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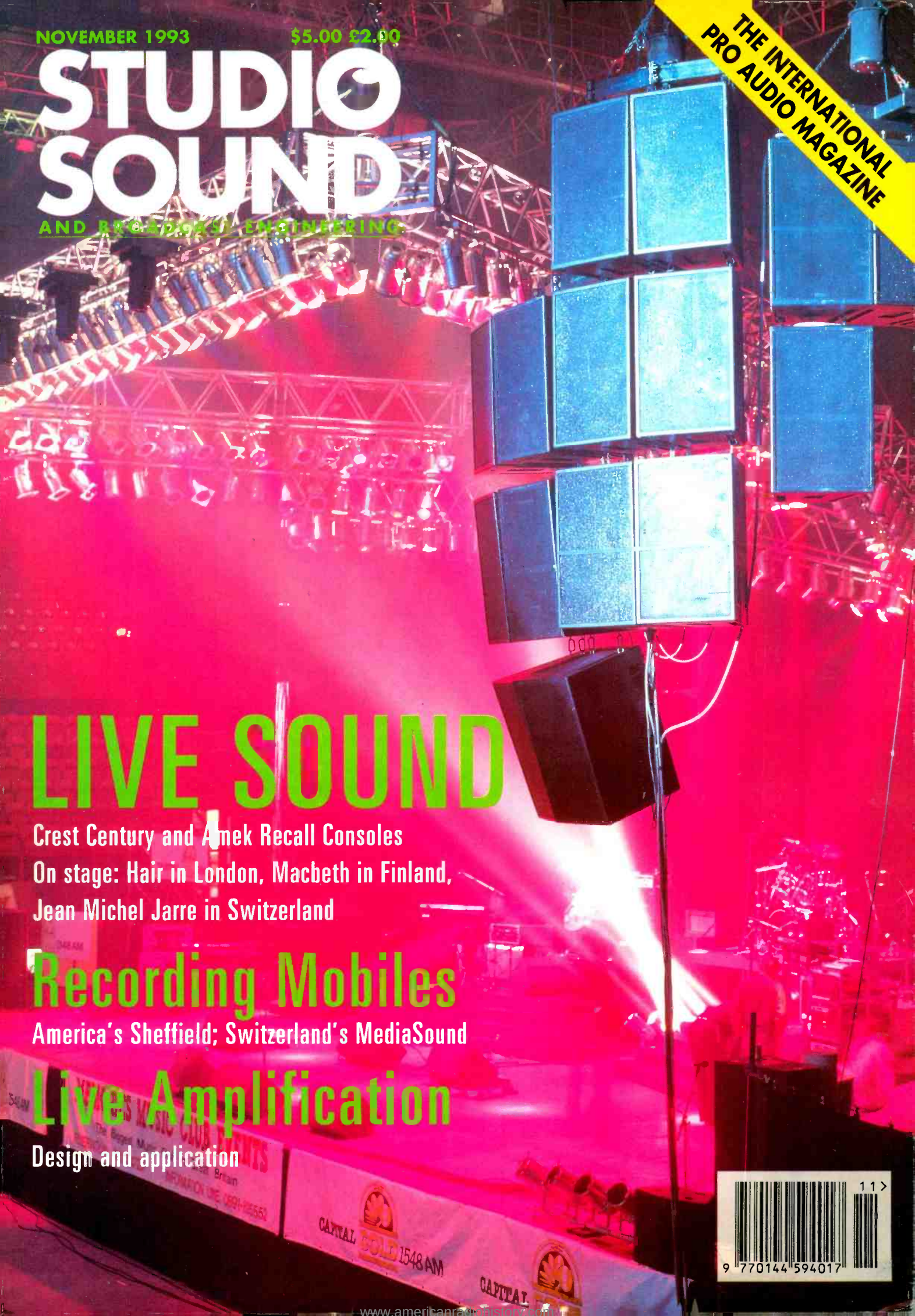
AND BROADCAST ENGINEERING

THE INTERNATIONAL PRO AUDIO MAGAZINE



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"YOU WANT TO DO WHAT !?!"

So there he was, this *client*, for want of a better word, telling me, in no uncertain terms we needed a piece long ago consigned to the bin. I could see myself burning the midnight oil again, desperately trying to find this 3 second out-take from the 2000 feet on the cutting room floor.

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Space invaders

The advance of technology and its effect of the development of music is only half the story. Discussion surrounding the responsibility of technology for the emergence of nonacoustically based music continues, but what part has technology to play in the development of live performance? And what of the interaction between acoustic environments and music?

At its inception, music was undeniably a live phenomenon. Even with the alternatives to live musical performance available today, live events are still in demand, and the ongoing developments in technical support reflect the active nature of this relationship. The acoustic properties of venues also have their part to play—and have for some considerable time.

Plainsong is now something over 1400 years old, yet this early form of choral music readily reflected the nature of the acoustic within which it was performed. As larger churches were built, they offered corresponding increases in reverberation time. This reverberance dictated that a slow musical tempo be used and was used to set each tone against the last, giving a primitive form of double tracking. Close studies of this phenomenon suggest that it is actually possible to identify venues through the musical characteristics of the form of chant developed there.

A more recent example of this interaction of music and acoustic can be found in Haydn's symphonic works. Calculations suggest the reverberation times for the halls used to perform his works between 1760 and 1795 varied between 1.0 and 1.7 seconds —although there was no consistent trend upward (or downward) as there was influencing plainsong. The differing hall volumes produced marked differences not only in reverberation time but on the sound level available to the orchestra (which itself increased throughout his work). Haydn's response was to compose with the acoustic in mind: consequently, following a loud passage there is a bar rest in the *Symphony No.102* which was included to accommodate the long reverberation of the London King's Theatre, where it was first performed.

In more modern times, concert halls have had a greater number of conflicting acoustic and visual demands placed upon them than ever before. And while the understanding of acoustics has advanced over the years (although, perhaps not consistently), there is still much that is not understood. Today, theatre presentations probably enjoy the most sophisticated integration of acoustics, visuals and technology—partly because of the venues' design, but also because such shows can employ more complex installations than the average rock 'n' roll circus. Certain of these circuses—notably Peter Gabriel's and U2's—have made considerable demands of available venues, with corresponding areas of success and failure from a sound perspective. Due to the scale of these events, however, the choice of venue is more often dependent on audience seating than on acoustic suitability.

At the other end of the scale, Brian Eno has pioneered the use of venues normally not designed for high-quality acoustics through his 'sound installations'. Here, as with Haydn's symphonies and plainsong, the music is being shaped to fit the characteristics of the venue rather than the reverse. Although these make use of recorded rather than live sound, they may hold a fundamental lesson in how best to approach the use of acoustic space, if not further understanding of its design.

The question raised here is that if older musical styles accommodated the acoustics of the available venues, why can this not be done today? If we must make our music in the 'artificial' environment of the recording studio, perhaps we should be more ready to adapt it for presentation through the medium of live performance. ■

Tim Goodyer

Cover: EAW SR at Wembley, London

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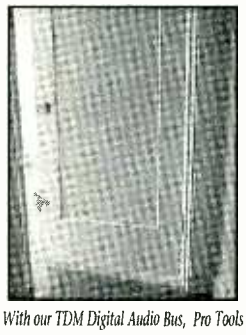

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So while we call it Pro Tools 2.0, you might call it exactly what you need. And if so, perhaps your next call should be to us.

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International News

In-brief

● Plasa '93 breaks records
This year's Plasa Light and Sound Show surpassed all previous attendance figures with a final number of 9,465 visitors through the doors over the show's four days, representing an increase of 1,411 on last year. Of these 1,458 were from overseas.

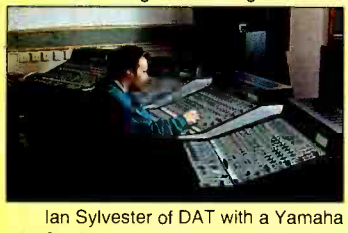
● One-step autoconforming centre
North-London-based Sound Developments Studios have launched the first one-step overnight autoconforming service of digital multitrack sound and video in the UK. The facility is called The Conforming Centre. The Centre's system including Avid, Lightworks, Cuedes, Shotlister and Edit Master; and pictures are conformed in *D3* or *Betacam SP*.

● Changes at Otari Europe
Following the formation of Otari Europe in February this year, by which sales and marketing has been integrated into a single location in Dusseldorf, Otari now announce the unification for service and parts supply to be also performed from the German base.

● Sabine issue technology patent
Sabine Musical Manufacturing Company were recently awarded a patent for its method of controlling feedback. The patent protects the advanced technology Sabine have developed for use in the company's products—the *FBX900 Feedback Exterminator* and the *ADF-1200/2400* workstations. Using DSP the products automatically detect feedback and precisely determine its frequency. Filters remove only the ringing frequency in less than 4 seconds and without changing sound quality.

● Euphonix open more offices
As a result of increasing sales in the US, Euphonix have announced the opening of a New York sales and service office and a new office on Nashville's Music Row.

▼ Digital's Mr Fix-it moves
Digital Audio Technology, a leading digital audio hire company and commissioning consultant for Yamaha Digital Systems, are now operating out of a new studio in North West London. The facility includes a 92m² control room, 250m² live recording room. They now operate four Yamaha *DMC1000* digital recording consoles.



Ian Sylvester of DAT with a Yamaha *DMC1000* console at Union Hall Studios

Historic Linkup

In an historic ISDN linkup, London's CTS studios joined forces with Barcelona's DUY to record a new Spanish musical, *Rejas*. Producer of *Rejas* (and MD of DUY), Rafael Duyos, wanted to involve a Spanish choir in the London-based recording, but chose an ISDN link as a cost-effective alternative to air travel. The choir worked to an ISDN-fed guide mix allowing interactive alterations to be made to both parts, as an alternative to overdubbing after the main recording.

The ISDN link was made over the *CDQ2000* system and the orchestra recorded to Sony *PCM3348* digital multitrack. The choir used DUY's SSL *ScreenSound* via *SoundNet* which was used to compensate for the transmission delay. The final mix took place in Barcelona on DUY's synced Yamaha *DMC1000* consoles.

Sensaura updates Binaural stereo

Central Research Labs (CRL), and R&D company within Thorn EMI, have launched what they are calling the most significant sound recording development since stereo. Its called *Sensaura Audio Reality*.

Like a lot of the recent stereo enhancement systems on the market *Sensaura*'s natural dimensional recording system creates a sound field which extends beyond standard stereo speakers. *Sensaura* promises to allow the listener to identify the direction, height and distance of the sound.

Sensaura uses an 'artificial-head' as a basis for recording, with microphones incorporated in the auditory canals. The signals are equalised by the system to overcome the effect on tonal quality of the audio signals passing through two sets of ears (the artificial head's and the listener's).

Binaural recordings can be made by 'artificial-head' systems with microphones placed in the same canals. However these recording need tonal correction and cannot be mixed in a conventional manner as well as only being suited for headphone listening. With *Sensaura* the artificial-head signals are equalised to correct this tonal imbalance.

Sensaura provides the capability of mixing additional microphones along with the artificial-head signals; the digital mixing stage then makes use of the relative positions of these microphones. The recording hardware is a multichannel DSP unit, controlled by a PC running proprietary software. External 20-bit A-D convertors are used together with 24-bit internal processing.

Producer Rupert Hine who has recently used the system said: 'For more than 12 years companies have been struggling to achieve the third dimension in sound, suffice to say that *Sensaura* is the first.'

The Tyrell Corporation have announced the sale of a Sonic Solutions CD PreMastering and NoNoise system to Sony Music Studios in London, formerly The Hit Factory. Tyrell have also supplied the studio with the Sonic Solutions Turbo and Super Bit Mapping options in addition to the *PRISM* Noise Shaping A–D convertor. Pictured are (left to right) Ray Staff, Mastering Engineer; Matthew Villa, Studio Manager; and Nigel Scott of Tyrell

Abbey Road corrects room electronically

Abbey Road's Sonic Solution equipped room has been acoustically treated by digital filtering and not physical treatments. The room, which is used for a wide range of mastering, remastering and editing work, has always had the problem of being slightly bass light. The Sigtech *AEC1000*, a powerful digital filtering system, was chosen by the studio as the most cost-effective solution short of a major rebuild.

Peter New of Abbey Road explained: 'The room was never acoustically designed and being square does not lend itself to physical acoustic treatment. The room is definitely bass light and although I can automatically compensate for myself, clients are always asking for more bass. I can't just increase the bass as this then makes the bottom end woolly because the room is light at a particular frequency. The Sigtech system allowed precise compensation to the room and the difference is like night and day.'

Sigtech is available in the UK from Munro Associates. Tel: 071 379 7600.

BT helps DJs stay at home

British Telecom's ISDN has helped Quentin Howard, a presenter for Classic FM in the UK, to transform his living room into a studio for the first regular home broadcast by a major radio station.

ISDN enabled Quentin Howard to broadcast his 'Six of the Best Quiz' show live from Wiltshire, instead of travelling to Classic FM's studios in London. By using two ISDN lines, giving four channels, the presenter can play music, set the quiz and receive instructions from the studio and calls from listeners

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simultaneously.

Quentin Howard commented: 'The advent of low-cost compact disc systems and digital audio computers, coupled with ISDN, is set to revolutionise the way radio stations operate. The future is definitely in digital audio broadcasting.'

The compressed digital signal using the apt-X *DSMI 00* codec is sent via ISDN from the presenter's home to the studio for broadcasting to nearly five million listeners without the need for fibre-optic or satellite technology.

Hit Factory choose Audio Kinetics

UK manufacturer of synchroniser products Audio Kinetics have won a major order from the New York Hit Factory studios. The contract involves 21 *ES.Lock 1.11* synchroniser modules installed in a total of eight rooms in both the Hit Factory Broadway studios and the new Hit Factory Digital.

The installation has passed its initial three month test, reducing maintenance time associated with machine control and sync problems from 30% to nearly 0%. Audio Kinetics won the contract on the basis of the market performance of the *ES.Lock* system, which is designed for complex multimedia and multimachine applications.

Ian Southern MD at Audio Kinetics said 'The US market is clearly very significant for us and the Hit Factory contract coincides with our decision to raise our profile in the US market. In today's complex studio environments, we are seeing more and more situations where control systems simply cannot cope with the demands made of them. We are determined to demonstrate across the US that *ES.Lock*, which fully implements the ESbus standard, is really the only viable system capable of meeting the industry's stringent requirements for performance, reliability and functionality.'

AMS-Neve boost US

AMS-Neve North American distributor, Siemens Audio Inc are region-listing sales and service network and strengthening communications with AMS-Neve's head office in the UK.

Siemens Audio will be increasing staffing levels and office space in New York and LA which, together with the Toronto office, will form the main sales and service centres. Satellite offices at Chicago and Nashville will offer enhanced service facilities to customers in the central regions.

Siemens Audio President John Gluck explained: 'Given the large geographical spread and the increasing size of our North American customer base, a concentration of resources in the key areas is clearly imperative. In addition, we can only further improve response times and general information flow to customers by allowing more open lines of communication between the regional centres and AMS-Neve's head office departments in the UK.'

DUY Studios in Barcelona (shown above) joined forces with CTS Studios in London in a ISDN linkup to record the choir for a new Spanish musical—see 'Historic Linkup'

APRS venture for AES

The APRS is organising a joint venture of UK exhibitors at the AES Convention to be held in Amsterdam next year from the 27th February to the 2nd March. This will offer the chance of a DTI subsidy for qualifying companies with products or services for the professional audio market.

Participants in the venture receive a subsidy from the Department of Trade and Industry which is around half of the cost of the exhibition stand. Companies which have not yet reserved a stand in Amsterdam should apply immediately to the AES organisers; and they should also advise the APRS if they wish to join the venture.

APRS. Tel: 0734 756218.
Fax: 0734 756216.

Synclavier claw back profits

The Synclavier Company, set up earlier this year after the demise of New England Digital, are showing signs of healthy business.

The company have reported that they have surpassed their financial goals for the first quarter of operations, recording nearly $1m in revenues from sales, services and upgrades, with net profits exceeding $100,000.

Company President Griffith W McRee attributed these strong financial results to a greater than anticipated demand for new *Synclavier* and *PostPro* systems, and the timely release of new product enhancement, such as FastTrax and MegaRAM storage and memory options.

McRee commented: 'This is a company owned by the owners and operators of *Synclavier* and *PostPro* equipment. They measure our performance not by the numbers, but by the quality of service and support we can provide. We are therefore managing this company for the long term, to assure our customers that their investment in technology will be preserved over years to come.' ■

Contracts

● Todd-AO buy five Fairlights

Todd-AO Glen Glenn have ordered five Fairlight *MFX-2* systems to be used during dialogue editing and mixing for feature film and episodic television postproduction. John Lanken, Fairlight's International Sales Manager was reported to be looking for a US West Coast distributor at the time of the New York AES Show.

● First Sennheiser go to Gradav

'Dry Hire' company, Gradav Theatre Services, have bought the first Sennheiser *EM203* UHF 3-channel switchable diversity receiver system in the UK. As a support company Gradav supply radio microphones to a large number of microphones to a large number of theatre companies, TV and film units as well as sub hiring to other hire companies.

● *Logic 3* arrives in Ireland

Telegael are currently putting the finishing touches to Dubbing Suite 2, a new studio which will feature an *AudioFile* with a *Logic 3*. Increased demand for Telegael's sound dubbing expertise, particularly with the imminent arrival next year of a new Irish language TV channel, has prompted the expansion of facilities.

● Eastern Acoustic Reworks

In a recent article on Harman International's purchase of AKG, we mistakenly included Eastern Acoustic Works (EAW) of Whitinsville, Massachusetts in a list of Harman-owned manufacturers. EAW is a privately held company manufacturing professional loudspeaker systems. Harman UK is the EAW distributor for the UK, but EAW have no other business relationship with Harman.

▼ Snaptrax rejuvenates Denham

Snaptrax is a new audio postproduction company based at Denham film studios, outside London, which is regaining its importance as a centre for film and video production and postproduction companies. Chris Ackland one of the company's directors tested the SSL *ScreenSound* audio editing system and as a result Sanptrax has now bought two *ScreenSounds* and a *SoundNet* digital audio network. ■

Chris Ackland, Director of Snaptrax with the SSL *Screensound*

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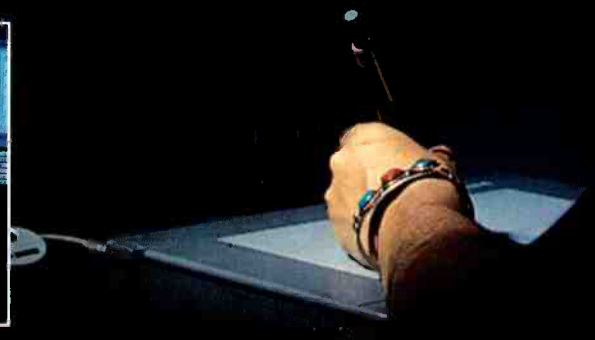
Now You Can Add Digital Video To ScreenSound



ScreenSound V5 combines a new faster processor with major operational advances, like internal reconform of your audio to EDLs. You can even add random-access video with SSL's VisionTrack.

Together, the new, faster ScreenSound and VisionTrack provide instant access to audio and picture at any cue or mark point. With spool time and machine lock-up problems eliminated, you can dramatically speed up your editing, voiceover and ADR sessions.

VisionTrack even comes with its own machine control port and audio recorder, allowing you to load both sound and picture off-line, saving valuable ScreenSound time.

Digital video - just what you'd expect from the world's leader in digital audio.

ScreenSound V5 & VisionTrack

- New generation, faster processor
- 8/16 channel random-access recorder/editor
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- Random-access 525/625 video (dual standard)
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- Off-line loading of sound and picture
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New, Faster ScreenSound

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Over Quality console

ADgear, the engineering division of Japan's VAP Inc. and affiliate of NTV, have introduced the *Over Quality 8100* mixing console. The desk has been developed in association with George Massenburg Labs and promises to set new standards for indiscrete console design and manufacture. Input and monitor paths in each module are combined with the ADgear *DOP-210A* discrete op-amp used throughout.

The console has no microphone inputs, will all signal circuits operating at console line level. Complementing the design is the remote ADgear *KZ-902U* microphone head-amp, which converts signal to line level right in the studio, with low impedance and high output.

The *8100* has a 30mm module width for the input module. With the 80-plus channels common today, the old standard module width results in consoles so large that accurate monitoring becomes harder. With the 30mm width the console gives the engineer an advanced multichannel interface.

ADgear, VAP Shinane-Machi, 10-8 Minami-Motomachi, Shinjuku-Ku, Tokyo, 160 Japan. Tel: 81 3 3356 5411. Fax: 81 33 3356 3005.

HHB Portadats

The result of a two years of research and development programme, HHB Communications have launched the Portadat *PDR1000* and *PDR1000TC* (Time Code). These are fully featured, professional portable DAT recorders, designed and engineered to meet the various demands of allocation sound recording applications. The *PDR1000* uses a rugged, four-head, four-meter transport derived from DDS technology. Features include 44.1kHz, 48kHz and 32kHz selectable sampling rates, balanced XLR mic-line inputs, AES-EBU-SPDIF digital I-Os and 48kHz and 32kHz selectable sampling rates, balanced XLR mic-line inputs, AES-EBU-SPDIF digital I-Os and 48V phantom powering.

A unique feature is the application of Nickel Metal Hydride rechargeable battery technology, powering the *PDR1000* for longer than other portables. The *PDR1000TC* is equipped to jam sync, convert Absolute Time to Time Code and to record, generate and reference to Time Code in all existing international standards.

HHB Communications, 73-75 Scrubs Lane, London NW10 6QU, UK. Tel: 081 960 2144. Fax: 081 960 1160.
US: Independent Audio, 296 Forest Avenue, Suite 121 Portland, Maine 04101–2000. Tel: 207 773 2424. Fax: 207 773 2422.

HHB's bid for the pro portable DAT machine market

New software for Akai samplers

Akai have announced the introduction of v1.3 software for its *S2800*, *S3000*, *S3200* and *CD3000* samplers. Key features include a new Disk modeoperating system which enables easier and faster access to volumes and partitions; a Find function which allows you to search for samples, programs and other files by name; an Edit Sample mode: resample functions which include a quality control that analyses at lower bandwidths; a Cut function which will automatically trim sample to loops without having to set the start and end times manually, Loop points are now shown in the ED.I Trim page for added convenience when trimming samples. ▶

***Over Quality* and over here—the ADgear mixing console**

In-brief

● Euphonix dynamics package
The *ES-108* console dynamics system provides 8–128 channels of dynamic range processing for the Euphonix *CS2000* and *CSII*. Operation is integral to the control surface with a unique on-screen display showing the transfer characteristics of the processor being adjusted. Up to two processors may be fitted per channel.
Euphonix. Tel: +1 818 766 1666.

● The *Opal 2802*
The Australian Monitor *Opal 2802* offers 280W per channel with a frequency response of 20Hz–20kHz; balanced XLR inputs; bridge switch; and Speakon connectors. Australian Monitor Tel: 61 2 816 3544. Fax: 61 2 817 4303.

● Sennheiser swap *400-series*
Sennheiser have replaced their *400-series* with models *320,330,340*. The new models have 99.99% OFC leads used for clarity and signal transmission, reinforced with woven Kevlar strands for reliability. Copper clad aluminium wire is used in the drivers giving good transient response.
Sennheiser UK. Tel: 0628 850811. Fax: 0628 850958.

● GS3V SMPTE option
The Allen & Heath *GS3V* automated console has a SMPTE option module available. The module reads and generates time code direct to and from the console. Additionally, it will automatically detect the time frame used and is easy to install a V-Edit function also gives access to user variable functions. These are generator start time, plus time and frame rate. Input and output is via a single 1/4-inch stereo jack socket and the package is factory set to operate with low level equipment.
Harman Audio Tel: 0753 554900.

● Next generation sound board
A digital audio board with Dolby AC2 coding real-time compressed professional broadcast quality stereo sound through PCs, PS/2s and compatible computers is now available from Antex Electronics Corporation. Unique to the design of the *SX-22* is a built-in EEPROM based software security scheme. This allows developments and system integrators to give each board a unique ID number.
Tel: 310 532 8509.

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THIS MICROPHONE MEANS BUSINESS

Quality for the Budget Conscious

"Microphones by Neumann..." What better endorsement could there be for a studio. And what better news for your studio than a budget price Neumann.

The TLM193 is a large diaphragm cardioid condenser microphone designed for discerning studio and live applications.

With breathtaking sound, outstanding specifications and superior build quality, it's a microphone you would expect from Neumann, at a price you wouldn't.

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NEUMANN

NEUMANN, **FREEPOST**, LOUDWATER, HIGH WYCOMBE, BUCKS HP10 8BR.
TEL: 0628 850811. FAX: 0628 850958.

Additional new features for the *CD3000* operating software include Auto Finish function in Record which automatically finishes a recording and pauses the CD for convenient sampling from special sampling CDs and an Auto Naming function that automatically creates new names for samples allowing you to make several recordings in succession without needing to name new samples.
Akai UK, Haslemere Heathrow Estate, Parkway, Hounslow, Middlesex TW4 6NQ.

Spheroidal loudspeaker in Marble

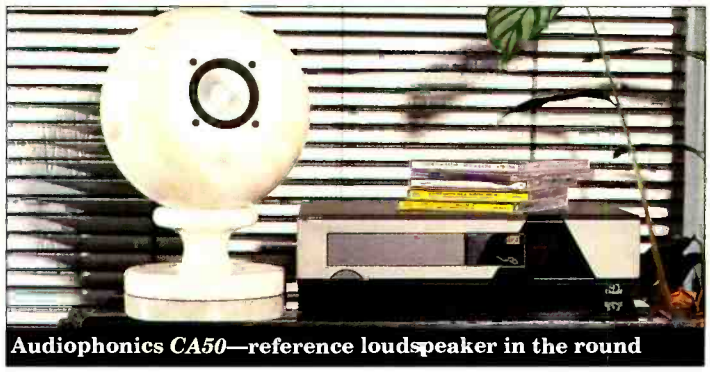
Audiophonics have introduced a phase coherent point source loudspeaker based on a spherical form with a single wide range drive unit in an enclosure from a solid block of marble or granite. The spherical enclosure shape results in much lower diffraction distortion than the conventional box form, and the high mass of the stone acts as an acoustic link so the enclosure adds little coloration to the sound being reproduced.

Using a single 50mm metal cone driver of only 1.5gm moving mass the *CA50* covers the audio spectrum from 100Hz to 22kHz. Internally the *CA50* is filled with long hair black sheep's wool and wired with 'linear Crystal-Oxygen free copper' cable to heavily gold plated terminals. D&J Recording of London, have ordered a pair of *CA50* pro speakers for use during sessions. A spokesman said 'The Quad *ESL63*s which we use for monitoring are a bit on the large size for carrying around.
The Audiophonics *CA50*s are the first compact speakers we have evaluated that have a similar clarity and tone to our Quads. We are now confident that what we hear during recording sessions will match up with what we will hear during editing.'
Audiophonics, 21 The Crest, Berrylands, Surbiton, Surrey KT5 8JZ, UK.

Cooper *CS106 I* now user-configurable

New modules for Cooper

Cooper Sound Systems now allow the user of their *CS106 I* professional Cooper Sound Systems now allow the user of their *CS106 I* professional mixer the ability to configure the audio mixer to suit their own requirements. The user can now select between 47 mono inputs, stereo modules with M-S decoders or the new D-I Aux module. The D-I Aux module, in addition to providing two extra isolated outputs, directly interfaces with the Nagra *D* recorder. The CS106 plus 1 comes standard with six input channels and an output module with comprehensive communications features. Some standard features are three discrete monitor outputs with tape returns talkback and communications, remote roll, P&G slide faders, PPM or VU analogue meters, gold plated switches and connectors and external or internal powering.
Cooper Sound Systems, 31952 Paseo de Tania, San Juan Capistrane, CA 92675.
Tel: 714 248 1361.
Fax: 714 248 5256.



Audiophonics *CA50*—reference loudspeaker in the round

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Now Sony is setting a new standard in audio mastering.

The audio mastering revolution starts here.

Because now, Sony sets a new standard in audio mastering to take you into the next century.

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And it means that a single unit for recording and simple editing can be all you need. Compatibility with current and future Sony editing systems is guaranteed.

The new PCM-9000 MSdisc recorder is exceptionally compact, and because it has a modular design, you pay only for the functions you need.

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George Peterson.
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Recording Musician/Audio Media

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Dr Martin Ennis (Piano) and AGM's Anthony Morris (Horn) testing the prototype AGM *MR1* microphone recording system

AGM Microphone recording system

The AGM system was first introduced at the Berlin AES earlier in the year, and at the New York AES in October the complete system was seen. It's a true 20-bit technology and offers unique control of the tonal quality of a recording by selectively compiling sound components from all around the microphone. The tetrahedral '*SoundField* Style' microphone array consists of four capsules placed so that sound can be captured from all directions. The microphone controller is designed to match electronics to the performance of this microphone and feeds line level signal to four channels of 20-bit signal.

The microphone processor is a DSP-based 4-channel 20-bit mixing matrix where Ambisonics, UHJ encoded stereo, Mono) after a range of azimuth and elevation controls have been applied.

AGM Digital, 14-16 Deacons Lane, Ely, Cambs. CB7 4PS, UK.
Tel: 44 353 665588.
Fax: 44 353 667637.

Sabine digital audio processors

Sabine have introduced the *ADF-1200* workstations. These units are fully adaptive digital filters for sound engineers. The *ADF* workstations include 12 or 24-band digital parametric filtering, digital shelving filters, digital delay, noise gate, multiple configurations storable in memory and password protection, also featured is 31-band real-time analysis. Each ADF filter can be set anywhere from plus 12dB to -80dB cut one dB increments, and filter width may be set anywhere from a ninth of an octave to one full octave. The centrepoint resolution is one Hertz; thus giving engineers the ability to precisely control the shape of the sound.

The heart of the *ADF* Workstations and the function that distinguishes them from all other equalisation devices, is their ability to automatically detect feedback and adaptive digital filters assign an extremely narrow notch filter (10 times narrower than a third of an octave EQ filter) to remove the ringing frequency. The unit accomplishes this is approximately 0.4s without changing sound quality.

UK: Shuttlesound Ltd,
4 The Willows Centre,
Willow Lane, Mitcham, Surrey,
CR4 4NX. Tel: 081 646 7114.
Fax: 081 6407583.

Avid launch cheaper models

Avid Technology have announced the launch of two more *Media Composers*, models *100* and *1000*.

The *Media Composer 100* is based on the Apple Mac *Centris 650* and offers nonlinear picture quality guide quality only and provides up to 200 minutes of disk storage. The Mac *Centris 650* has 32Mb RAM two 14-inch multisync monitors and stereo speakers. Cards include a NuVista video processor and the latest generation of JPEG Compression board. The cost £13,950.

The *Media Composer 1000* combines the full functionality of the v5.0 software storage for £39,000. Included within the system components will be a 3Gb disk drive developed specifically for Avid Technology.

Avid Technology Inc,
Metropolitan Technology Park,
One Park West, Tewkesbury,
MA 01876, USA.
Tel: +1 508 640 3158.
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NEUMANN TLM193

New microphones from Neumann are something of a rarity, so it is quite surprising to see two launches quite so close together. No sooner have we come to terms with the reintroduction of the *U67* than along comes an altogether new model, the *TLM193*. This is priced to fall firmly in the middle of the market—to be an 'affordable' Neumann. Neumann microphones can be regarded as two broad groups: the old, established tradition represented by the various *U*-prefix and *KM* microphones, and the more recent models, such as the *TLM*s, with their new shapes. This new model has a foot in both camps. While clearly following recent developments in terms of electronics and model number, its styling is quite in the classic Neumann mould.

The marketing for the *TLM193* is quite specific in its aims—Neumann quality for the budget conscious. The idea is a fully fledged pro Neumann microphone, sufficiently simplified in terms of facilities (not performance) to allow its price to appeal to private studios as well as the larger facilities who can already afford the familiar grown-up models. The design quite blatantly says, 'this is a Neumann—accept no substitute.' Perhaps with an eye to some recent models with more than a hint of imitation about them.

