HMS NYC

**STUDIO
DESIGN**

STUDIO SOUND
AND BROADCAST ENGINEERING

Dolby SR-D — see Digits Meet Sprockets

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STUDIO SOUND
AND BROADCAST ENGINEERING

Finding space for boxes

Studio design has come a long way in the last twenty years. In this issue we have Philip Newell finding a justification for acoustic traps and examining the style of studio that has become associated with such sound control methods. He then describes an approach derived from this experience that appears to be showing very positive results.

This contrasts with an interview with Dr Peter D'Antonio who has developed a business out of acoustics diffusion products based upon the Quadratic Residue mathematical theorem. He describes the philosophy behind the QRD, their uses and what other products and applications have grown from these beginnings. The traps and the diffussors contrast some of the tools available to the studio designer — and perhaps they can best be summarised in a misappropriation of the slogan — diffuse it or lose it.

We have touched on many of the acoustic problems still troubling studio control rooms over recent months and it appears that some of these are being addressed more urgently. The disruptive effect that the console has on control room acoustics has been particularly highlighted and we know of several manufacturers who are beginning to tackle this in their own different ways.

There is however still one problem that I have experienced and I am sure that I am not alone. Just how do you keep all your outboard processing gear within easy reach without messing up the monitored sound.

Years ago when only a small amount of processing was used (there wasn't much available anyway) it was normally possible to find a place for it on the console or even in it. As demands grew we used the low side rack, the L-wing on the console and even the compression ceiling to hide our toys. But as our processing needs grew and studio designs changed there were fewer placed to hide even more boxes.

Perhaps the approach most in vogue at the moment (aside from the basic 'pile 'em high' technique) is the producers desk behind the console with the processors situated facing the back of the console operator. Although effect of the close proximity of this reflective surface can be minimised, to operate the units you need to turn round and crouch on the floor and I know of no studio design that can guarantee a reasonable approximation of the monitor output in this position. Other more practical methods include the racks on wheels that are moved up to the desk for adjustment and then wheeled back; and the racks that rise from the floor. Aside from the constructional problems that the last technique entails, you do need large rooms and a great deal of space that is to be kept clear in the immediate vicinity of the console.

I have to profess that I do not see how current design thinking will develop to encompass these needs without compromising the monitoring quality. A major rethink in approach may be needed for what is an increasing problem. We may have to reassess the control room at its most basic level including the role of the console itself as the centre of the studio system as processing and manipulation power devolves to the hard disk editing system and ability to fully control remote electronics grows.

This may be one studio design problem whose solution does not lie in the hands of the acoustician. □

Keith Spencer-Allen

Cover: Studio 9 at Howard Schwartz Recording, New York. Designed and built by Walters-Storyk Design Group. Photography by Robert Wolsch

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Digidesign Reinvents the

WaveFrame film mixing

WaveFrame Corporation of Boulder, Colorado, and Magna-Tech Electronic Co, New York, are to jointly develop a new multitrack disk-based recorder/playback system for film-mixing application.

Magna-Tech are well known as manufacturers and developers of sprocketed film recording and playback equipment for motion picture mixing. They will direct the development and marketing of the new multitrack system while a lot of the actual development will be from WaveFrame's Long Beach office.

At the time of going to press we didn't know how far the development had gone and when the product was due to be launched. Only that the system would be sold as a Magna-Tech product.

Magna-Tech's CEO Ed Flinn saw the new development benefiting existing Magna-Tech users, "This new equipment not only enhances our product line, but also extends the useful life of analogue systems in service around the world."

● WaveFrame are also reshuffling their product line with a re-naming of their two main products. The *AudioFrame* will now be called *WaveFrame 1000* and the *CyberFrame*, *WaveFrame 4000*. The reason is that users are now able to run software functions on either system. Post-production editing, for example, was previously only available on the *CyberFrame* but is now on the *AudioFrame*.

The systems are now being presented according to software capabilities. The *WaveFrame 1000* accommodates ten modules and four storage devices. The *4000* accommodates four modules and two storage devices.

Addresses

● **Euphonix** has opened its worldwide sales, service and marketing office at 10647B Riverside Drive, North Hollywood, CA 91602. Tel: (818) 766 3401.
● **Audio Follow** have moved to 73, rue de l'Evangile, CAP 18 Voie D Porte 13, 75886 Paris Cedex 18. Tel: (1) 46 07 26 26. Fax: (1) 46 07 00 26.

