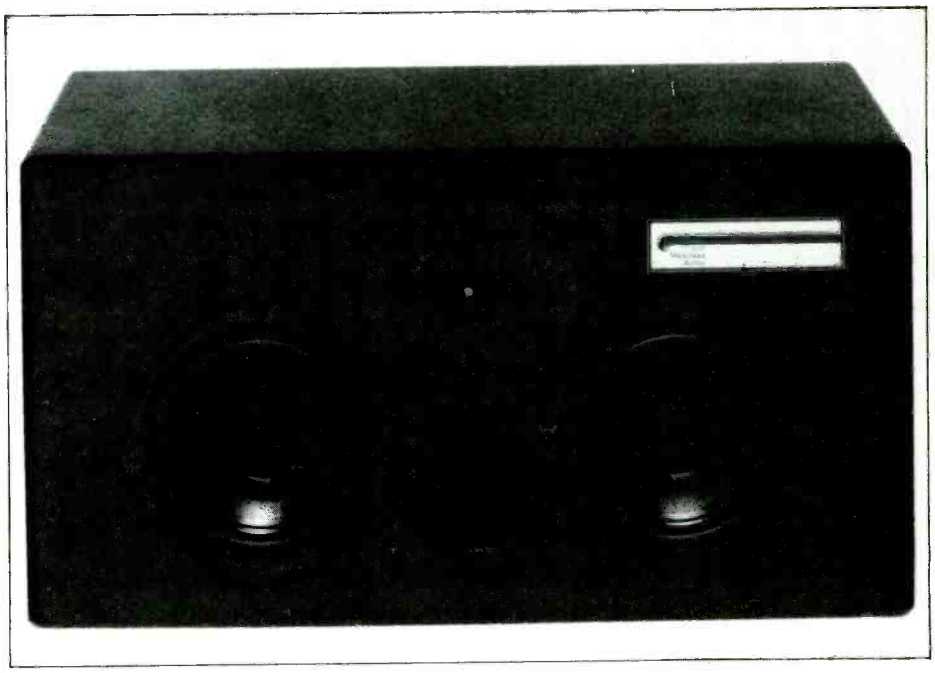
• **Waveframe:** the latest hardware and software for the *AudioFrame* digital audio workstation and the digital audio bus digital processing, synthesis and mixing systems. • **Westlake Audio:** their *BBSM* series of reference monitors including the new *BBSM-4* 2-way monitor. • **Whirlwind:** audio and video cables for studio, remote and special applications with a wide range of accessories. • **Wireworks:** multicable components for mics, multipin audio interconnection products including splitters, stage boxes and racks, coaxials and colour-coded cables.

X/Y/Z

• **Xedit:** wide range of editing peripherals • **Yamaha:** full range of digital processing and mixing systems. • **Zoom:** no information available.

●

Studio Sound will be exhibiting at the Convention with copies of the latest issue together with our sister publications *One to One* and *Broadcast Systems International*. Editorial and advertising staff will be in attendance at the stand or around the convention and we look forward to meeting anyone who wishes to drop by.



Westlake BBSM-4 reference monitor

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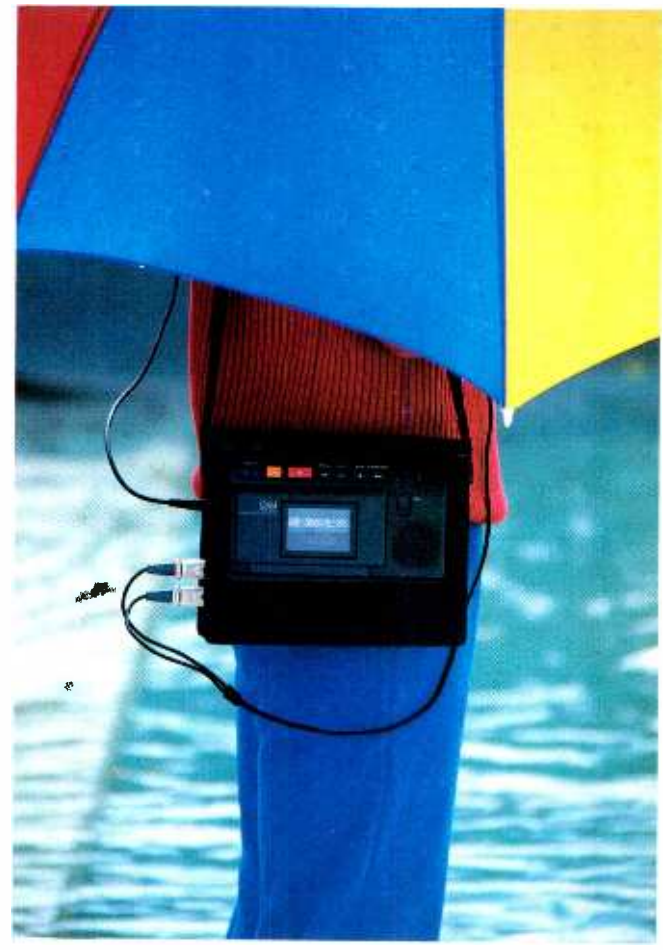
THE NEW SONY DAT RECORDER IN ITS ELEMENT.



DAT recorders are great, but not when it comes to the great outdoors.

Enter the TCD-D10 PRO from Sony – a portable DAT recorder specifically designed to work wherever your work takes you.

The TCD-D10 PRO is a genuinely professional recorder (not just a consumer model with XLR connectors!)

You'll find two independent A-D convertors with over sampling, an AES/EBU compatible digital I/O connector, an hours-meter and multi-function LCD display.

But while it's heavy on features, it's light on weight. Even with internal battery pack it weighs in at just two kilograms – so there's no need to take a crash course in yomping.

The D10 PRO also comes with AC power adaptor and charger, remote control/microphone holder and optional AC-DC convertor.

Which is why, wherever you happen to be, you'll feel at home with a Sony TCD-D10 PRO.

Call Sandy on Basingstoke (0256) 483506, fax her on (0256) 816397 or return the coupon to Sony Broadcast and Communications (UK), Pro Audio Dept., Jays Close, Viables, Basingstoke, Hants RG22 4SB.

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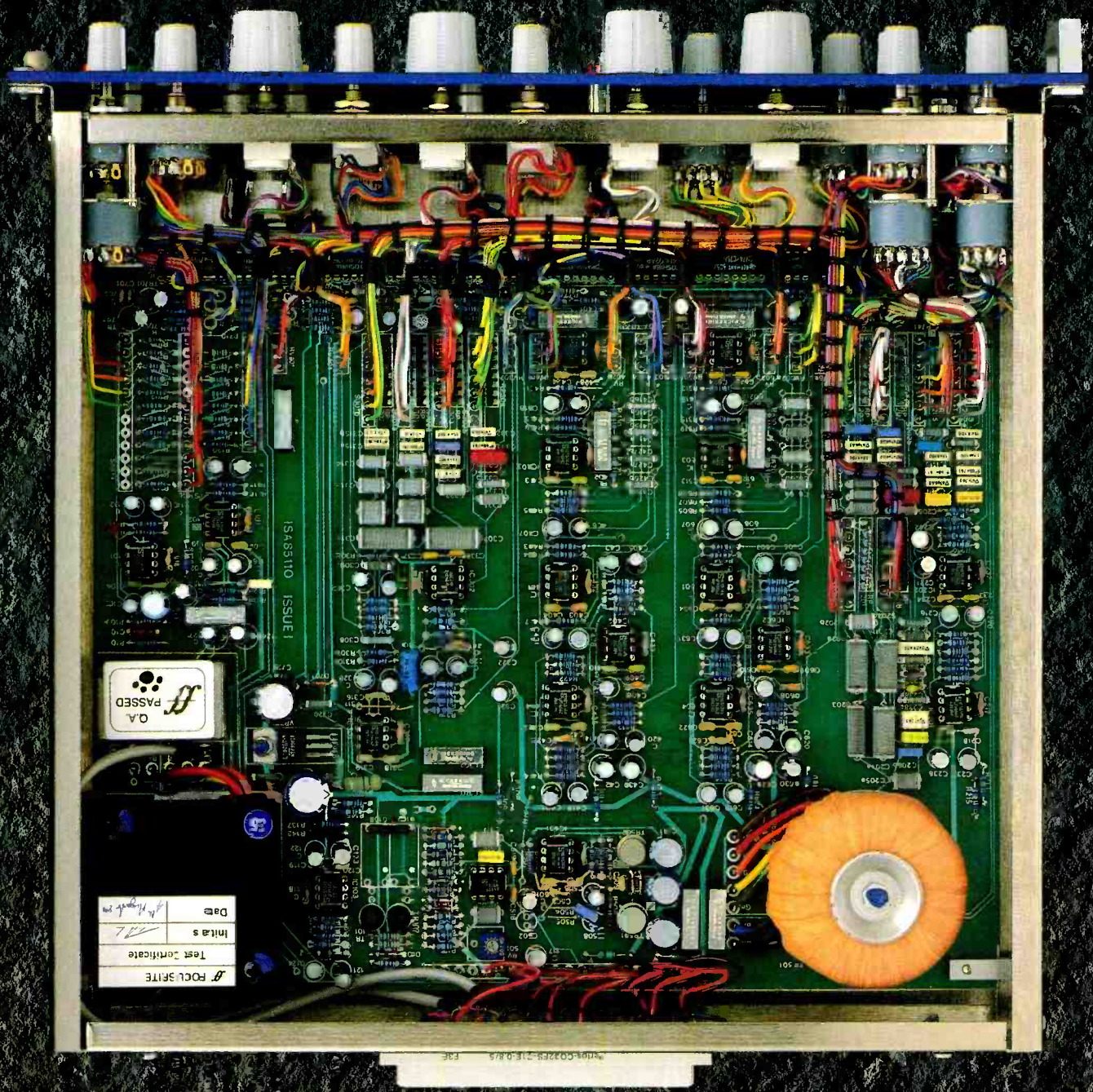

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"Digital probably won't surpass Focusrite's analogue quality within the next fifteen years".

NOTHING SHORT OF EXCELLENCE

On the left is what amounts to a work of art in analogue.

For within this hand-crafted maze of circuitry lies perhaps the finest audio signal path ever created.

The work bears the imprint of its legendary designer, complete with his experience and emotions, since it represents the embodiment of the attributes that he considers paramount.

It was the product of an almost fanatical devotion to the mathematical calculation of component values – as well as their specification – and some of the solutions it contains don't exactly conform to the norm. For instance, circuits are isolated from each another by the copious use of buffering, and all inputs and outputs are transfomer isolated. The actual circuit topology is rather unusual too.

Of the hours spent in development, perhaps the most critical involved auditioning by some of the finest ears in the business; a test, incidentally, that we'd like you to do as well.

The result is a sound that is unique to Focusrite; a warm, musical sound with no side effects at all; a sound that can be found in our module products which are used extensively in major recording studios today.

But what of the future?

While maintaining the integrity of our audio paths, we are furthering the development of the Focusrite console. We believe that the innovations within this new evolution will make it the ultimate expression of analogue recording console design. And it will set new standards of performance that will last for many years to come.

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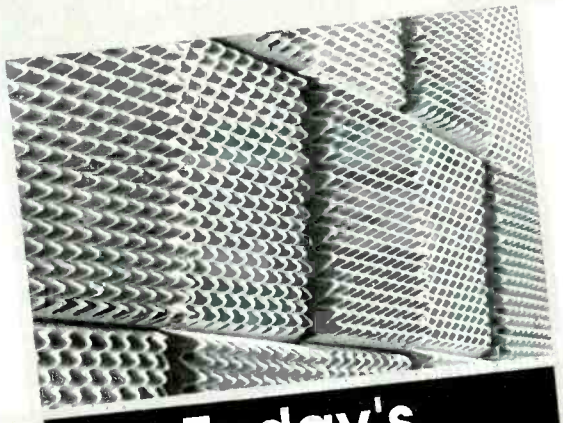

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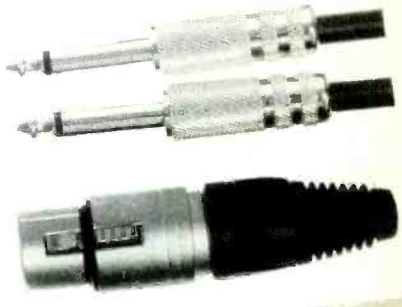

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Remember *FMX*, the system that CBS proposed between *CX*, the 'Compatible Expansion' system that wasn't compatible, and *Copycode*, the inaudible anti-copy system that spoiled music and didn't work. *FMX* was claimed to extend stereo radio coverage by putting an extra, companded, difference signal on the sub-carrier. Phase reversal supposedly keeps it clear of the conventional difference signal on the same carrier.

Immediately, broadcast engineers wondered what multipath effects would do to the signal. Would multiple reflections shift the phase of the carrier, so that ordinary receivers would end up trying to decode the *FMX* companded difference signal? The BBC offered to try *FMX* in the Welsh valleys, their traditional testing ground for any new broadcast system. But surprise, surprise, CBS never provided the necessary equipment.

For a while it looked as if *FMX* was well and truly dead. Not so. I recently came across a string of patent applications filed by Sanyo of Japan for *FMX* stereo receivers. Then things came to a head in America where Broadcast Technology Partners, BTP, have taken over responsibility for *FMX* from the now defunct CBS Labs and the National Association of Broadcasters.

At the Massachusetts Institute of Technology, Amar Bose laid into *FMX*, arguing that both theoretical studies and practical tests showed that the system was prey to multipath. Bose, who is a professor at MIT as well as head of the loudspeaker company, warned that reflection effects would be worse on the move, with car radios and personal stereos.

The Bose Corporation had flown the trade and consumer press to MIT for a discussion on a study carried out by MIT. The object was made absolutely clear: to stop hardware manufacturers and radio stations supporting *FMX*. Behind the scenes there had been legal moves to stop MIT making the announcement. During the presentation, ex-CBS man and *FMX* inventor Emil Torick popped up from the audience and defended the system. Later BTP rebutted MIT's criticism.

Here the story takes on a familiar twist. Exactly as happened with *SQ* quadraphonics, *CX* and *Copycode*, the *FMX* designers now admit that the original system was not right—but they have now modified the technology to make it right. It's the old moving target ploy all over again. Every criticism is countered by a technical change, so that in the end there is a complete muddle with no-one knowing what system they are talking about.

"The thing got out of the lab before it should have," BTP is quoted as saying. "The system now is not what it was then."

All Bose could do was argue that the tests had been conducted with the latest *FMX* equipment available.

Remember how those who said they could hear the *Copycode* notch—because it was too wide—were told by CBS that the notch was now narrower. Then, when critics warned that a too-narrow notch might be audible, CBS refused to say how wide the notch was.

All the squabbling on *FMX* may seem a very long way away. It isn't. In April, Peter Baldwin, Director of Radio at the IBA, gave a talk at the Royal Society of Arts in London. Baldwin's talk was part of a seminar on 'Radio in the 1990s, for better or worse'. During his talk, Baldwin let slip the dreaded words: "The IBA is now interested in *FMX*."

Barry Fox

I phoned Baldwin a few days later and asked him if he meant what he had said.

"My engineers advise me that it is so," confirmed Baldwin. If the IBA engineers who gave their boss Peter Baldwin this advice haven't yet talked to Amar Bose in Massachusetts, they should surely do so as soon as possible.

All the TV channels broadcasting from the Astra satellite admit that they are losing money and do not expect to break even until the 1990s. But a recent whistle-stop tour of the production and presentation facilities for all channels left no doubt that they are very serious about turning a profit as soon as possible. Apart from the new Sky studio complex in Isleworth, all the Astra broadcasters are working out of very tight, lean and hungry centres, buried in rabbit warren basements across London. Even the new Sky complex is clearly run on far tighter budgets than the BBC, ITV or Channel 4 companies.

Significantly all the Astra broadcasters have standardised on Sony's ½ inch Betacam SP video format for programme production, editing and transmission. Betacam is far cheaper than open reel 1 inch C-format tape. Even more important than cost, the cassette format lends itself to automation. All the programmers are using Betacart machines, which stack 40 cassettes vertically alongside a gang of Betacam machines, with mechanical arms loading and unloading cassettes under computer control. Transmission is thus almost wholly automated. This saves on staff, space and time spent lacing open reels.

MTV, Music Television, is spawned from the nine-year-old US station but generates all its material in the UK. Much of this derives from the 30 or 40 pop videos the record companies put out a week. The nice thing for the likes of MTV is that the record companies carry the price of production, which in some cases reaches six figures sterling.

MTV is currently negotiating a deal with Russia. The snag is, no hard currency can be brought out of the country.

MTV shoots new material on the new SP format cassettes (which have metal tape) but has a back catalogue of 6,500 videos on the original standard Betacam format (which uses oxide).

Most cassettes are five minutes long, with the Betacart grafting pre-recorded VJ (Video Jockey) introductions in between.

Small studios buried underground in London's Camden Town are just large enough to tape interviews with passing pop stars. Total staff is still less than 100.

Profit? The plan is by 1992.

The Children's Channel ('Kids') works out of an even smaller production facility in London's West End.

Kids wanted its own transponder on the Astra satellite but couldn't get one, so it sub-leases part of the day from a transponder leased by W H Smith. Programmes are shot in a tiny basement studio which feels like a sauna bath. With incredible professionalism that puts terrestrial programmes like TVam to shame, presenters work direct to camera, without script or autocue, pre-recording links of up to eight minutes—often in one take without a fluff.

Again the tape standard is Betacam but Standard not SP. Kids started automating in November 1986, before SP was available. But all the standard Betacam machines have now been modified (free) by Sony to cope with SP's higher carrier frequencies, and thus play SP cassettes.

Break even? "Two years, but we are losing less than anyone else."

W H Smith puts together its two channels Screensport and Lifestyle, in another underground West End warren. There is one small studio, where vision links for Lifestyle are recorded once a week. Screensport uses no vision link content; everything is sports material shot on location, with sound-only links. Both channels use Betacam SP but some special tricks are needed to let Screensport broadcast three language commentaries at the same time, British, German and French. In future there may be more, probably Italian and Spanish.

The video tapes are edited, and foreign language commentators brought in to watch and speak 'live', without knowing the result of the event. The Betacam SP format provides four sound channels, a linear pair and a hi-fi pair. It is impossible to dub onto the hi-fi tracks, without dubbing vision at the same time. So Screensport sync-lock Ampex 8- and 24-track analogue recorders to the Betacam machines. Clean sound effects go on one track, original commentary on another and extra language commentaries on remaining tracks.

Sky, being a completely new operation, is wholly standardised on Betacam SP and the studio's 'fully component'. The cameras are Sony 3-chip CCD *BVP-7P* units, which put out three component signals (one luma black-and-white and two chroma colour difference signals) for feeding direct to the Betacam recorders. News goes out live, most other programmes are pre-recorded, if only by a few hours, at theatres around London. This way, Sky One makes 50 hours of original programming a week.

In the short term over-staffed crews with the BBC and commercial companies may look down their noses at the satellite channels, where a few staff work in the electronic equivalent of sweat shops. But in the long run it could be the satellite channels that have the last laugh.

As broadcasting gets more competitive and terrestrial stations cut costs, cushy jobs will go.

Whatever happens to satellite programmers, whether they ever turn a profit or not, Sony is laughing. By making Betacam SP the standard for Astra the company have already shown a healthy profit from satellite television—and gone a long way towards making Betacam SP the future standard for terrestrial TV production.□

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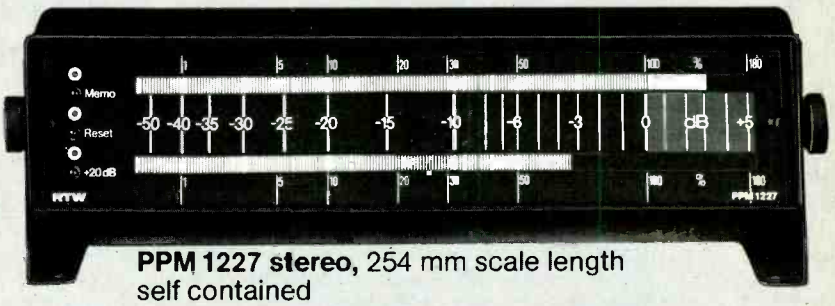

PPM 1227 stereo, 254 mm scale length
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Model 1206
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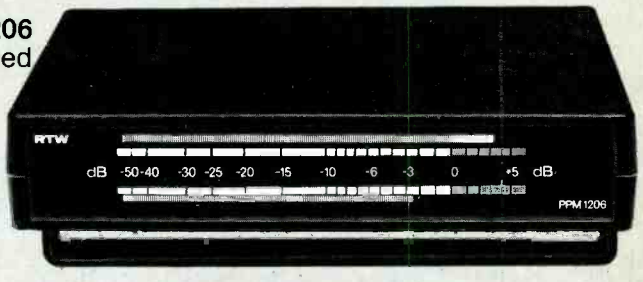

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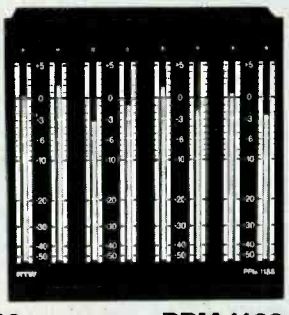

PPM 1118
2-Channel
Module

PPM 1188
8-Channel
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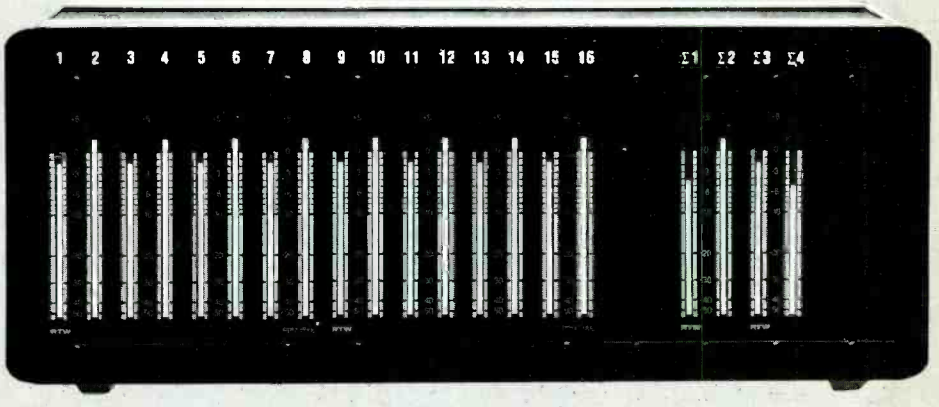

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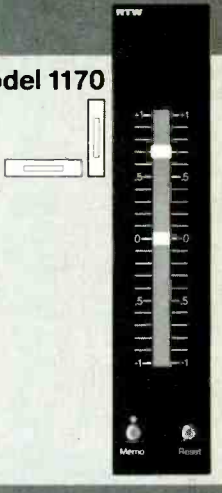
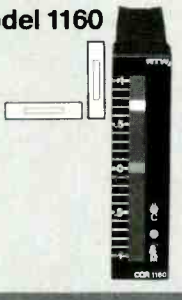
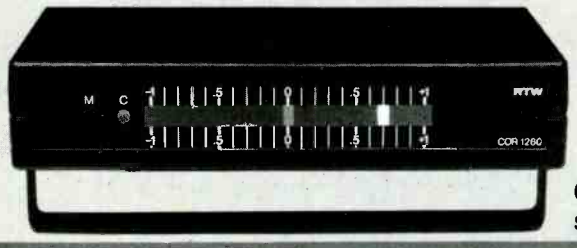
Correlator Model 1170



Correlator Model 1160





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TAPELESS IN TANGIERS

Nick Hopewell-Smith talks to Chris Potter, engineer on the latest Rolling Stones album *Steel Wheels* and discovers the background to the recording of one of the tracks in Tangiers, North Africa

Mick Jagger has never been one to mess about. One afternoon in early June, the first few tracks for a song on the new Stones' album, *Steel Wheels*, were being laid down at Virgin's Olympic Studios. All those present: the band, plus producer Chris Kimsey and engineer Chris Potter, agreed that the track had a noticeable North African feel. According to Jagger, there was only one thing to do: add genuine North African vocals and ethnic instruments.