Although significantly smaller than the familiar *U87*, the *TLM193* remains a large-diaphragm, double-membrane, side-fire microphone with a reassuring weight and chunkiness about it. It comes in an elegant polished dark wood box along with its stand adaptor ring, but that is all —windshields and shockmounts are extra. Like the *U87*, the *TLM193* can be stand-mounted in three ways: via the familiar Neumann screw-lock XLR connector with its built-in swivel and stand thread (not supplied); with a simple screw-in base ring through which the connector passes; or using a typically elaborate optional cat's cradle suspension. In fact, when I received the review sample the elastic suspension was not yet available, and a modified *TLM170* mount was provided. This handled the weight of the microphone with ease, never sagging or drooping, although I did have to tighten up the swivel joint before I could use it—as always seems to be the case with these cat's-cradle mounts. Apart from this, the construction quality and attention to detail are of the highest order, as one would expect from Neumann. The all-metal body and grille also suggests that the microphone will last as long as its prized predecessors.

Operationally the *TLM193* is just about as simple as it is possible for a microphone to be. It is phantom powered, with no external electronics of any kind, and has no controls on it whatsoever. Its polar pattern is fixed at cardioid, and it has no bass cut filter or pads. Despite this, it is supposed to be capable of handling 140dB spl at less than 0.5% THD, and its claimed frequency response extends down to below 8Hz (and up above 20kHz).

***TLM 193* a classic combination of accuracy and flattery**

With an A-weighted self-noise of 10dB this adds up to a specification worthy of a top-flight microphone. Which is pretty much what it sounds like.

However much Neumann wanted to offer a less expensive microphone, it is hard to imagine them compromising their famous sound quality, and certainly no corners seem to have been cut here. The *TLM193* has the classic combination of natural accuracy with a touch of flattery. The extended HF response allows detail and sparkle without a trace of hardness, and is not so pronounced as to be described as bright. At the other end of the spectrum, the sound is warmer than, say, an AKG *414*, but again not exaggeratedly so—this could not be called a coloured microphone. On voices it gave me the sound I expected to hear from a microphone of this shape, and it handled its sternest test—two trombones flat out a foot away —without complaining. It is hard to imagine an application the *TLM193* could not deal with —except, obviously, those requiring another polar pattern—and it deserves to join the select band of classic all-rounders. Even its size is on its side, as it can be poked into places a *U87* can not reach.

Only a company of Neumann's status could have the nerve to describe a microphone costing nearly a thousand pounds as being 'for the budget conscious'. The *TLM193* does, however, justify its manufacturer's claims of following in the Neumann tradition for substantially less cash than its famous stablemates. By stripping away the frills, the *TLM193* offers the classic Neumann sound without the classic Neumann price tag. ■

Dave Foister

HHB DAT TAPE

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USA: INDEPENDENT AUDIO
Tel: 207 773 2424
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Contact: Fraser Jones

HHB

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ALL DAT TAPES ARE NOT THE SAME

In recommending DAT as the format for exchanging digital audio*, the European Broadcast Union also warned its members that the tape itself should be chosen with great care. Block errors, archiving stability – even head wear are affected directly by the quality and design of the tape and the shell in which it's housed.

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* EBU Technical Recommendation R64-1992

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Address: _____ Phone: _____

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Summer season

No quarter given by Metallica or their EV *MT4* SR system

Despite all the talk about recession, the summer touring season has been very busy with both arena and indoor concerts, minifestivals and fully fledged festivals. The Metallica tour set the season off to an early start with technical support from SSE Hire (together with dB Sound from the States) and a 250kW Electro-Voice *MT-4* system, which is proving to be very well-suited to large, outdoor events in terms of coverage and bandwidth. Big Mick Hughes mixed the band on a TAC *9000* console with Paul Owen behind a Midas *XL3* on monitors. Davy Kirkwood on FOH and Suicidal Tendencies. (Grand Funk reborn?)

Other SSE activities included Hot House Flowers with an *MT2* system and Norman Verso on house—Niall Slevin on monitors, Alexandra Palace Jazz Festival with EV *MT2/DML* speakers and TAC and Midas consoles. There was also a UB40 world tour with Jerry Parchment engineering the house sound behind a TAC *SR9000* and John Ormesher running monitors on a TAC *6500*. The system runs at a comfortable 80kW powering a mixture of EV *MT4* and *MT2* speakers.

Britannia Row Productions are currently out with Depeche Mode. Jon Lemon is engineering the house behind a Midas *XL3* plus extender running a flown Turbosound *Flashlight* system while Brit. Row stalwart, Anzac, is on monitors. The left and right standard clusters are being augmented by new, underslung mid-high cabinets for better overall coverage and the overall production (at the Lausanne show in Switzerland) was outstanding for the vocal sound (though the subwoofers tended to be overpowering at times)—the best this writer has heard for some time.

Other *Flashlight*-equipped tours from Brit. Row include Peter Gabriel (currently out with a mixture of standard *Flashlight* and custom cabinets), with Peter Walsh on house and Bryan Olson on monitors, and the early summer European tour for Luther Vandross with Mark Smith on sound house.

Britannia Row have also had a busy festival season during the summer and this included Glastonbury with Steve Ludlum & John Newsham sharing the FOH duties and Gareth Williams & Steve Fluwin on monitors, and a minitour to cover three consecutive festivals across Europe, namely: Midtfyn, Roskilde and 'Out in the Green' at Frauenfeld, Switzerland ('Out in the Rain' would have been a more appropriate description). Marcus Hyde & Bob Lopez were on house with Alan Bradshaw & Dee Miller on monitors.

Zurich provided an opportunity to virtually A-B two large touring systems from different stables —though with different acts. An interesting exercise, to say the least. The Hardturm football stadium was the venue for Bon Jovi and Billy Idol with James 'Trip' Khalaf mixing the former on Clair Brothers custom consoles through an *S4 MkII* system. The speaker system were arrayed in two vertical 'hangs' of 7 x 4 *S4*s and 8 x 2 subwoofers.

The following day saw a swift (frantic?) turnaround for the respective crews with the installation of a Showco *Prism* system for Prince and Duran Duran. The main house system was also augmented with a central delay cluster flown behind the lighting control tower. A particularity of the show was that whereas Duran Duran were mixed from the house position as per usual, Prince wanted to be mixed from the stage —presumably so that he could monitor the results.

Dispatch of Paris have had a busy summer, including the Michel Sardou tour with Patrice Cramer mixing front-of-house with the aid of a Saje *Memory* console and a Meyer *MSL-3* and *UPA-1A* system. The speaker arrangement was broken down into two main left and right clusters with delay arrays and a trio of *UPA*s.

Other events with Dispatch include the Jean-Michel Jarre tour and the Leysin and Paleo festivals in Switzerland. The latter were under the supervision of Francois Maze & Olivier Croguennec with Soundcraft *Europa* and *Series 4* consoles and a Meyer system comprised of *MSL-3*s, *650* subwoofers and *DL-2* low mid horns. The Paleo festival saw them joining forces with MSI, who supplied the control end for Neil Young and Booker T and The MG's, with Davey Moore in charge of the sound systems.

Meyer Sound were once again at their annual rendezvous with the Montreux Jazz Festival, this year with Jurgen Dudda of Germany in charge of the installation and festival regulars, Chris Ridgway & Steve Thorneycroft, running house and monitors. The 1993 festival saw a change of venue (the Palais des Congres) and a change of system, with the world debut of the *MSL-5* —a smaller version of the *MSL-10* arena enclosure. Chris Ridgway commented that working in the new hall was easier than in the Casino: 'Some engineers always had difficulty in coming to grips with the fact that the Casino is basically a small venue and that you have to mix around an already loud stage sound. The Stravinski Hall has been a pleasant surprise in that the stage volume was often very reasonable and the spaciousness of the room allowed mixers to hear the results easier.' (See also Mike Lethby's report in the August 1993 *Studio Sound*).

Talking about new systems, the L Acoustics *V-DOSQ* made its first major concert appearance at the *Fete de l'Humanite* in Paris in September for three nights of open-air festivals. Under the aegis of sound company, Potar Hurlant, the system featured left-right stacks of 12 cabinets each plus two outrigger towers of eight enclosures. The system was augmented with Heil Incremental subwoofers for the low frequencies. (The *V-DOSQ* concept will be covered more fully in a future issue.) ■

Live Sound is compiled by Terry Nelson

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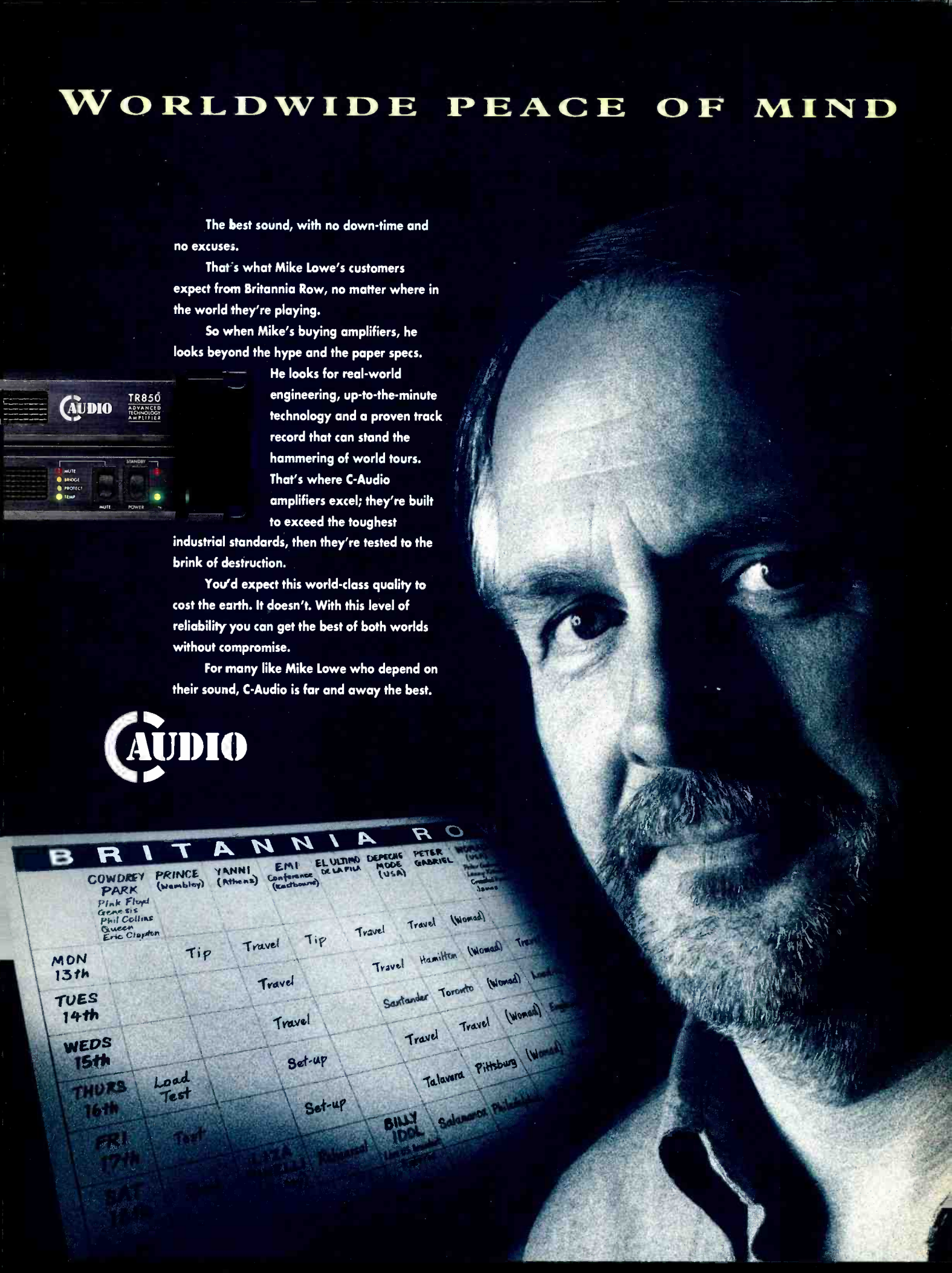

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Matchbox DI

Award's *Matchbox* is a DI box with a difference, encompassing applications beyond the usual confines of this type of interface. Built into a small metal case with two jack sockets, two pots and three switches, power comes from a 9V battery or optional AC adaptor which improves the unit's headroom.

One balanced output is provided on a stereo ¼-inch jack feeding from a single jack input working in conjunction with a sensitivity pot and INSTRUMENT-LINE selector switch. From here the signal passes through a switch-activated guitar EQ circuit which also inserts a treble pot. Finally a switchable speaker simulator, similar in performance to that employed in Award's *Sessionmaster* recording preamp, completes the chain.

What this unit does is concentrate on the generation of clean guitar sounds with some considerable success. Firstly the unit is supremely silent, secondly the basic tone without anything added is very good. Activate the Guitar EQ and there's a noticeable brightening and filling out of the sound with clockwise rotation of the treble pot giving well tuned boost to the upper frequencies particularly well suited to bringing out Strat character and resonance. Counterclockwise movement is less pleasing on a single coil but tones down a humbucker well. The speaker simulator can then be added to this or used in isolation its basic effect being to de-emphasise either end, and increasing the focus on the remainder. These two simple sections offer a surprisingly wide range of tonal possibilities not all of which are subtle. My particular favourite is using the EQ section without the speaker simulator for a very vibrant and wholesome rhythm sound which persuaded me that perhaps those old strings did not need changing after all. The simulator does favours when processing pedalled guitar sources as it rounds off the top end with an 'organic' feel.

On the downside, the *Matchbox* could do with some sort of input overload LED simply for the sake of reassurance and I would have thought that an XLR and phantom powering ought to be expected.

The *Matchbox* does not really look like much but it has got to be a far better way of DI-ing a guitar or anything else for that matter—it is particularly handy on organ samples—than your average DI black box. The sound is solid and controllable and it is a great way of supplementing the clean feed to and from a multieffects unit and as such it is a really good starting point. Beautifully quiet too.

Award, PO Box 3, Basingstoke RG24 0GB UK. Tel: 0256 477222.

Roland S760

Roland have announced the addition of the 'affordable' *S760* to its range of *S-series* digital samplers in the form of a 1U-high rackmount with improved D–A convertors.

The operating system is upgradable and compatible with *S700* sample libraries as well a being able to convert samples from *S550*, *W30* and Akai *S1000/1100* samples. More than three minutes of stereo 44.1kHz sampling time is available with internal RAM expanded to its full 32Mb while a new Quick Load feature loads only those sounds on hard disk that are tagged for playback. Load While Play permits samples in memory to keep playing while the *S760* loads new volumes, performances, patches and partials.

Digital 2-band EQ can be configured to match the output configuration to act as four stereo EQs or eight independent EQs.

An optional interface supports a video out and mouse connector for simple visual editing and a 600Mb CD-ROM disk is included.

US: Roland Corporation, 7200 Dominion Circle, Los Angeles CA 90040. Tel: +1 213 685 5141.

UK: Roland UK, Rye Close, Ancells Business Park, Fleet, Hampshire GU13 8UY. Tel: 0252 812879.

Programmable SansAmp

SansAmp's new *PSA1* programmable guitar preamp offers 98 presets and the company's analogue tube amp emulation circuitry. The 1U-high rackmount combines a two figures LED read-out and 256-step pots for preamp, buzz, punch, crunch, drive, low and high EQ and level.

Pot settings of desired sounds are stored on a recessed SAVE button and single LEDs give directional information on nulling pots to existing patch values.

Forty-nine factory presets are supplemented by 49 user locations with dumping, loading and preset selection possible via MIDI. Dual rear connectors are supplied on ¼-inch jacks and XLR both selectable individually for instrument or line operation along with a mono send and stereo return effects loop selectable for 50-50 mix. Meanwhile the *GT2* goes some way in improving on the original SansAmp Pedal with bigger controls and more immediate tweakablility. Pots are provided for level, drive and high and low post EQ plus three 3-position switches for altering the basic character of the foot pedal. Amp emulations are supplied for Fender, Marshall and Mesa Boogie styles with clean, high gain and hot wired responses with approximations of centre, off-axis and distant miking.

Tech 21, NYC, 1600 Broadway, NYC, NY 10019.
Tel: +1 212 315 1116.

Award's *Matchbox* is a DI box with a difference

Visual Conductor

Taking the concept of visualising music tempo a stage further, TimeStream Technologies' *MC/48PR Visual Conductor* is a 1U-high rackmount that displays beat visually on 15 LEDs and functions as a remote master for the company's original stand-alone *Visual Conductor*.

The latter uses a foot square smoked plastic panel and 48 LEDs to emulate the motion of a baton in response to MIDI clocks.

Tempo and time signature can be entered from the front panel and it is designed to function as the central timing device in a set up. It will read and generate MIDI clocks, MIDI start, Stop and Continue commands, generate an audio click and through an audio input follow incoming audio clicks tap-tempo style.

TimeStream Technologies. 318 Marlboro Road, Englewood, NJ 07631. Tel: +1 212 724 1794.

Switchblade

Sound Sculpture have upgraded their original matrix switching system with the *Switchblade* 16 aimed at guitar rigs and any other application that requires fast and efficient rerouting and mixing of numerous inputs and outputs.

With 16 inputs and 16 outputs in a 1U-high unit, the *Switchblade* permits simultaneous mixing and distribution of audio from any input to any output with programmable gain on each audio path which can be influenced by MIDI continuous controller data. There are 75 user-programmable presets, with user-programmable crossfade times, each of which can transmit a burst of 16 program change commands.

The system can be controlled by MIDI, footswitch or a soon to be released *FP2* footboard.

US: Sound Sculpture Music Instrument Products, 5741 Arapahoe Road, Suite 2A, Boulder, CO 80303. Tel: +1 303 442 1954.

Overseas: Systems Workshop, 24 Church Street, Oswestry, Shropshire SY11 2SP, UK. Tel: 0691 658550.

Music News is compiled by Zenon Schoepe

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MACBETH

The stage set of Savonlinna's *Macbeth*

The Castle of Olavinlinna dates back to the year 1475 and stands on a rock island, surrounded by swirling black water, in the Eastern part of Finland. Most of the year it is a major tourist attraction, but every July it gains particular significance when it plays host to the Savonlinna Opera Festival.

The Festival was first held in 1912 and continued its run until 1916. However, its apparent demise became a hiatus when it was resurrected in the late 1960s. Since then the festival has gained recognition both for its high standard of performance and for the unique ambiance offered by the castle setting. Opera performances are held in the courtyard, and the surrounding high stone walls add considerably to the atmosphere. Of the several operas performed every year, the main premiere this summer was Verdi's *Macbeth*, which was videoed by the Finnish Broadcasting Company (YLE) crew and OB vehicles. Eight cameras, digital sound and partly digital video were the order of the day.

Some 80,000 visitors see the opera performances each year—2,300 of them from the courtyard. The castle is an impressive place in its own right, and when a good opera is added, it is quite unforgettable.

In 1989 YLE videoed *The Flying Dutchman* on the same stage. It was released as a commercial video and also broadcast on the Finnish national network. *The Flying Dutchman* was partly funded by the French AMAYA, and when they were satisfied with the results, they wanted to continue.

'*Macbeth* was chosen this year, because currently there was no remarkable competitor available on video cassette,' says TV director Aarno Cronvall, who also directed *The Flying Dutchman*.

'In *Macbeth* we had very good soloists, and though there were no big international stars, casting was very good. It will be released as a commercial video cassette, and probably on a laserdisc.

'I wanted to emphasise my directing in music, because that is more what I have expertise in, more than drama,' he explains. 'I also examined carefully in what areas we succeeded when making *Dutchman*, and what limits and possibilities the castle has.'

As a result, co-operation with the head cameraman was necessarily close from the beginning. However, the planning and analysis period involving the stage director was delayed and this tightened the schedule.

Siting the OB vehicles has always been a major problem in Olavinlinna TV productions—the castle is on an island that provides almost no free space ▶

Every year the Castle of Olavinlinna provides a dramatic setting for a Finnish TV spectacle. Ilkka Kangastalo reports on the production of Verdi's *Macbeth*

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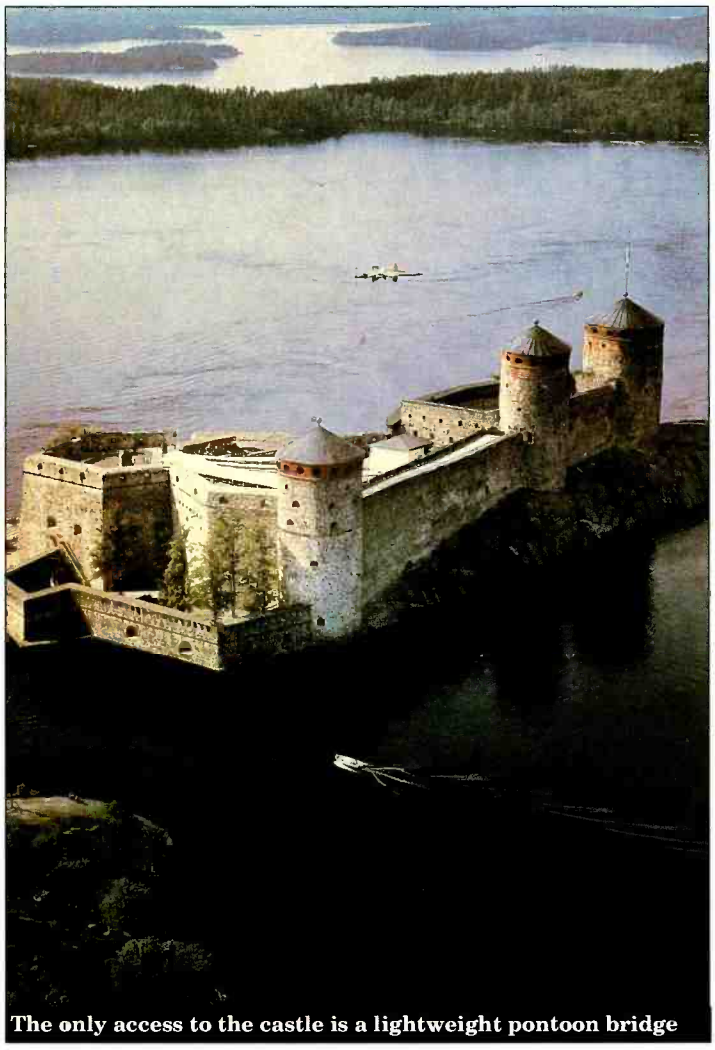

The only access to the castle is a lightweight pontoon bridge

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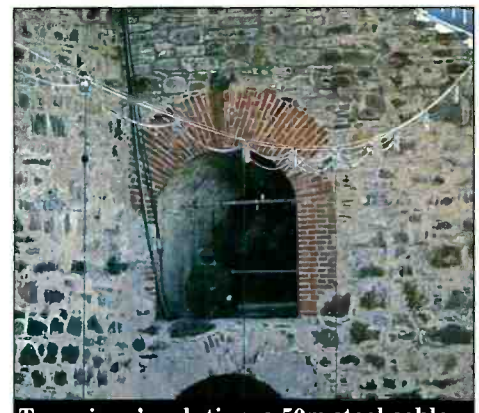
Siting the OB vehicles has always been a major problem in Olavinlinna TV productions—the castle is on an island that provides almost no free space ▶ outside its high stone walls. Several solutions have been tried: the vehicles cannot be driven to the island, nor to anywhere nearby and laying cables through the heavy river currents surrounding the castle is a risky business. The only access to the castle is a pontoon bridge that spans a shipping route. This has to be turned aside every time a ship passes, so no cables can be run across it.

OLAVINLINNA ORCHESTRA MICROPHONE LIST

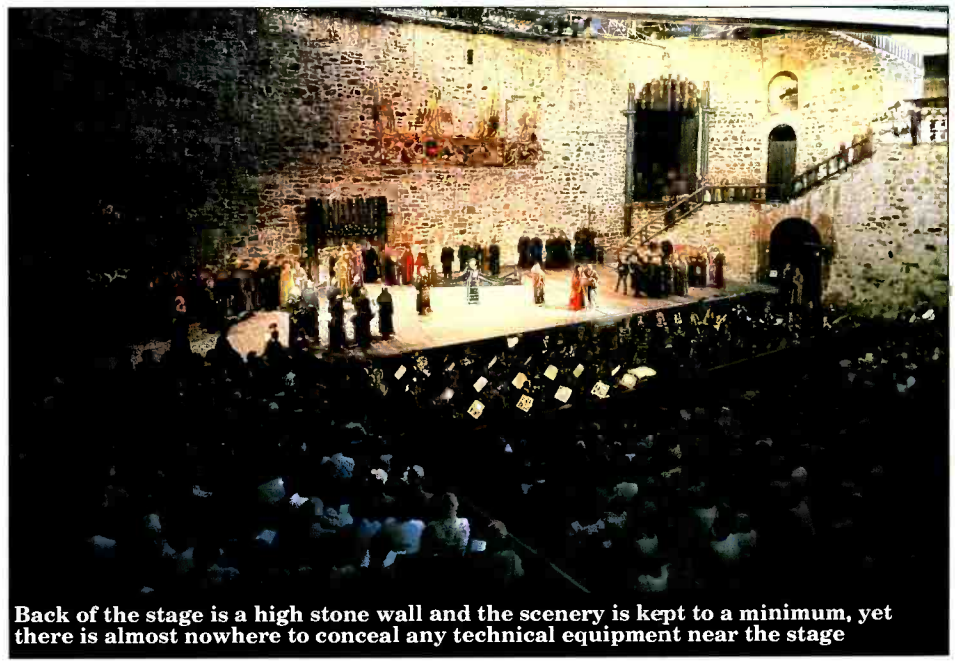
Solo Violins	B&K *4011*
Violins	B&K *4006*
Cello	B&K *4011*
Bass	TLM *170i* (2)
Harp	TLM *170i*
Woodwinds	Neumann *KM100* (stereo)
House stereo pair	B&K *4011*
All suspended microphones	Sennheiser *416*
Front of stage	Sennheiser *MKH60*

In a production of *The Flying Dutchman* four years ago, vehicles were kept on a barge moored to the waterline by the castle island. The waves gently rocked the barge throughout the recording, however, and caused seasickness among members of the crew working inside the vehicle—this year a solid grounding for the OB trucks was considered a necessity. Consequently, both production vehicles were hauled to the island by barge and parked wherever it was practical.

The opera was performed on a temporary stage, and this caused some problems when compiling a shooting script. After the first of the four nights was taped, director Cronvall and head cameraman Klaus Relander realised that radical changes were



Tamminen's sclution: a 50m steel cable between the side walls with a microphone cable support system.



Back of the stage is a high stone wall and the scenery is kept to a minimum, yet there is almost nowhere to conceal any technical equipment near the stage

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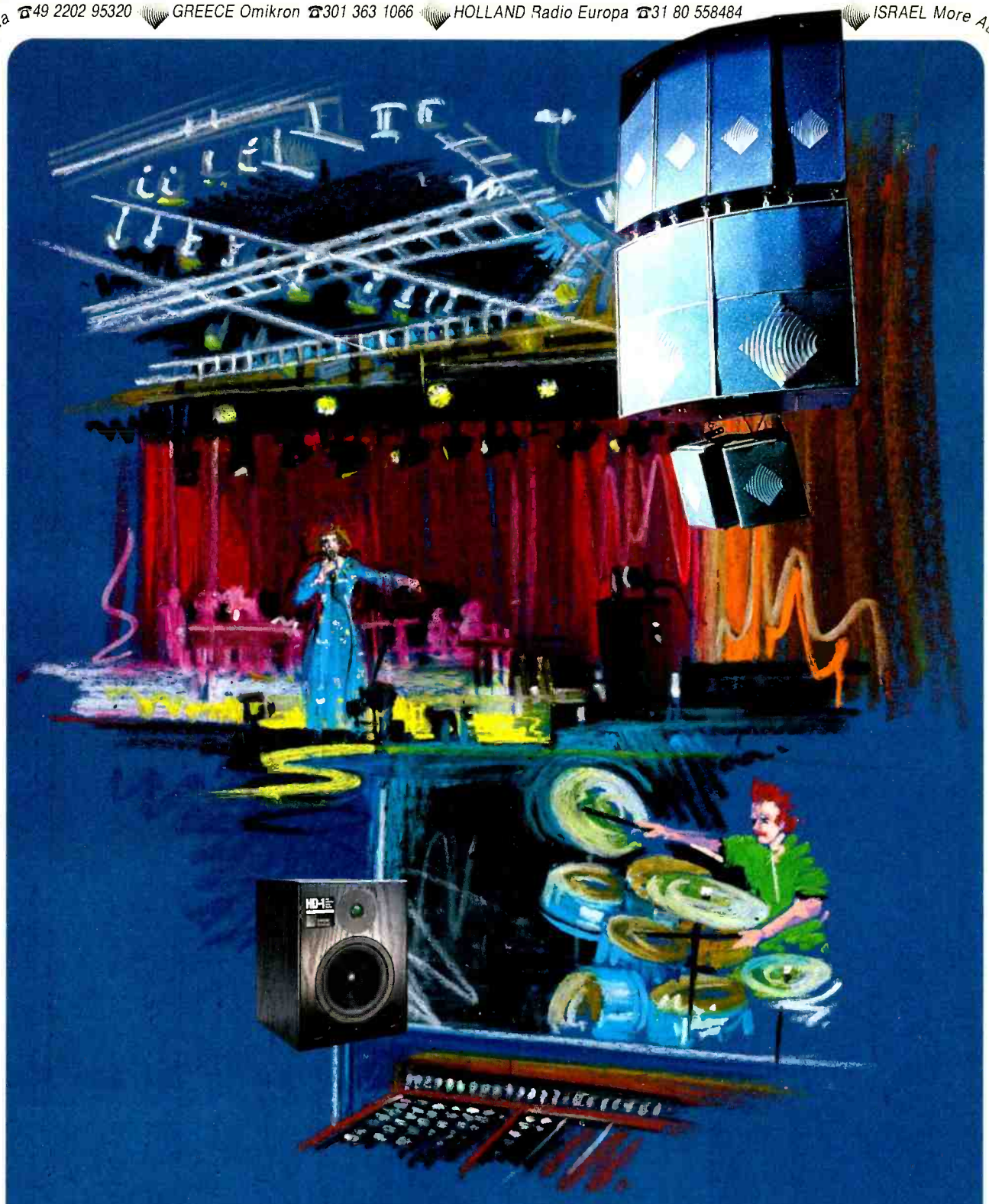

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not need to be touched during the performance. The costumes in *Macbeth* were extremely thick and heavy and even in the cool of the castle, perspiration was expected to cause humidity problems with the microphones—but happily this was not the case.

'This wireless system gives a very rich full tone, I tested it on my own head (Tamminen is a highly trained singer himself) before going to Olavinlinna, and since it worked with me, I knew it would work in this production as well. With bass voices wireless does not necessarily give good results when placed on top of the head, the low end is not complete. For that reason Banquo (Jaakko Ryhänen) had a microphone at his chest. But the higher the voice register, the better the result.'

Tamminen's basic idea of recording stage action in *Macbeth* was to use three different systems: ceiling-suspended microphones, shotguns in the very front of the stage, and wirelesses.

'I believe I will employ something from all systems in mixdown,' he comments. 'If I was forced to choose just one, it would be wirelesses, no doubt about it,' he confirms.

Tamminen plans to mix the tracks down with very little panning, all wireless mics remaining in the centre. 'This may give an uneven effect in stereo image, especially when moving from close-up shot to a long shot, for instance, but good clarity will remain'.

Lady Macbeth, Cynthia Makris having a microphone concealed in her hair

Mic placement

The placement of overhead microphones was by no means easy. There were eight ceiling-suspended mics, four across the front section of the stage and four across the orchestra pit. The castle courtyard is normally roofless, but during the opera season it is covered with temporary plastic roof for protection from the weather. Access to the roof is, therefore, impossible; the back of the stage is a high stone wall and the scenery is kept to a minimum. There is almost nowhere to conceal any technical equipment near the stage.

Tamminen's solution was to hang a steel cable across the 50m between the side walls then attach suspension systems and a microphone cable support system.

Two cables were bolted on the side walls; while the cable was hanging loose, eleven specially designed aluminium 'gadgets' were attached. Each gadget had one, two or three axles, depending on how many microphone cables the gadget was to support, each axle had two nylon rollers side by side. Microphone cables were then threaded through each gadget, over the rollers, and dropped down at the desired position. Each gadget was tied to the next one by nylon rope, and getting the required distance between the gadgets was achieved simply by leaving the right amount of loose rope between each gadget. Between the gadget and the microphone there was a chunk of steel bolted around the mic cable to ensure that once the mics were pulled to their upper position they would also slide down afterwards. (During performances other than *Macbeth*, they would be lowered.) The steel cable was then tightened and the system rose to its operating position. After that the nylon rope was tightened, and the gadgets slid to their positions over the orchestra, with the microphone cables hanging down where they were supposed to be.