CTS Studio One refit

CTS Studios, alongside London's Wembley Arena, has completed an extensive refurbishment of its Studio One control room with the installation by its own engineers of a 60-channel Neve *VRP60* console with *Flying Faders* and recall.

Adrian Kerridge, co-owner of CTS's parent company the Lansdowne Group, says the 80×50 ft Studio One is the UK's second-largest purpose built orchestral recording room, with a maximum capacity of 130 musicians. The refurbishment programme to the 25×15 ft control room has included new acoustic treatments as well as upgraded aesthetic elements.

A major feature for CTS is the *VRP60's* internal switching matrix, which allows instant switching between film, video and multitrack recording modes — the three main roles of Studio One. The control room is also equipped with Dolby stereo music mixing and further audio post-production facilities including *Q.Lock* and and widescreen projection. The desk joins a Sony *PCM3348* digital multitrack, Studer *A800* 24-track and Sony *PCM1630* recorders, along with ATC *SCM250A* monitoring. Kerridge claims of the new console: "We firmly believe that sonically it outclasses any comparable console; we are equally delighted with its logistics." Studio One has now re-opened for bookings.
Mike Lethby

Small runs for CD maker

A new CD mastering and duplication company, Triple Six Productions, has recently opened in the West End of London. The difference between this and other similar companies is that Triple Six offer at the most CD runs of only 10 discs.

Triple Six uses the new Yamaha *YPDR601* Professional CD recorder to produce one-off or short runs from a variety of tape formats. They provide a same-day service at around £60 per disc, excluding VAT (approx $100), whether the CD carries one jingle track or a full 63 minutes of audio.

Eric Hine set-up the company after he saw the Yamaha machine at this year's APRS show in London, "As far as I can see there are a number of markets for this kind of service. The songwriters and pluggers, the musicians who want to keep a pristine copy of their work for ever, the audio/visual use in museums, and the radio jingle and station ident work.

"We've already had business from most of those areas including a few copies of the new Kylie Minogue album. We mostly get DAT and ¼ inch but we have had audio cassettes as well."

If you order more CDs there is a slight discount but Hine thinks that an order of more than 10 discs is not so parctical as costs do not decrease to any great degree.

Triple Six Productions, 34 Pall Mall Deposit, 126-8 Barlby Road, London W10 6BL. Tel: 081 964 4091.

In brief

● Maidstone, Kent, UK: **Statement from Hill Audio.** "Mainly due to losses sustained by our former American subsidiary Hill Inc, which ceased trading at the end of 1990, it has become necessary for us to restructure our finances to secure the company's future. In consultation with our bank we considered a number of options and with their full backing we have decided the most positive option is a voluntary agreement with our suppliers which, with their support, should ensure the company's successful future."
● Nevada City, California: **NVision audio.** NVision has announced the formation of the Audio Products Division. Their strategy is to offer a family of affordable digital audio system-solution products for the broadcast and post-production markets.
● London, UK: **Sypha lectures.** Sypha are now running a series of in-company lectures concerning digital audio technology. Two prepared sessions are — an introduction to tapeless technology *and* a review of the digital audio workstation market. Contact Yasmin Hashmi, SYPHA, 216A Gipsy Road, London. SE27 9RB, UK. Tel: (81) 761 1042. Fax: (81) 761 8279.
● London, UK: **Employers launch freelance training fund.** ITV, Channel 4, TPA and IPPA have launched the Freelance Training Fund to address some of the problems of who provides and pays for freelance training. More information from Rod Hastie on 071 612 8000.
● Zurich, Austria: **Studer/Digitec.** Studer Revox and French Digitec SA recently entered into an alliance. An agreement was reached for Studer Revox in France to have a controlling interest in Digitec SA by a capital increase, forming a new company Studer Digitec.
● Borehamwood, UK: **Companies join Soundcraft group.** Harman UK, a subsidiary of Harman International and the holding company of Soundcraft Electronics recently announced the acquisition of Allen & Heath, Allen & Heath USA and MBI.

When they build a speaker in the Cotswolds, they make sure it will be heard in New York.

Like the surrounding Gloucestershire countryside, the people of the Cotswolds are famous for their silence. But occasionally something comes along that is just too good to keep quiet about. Like ATC loudspeakers.