Enquiries were made and artists identified. But as subsequent discussions underlined, it was impractical to bring the performers to the UK from Morocco. Not only would this prove expensive with the number of musicians envisaged but few of them had even worn headphones, let alone set foot in a recording studio. The chances of them responding with their characteristic lack of inhibition in a London facility were considered slight, to say the least. Somehow, the studio had to be taken to the musicians. The BBC, already filming a documentary about the making of the latest Stones' recording project, were enthused at the idea. A picturesque venue, the courtyard of a large private house in a quiet part of Tangiers, was soon confirmed—albeit chosen for its medieval beauty rather than for any acoustic characteristics.

Several basic tracks for the new song—entitled 'Continental Drift'—had already been recorded at Olympic, on an *X-850* digital multitrack. Although a Fostex *E16* was considered for the location session, both Kimsey and Potter felt strongly that any subsequent recording on the song should remain in the digital domain. Although the whole album was conceived as a digital recording throughout, the desire to stay digital was not purely aesthetic. Not only might a large amount of track bouncing yet prove necessary but the ambient noise from an outside recording was certain to be higher than normal anyway. Certainly, a descent into analogue murkiness was something to be avoided at all costs.

How then, would the recording be made? A 2-channel DAT recording was initially discussed but quickly ruled out. No-one involved could predict what the results of the Moroccan session would be: how many instruments, which passages, which take to use, and so on. As basic tracks were already in existence, a form of SMPTE lock-up would be imperative. Obviously some kind of digital multitrack was required. Finding the right system, however, was a deceptively simple task.

After all, how practical would it be to take a large digital multitrack out to Tangiers? The natural thing to do would be take the Stones mobile. However, not only was this prohibitively expensive for a single song but getting the large mobile up the winding Tangiers backstreets to the location was likely to prove a major feat in itself. Furthermore, there was hardly any space within the tiny area off the courtyard allocated for recording equipment, a factor that also ruled out a conventional digital multitrack tape machine. With size such an important consideration, the new Akai *DR1200* multitrack was discussed as an option but generally considered too unproven for such a key project.

It was producer Chris Kimsey who first suggested the *AudioFile* hard disk recorder and editor. After all, was there not some new software package that made the AMS device more suitable as a music recording tool? A quick call to rental company Hilton Sound was to bring the answer everyone involved in the project wanted to hear. While Hilton Sound boss, Andy Hilton has been promoting the AMS system on rental for almost two years, *Version 8* software has now made him something of an enthusiast about its new capabilities. As Europe's leading digital audio specialists with a large inventory of multitracks, Andy is also well-used to the problems of their transportation and he has found the *AudioFile*'s compactness has contributed to its popularity as a rental item. However, neither Chris Potter, nor Chris Kimsey had used the *AudioFile* before. Therefore, for safety's sake, it was agreed an experienced operator would be necessary. Hilton Sound's own *AudioFile* engineer, Nick Savage, was allocated the job.

A couple of days before departure, Savage went to Olympic Studios in London with the *AudioFile* and copied a slave mix of seven different tracks—largely made up of drums, keyboards, vocals and click—onto the *AudioFile*'s Winchester disk. This was essentially to serve as a controlled foldback on the small PA that would be set up in Tangiers. A straight stereo mix was considered too limiting, especially as no-one could be precisely sure what backing the Moroccan musicians were going to respond to best, once the session was underway. It was also felt that too much music information on the foldback system might impair the quality of the recording, as it would add to the overall background noise. As well as recording the seven tracks, the *AudioFile* was fed timecode from the multitrack, with the idea that once the location recording was made, it could be passed back from the hard disk onto the multitrack in perfect sync.

Chris Potter was amazed at how little equipment there seemed to be on the carnet. Along with the *AudioFile*, he took a small console—a 16-channel Allen & Heath—to mix the various mic inputs. The microphones selected for the task were six Neumann *U87*s. Other items included a Fostex *E16* as back-up, a DAT recorder, a variety of power supplies and the small PA.

The recording team arrived in Morocco on Friday June 16th at 4.00pm. At 9.00am the next day, they were at the location setting up the PA, placing the microphones and commissioning the recording system. By midday, all was ready to go. ▷

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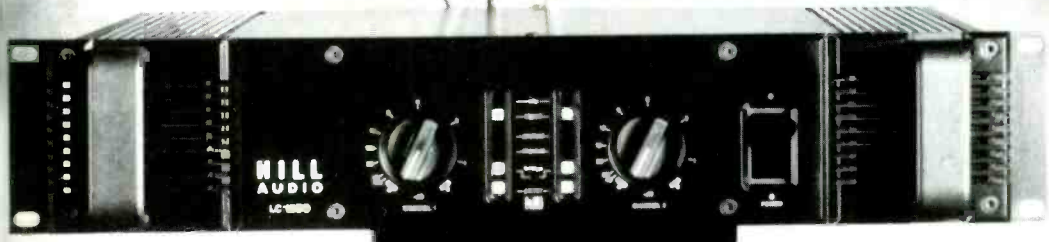

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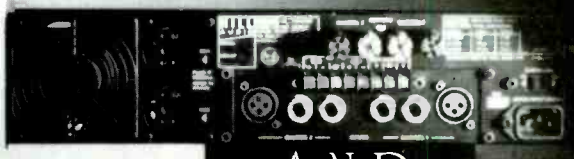

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◁ A total of 18 local musicians and performers had been assembled. Virtually all were multi-instrumentalists, with most playing a combination of drums and special pipes. Two played a violin-type instrument on their knees, while a form of lute called a gimbri was also played by several members of the ensemble. A long day of recording a wide variety of different instrument and vocal combinations, together with many different run-throughs was ready to commence.

The *AudioFile*'s Winchester drive held up to two hours of 16 bit digital audio. The song itself was around five minutes long. With the seven backing tracks already on the drive, this left around 85 minutes for a stereo mix of just over 40 minutes. Consequently, with several stereo takes envisaged, some form of back-up was required. Not surprisingly, this was an application in which the convenience and performance of DAT came into its own. Thus after every few takes, while the musicians took a breather or changed instruments, the recordings were downloaded to a Sony *DTC 1000ES* from the hard disk. To guarantee perfect sync, the music programme was accompanied by *AudioFile*'s own timecode signal as a click, placed immediately on the DAT cassette before each take.

With the experience of Mick Jagger as master of ceremonies and Chris Kimsey in the producer's seat, the recording took shape. Somehow, in the tiny courtyard, in amongst the BBC crew (considerably larger than the small recording team) not to mention the inevitable Rolling Stones' entourage, some 20 different takes were recorded of the whole song. These included a variety of instrument combinations, including solo pipes, all drums, all pipes, violins with gimbris and of course, vocals. Throughout the recording, the PA was kept as quiet as possible but it had to be loud enough for the performers to follow. While the technology behaved itself impeccably, the recordings themselves were not easy. The musicians had never played along to a click, while the multiple and gradual tempo changes in 'Continental Drift' seemed a lot less North African to them than they had appeared to the band back in the Olympic control room. Even so, late in the evening, after much hard work and not a little fun, especially when the performers started to play their own material between takes, a replete Winchester drive and several DAT tapes told their own story. Once back in the UK, some sense had to be made of the wide range of material available. Each take had to be listened to carefully, cleaned up if necessary and the best passages selected for use at various points within the Stones' song. Not surprisingly, this was a natural, if slightly more orthodox task for the AMS *AudioFile*. The whole process took place over two days at Maison Rouge, with Hilton's Nick Savage operating the system under the supervision of Matt Clifford, the keyboard player and arranger working with the Stones on the new recording. Most of the material was a straight transfer but, as anticipated, the drums created some problems. Consequently the sections in which the drummers kept perfect time was sampled and replayed across the track where appropriate.

Once the material had been compiled and edited, it was then laid digitally onto 15 tracks on a slave tape running on one of Hilton Sound's Otari *DTR 900*s. The tape was then sent back to Olympic where further recording for the song, including some vocals, could take place. Mixing in Olympic Control Room Two then ran its course. The whole album—digitally recorded throughout—was completed by July 10th, with a tentative September release date planned. At the time of writing, a BBC documentary of the project was set to hit British screens by the early Autumn. Meanwhile, through playing a vital role in one of the year's most prestigious sessions, the *AudioFile* has proved its versatility in music recording applications. □

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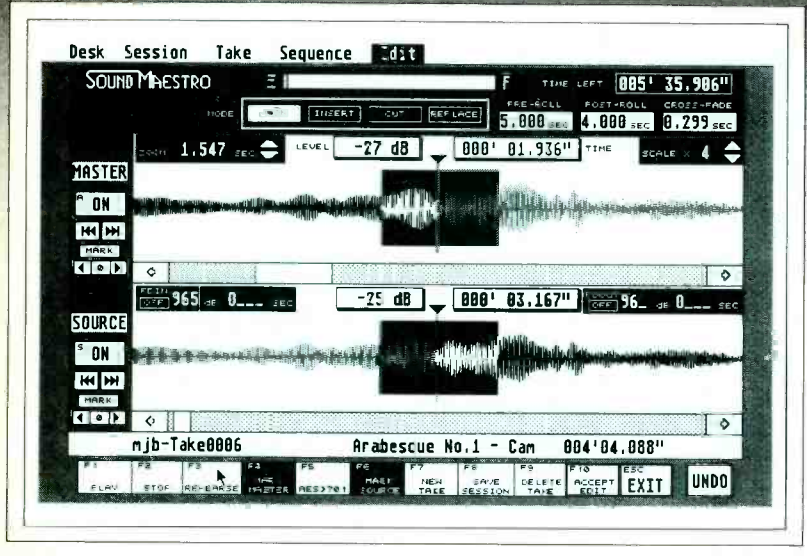

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MUSIC MIXING FOR DOLBY STEREO

With an increasing demand for film music more work is being completed in studios not so familiar with the techniques. Tony Spath and Dave Harries of Dolby Labs cover the subject

Music is an important element of any film, however, the mixing of music for the Dolby *Stereo* format requires a rather different approach from that of conventional music mixing.

Stereo in the cinema

In the field of film sound 'stereo' has historically been from four channels, three across the width of the screen (left, centre and right) and a fourth (surround) channel, which delivers a sound field from the rear of the audience. The centre channel enables a clear central position in the stereo to be perceived wherever a person is sitting in the auditorium; an image in the centre of the screen should 'sound' in the centre. The surround channel enables the creation of sound atmospheres around the listener as well as the use of specific effects away from the screen. The object of the surround channel is to provide a sound field rather than specifically directional information, although of course it can be very effectively used to convey front/back or overhead motion. Originally these four channels were replayed from four magnetic stripes, two down each side of the 35 mm film. This was a very expensive release format—after each film print had been processed, the magnetic coating had to be applied along the length of the film and then recorded in realtime.

A 4-channel matrix

Dolby *Stereo* uses an optical soundtrack—a simpler and cheaper process and a more reliable and robust format. It enables the director to use a far wider range of sounds than was previously possible. At its inception in the mid '70s, the format provided the first real improvement in optical soundtrack quality in over 30 years. As an indication of its subsequent success, every Academy Award for film sound since 1977 has gone to films with Dolby *Stereo* soundtracks. In the first 12 years, over 2,000 films in 25 languages were made in Dolby *Stereo*, for replay in nearly 13,500 equipped cinemas throughout the world.

The optical soundtrack area available on a 35 mm film allows only two tracks of sufficient quality to be recorded. If the system is to be discrete, only a simple left right stereo is possible. For this reason *Stereo* makes use of an intelligent matrix in order to store the four required channels onto the two tracks available, left total and right total (Lt, Rt). The encoding of the four channels on to two is done at the final stage of production in the dubbing theatre; these two channels are then decoded back to four in the cinema using a Dolby Cinema Processor [1,2].

The performance of any matrix system is dependent on the matrix decoding. The basis for the *Stereo* matrix is that identical in-phase information from Lt and Rt will be decoded as centre, while identical yet out of phase information from Lt and Rt will be decoded as surround. Such a simple matrix will result in a channel separation of only 3 dB between adjacent channels, however, by means of some sophisticated logic steering, separation is increased to >30 dB and further enhanced for the listener through psycho-acoustic techniques such as the Haas effect [3].

Monitoring in the cinema

In the home, the hi-fi listener has a volume control, so that he can adjust the volume to what he feels is 'the right level'. In the cinema someone else has to set the volume. It still needs to be at 'the right level' as differing cinema monitoring levels would result in the same film sounding quite different, losing the desired effect on the audience. Consider for example the film *Alien*. Throughout the film, the subtle sounds of the spaceship on which the action takes place are always present; these create the atmosphere and build the tension which would be lost on quiet playback. Playing a film too loud also has its problems: it can result among other things, in an unreal relationship between the image of the actor and the volume of his lines as well as possibly distorting the sound. For this reason films are mixed at the same level they will be reproduced in the cinema. Fortunately this level has been standardised: in music studios a monitoring level of 85 dBc for pink noise at 0 vu (or 6 dB below peak) would be equivalent.

A monitoring unit for music studios

No matrix can offer the stability and channel separation of a discrete system, however listening 'through' a matrix, ie putting the matrix encoder and decoder into the monitor chain while recording, offers a practical solution. Just as when a record is mixed, the object of mixing music for film is that it should reproduce predictably in its intended listening environment, while achieving the artistic aims and intentions of its producer/performers/engineers. This is why Dolby make the *SEU4/SDU4* studio monitor combination available for film soundtrack work in music recording studios. The combination contains the *Stereo* encoding matrix (the *SEU4*) and the professional Dolby *Stereo* matrix decoder (in the *SDU4*), allowing the music engineer to hear exactly how the matrix will affect his sound and to adjust his mix accordingly (**Fig 1**).

These units are designed quite simply to interface the encoding and decoding circuits with music studio consoles and monitoring. Level presets are provided for 4-channel input on the *SEU4* encoder and 4-channel output on the decoder, along with LED metering to make the level matching simple. The 2-track output of the encoder (Lt, Rt), which in a film dubbing studio would ultimately be used when recording the matrixed optical soundtrack, is hard-wired to the 2-track input of the decoder for music studio use. In addition, there is a monitoring section on the *SDU4* output: this has a 4-channel monitor level control and mono and (conventional) stereo buttons for compatibility checks. Finally there is a pink noise facility for calibrating the acoustic level to 85 dBc from each monitor channel.

Studio equipment requirements

The basic difference between the conventional stereo mixing that is done every day in recording and mixing records, and the mixing of music for Dolby *Stereo* films, is in the number of monitoring channels. This means that music studios have to be able to alter their monitoring as follows (**Fig 2**).

A third speaker must be installed as a centre channel. As the front stereo information is carried on three and not two speakers, this third speaker and its power amplifier should be the same as is used for left and right. In cases where speakers

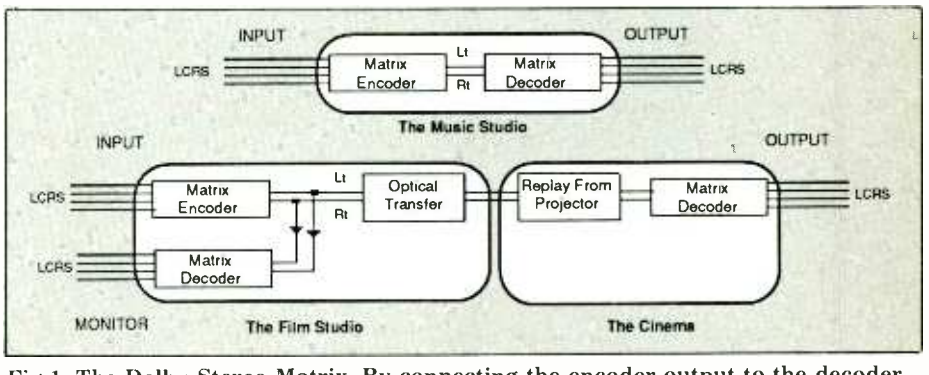

Fig 1: The Dolby Stereo Matrix. By connecting the encoder output to the decoder input in the music studio, any affect the matrix has on the signal will be identical to that when the film is ultimately replayed in the cinema

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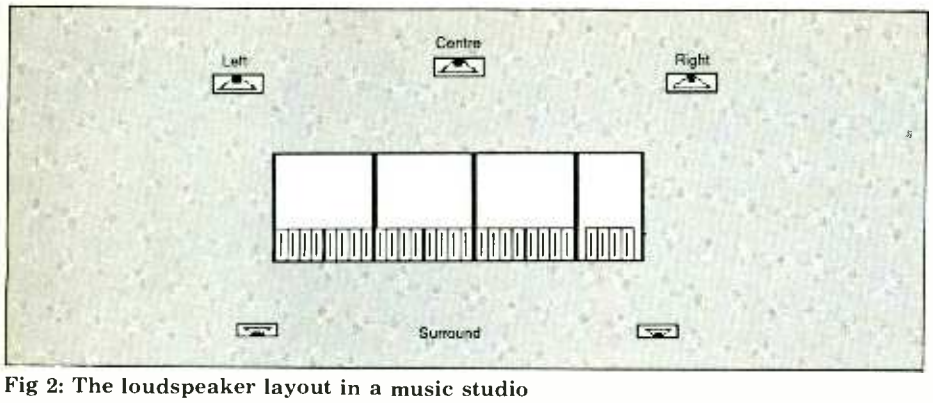


Fig 2: The loudspeaker layout in a music studio

are built in, it is often the best solution to install three separate high quality speakers and amplifiers on a temporary basis.

At least two speakers must be used behind the console for the surround channel. These do not need to be very high quality—hi-fi speakers will do very well. The idea is to present a sound field, rather than specific point sound location, hence the use of more than one loudspeaker. (A good cinema will use surround speakers all around the walls of the back half of the auditorium to create this effect.) The surround channel is band-limited removing extreme high frequency sound, which would otherwise result in the listener hearing a series of point sources rather than a sound field.

All four channels—left, centre, right and surround—need to be controlled from one monitor pot. This is most important and often overlooked by studios when they become interested in doing Dolby *Stereo* work, and consoles which are configured to give 2-channel stereo only as a principal loudspeaker output have always entailed an unnecessarily awkward way of working. The 4-channel monitor level control on the *SDU4* offers the solution to this problem. As the monitoring is invariably the part of a *Stereo* film music installation that takes the longest to set up—connecting directly into the studio monitoring is hardly an every day occurrence in music studios—Dolby would suggest that the *SDU4* studio monitoring unit would be a sensible purchase for studios already doing, or expecting to do *Stereo* music mixes on a regular basis. This—the decoder—can remain permanently installed and simply patched when required; the encoder would still be necessary but is very simple and quick to install on its own.

The format onto which the music is mixed and the track configuration (LCR, LCRS, LRS, etc) should be discussed with the studio where the film will finally be mixed. Typically the music will ultimately be transferred to 35 mm magnetic film stock for this mix, and if a music studio can mix directly to this, then a generation will be saved. Any other formats used should be able to run 'synchronised', for example:

2-track (left-right) with centre-track timecode;
4-track ½ inch (left-centre-right with a 50 Hz pulse or timecode on track 4);
8-track 1 inch or other multitrack format (left-centre-right-surround with a 50 Hz pulse or timecode)

In some cases, for example if it is a music based film, the film studio may ask for a multitrack split such as L,C,R rhythm track, L,C,R,S synths, one track for each of lead vocal and instrumental solos, and of course a track for timecode. In any case, the film studio will usually say how they would like to receive the music. If they have Dolby *SR* as is the tendency nowadays, it should be used on the mix format, otherwise Dolby *A*-type is the minimum requirement. It is also possible to record onto digital, provided a suitable synchronous transfer will subsequently be possible. *PCM F1/701* for example cannot always be synchronised.

Alignment tones and Dolby tone, or Dolby noise with *SR*, should be recorded on all tracks. If the mix is straight to 35 mm magnetic stock, Dolby level should be 185 nWb/m, accompanied by pink noise or an extended tone run: 50 Hz, 100 Hz, 1 k, 3 k, 10 k and 15 k.

Setting up the system

All that is required to set up the *SEU4/SDU4* combination in a music recording studio is to fix the relationship between programme levels on tape and their acoustic level from the loudspeakers. Typically the setup will involve the following steps:

turn the monitor level knob on the *SDU4* right down;

send a 1 kHz tone at 0 vu from the console to each input in turn and adjust the appropriate trimmer to give Dolby level—equal brightness of the two green LEDs on the *SEU4*. (It is important to send the 1 kHz tone to only one channel at a time);

While sending tone to left and subsequently to right, check that the two green LEDs on the *SDU4* are also lit. If necessary adjust the Lt trimmer for left and the Rt trimmer for right on the *SDU4* to achieve this;

ensuring that the *SDU4* is in 'Dolby Surround', switch the on-board pink noise to auto. Pink noise will now be sent to each of the loudspeakers in turn around the sequence L,C,R,S. Turn the *SDU4* monitor level knob up to the detent. Using an appropriate SPL meter, adjust the individual L,C,R,S output trimmers for an SPL of 85 dBc on each channel.