With this construction, microphones could be raised and lowered individually without taking down the whole system. All microphones could also be pulled out of sight near the side wall, like a curtain, if necessary. Anchoring points were fairly high and the rig did not obstruct the view to the stage. The system did not need to be touched after it was in the right position and worked smoothly throughout the performance.

There was a similar suspension system over the main stage. Microphones here were Neumann *MKH416*s, four in both systems. They were hanging freely and pointing straight down. A foam windscreen was necessary in case of a windy night.

Raija Kurkola sewing a microphone into Macbeth's costume

The Young Ghost

Tamminen decided to use Brüel & Kjaers for violins, Neumann *TLM170i* for basses and a stereo pair of Neumann *KM100* for woodwinds. There was also a stereo pair of B&K *4011*s over the audience, which was mainly for house recording but also connected for TV use.

There were an additional three Sennheiser *MKH60* shotgun mics aimed towards the stage and slightly upwards, right at the front edge of the stage. One of them was aimed manually by Raija Kurkola. She was hiding in the orchestra pit between the harp and Sennheiser wireless receiver station. In addition to handling the microphone ▶

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minimum. There is almost nowhere to conceal any technical equipment near the stage.

Tamminen's solution was to hang a steel cable across the 50m between the side walls then attach suspension systems and a microphone cable support system.

Two cables were bolted on the side walls; while the cable was hanging loose, eleven specially designed aluminium 'gadgets' were attached. Each gadget had one, two or three axles, depending on how many microphone cables the gadget was to support, each axle had two nylon rollers side by side. Microphone cables were then threaded through each gadget, over the rollers, and dropped down at the desired position. Each gadget was tied to the next one by nylon rope, and getting the required distance between the gadgets was achieved simply by leaving the right amount of loose rope between each gadget. Between the gadget and the microphone there was a chunk of steel bolted around the mic cable to ensure that once the mics were pulled to their upper position they would also slide down afterwards. (During performances other than *Macbeth*, they would be lowered.) The steel cable was then tightened and the system rose to its operating position. After that the nylon rope was tightened, and the gadgets slid to their positions over the orchestra, with the microphone cables hanging down where they were supposed to be.

With this construction, microphones could be raised and lowered individually without taking down the whole system. All microphones could also be pulled out of sight near the side wall, like a curtain, if necessary. Anchoring points were fairly high and the rig did not obstruct the view to the stage. The system did not need to be touched after it was in the right position and worked smoothly throughout the performance.

There was a similar suspension system over the main stage. Microphones here were Neumann *MKH416*s, four in both systems. They were hanging freely and pointing straight down. A foam windscreen was necessary in case of a windy night.

Tamminen decided to use Brüel & Kjaers for violins, Neumann *TLM170i* for basses and a stereo pair of Neumann *KM100* for woodwinds. There was also a stereo pair of B&K *4011*s over the audience, which was mainly for house recording but also connected for TV use.

Kari Tamminen (left) and Jukka Siberg at the Studer desk

There were an additional three Sennheiser *MKH60* shotgun mics aimed towards the stage and slightly upwards, right at the front edge of the stage. One of them was aimed manually by Raija Kurkola. She was hiding in the orchestra pit between the harp and Sennheiser wireless receiver station. In addition to handling the microphone ▶ she monitored receiver units. The new Sennheiser *EM1046 RX* displays not just the normal field strength information, but transmitter battery charge as well. Spare batteries were at hand, in case any of them ran low, but no changes were necessary. The two fixed Sennheiser *MKH60* shotguns were recorded to Sony *7030* DAT.

TV-S sound vehicle outside the castle

'The main purpose for using three shotguns in front of the stage was to pick up the choir, especially when the choir of witches were singing lying down,' explains Tamminen. 'They also acted as a backup for wirelesses.'

'The stage is so wide that a normal stereo pair is not enough to cover all action on the sides,' Tamminen explains. 'The suspension system worked excellently for the choir, even though they moved around over a very large area.

'If we'd worked without cameras, suspended microphones would be adequate—even without wirelesses. But in the TV world we have plenty of close-up shots, and if a soloist turns around in a close-up, the sound will disappear and there's the feeling that something is missing. The house stereo pair and suspended microphones were for overall atmosphere and stereo image, the wirelesses were for clarity and to support visual realism,' he says.

'When a suspended microphone is right above the soloist, it works acceptably no matter which direction the soloist is singing in, and cold spots are less apparent.

'There were lots of squeaks from the wooden floor, but it was part of the atmosphere. So were the screaming swallows.'

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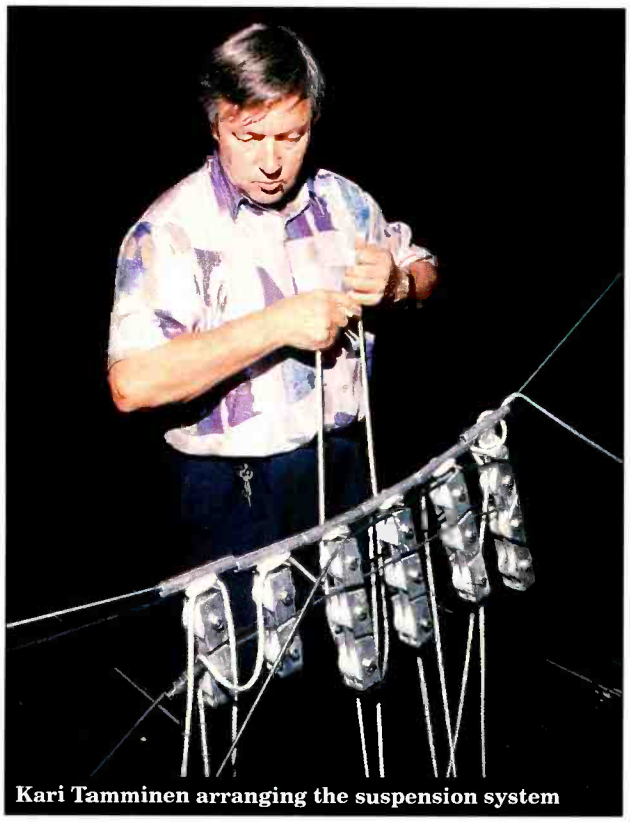

Kari Tamminen arranging the suspension system

SONY 3224A TRACK LIST	
1-4:	Ceiling suspension microphones, stage
5-8:	Ceiling suspension microphones, orchestra
9:	Harp
10:	Hand-held shotgun microphone
11:	Solo violin
12:	Violins
13:	Cello
14:	Basses
15-16:	Stereo pair for woods
17:	Macbeth
18:	Lady Macbeth
19:	Banquo
20:	Macduff, First Ghost
21:	Lady-in-waiting, servant
22:	Malcolm, Second Ghost
23-24:	Stereo pair for house B&Ks

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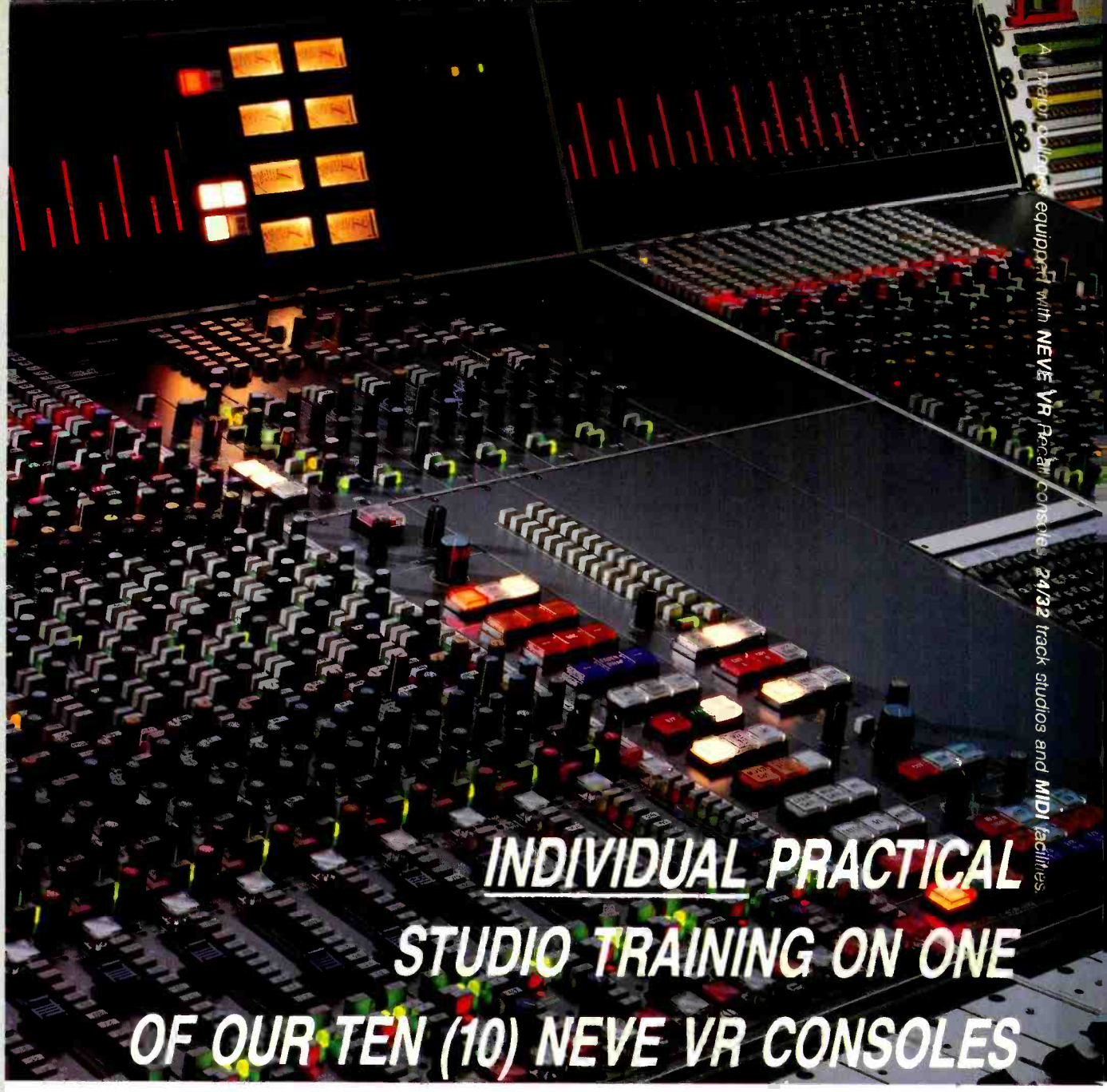

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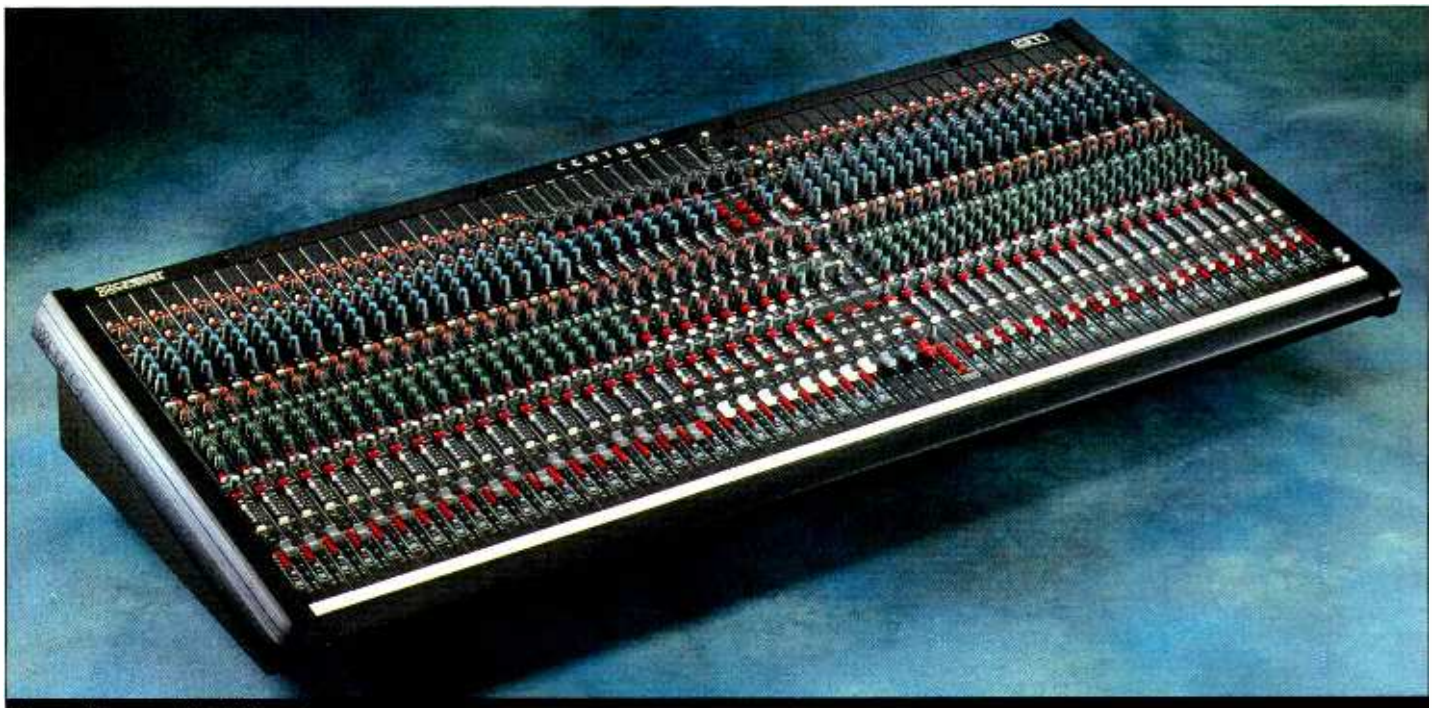
CENTURY INNINGS



Crest *Century GT* with centre groups

American-based Crest Audio are a rapidly expanding company with bases in Europe, the Far East and Latin America. The company was formed in 1978 as an amplifier manufacturer and quickly gained a reputation for producing high quality, compact power amps—in fact, Crest were the first to produce a 2U-high, 400W-per-channel, 4Ω amplifier. From the beginning, the company's main market has been sound reinforcement and four years ago they expanded the operation by acquiring the rights to manufacture and sell worldwide the Gamble *Series EX* consoles, and as recently as 1992, the company formed a dedicated console division. The high-end, if not esoteric, Gamble consoles have recently been joined by the *Century Series*, which are targeted at the mid-range SF market currently dominated by companies like Yamaha and Soundcraft.

The *Century Series* consoles retain many of the features and high standard of engineering of the more expensive Gamble consoles. There are presently five variants of the *Century Series* —three house desks (*GT*, *TC* and *SP*) and two monitor desks (*LM-Mono* and *LM-Stereo*).

Each console uses the same frame type, which is supplied in six sizes ranging from 34-inch to 82-inch widths and catering for 16–52 input modules.The modules from different house consoles are interchangeable, allowing for a variety of customised configurations.

House consoles

The *Century GT* is the flagship of the range, and it is this console which will be examined here in detail. Brief outlines will be given for the lesser featured *TC* and *SP* desks to distinguish facilities and applications.

All house consoles are fitted with six types of module as standard: Input, Group, and four Masters; optional stereo and matrix expansion modules are also available. As mentioned, consoles can be supplied with up to 52 input modules with either four or eight groups depending on size. Master modules provide Left, Right and discrete Mono outputs with a 2-channel matrix system.

An input module can, broadly speaking, be divided into five sections —input, equaliser, auxiliary, bus assign and fader. Controls have been sensibly laid out and are surprisingly accessible considering the slimness of the module.

The input section incorporates switching for mic-line, phantom power, 15dB pad, phase reverse and an 80Hz 12dB/octave HPF. The 4-band sweep equaliser makes use of dual-concentric pots in order to maximise use of space, and provides an overall range from 40Hz to 20kHz ±15dB with generously overlapping bands. The HF and LF bands are each switchable between peak and shelf, while the two mids are peak with a fixed Q. The sonic performance of the EQ is excellent, producing high quality, accurate results.

There are eight auxiliary sends arranged in two sections. Aux 1–2 and 3–4 are switchable between two level controls, while Auxes 5–8 each have dedicated controls. Pre-post switching is grouped for Auxes 1–4 and 5–8, and an internal jumper allows the pre signal ▶

Crest's *Century Series* desks offer an attractive alternative to more established desks in the middle of the live console market. Patrick Stapley rides the wave

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to be sourced before of after the EQ. An additional feature is the facility to locally disconnect Send 8 from the Aux bus and route it to the channel's direct output—this is useful on occasions where it is unnecessary to tie up a whole aux bus (for example, to send to a one-off effect from a single channel).

Routing assignment is from six buttons feeding the mono output, and the eight groups and main stereo output in pairs via the centre-detented pan control. Positioned just above the 100mm fader is the PFL button, which directs signal to the console's headphones and local monitor outputs. Below this is a Dynamic Signal Present Indicator: a green LED indicates signal present and varies in intensity according to its level, while a red LED lights when signal (measured at three points in the module) gets within 3dB of clipping. This simple but effective metering system has the secondary function of indicating PFL selection by lighting the peak LED at half intensity. Although this may seem confusing, in practice there is no problem in differentiating between functions. Both PFL and the two level indicators remain active during channel mute, enabling the engineer to visually and audibly monitor muted signals.The final set of controls on the module are the SCENE MUTE switches which assign the channel to the four mute groups controlled from the central master switching. A SAFE switch is built into each section.

Group module

Each group module contains two signal paths—the group itself and a fully featured mono effect return. In normal operation, the 100mm fader will govern group level, while the effects return is controlled by a rotary level control. This relationship can be locally swapped using the fader reverse facility.

The group output has individual routing to the stereo and mono buses as well as selection to a group XLR output at the rear of the console. Additionally, the group signal can be sent to the console's two matrix outputs (A and B) via two rotary level controls.

The effects return can accept both line and mic input levels via its wide-range gain control. Also provided is basic fixed HF (10kHz) and LF (80Hz) equalisation, plus access to Aux 1–2 or 3–4 using the same arrangement as on the input module. Output is to the Stereo, Mono or Group buses via level and pan controls, and access to the four Scene Mutes is also provided.

Both paths incorporate the same Dynamic Signal Present LEDs and PFL switching used in the input module, but the group includes an additional 10-segment output meter built into the uppermost part of the module.

Master section

Four modules make up the master section. Three provide outputs for the Left, Right and Mono buses on long-throw faders, while the fourth controls monitor functions, talkback, matrix masters, etc.

The eight Aux Master rotary controls are distributed centrally between the Left and Right Master modules. Each is fitted with an AFL switch which functions in mono for single selections and in stereo for paired selection. Aux master mutes are sited well above the other aux controls to avoid accidental operation. Aux muting is further controlled by an overall GRAND MASTER switch which controls all master mute selections. This simple but rather ingenious system can be used in a variety of ways: for example, to cut effects sends at the end of a song (rather than muting the returns which cuts off the effect tail) or to control

LM-Stereo console detail

spot delays from the central part of the desk.

The middle section of the Mono Master is taken up with a line level stereo program return. This is similarly featured to the mono effects returns and includes a stereo version of that EQ. Unlike the mono returns it also includes matrix routing and has the facility to simultaneously send to Aux 1-2 and 3-4—all output assignment is sourced post the output level and balance controls, there being no dedicated matrix or auxiliary level controls.

The main stereo and mono buses can each be assigned to the Matrix pre or post fader, and the Left and Right outputs can also be routed through to the Mono bus, allowing a good deal of flexibility. The main stereo output may also be routed to Aux 1-2 and-or 3-4, with level being controlled from a single pot. This facility allows quick monitor mixes of the house mix to be set up directly from the stereo output, which can then be augmented from individual channels.

The four SCENE MUTE master switches that control programmable group muting for the input modules and effects returns are sited at the bottom of the fourth master module. This is also where the Auxiliary Grand Master Mute is located.

The two matrix masters contain rotary level controls, PFL and mute switching plus peak-signal present LEDs. Engineer's monitoring is either from headphones or local speakers, and separate level controls are provided for each. Both monitor circuits share DIM and MONO switches, while the Local Monitor section includes CUT and PFL DEFEAT switches. PFL DEFEAT prevents the headphone mix being overridden by PFL selection and thus facilitates the use of the Local Monitor circuit as an additional stereo feed without having to resort to matrix or auxiliary sends.

Headphone sockets are positioned below the front buffer and at the top of the master module. Also at the top of the module is an XLR connector for the talkback mic.

Talkback can be assigned individually to all the buses in the console with additive push-button selection—it is then enabled from a TALKBACK ON switch. External signals from other consoles can also be injected into the talkback circuit, and provision is made for sending talkback to an alternative destination via an XLR marked Ext T/B. An internal 1kHz oscillator (or external oscillator) may be routed to the console buses using the same assignment switches, in which case the talkback mic is defeated.

The main stereo outputs are metered on 10-segment bargraphs. However, this facility is overridden and replaced with PFL selection. Next to the stereo output meters is a dimmer control for the optional XLR-mounted Little-Lites positioned along the back edge of the console.

All *Century Series* consoles share the same build and sonic quality

Inputs, outputs and connectors

All connection to the console is at the rear, there is no patchbay. Standard connectors are XLR and jack (tip, ring, sleeve), although provision can be made for multiway connectors.

The input module has balanced mic and line inputs via XLR and jack sockets respectively, a jack insert point, and jack direct output (sourced from channel out or Aux 8 send depending on switching). The group module balanced output is on XLR connectors which is switched on-off from the XLR routing switch as described. The group insert point is switchable from +4dB to -10dB to accommodate semiprofessional gear, and the effects returns have both XLR (+4dB) and jack sockets (-10dB). There are also Bus Input XLRs to link groups with other consoles and signal sources.

The Matrix, Left, Right and Mono outputs all appear on balanced XLRs with jack inserts. Auxiliary outputs are all XLR, along with external talkback connectors, and the stereo local monitor output. The stereo return and external oscillator are both via jack socket.

Optional transformers are available for microphone inputs and the Group, Stereo, Mono and Matrix outputs.

Optional modules

Two optional modules are available for all house consoles—a stereo input module and matrix module—which fit in place of standard input module. There are no restrictions on the number of these modules that can be fitted other than space.

The stereo module may be used for stereo microphones or as a stereo effects return, and will fit both 4 and 8-bus consoles. It remains similar to the mono input, although there are obvious changes such as left and right input select and gain controls, stereo auxiliary send capability, width-stereo reverse control, and so on. The EQ is 3-band, with a fixed frequency HF and swept Mid and LF.

The matrix modules are equipped with 100mm faders and output bargraphs. Individual rotary controls are provided for the Group, Left, Right and Mono signals, plus additional line inputs for external signals. TALKBACK ENABLE, MUTE and PFLswitches are included on each module.

Century Series TC and *SP*

The *TC* console is designed for applications where the level of features in the *GT* console are more than required. The biggest differences are the removal of the A-B Matrix, Scene Mutes and the simplification of input channel EQ by changing the high and low bands to fixed-frequency operation ▶

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(10kHz and 80Hz)—the mid bands remain swept.

Other features that have been left off include the Aux 8 Direct Out facility, fader reverse between the group and effects return outputs, the GROUP DIRECT OUT XLR switch, auxiliary muting, the stereo return section, and main stereo output to auxiliary facility. The talkback system has been simplified, having access to fewer buses, no external facilities, and the oscillator has been removed.

The *SP* differs from the *TC* in just two respects—there is no PHASE REVERSE switch on the input module, and the 4-band EQ is all fixed frequency (10kHz, 2.7kHz, 300Hz and 80Hz). The *SP* is aimed at fixed installations where the onus is towards ease of use and value for money.

All *Century Series* consoles share the same build and sonic quality, the only variation being in the number of operational features on offer.

Monitor consoles

The two currently available *Century Series* monitor consoles differ in their arrangement of buses —the *LM-Mono* conventionally offers 12 mono buses, while the *LM-Stereo* has eight stereo and four mono buses.

The input module has the same input gain section and 4-band EQ as the *Century GT*, although the high-pass filter operates at 100Hz rather than 80Hz, as the slightly higher frequency roll off is better suited for stage monitors. The sends to the buses are arranged in three groups of controls above the fader; in the case of the mono desk there are four rotary controls per group; with the stereo desk the first two groups are stereo dual concentric controls (level and pan) while the remaining four controls are mono. Each group includes pre-post switching.

The first eight outputs feed to either mono or stereo output modules which feature 3-band swept EQ and continuously variable HPF, while the last four will always send to mono modules. Both types of output module have long-throw faders and 10-segment bargraph meters (two in the case of the stereo module). Also included are two line-level returns which can be used for feeding external effects, cues and so on into the channel, and there output (pre or post) can be mixed back into any of the first ten output modules via local level controls. Each output also includes a switchable balanced XLR insert loop, a 6dB DIM switch to quickly reduce channel level in the event of feedback, and a TALKBACK ENABLE switch. Stereo modules have a MONO OUTPUT switch.

There are two operator monitor sections which follow priority switching for the output module and input module PFL signals; alternatively a post fader signal can be monitored. External talkback and oscillator facilities are also provided.

Other matters

The consoles vary in weight from 85lbs to 220lbs and have recessed grips built into the side cheeks. Two grades of flight case are available—the *Standard* or *Primo* (which is used for Crest's Gamble consoles).

Power supply is either from a single external unit or optionally from dual units providing shared load parallel supplies. The dual system has the advantages of switchless, uninterrupted operation in the event of rail failure, and runs much cooler due to reduced power consumption.

Crest have no plans at present to design an automation system for the *Century Series*, but provision has been left within the modules for future interfacing. However, the company appear more likely to recommend the retrofit of other manufacturer's systems rather than developing a proprietary one.

Conclusion

The *Crest Century Series* offers a wide choice of well-engineered, high-quality mid-priced consoles suitable for a variety of sound reinforcement applications. Because the same frame type and components are used throughout, quality remains consistent from the top to the bottom of the range. Another advantage of this continuity is that modules can be freely swapped between house consoles; this combined with the availability of optional modules, and 4 or 8-bus versions, provides the user with a versatile, configurable platform.

The console has purposefully been designed for ease of operation, with logically laid out and accessible controls. Facilities such as Scene Mutes, Aux Grand Master Mute, and subgrouping capability (on the monitor desks) all help to make the mixers job a little easier.

It is still very early days for the *Century Series*, and it will be interesting to see how a new product range from this respected company is received. My guess is that we will be hearing a lot of Crest Consoles in the future. ■

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Series III Rev 8
Dynamic Voice
Allocation
8 track disk recorder

1988

Series III Rev 7
Fast disk transfer card
Caching of software
display
32-bit processor added

1987

Series III Rev 6
Cue List timecode
sequencer
CAPS music sequencer
Integrated mono disk
recorder

1985

CMI Series III
First 16 bit sampler
16 Voices
Shared Memory
Architecture

1982/3

CMI Series IIX
HiFi sampling
MIDI Implemented
Page R sequencer

1980

CMI Series II
First Real Time
Graphics based
Music Sequencer

1978

CMI Series I
First Sampling
Digital Workstation
Waveform Editing

1976

QASAR
8 channel Fourier
synthesis
Light pen interactive
graphics
Dual CPU architecture

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CITY IN CRISIS

High riser— Jean Michel Jarre's urban backdrop

Regarded by many as the epitome of the electronic music proponent, Jean Michel Jarre is again on tour with his latest offering, *Chronologie*, together with a selection of his 'greatest hits.'

The tour kicked off in July at Le Mont St Michel in Brittany, France, before an estimated audience in excess of 60,000, with the next stop being Lausanne in Switzerland for a special concert on the 1st August, the Swiss national holiday. It is planned to cover major centres all across Western and Eastern Europe, and the sound facilities are being supplied by Dispatch of Paris. *Studio Sound* was able to meet up with Dispatch MD, Eric Alvergnat (who was also in charge of coordinating and organising the technical side of the tour), in Lausanne and discuss the particularities of the tour.

'Given the fact that Jean Michel likes to play in grandiose settings, such as the Mont St Michel,' begins Alvergnat, 'the system had to be capable of covering a large audience area—both in width and in depth. However, the tour also has smaller venues, such as the Pontaise football stadium in Lausanne, which again demands a certain flexibility on the part of the sound system to be able to deal with different audiences.'

To compensate for the lack of decor such as skyscrapers and large buildings in certain places, Jarre's 'city' is being taken on tour with him—in the form of a skyscraper skyline which also serves as a backdrop for the different back-projections and laser graphics as

Rigging the stage

well as providing sound-wings for the left and right stacks of the main PA. The idea of the staging is to make the spectator lose the impression that he or she is 'just' watching a stage performance and, instead, is part of a wider audience in a city centre.

Alvergnat: 'For the main system we are using 42 SCV *246* compact enclosures (designed in conjunction with Dispatch) per side and distributed over four levels, viz: three rows of 12-inch arced arrays plus a top array of six cabinets. There are also 16 Meyer *UPA-1A* speakers for nearfield coverage and a row of 24 Meyer *USW-650* subwoofers across the width of the stage at ground level.

The SCV cabinets are full-range and are loaded with JBL components, these being two *2240H* 18-inch (46cm) bass drivers in separate, tuned chambers; four 10-inch (25cm) low mid drivers, a 2-inch compression driver (*2441* or *2445*) and two *2405* tweeters for the upper mids and high frequencies. Power is provided by standard amp racks with Amcron *2400* and *1200* amplifiers for the lower frequencies and *PSA-2* and *D-75*s for the mids and HF.'

Due to the size of the overall installation, separate control towers ▶

Terry Nelson monitors Jean Michel Jarre's latest live extravaganza and discovers that the French master of large-scale visuals is taking a city on tour

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Side detail of the 'City' backdrop

are installed for sound and light and the rear of each tower provides support for the Meyer *MSL-3* delay systems, 24 per tower in the case of Lausanne.

'There are basically two ways to handle large audiences,' notes Alvergnat. 'You can either put up two large woodpiles by the stage and kill the front rows, while for the back it is not loud enough, or install a sufficiently powerful main system supplemented with high quality delay systems.

'As the football stadium limits the depth of the audience here, we are only using two delays but we have enough in the trucks for four more. The first concert used the six delays, for example, so it was also a good test for the whole system.'

The height of the delay system is such that it is effectively only reaching the rear of the stadium and integrating smoothly with the upper, long throw sections of the main PA. A walk around the pitch during the concert shows that coverage is fairly even and does not exhibit hot or dead spots.

With the increasing awareness concerning potential hearing damage from high pressure levels, all concerts are now monitored in Switzerland by a special department of the gendarmerie to make sure that the legal limits are not exceeded. Somewhat surprisingly, these limits are well within the bounds of practicality and are 100dB SPL average ±2.5dB at the first row (which tends to translate in being the mix position so there is already a gain due to the inverse square law) with peaks of 125dB.

At present, the situation is that the promoter is responsible for concerts that are too loud, which also means paying the fines. There is a move to make the artist themselves liable—or at least 50% liable—in order to put a brake on irresponsible sound levels as the promoter is rarely in a position to do anything about excessive levels. He can complain to the production but that is about all.

It is the old question of whether the audio industry will take the step of policing itself or whether the matter will be decided by non-audio people. It is rather sad that when the current 'supergroup' with an incredibly large production does a concert, the main impression left on the public is one of painful volume and the reviews in the press insist on trying to declare the show as being 'the loudest ever'.

In the case of Jean Michel Jarre, Eric Alvergnat seems pleased to report that the average was SPL was around 95dB and that no one was complaining. Admittedly, the music is not exactly rock 'n' roll but it still sounded powerful when it needed to.

The show was mixed through a Yamaha *PM4000* with 48-channel console with a stereo submix for a Sony *PCM3324A* with the various effects and additional backing tracks coming from a TAC *Bullet* 28-channel console.

According to the Dispatch crew, there was 'nothing special going on in the way of outboard —just standard racks with Lexicon *480*'s, Eventide *H3000 Ultraharmonizers*, dbx *900* racks and BSS gates and compressors'.

House engineering on the tour is assigned to long-time Jarre collaborator and equipment designer Michel Geiss. Although essentially a studio engineer, Geiss has accompanies Jarre on many previous outings and is comfortable with a pair of delayed Meyer *UPA-1*As for close monitoring. Second engineer is Renaud Letang.

In contrast to some earlier concerts, the majority of the music is played live and the band includes solo guitar, three keyboardists, bass, drums and percussion. A particularity of this tour is also that it uses local musicians for some numbers and in the case of Lausanne, features a mixed choir of over a hundred choristers.