Their exquisite performance has set tongues wagging from Tokyo — where they have won numerous awards — to New York, where world-famous audio professionals choose to listen to them every day.

So why all this excitement about ATC professional monitors? Is it that they are hand-built to extraordinary standards, or because of their unique ability to deliver clarity and detail at any sound level? One thing is certainly clear, the revolutionary soft-dome midrange driver manufactured by ATC is the envy of monitor designers worldwide.

The ATC range is comprehensive. There are two free-standing, self-powered models for instant plug-in-and-listen professional monitoring. The remarkable SCM100A — with its hefty 312mm driver — provides a low frequency performance to match studio control systems three times its size. There's also the SCM50A, a smaller three-way unit equally popular amongst leading broadcasters and recording engineers. The top-selling passive model is the SCM20, a compact but powerful loudspeaker that's rapidly becoming a near-field monitoring standard. And if you want to build ATC into your control room, the SCM200 and SCM300 provide a choice of large-scale systems to meet the most demanding requirements.

ATC loudspeakers can be auditioned at HHB and a network of leading distributors worldwide. Once you've heard them, you won't stop talking about them either.
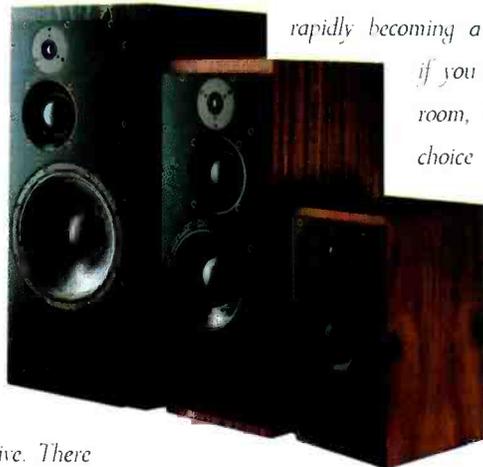
People

● **Tannoy-Audix** has appointed Charles Williams as sales manager of its public address division. He will lead the sales operation of all PA and voice fire products worldwide.
● **Audio Processing Technology,** the Solid State Logic subsidiary, has appointed Steve Cheung to head its international marketing operation.
● **Fostex (UK) Ltd** has announced the appointment of Mark Perrins to the position of Product Manager. Perrins comes from working with Akai, E-mu and DAC.
● John McDiarmid has joined **Focusrite Audio Engineering** as sales manager, responsible for managing the Focusrite distribution network throughout Europe and Australasia and for developing sales for the Focusrite *Studio* console.
● Robert Mahoney has become the new Director of Marketing of **NVision** in Nevada City, California.
● **Grass Valley** has appointed Peter Blatchford, formerly Abekas product manager, as UK Marketing Manager and Martin Cook, of Fostex UK, as UK sales manager.

Corrections

● In our August issue we inadvertently added the word Cabling to the name of power amp manufacturer FM Acoustics while listing a few of their latest South Korean amplifier contracts.
● Our Audio Recording feature in *Studio Sound* September issue failed to mention that HHB Communications distribute the Stellavox *StellaDAT* player in the UK. HHB Communications, Tel: 081 960 2144.
● In an article in our September issue, called Midas *XL3*, we mentioned that Midas were part of DDA before they joined Klark-Teknik. In fact Midas were never part of DDA and are now part of K-T in the Mark IV Group.