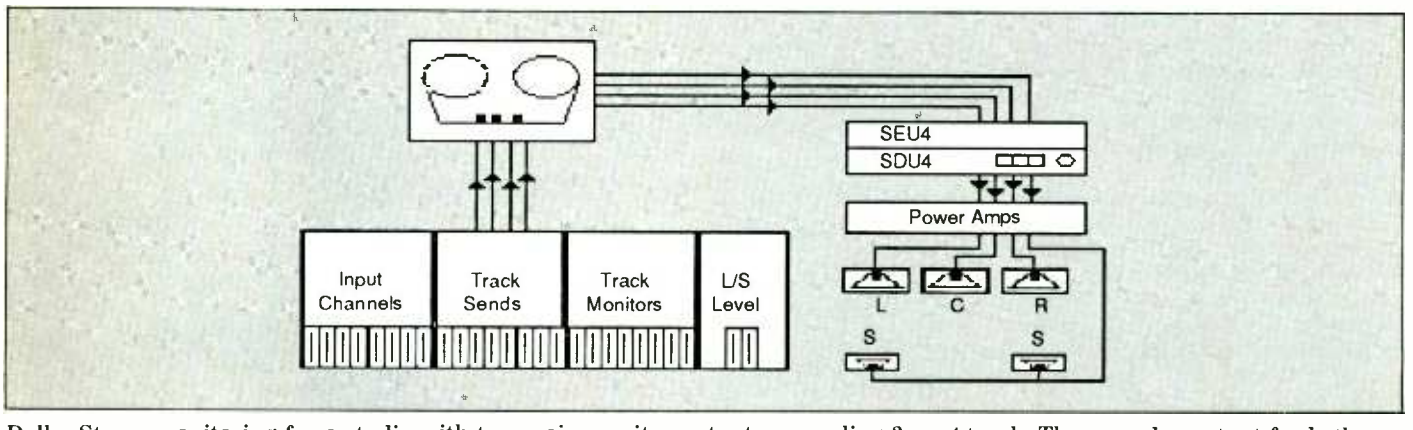
The unit is now ready for use and will give an accurate representation of the effect of the matrix on the music at the kind of level the music will be heard in the cinema.

NB The surround channel contains a 100 Hz to 7 kHz bandpass filter, so an audible quality difference on the pink noise will be obvious.

Making the music work

Music mixing for record is invariably stereo from two speakers, left and right producing a phantom centre image. Typically bass drum, snare, bass and vocals will appear from this phantom centre, with other instruments, effects and reverbs spread around the stereo on either side. Generally record mixes are not very wide in terms of stereo width—too wide a stereo is often not desirable for a variety of reasons. So, when a conventional record mix is replayed through the Dolby *Stereo* matrix, several things will most likely happen.

A large percentage of the 'stereo' information will be directed to the centre loudspeaker as being in phase and common to both left and right—not just as a 'phantom' centre but as a more noticeable 'hard' centre. This is coupled with a general narrowing of the true stereo image—the decoder is biased slightly toward the centre so that any dialogue will hold centre channel. Similar sounds will also tend to pull towards the centre, as will the presence of high level centre signals themselves. (In very extreme cases the



Dolby Stereo monitoring for a studio with two main monitor outputs, recording 3- or 4-track. The recorder output feeds the power amplifiers via the SEU4/SDU4 combination, the recorder must therefore be used to provide line in/line out monitor switching

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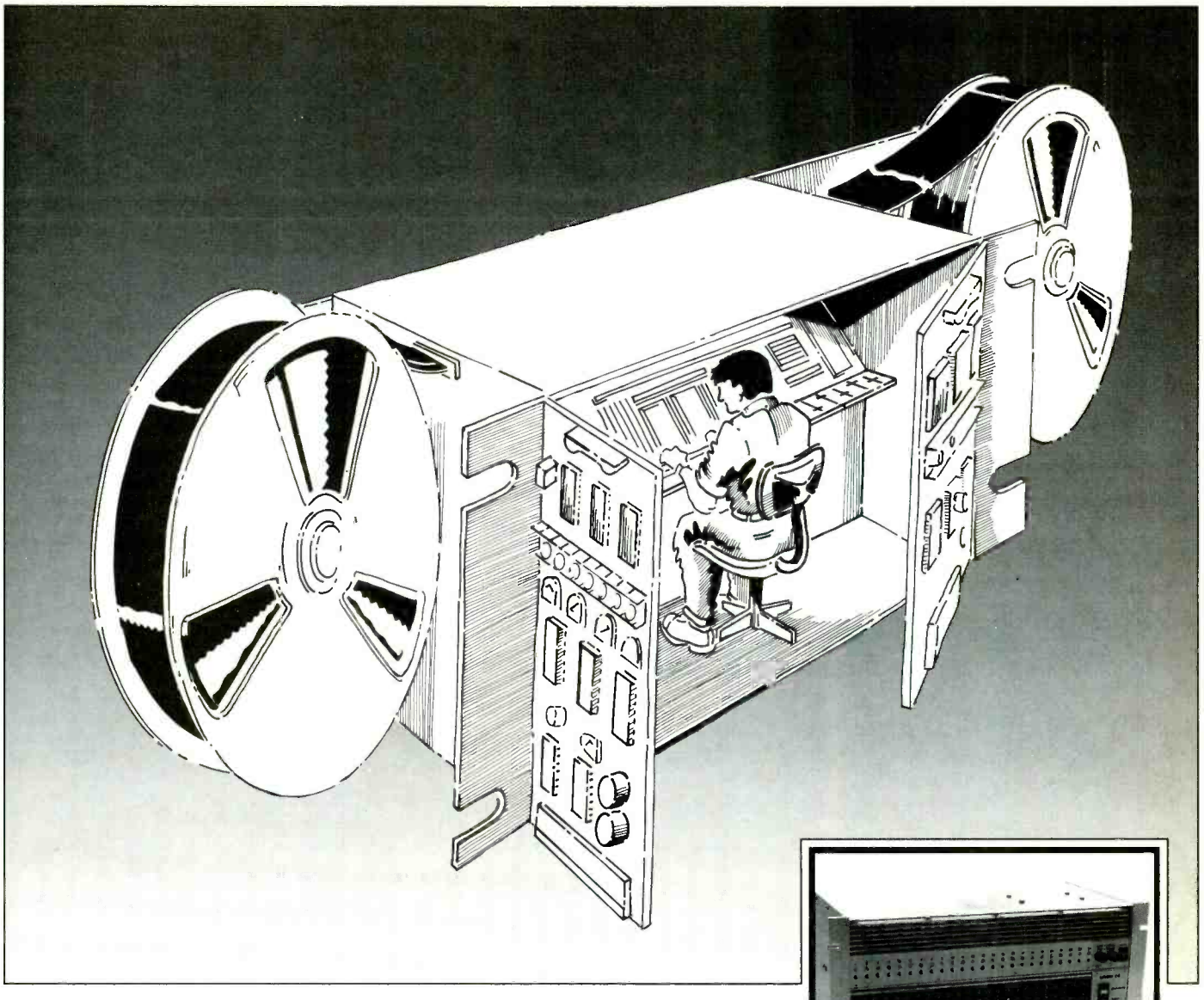

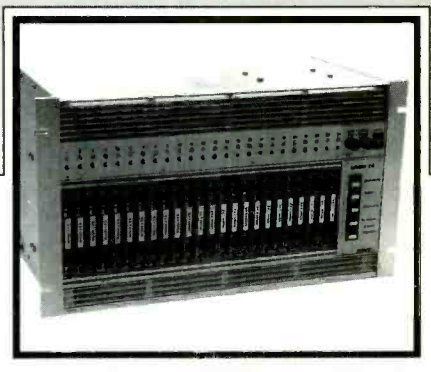

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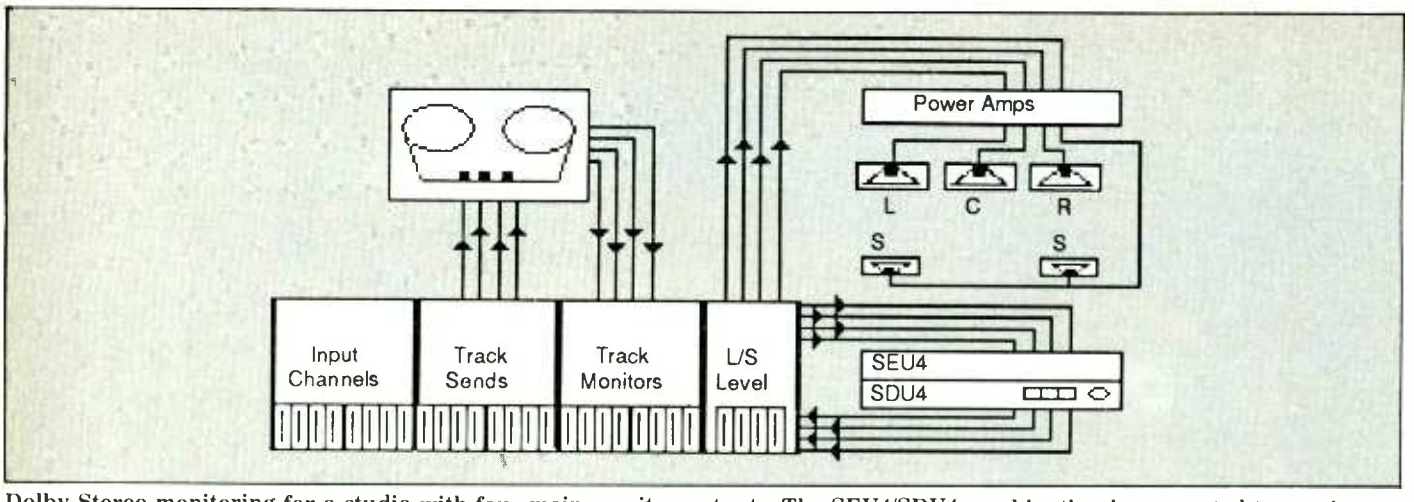

Dolby Stereo monitoring for a studio with four main monitor outputs. The SEU4/SDU4 combination is connected to monitor insert points, allowing monitor level control and line in/line out switching from the console main monitor section (This method may also be used with a 2-track console where only a 2-track recording is required by the film studio)

image will move with the dominant signal element.) The audible result is that the sound tends to 'pile up' in the centre, effectively in mono.

Anything common to both left and right yet containing out of phase information will be directed to the rear surround loudspeakers. Reverberation and ambience as delay phenomena are typical of signals that the *Stereo* matrix will interpret as 'surround' and can sound very effective, adding to atmosphere and mood. However, many musical instruments and studio devices provide 'stereo' outputs, which are in many cases derived from mono sources using phase/delay techniques; as an extreme example, the result through the matrix could be a naked rhythm track at the front with all the synths coming from the rear.

Simply put, the vast majority of record mixes would not sound very good in a cinema.

In order to get a wide stereo spread, the L and R signals need to be as distinct and different as possible. If an image is very narrow, an improvement can sometimes be effected by the use of delays between L and R; alternatively, adding a little of the sustained music elements into the surround can give the impression of a wider stereo.

More usually the problem (as with many stereo synthesisers for example) is that there is too much from the surround, ie a lot of out of phase information. Sometimes an improved result can be obtained by changing the phase of one channel by 180°, or by adding a short delay (normally between 5 to 15 ms).

The majority of *Stereo* mixes are made to be 'compatible', giving an acceptable result when replayed in a mono cinema. (The mono button on the *SDU4* allows this compatibility to be checked.) Delays that can give added stereo width by creating a difference between L and R may not be quite so nice in mono where such signals will end up as a mixture of the signal and the delay from the same (centre) speaker. When switching to mono, the balance of the front (L,C,R) will be as compatible as a conventional stereo mix would be, however, the rear surround information is lost altogether. Important surround information should therefore be placed on front channels as well. Incidentally, stereo synthesisers with a lot of out of phase components (ie there is plenty of them in the surrounds) will also suffer on a mono release—this is not, however, a problem unique to the *Stereo* matrix; exactly the same would happen from a mono TV/radio broadcast.

On the subject of phase, most studios have a phase meter—a device designed to show mono compatibility with a 2-channel stereo system. Looking at a phase meter when working on a 4-channel matrix, ie *Stereo*, is likely to give some fairly meaningless results unless it is comparing L and R before the encoder, when it will simply show the relationship of centre (in-phase) to surround (out-of-phase) in the original L, R material.

While left, centre and right speakers are behind the screen and the sound directly associated with the picture, the surrounds are normally used in film mixes to give an almost subconscious impression of atmosphere to the audience. Distinct sounds from the rear channel can be distracting, pulling the audience's attention away from the screen; while reverberation and sustained sounds work very well on surround, percussive sounds can detract from the experience of the film and should generally be avoided. Furthermore, it is not really necessary to put any music on the surround track at all—a good L,C,R balance is worth a lot more than startling musical snatches from the rear or gimmicky front/back panning. And if an instrument really works well on surround, it is often best to record it 'solo' on the surround track so that the ultimate decision can be made at the final mix.

Particular consideration should be given to reverberation. Music studios are normally small and have a fairly dry acoustic. Dubbing studios are usually rather larger with typical reverb times of around 0.6. Cinemas are often even larger and can have reverberation times of up to a couple of seconds.

Generally then the music studio will be the driest acoustic in which anyone hears the music, so it is better to err on the side of adding less reverb, rather than more. Furthermore, where there is dialogue over the music, or in a scene with high levels of music and effects, a greater level of music can be used on the film mix if reverberation and sustained sounds are quieter in the mix. When considering spatial distribution, much of the stereo reverberation may end up coming from the surround channel; as an alternative, a stereo reverb output can be sent C+S rather than L+R.

Often engineers and producers like to vary monitoring levels, to check at different volumes and gain fresh perspective on their balance. There is no reason why this should not be possible when mixing *Stereo* film music; but Dolby advise that when the record pass is made the monitor level is set for 85 dBc. This monitoring level is likely to be about as loud as the music will ever be in the film, and often the levels will be even lower. Care should therefore be taken that the mix and tonal balance still work at lower levels, as well as at the 85 dBc reference.

Finally, the unit has a bypass switch that enables the mix to be monitored directly although, it is not necessarily a good idea to switch between matrix and bypass trying to make the mix so that the matrix encoded result is as similar as possible. In any case the film music mix will always be replayed through the matrix, and if a record mix is required this should be done separately.

How Dolby can help

As part of the Dolby *Stereo* agreement that every film production company signs, Dolby Labs offer to supply an *SEU4/SDU4* monitoring unit for music mixes. This unit is temporarily installed by one of Dolby's *Stereo* consultants. Where a studio buys and installs an *SDU4* in order to cut down on installation time and inconvenience, Dolby Laboratories will supply just the encoding part of the circuit—an *SEU4*— for the mix. This alone is very simple to install, however, in cases where a studio is regularly working on Dolby *Stereo* music mixing, they would be prepared to discuss the possibility of leaving an *SEU4* permanently installed, although it would always remain the property of Dolby Laboratories. Sound consultants at Dolby Laboratories are always available to discuss in more detail the practical requirements of film work, and what these would mean for a particular studio.

As an ever-increasing number of films are made in *Stereo*, more and more music studios are taking film music sessions for Dolby *Stereo* films. There is no reason why a conventional music studio should not achieve a good result using the Dolby *Stereo* format within the confines of the system. By necessity it will entail a different approach to mixing but it is certainly better to have any surprises sooner rather than later.□

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1 Ralph Hodges, *Sound for the Cinema*, S81/3382.
2 Larry Blake, *Mixing Techniques for Dolby Stereo Film and Video Releases*, S85/3242/6599.
3 Roger Dressler, *Dolby Surround Sound for Stereo Television—Principles*, L89/003.

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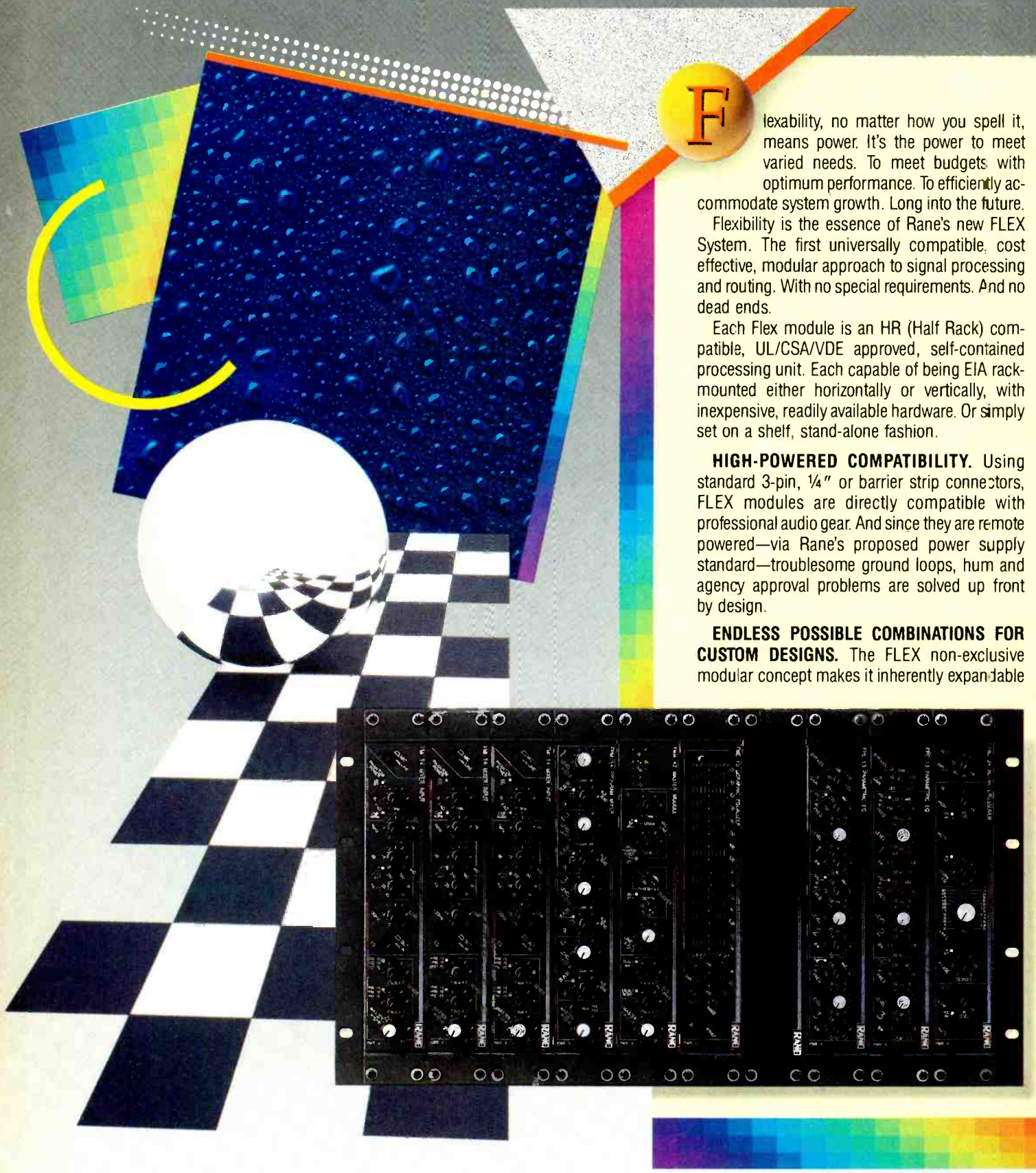

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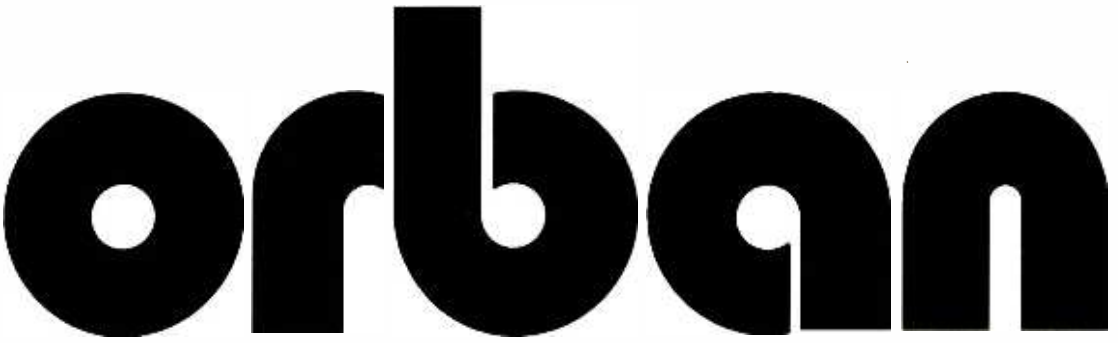

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AUTOGRAPH:
RECORDING FOR THE THEATRE

Autograph Sound Recording's London studio is dedicated to sound effects production for theatre. David Mellor describes their methods and equipment

Autograph Sound Recording have a long list of West End theatre credits behind them: *Cats, Les Miserables, Time, Chess, Metropolis* . . . the list could go on, but a few of the big name shows should be enough.

An essential part of almost every stage drama is a number of recorded sound effects. Door knocks may still be handled perfectly well by an assistant stage manager but more sophisticated sounds need more preparation.

But where do these sound effects come from? Well, few sound engineers can be unaware of the BBC's contribution to live theatre in the form of their series of sound effects records. Excellent effects they are too, with the 'Sharp Clap' thunder effect from disc number 1 as yet unsurpassed. Other companies, such as Sound Ideas, supply large libraries of effects. Of course, compact disc is now the ideal medium, rather than scratchy vinyl.

A good sound effects library will have clear, separate recordings of each sound. It is important that each effect is heard in isolation from other sounds. This makes it possible to compile sound effects to suit the particular need.

Using sound effects in the theatre is rather different from sync'ing effects to film or video. Effects are normally sync'ed to picture only when the film or video recording is complete and fixed—barring director's afterthoughts. Theatre sound effects have to match action that will almost certainly change. The effects have to be put together during the rehearsal period, while the show is still in a state of preparation. Therefore, complex sequences of sound effects may need to be altered many times—even during the previews of a show. Getting it right once is not enough, the effects have to bend to the changing requirements of the action on stage.

Studio

Autograph Sound Recording have possibly the only studio in Britain dedicated to the production of sound effects for the theatre. It is situated at their headquarters in London's Kentish Town and staffed by Nick Gilpin.

The studio was designed by Andrew Bruce in the moments he found spare from designing theatre installations. Bruce uses an Apple *Macintosh II* running *MacDraft* software (now upgraded to *Dreams*) to assist in his design work. **Fig 1** shows some of the detail involved. Obviously, using a computer makes it much easier to experiment with different layouts and to modify the design as it progresses. The studio has an 'architect-designed' feel to it. The equipment installation was by a team from HHB, joinery by a local firm.

In one major respect, the premises ought to be entirely unsuitable for use as a studio—the building is coupled to a railway line. Coupled, that is, by solid brick and mortar. A floating construction for the studio was therefore essential, and although you can see the trains hurtling by towards Euston station, you can only just hear them.