Over on the stage, systems engineer, Bernard Vanere, is in charge of a team of 13 technicians and at Lausanne had just finished tracking down a rogue amplifier before making a few comments.

'The setup is basically four separate stereo systems over the four levels and these are broken down into subsystems for the dedicated amplifier racks. Though I would hardly say that the system is very complicated, you really do have to pay careful attention to cabling and distribution—one stray ground (earth) connection and you can end up with one very loud hum or buzz. The fun is then tracking it down among all the different amp racks.'

Though there is nothing particularly new in the system, the tour is keeping us on our toes as there has been very little production rehearsal and about half of the personnel have never been on tour before. This mainly includes the lighting and visual effects crew, who are more familiar with fixed installations, as well as some of the people with Jarre who are from studio environments.

The idea of the staging is to lose the impression of 'just' watching a stage performance but to become part of a wider audience in a city centre

Running monitors behind a Soundcraft *Series 4* 40/24 console is Bernard Alexandre:

'The monitoring is mainly confined to Meyer wedges as a large sidefill system would upset the staging and provide too much spill on a stage as large as the one we are using.

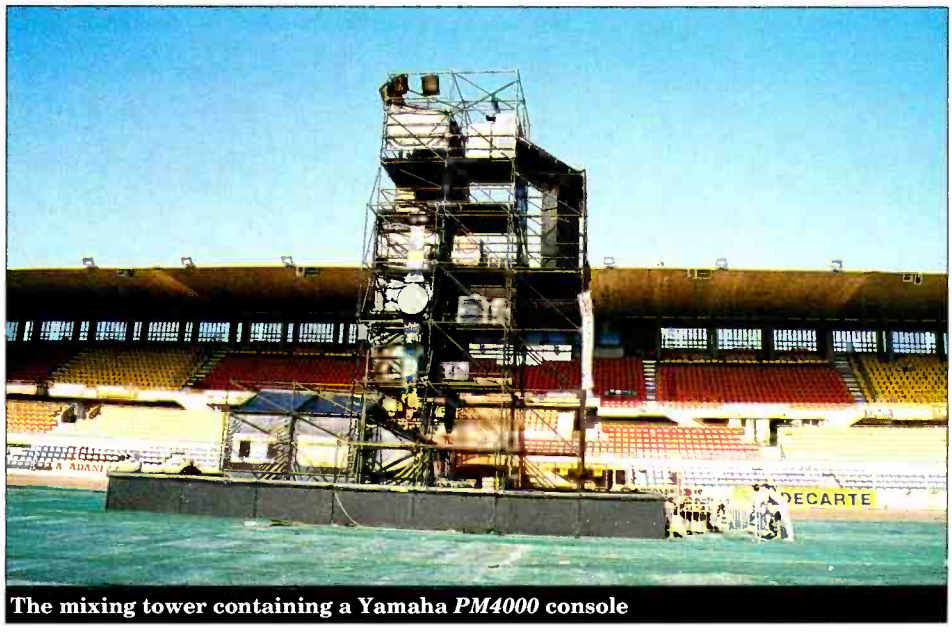
'In addition, we are using in-the-ear monitoring for Jean Michel and the solo guitar.'

I asked if any particular system was being used for the ear monitors: 'As we have a lot of Sennheiser radio systems, it seemed logical to use their transmitters and receivers, and we have the 001 and 002 prototypes on the tour! Apart from the fact that we have a large selection of frequencies, it means that spares and service for all radio systems are confined to one supplier.

'Special mouldings were taken of the respective ears by an ear specialist in Paris and turned into ear inserts with the transducers. So far, everything has turned out very well and we will almost certainly be expanding the system.'

Although Eric Alvergnat seems to take everything in his stride and underplay the complexity of the operation, he points out that communications in an event of this type played a large role behind the scenes, and that *Chronologie* was using 50 communications outstations in a large system, together with two permanent operators to keep track of everything.

It seems Jean Michel Jarre's affinity for large-scale operations is nothing if not consistent. ■



The mixing tower containing a Yamaha *PM4000* console

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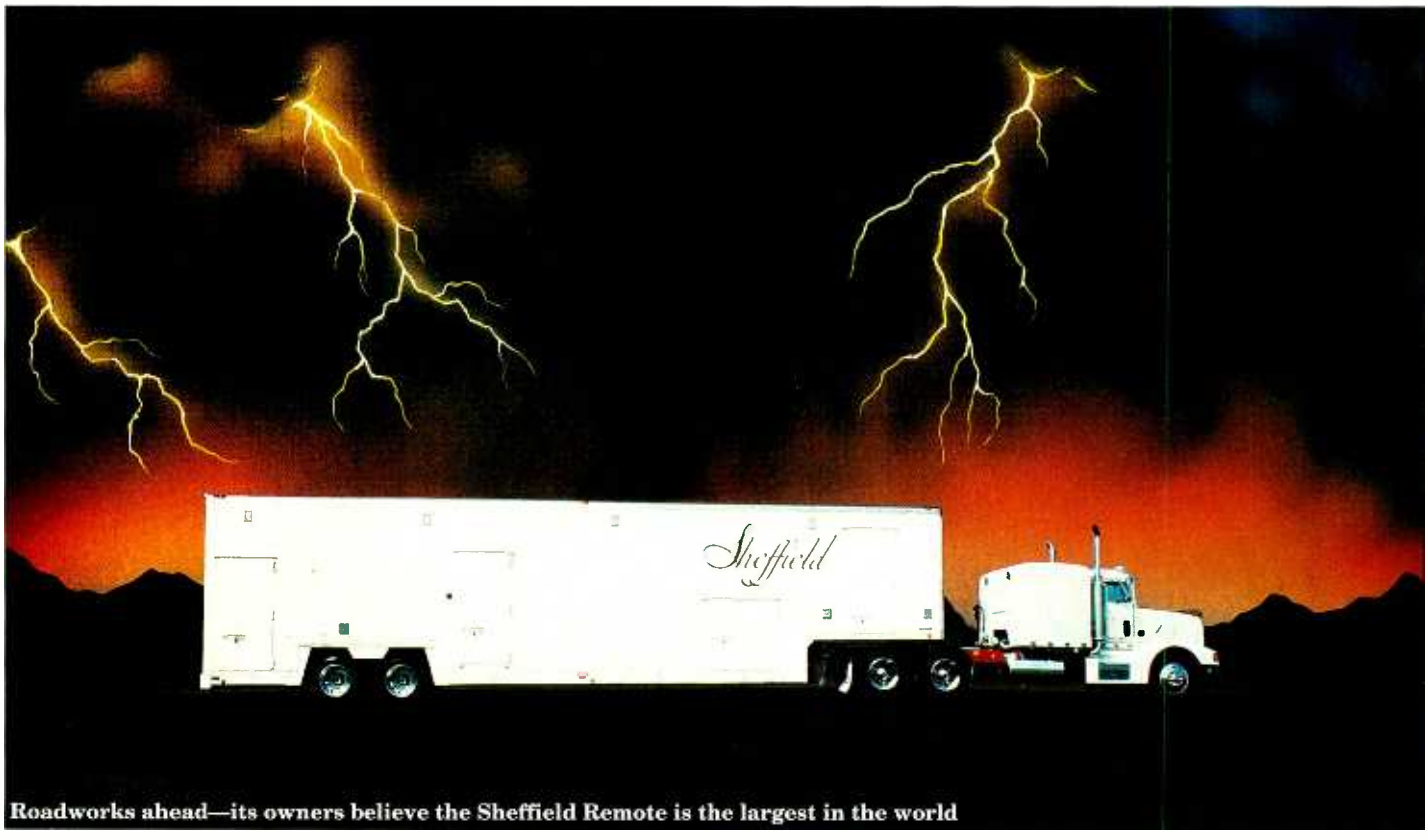

Roadworks ahead—its owners believe the Sheffield Remote is the largest in the world

Driver Dennis Hanlon, truck tech Garth 'Gaffer' Michael and stage tech Steve Weinkam (the permanent 3-person team in charge of Sheffield Audio-Video's Remote audio truck) almost made it back to Baltimore after their successful digital recording date with Johnny Cash and Barbara Mandrell in Branson Missouri. It wasn't the recent floods or the 2000 miles that stopped them. It was business...as usual.

According to studio manager Richard Van Horn, a request for the truck from Gold Mountain-Epic Records for a Cyndi Lauper date in Toronto one day later had just been received at Sheffield's home-office in Baltimore. After a short conversation with the crew, it was determined that one of the smaller Sheffield trucks carrying two 24-track analogue recorders for the Lauper date would head west to meet the eastbound tractor-trailer at a Morgantown W.VA. truck stop. There, in the parking lot, they would swap tape machines.

'They charged us $18 for 3-page faxed manifest!' recalls Hanlon. 'We swapped-out the machines, took a left turn and headed north.'

Their matter-of-fact acceptance of the gyrations that face them on a daily basis is part of the reason the truck is used so much, confirms Sheffield owner John Ariosa, who is used to getting good comments about the crew.

You can have a the greatest truck in the world, but without great people, you're not going to do well,' he continues. 'We know this because we've been at this for 25 years now. This is our fourth audio truck. We believe this is the largest audio-only truck in the world.'

The air-cushion suspension 102-foot wide, 48-foot trailer weighs in at 62,000 pounds with tractor, and was the longest Maryland state law would allow on the roads when building began two years ago. A desire to work in New York also figured in the vehicle's 13-foot height, since access to the city is much quicker through the 13-foot opening of the Lincoln Tunnel than across the GW Bridge, which has a 13.5-foot vertical clearance.

The Structure

The bane of most remote recording trucks is that, in order to fit on a truck bed, the control room itself has to be rather small. Sheffield's answer to that challenge is a unique design that provides a noticeably larger interior work area. Instead of beginning with a dry, freight-type flatbed type van, Sheffield used a double-drop, which is closer to the ground.

'From the outside, it's hard to tell our truck from others,' explains Ariosa. 'You've got the dance floor—that's the portion of the truck where the cab and trailer connect. Immediately after that we dropped about three feet. I don't know of any other audio truck that does that.'

And whereas most vans use that lower space for storage bins, Sheffield's unique design allowed them to increase the ceiling height from the typical seven feet to an almost cathedral-like ten feet. ▶

Ty Ford takes a ride in the largest remote recording truck in the world—Baltimore's Sheffield mobile

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This design also a lowers the vehicle's centre of gravity, which helps when you are carrying around a lot of sand and lead as sound deadening treatment.

From front to back, the trailer is divided into three compartments. The first compartment sits atop of the main connection to the tractor and houses the three air conditioning systems, the Liebert computer-grade AC and power conditioners, SSL computer, power supplies and power amps. The three air conditioning systems, each of which is mounted on its own air suspension system, provide dedicated climate control for: the SSL computer, power supplies, power conditioners and amps; the tape machines; and the control room space, respectively.

Behind the first compartment is the control room, which is 32 feet in length and eight feet wide. The rear of the control room rises four feet to form a client-producer lounge capable of seating five people comfortably. Standing clearance in the lounge is six feet three inches. The middle section of the control room, where the main tape machines and other gear are installed, is constructed to allow unobstructed sight lines between the lounge and console and the monitor wall. The RPG diffusers that line the centre of the ceiling are flanked by air conditioning ducts from front to back. The inner skin of the side walls is a sound absorptive, velcro-friendly fabric stretched over an underframe that supports more sound-deadening treatment. A custom-built, motorised, sliding door on the right side of the van allows access to the control room. The rear compartment serves as the equipment locker for mic stands, cables and other essential gear.

Sheffield's crew also had to figure out how to mount the SSL *4048E-G* console across the width of the front end of the trailer. The main problem arose from the fact that the SSL console, which was being removed from in-house studio 'B', was a 40-input frame with integral right-hand patchbay. They had to separate the patch bay and, using DL extension cables, relocate it in the upper bridge of the Neve *5104*, which sits directly behind the SSL. An additional eight modules were added where the SSL patchbay existed. Then the trailer frame had to be specified to include reinforced, built-out pockets on both sides of the SSL console. The right-hand side pocket is constructed with a hatch to allow access to and removal of the console.

Special care was taken to insure the control room would be sound-tight. Stud centres were reduced to one foot. The frame was insulated, then lined with plywood on all sides. The internal surfaces of the plywood were then coated with sheets of lead $^{1}/_{32}$ to $^{1}/_{64}$ of an inch thick. The lead sheathing was then covered with a fibrous sound-deadening board. The control room walls were then built inside the shell. As a result, anything that touches the wall is isolated from the truck body. By the time they were done the walls were about 3-inches thick. Under the flooring is a lead-lined wooden deck, filled with 3.5-inches of sand, and lead-lined cable troughs.

RECENT DATES

Gloria Estefan
July 1992
Miami Florida

Doro Pesch
December 1992
Ocean Gate, New Jersey

New Orleans Jazz Festival
April 1993
New Orleans, Los Angeles

Johnny Cash
June 1993
Branson, Missouri

Cyndi Lauper
July 1993
Toronto, Canada

Sting-Don Henley
September 1993
Boston, Massachusetts

Dr Dre and Snoopy
September 1993
Milwaukee, Wisconsin

Elton John Aerosmith
September 1993
Foxboro Stadium, Massachusetts

Equipment

The 48-input SSL *4048 E-G* and the 24-input Neve *5104* provide a total of 72 mic inputs. On occasions that require more inputs, there is ample room elsewhere in the control room for auxiliary mixers. Both SSL and Neve consoles are common to the patchbay, providing complete cross-patch flexibility between the two consoles.

The control room is wired for four 24-track or two 48-track tape machines, using DL connectors, wired SSL standard. The 52-pair mic snake to stage uses AMP *Quicklatch* multipin connectors wired to Maryland Sound standards. The monitor wall houses custom spring-mounted Urei *815c* and Yamaha *NS10M* monitors. The area over and around the monitors is sand-filled to reduce vibration. The Ureis are vertically mounted. Their high-frequency horns are positioned to be furthest apart and are seven feet apart centre to centre. The monitors are angled in a few degrees to form a 'sweet spot' at the console.

Also on the monitor wall are five video monitors.

Ariosa: 'Because we also have our own video truck, and do a lot of video remotes, we know how video works. We put five colour monitors in the truck to cover those situations where we're multitracking for a video project. There are two 25-inch colour monitors dead centre in the wall, and three 19-inch colour monitors across the top of the monitor wall. You can see what's going on even from the client-producer lounge.'

Inside the 'cathedral-like' Sheffield mobile

The crew have found that, during a busy session, it helps to be able to quickly identify the person talking on the intercom. The six channels of RTS communications equipment by the console and two channels at the tape machine positions are, therefore, assignable via a Source Assignment Panel (SAP) to dedicated speakers placed in different areas of the control room. For example, when you hear a voice coming out of a speaker, you know it's the video truck director, or whoever has been patched to that speaker.

Since most of the truck's assignments are for tracking, the standard complement of outboard gear (see side bar) is adequate. Should mixing be required, there's plenty of room for additional gear. The control room also has both U-Matic and VHS video recorders to allow the producer to commit the event to video tape.

As with most large investments in technology, Ariosa confirms that change is a constant. 'We're reworking the air conditioning for better redundancy and we're going to bigger units that are constantly in parallel so you don't have to worry about re-routing the ducts if a failure occurs.' The Sheffield crew also has their eye on developing technology. When they feel twisted-pair digital snakes capable of handling 64 mics are ready, they'll be installed. What else would you expect from a mobile facility that has its own central vacuum-cleaner system? How about a 6-camera, 30-foot video truck?
Too late—Sheffield's is already on the road. ■

OUTBOARD EQUIPMENT

1	Cipher Digital *750* Time Code Reader-Gen-Ins
1	Eventide *H3000* (fully loaded)
4	*Kepex II* Gates
1	Lexicon *200*
1	Lynx *TimeLine* Module
1	Nakamichi CD Player
6	Neve Compressor-Limiter
2	Panasonic *SV3700* DAT Recorders
1	Sony *V7600* ½-inch Video Recorder-Player
1	Sony VHS Hi-fi Video Recorder-Player
1	tc electronic *2290* Sampler-Multieffects
2	Tascam *MkII* Cassette Decks
3	Urei *LA1176*
1	Urei *LA4*
2	Urei *LA3A*
3	Urei *LA22*
1	Yamaha *Rev 7*
2	Yamaha *SPX90*
1	B&W TV camera

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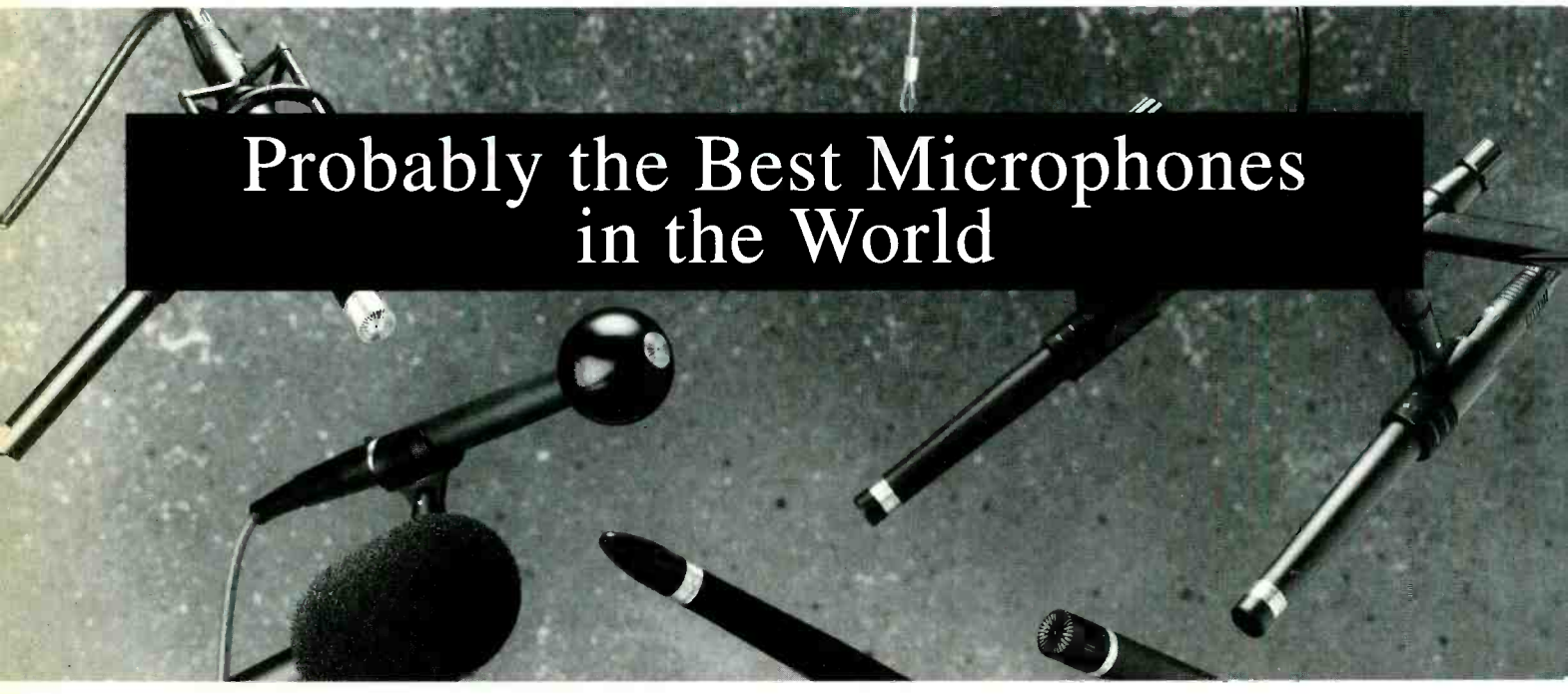

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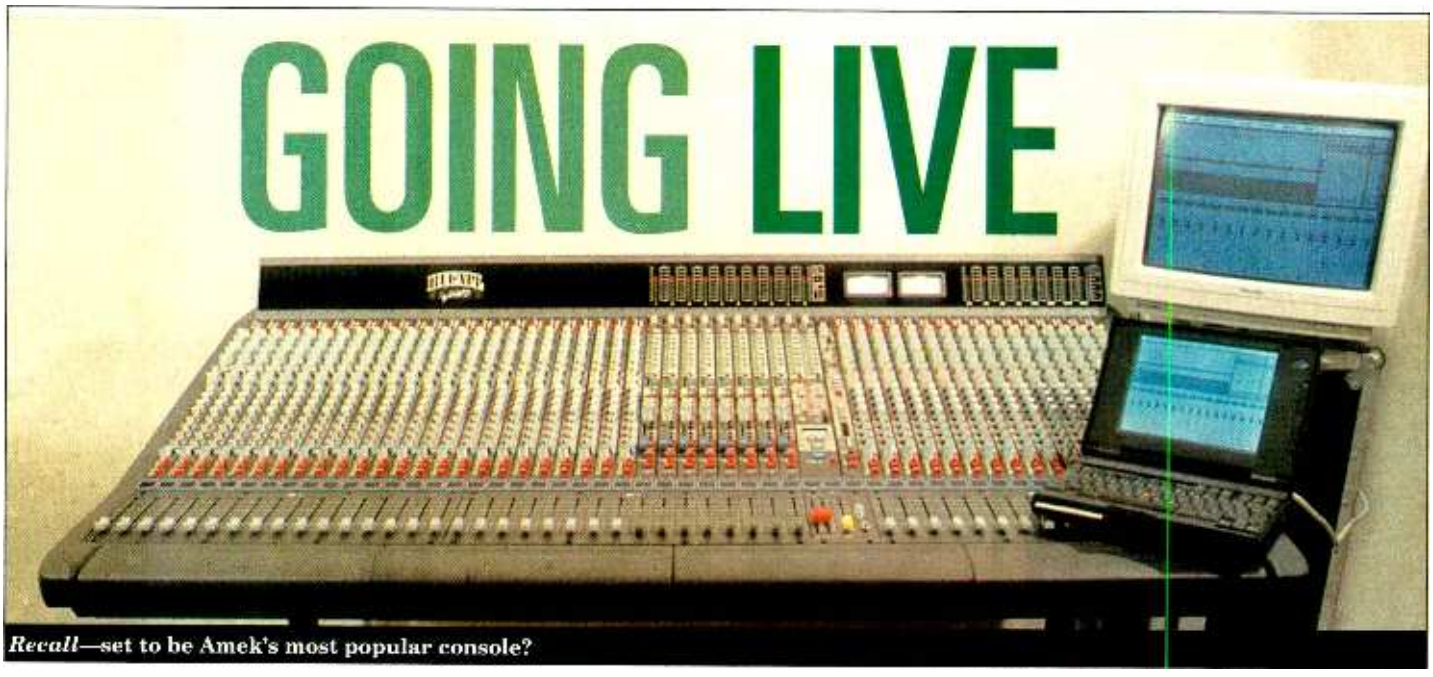

Recall—set to be Amek's most popular console?

Patrick Stapley looks at Amek's SR desk and finds studio sophistication that talks back

'*Recall-By-Langley* is the result of us saying we are bored with making normal PA consoles, they've all been basically the same since the early 1970s and we think its time for a change,' says Nick Franks, Director of Amek.

The *Recall* console is the second to appear under Amek's 'Langley' banner —*Big-By-Langley* being the first. *Big* broke new barriers for Amek, offering an impressive array of features, including automation and recall, at a very competitive price. It was this that inspired Nick Franks & Graham Langley to produce a fully featured live console, that would include a proprietary automation system and be the first sound reinforcement mixer to offer recall.

'Having developed all this expertise in software for studio consoles, we thought why don't we do something different by applying it to sound reinforcement, and see if people like it,' says Franks. 'They may hate it, of course, and think there is no point in having this kind of facility, but from the initial response we've been getting I doubt it very much.'

The automation system is based on Amek's established *Supertrue* system, and has been aptly named *Showtime*. Both snapshot automation and recall are contained within the system, along with various other console control functions. By including a recall system, Amek hope the desk will offer a new level of sophistication to the SR market, in particular removing the need for multiconsole setups at multiple act live events. Amek's *Virtual Dynamics* software package can also be fitted as an option, providing one virtual device per input module.

The console is supplied in two frame sizes—with 35 or 52 positions—and has four types of module: Input, 8 x Group-Matrix, Stereo Master, and Monitor Master. The desk can perform either FOH work providing a 24 or 40:8:2 configuration with 12 aux sends and an 8 x 8 matrix, or as a monitor desk providing 12 sends with an additional 4 x 4 matrix. It can be also used as a dual function FOH-monitor mixer. Recall's other features include eight mono and two stereo returns, and eight programmable 'soft' switches that can be used to trigger mute groups or external events.

The console is robustly constructed using a solid steel chassis with removable base panels allowing access to the fixed mother boards. The power supply is a dual system with electronic autochangeover between units; a spare PSU is also supplied for the automation system. Specially designed flightcases are available for the console, PSUs and automation monitor.

Input

The input module normally sources either a balanced-mic or balanced-line input. However, by changing internal components, the module can source between two mic or two line sources. A single gain control is employed with an associated 15dB pad; phantom power reverse switches are also provided.

The next stage is the equaliser starting with the continuously variable high and low-pass filters, both operating at 12dB/octave. Like the filters, the 4-band swept EQ is arranged on dual concentric pots with an overall range from 30Hz to 18kHz ±18dB. The HF bands are switchable between bell-shelf, while the mid bands have switchable Q (0.7–1.5). Separate in-out switches are provided for filters and the 4-band equaliser. The EQ is a Graham Langley design which differs from the *Big* console in that all bands are swept—the HF and LF bands on *Big* are switched. The EQ section offers versatility along with extremely responsive and well-defined control.

A switchable insert point is normally positioned directly after EQ, but can appear pre by accessing internal switching. It has an unbalanced send and balanced return.

Auxiliaries 1–8 have individual sends with their own pre-post and on-off switching—the on-off switches for Aux 1 and 2 are automated. Aux 9–10 and 11–12 have dual concentric sends with paired switching. Aux 12 may additionally be disconnected from the auxiliary bus and routed to the channel direct output path; this replaces the normal channel direct output feed providing a secondary variable post fader output. Another feature is the ability to allow sends 9–10 to be sourced after the channel panpot—this is achieved by ▶

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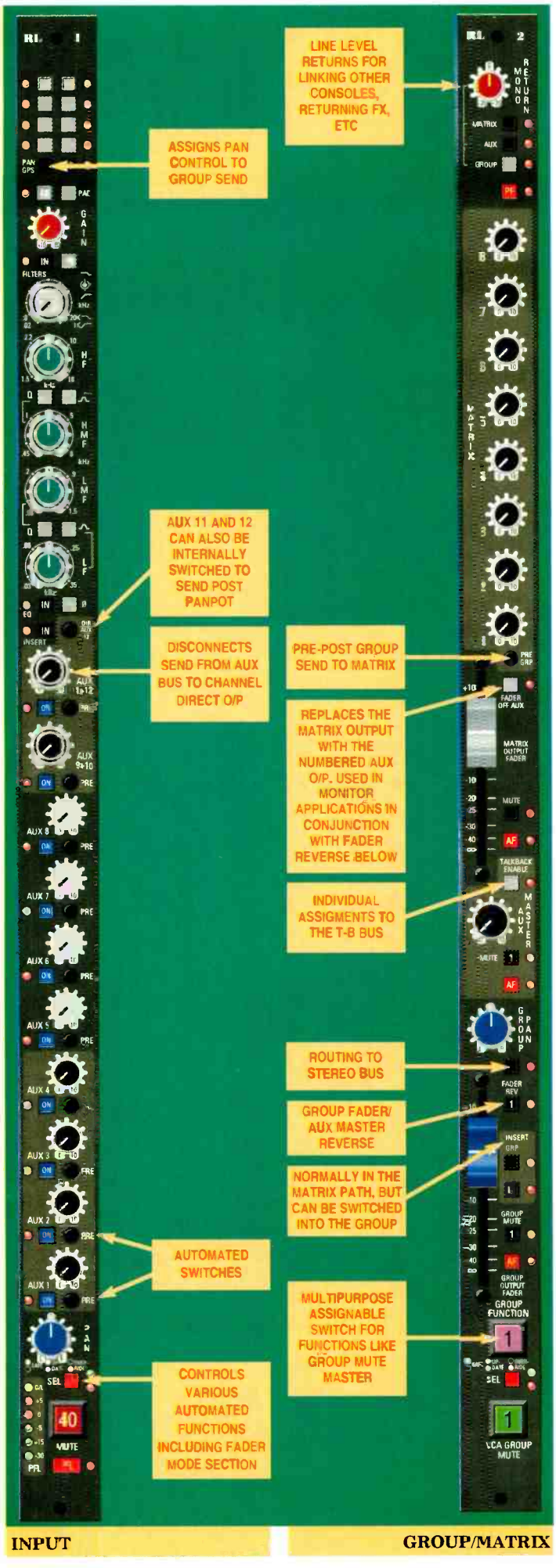

internal switching.

Routing to the eight group buses and the stereo bus is from individual switches at the top of the module. Group sends can be disconnected from the pan control, but sends to the stereo master will remain post pan.

A large automated mute switch bearing the channel number, and a PFL switch lie at the bottom of the module alongside a 6-LED meter with overload indicator (set 6dB below clipping). This meter is positioned pre fader but post mute to allow signal to be monitored while the channel is cut. Similarly, the PFL switch functions pre mute and will operate either in momentary, interlock or latching modes dependent on master selection; it may also be internally switched to source stereo AFL. A destructive solo-in-place facility is provided which is assigned globally to the SELECT switch. This is a computer-controlled function, hence the use of the multifunction SELECT switch which is also used to access automation modes, and to set up VCA groups.

The channel fader is an ALP 100mm using a dbx VCA chip.

Groups and matrix

From the input module the signal can be sent to the eight groups and-or the stereo bus. The console is fitted with eight Group-Matrix modules which each govern five functions relative to the module number—so the first module will control Group 1 output, Matrix 1 output, VCA Group Master 1, Auxiliary 1 master, and Mono Return 1.

There are three faders associated with the module: two are built-in and control the group and matrix outputs (both nonautomated), while the long-throw VCA Master is placed below the module in the fader block.

The audio group output is routed to the stereo bus via a selector switch and pan control. The group also has automated mute, AFL, and can be fader reversed with the auxiliary master level control. This facility is used for monitor applications where the operator requires fader control of the aux masters, and will normally be making use of VCA groups rather than audio groups. The remaining auxiliaries (9–12), which appear on the stereo master module, may be individually selected to the first four matrix output faders, thus still leaving a 4 x 4 matrix capability if required.

The pre or post group is sent to the matrix via eight rotary controls, below which is the module's matrix output fader with AFL and mute. A switchable insert point is normally in the matrix path, but can be moved to the group output from a front panel switch.

At the top of the module is the Mono Return section, which consists of a detented gain control (±20dB), PFL switch and routing to the modules Group, Auxiliary or Matrix outputs. The primary use of this facility is to link group outputs from an external console, but it has many applications for returning line level signals—if used in conjunction with a redundant group, its automated mute switch can be utilised.

At the base of the module are two large illuminating switches: one is the VCA GROUP MUTE which can be automated, while the other is a soft GROUP FUNCTION switch that can be assigned to various functions from the automation screen, such as a mute group master (independent to the VCA group mute), or EVENT TRIGGER switch.

Masters

The Stereo Master is a double width module housing matrix assignment controls for each Left and Right output (pre or post fader), master controls for Aux 9–12, and two stereo return sections which can be routed into the stereo bus or to either of the console's two monitor paths (A and B). The stereo output is controlled from the two long-throw VCA faders directly below the module which feature gain trimmers, and pre fader insert points.

Selector switches are provided for an additional mono output sourced either pre or post the stereo output or from the PFL signal. The output is controlled from a 100mm fader (nonautomated) and can be used for applications such as sub-base centre stage monitoring, or to provide an operator's wedge during live monitoring.

The remaining control on the Stereo Master are connected with automation (of which more later) and setting up VCA groups and mute groups. The Monitor Master module controls the console's communications, oscillator, solo, metering, and of course the monitoring systems.

Talkback is separately assignable to the Stereo, Group, Matrix, and Auxiliary outputs (each aux master incorporates a T-B ENABLE switch allowing individual assignment); it is then activated from a large illuminating TALK button.
The talkback output can be removed from the engineers headphones from a switch next to the microphone XLR. An additional two-way external communications system may be added via rear XLR connection, and this is addressed from a second talkback switch labelled CALL. The CALL button will flash to indicate external activation which can then be monitored by means of a COMMS TO PHONES switch.