Agencies

● **Focusrite Audio Engineering** of Bourne End, UK, and GML of Los Angeles have officially announced the signing of a major distribution agreement that has GML Inc. as the official North American distributor for the Focusrite *Studio* console. GML, 7821 Burnet Ave, Van Nuys, CA. Tel: (818) 781 1022.
● The Home Service has taken on the marketing and worldwide distribution of a psychodynamic processor developed by the German company **Sound Performance Laboratory.** The Home Service are currently setting up a worldwide dealer network for the product. Interested parties should contact The Home Service, 178 High Street, Teddington, Middlesex, TW11 8HU. Tel: 081-943 4949. Fax: 081-943 5155.
● **The Rolls Corporation** of Utah has appointed Flaa Musik to handle distribution, marketing and sales of its musical instrument range of range of products within Sweden. Flaa Musik, Osakargatan, Box 6024, 580 06 Linkoping, Sweden. Tel: (13) 123 221. Fax: (13) 148 250.
● **BBE Sound Inc** has appointed Aramini srl to look after distribution, sales and marketing of its products in Italy.
Aramini srl, Via Buozzi 1b, 40057 Cadriano, Di Granarolo, Italy. Tel: (51) 766 077. Fax: (51) 766 109.
● **Horizontal Productions,** based in North London, has recently been appointed UK sales and service centre for **Fairlight ESP** audio products. Horizontal Productions, 23a Benwell Road, London N7 7BL. Tel: 071 700 1852. Fax: 071 607 1410.
● As we went to press we heard that **Neve North America** and **AMS Industries North American** had merged to form **Siemens Audio Inc.** The merger was announced at AES New York. Barry Roche has been named President of Siemens Audio, Gerhard Gruber is Executive Vice President of Sales and John Gluck, Executive Vice President. Neve and AMS will continue to share the same corporate facility in Bethnel, Connecticut.

Post-production with Roland W-30/Cubase

Apart from its more popular role as a keyboard/sampler in music production, the Roland W-30 is a true workstation. With features such as digital filtering, incorporating high and lowpass, and DC filters with variable Q, time variant filters and amplifiers, and the ability to loop, mix, merge, copy and truncate samples, the device is equally at home in post-production work.

A current A/V soundtrack project involves an original music score, programmed on *Cubase*, and location sound effects recorded using a Sony portable DAT machine, MIDI being the overall sync medium for soundtrack and slide projector pulses.

When the show goes on the road the internal 16-track sequencer of a second W-30 will be loaded with the music score from *Cubase*. The initial task is to sample the 'live' FX into the W-30's wavebanks. At 30 kHz 7.2 secs of sampling time is available in units of 0.4 secs. At 15 kHz this is doubled.

A large LCD provides graphical information and with the DAT machine connected, the input threshold is adjusted for automatic or manual triggering. Pre-trigger prevents the front of the sample from being cropped. The Roland sampler incorporates a device called Differential Interpolation to avoid noise and harmonic distortion of samples. Pressing GRAPHIC then brings the resulting sample waveform to view at a variety of different magnifications and turning the VALUE DIAL adjusts Start, End and Looping address points.

A problem of looping or joining samples together is the possibility of glitching where the peaks of the waveform do not match up. To avoid this a peak search mode is selected with further help from Auto-Smooth.

Tone parameters may be changed and one of eight different outputs assigned for interesting stereo and multi-speaker effects to be created.

The resulting sample disk may be loaded into the Atari and W-30 editor software used for further processing, such as 'redrawing' the waveshape or 'shrinking', 'stretching' and then pitch correcting.

Eventually, the edited tones reside in the 32 tone banks from where they may be assigned to note numbers on the keyboard using Patch Split mode. Two tones may be assigned to each key with six-key velocity crossfade options available.

Using *Cubase* the FX are then programmed into position and if need be, the music and FX tracks may be merged into one of the W-30's 16 tracks and saved to disk under a Song title, making for operational ease in the live situation where more than one synth and processor may be under MIDI control.

Song and Sound data may be saved together or on separate disks and it is sometimes quite interesting, even inspiring, to run a Song with Sound data originally intended for another performance. A Differential Interpolation of the brain cells!

David Hastilow

Exhibitions and conventions

Given Freedom of Choice ...

SOUNDTRACS PLC the People's Choice

Audio Seal portable booths

New to us are a range of portable sound booths from Audio Seal. The booths are made of flexible panels constructed from Audio Seal *Barrier* and Quilted *Fiberglass* Absorber Combination blankets which are described as providing sound absorption within the booth and reducing noise transmission into the booth.