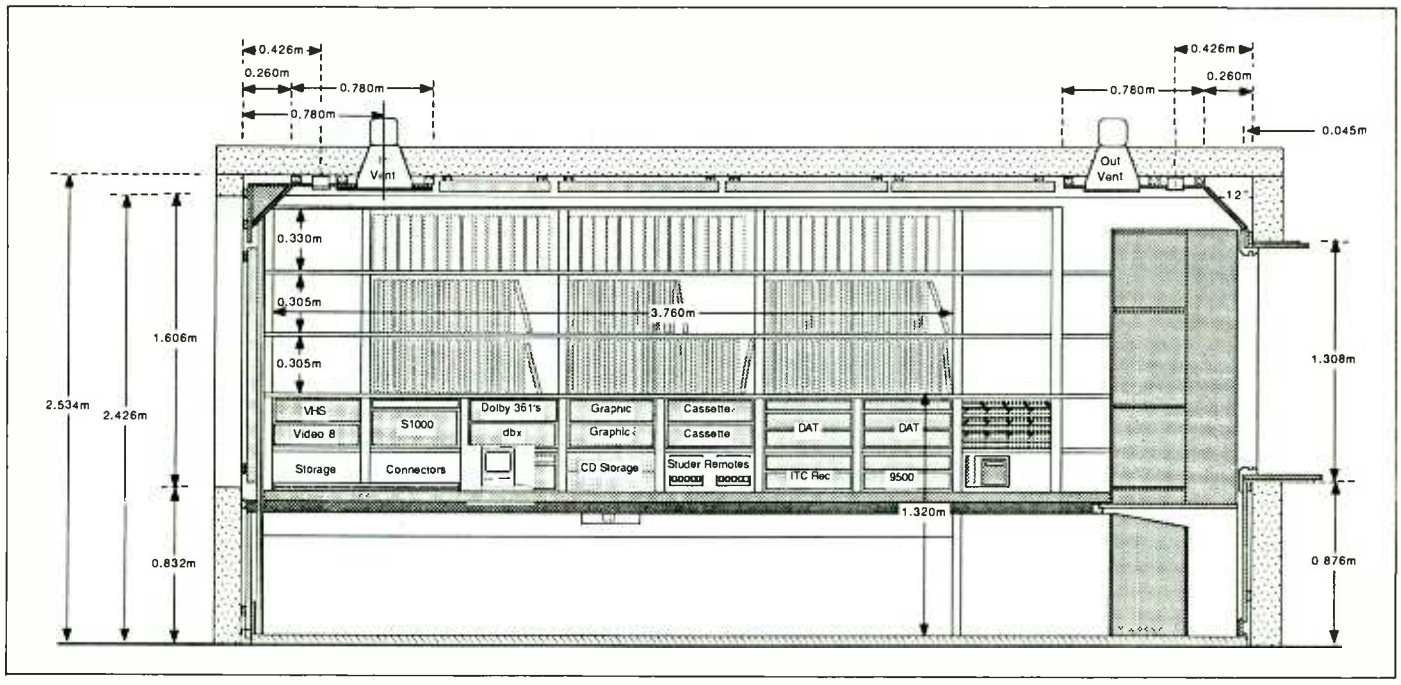
A fairly live acoustic was chosen for the room, together with near field monitoring. This is intended to make the room a pleasant environment in which to work. It is not always easy to persuade a theatre director to sit in on the creation and compilation of sound effects—he has more precarious elements of the production to worry about. But if he does come, then it is best for him to enjoy comfortable surroundings and a comfortable acoustic.

Through the studio window is a recording area, as yet unfinished at the time of writing.

Equipment

The centrepiece of Autograph's new studio is a DAR *SoundStation II*. Hi-tech indeed when most of the country's theatres would feel hard pressed to afford a Revox *B77* of their own. But the technical experience—staging, lighting and sound—is an intrinsic part of good theatre. If audio post-production houses need *AudioFiles, Opuses, Synclaviers*—and of couse DARs—to produce sound to go with a picture a foot or two across, then certainly the theatre needs equivalent technology to cope with a stage perhaps 40 ft wide.

Sound effects are sourced mainly from compact disc, using a Studer *A730*. 'Old fashioned' black disc playing equipment, an EMT *948*, is available for emergency use (it's actually a rather good



Layout for the back wall of the copy room

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Nick Gilpin at the controls

SoundStation outputs to a Studer 962 console. The A730 and Apple Mac stand in attendance

machine).

Of course, it will be a long time before every sound one could possibly need is ready and waiting in the CD effects libraries so a Sony portable DAT recorder is kept handy for home-brewed sounds.

The eight outputs of the DAR go into a Studer *962* console. Although the SoundStation gives control over the levels of the various individual effects one might use in a compilation, EQ and reverb might be necessary to persuade them all to fit together in a natural manner.

Other equipment includes a keyboard and synthesiser modules which a musical director may use to create a click track which he, and possibly the musicians, will hear on headphones during the show. Effects include a BSS Audio *DPR 502* MIDI noise gate, Klark-Teknik *DN 780* digital reverb, Meyer *CP10* parametric equaliser, and Yamaha *SPX 90 II* and *SPX 900* multi-effects units. Monitoring is via Amcron-powered Tannoy *DTM8*s (at present on evaluation loan).

The installation itself has some interesting features. The patchbays are ADC *Ultra Patch* units which are wired via insulation displacement connections (IDCs). Although the ADC patchbay units are more expensive than conventional soldered models, evidently the time saved in wiring them up is to their advantage in terms of installed cost.

The outboard equipment is connected to *XLR*s mounted on the trunking running around the room. Nothing unusual in that, but the amount of attention to detail in this studio is shown by the octal sockets beneath each *XLR*. If a piece of equipment is unbalanced, then balancing transformers can simply be plugged into the appropriate sockets to rectify the omission.

Production

The most recent production with sound effects prepared in the new Autograph facility is *Frankie and Johnny in the Clair de Lune*, with Julie Walters and Brian Cox, at London's Comedy Theatre. The shows opens with a collage of sound effects to simulate a New York city atmosphere. This includes traffic, car horns, pneumatic drills and a police siren.

A new project would normally come in as a series of sound cues drawn up by the director. At this early stage, the director will probably only have a vague idea of what each cue should actually sound like. For instance, 'traffic' could mean light car traffic, heavy lorries, rush hour . . . a number of different things. Often, it is not until the director has heard what he doesn't want that he knows what he does want. It's not that he is being intentionally unhelpful, he has a thousand things on his mind. Sound effects are just one component of the production.

In the case of the opening effects for *Frankie and Johnny in the Clair de Lune*, the important thing was the timing. The police siren had to occur at a precise instant to fit in with a lighting cue. Autograph were working on the effect right from the beginning, but it wasn't until after a week of rehearsals that it was possible to specify the exact time the siren should come in.

This is where a hard disk recorder like the *SoundStation II* has an advantage over multitrack tape. If the effects had been compiled on tape, then each attempt at a new version would mean re-recording the siren, and remixing the effect. On the *SoundStation*, it is simple to move the siren to its new timing. All data concerning the levels and timing of the other effects is retained with the cue in the hard disk memory.

Apparently, even simple effects may need to be remade four or five times before they come up to the director's expectation and fit in naturally with the acoustics of the theatre.

Another interesting sound effect from the same show happens when an actor appears to light a gas stove and fry an egg. A sound effect here is clearly much less of a fire risk than the real thing! Acquiring the effects is straightforward, but making it sound real is another matter. As Nick Gilpin explains, "Half the battle is getting a good loudspeaker position." In this case, the ideal position was inside the stove. A Bose *101* fitted the bill perfectly.

Playback of effects in *Frankie and Johnny* is from NAB cartridge. The compilation of effects in the studio means that, in any production, the number of cart machines can be reduced, thus fitting better into the budget and also reducing the workload on the sound operator. Of course if there are multiple effects happening simultaneously and one of them depends on the delivery of a line by an actor for its timing, then an extra machine must be used.

For more grandiose productions, such as *Metropolis* at the Piccadilly Theatre, NAB cart machines are out and digital cart machines are in. The Ferrograph *Series 9* unit is perfectly suited for theatre use. It records stereo audio onto a magnetic disk cartridge and plays back just like a conventional cart, with start, stop and cue buttons. There are several points to its advantage: It cues quickly, it starts quickly—and it sounds good! Nobody could ever say that about a NAB cart.

Autograph keep one Ferrograph *Series 9* in the studio. *Metropolis* uses two machines. All the effects for the show fit on two magnetic disk cartridges.

Demonstration

Nick Gilpin demonstrated the DAR *SoundStation II* for me by remaking an effects sequence I had recently done myself on multitrack. The benefits were apparent. The first stage was to find suitable effects from the CD library and record them into the DAR. Once they were on hard disk, they could be manipulated into sequence.

One effect was of footsteps. The sound was right, but on the CD they were too quick. This problem was solved by using the Time Warp function. This can increase or decrease the length of a recording by up to 20% without changing the pitch. It takes a little time to work out, but the result in this case was good.

Editing the effects and putting them in the right order was very straightforward. One sound had a slight click which was easily edited out. Unfortunately, the software did crash at one point, but it was restarted without losing any audio, which was retained safely on the hard disk.

To put the sequence together took about the same length of time as it did on multitrack. The important difference is that if the multitrack version had to be altered to new timings, then more than likely it would have to be re-done from square one. On the DAR, retiming is simply a matter of shuttling cues backwards and forwards on the screen.

The time is certainly ripe for an improvement in the quality of sound in the theatre. For an important musical show, sound is obviously a priority. But in smaller plays in smaller theatres, unless sound specialists are brought in, sound tends to be a poor relation to just about everything else. Many theatres bundle sound in with lighting, and the chief electrician has to be chief sound man too. He might be expert at both, but surely sound deserves individual attention.

Hopefully, Autograph's hi-tech facility that fits well the needs of large productions will be used on lower budget shows too, and will serve as an inspiration towards better sound in the theatre in general.□

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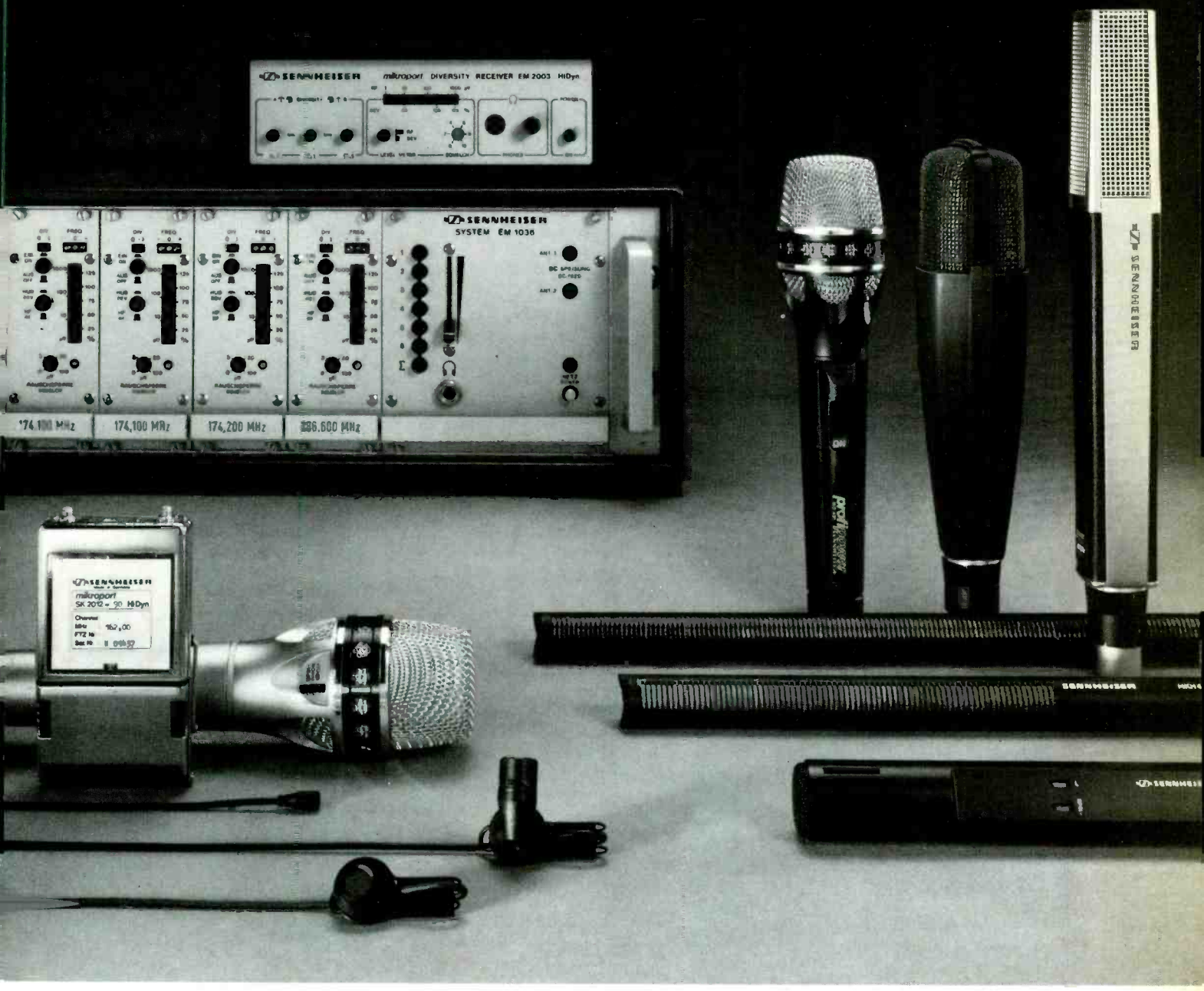

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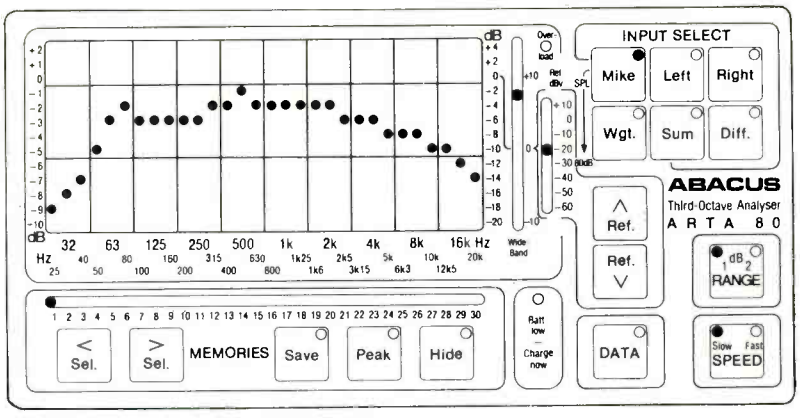

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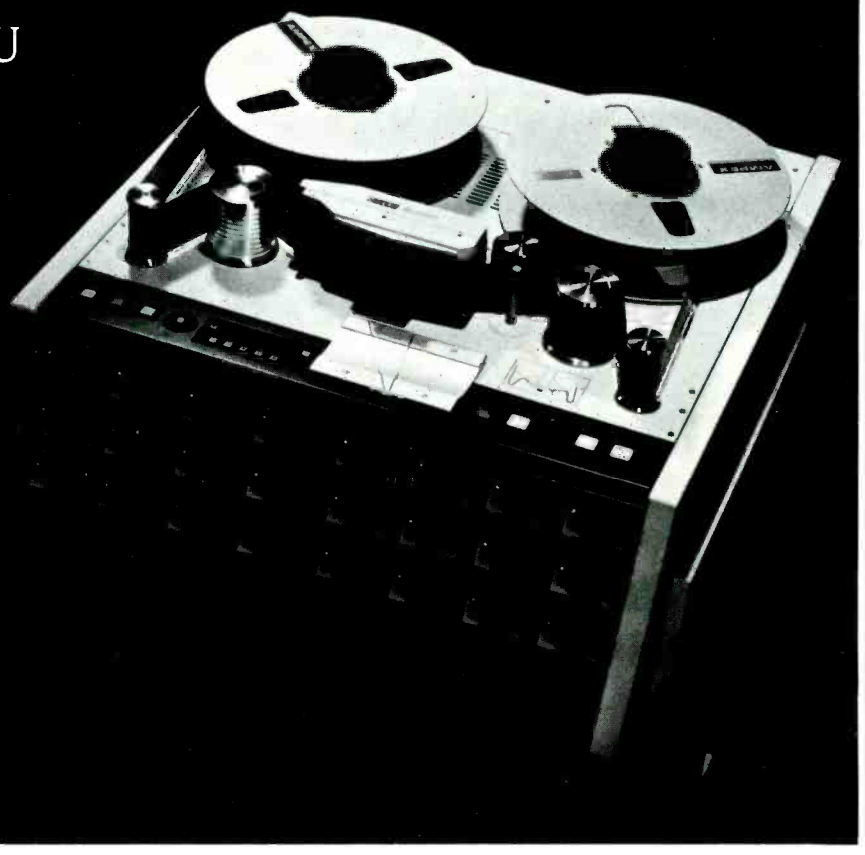

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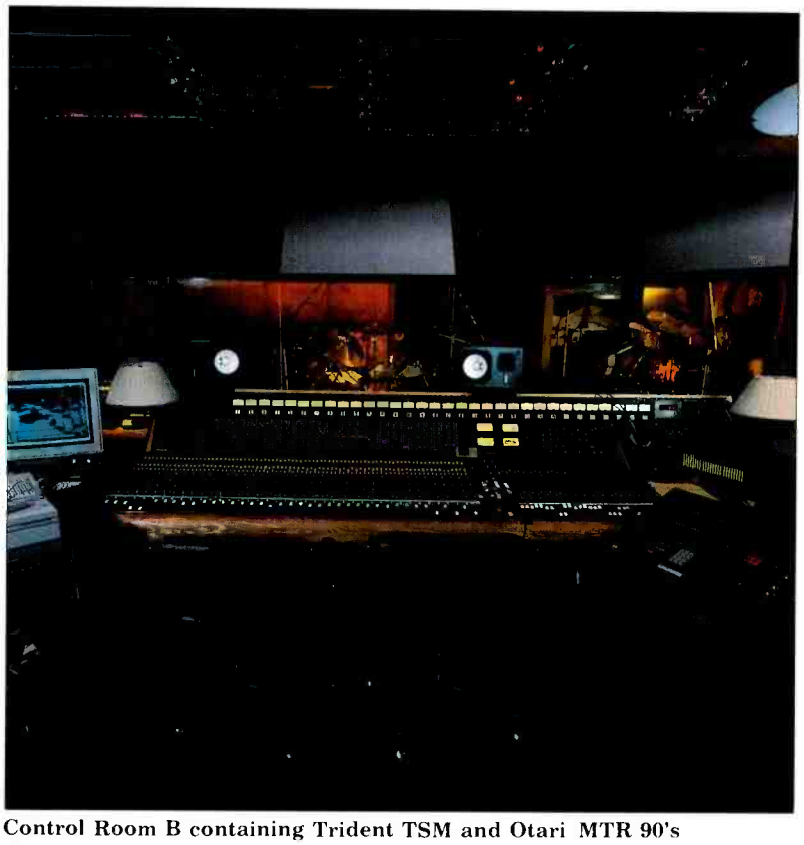
THE PLANT

Surviving a turbulent management history, The Plant has remained a flourishing studio in the Bay Area of San Francisco. Jennifer Leavenworth traces the 17-year story

In the dawning of the '70s, although the 'Summer of Love' may have ended, the San Francisco music scene was still helping to set the pace for the world's youth culture. That's when engineers Gary Kellgren and Chris Stone started building Golden Gate, a new studio in the San Francisco Bay Area, a sister studio to their successful Record Plant operations in Los Angeles and New York City (where Kellgren's first client was Jimi Hendrix recording *Electric Ladyland*). The idea was to build a multitrack facility, one of the first in Northern California, a showplace that would attract the finest rock and R&B musicians. Kellgren and Stone chose Sausalito, just an hour by plane from Southern California, as their haven for musicians accustomed to the hectic 'Hollyweird' recording scene.

Overlooking the Golden Gate, Sausalito is a waterfront town in a quiet, Mediterranean-like setting. A short ferry boat ride from San Francisco, the picturesque area has attracted artists, writers, and craftspeople since World War II. Folks walk its streets all year enjoying the boutiques, restaurants and art galleries. When they get thirsty they drive north to the famous 'wine country' in Napa Valley, 45 minutes away. Stone and Kellgren found a great location for their studio: sheltered by a grove of eucalyptus trees, right off Sausalito's main road, hidden from passer-by view.



Control Room B containing Trident TSM and Otari MTR 90's

Studio B

The Sausalito facility opened in 1972 and represented a new breed of studio, the kind dedicated to making musicians feel comfortable musically and physically. The luxuriously appointed, two-studio interior was a maze of winding corridors with slanting, redwood-lined walls.

Within the intricately carved doors and walls were gleaming new consoles, tape machines, echo plates, grand pianos and tube mics. along with a hot tub and shower, wet bars, kitchen, basketball court and pinball-equipped game room. All inside a one-storey grey wooden building that looked more like a weathered barn than a music mecca with control rooms where, said Chris Stone in an interview, "We have arranged the console, patching and outboard gear like a one-man cockpit."

Top rock and R&B artists came to the Golden Gate. Carlos Santana, Stevie Wonder, Fleetwood Mac, Yes, Blue Oyster Cult, Van Morrison and others wanted to work there. For a time, Sly Stone even lived there and built his own bathroom and private side entrance.

The Sausalito Record Plant flourished for several years but by 1981 the music industry was deep into recession. While record companies hacked away at recording budgets, the studio managed to survive, added a small pre-production room, and continued to attract internationally known acts. But Kellgren had died in a swimming pool accident in 1977, and in 1981 Stone sold the financially strapped business to an avid young rock fan named Laurie Necochea. She paid for the studio with the settlement money she won in a malpractice suit—a medical mishap had left her wheelchair-bound.

During Necochea's reign of the studio (renamed The Record Plant), she tried to ingratiate herself with rock stars. The studio benefited when she undertook an acoustical redesign of Studio A, including the installation of louvred, tunable trap systems and new isolation booths, under the watchful eye of star engineer Tom Flye. Local musicians did the construction work and were 'paid' with free studio time.

From '82-'84 a steady stream of recording musicians kept the staff engineers—Jim Gaines, Ron Nevison, Jeff Norman, and Ann Fry—very busy. Necochea utilised Kellgren's rarely used experimental studio, The Pit (originally Sly Stone's bedroom), as a rehearsal studio to accommodate smaller, mainly independent label projects. The summer of 1983, said then-studio manager Paul Broucek, "was our best in many years". In those two months The Record Plant hosted Grace Slick, Ted Nugent, Rick Springfield, Romeo Void and others.

By 1984 an automated Trident *TSM* console was in Studio A, and Studio C contained a Steinway grand piano in addition to its Hammond *B-3* organ. Now called simply The Plant, the facility was promoted as 'the only major studio in the Bay Area offering our own nearby housing for out-of-town guests'.