The communications routing is also used to route the oscillator ▶

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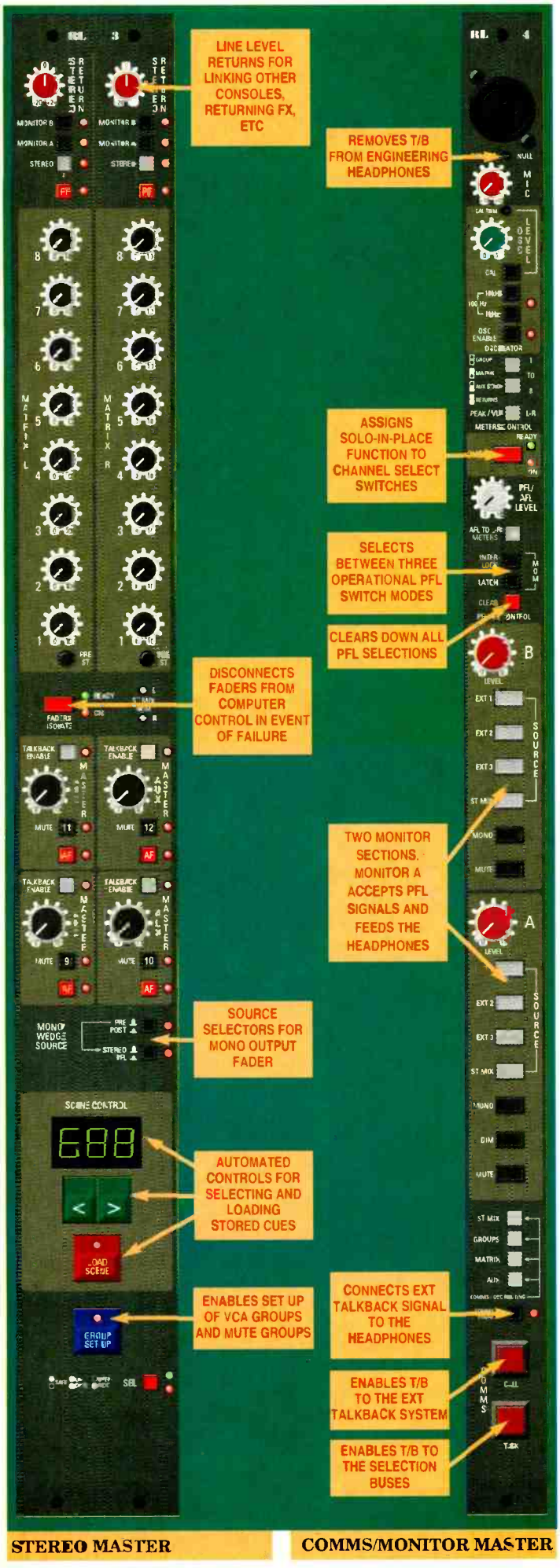

once enabled. Three frequencies (100Hz, 1kHz, and 10kHz) are available with either a calibrated OVU output or adjustable level.

As mentioned, PFL-AFL switching modes can be globally set to momentary, interlock (cancels existing selection), or latching (additive); all local switch selections can be cleared down from a master CLEAR switch. The destructive Check Solo mode (solo-in-place) described earlier operates through the automation system, and can only be selected through a special procedure to guard against accidental use. This entails pressing the CHECK button until a Ready LED lights, releasing the switch and pressing it again until the On LED illuminates—the same sequence deselects the function.

The meter bridge contains eight peak-reading LED meters placed above the Group-Matrix modules, mechanical Left and Right meters switchable to peak or VU above the Stereo Masters, and a further eight light meters to the right of the master section. The stereo meters normally monitor the stereo output signal, but can be switched to read the PFL-AFL bus. The eight meters above the groups can be sourced between the group outputs, matrix outputs, Aux 1–8 outputs, and the mono returns. The remaining eight display the matrix outputs, but follow source switching to display the stereo output, mono output, oscillator output, and Aux 9–12. This flexibility allows various source combinations between the two banks of light meters, and provides simultaneous metering of the Stereo and PFL-AFL buses, as well as all 12 of the auxiliary outputs.

Monitoring is divided into A and B sections. Monitor A is the primary path as it feeds the headphone amplifier and accepts the PFL-AFL signal. Both monitor outputs source the stereo mix and three external outputs, and are equipped with mono and mute switches—Monitor A also has a DIM switch. Apart from being used for operator monitoring purposes, these can provide additional level-adjustable mono-stereo feeds for recording, broadcast, green room and so on.

Automation

Amek's *Showtime* automation is the SR version of *Supertrue* and has been designed to provide snapshot reset of all automated controls. These are the Input, VCA group, and Left and Right faders and respective mutes, plus the channel mutes for Aux 1 and 2. It also affects VCA group and mute group setups, can trigger external events via MIDI, and implement changes to Amek's *Virtual Dynamics* software package if fitted. Showtime also includes the recall system.

Amek recommend their system runs on an IBM *486* laptop for road use, or a desktop version for fixed installations. A minimum of 2Mb of RAM is required.

The system is organised hierarchically into Performances, Cues, Scenes and Events.
A Performance may contain up to 256 Cues which are made up from Scenes (console snapshots) and Events (MIDI messages and so on). A maximum of 64 different Scenes can be stored in a single Performance, and alternative

included on the main screen are details of the current Cue along with any user notes that have been attached to it

Performances may be stored containing different arrangements of Cues.

Actual control of the system during a performance is from the Stereo Master module, from where the Cue List may be stepped through in sequence song-by-song, section-by-section, changing console parameters and external parameters as programmed. In the event of a last minute alteration to running order, the Cue List can be scrolled backwards or forwards to access the relevant Cues. Accessing and loading of Cues can, of course, also be performed from the keyboard.

The system's main screen displays all the automated faders and their mutes, along with each selected automation status (of which more later). VCA group selection is indicated below the input faders by the group number and up to three VCA masters can be assigned to one slave (master-to-master selection is not permitted). The screen can be zoomed-in to display 16-input faders along with their VCA and mute group assignment, plus channel and aux mutes. Fader VCA levels are displayed by bargraph, while the true physical position is indicated by the fader head. Also included on the main screen are details of the current Cue along with any user notes that have been attached to it. A menu bar running across the top of the ▶

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Algorithms include reverb as only TC Electronic could do it, pitch/harmony effects, and unmatchable chorus/flange/delay effects. Other algorithms are already under development by TC Electronic and third party programmers. Since the M5000 is software based, updating or adding new algorithms is as simple as loading in a RAM card or floppy disk.

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screen provides access to further screens and command boxes.

Console snapshots are captured and stored into a Scene List where they are numbered and can be named. If required these Scenes can be 'masked-off' by deselecting functions (either individually or globally) or entire modules from the snapshot.

Scenes are then dropped into the Cue List to construct a performance sequence. As mentioned Cues can also contain MIDI messages (8 events, 16 channels) and *Virtual Dynamics* events. Both types of event are stored under the category of 'Specials', and like Scenes can be added to the Cue List as individual Cues or to existing Cues. It is only possible to have one Scene per Cue, but there are no restrictions on the number of Specials. Each cue can be named, and to help blend Cues, a transitional crossfade of up to 25 seconds can be added to Scenes.

There are three fader-automation modes Override, Safe and Update which are stepped through from the local SELECT keys or globally set from the keyboard. In Override, the fader is disconnected from the computer and can be manually controlled; in Safe, the fader is set to the snapshot level and will be unaffected by any manual movement; in Update, the fader is set to the snapshot level but can subsequently be moved relative to that level (this does not cause the snapshot itself to be updated). The switches remain fixed in the equivalent of Update mode.

Recall may also be set up using Voice Prompt

As a safety precaution, a FADER ISOLATE switch is placed in the middle of the Stereo Master module which will disconnect all faders from the computer in the event of failure. The switch operates in the same way as the CHECK SOLO switch to prevent accidental selection.

The recall system stores the positions of all the controls on the Input, Group-Matrix and Stereo master modules apart form the solo switches and automated functions (which of course will reset automatically). A total of ten recall stores are available, all of which can be named.

When recalling a console setup, the system will allow certain groups of functions to be ignored, such as auxiliaries 9–12 for example, which saves a great deal of time when only certain controls are being used. The system then scans through the console module by module until it discovers a mismatch. Once found, the offending control(s) will be highlighted in be set between three levels—Coarse (within 6°), Medium (within 4°), and Fine (within 2°). As the system works its way through the console it will switch on the red automation LEDs to indicate matched modules, and alternately flash red and green LEDs to indicate the channel it has reached that requires adjustment. It is also possible to individually specify a module for recall.

Recall may also be used during a performance, say to reset a vocal mic EQ for a particular song. To allow this, a lot of work was put into isolating digital clock noise from the analogue circuitry. In the *Big* console this is not a problem because the *Recall* operation is always an off-line setup procedure, but for live use it is quite different.

Like the *Big* console, *Recall* may also be setup using Voice Prompt. This uses samples of Rupert Neve to tell the operator which control to access and what to do with it. It is a novel facility and useful as a backup, but is guaranteed to drive operators mad after the first few modules!

In addition to the ten recall stores, the system provides seven recall templates. Three of these are factory presets used to configure the console for House, Monitor or Split function operation, while the remaining four are left free for user configurations.

All Showtime data can be backed up to floppy disk.

Conclusion

Recall-By-Langley is a product for which many people in the sound reinforcement business have been waiting a long time. It has the potential to revolutionise the way live events are operationally managed by bringing facilities previously only available in the studio, to the stage.

Like its *Big* brother, *Recall* offers an impressive feature-to-price ratio, which combined with the desks multitasking flexibility make it a very attractive proposition.

Amek will be 21 next year, by which time they may also be celebrating the success of their most popular live console to date. ■

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World's Largest Music Console to Ocean Way

"G Plus Sounds Excellent By Any Standards"

▲ *100-channel SL 8000 G Plus and classic microphones at Ocean Way*

Ocean Way, the renowned Los Angeles music recording facility, has added its first SSL console. The 100-channel SL 8000 G Plus is housed in the company's Sherman Oaks facility, Record One.

"Record One and Ocean Way share a common ethic – to provide the best possible equipment, classic and modern, to meet the needs of both artist and producer," says Allen Sides, owner of Ocean Way and a respected engineer in his own right. "As we have clients who enjoy using SSL consoles, we decided that this should be part of the service that we provide." He adds: "I have always respected the ergonomics and automation of SSL desks. The addition of Ultimation™, bypassing the fader VCAs, and the latest audio enhancements mean that G Plus sounds excellent by any standards."

"The control rooms at Ocean Way and Record One are equipped with the best sounding consoles, tape machines and processors ever built - mostly modified to our own exacting standards," says Sides. "The recording spaces themselves are also unique. Ocean Way, in Hollywood, was the site of many classic recordings by Frank Sinatra, and the Duke Ellington and Count Basie Bands, amongst others.

"The rooms have a sound all of their own, and have been left largely unchanged to preserve their acoustic qualities."

G Plus Consoles Set New Standard in Audio Quality

SSL's new G Plus consoles are attracting attention from even more studios and producers because of their enhanced sound quality (see Ocean Way story) and advanced features.

G Plus consoles add to the basic specification of SL 4000, SL 6000 and SL 8000 consoles, without adding to the price.

G Plus features include:

- **Optimised audio performance.**
- **Linear crystal oxygen-free cable.**
- **3.5" disk drives - (1.44MB) disks, providing low cost mix data storage.**
- **Audio phase scope - permanent display of amplitude and phase relationship of left and right stereo signals.**
- **Remote controlled talkback system - via PCM encoded infra-red handset.**
- **Automated Solo - channel Solo buttons can now be automated.**
- **Video switcher.**
- **PPM metering.**

VisionTrack with ScreenSound

Digital Video Option For ScreenSound

SSL has further expanded its family of digital post-production products by making its VisionTrack non-linear video system available to ScreenSound users. This new option gives ScreenSound a re-usable random access picture source, for use on both standalone projects, and in preparing material for completion on Scenaria or OmniMix.

VisionTrack complements the speed of SSL's random access audio systems by providing instant location of picture to cue or mark points. With no spooling time, and no machine lock-up problems, the totally digital system saves on production time, and can dramatically speed up editing, ADR and voice-over sessions.

"VisionTrack brings the speed and convenience of non-linear video to standalone ScreenSound units," says SSL's Engineering Director, Phil Hill. "It also adds to the range of configuration possibilities for large networked systems."

Two versions of VisionTrack are available to ScreenSound users. One provides around one hour of digital video, while the second additionally records two audio tracks. The audio/video version enables VisionTrack to function as a capture station on the SoundNet network, recording picture and sync tracks without a ScreenSound. The audio material can then be accessed by other users on the same network for editing, sweetening and mixing. The picture may also be switched between rooms.

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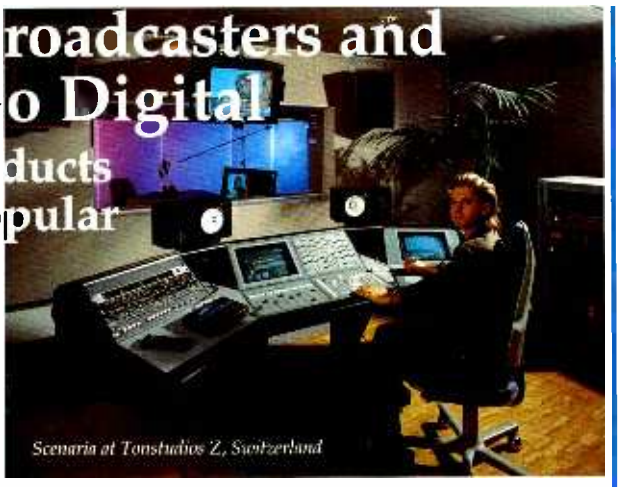
European Broadcasters and Facilities Go Digital

SSL Digital Products Increasingly Popular in Europe


Scenaria at Tonstudios Z, Switzerland

Throughout Europe, broadcast and post-production facilities are specifying SSL Digital products. Amongst the latest is **NOB**, which has chosen a Scenaria as the centrepiece of its new audio post-production department designed for use on television documentaries.

ORF, the state broadcasting company of Austria, has added a Scenaria to the post-production facilities at its headquarters in Vienna. It is used on all kinds of television post-production work.

VTM, the biggest commercial TV station in Belgium, has set up a new audio post-production suite featuring ScreenSound and SoundNet.

A ScreenSound and SoundNet network is also the centrepiece of a new production complex designed for audio to picture editing for a variety of productions at **Le Studio Ellipse**, one of France's foremost cartoon producers. Also in France, **Canal Plus** has selected a ScreenSound for use on short-form programmes.

Swiss studio **Tonstudios Z** has expanded its digital network of two ScreenSounds and a SoundNet with the addition of a Scenaria. **Proton Video** in Zurich has also added a Scenaria for use on commercials.

Two Spanish broadcasters, **Tele 5** and **Antena 3**, have both added ScreenSound systems to their post-production suites, as have **Trafalgar Studios**, **Forum Studios**, and **Guicar Television** in Italy.

The Post Group Adds Scenaria

▲ Scenaria at The Post Group, Hollywood

The Post Group, based in Hollywood, is the latest in a growing number of West Coast facilities to realise the advanced production capabilities of Scenaria, SSL's digital audio/video production system.

"The ergonomics of Scenaria are what initially attracted us to the system," says Rick Wilson, Audio Engineering Supervisor. "Our problem was that we needed an automated system, but were limited in the amount of space available for its installation. Scenaria solves both problems now that recording, editing and mixing can be carried out in a compact control surface and in the digital domain." Wilson continues: "I also have a much less cluttered work area than I would have had if I had gone with the individual components required to obtain the same result."

The Post Group, which already has a ScreenSound, recently completed work on the audio editing and mixing for the 100th episode of *Adventures in Wonderland*, a daily Disney Channel children's show, and were recently responsible for the post-production of two one-hour Prince music specials.

Spanish Broadcasters Choose SSL

Spanish broadcasters are increasingly demanding SSL consoles and digital post-production systems.

Antena 3, Spain's first private television station, features ScreenSound in its new post-production room. Cosme Rubio, Operations Manager at Antena 3 explains: "We chose the ScreenSound for its operational flexibility and comprehensive machine control."

A ScreenSound has been added by the private television station **Tele 5**, for use on promotional spots for the network's own programming. "The operators have acclaimed the ease of editing and general speed of response of the ScreenSound," says Steve Northam of Tele 5.

Catalonia's television network, **TV3**, has added an SL 4040 G Series console with Ultimation™ to its post-production room. "Reliability was a key factor in its selection for the network's audio production work," says Laura Baladas of TV3.

TVE, Spain's national television network, already uses eight SSL consoles for post-production work on music programmes, and is now adding SL 4000 desks in another five studios. "We appreciate their versatility, particularly for multitrack recording, and the facility to simultaneously mix in mono or stereo." says Constantino Montaner, TVE's Director of Technological Planning.

Time Machine

The Time Machine, an exclusive recording retreat in Vermont, has selected an 80-input "winged" SL 4000 G Plus console for the centrepiece of its Studio A. Spanning 20 feet, with 22-degree wings, the console features both Ultimation™ and Total Recall™.

Mike Cordell (pictured), owner of Time Machine, says: "A lot of the clients and engineers that take advantage of a facility such as The Time Machine seem to be SSL devotees, so it was an obvious choice for our Studio A." Chief Engineer Bruce Marshall, a 20-year recording veteran, adds: "I was particularly impressed with the configurability and flexibility of the console. It allows me to do things I never thought were possible."

The 11-building, 150-acre Time Machine complex houses two independent yet interconnected recording environments. The two studios were designed with an emphasis on privacy and luxury. Mike Cordell explains: "The Time Machine was built to give artists the freedom and focus to do the best work of their careers by placing them in an environment completely supportive of the creative process."

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Solid State Logic

OmniMix – Digital Surround Sound Technology

OmniMix is the world's first fully digital, surround sound capable audio/video production system.

It adds major advances in surround sound technology to the proven advantages of combined digital audio and video production first seen in SSL's Scenaria.

OmniMix additionally provides:

- Mixing to all major surround sound formats.
- Programmable mix matrix.
- Heirarchical submixes.
- Configurable mix busses.
- Simultaneous stem mixes.
- 96 channels of internal mixdown capability.
- Dynamic pan automation of up to 38 sources or submixes.
- 24 channels of digital effects processing.

OmniMix adds advances in surround sound technology to Scenaria's proven digital audio/video production capabilities

The objective of the OmniMix system is to take the presentation of digital audio into the multi-format era of creative possibility. SSL's patented MotionTracking™ and Spatial Processing™ add audio effects with new dramatic possibilities and impact. MotionTracking is a major advance in surround sound technology. It uses the OmniMix pen and tablet, and colour graphics, to quickly and accurately trace audio within the surround sound field. Unlike any other surround panning system, Motion Tracking can also be edited and updated. Up to 38 channels of MotionTracking are available simultaneously.

OmniMix features a substantially larger control surface than Scenaria, with additional hardwear controls, dedicated metering, and an additional graphics screen. It is also available as a hardware upgrade to existing Scenaria users.

Hollywood's First Entirely Digital Post Facility

Hollywood Digital, a new multi-million dollar, all-digital post-production facility has installed two Scenaria digital audio/video systems and two ScreenSound digital audio editors.

Hollywood Digital provides a variety of client services, including film and tape-based television post-production for commercials, promos, music videos, feature films and corporate productions. The facility offers the latest technologies in video editing, graphics, telecine transfer and duplication, and features two Scenaria digital audio production suites as well as two ScreenSound digital audio editing suites.

All four of the SSL rooms are connected via SoundNet, enabling instant retrieval of recorded information and shared access to all audio work.

Bill Burnsed, President and Chief Executive Officer says: "Opening Hollywood's first entirely digital post-production facility was a long-standing dream for my partners and I. When we saw Scenaria, with its combination of digital audio and video, we loved the concept. It represented exactly what we are trying to do here. It's also proving to be one of the most profitable decisions we made."

One of two Scenaria production suites at Hollywood Digital (Inset) Bill Burnsed, CEO

Head of Audio Services at Hollywood Digital, Andre Perreault, comments: "Scenaria cuts my mix time down by 40%. The fact that it is a completely integrated system makes file and project management much easier to handle. Everything is right at my fingertips whenever I need it, and the audio quality is superb - most definitely exceeding that of the CD."

One of the latest projects to come to Hollywood Digital is Fox Broadcasting's popular *X-Men* cartoon series. This number one rated Saturday morning programme in the United States demonstrates the highest level of quality in animation and effects, and as a result Fox was looking for the state-of-the-art technology and expertise which Hollywood Digital could provide.

At the heart of Hollywood Digital is the machine room, containing the processing power for the ScreenSound and Scenaria suites, and the SoundNet digital audio networking facilities ▼

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AUTUMN 93

Solid State Logic

Largest Music Console to Ocean Way

100-Channel SL 8000 G Plus for LA Studio

ALSO INSIDE

First G Plus in Japan

US Networks Install SL 8000 GB

European Mobile Goes SSL

'Winged' SL 4000 G Plus for The Time Machine

Strongroom Installs First G Plus in UK

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Top US Television Networks Choose SL 8000 GB

CBS and NBC Select On-Air Production Console for Two New Shows

CBS has purchased a 56-input SL 8000 GB console, plus an 80-input SL 4000 G Plus console, for its New York broadcast facility.

The two consoles were purchased by CBS for use on the new Letterman show, to be located in the legendary Ed Sullivan Theatre. The SL 8000 GB, which includes 48 mono and 8 stereo modules, a remote patchbay and full multitrack capabilities, will be used as a production console on the show, taking feeds from various sources and sending them to air. The 80-input SL 4000 G Plus console, which features Ultimation™ and Total Recall™, will be used in the music room by the show's audio consultant, Michael Delugg.

NBC has also purchased an SL 8000 GB console and a 96-channel SL 4000 G Plus with Ultimation™ to add to its already extensive SSL audio production facilities at Rockefeller Centre.

NBC is installing the consoles as part of an extensive upgrade of its audio, video, sound effects and music rooms.

New SL 8000 GB for On-Air Production

Designed for on-air and production versatility in the broadcast environment.

- Unique, switchable operation modes for Broadcast, Recording and Remix.
- Master Status switching for rapid reconfiguration.
- 24 mono or 12 stereo clean feeds in Broadcast mode.
- Up to 8 VCA control groups.
- Four stereo subgroups and two stereo output busses, accessible from either signal path, plus full 24-track routing.
- Wide range of custom options, including the ability to incorporate any SL 5000 M Series cassette.

River North Flows To SSL Again

River North, a major recording facility in Chicago, recently installed its second SSL. The 80-input SL 4000 G Plus console features custom 12 degree wings, Ultimation™ and Total Recall™. Joe Thomas, President of Platinum Entertainment Worldwide which owns River North says "It is undoubtedly the most flexible and easy-to-use console I have ever worked with. It helps us to achieve a great mix at an incredible speed."

Joe Thomas at the G Plus console in River North

SSL Speeds Post-Production In U.S. Mid-West

Audio Post Companies Rush to Install Scenaria

Recent sales of Scenaria in Michigan reflect its growing acceptance as the digital audio post-production standard.

Avenue Edit, a major television creative editorial and post-production facility in Chicago has now installed its second system.

Director of Development, Bill Webber says: "We particularly like all Scenaria's functions being integrated into one system, as well as the capacity to network two Scenarias together."

Producers Color Service, the full-service production and post-production company in Detroit, has also added a Scenaria as part of a major expansion of its facilities. VP of Engineering, Vince Capizzo says: "Scenaria is an essential addition to our facility. It is the breakthrough in digital console technology that we have been waiting for."

▲ Avenue Edit has taken delivery of its second Scenaria system

Producers Color Service has installed both ScreenSound and Scenaria systems, as well as the SoundNet digital audio network ▼

Recording School Opens With SL 4000

Alchemea, a school for recording engineers and producers which has recently opened in London, uses a 40-input SL 4000 G Series console for its Advanced Audio Production course.

Its philosophy is to train students to the highest levels of efficiency and knowledge, using state-of-the-art technology. Claude Camilleri explains the decision to install an SSL console: "We had to make the same commitment to our students that we were asking them to make to their future."

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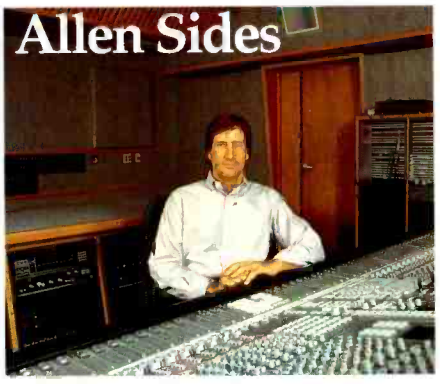
From the Desk of.... Allen Sides



"At Ocean Way, I am somewhat fanatical about sound quality. My priorities lie in having large, live rooms that have great sound and atmosphere; rooms that will cater to any given situation. One day we'll be working with an 85-piece orchestra, and the next we'll have an Ice-T and Slayer duet!

"The rooms here were designed in the late-1950's by Bill Putnam and have been left largely unchanged to preserve their acoustic qualities. Because I look at things from the perspective of the musician as well as that of the engineer, I put equipment together in packages that will work for me. I personally tend to go for items that are a little out of the ordinary, particularly when it comes to auxiliary equipment. I'm always on the look-out for that remarkable device that is no longer in production, be it a Fairchild limiter or an EMT 250. Take, for example, the Ampex ATR 124 multitrack. There were only ever 50 of these machines produced. We have managed to locate 12 of those original 50 systems, and they are all in use here at Ocean Way.

"My recent installation of a 100-channel SSL G Plus console has been a long time in coming. In all honesty, I wasn't a fan of the early E Series consoles, but over the years, the company have made some very significant improvements. From an ergonomic and functional aspect, the SSL has always been an outstanding console, and the company's level of maintenance support is unparalled in the industry. SSL also had the first VCA-based automation system that really worked.

"The advent of G Plus has made the console sonically acceptable to me and to my mainstream clients. The addition of Ultimation™, bypassing the fader VCAs, and the latest audio enhancements mean that G Plus sounds excellent by any standards. As my goal is to provide the best, I decided that the SSL should be part of the service that we at Ocean Way can offer our clients."

Training for SSL Users

The availability of well trained operators is an important consideration for anyone adding new equipment to their facility. In recognition of this, SSL offers detailed practical training on all of their consoles and digital systems.

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

SSL G Plus Chosen by Japanese Studio

First G Plus In Japan Installed In Landmark Studio

Landmark Studio in Yokohama, a new facility owned by the Bay City Group, has recently installed two SL 4072 G Plus consoles. These are the first G Plus consoles to be installed in Japan.

Mr Hiromi Kuroiwa, Studio Manager, says: "Landmark Studio chose the SSL consoles because they are very popular, both in Japan and throughout the world, so they are suitable for many clients, including those who come from overseas." He continues: "The G Plus consoles also have excellent operational features, including the 3.5" floppy disks, which make the storage of material very easy. The sonic enhancements of G Plus are also appreciated."

Landmark Studio is a spacious facility, with a large lounge and bar where clients can relax comfortably between recordings. The control rooms are also spacious. Situated in Landmark Tower, the tallest building in Japan (296 m high), the studios are linked by tie-lines to Landmark Hall, which makes recording live performances very straightforward.

SSL Wins Third Queen's Award

SSL has been awarded a 1993 Queen's Award for Technological Achievement. The award was made for SSL's digital audio editing systems, which are widely used in the production of television, video and film soundtracks around the world.

This latest success complements SSL's two previous Queen's Awards for Export, and proves once again that SSL's technology leads the world.

"The Queen's Award for Technological Achievement is the most prestigious award to be conferred on SSL for its success with digital technology," says Solid State Logic's Managing Director, John D. Jeffery. "We are honoured and delighted to receive this award, and welcome it as recognition of the imagination and technical excellence of our design and engineering team."

▲ *Sir Ashley Ponsonby, Lord Lieutenant of Oxfordshire (left), presents the Certificate of the Queen's Award to John Jeffery, Managing Director of SSL*

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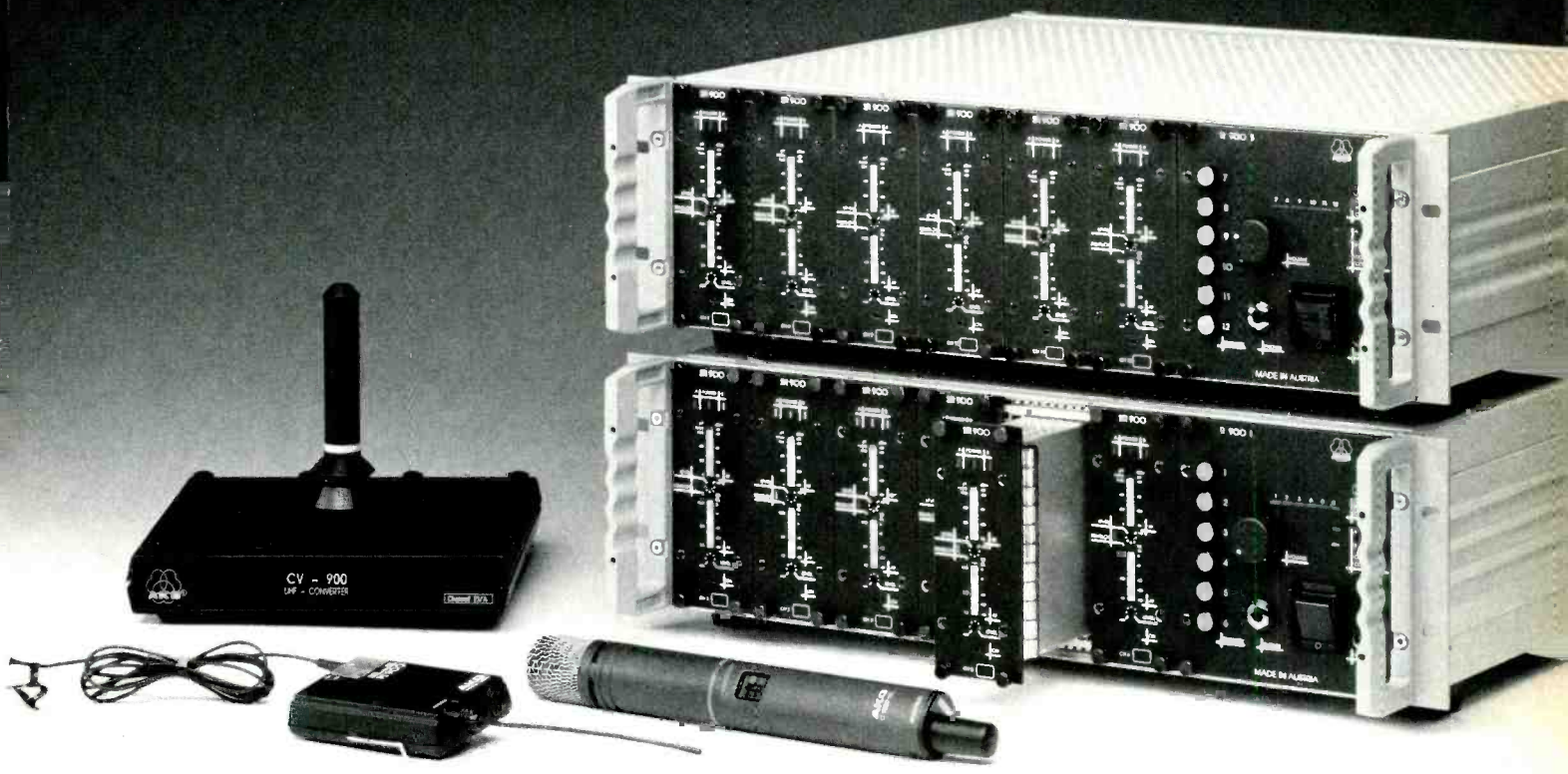

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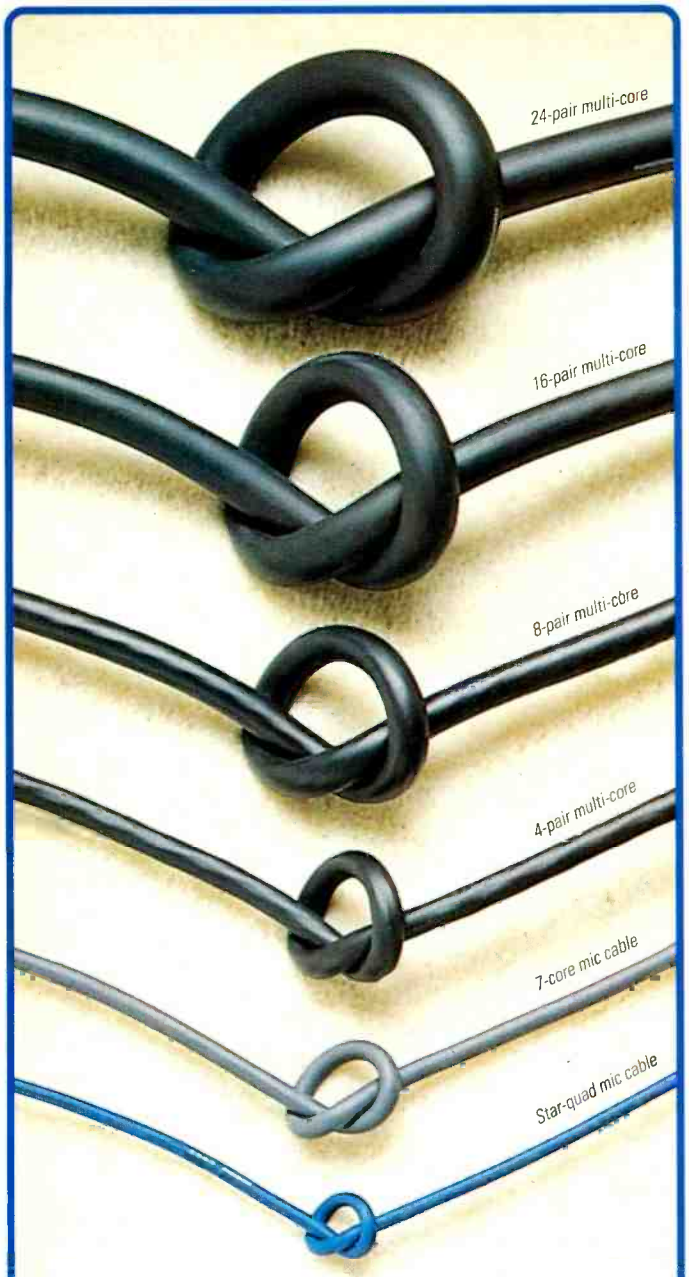

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HAIR TODAY

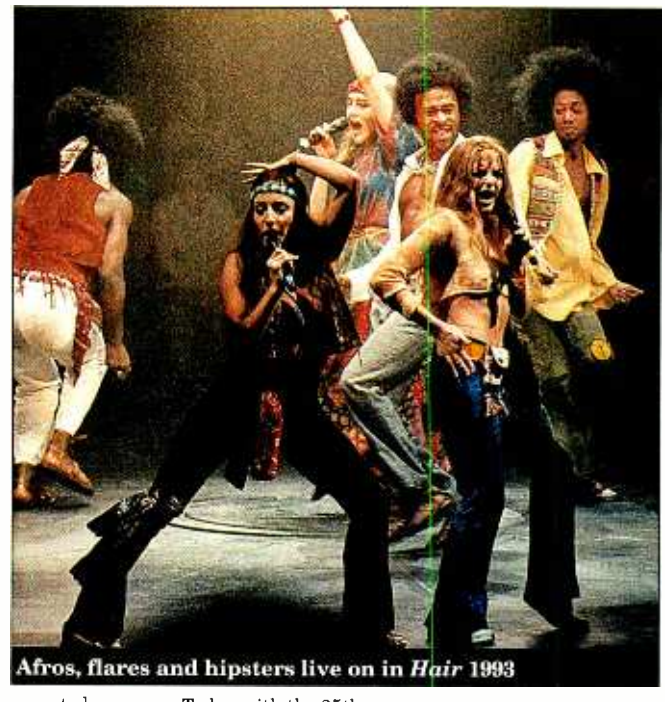
Twenty-five years after it shocked the public, the musical *Hair* is back on the London stage. Zenon Schoepe takes a trip behind the scenes

When it opened in 1968 *Hair* caused an awful stir. Here was palpable proof of the swinging 1960s slapping the face of a public that could still be shocked. It identified the generation of parents who succeeded those that had been outraged by the arrival of rock 'n' roll in the 1950s and dared them to react in a similar manner to longer hair and the associated paraphernalia and attitudes of the 1960s.