The construction uses a steel frame, component parts and Velcro fasteners, being decribed as easy to construct and dismantle. The booths have US ratings of STC 29 (Standard Transmission Coefficient) and are Class 1 fire rated for flame spread and smoke density.
**Acoustical Solutions Inc, PO Box 5402, 711 North Allison Street, Richmond, VA 23220, USA.
USA:** Alpha Audio Acoustics, 2049 West Broad Street, Richmond, VA 23220. Tel: (804) 358 3852.
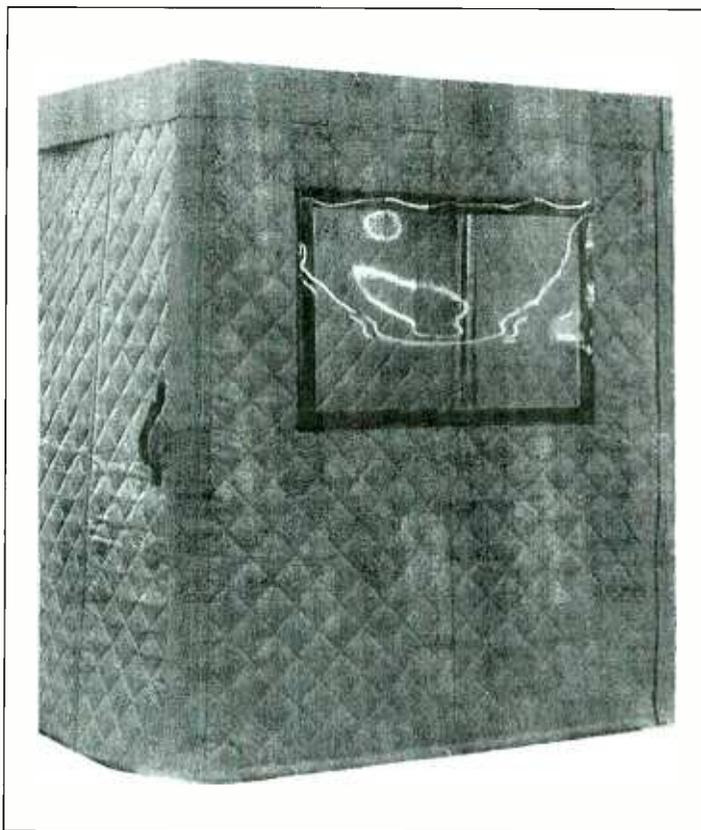
File Effects atmospheres

File Effects is a new library of sound effects on CD. Newly recorded over the last three years by two engineers working in the film and TV industries, all the tracks are fully digitally recorded. The majority of the tracks on the first set of ten CD's are of three minutes duration to provide longer atmosphere tracks. Each disc contains line-up tones to aid transfer level setting.

Current titles include Travel & Transport; Quiet Rooms & Other Worlds; Traffic; Birds; Insects & Animals; Industry & Commerce; Skylines & City Sounds; The Elements; and Interiors & Exteriors With People.
Josef Weinberger Ltd., 12-14 Mortimer Street, London W1N 7RD, UK. Tel: 071 255 1829. Fax: 071 436 9616 (worldwide distribution).

Valley Dynamite 2

Valley International have announced the release of the latest version of the *Dynamite*. This is equipped for simultaneous compression, gate/expanding and peak limit as well as independent use. Valley say that the unit incorporates mechanisms to differentiate between simple and complex waveforms and not to perform arbitrary processing regardless. The two channels may be stereo linked, with an eight LED indicator showing gain reduction on each channel.
Valley International Inc, 616 Bradley Court, Franklin, TN 37064, USA Tel: (615) 370 5901.

Audiomation Uptown

Following the article in this issue, there have been a number of updates to the Uptown Audiomation system with the release of *Version 2.50* software. More precise control is provided with the addition of 'single touch' machine control via the middle mouse button, a 'hold trim' function and improved cue list behaviour. The timecode display now has its own dedicated window with more information and a local zero for timecode offsets. Extra filing features offer the ability to read/write MIDI SMF files as well as store or retrieve system configuration info in user files and to preset faders to positions stored in snapshot files.

Other new hardware includes an interface for the DDA *DCM* switch controller and a special automation system for the Harrison *PP1* console.
UK: Audiomation Systems, Rockwood House, Barn Hill, Stanley, Co Durham DH9 8AN.
Tel: 0207 282880. Fax: 0207 232023 (international distribution).
USA: Audiomation Systems, 96 Dudley Road, Sudbury, MA 01776. Tel: (508) 443 8053.