The Plant was growing but under Necochea it became top-heavy in management. She made questionable business decisions—like the one to trade studio time at the going rate of $100 an hour—for carpentry work. Her trust administrator ▷

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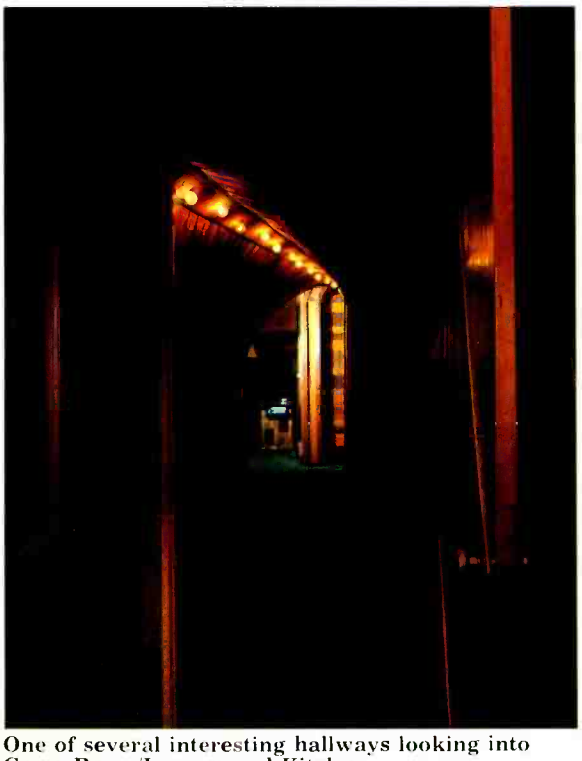
◁ intervened. In January 1984, a judge deemed Necochea unfit to govern her award money and The Plant was sold. Necochea died less than a year later at the age of 23.

The new Plant owner was Stanley Jacox.

By now the record industry slump was a fading memory; labels were signing new bands. The San Francisco Bay Area once again was turning out one superstar after another, from Night Ranger to Journey to Huey Lewis & The News. It also boasted a marvellous, eclectic music industry, home to the top new wave label (415 Records), top acoustic label (Windham Hill) and two top independent jazz labels. And overall studios were operating on a more professional, competitive basis.

In 1984, with solid bookings and business on the upswing, The Plant continued to attract the music industry's finest: Jefferson Starship, Angela Bofill, John Waite. Ex-Creedence Clearwater Revivalist John Fogerty broke his recording hiatus at The Plant to record his hit solo LP *Centrefield* in Studio C which Jacox had created out of the rehearsal studio. The studio purchased the region's first Kurzweil *250* synthesiser, which became a major selling point. They also bought another automated Trident *TSM* console, lots of outboard gear and new synthesisers, and custom monitors for every room. Bands came to The Plant from as far away as Japan because they wanted to work with fabled main engineer, Jim Gaines, whom Jacox had hired as general manager.



One of several interesting hallways looking into Game Room/Lounge and Kitchen

In 1985 The Plant was nominated for a Technical Excellence & Creativity Award by the readers of *Mix* magazine. That September the studio hosted the popular hard rock band Journey while they worked on a new album. Steve Perry and his mates were true rockers, no doubt used to all kinds of bizarre occurrences. But even they were surprised when in mid-session, a horde of police and federal law officers swarmed into the studio, made mayhem, sent everyone home, and stood guard at the famous, carved front door.

Owner Stanley Jacox had been indicted on federal charges of tax evasion and drug trafficking. The government took over his studio, acting within a federal law that allows officials to grab assets they suspect are bought with profits from illegal drug sales, and then sell those assets, pending court approval. Jacox was put in jail. Not a single employee was implicated in the charges.

For the next two months the studio was closed. But authorities in Washington knew that The Plant would not be worth much gathering dust. So Deputy US Marshall Alan Jeannerett told reporters, "We're not in the line of rock and roll, but we decided to re-open the studio under contract, to maintain the market

New Media Production Room

value of the property and to offset the costs of maintaining it, until the trial is settled."

A skeleton crew of Plant employees was brought in to run the studio under contract with the Government. 'Uncle Sam' acted as accountant, looking over bookings, collecting money and paying bills. The Government stayed in the background so the studio's famous clients weren't alienated. First in was Carlos Santana to record a self-produced release. He was soon followed by Huey Lewis, Buddy Miles, and an evidently unphased Journey, who all continued to cut tracks at the studio the local rock community nicknamed 'Club Fed'.

At the end of the year the studio was put up for auction and eventually purchased by Bob Skye on August 15th 1986.

Skye was no stranger to the industry. The year the studio ▷

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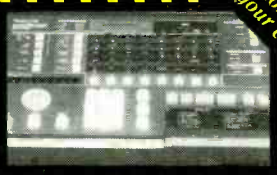

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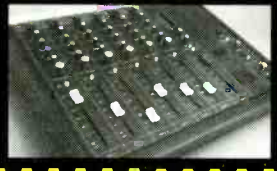

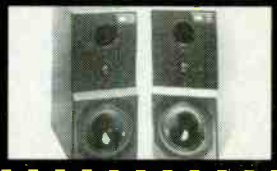

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◁ opened Skye was working in Los Angeles—coincidentally, as part of the construction team that rebuilt Studio B at the LA Record Plant. Skye had soon begun producing bands and through the years worked in various industry occupations—as a radio DJ and in acoustic design, hi-fi sales and live sound recording.

The Plant also runs a mobile studio, which has a cleverly arranged control room and a cushy travel lounge, which Skye explains is wired for overdubs.

This rolling studio is the legacy of Skyelabs, founded in 1983 by Skye. He built and ran the mobile 48-tracker, which is the world's only certified *Live-End-Dead-End* control room on wheels. Skyelabs was based near Washington DC and equipped to handle live concert recording, remote broadcast and satellite uplinks, and audio-for-video. The General Motors diesel coach known as Rover ("what else do you call a Greyhound?") was credited with on-location recordings of Peter, Paul & Mary, Al Jarreau, Billy Preston, Harry Belafonte and John Denver, along with on-location audio production for programmes by National Public Radio and Jacques Cousteau.

When Skye moved west to give new life to The Plant, Rover took him there.

Soon after he took Plant ownership, Skye told industry reporters that his plans for the studio included equipment upgrades while retaining "...the aura and operation values that The Plant's always operated under—basically a laid-back, easy-going, incognito place. There's too many important people who like the way it is, and their wishes need to be respected."

Since taking over, Skye quickly set about bringing the studio up to a new plateau. He brought in additional employees, hired a full-time chief tech, remodelled Studio B, and installed Studer tape machines and new audio-for-video equipment.

Understanding the recent trend of musicians and producers trying to hedge production costs by working at home-based MIDI studios, Skye decided to take on a new partner—recording engineer/producer and digital audio pioneer Arne Frager.

Frager moved to Los Angeles in 1973 when his rock band attracted label interest. The band eventually broke up but Frager turned their small 8-track studio, Spectrum, into a wildly successful 24-track operation, one of the earliest to delve into digital audio via Sony's first *PCM-1610* system. Dolly Parton, Bob Dylan and Little Richard were among Spectrum's clients before Frager moved the studio to Hollywood and renamed it. Until 1986 it was known as Hollywood Central, where Frager recorded clients such as Prince, New Edition and George Clinton.

Intrigued by the Bay Area—particularly The Plant, Frager had also submitted a bid to the government—he sold his studio and moved to the Bay Area in 1986. He continued to freelance as an engineer and producer. Between '86 and '88 he engineered two Prince albums and Robert Palmer's album *Heavy Nova*, among others. His last freelance gig since joining forces with Skye in late '88 was engineering cuts from the new album by Paul McCartney.

When Frager joined forces with Skye last September, they decided that they wanted to help return the Bay Area to its former status as a major recording centre for label artists and at the same time, serve the area's tremendous audio-for-video/film industry.

So they equipped all three studios for video sweetening and multiformat synchronisation, purchased Apple *Macintosh* computers and new MIDI synths and samplers. They moved into fully automated mixing with the installation of the Bay Area's largest Solid State Logic console, a *4064G*, in Studio A. They bought new Otari *MTR-90* 24-track machines. And what was once The Pit, or Studio C, they transformed into a unique digital audio production and post suite called 'Studi 01'.

The heart of Studi 01 is the *Synclavier* and 8-channel *Direct-to-Disk* systems by New England Digital. Also vital are a Kurzweil *250*, Yamaha *DX7IIs*, Roland *D-50s* and other such cutting-edge synths and samplers. The entire complement is controlled from a *Macintosh II* computer. It all works in conjunction with a 24-track DDA *AMR-24* console, a 32-track Mitsubishi *X-850* digital recorder and a video projection system.

The whole idea was to create a completely self-contained room where engineer and producer could sit down and create high-fidelity music and audio tracks for records, TV and film. They mix in stereo and final output can be in any format.

All this was possible thanks to a new Plant joint venture agreement: Frager brought in composer, computer programmer and *Synclavier* artist Greg Shaw from San Francisco. Shaw began experimenting with computers at Massachusetts Institute of Technology while barely a teenager. Later he was a programmer for the Xerox Corporation, and in 1979, he co-founded 3Com Corporation, a computer network company. After the company reached more than $50 million in sales, Shaw sold his part and bought a super *Synclavier*. Working out of his small San Francisco studio, he consulted on music system design for New England Digital and Apple Computer, and composed and produced music and sound effects for Emmy Award-winning films, ABC Sports, Audi and the United Nations, before bringing his *Synclavier* to The Plant.

Among the first clients to enjoy The Plant's Studi 01 were Starship, working on their new album with Frager co-producing and engineering.

Frager and Skye also built a new media production room specifically for one client. Frager says, "We wanted to make a major move into advertising," and they did. Now Mark & Jeff's Jingle Company, the supplier of original music to such clients as Levi Strauss, Toyota and the California Raisins campaign, occupy that media production room.

What has kept The Plant vibrant through recession and changing management is what makes it healthy today and will continue to nourish it: a creative environment and relaxed atmosphere; plush surroundings; a winning combination of classic and current technology in four great-looking studios and a mobile facility; and an experienced, personable staff with renowned engineers.

But it's something more than that.

Arne Frager reaches out and touches a redwood panel, saying, "I think there's magic in these walls. Besides having all the new technology and the right tools, there's just something very special about the way the place feels."□

The Plant Recording Studios, 2200 Bridgeway, Sausalito, CA 94965, USA. Tel: (415) 332 6100. Fax: (415) 332 5738.

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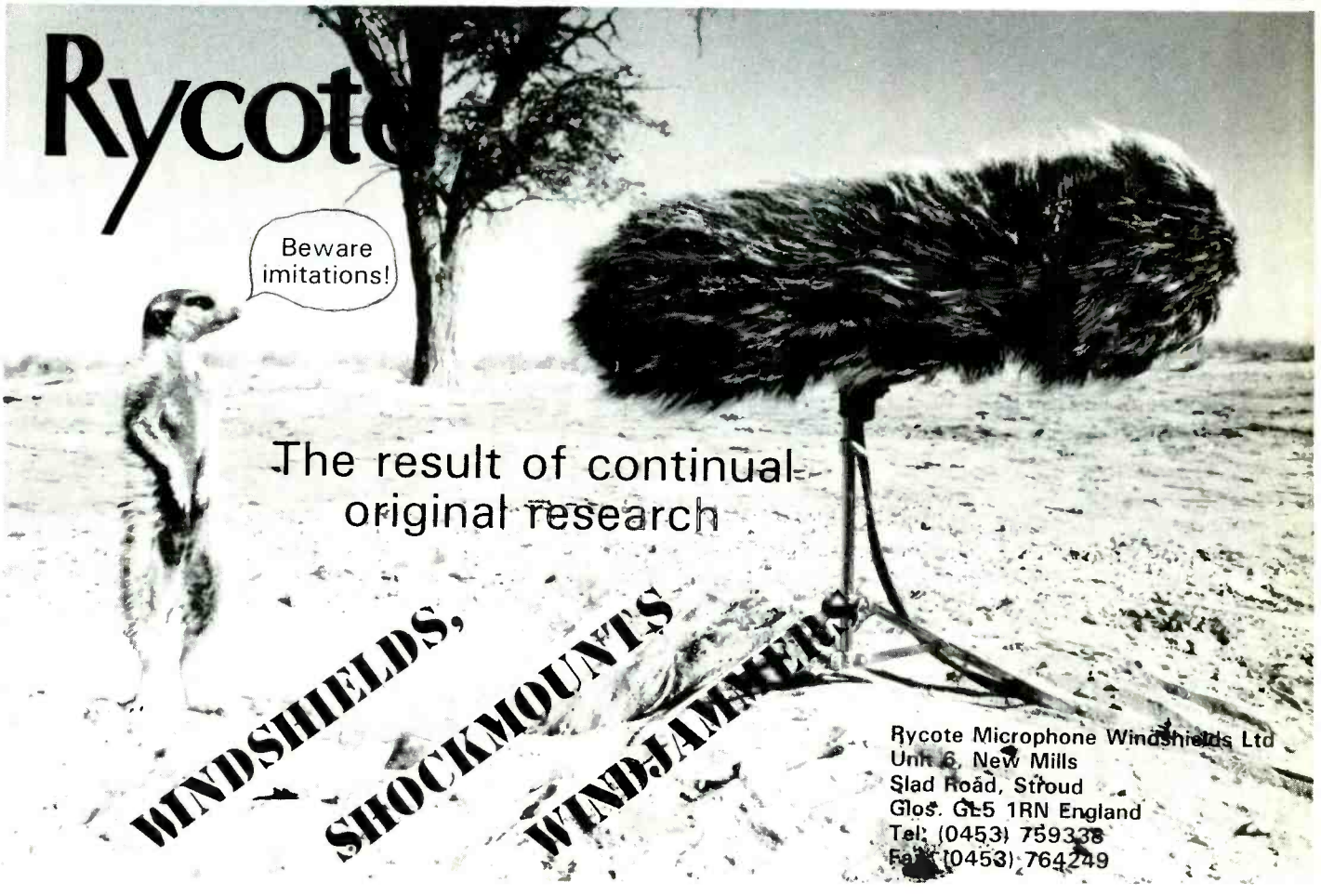

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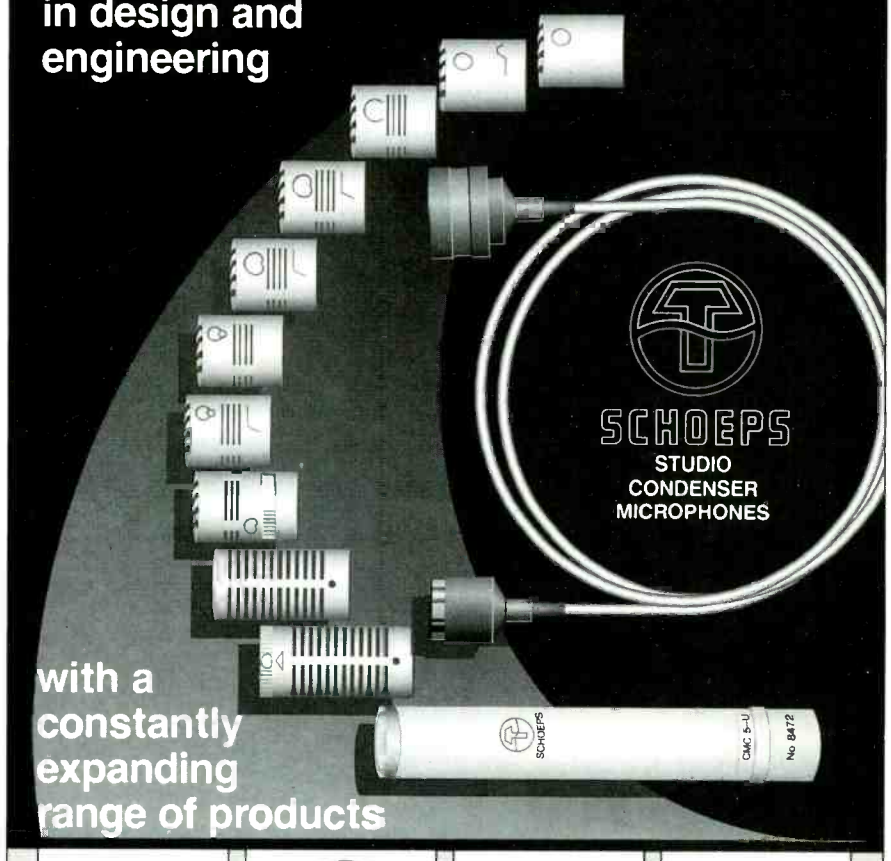

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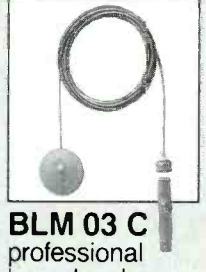

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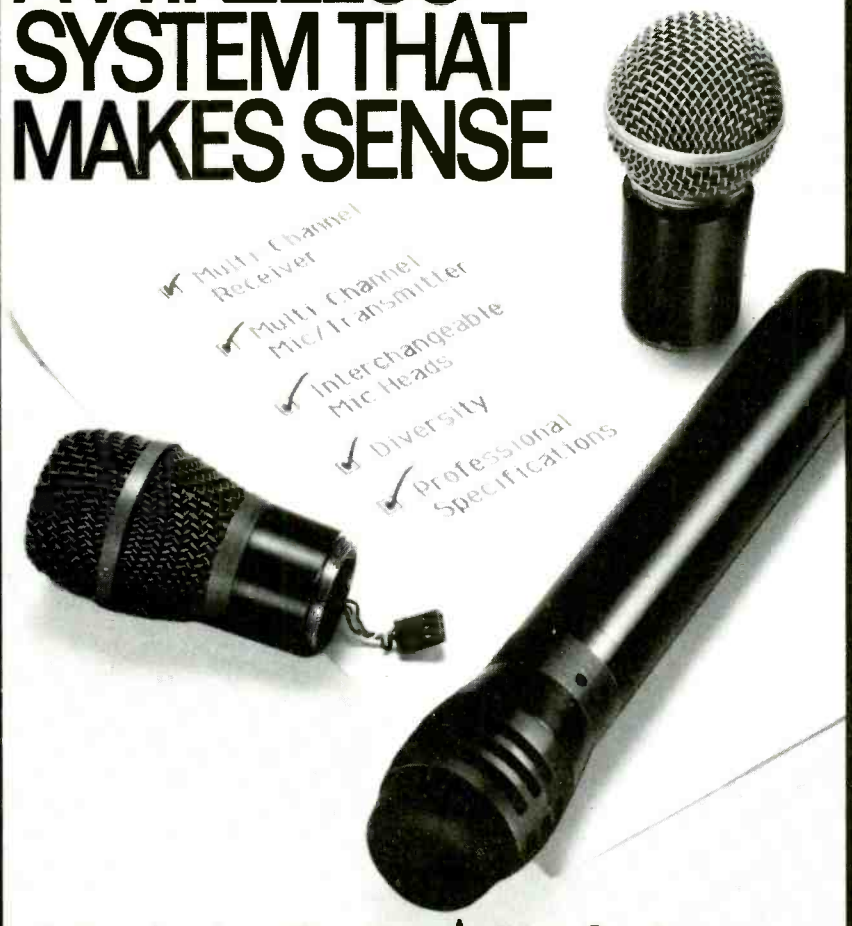

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FOCUSRITE'S FORTE

The original Focusrite company delivered two consoles prior to financial troubles. Refinanced and under new ownership, console production will restart in 1990. Patrick Stapley looks at the first Forte console installed—at Master Rock, London

When Steve Flood decided to build a second studio at Master Rock some three years ago, he was in a quandary—the existing room was equipped with an SSL, and apart from not wishing to repeat himself, he wanted a console that would provide extra facilities as well as a different sound. Such a desk just didn't seem to exist and none of the major manufacturers were prepared to customise to the extent he required; so Flood was left with the nagging feeling that he may after all have to buy a console that would only partly satisfy his requirements. It was about this time that he came into chance contact with Rupert Neve.

Flood: "It was really strange, there was a small ad in the back of *Studio Sound* for a company making equalisers (Foundation First), I rang to get some details and found myself talking to Rupert. Shortly after our conversation he appeared at the studio and I remember some Americans who were there at the time, were amazed to discover that this unassuming man was the great Rupert Neve."

The two seemed to click immediately, both suffering from what Flood calls, 'Chronic Mixeritis'. It took a great deal to convince Neve that he should return to console design, but with Steve's persistent badgering and a strong American interest, he was eventually persuaded, and to cut a long story short, Steve Flood had on order the console he had originally envisaged.

As you will know, the fortunes of Focusrite were to be marred by the company's liquidation earlier this year but two consoles were completed, albeit in a rather unorthodox manner. The first installation was at Master Rock, the other was at Electric Lady Studios in New York; both studios had to inject considerable amounts of extra money to get their desks finished off, and at Master Rock key members of the Focusrite team moved into the studio to complete the job.

The Master Rock desk is a 'monster' measuring 16.5 ft long by 5.75 ft wide, and weighs 1.5 tons. It consists of six equal-sized bays that are joined together at slight angles to form a gentle curve. The console is in-line and at present offers 48 inputs, although the intention is to upgrade it to 64 in the near future. Seeing it for the first time it appears a strange mixture of sturdy old-fashioned construction and innovative modern design.

I/O module

Owing to the fact that Focusrite had already developed EQ, dynamics and mic amps, for their highly acclaimed ISA series of rack modules, a large proportion of the I/O module was essentially already designed—those of you familiar with these modules will have an insight into some of the facilities as well as the kind of quality on offer.

The longer your arms the easier you'll find the console to operate: the stretch from channel fader to the top of the I/O module is vast, and until one knows the functions of the furthest controls, it's sometimes hard to read their legends. This is definitely not a desk for back sufferers! The module is also wide (5 mm wider than an SSL) and consequently there is room for large, well spaced controls. The overall quality of the controls is good and they have a well engineered solid feel about them; the only slight reservation I had was that certain pots, like the filters, were too stiff.

All pushbuttons are 'soft' and have quite a slow activation time, with the exception of modified fader cuts, aux cuts and the Ready Tape/Group Record buttons. Buttons throughout the desk have integrated LEDs—the only place lamps are used is for meter illumination.

Running from the top of the module down, there are separate notched mic (0 to −60 dB) and line (+18 to −18 dB) gain controls sharing a ±10 dB trim control. Also at the top of the module are phantom power, mic/line, phase and subgroup buttons—the subgroup facility works in the same way as an SSL, ie the channel derives its input from the group sharing the same number.

Dynamics is split into two independent sections for compression/limiting and expansion/gating. Each section contains a proprietary designed VCA, which was specially developed because it was felt there was nothing in the marketplace that provided the required standards and lack of colouration. Although there are two VCAs, just one will operate when both sections are in the same part of the signal path—thus eliminating extra noise. The compressor is peak rather than RMS sensing and offers THRESHOLD (+10 to −30 dB), RATIO (1:1 to∞), RELEASE (0.1 to 4 s and AUTO) and 20 dB of GAIN MAKEUP. The switchable expander/gate has an 80 dB RANGE, THRESHOLD (−40 to +10 dB), RELEASE (0.1 to 5 s) and HOLD (20 ms to 4 s). There is a KEY button that switches a dynamic sidechain insert from the patch, and frequency conscious gating is possible either from the desk EQ or by patching in external EQ; similarly the compressor has been designed to provide frequency dependent operation. Both gate and compressor have a fast attack button, a SELECT button that determines whether they are in the channel or monitor path, and in the case of the channel whether they are pre or post EQ. They also have separate LINK buttons that couple together adjacent sidechain for stereo applications,

Forte installed at Master Rock, London

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◁ so that whichever is the more dominant takes control. This is rather different to the type of linking where control settings are duplicated from one channel to another. Gain reduction metering on each dynamic section is via 6-segment bargraphs. The dynamics seem to have been well received by users and the Master Rock engineers are tending to use them to the exclusion of other outboard devices. The speed of the gate is especially impressive and I found it worked successfully on a variety of programme material including vocals.