Tied so firmly to the kaftans of the period as it is, much of *Hair* now looks a tad dated but it serves as a reminder that when there is a buzz about something it can grow beyond its real proportions. The commonly held belief, among those who never saw it, that this was some 'Romans in Britain' sort of presentation of the day are widely unfounded. The concept of *Hair* comprising almost exclusively of a riot of buttock-to-buttock nudity and four-letter words is somehow deflated by the realisation that the flesh is confined to a meaningful moment towards the end of the first act. And there is not actually enough swearing by modern standards.

However, at the time racy it most certainly was opening in April 1968 at The Biltmore Theatre on Broadway followed on 27th September by the London production at The Shaftesbury Theatre. This date is significant as the day before it opened, the office of the Lord Chamberlain, who dictated matters of 'taste and decency' for the stage, closed. Legend has it that the nudity and the first expletive elicited standing ovations and presumably calls of 'Right on man!' from the be-beaded audience on the first night.

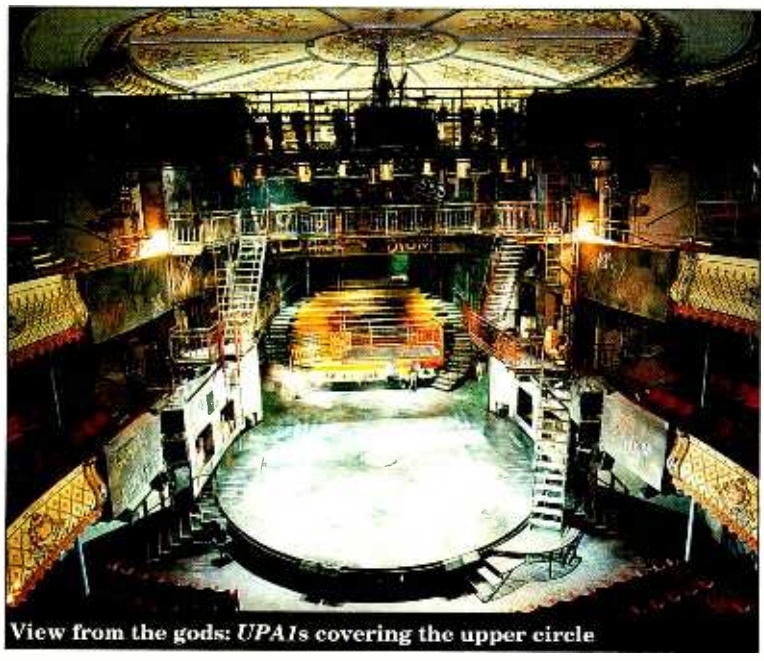
In London, *Hair* ran for 1,999 performances before the theatre ceiling collapsed. It was revived in 1974 at The Queens Theatre, at which time lines such as 'Get down sister!' were still accepted currency. Today with the 25th anniversary production at The Old Vic in London such parlance is not acceptable in the business world, but *Hair* remains a time capsule, packed full of energy and some stonking numbers that over the years have got the treatment from people like Oliver Tobias, Elaine Page, Tim Curry, Diane Keaton, Meatloaf and Donna Summer among others.



Afros, flares and hipsters live on in *Hair* 1993

Sound Designer for the new production is Andrew Bruce, cofounder of theatre sound and hire specialists Autograph Sound Recording, himself responsible for such theatrical milestones as *Cats*, *Starlight Express* and *Evita* among many, many others. It is not surprising that Bruce is taking the sound system away from the Altec Voice of the Theatre speakers and *Alice* console used 25 years ago and leaving the authenticity to the 11-piece band —Hammond, Rhodes, two electric guitars, bass, percussion, drums and 4-piece brass.

Particularly memorable parts of the show like the nudity and the famous Supremes-in-one-dress piece have been reproduced faithfully, but 25 years on, the show has benefited from technology. Most notably the players are released from the constraints of cabled hand-held mics with the corresponding freedom of choreography afforded by Sanken ▶



View from the gods: *UPA1*s covering the upper circle

ALL AUDITORIUM PHOTOS: NIK MILNER

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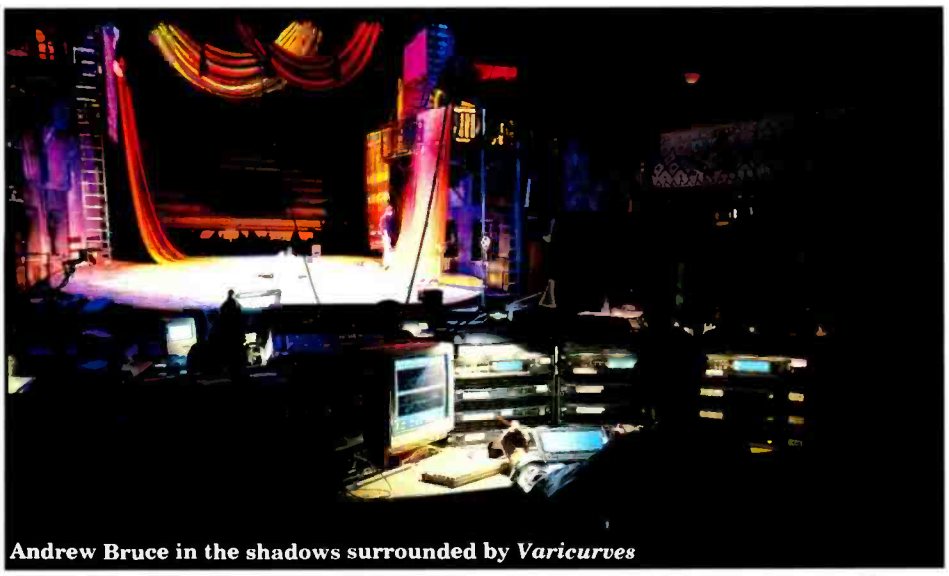

Andrew Bruce in the shadows surrounded by *Varicurves*

1968 IN PERSPECTIVE

England were reigning World Champions in football; Manchester United won the European Cup; Mexico Olympics—Tommie Smith and John Carlos raised gloved fists in Black Power salutes during US national anthem; UN condemned apartheid for the first time; there was famine in Biafra; America was in Vietnam; Martin Luther King and Robert Kennedy had just been assassinated; Prague had a Spring; Paris students revolted; Harold Wilson was UK Prime Minister; nearly 90% of Britain had TV sets (mono mostly); the most popular programme was *Coronation Street;* Eamonn Andrews was rumoured to be earning £50,000; 'Jumpin Jack Flash', 'Those were The Days' and 'Hey Jude' were in the charts; *2001, The Graduate* and *The Good, The Bad and The Ugly* were at the cinema; *The Naked Ape* and *Airport* were popular books; everybody was talking about a model called Twiggy; the Pope banned artificial contraception. ■

COS11 mics on Sennheiser *SK2012* lavalier transmitters chosen for their compact size and ability to be concealed in headgear. The nude scene and a belt pack? I don't think so. The receiving end of the radio mic systems includes a Micron multichannel diversity rack. Bruce selected this unit for its compactness, quality of display and ability to provide 12 channels of full diversity reception in an 8mHz bandwidth.

The problems

Bruce has been using the Meyer *SIM II Source Independent Measurement* analysis system for rig equalisation since 1986 and swears by it. *Hair* had very special production requirements that necessitated the construction of a very complicated sound system and *SIM*ing came into its own. 'There are shows in which you can recommend, suggest, plead and beg for the sound and still the visual side will take precedence,' explains Bruce. 'It's one of the joys of working in the theatre—these unreasonable things that are thrown at you.'

The first problem arises from the use of a triple-revolve stage which is built out into eight rows of the auditorium. With bums-on-seats in mind and an eye for the unusual, 100 seats have been relocated at the back of the stage in a steeply raked block and painted with a giant sunflower to act as a backdrop for the performers.

'That immediately gives us the need to feed everything in two directions,' says Bruce. 'The acoustics of the auditorium are excellent but the acoustics of the stage area are different. It's empty, there's very little in the fly tower which goes up 100 feet above the stage, it's a big empty box that is quite capable of taking any sound you put in and spitting it out a lot later.

'We've hung as much damping material up there as we can but it's not as much as we would have wanted because of the large lighting rig. What we have is an audience of 100 sitting in a rectangular box bounded by concrete and brick walls with no absorbent material to speak of, with a high-power loudspeaker system feeding straight into it.'

Bruce has recommended that the sunflower seats be kept full at all times so that the bodies can act as absorbers. 'Alternatively, if there is nobody sitting on the stage then the mixers have been told to turn that system off,' he says.

The second curio also revolves around the use of the new stage, because the orchestra pit is covered, the musicians have been located on the set and split at different levels in the galleries either side of the stage. 'This means they're in the least controllable place you could possibly have put them—right out in the middle of the volume of the space,' observes Bruce adding that the musicians are in full view, wear costumes and consequently cannot be hemmed in with the usual screening.

Both instances aggravate the standard problem of getting level out of headworn omni radio mics in a high ambient field but it does not stop there, hand-held radio mics are used to add authenticity to the out and out rock numbers.

'Very early on we realised that we needed a radio mic for every member of the company who had a line because the style of production means that performers don't generally leave the stage to allow us to reuse frequencies and packs in the normal way,' says Bruce. 'So that's 22 lavalier radio mics and then we had to find frequencies for 11 dedicated hand-helds, three of which are spare.' The cherry on the cake is the radio electric guitar for lead man Paul Hipp at the beginning of Act 2.

'That's a total of 34 radios which to my knowledge is seven more than any other show in the West End or Broadway,' states Bruce. 'It's making full use of the theatre allocation plus some of the Association of Service Providers frequencies which are available for general use on a frequency-by-frequency basis,' he says. 'It's stretching it, but we do have three spare frequencies one of which can double as a lavalier spare.'

Bruce is describing a scenario with a potential for 37 open mics on a small stage bounded by loudspeakers and a band overhead.

The system in brief

Bruce splits the Meyer loudspeaker system for vocals and the band in all instances apart from fills using two *MSL2* speakers arrayed vertically on each side of the stage to do the stalls and the first circle. Hanging beneath, a pair of Ultra monitors act as down fills and extreme side fills. The upper circle is covered by a cluster of three widely arrayed *UPA*s with a token ring of delay speakers for vocals and orchestra.

Facing perpendicular to the sunflower seats is a stereo pair of *UPA*s with *UPM*s for side fills. Out front, six speaker sites on set handle the orchestra reinforcement for the main auditorium to bolster the band's own level and these are also used for sound effects. Ultramonitors at the stage edge and pairs positioned to fire across stage act as monitors for the hand-held mics. ▶

The Old Vic auditorium

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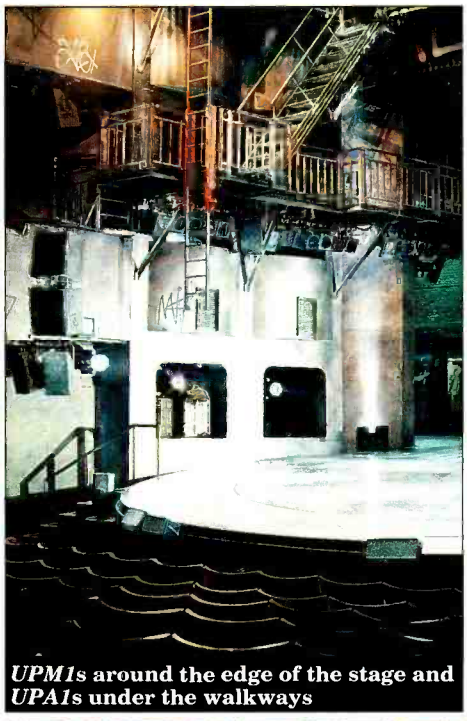
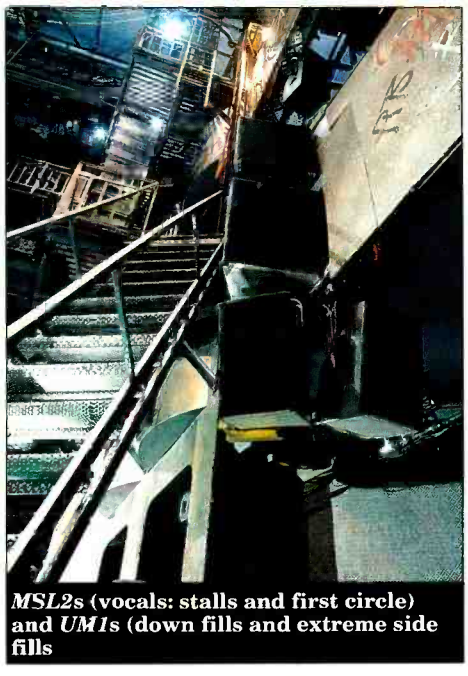
View from the 'Sunflower' seats



***UPM1s* around the edge of the stage and *UPA1s* under the walkways**



***MSL2s* (vocals: stalls and first circle) and *UM1s* (down fills and extreme side fills**

Why SIM?

'Using *SIM* makes sense,' says Bruce. 'It takes one signal which can be anything—that's why its Source Independent—as long as its generated within the system and it compares that with the signal as it appears at the microphone having gone through the chain of the equalisers, the loudspeakers, the air and the auditorium itself. It compares like with like and all it tells you is that it doesn't match,' he explains. 'It doesn't try to influence your decision about whether there should be some global curve to it, some roll off, some weighting. It just tells you that what left the desk is or isn't present in the same quantities at the measuring point. This it does very quickly and accurately.

'SIM gives a pair of curves at any time, one is amplitude response the other is called coherence which is the measure of how coherent the signal is to the original,' he says. 'So you've immediately got something that tells you how coherent the data is and whether you can trust it. The points of incoherence are almost always due to cancellations in the room and that always occurs no matter what system you are using but the good thing about *SIM* is it tells you what you can ignore.'

Bruce *SIM*ed the Old Vic installation using eight Sennheiser *MKH40* mics and starts by giving himself a best shot by moving them quite close into the speakers. 'I'm looking at as good a signal direct from the speakers as they'll get so I can correct any shortcomings in the speaker in almost clinical conditions. Then I move the mics further away and work on the changes as the room starts to creep in,' he recounts.

The EQ

For equalisation Bruce is using BSS *FCS926*s *Varicurve* programmable EQs for the first time. 'I usually use Meyer *CP10*s which are absolutely brilliant and they've paid a lot of attention to phase response on adjacent bands and the *Varicurve* matches the *CP10* almost exactly.'

Bruce tried the 13 *Varicurves* feeling safe in the knowledge that if they did not perform he could fall back on the *CP10*s—but he didn't have to. 'They're under MIDI control, you can download curves, you can store curves, they're made in Britain and a cost comparison of using an *FCS926* in each rack and three slaves comes out at just under half price,' Bruce states. 'Potentially you can save space but actually you can't because they get so hot that you have to leave as much space as you can. It's an exercise that has paid off because much as I like the *CP10*, we've got 70 of them and I'll always use them, the *Varicurves* are brilliant.'

Bruce ran a prototype BSS *Varicurve* remote to control the system and explains that it is all that is required in addition to *SIM*. 'The other good thing about *Varicurves* is that, because I'm able to store curves on them I can keep all my attempts from my first curve and all my refinements just in case,' he says adding that the *SIM*ing took eight hours. His use of *MKH40* cardioids is contrary to the Meyer-recommended B&K omnis but he has practical reasons for his choice. In attempting to *SIM* an off-centre cluster in a spherical brick auditorium in Copenhagen with omnis he achieved virtually zero coherence. He could not make a judgment on equalisation and could not get any closer to the speakers.

'So I started with a rifle mic and got quite a coherent curve,' remembers Bruce. 'I equalised the speakers on the basis of that and then backed off using a cardioid and taking in more of the

Autograph's FX studio

auditorium.' This made sense to him as he was concentrating on the speakers as opposed to the room. 'We have the remarkable ability within our brains to get rid of reverb and tailor our hearing to be cardioid, or whatever, to listen to what is going on on stage,' observes Bruce. 'I use *MKH40*s for that very reason. I would rather be able to produce an EQ curve on the basis of something that's real, although perhaps slightly flawed in being a cardioid and missing certain things, because at least it's a real curve.'

He is adamant that *SIM*ing has given him results which are '100% better' than anything else he has ever used and recounts the first time he used the system was on *Chess* in London. He found he used less EQ on the orchestra and the mix came together faster.

'However, the really remarkable thing was when they started to play and we put all the channels up it sounded quite reasonable for a first attempt,' remembers Bruce. 'I walked down the aisle towards the orchestra pit and not one thing moved. That is quite remarkable and I have found that ever since.' ■

EFFECTS

Central to *Hair* arrangments is a 36-input Cadac *E-Type* with 12 subs, 12 groups, 9 VCAs and 8 auxes strapped to a 25-input Cadac *G-Type* side car for most of the vocals with the main desk split for what is left and the orchestra. Effects are handled differently.

'One of the things I learnt about seven years ago was that when you have a heavy sound effects show—automate,' states Bruce. 'That is exactly what robots can do best. For mixing live, moving faders are not very helpful because things are so different from night to night but with sound effects what you want you do is hit a button and for all of them to come out of the right places at the right level. You don't want to even have to think about it,' he says. For this purpose he uses an Outboard Electronics *SS2* 8 x 8 moving fader mixer accessing its own speakers and some of the others and scene changes and fader moves are triggered from an Autograph in-house designed automation system which also drives the Cadac. Sound effects are derived from an Akai *S3200* with optical disc with DARTs as backup and the Autograph system permits the sequencing of strings of Cues for multiple dynamic combinations of sound effects.

Playback is through a quadraphonic diamond of speakers throughout the theatre with *650R2* subwoofers providing the necessary bottom end. 'We can get enough low end in here to make you wonder if the building is safe,' says Bruce. ■

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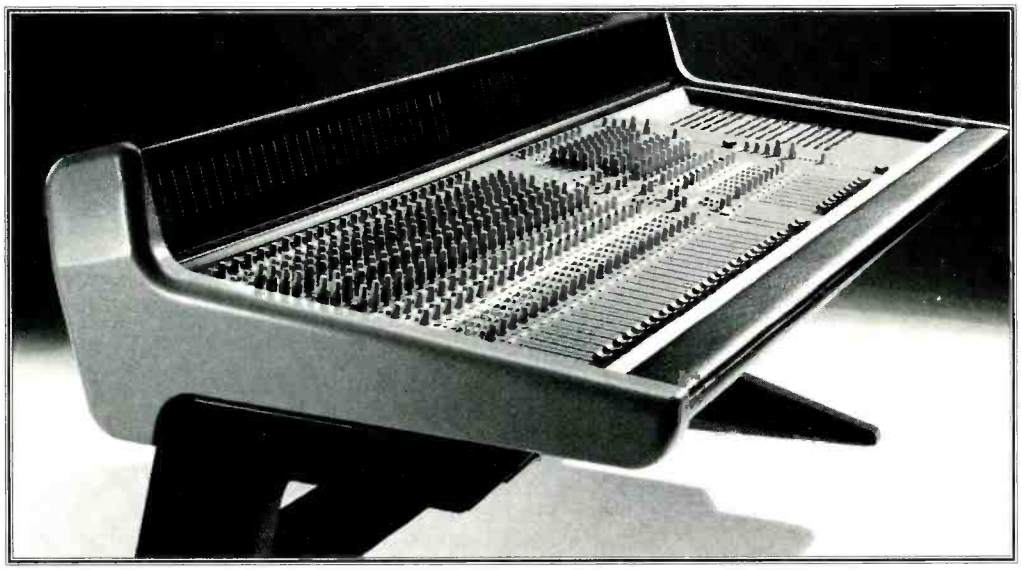

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ON THE WAGON

Terry Nelson hitches a ride with the Swiss MediaSound mobile recording truck

Sweden is not the first country to spring to mind when thinking of large, mobile recording studios—or, as the Americans have it, remote trucks. However, visitors to the AES Convention in Vienna last year could hardly have failed to notice the large truck parked outside the Congress Centre—an exhibit a bit too large for the exhibition hall itself. It was, of course, the MediaSound mobile.

Walking inside the truck is very much akin to walking into the TARDIS (as fans of the cult BBC TV series *Dr Who* will know) there is far more space inside than appears to be possible from the outside. It is easy to conclude that you have either indulged a little too much in alcoholic beverages the previous evening. The explanation to this particular anomaly, of course, is that the truck expands out but the way that it had been parked in Vienna made it easy to overlook this fact.

Expanding mobiles, though not new, are still the exception rather than the norm—and the MediaSound truck does it in style. But before going further, maybe we should meet the man behind the wheel (or is that console?).

Owner and co-designer of the truck, Anders Muhr made an early start in professional audio by joining Swedish radio at the age of 16. Being a vehicle enthusiast, he soon passed his HGV licence which meant that he went into remote operations (OBs) right from the beginning.

'In those days the equipment often consisted of an old 7-channel valve (tube) mixer with one VU meter,' he reminisces, 'and we handled everything from Sunday church services to concerts.'

After radio came the step up to sound for television broadcasts together with an ongoing education in audio engineering and music recording.

'I reached the status of music engineer in 1976,' he says, 'and this led to my producing a live rock show programme which could loosely be translated into English as *The Grip*. This was all good experience as I was both producing and engineering, as well as gaining a lot of exposure to different styles of rock music and getting it on-air under live conditions.'

Muhr continued to move up the ladder of promotion and between 1979 and 1985 was the head of regional engineering for remote operations.

'I then reached the point where I had to decide whether I wanted to be a part of a large organisation or branch out on my own. It was getting increasingly obvious that Sweden needed a

The 96-channel Raindirk *Symphony* dominates the control room

On the road again—with MediaSound

modern multitrack mobile—it was just a question of who was going to build it. Swedish broadcast were talking seriously about a project with me and at this point I decided that the best idea would be for me to capitalise on my experience, build my own truck and turn my former employers into customers!'

The first MediaSound truck, a 10.5-metre Volvo rigid, hit the road soon after and was equipped with a customised Saje *Odyssey* console (48-24) and MCI 24-track. The mobile soon built up a strong reputation in Sweden, Norway and the surrounding Scandinavian countries.

'For a lot of jobs in the North, the truck is just the right size, especially for Norway,' explains Muhr. 'The roads are not always wide and going through the mountains can get fairly tight on the bends.'

Success, as the saying goes, breeds success, and in 1990, Muhr was seriously considering putting a second, larger truck, on the road.

'Whereas the first studio was handling local work just fine, it was clear that if we wanted to expand operations further south, we would have to have a truck that would not only be as good as the best on the market, but better. The question was to find the facility that would set us apart from the other studios.'

As anyone involved with mobiles will know, the single biggest limitation is space—getting the equipment is 'just' a question of budget. However, a standard truck or tractor-trailer can only be so big due to size and weight regulations in force across Europe.

'Looking at the latest generation of trucks, expanding sides were the obvious answer but even this had limitations when I saw what had already been done.'

The answer to the problem was provided by a friend of Muhr who is, as he politely puts it, a truck nut: 'I have this friend who builds the most outrageous customer trucks and trailers —but who is also an excellent engineer.'

At the time, one of Muhr's projects had been an exhibition trailer for Scania (the Swedish truck manufacturer) which expanded out to provide a mobile showroom and conference centre for Scania dealers and customers. The 'box-in-a box' construction meant that the overall dimensions were 16.5 metres long by 5 metres wide—a lot of space.

'The trailer only did a ▶

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RECENT DATES

About 70% of the work undertaken by MediaSound is for television audio production such as for the Swedish Film Awards, Danish 'Grammy', a series of 40 live broadcasts (4–5 bands in each show) and various European recordings with Harry Braun of Sony Classical.

Other dates:

Bon Jovi
(TV)

Duran Duran
(TV)

Alana Miles
(TV)

Leonard Cohen
(TV)

Hot House Flowers
(TV)

Lou Reed
(FILM)

Santana
(TV)

Robert Plant
(TV)

New Order
(TV)

Berlin Philharmonic Orchestra

Keith Richards

couple of promotional tours in Sweden and then Scania started to wonder what to do with the trailer. At this point it was a question of, "I have a friend who..." and from then on the project just grew and grew.'

The first job for the new MediaSound mobile, christened Track Truck One, was a rock show in Stockholm for television, *Cafe Opera*, followed by a Lou Reed concert in Berlin. From then on, the studio just keeps on trucking.

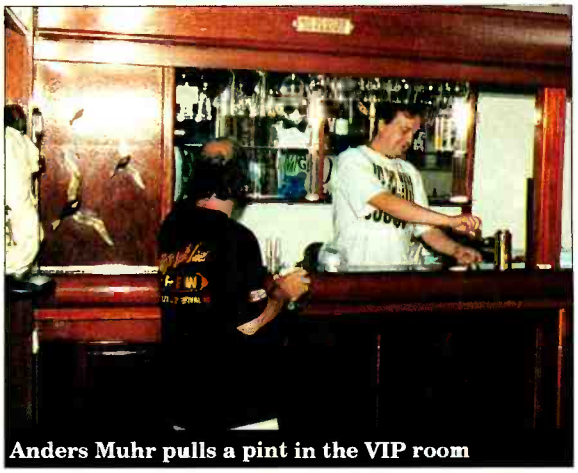
Looking inside the mobile, the main entrance is at the rear and one of the first things that a visitor notices is that the rear of the truck virtually 'sits down' on the road, making access very easy—especially when outside equipment has to be brought in.

Muhr explains: 'The rear bogie can be moved over a distance of 4.8 metres by means of two double-action pistons, and the special framework allows the rear of the truck to lower itself down. This is a spin-off from the large logging trailers in Sweden where they are often transporting loads in severe weather conditions on small roads and cannot stop or they will get stuck. Moving the rear bogie allows them to get round difficult turns without stopping.'

The inside of the truck is divided into two parts, the control room and the aptly named VIP Room/Machine Room. To compensate for the slope of the truck, the control room floor is angled down in order to be level when the trailer is in position. There is then a step up into the VIP Room/Machine Room, where the floor is similarly compensated.

The control room is installed along the length of the trailer —rather than across—and the reason is evident when one sees the 96-channel frame of the Raindirk *Symphony* console extending over 5.5 metres.

The console frame is equipped with 64 channel-strips, with each featuring two microphone preamps, plus a line input, thus providing a total mixing capacity of 192 lines. Other features include 48-track routing. Yellowtec *System 4* automation and a 'split facility' which allows the console to be divided into two sections for two-man operation and effectively give 96-track routing for multi-machine use.



Anders Muhr pulls a pint in the VIP room

Monitoring is Westlake powered by BGW, together with a selection of nearfield speakers according to choice. Two video screens are installed behind a plexiglass window between the main speakers and various video sources can be called up via a 12-way video switcher keypad installed in the desk.

The control room features a large vertical rack for the outboard equipment, which ranges from vintage *LA1176* limiters to Eventide *Ultra-Haromizer*s, together with a large leather sofa for visitors and.or the production team. The acoustics are a mixture of trapping and diffusion with the calculations for the quadratic diffusers having been done with the collaboration of the University of Stockholm.

As well as providing all the technical facilities expected of a first class recording studio, a large mobile has to be equipped with all the necessary interfacing, communications, etc, that are not typically found in a fixed studio. Track Truck One is fitted with both 4-wire and 2-wire communications systems, large audio and video patchbays, 380V 3-phase operation together with integral backup generator providing 35A, SCV active split system with three outputs per input and ▶

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MediaSound 'sitting down' for ease of access

extensive multicore cabling.

Apart from a large control room, what really sets the MediaSound truck apart is the incorporated bar—sorry, the VIP Room.

Stepping up into the other half of the truck, one gets the full impression of the space available as well as a bit of difficulty as the brain tries to reconcile the fact that you are in a truck trailer and not a large room. One side is fitted out much like a comfortable clubroom with (authentic) marine paintings on wood, armchairs and tables, antique lighting, musical and recording memorabilia and the centrepiece—a mahogany bar with beer on tap at the far end of the room.

As well as featuring a wide range of drinks, the bar is also equipped with a large fridge, microwave oven, coffee machine and wash basin.

The other side of the room is more spartan and can easily house four multitrack machines (digital or analogue) together with a selection of master machines. A suitably period desk rounds off the furnishings and provides a useful office area for the studio and production staff.

Muhr: 'I always felt that a large area for visitors and the machines was essential for a new truck. The number of people that actually need to be in the control room during recording is very small so you need to have space for the other people concerned with the production where they will not obstruct or inconvenience the engineering team.'

The machine room can also double as a recording room for overdubs or as a continuity suite for live broadcast—all with the bar facilities on hand. There is also a service door so that people can come in and out of the room without having to tramp through the control room.