The 4-band equaliser consists of a HF and LF switched frequency shelving section, HMF and LMF parametric peaking sections with adjustable Q, and a low- and highpass steep cutting filter section—all four sections have independent bypass switches, as well as being controlled by the normal EQ in/out button. The EQ has a range of 33 Hz to 18 kHz, with ±15 dB of control, and it sounds excellent—inevitably bringing to mind over-used clichés like 'musical' and 'transparent'. The three sections of EQ as a whole, and the filters, are independently assignable to the channel, monitor, compressor or expander paths but there is a facility (not taken up by Master Rock) to individually assign all four sections (HF/LF, HMF, LMF and filters). To clarify the situation, a separate EQ assignment display is incorporated directly below the channel meters.

The console can access 16 dedicated auxiliary buses from each module. The auxiliary section comprises two stereo pairs (Cue 1 and 2) and four mono sends, each of which can be assigned to three auxiliary buses (12 in total), so mono send 1 will access Aux 1, 5 and 9; mono send 2 will access Aux 2, 6 and 10—and so on. Each stereo and mono send has a CUT button and a SELECT button, which overrides the default condition and sequences through the four possible sources, with the aid of a bi-colour display, ie channel or monitor, pre or post. Selection of the 12 aux buses is controlled by just two buttons at the bottom of the section: one steps through the buses, while the other switches them in or out, this is also displayed using bi-colour LEDs. The arrangement of the cues and auxiliaries has been designed to offer the user maximum flexibility with the least number of controls but a degree of planning is required when using large numbers of sends.

What is immediately evident when one sits down at the desk is the absence of a conventional routing matrix. In fact, the familiar 32 group buttons have been replaced by three easy-reach selector buttons and a display. The display is situated directly above the module and consists of an LED matrix with the 32 groups arranged into odd and even columns. These LEDs are stepped through in pairs, using the GROUP SELECT button and set by pressing the ODD and EVEN buttons. To route out to the monitor bus a pair of separate LEFT and RIGHT buttons are provided just below the group select buttons. The matrix panpot will only become connected if an odd and even group selection has been made, which is a nice touch of logic except that it doesn't apply to the monitor bus selectors and consequently an odd and even group assignment must be made to allow the channel to pan to the monitor bus. A further facility Master Rock did not require was an extra three monitor groups in the style of the *SSL 6000*.

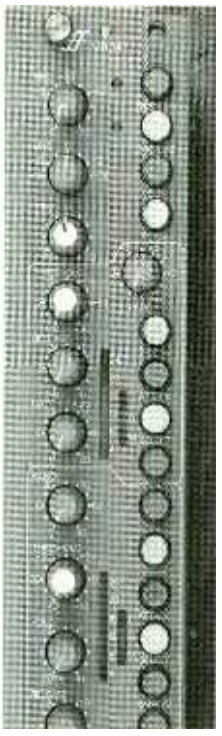
The desk offers a comprehensive solo system on both channel and monitor paths. There are four types of SOLO available through central switching: Solo In Place (all channels cut except those selected or those which have Isolate buttons selected); AFL (stereo); PFL (centre mono); and Solo Up Front (the AFL signal is mixed with a predetermined amount of the stereo monitor mix to aid cueing, etc). AFL and PFL have separate master level controls. In addition to these states there are three modes of operation, also set globally: LATCHING, which is the default condition; MOMENTARY; and INTERLOCK where the current selection cancels the previous. It is possible to link the channel and monitor solo buses so they function as one, and all solo selections made on the modules can be cleared by a master SOLO CLEAR button. Incidentally there are also master clear facilities for group routing, EQ/dynamics buttons and cues/auxs (returns them to default condition), all master clear buttons are double action switches operating over a time limit to guard against accidents.

The small fader is a P&G *3000* series and has a longer stroke than most at 83 mm. In normal record state the small fader will be used as the channel fader feeding the groups. In mixing the small fader will again normally route to the matrix and can switch its source from the default to the following: IP, channel pre-fade pre-EQ; PF, channel pre-fade post-EQ; or AF, channel after-fade. Small and large faders can be flipped with the SWAP button, and this can also be achieved across the whole console from a centrally placed master. A DIRECT button inhibits any other bus selection to that group, and there is a GROUP TRIM offering 20 dB of attenuation.

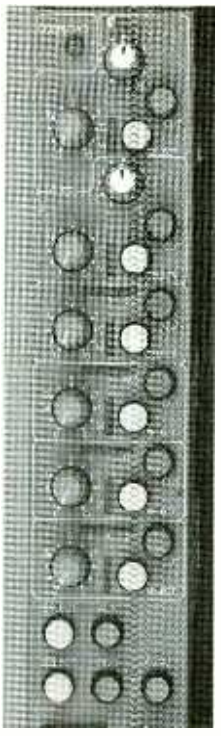
The TAPE TRACK status buttons bear a striking resemblance to the SSL system, consisting of three buttons labelled GROUP, TAPE and RECORD. The two systems work in the same way, including level compensation when tape and group signals are combined. At Master Rock, two Studer *A800*s have been interfaced so that the channel RECORD button readies the track flashing as it does so.

A 'floating' insert is provided, which is switchable into the channel or monitor paths and can be positioned in one of three points: IP, PF or AF. For bouncing or subgrouping purposes, the MATRIX ONLY button is used and this will cause whichever fader is feeding the monitor bus to re-route to the group bus; it also causes the signal on the other fader to be cut.

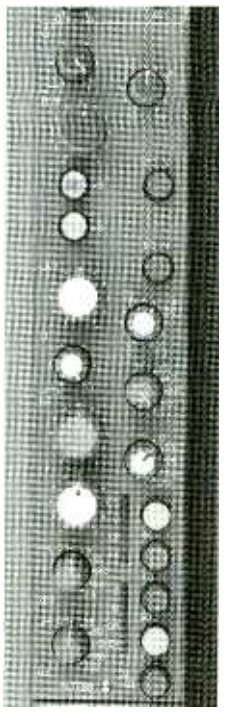
The large fader is Massenburg as the Master Rock desk has been fitted with GML automation.



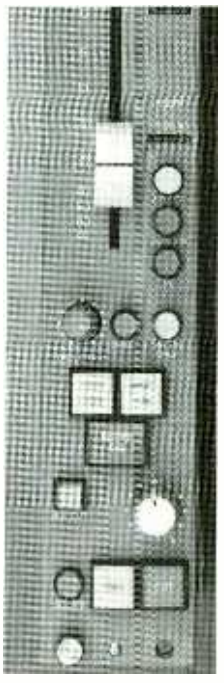
Mic amps/dynamics



Cues/aux



EQ/filters



Monitor/master channel functions

Central controls

The console has been designed very much with 'split' working in mind, that is to say using the left block of large faders for track monitoring and the remaining right hand large faders for mic/line inputs. There are three selectable points at which the desk will split—channel 24, 32 or 48—so if overdubbing on a 24-track tape, the first 24 channels will provide monitoring on the large faders with the EQ, cues and auxs automatically switched into the channel path, in addition the two stereo cues will be switched prefade to accommodate foldback. The remaining large faders will be switched to receive a mic input and will feed the group matrix, again EQ cues and auxs are all switched into the appropriate signal path and foldback is sent pre. The split facility allows the console to be configured for 'large fader overdubs' in literally moments.

SPLIT STATUS is one of the five master states available, the others are:

RECORD (multitrack switches to sync)
Mic—Chan—Small Fader—Matrix Pan—Groups
Group/Tape—Mon—Large Fader—Stereo Pan—Stereo Bus
EQ—Chan:Cues—Mon Pre:Auxs—Mon Post

MIX (multitrack switches to repro)
Line—Chan—Large Fader—Stereo Pan—Stereo Bus
Group/Tape—Mon—Small Fader—Matrix Pan—Groups
EQ—Chan:Cues—Chan Post:Auxs—Chan Post

RECORD & MIX (multitrack switches to sync)
Group/Tape—Chan—Large Fader—Stereo Pan—Stereo Bus
Line—Mon—Small Fader—Matrix Pan—Groups
EQ—Chan:Cues—Chan Pre:Auxs—Chan Post

SIMUL (multitrack switches to sync)
Mic—Chan—Large—Fader—Stereo Pan—Stereo Bus
Mix—Mon—Small Fader—Matrix Pan—Groups
EQ—Chan:Cues—Chan Post:Auxs—Chan Post

Record & Mix has been designed to reconfigure ▷

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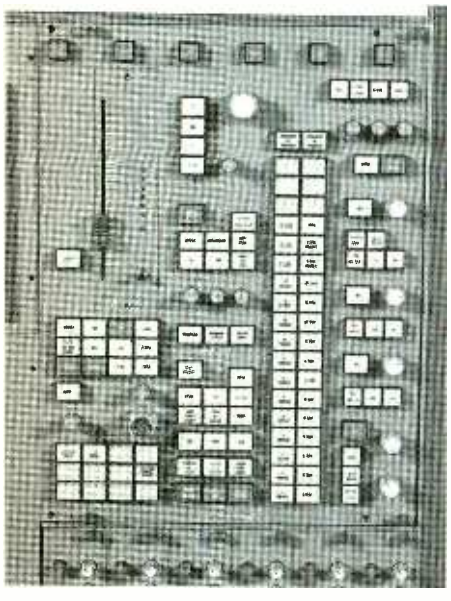
◁ the desk ready for an overdub during a mix and will only switch from mix status once a group tape selection has been made. Simul provides a status whereby a stereo and multitrack recording can be catered for at the same time.

There is a status override facility called PLAY, which enables a quick method of checking off-tape, by switching the machine to repro (can be sync if required) and overriding group/tape selection to tape only. Similarly there is a MASTER GROUP button that switches the monitoring to group. Other master switching includes FADER SWAP; FADER SWAP INHIBIT (only affects faders in the left side of the desk); mic/line INPUT FLIP; and SPLIT SOLO ISOLATE, where all channels above the split point (ie inputs) are put into solo isolate. Status can be protected with STATUS LOCK, which will also inhibit solo-in-place, all feeds to the SLATE and SLS circuits as well as lock group routing.

The control room monitor selector is reminiscent of the Neve *V* series, with two columns of buttons marked 'Internal' and 'External'. Between them they provide monitoring access for the stereo bus, cues, auxs, stereo machines, external devices, etc (36 choices). Associated with these are three sections that source and output the signal to the SLS, the ELS (which are speakers in the machine



Master switching functions

room at Master Rock) and to the cues. The signal going to the cues can either be mixed in with what is being sent from the modules or replace it. One problem is that if the cues are being fed from the stereo bus, ie selected from internal, they can't be monitored, as the very process of checking the cue send disconnects the stereo bus. All sends to the cues can be cut from this section and this occurs automatically when the oscillator is routed to multitrack groups. The oscillator has seven frequencies, including a crystal controlled *A 440*, and offers pink noise.

Apart from the main control room loudspeakers there are three alternative circuits all with separate level controls. Speakers can be phase reversed, mono'ed, cut left and right, muted and dimmed by a preset amount.

There is a comprehensive communications section that includes listen mic and auto cue facilities. Above this is a matrix of 12 buttons provided for future user requirements. The main stereo fader is a motorised P&G and associated with it is an insert bypass button.

The main stereo output of the desk is metered by separate vu's and PPMs; in addition there is a phase meter and a summing mono meter. The meters are switchable between main output, follow monitor and external. The channel meters are vu and follow monitor selection except in mix where they default to read the channel input. In states other than mix there is a facility to switch all channels to the input stage. Associated with each channel meter are four LEDs denoting group, tape, record and input. A further 16 vu's, situated below the stereo meters, provide metering for the cue and aux sends. All metering on the Master Rock desk is mechanical.

The two cue masters have stereo level control, a centre detented balance control, basic top and bottom EQ, and a cut. The 12 auxs have the same facilities but in mono. At present there are six stereo echo return modules providing level on a fader, balance, width, cut, AFL and send to cues. These are in the process of being replaced by more comprehensive modules, which return the signal on faders rather than pots, and in addition provide EQ and group matrix assignment.

As would be expected the Mosses & Mitchell patchfield is large and detailed. There are some nice features like the ability to access the summed mono output to allow simultaneous mono mixing and there is a patch that has been specially designed for inserting a tuner so that it receives the AFL signal from soloed channels.

At the time of writing a *Penta* synchroniser was being fitted to the centre of the console, which will provide control for up to five machines and autolocator facilities; this will be integrated at a later date with the GML automation.

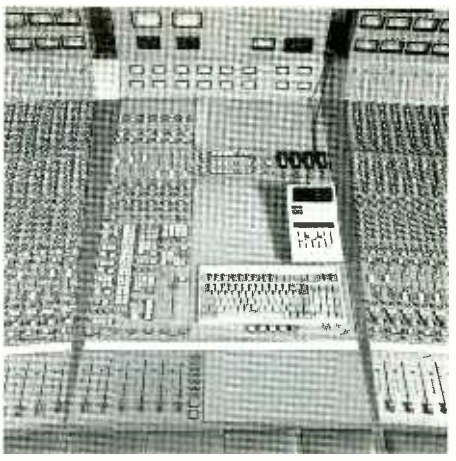
The team at Master Rock have got to know the *Forte* console inside out, and with access to the original design team and a good relationship with the new Focusrite management, there are no problems with technical back up. The inevitable teething problems have been sorted out and there have been some general improvements; indeed some of the points raised in this article will have been addressed by the time it appears in print.

The sound

It's difficult to get a totally objective impression of the sound of a console in just a few hours but one does get an instinctive feeling of excellence with the Focusrite. With an overall noise floor measured at better than 94 dB, and in the channel at 100 dB, it is no wonder that some engineers have found it hard to believe that they've plugged in a mic. Another effect of this incredibly quiet desk is that it does little to mask noise coming from external gear, and consequently Master Rock have had people comment that the outboard in the Focusrite room sounds noisier than in the SSL room—of course there is no difference. Some other impressive figures are harmonic distortion 0.00% headroom +26 dB (ref 0 dB) and the incredible frequency response, which when measured in the channel was flat from 16 Hz to 150 kHz and when measured in other parts of the desk it goes a lot higher.

The future

In April, Soundcraft's ex-chairman Phil Dudderidge acquired the assets of Focusrite and, along with technical director John Strudwick, set up a short term UK industrial base at Bourne End. The new company, Focusrite Audio Engineering, is in the process of building up a team, which they hope will include a number of previous Focusrite employees; Rupert Neve, currently involved with Amek, will continue to act as a consultant.



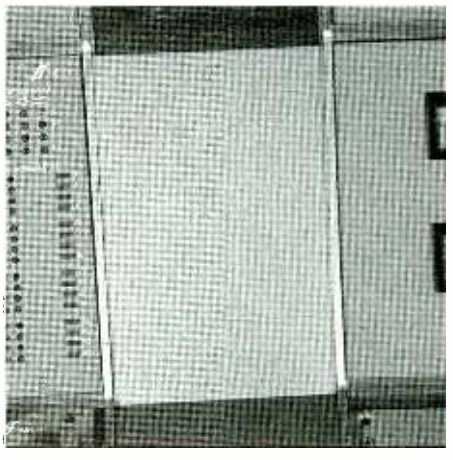
Master section

The objective is to continue manufacturing and evolving the desk retaining the functionality, layout and, indeed, the essential ideology behind it. The three extra monitor buses, which were left off the Master Rock desk, will become a standard feature, and remote switching will be looked at in the future along with the possibility of incorporating a recall system.

They hope to complete two desks this year and the company are forecasting manufacture of a further 10 in 1990. Production of the ISA modules continues and they are immediately available.

Conclusion

It's plain to see that the console has been strongly influenced by SSL but I wouldn't say it was copying, as much as incorporating tried and tested ideas that over the years have become acceptable to a great many people, and in many instances these ideas have been further enhanced. On the other hand the desk contains a number of exciting original features as well as the Rupert Neve hallmark of over-engineering to achieve sonic excellence. A great deal of thought has been given to making the desk easy to use as well as flexible, and consequently it's quick to learn. This is an impressive console that offers plenty of facilities combined with exceptional quality and it deserves to be seen and heard much more of in the future.□



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RINGSEND ROAD
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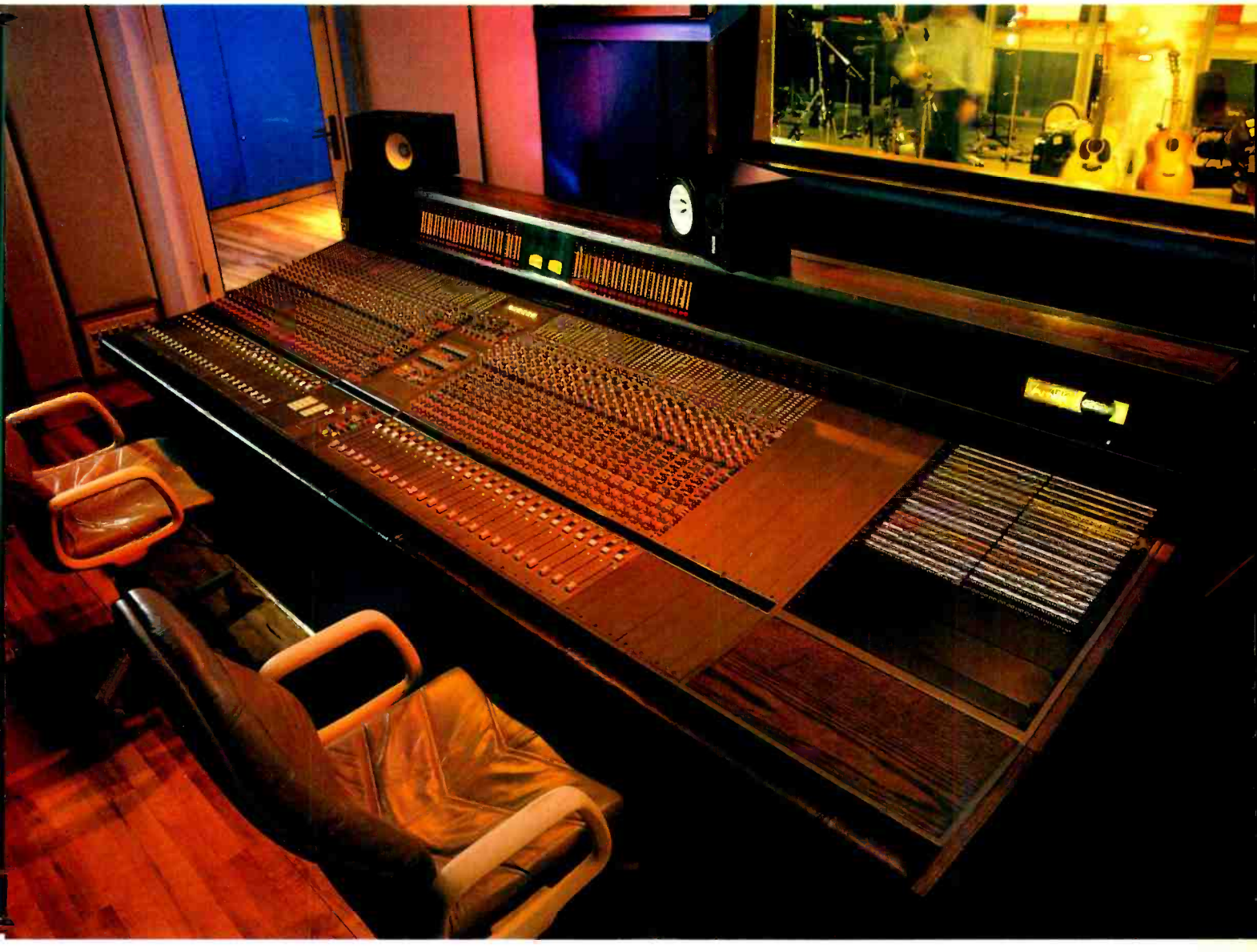

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Andrew Boland, Director, Ringsend Road Studios, Dublin.

AMEK G2520 is available in 40, 56 and 68 input frame sizes and has a Dynamics option on each input. Both VCA-based and GML Moving Fader Automation systems are available. The console has a Master Status control system and the input channel features the AMEK 4-band parametric equalizer.

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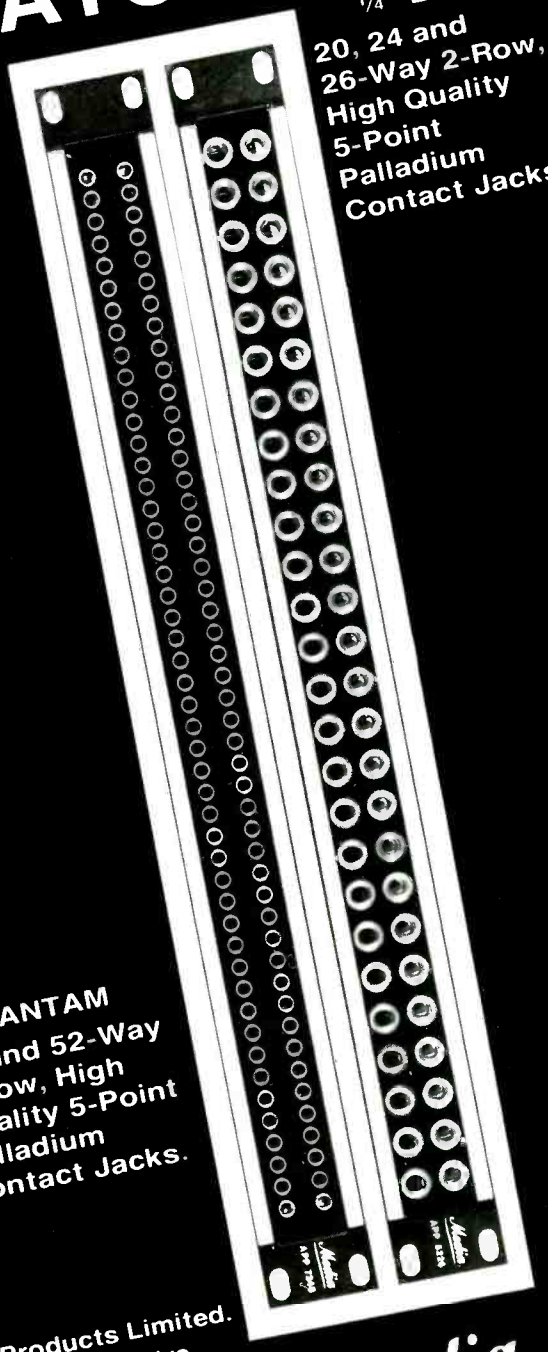

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Martin Polon

Europa, Europa, are we smarta or are we a dopa? Comment from our US columnist

Christopher Wren knew his business was successful. He was selling more portable broadcast audio mixers to radio stations in England and Europe than any other small equipment maker on the continent or in the British Isles. He had taken the time to listen to his clientele and build in those features that make a product desirable. He had spent three months in the US studying the world's largest and most successful broadcast radio marketplace. He had learned his lessons there too, since the products were beginning to take off in the American market as well. In fact his American business had reached the point where he was about equal on both sides of the Atlantic.