The other limiting factor in many mobiles is the height. Due to the fact that Swedish regulations concerning heavy goods vehicles allow larger overall dimensions, the internal ceiling can be termed 'comfortable' and is not unpleasantly low.

As would be expected, the truck is fully air-conditioned but rather than using a large central unit, makes use of Sanyo wall-mount air conditioners that are connected to duct paths for the two rooms.

'The Sanyo units offer the advantage of being small, quiet, very efficient and are low in power consumption. They are also very economical!'

Truck enthusiasts will be interested to know that the trailer is pulled by a Scania *R142M* tractor with a 14-litre diesel engine that develops 450 horsepower and uses a computerised gearbox.

MediaSound's Track Truck One has got off to a very good start and has been used for various live recording sessions as well as complete projects with overdubs and mixdown. The space and technical excellence of the mobile must make it rank as Europe's foremost remote facility—if not one of the world leaders. It certainly lives up to the three main targets laid down by Anders Muhr: capacity, space and convenience. ■

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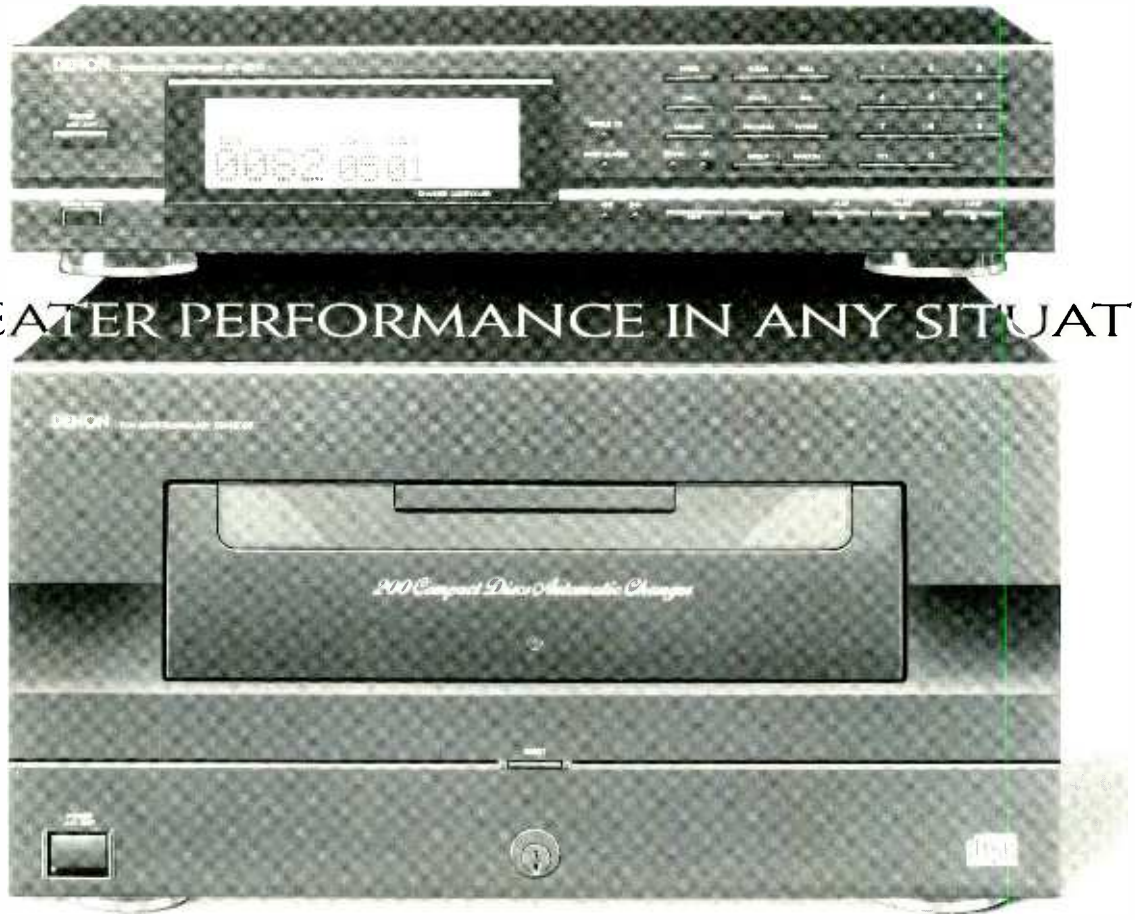

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Language barrier

Dear sir, I sympathise with your views expressed in the July1993 editorial ('Language is a Virus'), both on technical terms and on standard methods of measurement. However, the solution is entirely in the hands of the industry. There is a very active BSI committee. EEL/32, which deals with methods of measurement for all audio equipment, analogue and digital. This Committee closely parallels the international committee IEC TC84. Together with the allied committees TC60 and SC12A, TC84 has a Joint Editing Committee on terminology.

The problem we have is to get representatives from industry to take part in the work, either at national or international level. Just at present, there is a major project on basic methods of measurement for digital audio equipment, and both Tim Shelton and I are members of the international working group. But for all the reaction we get when documents are circulated to the organisations represented on the BSI committee, one would think that no-one had any interest in the subject. It is even worse with terminology: the reason for setting up the Joint Editing Committee was that an insufficient number of industry representatives was prepared to participate in the terminology working groups of the three committees involved. Furthermore, in spite of the problems you recount, no proposals have been received for new terms to be introduced and defined since the JEC was set up!

The problem is not to be laid at the door of BSI. Standards are written by industry representatives, not by BSI staff (save in a very few special cases, such as BS 0). Membership of a technical committee is open to any *bona fide* trade organisation, or academic institution, which can demonstrate an interest in the work.

It may be a cliché to say that industry gets the standards it deserves, but if people will not contribute, it is inevitable.

John Woodgate, Chairman, BSI EEL/32 Committee, Essex, UK.

Syncing in

Dear sir, while Chris Meyer's article ('Deadly Embrace', *Studio Sound*, July 1993) on synchronising digital audio within the video environment covered many points well, including the complexities of NTSC and SMPTE time code, it does seem to be a little skimpy about some essential details. It is an audio work that causes immense confusion and some additional explanation may be of value.

Although it is galling for sound engineers to accept subservience to pictures, the narrow tolerance for video sync timing dictates that word clock or DARS must be the slave.

The relationship between the video and audio references is a complex mathematical one and the repetition rate for full video picture cycles is slow so it takes some while for the lock loops to stabilise—sometimes minutes to achieve minimum jitter. Thus the video signal used as master must be both stable and permanent. It is no use trying to use off-tape video that may have tens of microseconds jitter, holes in it every time you rewind and only five seconds run-up each time you need it.

Less obviously you also need to feed the same video reference to your synchroniser. SMPTE-EBU time code is never the perfectly positioned set of numbers it is supposed to be. Longitudinal time code has a defined position relative to the video frame sync and also to colour framing (4-fields in NTSC, 8-fields in PAL). These relationships are frequently damaged in editing and synchronisers have to make the best of it, and also cope with holes and nonsequential numbers. They usually smile and get on with the job by counting something during the periods when 'the numbers don't work.' In these circumstances it should be video frames and the synchroniser should be set to this option. The VTR tach or control track is a very poor second.

This hierarchical reference structure is similar to that which Mr Meyer recommends: house video sync locking the VTR, the synchroniser and the word clock/DARS source, which in turn locks all the digital audio devices. But what Mr Meyer does not make clear is that the whole purpose of synchronising is to destroy this tidiness.

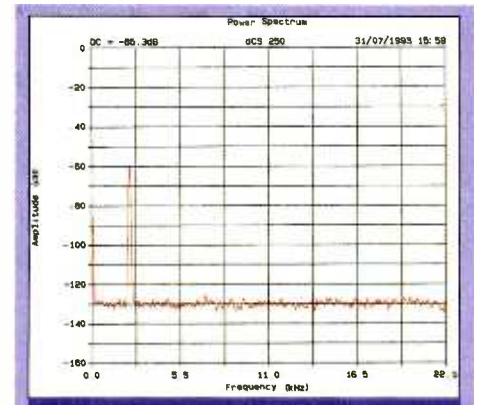
The synchroniser's machine commands force all the slaves to run *out of lock* until the numbers on the slave tapes match the numbers on the master (video). The slaves then try to run to two references, the stable word clock, DARS or video sync and the far from stable time code/synchroniser command one. This is an impossible situation and different combinations of machines produce very different results—anything from momentary muting to infrequent 'zzts' or 'whispers'. A correctly set up synchroniser will release its control since the audio-video sync reference relationship is fixed there is no possibility of slippage. Of course if the digital player is being used with internal clocking this method cannot work so synchronisers also offer the 'hands on' style of control that is mandatory for analogue audio devices, nudging it faster or slower as needed. Although you are using the same machine it must be synchronised in an entirely different way and failure to switch modes is an all too common cause of difficulty.

It does take a degree of persistence to follow the complicated menus, switches and DIP settings that are needed to set all these conditions and some engineers may baulk at the thought and retreat to the comforts of analogue. However when the correct states have been achieved the results are breathtaking. Try running two stereo machines together to give 4-channel Ambisonics—without any image shift or phasing.

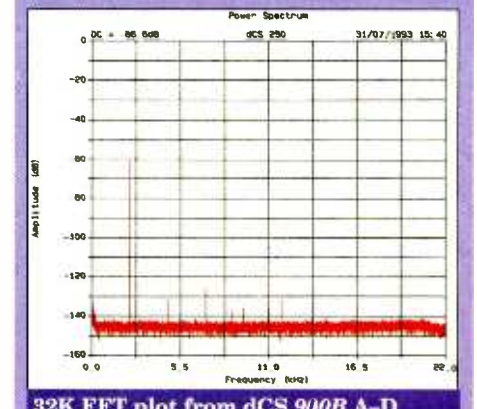
Chris Woolf, Broadcast & Recording Systems Engineer, Cornwall, UK.

On spec

Dear sir, your July 1993 letters page ('Conversion Factor' and associated reply) makes interesting reading but offers little in the way of commitment to improving the situation. Specifications must be based on worst-case results—ADCs are not only presented with 1kHz -60dBFS input signals. This would ensure fair comparison between all convertor architectures; why adopt a test which includes low-level distortion but ignores possible high-level distortion generated by DSP algorithms? The dCS *900B* is specified against all input frequencies and amplitudes. The 0.004% THD+N (0 to -24dBFS) claimed for the Lexicon *20/20 AD* raises another issue: units of measurement. Specifying -87.96dB THD+N (0 to -24dBFS) would be more convenient for the reader, although certainly it is a far cry from the implied performance.



1K FFT plot from dCS *900B* A-D (-190dB floor)



32K FFT plot from dCS *900B* A-D (-145dB floor)

The 'FFT-type spectrum should not be ignored'—see 'On spec'

As a general point, and at great risk of being labelled an 'anorak', the issue of reading levels from FFT-type spectrum should not be ignored ('Audiophile Conversion', Sam Wise, *Studio Sound* April 1993, see page 68). Readers cannot interpret results from graphs without knowledge of the number of FFT samples and window function used. Although this feature of the FFT in no way changes the measured test results, it is undoubtedly possible to present a visually misleading noise floor. I am sure Sam Wise is in a better position to comment on this subject and ensure *Studio Sound* provides its contribution to better communication and, ultimately, progress.

Paul Maddox, dCS, Cambridge, UK. ■

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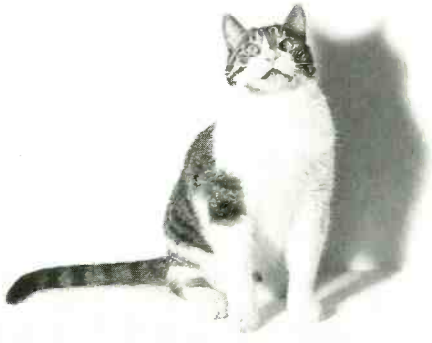

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Martin Polon

Flying, flightcases and equipment that takes off on its own

Imagine your joy on discovering you have landed the contract to record the KGB Male Chorus performing the Wayne Newton songbook—in Moscow. Of course, you will be taking your mobile recording setup with you. Or your eager anticipation of attending the AES convention in Amsterdam to demonstrate your new invention—a four-channel recorder that places an hour of music on the head of a pin using NT (New Testament) encoding. Sounds good? Your shot at the good life? Think again.

Roughly half of all plainly marked electronic items of value placed in the aircraft cargo hold as checked baggage will be scrutinised for likely theft or be in jeopardy of some indignity or other in transit. Even carry-on does not offer an absolute guarantee of safety for valuable recording gear. Checking-in recording equipment as baggage is part of the greater problem of theft by airline baggage personnel, that has already reached epidemic status at several airports in the US. New York's Kennedy and La Guardia airports, Los Angeles International Airport and Miami International all have the highest level of reported losses from theft and other forms of theft by airline and airport personnel.

The most likely scenario finds baggage handlers opening and examining the contents of bags and cases of obvious value in the aircraft cargo hold as they load or unload an aircraft, on the ramp as the bags are transported to or from the plane, near the carousel-conveyor belt 'feeds' as the baggage goes in or out of the terminal, or in some quiet corner of the baggage storage area.

Who are these dishonest airport workers? Depending upon who you talk to in law enforcement, they can be the Mafia in New York, Mexican gangs in LA, Cuban gangsters in Miami, the IRA at Heathrow, the Union Corse at Paris' De Gaulle and so on. The reality may not be quite so simple. The thieves are underpaid baggage handlers who have found a way to supplement their meagre income. That they work with 'fences' when A-V gear is stolen is a given fact. One studio owner commented, 'I lost my portable mixer and recorder on a flight to Mexico from LAX. Two months later, I found my gear in an computer and electronic flea market in LA. I could not prove the gear was mine because the serial number plate had been pried off both pieces, but the mixer had the exact same scratches I had made while repairing the unit! Needless to say, the LA cops were too short handed to get involved!'

The contents of an item of airline baggage are identified by airline thieves as valuable, by the status, or the cushioning quality, of the case they travel in. Any bag made by Gucci, Hermes or Louis Vuitton is an automatic candidate for the examination of its contents. So are top-of-the-line suitcases by Delsey, Hartman, Orcis and others. Heaven help the recording studio that ships equipment through the 'wrong' airport in the elegant and expensive flightcases made by Zero Halliburton. The same can be said for a factory shipping box clearly marked as carrying a professional DAT recorder.

Locking luggage or cases is only marginally effective if airline 'brigands' are at work. Arrested in the act, such individuals have been found to hold complete sets of keys for most brands of luggage. In fact, the companies who sell locks to luggage manufacturers service any number of companies with the same lock sets. And what keys will not open, knives will.

The baggage assistance staff who work at the curbside have a set of tricks all their own. They will tag your baggage for what you think is your destination but is in fact an alternative destination, or change the tags after you leave the curbside check-in. Now, if you are at Los Angeles, your bag goes to Orange County's John Wayne Airport to be claimed later by the 'Skycap' or a confederate. Of course, if you are really casual, unload your car and leave in a hurry without verifying that your equipment is placed on a conveyor belt, your equipment does not have to be checked at all by the Skycap but can be placed in a corner for later pickup by a confederate.

The fact of the matter is that by international agreement, industry practice and-or domestic rulemaking endorsed by Federal agencies, the airlines only have an obligation of $1250 per checked unit including the bag or case on domestic flights. International travellers must deal with the infamous 'Warsaw Convention' that dominates IATA (International Air Transport Association) policy on loss or theft of checked baggage.

None of this takes into consideration another serious threat to checked items which is the incredible abuse that anything shipped via an airline takes. Stories of boxes marked fragile carrying expensive mixers or recorders being propelled 18 feet to the tarmac are legendary. Even with the best of cases, the simple mechanism of the rubber conveyor belts can cause truly horrific damage. One remote recordist of note lamented, 'I had gotten into the habit of sending the DAT machines I used in special shipping boxes... well reinforced, of course, with fibreboard and with steel corner guards. Large canvas straps completed the enclosure process. On one trip, when I reached the baggage claim area, I discovered that one of the boxes had become lodged against a corner and that really quite sturdy conveyor belt driven by its powerful motor had slowly cut through the straps, then the box and its protective sheathing and revealed the contents. The whole thing sat there without the recorder because some enterprising passenger had reached in and 'bagged' my Sony professional DAT portable and popped it into their own luggage. The airline refused to settle stating that if the box was torn asunder in that way, it was obviously too flimsy to carry!'

> Airlines only have an obligation of $1250 per unit including the case

The key to shipping a recording setup on a commercial airline is to lower your profile. This means to remove any markings that might indicate a 'studio' or entertainment production facility—this includes eliminating any luggage tags that specify your business. And you might as well forgo the 'Fragile' stickers since apparently they are ignored by most airline employees and only serve to encourage thieves to open the containers.

One way to discourage unwanted attention is to use a false label. One studio owner has all of his remote luggage tagged for 'SAMPLES—Seabrite Fish Fertiliser Company', with his real address. He has not had a problem since he has used this marine subterfuge.

Another answer is to use a freight delivery service with constantly updated computer tracking such as United Parcel Service (UPS) or Federal Express. Both of these services utilise their own aircraft, have their own ramp crews and handlers and have very effective security departments employing retired FBI agents and other law enforcement personnel. Their insurance options are also reliable and you do not get 'hassled' if something goes amiss. This is more than can be said for the airlines additional insurance coverage. There are other freight forwarders, but many of them use conventional airline flights between some or all of their services points and the shipment is just as vulnerable as if it were checked as baggage.

To use carry-on storage for a remote recording setup, you have to negotiate a terminal—these days that can be as risky as checking the recording bag as luggage. What frequently happens at airports such as Los Angeles International, is that teams of 'rip-off artists' descend upon a passenger carrying a 'likely' bag. An audio industry 'expert' waiting for a flight, found himself 'holding a small and disarmingly beautiful baby. While the mother and her two friends made elaborate preparations to diaper the little boy, my bag was 'appropriated'. After they had gone, I discovered my loss but alas, too late!'

An expensive option is the same one used frequently by travelling classical musicians, who have already learned about airlines the hard way. They buy a separate seat for their precious and irreplaceable instruments. That may seem gratuitous but it is an absolute way to control the safety of an item like a CD-R recorder. The only problem with that option is that both other passengers and flight attendants will frequently harass you for control of that seat at boarding time and for the in-flight movies.

The bottom line is to buy old but durable suitcases and-or shipping containers, properly insulate them from shock and mark them only with name and address. Airline theft is like any other assault on property. Harden and disguise the recording gear you send around the country or the world, and you will escape unscathed. ■

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LIVE POWER

Ben Duncan highlights some considerations in the design of heavy-duty PA and main monitoring amplifiers, and offers advice on evaluation

In recent years, changes in the technology of professional power amplifiers have been relatively few. We have all seen more Speakon connectors. More recently, a number of changes, both evolutionary and radical, have been stockpiling and will be seen increasingly in the next 24 months.
Right now, switching power supplies have not advanced much beyond the pioneering makers and types documented previously.
With uncertainty as to how EEC legislation on EMC will ultimately be interpreted in the context of pro-audio power amplifiers, makers of both old and new power supply technology are holding fast. While 50–60Hz toroidal transformers made with the latest cores and winding techniques are 40% of their size a decade ago, switching supplies continue to win hands down when weight is the key issue, but their size benefit today is less pronounced.
The size-power ratio of amplifiers continues to reduce as other major components, notably capacitors and fans, shrink for a given capacity.

Higher power: the rationale

In the past decade, power amplifier makers have been mostly concentrating on supplying a given power for less bucks, while shrinking size and-or weight per watt. The exploration has proved worthwhile, but while the amplifier manufacturers' backs were turned, some loudspeaker system developments have crept up.
Throughout history, it seems, the ratings of loudspeaker voice coils have lagged behind the power available to cook them. An increasing number of bass and even midrange drive units from the world-leading UK and USA makers have AES power ratings (see sidebar) above 500W, ranging up to 1kW. The majority of drive units built with modern materials can handle music transients with instantaneous 'power' equivalent to at least three (and up to ten) times their AES power rating, depending on the music's PMR.

To experience the full dynamic capabilities of such drivers without risk of damaging them through clipping, amplifiers capable of delivering 1kW and more are required. Even for quite compressed music program with a 10dB PMR (averaged over a period), the long term heating (comparable to the AES rating) will be about 1/10th of the transient maximum (**Fig.1**), so a 600W driver meeting this signal is in no danger when driven by an 2000W 'rms' rated amplifier—assuming it has no excursion problems and is never driven into clip. Any Xmax limitations (at the bottom end of any driver's range) can be handled by suitable dynamic EQ processing.

Why does anyone need all this power? In main studio monitoring, direct radiating speakers with at best 0.1% to 0.5% efficiency are the norm.
Improvements in reproduction accuracy are usually at the expense of efficiency, so with continuing refinements, increasingly high power handling is necessary for the ideal single drive unit per frequency band to continue to comfortably reproduce the highest SPLs in music, say 140dBc $_{SPL}$.

In medium to large scale PA systems, for a given maximum SPL, higher power rated drive-units and amplification spells fewer drivers and cabinets.
In turn, fewer boxes (subject to having enough for full coverage) generate a more coherent soundfield—as well as lowering operating costs. In the UK, Funktion One Research have made breathtaking reductions in array size with their established *Flashlight* and newer *Floodlight* speaker designs.
Amplifier makers are now being rightly challenged to put more power than ever before in a medium-sized box, rather than offer existing power ranges in ever smaller, deeper boxes.

Increased power handling is equally about headroom and the effortless sound it permits, most appreciated by those who can afford it, and about avoiding the amplifier clipping that is so harmful to drive units and human hearing alike.
Reliance on limiters as the primary way to avoid output clipping creates a temptation to underspecify amplifier power, hence system headroom. This makes routine hard limiting more likely. The resulting compression may not be much kinder to ears and drivers than amplifier clipping. But with adequate amplifier headroom, limiters can be employed solely as safety nets, rarely to be heard.

Increasing power delivery

Most professional drive units are nominally 8Ω, and very few power amplifier channels can 'swing a k' (89 volts) or more into 8Ω. How do we get higher power? Most amplifiers approximate a voltage source (see sidebar), so increased output power is achieved by reducing the rated load impedance. By parallelling enough output transistors, it has long been relatively straightforward to attain kilowatts of power. But this kind of power is only available into impedances that lie well below the average impedance of most drive units, and should really be reserved in case of impedance dips. Commonly, an amplifier's 4Ω or 2Ω rating is utilised by connecting cabinets (or two or more drivers in one box) in parallel.
While concentrating power delivery into fewer amplifier racks, this does nothing to concentrate power delivery into individual drive-units, so the system and number of sound sources shrinks less than it could. Also drive units with higher power ratings are wasted, unless they have proportionately lower impedances. Most makers could design-in a 4Ω or 2Ω coil, but then the drive unit is two or four times more sensitive to cable resistance, and not a comfortable load for most amplifiers whenever the impedance dips, or if boxes need *ad-hoc* parallelling because of an amplifier failure.

In the past decade, nearly all power devices (whether bipolar or MOS) ▶

TERMINOLOGY

EMC: Electro-Magnetic Compatibility, essentially the keeping down of RF interference and mains harmonics.
PMR: Peak to Mean Ratio, a signal voltage ratio that is 3dB for a pure sine wave, about 10dB for compressed music, 15dB for most music styles, and around 20dB for orchestral works.
Slew rate: the maximum rate of change of signal that an amplifier can process accurately, above which severe distortion sets in. Some large ultrasonic & RF signals may be capable of approaching or exceeding the slew limit (or 'rate') of amplifiers with marginal slew rates and-or poor RF filtering.
Zobel: a series RC network, in this context placed across the output of most amplifiers to prevent RF oscillation caused by the potentially adverse reactive loading of cabling, passive crossovers and drive units. Named after Dr Zobel, of Bell Labs, USA.

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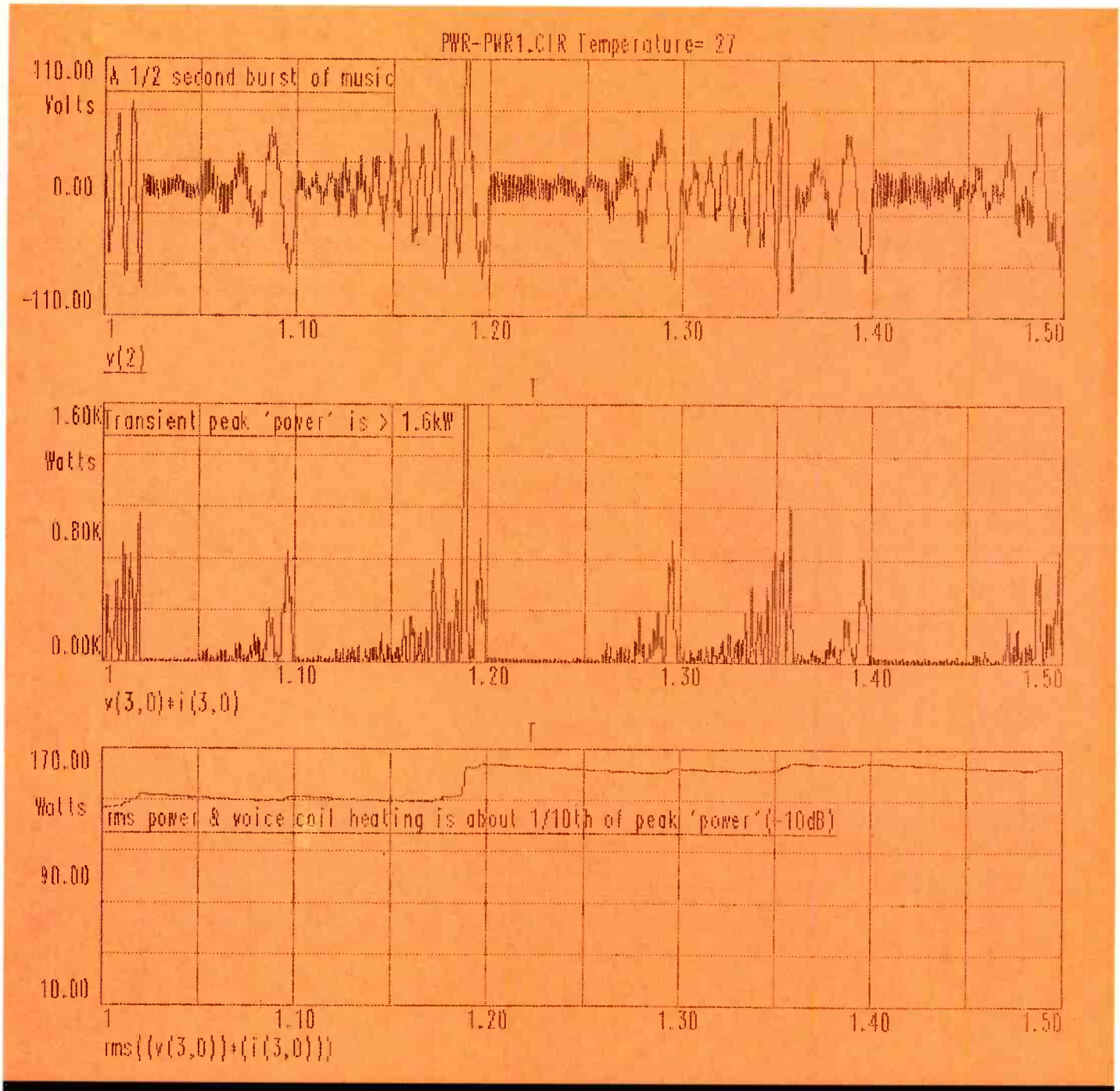

Fig.1: Power comparisons for a compressed music signal. The upper plot shows music momentarily peaking at over 110v, and regularly peaking at over 55v. A 1kW-8Ω amplifier would be required to handle this signal without clipping, with just 1.5dB of headroom. The middle plot shows instantaneous power, which momentarily exceeds 1600 watts. The lower plot shows the average power, the rms value that mirrors voice coil heating. Here, after 1.5 seconds it is barely above 160W, or 1/10th of the peak instantaneous power. With adequate amplifier headroom, a 200W rated driver could be safely used in this situation, and with the same music signal, a 600w rated driver would be safe with transient powers and voltages up to three times as large. However, an amplifier capable of about 220v (3kW into 8Ω) would be needed to realise this capability.

that are usable for audio, have been limited by their breakdown voltage and economics to producing some 65v rms per channel, corresponding to 1kW into 4Ω, or about 500W into 8Ω, with conventional topologies. The world's semiconductor makers have not developed any complementary power devices which can withstand higher voltages, and with the right blend of speed and ruggedness. Only the series connected Class G scheme (patented by one leading US manufacturer) and certain new topologies developed in the USA and UK have realistic, economically viable, higher capabilities. Without these, anyone needing above 1kW into 8Ω, particularly rock solid power for the bottom end (where some amplifiers using Class G and H topologies, alias dynamically switching rail voltages, are not so widely rated), the most usual answer was to bridge two channels. Of the few amplifiers from the past that pioneered over 1kW into 8Ω per channel, all were really dual bridged or class G or H amplifiers.

Aspects of bridging

Bridging amounts to balanced drive. It alters the current pathways in the amplifier. In traditional topologies, it keeps hostile currents out of the ground system. With the big caveats of power supply, heat sink and output stage current capacity all allowing, bridging potentially quadruples power delivery into a given impedance. More usually, rated power is barely doubled. Amplifiers capable of just over 1kW into 8Ω when bridged are relatively commonplace and 'old hat'.

With a cursory inspection, bridging sounds like a thoroughly good thing. It is after all balanced drive. But it is commonly overlooked that bridging halves any given output damping, doubles the amount of circuitry, connectors and solder joints in the signal path, and perhaps most important, theoretically cancels even-order harmonics created in the amplifier. As no amplifier has solely even harmonics, odd harmonics are left, and most are highly unpleasant and fatiguing.[1] There is also the matter of the differential delay and complex distortion pattern when one side of the drive is derived (for cost saving) from the other's output. In amplifiers with 'grounded emitter' topologies, ▶

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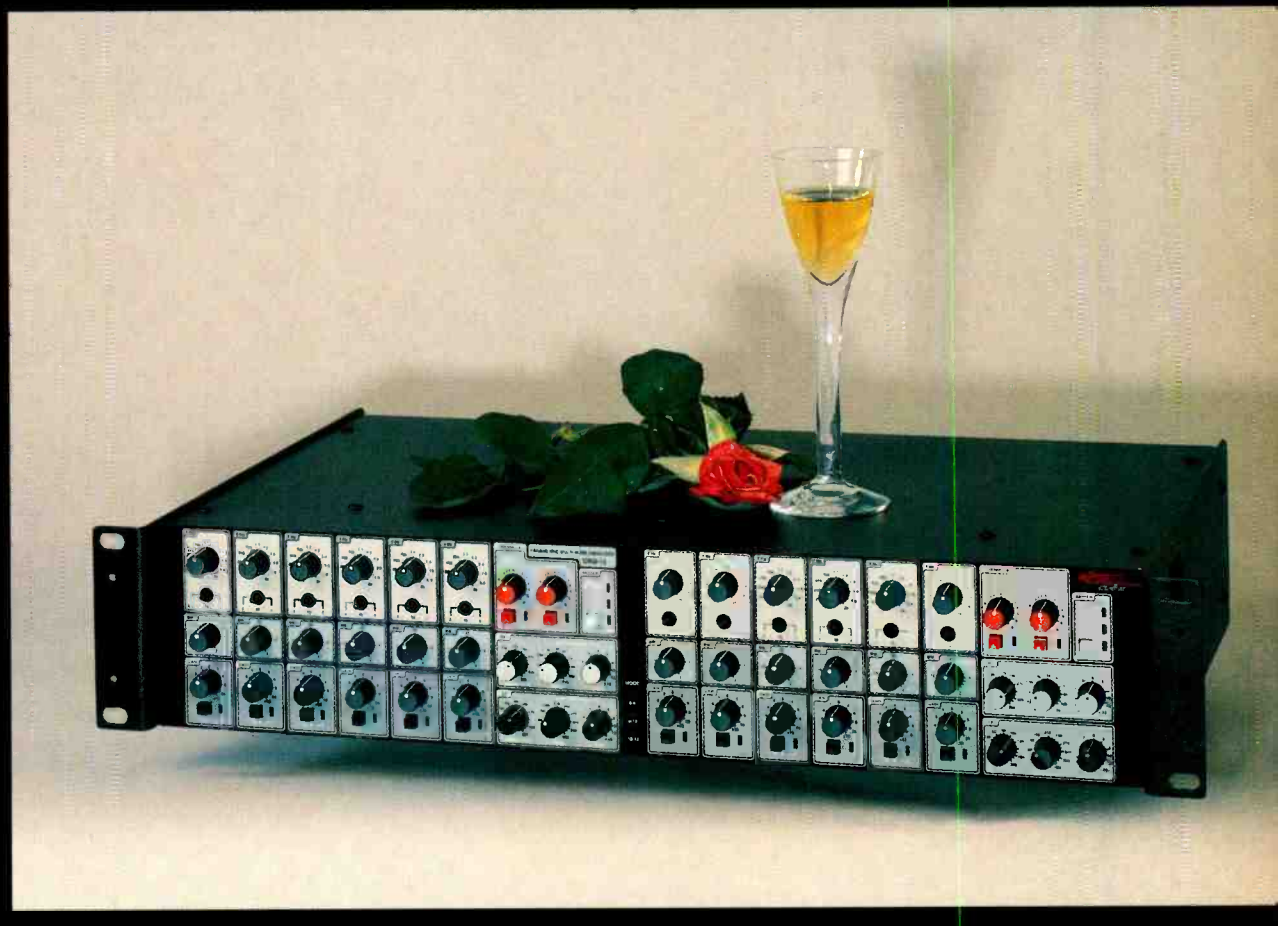

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AES-EIA DRIVE UNIT POWER RATING

The power ratings of loudspeaker drivers used to be 'as long as a piece of string', but today, most reputable makers now specify drive-units' power handling according to the AES standard.[3] The AES test is an adoption of the standard pioneered by EIA, the USA's Electrical Industries Association. Testing employs pink noise, shaped by well-defined clipping and band-pass filtering, so the resulting power spectrum is representative globally averaged music program with the low (3dB or 1.414x) PMR of a pure sine wave. This test signal amounts to a random, multi-sine wave stimulus, occurring at all audio frequencies over time, with plenty of compression and clipping, and is similar to the older 'continuous rms' (strictly an average) power rating. The driver's AES power rating is derived from power input needed to raise the temperature of the voice coil to the maximum safe limit. For a tweeter, temperature rises rapidly to the maximum, but bass drivers are most conservatively tested over ten hours or more. ■

high currents pass through the ground system, and distortion may worsen as a result.