Paul Revere felt very good. His products—tube-powered limiters, equalisers, preamplifiers—had captured a comfortable niche in studio products in the US and in England. He had carefully upgraded classic designs, with the use of the more reliable and higher quality resistors, capacitors and transformers available today. The result was state-of-the-art digital quality with the pleasing harmony of vacuum tube sound, and hand-wired at that. The factory was a loft space in Cambridge (Massachusetts) and each unit was tested sonically as well as electrically. He was selling all he could make with so many orders that dealers around the world were on allocation.

Revere had felt it first. He was made to understand via an official document from Her Britannic Majesty's Government, submitted to his customs broker in England and thence to him. It informed him that in future, product origin had to be within the boundaries of 'Europa 92' or else the newly heightened tariff rate of 33% would be applied to the importation of his products. He knew he couldn't sell his products at that rate; at least to anything other than a boutique market. He hired a European 'Customs Advisor' who eventually produced a lengthy report concluding that he had to find a company that he could buy, or that would buy him, from within 'Europa'. That prospect was not appealing to him, whose company's small size had seemed an advantage.

Wren had truly believed all of the hoopla. That he would never feel negative about 1992. It would just happen, boosting his business. His shock had started with contravening tariffs from the US. As 'Europa 92' took off, so had the sort of international 'tit-for-tat' that had so decimated world trade 60 years ago. The people from the US Commerce Department at the Embassy were sorry. They had not started the 'tariff war'. Europa had. But what happened next really appalled him. His European competitors started to 'clean his proverbial clock'. There were now no controls to prevent anyone from inside 'Europa' from selling directly into England. Being well financed (something Wren was not), the presence of new British distribution and service facilities had placed his competitors on an even keel with Wren in England. And he could not afford to copy their style on the continent. Worse still, he had to meet certain mandated regulations from the European parliament raising the pay of all his workers and requiring several new benefits. He would have to hire someone just to do all the paperwork to keep the 'Eurocrats' happy!

Much of the good fortune felt by these successful audio entrepreneurs apparently came to a crashing halt. The new regulatory climate of 'Europa 1992' had seen to that. But is this outcome the only possibility or is there a more benign future available as well? That question began as a direct challenge to business in North America and the Orient last year. It is still being asked in those quarters but now the questions are coming fast and furious from within 'Europa 92' as well as without. It has begun to appear as an uncomfortable reality that the combination of regulation and new market dynamics of '92 will hold as much promise (or threat) of change for those inside as for those on the outside.

To focus specifically on the expected impact on audio manufacturing and the provision of audio services, the question of a tariff wall assumes top priority. An English business advisor thought, "The first question asked and the most important question to the majority of my American clients is the 'Fortress Europa' thing. Specific to the area of electronic entertainment, we have already seen the European Commission (EC) establish a 50% limit on non-European TV broadcast programming as part of the EC transborder broadcasting initiative now under consideration for action. If we look at the current GATT meetings on tariff reductions for a broader perspective, we find that the rest of the world was willing to let the EC set a date to end agricultural trade restrictions—no matter how far in the future. The Europeans were not and are not willing. So we have two examples already in hand. The freezing out of programming above the 50% limit and the lack of interest in opening up Europe to agricultural imports. Add that to the effect of bonding the member countries together and it seems likely that the US audio firm competing for export sales to Britain from a US perspective will find it's selling at a disadvantage just in terms of shipping, paperwork and pricing penalties once the Community closes its gates."

The unfortunate reality of a 'common market' is that it isn't at all common and it certainly is not a free market. None of the 12 member EC countries will be exactly equal in terms of internal and external EC trade. Some will be stronger than others internally and some stronger external to the EC. The USA is after all a similar economic and political union with 213 years of existence on the record. Yet there are still terribly weak 'sister' states that cannot manage but to barely hold their own economically in the South and in the West. Another way to look at the Community is through the following example, according to UK and US business school experts.

To illustrate the conundrum the 'new order' will create, let's look at the Irish audio trade. Although the US professional audio trade with Ireland is not exactly proliferous, pro-audio products made in Ireland (which are few and far between) will not have to compete internally with outside audio products. If the tariff wall is retaliated by the US, Irish audio products will not be exportable there. Ireland does not need to be protected from imports where it has no internal industry to protect. Nonetheless, Irish businesses will be protected from both competition and from competing whether they like it or not. If this change complicates the current unfortunate weakness of the Irish economy, eventually the EC will have to compensate Ireland out of Brussels and that compensation charged against increased sales by EC companies at the expense of non-EC companies. Functional economics would therefore strongly suggest that barriers will exist by the simple definition of creating a common marketplace. For it to be common inside, it has to be protected from the outside.

In Greater Europe, Britain, Germany and Austria are probably the strongest external exporters of professional audio equipment. How will that trade stabilise after 1992? Then there is the question of the impact of the EC on the inside trade within any specific country. Britain for example, consumes a large percentage of its pro-audio products inside its borders—perhaps as much as 50% overall. Of the remainder, let us hypothesise that 15% goes to internal EC use and the remaining 35% to the external market, with the US taking a substantial amount of that category. After 1992, internal competition from Germany and Austria could reduce sales by British companies inside the country while contravening tariffs in the US could damage exports outside. Well established economic theory like the basic laws of physics, leaves little doubt as to action-reaction and the immutability of matter. Or to put it another way, you cannot 'rob Peter to pay Paul'. Or as many economists suggest as the eventual outcome of 'Europa 92', 'the survival of the fittest'.

The service sector will be equally impacted as the European confederation plan moves forward. Aside from the more obvious concerns of pricing for recording studios, post-production facilities and mastering houses, there are other concerns not the least of which might be the weather. A band with a one month commitment to produce an album might choose 'sun and fun' over 'gloom and doom', all other technical considerations being the same. Other more pecuniary issues will apply as well. For example, the leasing of property for business purposes in England leaves the lessee and not the lessor obligated for the local council rates or city/county property taxes. A studio facility in England will have to 'build' the paying of rates into its overall charge structure. In some other country within the EC, rates might not be handled the same way, leaving a price differential that works against English studios. Despite a ▷

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strong effort to rationalise codified differences between the member countries, there will remain such inconsistencies so the experts tell us. Only if a final amalgamation of all 12 countries takes place, will there be uniform codes of business regulation. To look at the USA again, even after more than 200 years each of the 50 states has business rules unique to that state in one category or another. So it may be a bit optimistic to assume that 'Eurocratic' behaviour will vanquish the diversity effected by human nature.

Let's consider some management directions for all of those audio companies that have to cope with the changing directions of doing business in the 'New Europe'.

Reduce excess capacity
It is important to consider the use of JIT systems in manufacturing and to size rental stock to rental demand, as two examples of controlling capacity. The Just In Time scheme uses reliable suppliers and transport to deliver parts to the plant just prior to the assembly process. The value is a significant reduction in funds tied up in assembly inventory. The same can be said of rental stock or studio facilities—better to have the newest and the best than a large stock of last year's hot buttons.

Focus on scale
Make sure your business is appropriately focused on the market you believe is being served. Break tradition and use some market research to verify that you are reaching who you think you reach. Then, scale your operation to the demand level of your known customer base.

Understand your business goal
Be sure you know what it is your business is doing today and what it should be doing in five or even 10 years time. Manufacturers should know the cost of manufacturing and the expected profit for every unit in their line. Service providers should have established profit factors for the rental of equipment or studio facilities. It is an unfortunate truism of the audio field that many providers still 'fly by the seat of their pants' or operate 'mom and pop' establishments. On some levels that was attractive—part of the charm of a business that paid more attention to 'improving the breed' than going to the bank. It may still be possible to do both, but only if that is part of the goals that are established.

Learn from the downside as well as the upside
When you attend a trade show and you happen to hear that 'XYZ' manufacturing has bitten the dust with their 10,000 W audio amplifier, consider it as more than a humorous anecdote. Find out what happened when a competitor or a friend has something turn sour. Study the business you are in and be an expert on trends and directions.

Divest operations that deflect from stated goals
To compete in the audio marketplace of the '90s, there is much to think about the conventional business school wisdom of '89 that says divest all but your core business and do that ever so very well. The trend towards horizontal conglomerates spread all over the map in military aviation, government electronics, meatpacking, steel fabrication, food products, cosmetics, and audio has not been terribly successful except for a few exceptions. Know your operations—make sure they all 'fit'—be sure your units are not competing with themselves rather than the outside competition.

Identify global competition
It has become a world marketplace in audio overnight as far as the member countries of the European Community are concerned. Therefore it is the task of every EC company in the audio business to study the new competitors from within the EC borders and their new business partners from the US, Canada, Korea and Japan.

Make sure market intentions are long term
If one lesson has finally been learned on the global business scene, it is that short term operating rationales are not capable of guaranteeing a viable return on investment. Despite the strongly held feeling in the stock markets of the US and the UK that only performance from one quarter to the next is pertinent, the reality is that those companies that value their staff as well as their customers, invest in new product development and old product improvement via research and development, and provide service in all ways to the client, will prosper in the 1990s. The buyer of audio equipment and services is not in business for just 90 days at a time.

Don't ignore indigenous product peculiarities
It may be that the audio industry of a particular country or region has standardised on PPM meters instead of vu meters, or 100 V 'metric' speaker line transformers or Preh connectors instead of Cannon for microphone connection. It is far better to modify product to meet these needs than to try to force the locals to conform to your 'homogenisation' of accepted practices. Identify and respect local technical mores or else risk the loss of sales.

Consolidate administrative overhead for '92
Under the new rules there is no reason to have multiple manufacturing distribution or transportation facilities within the borders of the Community. By consolidating numerous units, the business activities can be run from a centralised facility. With no more quotas, carnets and inspections, fast truck transport can reach most member countries overnight. Location should be a function of transportation logistics as much as local market demand.

Do not assume untoward risk
If, as most experts predict, the coming of 'Europhoria' brings an unprecedented wave of competition to the world business scene, the professional audio manufacturer or service provider must be ready to control exposure to risk. At first glance, that sounds like not engaging in new activities or spending for expansion. In some cases that will be true. Certainly, very careful econometric screening must be done for any new venture. But, in the face of unparalleled competition from both within and without, not moving forwards is a high risk decision as well. Consider that a London-based audio rental house could find itself competing with a French firm using toll-free telephone numbers for orders while shipping via the 'Chunnel' rail link daily. Competition could also come from an American firm that bought into a competitor to gain entry after '92 and whose deep pockets make that competitor twice as dangerous. A very difficult judgement call-risk assumption.

Now, if anybody had missed the point, the twin issues of competition and jobs are what the financial bottom line of the EC structure is all about. There are no mysteries in the emphasis the EC is placing on doing business within its 12 national boundaries or not at all. By placing the business of those who formerly traded as import/export partners within the Community, jobs by the thousands that were formerly in other countries are created within the confines of the EC. 'Buy, take over, partner or die' remains the hue and cry for companies outside the Community who intend to compete within. But the movement of jobs is not mandated to any one country inside the confederation. That means a level of competition will be engendered that has never before existed within and perhaps without Europe. No marketplace and no job is safe within the Community. There are no guarantees that manufacturing will stay in the chilly climes it has inhabited for years if not centuries. Spain, for example, is expected to boom as a low cost centre for electronics manufacturing with direct rail and road links to the rest of Europe. Attractive recording studios in villas in France and Italy will lure bands away from colder climates. A post-production facility on a Greek island could be very enticing for weary film makers who have spent weeks working in a cold English drizzle.

Of the major players in the audio industry, the majority have already committed to a major European presence. Certainly some American audio powers will be as competitive inside the European Community as they are in the US and they will rival long established EC equipment makers. Products in the EC audio marketplace will have to depend upon quality and pricing rather than depend to some extent upon national origin within a protected market, as in the past.

Manufacturers will have to remember that the market will focus on the best products and if the best can be produced anywhere in Europe by Europeans, Americans or the Japanese; so be it. Studios will have to upgrade facilities to keep a clientele exposed now to the recording scene in 12 countries—not just one. Conversely, the exportation of European audio products to the rest of the world will also benefit from the internal competition as quality and price competition in Europe hones development. All-in-all, the '90s promise to be a very interesting time in the audio business, in whatever part of the world you happen to be in.□

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MONITOR SYSTEMS - A BACKGROUND TO RESEARCH PART THREE

Following on his series, Philip Newell gives some background to the search for a new, high definition mid-range loudspeaker horn

Much maligned in perfectionist circles, compression horns remain to this day the only truly viable transducers for very high level, reliable monitoring systems. The true potential of compression horn design does not yet appear to have been approached. It would seem that detailed research into horns for studio monitoring purposes, has only been attempted in a very limited way. To loudspeaker manufacturers, the public address and domestic hi-fi markets are vastly more commercially important than studio monitors. The greatest number of studio monitoring horns are either of antiquated design, in some instances dating back to the 1930s or adaptations of public address components. Recording studios have been the poor relations compared with other users, suffering largely because their specific requirements have effectively neither been quantified nor qualified. In reality the requirements for monitors in recording, film, radio and television studios has now become a multimillion pound market.

Possibly from feeling left out, or maybe from speaking two different languages, a chasm has appeared between the academics and the end-users. Recording engineers and producers seem to academics to be uncertain of what they want and unable to convey accurately their requirements to manufacturers. To the studio staff, academics simply seem unable to provide the tools they need. There is a requirement to re-establish the credibility between the various ends of the industry. Recording engineers and producers are all professional 'hands on' people, doing a very difficult juggling job in an environment with an enormous number of variables. They are artists working in an artistic environment. The attitudes of science being in some way 'superior' to the art must be dismissed. The science has not yet produced what the artists need. The science does not produce the music; without the artists, the science would serve no purpose. To achieve the desired results, less polarisation and more liaison is necessary.

Horns have been designed mainly for efficiency, frequency response and directivity. Relatively little has been done to research what actually happens to the sound waves inside the horn, and the relevance of this motion to what the horn sounds like. From a vast array of available horns, some attempt must be made to correlate physical characteristics, mathematical and geometrical properties, materials and mounting methods; with particular attention to desirable or undesirable sound qualities. In order to design a horn specifically for studio monitoring, the following areas require further detailed discussion.

- Directivity: beaming, fingering, constant directivity
- Geometry: diffraction, radial, multicelluar, compound designs
- Distortion
- Colouration: reflections, eddy problems, obstruction in wave path, wave propagations
- Cross-sectional relevance: rate of flare, square to round throats (area rule?)
- Construction material: practicability, effect on sound
- Physical to acoustical relationships: diaphragm to mouth distance
- Effects of abrupt cross-sectional changes: velocity modifications

Directivity and geometry

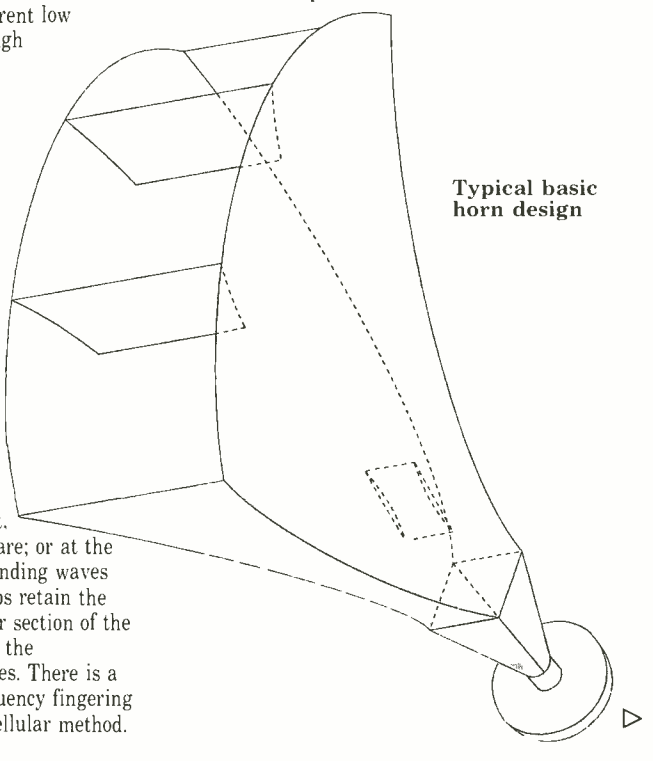
Directivity control has long been a prime consideration in horn design. The first criterion is to establish the desired horizontal and vertical directivity pattern, then to approximate as closely as possible to this ideal over the entire intended frequency range. Multicellular horns are clusters of similar horns, bunched together in the belief that each component horn can be arranged in such a direction that the overall coverage area is served by the entire cluster. The drawbacks are 'fingering' at high frequencies, when 'beaming' begins to occur as the polar pattern of each small horn narrows. A cluster of say, eight small horns, may well produce a relatively coherent low frequency directivity pattern. At high frequencies, however, eight narrow beams or 'fingers' are produced and are far more noticeable at close quarters than on longer throw, public address use.

A further problem with multicellular devices is that it is very difficult if not impossible to find an ideal way of mating a large number of individual throats to the single, circular output of the compression driver. A variation on the multicellular theme is the use of dividers to modify a basic, radial horn into smaller sections. These can be either near the throat, carefully shaped to maintain the flare; or at the mouth, presumably to break up standing waves across the mouth. This method helps retain the low frequency coupling of the larger section of the horn, while spreading more evenly, the distribution of the higher frequencies. There is a certain tendency towards high frequency fingering but somewhat less than the multicellular method. Rarely, however, are all the sectors perfectly symmetrical and equal. Once again, perfect mating to a simple circular throat can present difficulties.

Constant directivity designs have attempted to use cross-sectional geometrical changes to maintain a relatively accurate and equal directivity pattern across the entire design frequency range. A significant problem with these designs is that maintaining a constant polar pattern, independent of frequency, is achieved at the expense of a flat, on-axis amplitude response with frequency. The resultant necessity for equalisation circuits to flatten the frequency response can preclude the use of these units with certain studio monitoring design philosophies.

Distortion and colouration

It is the reduction of these two elements that present the greatest challenge. Once phase distortion in particular can be brought down within the range of high quality cone or dome drivers, the compression horn could then be



Typical basic horn design

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Genetic's Martin Rushent relaxing with the studio's new Mitsubishi X86 2-Track Digital Recorder. The X86 joins the Mitsubishi X850 32-Track Digital Recorder purchased by Genetic earlier in the year.

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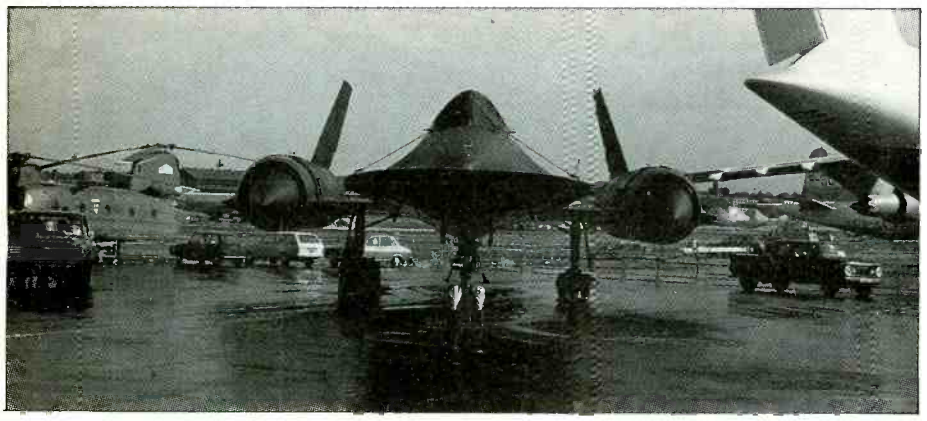

Aircraft designed for transonic speeds, comply with the aerodynamic area rule by making very gradual changes in cross-section. Thin wings gradually flatten in section at the roots, smoothly blending into a flattened fuselage cross-section.

reasonably expected to be capable of exceeding the performance of all other high output midrange loudspeakers.

The sources of colouration and distortion are manyfold. Until now, most assessment of horns seems to have revolved around amplitude measurements. In all probability, the main source of colouration is various forms of phase distortion. In the throat area, any abrupt cross-sectional changes are more akin to principles of pistol silencer design, than to the requirements for smooth, efficient sound propagation. A major stumbling block in effective horn design is that the problems to be solved, do not appear in either a consecutive or concurrent pattern. They appear in the form of a matrix, with seemingly endless cross-correlations and interactions. This degree of obscurity of the problems, has inevitably led in the past to an artistic 'try it and see' rather than scientific, orderly design approach. The scientific approach depends entirely on asking the appropriate questions in the first instance. Where these questions have not been clearly defined, the artistic approach has remained the only viable and practical alternative where the variables have been so complex and numerous. Until recently equipment had not been available to 'see' accurately what goes on within the horn. Now that more knowledge and technology is available, the true workings of the horn demand new research.

In order to achieve a horn of the highest fidelity, a single compression of the driver diaphragm must produce a single, coherent, pressure wave at the mouth of the horn. This wavefront must then be allowed to leave the mouth of the horn, and disperse into the room with as smooth a transfer as can be achieved. The uniformity of this wavefront is in many instances shattered by absurd cross-sectional changes in the throat of the horn and also at the mouth. This can be further exacerbated by any obstructions in the horn itself, sectional dividers, dampers, wave guides and other similar devices. Reflexion from these obstructions, together with further cross-sectional changes which they may impose, create multiple wave paths to the mouth of the horn. Some waves may even be turned through 90°, eventually dissipating their energy in the walls of the horn and never reaching the listening room. The result of the reflexions, absorption and path length variations, is phase chaos when the sound eventually reaches the ear. Colouration and intermodulation products are only to be expected from these above aberrations.

The shapes of the flares themselves would also appear to have a dramatic effect on the tonality of the different horns. Once again, however, prime design consideration appears to have been given to directivity pattern criteria, rather than what the horns actually sound like. Many expensive, high quality horns are mated to 2 inch drivers. Advances in diaphragm materials and designs have enabled responses to be pushed, sometimes with the aid of equalisation, to 20 kHz and beyond. This has led to a situation of diverging interests. The commercial tendency is to utilise this driver response, by attempting to enable the horn itself to retain its pattern control to ever higher frequencies.