Finally, bridging makes a nonsense of power-size ratios: two channels of 1kW into 4Ω become one channel of 1.2kW into 8Ω, without any halving in size to show for it. In its defence, bridging is fine if it does the job, but the potential cost in size, weight and sonics must be evaluated carefully.

Overall, bridging two amplifier channels remains a mixture of good and bad in engineering and sonics, a frustration to the designer and the user alike. Bridged or not, amplifiers that produce 1kW/ch into 8Ω-ch or 2kW-bridged, and above are beginning to appear. In PA, appropriate use of these multi-kW-per-channel amplifiers with the new class of drivers and suitable enclosures will reduce the number of sources, help simplify acoustic calculations and improve their predictive accuracy, improve sonic quality, reduce rigging time, reduce costs and should even increase system reliability, as there is simply less kit to go wrong.

Vignettes of reliability

Now that output stage expiry is less common than it used to be, attention can be turned to a perennial weak spot in most amplifiers. Most have Zobel networks placed across their outputs to keep them stable under diverse load conditions. These can smoke, burst into flames or even explode if driven with sufficient VHF level. It is easily done by accident when sweeping a test generator. Tiring of this, I have developed a burn-proof Zobel system that protects itself. Otherwise, it is useful to know that in most amplifiers, the Zobel networks are inherently fragile, so slightly singed (if not badly burnt) ones are commonplace, and the need checking for when amplifiers are overhauled, and also after anyone discovers that a faulty console (or whatever) has been driving RF up the system. Thoughtful makers will place the Zobel resistors where they can be readily inspected and replaced. Ironically, once the Zobel network is at all damaged, the amplifier is more likely to go unstable, generate its own RF output, and finish the Zobel off.

Considering amplifier cooling, the macho (and especially full depth) 'cooling tunnels' seen in many high power amps are less impressive than they seem. Frequently, when working hard, the temperature of the hottest device at the outlet end of the tunnel, can be 20°C hotter than the one by the inlet (**Fig.2a**). And this is just the surface temperature. Internal, junction temperature differences can be greater, especially if the transistor fixings differ in tightness. Any such temperature differentials affect power sharing and can lead to unreliability, as transistor life span potentially halves for every 10°C increase.

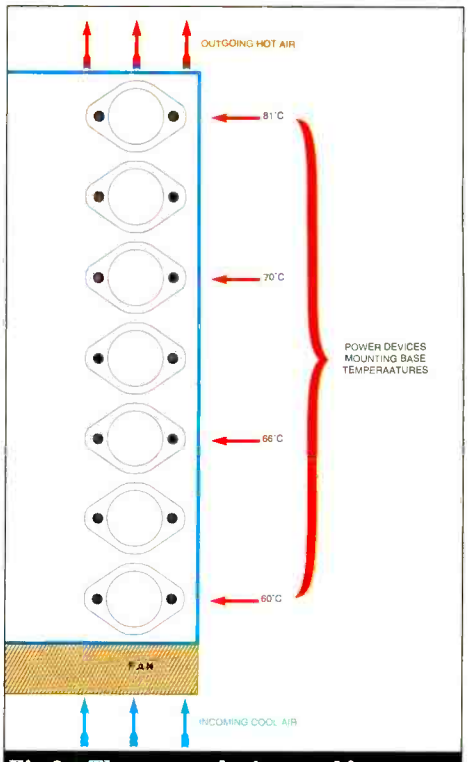

Fig.2a: The power devices on blown, tunnel heat sinks rarely operate at the same temperature. This upsets reliability, sonics and shared use of resources.

Any amplifier suffering significant temperature differentials between the output devices (whether caused by bad torquing or careless cooling) has to be derated for reliability, to well below the potential power capability. Because you can only derate so far while meeting a saleable price tag, some trade-off in reliability and sonics likely remains. A number of designs (including several of my own) have proven the value of short heat-exchangers cooled by a plane airfront. With all the power devices exposed equally, they operate at near identical junction temperatures, sharing out the thermal stress equally (**Fig.2b**). This approach allows every device to be safely used to its full rating, and fewer devices (and less stringent protection) may be needed as a result, for a given level of power handling and-or reliability. While you can not reliably estimate the reliability of an amplifier by counting the number of devices alone, a broadside-cooled array of power transistors is one good thing you can tell about an amplifier just by taking the lid off.

Power factor and slewing standards

In PA systems, the mains cabling is already bulky enough, and overrating cannot be provided on grounds of trucking space alone. Power factor correction would allow some cable gauges and 'genny' ratings to be reduced, as well as closing the sonic difference between hearing one small section of a large system (sounds good) and hearing the whole system (louder, but never sounds quite so good). The interaction, starvation and crosstalk (through the mains supply) between 50 and a 100 amplifiers all connected by a common cable ▶

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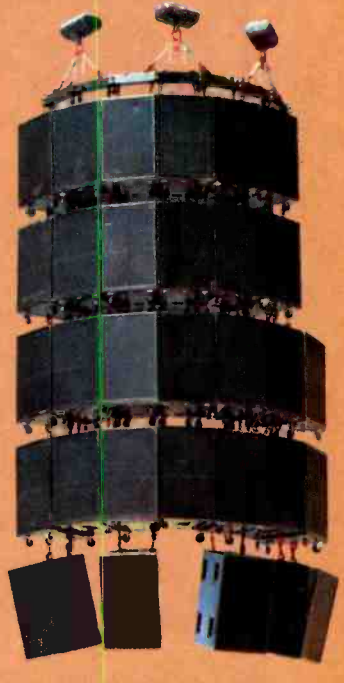

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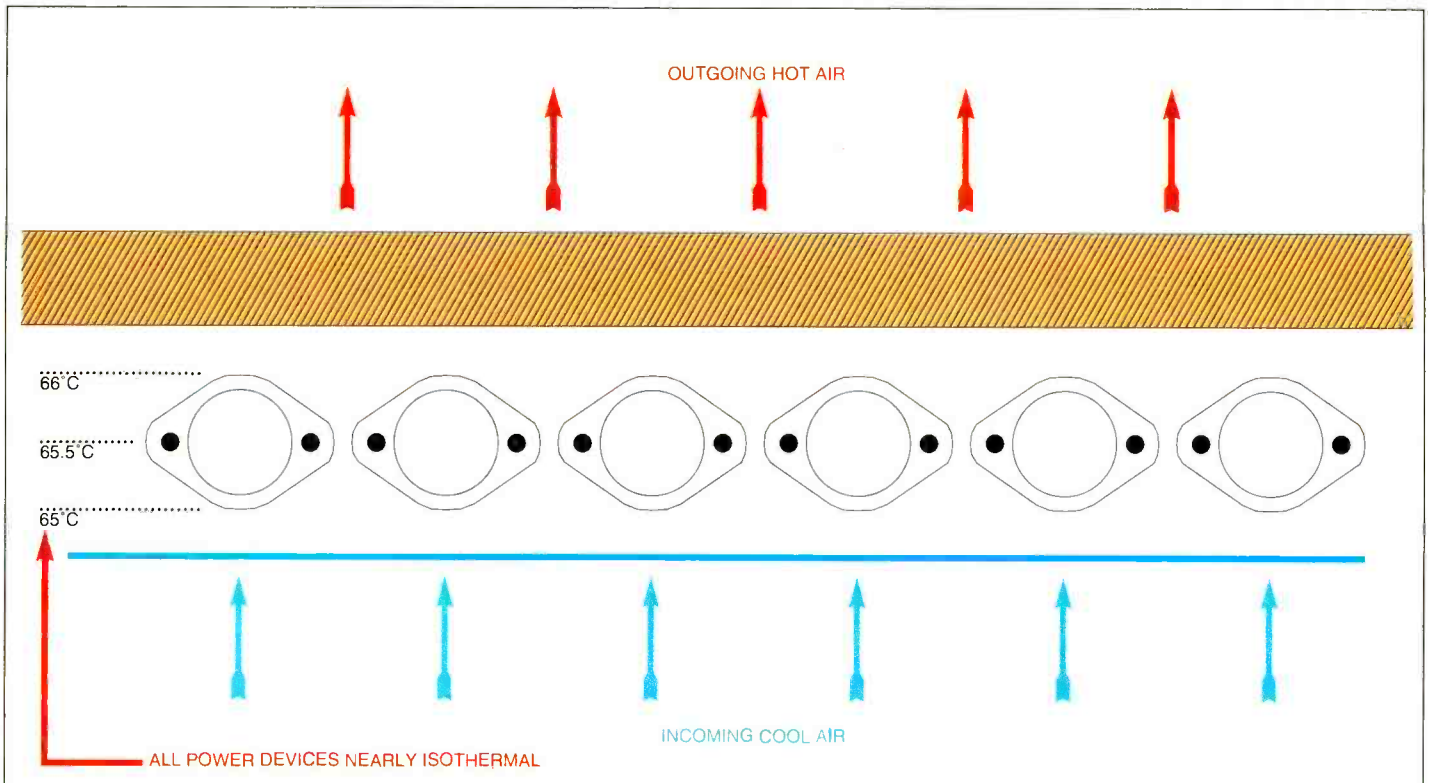

Fig.2b: On lateral heat sinks, power device temperatures can be almost perfectly equal, so diverse stresses are shared equally

to a main riser or generator must be considerable. Correction has been ignored thus far, being prohibitively expensive and bulky when bolted onto an existing multi-kW rig. However, it is a relatively easy and inexpensive add-on for makers of amplifiers using switching power supplies. Dramatic advances in this direction can be expected in the near future.

The slew rates of a number of high power amplifiers are below Walt Jung's well-established[2] criteria (see **Table 1**). This is fine so long as you realise that they will not sound too happy if subjected to RF fields or ultrasonic-laden signals. I have seen more than one mixer boosting ultrasonic signals coming off the mics, with only modest HF EQ boost. The fact that no compression driver can move at the acceleration implied is a red herring.

In the air tonight

Smoke machines have become *de Rigeur* in many musical and performing art circles. Readers are warned that some of the oils have proved quickly and fatally corrosive to amplifier electronics. Fan cooling exacerbates the deposition, and as most PA amplifiers have to be fan cooled, any placed near to smoke machines for prolonged periods can end up costing the user a new set of PCBs and a major decontamination exercise. Air intake filters provide little protection. Spraying a protective ('conformal') coating over all the parts can provide some protection, but beyond this, amplifiers have to be kept away from the worst of the smoke, and some control is meanwhile needed on the acidity of oils and mixtures being used.

However, well cooled, any amplifier can be defeated by careless racking, because the direction of forced air is not standardised. In the standard 'A', air drawn from the rear emerges from the front. This helps users know that the fans are working, and by assessing the waste air temperature, some idea of the amplifier's work condition. Plus the back of the rack is kept cool. Other makers choose standard 'B': they draw air in from the front, and exhaust from the rear. If the rear of the rack is inadequately ventilated, so the main ambient air temperature is lower, this yield cooler running. On the minus side, it stresses other amplifiers in the same rack employing the reverse flow, and also any equipment that lacks forced cooling, especially if it runs hot and depends on convection cooling.

TABLE 1

Slew Rate Check

Minimum figures to meet Jung's criterion[2] for audio quality:

Power into 8Ω/rms	Voltage Slew Rate
250w/45v	32v/µs
500W/63v	45v/µs
1000W/89v	64v/µs
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Choosing the right amp

More than most, amplifier makers' wares appear superficially much the same, and they have to work hard to convince you that their unit is the one to buy or specify. In touring PA, 'reliability', (let's face it, a euphemism for proof against abuse) levity, a certain size for a certain power, and ability to 'kick ass' are likely to take precedence over general sonic quality in any selection listing. But anyone who has not studied amplifiers in great depth may be on treacherous ground when it comes to optimum decision making over a new investment.

Some amplifiers sound good whatever they ▶

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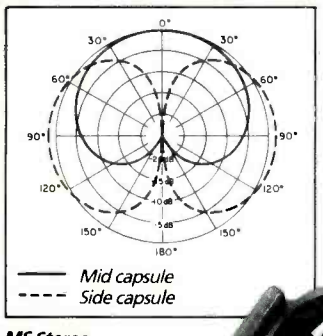

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AMPLIFIERS AS VOLTAGE SOURCES

That most amplifiers approximate voltage sources has been true since output 'transformerless', silicon transistor amplifiers became the mainstay of PA systems beginning with WEM in 1965. No amplifiers are pure voltage sources, but if they were, their output power would exactly double each time the load impedance is halved. In practice, this is just a handy approximation. Limited power supply capacity, limited heat dispersal, and the spiralling cost of ascending output stage current rating means that most amplifiers only act like reasonably pure voltage sources down to 4Ω at best, below which protection and saturation set a limit. In contrast, most valve (tube) amplifiers had/have output transformers, and deliver their maximum power into the impedance that the transformer is set to; power delivery falls off as the load deviates in either direction. ■

are used with. With others, reliability and sonics may be considerably influenced by the boxes you are driving. An amplifier that sounds poor or shuts down driving one type of cabinet may shine with a different enclosure, even working over the same frequency band. Amplifiers that measure badly can sound good to some users, but inaccurate to others; pleasant amplifier distortion can mask unpleasant distortion elsewhere in the system, but if your system omits unpleasant distortion, the masking is unmasked. This means if you choose a given amplifier on the reasonable basis that it sounds best in your PA or studio, you may find that a completely different amplifier is preferred when you change the mixer or other major components. And of course, how well a given amplifier sounds on the day you check it out may depend on the quality of the mains supply (two weeks after rejecting Amp A, your technician finds that the test plugboard's was faulty; or someone welding trusses was pulling down the mains to 200v), and the general health of the system. If one channel of the mixer was marginally stable and putting out RF at 1MHz, then Amp B with better RF filtering might win over Amp A which has lesser filtering, but would normally sound better. Next, while reliability can be estimated by seeking out the experiences of other owners, inspection of the construction, and asking the maker some expert questions, there is no way to be absolutely certain. Any previously reliable amplifier model can go to pot at any point in the future if key factory staff change, or the design is 're-engineered' by accountants. And any well-engineered, usually rock-solid design can fail if a particular user and their equipment accidentally ekes out some weak spot. Equally, some users are happy and get reliable use from designs that are easily blown up when bench tested. An amplifier that blows up when 30m of one particular speaker cable is shorted at the other end is fine if you only ever use at most 5m lengths of another speaker cable.

Choosing the right amplifier

Listening is a good start. Make it extensive; listen over a few days, with lots of different source equipment and different speaker boxes. If you care about finer differences, you will make a point of listening in stereo, even if stereo content in concert PA is minimal. If you are looking for a bass amplifier, and one of the pile you are trying is obviously not giving the performance you were after, it might be worth trying it in other roles; this is the way great discoveries are made...
Equally, with disappointing results, it is valuable to contact the dealer or manufacturer. Getting them to supply another sample unit and making doubly sure that you are using it optimally may make no difference, but equally, the tables have been turned on such occasions.

Overall, power amplifiers are like cars and other intimate machines: their 'nth' degree interaction with your system in your part of the universe is not predictable from any spec sheet. Even with in-depth technical understanding, no amount of technical data and bulleted, internal technical features like MOSFET, Bipolar, high efficiency, soft clipping, low feedback, Class A, A-B, D, G or H, switching supply, intercooled, ozone friendly, not tested on roadies and so on, can tell you anything definite or specific that is truly relevant, good or bad, until you have experienced the leading edge and taken in the greater whole. In other words, you may find it useful to complete listening tests before reading any spec sheets and technical papers, or dissecting or proving the unit under evaluation. If the amplifier sounds bad, you may never have to wade that far. ■

Ben Duncan has spent the last year designing the first nearly 2kW/channel power amplifier to be made in the UK, for C-Audio of Cambridge.

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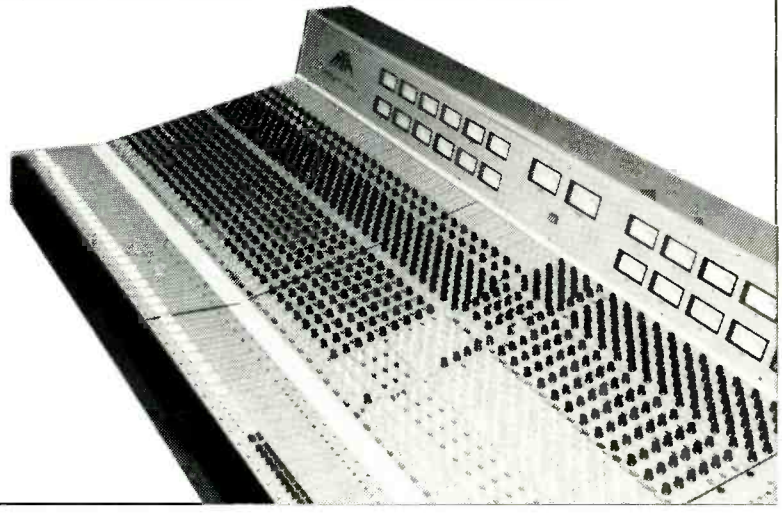

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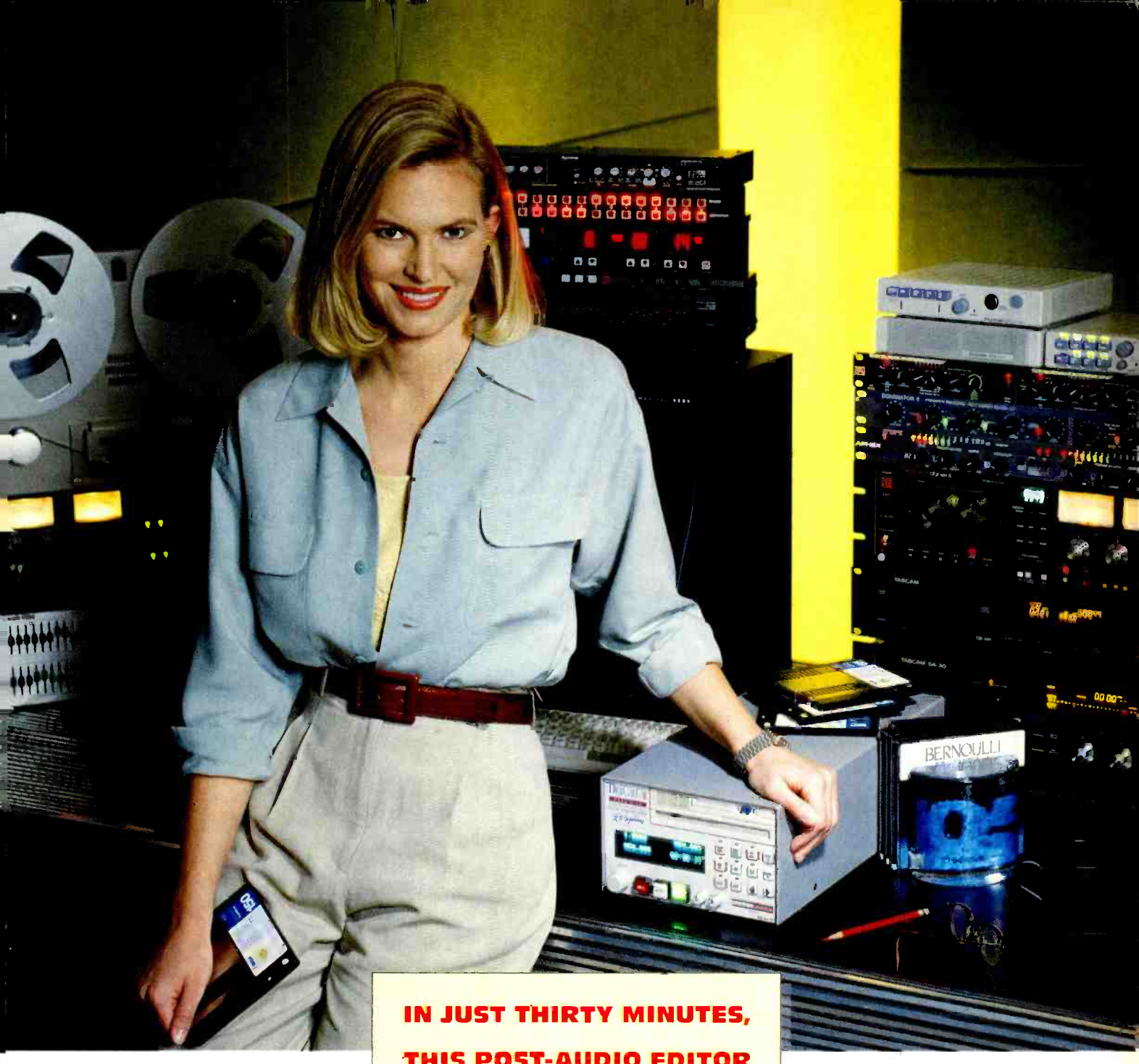

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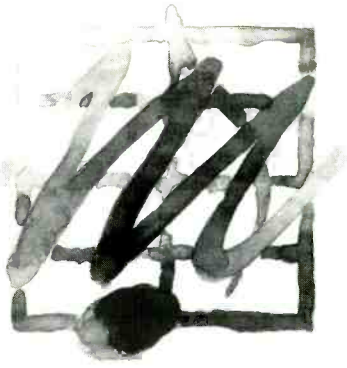

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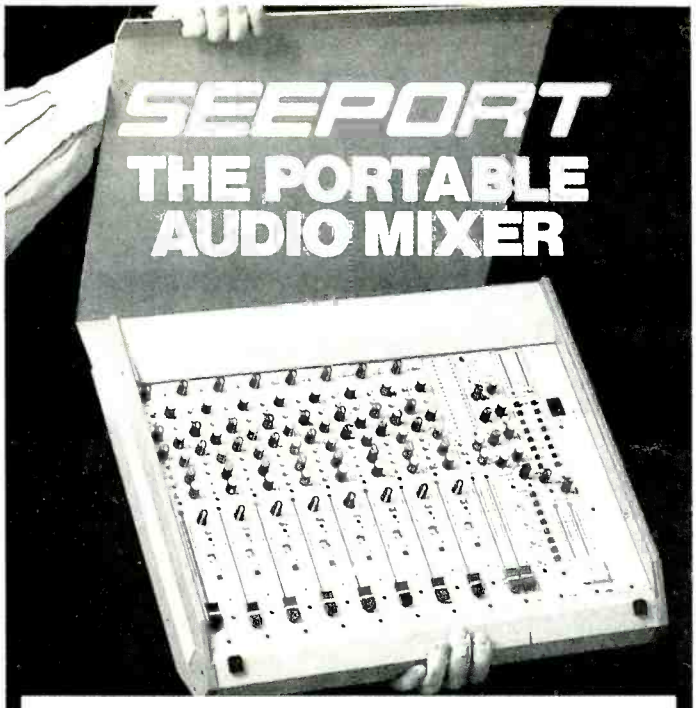

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Barry Fox

Curious BBC franchises and the trouble with metal

The BBC originally designed the *LS5/3A* monitor speaker in 1973. Two years later a selection of carefully chosen manufacturers, such as Rogers, started selling the speaker to the public. Twenty years on, the design is still good—witness the fact that KEF have just applied for, and won, a manufacturing licence.

Now the BBC have designed a new miniature monitor, the *LS5/12A*, and licensed it to Harbeth, with drivers sourced from Dynaudio (the hi-fi relative of DynaudioAcoustics) of Denmark. Sales should begin before the end of this year, at around £1,000 a pair. Power handling is greater (at 120W), bass handling swoops down to 55Hz (compared to the 70Hz extension of the earlier design), the sound balance matches that of much larger enclosures and the drives are magnetically shielded to make them suitable for positioning close to TV screens and monitors.

At least one other 'name' manufacturer applied for a licence to manufacture the *LS5/12A*, but was turned down. Designer Graham Whitehead has built reference models to which every single unit made by Harbeth will be checked for accuracy to within 0.3dB.

What an extraordinary contrast this makes to the way the BBC have recently licensed the manufacture of domestic video tape, which is already on sale, and audio cassettes which will soon go on sale.

In this case, the BBC have licensed Strand (1992) of Wimborne, Dorset in the UK, to make tape in Korea 'to BBC approved standards', and sell it under the BBC name and bearing the BBC logo. The fact that the tape is made in Korea is irrelevant. A lot of good tape now comes from Korea. It is the labelling that actually raises the first questions.

When I enquired, the BBC's Engineering Information division knew of no BBC standards for domestic video tape and first learned of the licence when engineers saw advertisements and the tapes themselves actually on sale. On the tapes the BBC name and logo is written very large along with 'high-definition blank video' and 'NICAM compatible'. The licence was granted by BBC Enterprises.

'High definition' is used by the BBC, like the rest of the TV industry, to describe new video and TV systems which have twice the number of picture lines than the present broadcast standard. The BBC tape, however, is a standard VHS video cassette for recording bog-standard 625-line PAL.

The NICAM system was invented by the BBC and 'piggybacks' digital stereo over the top of the transmitted analogue TV signal. A decoder in the receiving TV set or video recorder converts the digits into analogue stereo, for reproduction or recording. Since no domestic VCR records the raw NICAM code, any VHS tape must record the decoded stereo sound.

In September 1992, the British Tape Industry Association (BTIA) published a 15-page document which recommends detailed technical parameters for comparative testing.

'The quality of the Strand tapes is not at issue,' says Brian Smith, Chairman of the BTIA. 'What worries the BTIA are the BBC standards referred to on the tapes and in advertising material. While the BBC is prepared to use these standards to help sell these tapes, it is not prepared to release the standards and test procedures to other tape manufacturers or to the public. The BBC should come clean and publish both its standards and its test procedures.'

After a lot of pushing, BBC Enterprises have now explained that their Licensing Department worked to a manufacturing specification originally drawn up by a BBC engineer. But the engineer left, so the BBC contracted an independent consultant, Philip Demonti of Philip Demonti International in Bishops Stortford in Hertfordshire. The BBC made its own short list of likely manufacturers (which included BASF, Memorex and Strand) and chose Strand.

PDI disclaim responsibility for the use of terms like 'high definition' and 'NICAM compatible'.
Clearly, however, the labels do not bother BBC Enterprises, because the tape remains on sale.

BBC Enterprises never did get around to providing me with a copy of its approved standard, but PDI did. This is a 4-page document; the first page gives brief technical data (such details as dB measurements for S–N ratio performance). The second page is a technical specification which refers to basic VHS parameters, including tape speed and track width. The third is a drop-out test report, favourably comparing the performance of the BBC's tape against Sony *CD*, Sony *V*, Scotch *EG+*, TDK *HS* and TDK *Hi-fi*. The fourth and final page shows a histogram of the drop-out results.

Says Brian Smith: 'It is an absolute certainty that the tapes of every member of the BTIA will equal or exceed the BBC's standards, and should therefore be allowed to carry the same endorsement.'

James Arnold-Baker, Chief Executive of BBC Enterprises offered me an interesting explanation. 'In our judgement, they (Strand) offered us the best financial return.'

So where are the BBC going to go next? A BBC-brand speaker, perhaps, labelled 'High Fidelity' and 'Digital', and made by whichever manufacturer offers BBC Enterprises 'the best financial return'?

The *Last Night of the Proms* is a very British affair, with all-British music and British Telecom relaying the British Broadcasting Corporation's pictures and sound to 90 million people around the world. As always the concert this year ended with 'Rule Britannia' and 'Jerusalem'. It is all good stirring stuff, with the audience waving Union Jack flags bought on the way in...

Without wishing to be a spoilsport, I have one small suggestion to offer for next year's *Last Night*—which, incidentally, will be the 100th in the series. Could the BBC and the Albert Hall management please try to find someone in Britain to make the Union Jack flags which are sold at the door. This year they carried the proud marking 'Made In China.'

Any studio manager with spare cash lying around just now has an easy way to spend it: after nearly 20 years of research, and selling metal connecting cables, Dutch company Van den Hul have concluded that metal wires, however pure, limit sound quality. The electrical signal is degraded as it passes from one metal crystal to the next, so Van den Hul are now selling short lengths of cable that are made of pure carbon fibre. 'Strong enough to pull a car' boast the cable's makers.

In contract to this piece of advice, most people will use the new leads to connect audio equipment signal paths since banishing metal, the company pledges, 'brings about quite remarkable sonic benefits.' The power of autosuggestion is very strong so I don't doubt that anyone who pays the £180 which the one-metre long connectors cost will hear a big difference. Not to hear it would be to admit either having cloth ears or making a very expensive mistake.

But something about this bothers me; there is still a considerable mass of metal inside the circuitry of the units through which the signal has to pass. Unravel all those capacitors and coils and PCB tracks and you end up with an awful lot more than one metre. And, presumably, it has many of the same detrimental effects as the metal in 'old fashioned' cabling. Anyone ready for all-carbon recording studio equipment? And if so, at what financial cost? ■

ILLUSTRATION: CARL FLINT

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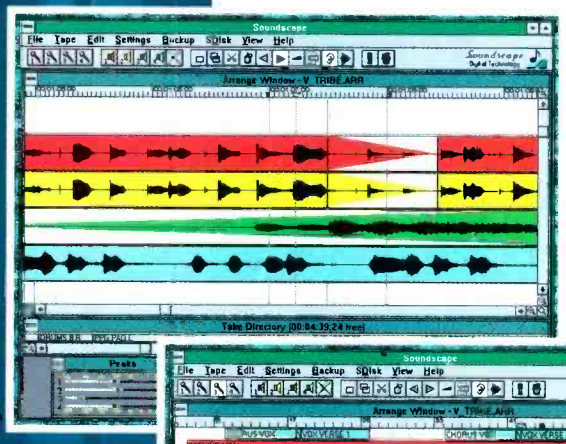

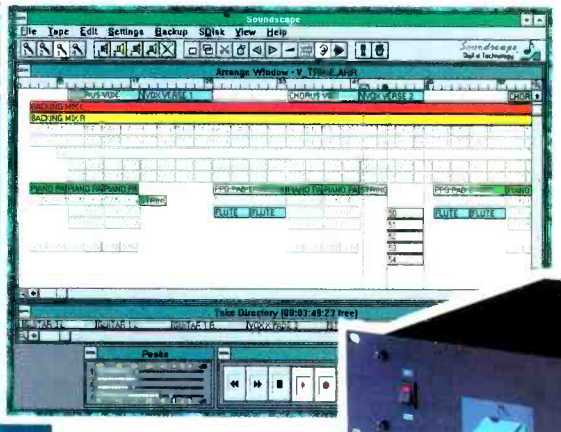

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