In reality, the diameter of a 2 inch horn throat can accept approximately three entire wavelengths at 20 kHz across its diameter. When achieving 125 dB at 1 metre, the sound pressure level in the horn throat itself, reaches levels where air compressibility effects lead to non-linearities in the sound propagation down the horn. We suspect that wave motion at such high levels in a wide diameter throat, result in poorly controlled wave motion within that throat. I personally feel that a 1 inch throat at 10 kHz; roughly a 1½ inch wavelength, would be a maximum in both diameter and frequency for well controlled, 'natural', uncoloured sound. This

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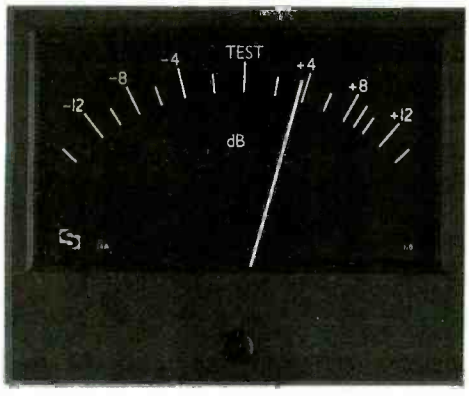

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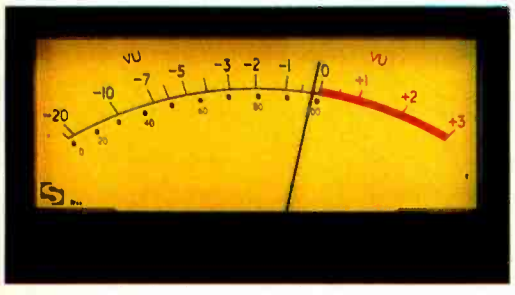

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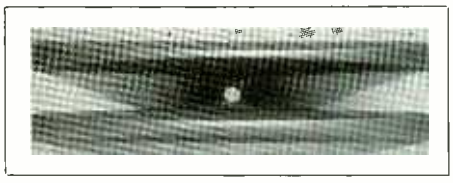
◁ throat should contour very smoothly into the geometry of the flare. The mouth should then smoothly release the pressure wave into the listening room with minimum interference and the most gradual transition. Obstructions in the sound path should be discouraged, to preclude the possibility of reflexions, eddies and disturbances in the flare rate.

Preliminary investigation would appear to suggest that, all other things being equal, within practical limits, the shorter distance from the diaphragm to the horn mouth, the most uncoloured the sound. This would agree with a common sense approach in that one would expect a larger horn to impart more of its particular characteristics upon the sound travelling 'down the tunnel'. Although not yet quantified, I feel a definite link exists between flare shape and colouration. Despite sound being a wave motion as opposed to an air flow, instinctively, the thought of the aerodynamic 'area rule' persists in my thought trains. Aircraft designed for transonic speeds, comply with the area rule by making very gradual changes in cross-section. Thin wings gradually fatten in section at the roots, smoothly blending into a flattened fuselage cross-section. Probably the best known example of this is the Lockheed *SR71 Blackbird*. Even though wave motion in a horn does not flow in a linear way, it does move, albeit over very short distances. Indeed, the resultant wave motion moves, by definition, at the speed of sound. There is a link! Turbulence as such is a function of a flow and would not be applicable in wave motion. Eddies however, could possibly be caused by non-adherence to the area rule. The term area rule is used here not as a definitive term but as the closest approximation of a known rule to an intuitive feeling.

Some repercussions of this effect have a bearing on materials used for the practical production of horns. Much has been made of the relative merits of wood, metal, urethane, glass fibre and other materials used for the manufacture of horns. Wood was long held by many designers, to be superior to metal due to more benign resonances and a less harsh sound. Recently, however, horns of very complex multiple curvatures, have been moulded from synthetic, mineral loaded resins and glass fibre. Much of the mystique of wood still lingers in the recording industry but it does not easily lend itself to the manufacture of complex, ever-changing contours. Again, the cross-correlation of certain shapes being made from certain materials and not from others, may have led to the apportioning of certain characteristics to those materials or shapes, whereas, the reality may not prove to have been so simple. For example, most wooden horns, for manufacturing reasons, terminate in a square section throat and have a sharp, angular, lip at the mouth. The square throat must somehow be mated to the round driver and many very expensive wooden horns have abrupt cross-sectional changes in this region. Does this influence the velocity and direction of the waves and is it uniform with frequency? Are eddies, or short term rarefaction and compression distortions present? By the time the wavefront reaches the mouth, what effects do any of these properties have on the phase correlation, or on any possible cancellations?

It was in the light of all these questions, that research work began at the Institute of Sound and Vibration Research (ISVR) at the University of Southampton in 1987. I had been designing a range of studio monitoring systems but in four years of intensive researching, I had failed to find an entirely suitable, proprietary, purpose-



Smoothly contoured horn

designed, midrange horn. Eventually, a modified ASS design was chosen as being closest to my ideals but it had subsequently been difficult to assess and quantify the relevant parameters that set this horn apart from the others. The intention of the research programme was to attempt to relate the physical properties of horns to the subjective sound qualities and subsequently to use the correlations to design a new horn.

These are the original criteria:

- To be a high fidelity, midrange, studio monitoring, horn/compression driver system
- To be capable of 120 dB at 1 metre
- Design frequency range 800 Hz to 7 kHz
- The amplitude response should be smooth and free of any significant peaks for at least one octave either side of the design frequency range—a smoothly falling response would be acceptable
- Directivity of approximately 100° horizontal by 40° vertical, held as equal as possible over the design frequency range
- The size should be within practical limits for studio purposes, say 30×12 inches maximum, front face area, preferably as small as possible but without compromise to performance
- Minimum intermodulation, harmonic and phase distortions
- Natural subjective sound quality with minimum colouration; to be assessed by a consensus of listening tests

Although the artistic approach to research is dismissed by many, the intuition and intellect of an experienced person can probably outstrip any existing computer by a considerable margin. Many years of experience can produce extremely, accurate intuitive extrapolations of data and experiences. The intuitive leap! The value of such achievements cannot be easily undermined. The drawbacks to this approach, however, are mainly in the area of ideas frequently appearing in isolation. This, in turn, results in a lack of predictability, poor continuity of progress and above all, a serious inability to communicate to others the true implications of the details. The artistic approach tends toward the unpredictable, findings frequently being made in a similar random nature to the sprouting of wild mushrooms. The scientific approach has a more ordered structure. By this method it is much easier for a team of people to communicate and to make more accurate predictions and assumptions. It also makes it far easier for a person to hand over a project to another person continuing research in the same vein. The drawbacks to the scientific approach, lie in the fact that the pertinent answer cannot be found unless, in the first instance, the appropriate question is asked. The great tendency, however, is for the technical fraternity to give the artists what the scientific instrumentation tells them they ought to have. The artists—the users—are frequently unable to communicate their needs to the scientists in a mutually understandable language so the path to the truth is by no means straightforward.

The satisfaction achieved by a manufacturer of musical instruments, is only gained by acceptance of the instrument by the musicians. Somehow, this bond never appeared to fully develop between monitor manufacturers and users. All too often, satisfaction has been gained by the loudspeaker manufacturers on the receipt of an instrumentation printout. Accceptance by the recording industry would appear to come much further down the scale of priorities. The roots of this no doubt lie in the fact that a musical instrument's 'rightness' is generally accepted as a personal choice of the individual(s) concerned, whereas studio monitor systems still have aspirations towards a more definitive rightness. "The closest approach to the original sound," as one manufacturer so aptly put it.

Only recently, I was discussing the relative merits of bass drivers with a technical person from a reputable manufacturer of high quality loudspeakers. I encountered a blinkered, semi-fanatical pursuit, dedicated to the minimising of harmonic distortion as the overriding priority in driver design. I was somewhat disappointed that I could not converse in realistic terms on the merits of some other drivers I considered to sound more natural. In fact the person persisted in criticising—entirely in terms of specification—the drivers I considered to be the finest currently available. I was left feeling that I just could not deal with these people. After all, it was shown some time ago by Moir, that at 60 Hz, 7.5% third harmonic distortion was inaudible from a loudspeaker, and that at 80 Hz, over 40% second harmonic distortion was inaudible. Given these facts, what does it matter if the measurable distortion of a driver at 80 Hz is reduced from 2% to 1.8%. It might look good on paper but in terms of perceived, subjective sound quality it is totally irrelevant unless it has some further, related, side effect. The pursuit of provable and measurable specifications in relative isolation, will not produce the relevant answers.

Notwithstanding that we are looking here at midrange horns and not bass drivers, the same attitudes still frequently prevail. I believe that the only workable approach is first, to find out what sounds good; second, use scientific means to find out why it sounds good; and third, discover the relevance of this data and apply it in a practical way to future designs. Colloms in his book, *High Performance Loudspeakers* [1] gives a very great deal of evidence in the chapter on Loudspeaker Assessment to support the lack of correlation between measurable non-linearities and subjective sound quality in loudspeakers. At present, we appear to have a situation somewhat akin to the 'flat earth' philosophy. Until somebody undertook to risk 'sailing off the edge' and eventually popped up from the other side, the arguments raged. This was another instance where the practical deed spurred on the scientific analysis. I agree that this is not true of all manufacturers but there are still many who persist in telling us in loudspeaker terms that, 'the earth is flat because we've measured it'.

A reversal of technique is required here, as the variables involved in loudspeaker designs are legion. Find out what sounds good, then find out why it sounds good. Only the ear is the ultimate arbiter, as it is coupled to the most advanced computer on earth—the human brain. Research work began with mathematical numerical, theoretical, practical and audiological approaches. Careful consideration was given to the interrelationship of these disciplines and the myriad of cross-connections between them. Never was it going to be an easy task.□

(Part Four next month)

Reference
1 Martin Colloms, High Performance Loudspeakers, Pentech Press

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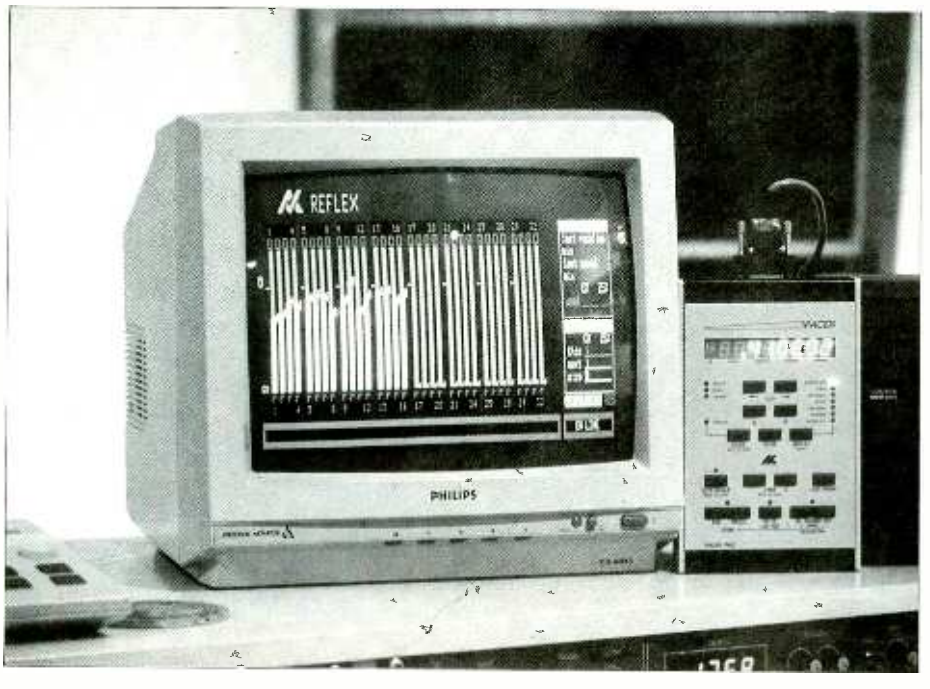
AUDIO KINETICS REFLEX

The *Reflex* console automation system is the most recent full automation system from synchronisation and automation specialists Audio Kinetics, and is aimed at the smaller studio market, below its stablemate, *MasterMix 2*. The Soundhouse in West London was a beta test site for the system and following this they purchased one. This evaluation was conducted at the Soundhouse with co-owner Phil Horne, to see *Reflex* in action and Dave Foister finds out how it fits into the studio's operation.

Reflex will retrofit to virtually any console with reasonably straightforward wiring—the Soundhouse uses a Soundcraft *1600*. Its VCA cards sit in the fader well, and the approach AK have adopted is to replace the fader in the audio chain with a VCA and to rewire the existing fader to provide DC control for the VCA. The VCAs come in multiples of eight on a card; the basic system will handle up to 32-, but may be expanded to a maximum of 64-channels. The VCAs connect to the rack mounted computer and power supply which in turn are connected to a high resolution colour monitor and the small portable control keypad. All operations are carried out from the faders and the keypad; as well as level automation the system provides mute automation, auto fades and VCA subgrouping together with a choice of operating modes for different mixing situations.

The Soundhouse found the installation no problem, although in the interests of minimising signal paths during tracklaying (when the automation would be irrelevant anyway) they had a master override switch fitted; this returns the faders to their normal passive roles and bypasses the VCAs, but ironically it turned out that the signal bleedthrough with the faders down was worse without the VCAs than with.



Operation of *Reflex* is intuitive with a comprehensive screen display and logical operating procedures. Horne was a comparative newcomer to automation when he began with *Reflex*, but he and partner Paul Deeley quickly settled in, as have visiting engineers. The system is SMPTE-driven—it includes its own generator—and all mix moves are made in realtime. The potential difficulty of dealing with handfuls of mutes simultaneously is avoided since the console mutes are bypassed and therefore inoperative, all muting being done from the keypad. Horne found this one of the few adaptations to be made operationally; "That's the only thing that was initially a bit strange, not being able to go like that (hits a mute button) to mute something". On the other hand, the keypad enables any combination of channels to be muted or unmuted simultaneously using its command line, which is central to the operation of the whole system.

This is not a command line in the conventional sense of a place in which to type in command words—*Reflex* never requires the user to remember commands in this sense. Instead it is a space at the bottom of the screen in which lists of channel numbers are typed; these are then the channels which will be affected by the next operation, be it muting or placing in 'Write' mode or whatever.

Channels can be entered individually, connected with plus (+) signs, or a series of consecutive channels can be entered as 8 thru 15, for example, and commonly used sets of channels—such as all the drum tracks—can be stored in one of four fader string memories for fast recall. Once a channel string, as it is termed, is typed into the command line it remains there for all subsequent operations until a new number or series of numbers is entered, thus saving repetitive keypad operations.

This is virtually the only area of the display that the user has to type anything, although the whole system (apart from disk copying operations and global setup parameters) is on view on the one screen. The bulk of the display is taken up with the ▷

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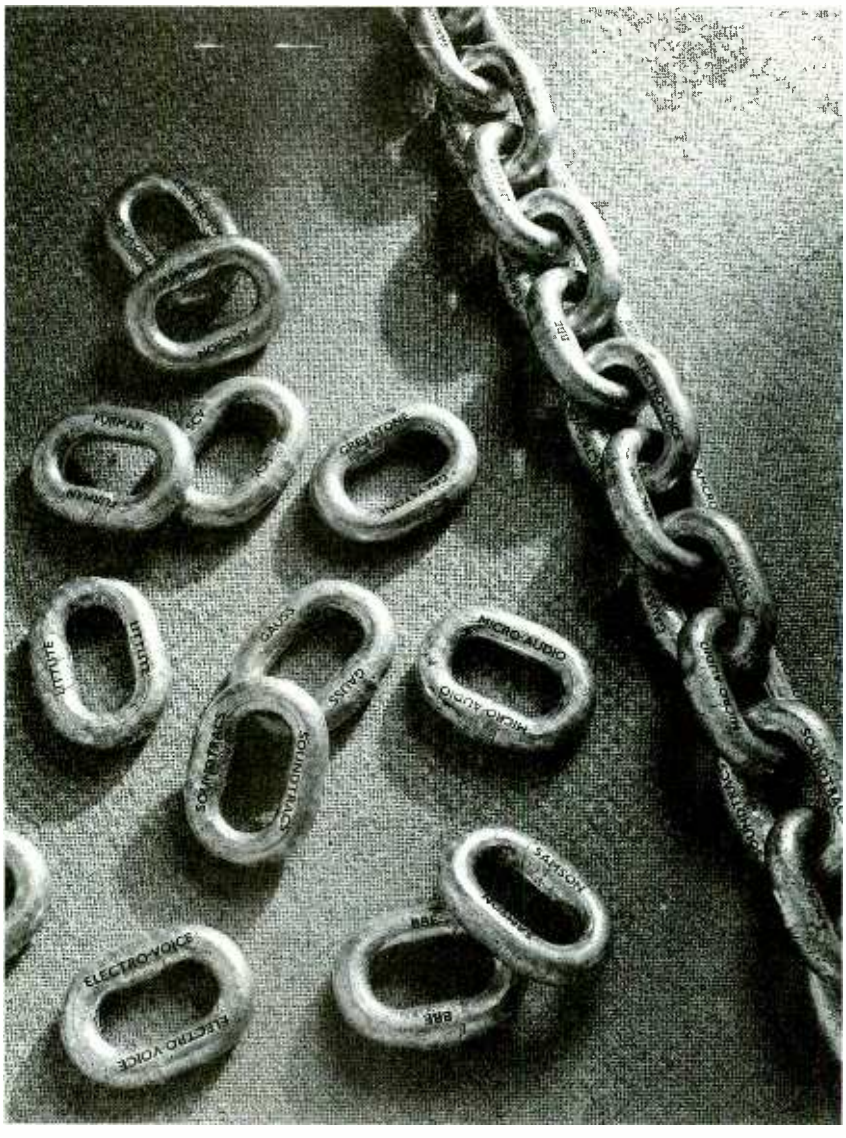

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The Reflex in situ at Soundhouse. The controller is in the foreground on desk

◁ automation status, showing vertical bars for the current VCA gain, arrows next to those bars showing the actual fader positions, mute status above the bars and read/write status below. The screen will show up to 32 channels, all moving in realtime, so clearly with a 64-channel system some form of scrolling sideways through the channels is necessary. The facility for doing this includes the option to scroll instantly to a pre-defined place. The rest of the screen is taken up with information about the disk status, the number of the current mix, and how much RAM has been used, as well as a small status box which shows, for example, when the Shift key has been pressed. Horne finds the display shows him all he needs while some engineers used to built in automation with LEDs and buttons next to the faders might find it takes a bit of getting used to, Horne says "I prefer it now; if something weird's happening you can look at it and see straight away what's going on. I think the visual display's the big advantage (over some other systems). It's like having a moving fader system, but up there!"

The operations on the selected channel strings are obviously largely going to involve level alterations, and *Reflex* offers three modes of writing fader movements into memory. The most basic is Write, which makes the selected faders immediately live at their current physical positions. This is obviously the one to use to set up an initial working mix, but would be less useful for making changes. The usual problem with automation of the non-moving-fader kind is what to do to make changes; how to match the physical fader position to the stored VCA level before assuming control (and when handing back to the computer at the end of a change) in order to avoid level jumps. *Reflex* provides two ways of doing this, neither of which requires very much thought on the part of the operator, and both of which shun the often-used idea of nulling LEDs. The first, to be used when a section of a channel needs to be re-written, is Null Write; here the fader will do nothing until its physical position matches (or nulls with) the stored VCA level, at which point it will take over and any further movements will be stored. This is straightforward to use and is further simplified by the display, which shows the fader position arrow changing colour as it passes the top of the VCA level bar. This mode is left by selecting Null Read—a single keystroke—which does the same thing in reverse, that is it returns control to the computer, and stops Writing, when the fader position coincides with the level in memory.

The other option is 'Update', for use when a channel's internal dynamics are correct but its overall level needs altering. When this is selected the fader is immediately live but nulled to the stored channel gain, making its actual physical position irrelevant. Any movements are then added to the stored dynamics as an offset, and updating is ended once again using the Null Read function. As a further refinement, the user may select (as part of the global setup) the Update at 0 dB option, in which case Update mode will only be entered when the fader crosses its 0 dB point. This not only guarantees a reasonable range of offset in either direction being available, but puts the fader in its area of highest resolution.

The system's use of RAM and its disk file handling are largely transparent to the user, although the processor carries half a Mbyte of RAM, divided into two, one for the last mix and one for the current updates. At any point the last mix can be saved to an MSDOS formatted 3.5 in disk, and the system automatically increments mix file numbers unless told otherwise. The RAM free space in each half is shown on the screen, but Horne says "We've never filled up the RAM on it".

So what's it like being a beta test site? "We had teething problems when we first had it but they were sorted out very quickly, and since we finally commissioned and paid for it, it hasn't given us any trouble at all. Practically, it's very easy to use—it's a simple system, but effective. The only thing that's still slightly 'iffy' about the system is the way the keypad's laid out, but the new one looks much nicer and easier to use". Audio Kinetics had just provided a new updated keypad with much larger buttons for the most commonly used functions—entering and leaving the various Read and Write modes—and clearer legending for the shifted functions, and this was evidently something Horne had been suggesting for a while.

The system provides several additional functions, such as pre-programmed automatic fades, solo in place, and very flexible VCA subgrouping—complete with clear group indication by good use of colour on the display—including the facility to use any of the channels as a Grand Master for the whole console. Another nice touch is the facility to automatically dim all the channels to a user-defined level as soon as timecode is lost. Horne finds some of these more useful than others: "I haven't used an autofade for an awful long time, but I tend to use the Grand Master a lot on channel 24 as 24 is generally a code track". But clearly the keypad-based mute and solo functions are worthwhile, particularly since the system still functions manually when off-line—"It adds to the flexibility of the console without even using the automation, that's the beauty of it".

Fitting a system like this is bound to change the feel of the console in some way; how did *Reflex* affect the Soundhouse desk? "The only slight difference it makes is the law of the fader. If you do a slow fade-in with the VCAs the signal doesn't start coming in until about here (points to fader marking), higher than without the VCAs. It's very slight". How about any other trade-offs? *Reflex* is a comparatively budget-priced system—how does this show up? "I don't know, I haven't got any real problems with it. It's very quick; you can give it loads of this (shoving handfuls of faders up and down) and it accepts it all. Some systems will bleep at you if you give them loads of information; if you sit there and waggle every fader like this they say 'hold on', I can't take this'!"

The Soundhouse is not a straightforward music studio; how does *Reflex* fit into what Horne does? "I suppose for the majority of the work we do—A-V and video soundtracks—we're not pushing it to its limits. On some video programmes we are; it's wonderful having that ability so you haven't got to try and get it right in one pass each time, you can sort out all the effects especially when you've been given tapes from certain video editors where suddenly channels swap and you don't know what the hell's going on". Recently, however, Soundhouse did an album for CD release, and was pleased to find that its performance and facilities stood up to the test.

It is evident that a lot of thought has gone into *Reflex*, and that most of that thought has paid off in producing a powerful, flexible yet simple and friendly automation system. As Phil Horne says, "It works!"□

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A827 Multitrack

Aspiring to a Studer multitrack recorder may seem like a distant dream to some people.

The A827 is the solution.

The new Studer A827 has the ultra fast proven A820 tape transport with 14" reel capacity. There are 3 tape speeds with integrated varispeed controller, an optional internal synchronizer/resolver and switchable Dolby HX PRO. It comes complete with phase compensated audio electronics, NAB/CCIR/AES EQ switching, 2 alignments/speed, amorphorus heads for improved response and long life and an RS232/RS422 port for full audio and transport control.

And if you should so desire, there are also comprehensive interfacing possibilities and a very impressive range of peripherals.

Your aspirations realised with Studer's cost-effective solution.

BAUCH
Solutions

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