LA Audio MIDI Mute

LA Audio have introduced a companion unit to the 16-channel *MIDI Gate* noise gate. The *MIDI Mute* is a MIDI muting unit offering 32 channels of muting in a 1U rack format with the mute attenuation being quoted as 106 dB per channel. Functions can be set from the front panel sending MIDI note on/off info to a sequencer or by triggering the 128 patch set-up memory. The unit has battery back-up and powers up fully muted. MIDI channel and note ranges are fully assignable.
LA Distribution Ltd, 15 Cam Square, Wilbury Way, Hitchin, Herts SG4 0TZ, UK. Tel: 0462 421919

In Brief

● **Sanken** has extended the range of uses of the *COS.11* miniature lavalier microphone with the introduction of the *COS.11BP* battery powered version. The range of accessories has also been extended to include double tie-clip mounts and a flat rubber mount for boundary effect uses.
● Resulting from R&D to reduce the number of chips in a timecode reader, **Audio Kinetics** have designed their own IC implemented in 2 micron CMOS technology. The *DAK 010* includes features for longitudinal timecode decoding and microprocessor interfacing. It is currently being supplied to a number of major pro audio manufacturers.

HHB DAT tape

Following their championing of low cost digital recording formats and in particular DAT (claiming sales of over 8,000 units to professional users) HHB have launched their own brand of DAT tape. Known as HHB *PQ* Professional Series tapes they feature the results of several years of experience with 'the strengths and...limitations, — of the DAT format. Features include concave tape profile to maximise tape to head contact, sealed design to eliminated airborne contamination (seen as a major source of trouble), and internal shell ridges to protect the tape edges. Available in lengths of 15, 30, 48, 62, 92 and 122 minutes, the tape itself is sourced from a major internationally known manufacturer while the case is specifically their own design which apparently fits with their research into DAT problems showing the

Summit Two-Channel Hybrid

Summit Audio have added a new vacuum tube/solid state hybrid processor to their existing range. The *DCL-200* is a two-channel compressor/limiter using 12AX7A gain stages with discrete op-amp output stages. Compression ratio is continuously variable from 1:1 to 7:1 and the slope has a soft-knee characteristic. The channels may be run as dual mono or with stereo link controlled from channel one. The meters are switchable for output or

gain reduction levels with the addition of LEDs for overload indication. All inputs and outputs are transformerless and there is provision for a side chain control input.
Summit Audio, PO Box 1678, Los Gatos, CA 95031, USA. Tel: (408) 395 2448.
UK: HHB Communications Ltd, 73-75 Scrubbs Lane, London NW10 6QU. Tel: 081 960 2144. Fax: 081 960 1160.

casing to be a potential problem area. The tapes will be distributed through the UK and Europe.
HHB Communications Ltd, 73-75 Scrubbs Lane, London, NW10 6QU, UK. Tel: 081 960 2144. Fax: 081 960 1160.

WaveFrame 5.0

WaveFrame have announced the introduction of software *Version 5.0* for the *AudioFrame* (which is now known as the *WaveFrame 1000*). New features include manual punch-in/out on all eight tracks including soft punch and a nominal 20 ms punch delay. Material just before and after the punch-in point are recorded also to allow adjustment for missed cues. Other *5.0* features include time compression and expansion to fit precise times.

The new Multichannel Digital Interface module *MDI-32* allows direct connection of 32 ins and outs in either PD or SDIF digital formats. Level control, emphasis control, meters, phase and mutes are provided for all channels.
WaveFrame Corporation, 2511 55th Street, Boulder, CO 80301, USA. Tel: (303) 447 1572.
UK: Stirling Audio, Kimberley Road, London NW6 Tel: 071 624 6000.

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Bel auto-tracking delay

Bel have introduced a new auto-tracking audio delay/synchroniser known as the *BDE-7000SA*. Designed for use in post and broadcast environments where it compares reference and source programme syncs in order to automatically maintain the required audio delay time to within one frame. The system operates in realtime allowing different audio and video transmission paths to be synchronised without manual adjustment although this is possible. There are eight user memories and a lock-out function.

UK: Michael Stevens & Partners Ltd, Invicta Works, Elliott Road, Bromley, Kent BR2 9NT, UK. Tel: 081 460 7299 Fax: 081 460 0499 (also worldwide distributor).

Wireless timecode system

New to us is the Noriyuki *Scriptboy* wireless timecode system that allows the transmission of timecode without cable connection and presents a useful tool when working with remote syncable sources.It comprises a transmitter and a receiver with a large display. The transmitter is low power (49 MHz) and would be connected to a source of timecode such as camcorder or VTR. The receiver has a personal readout and is attached to a clip board. The system works over a 50 metres range dependent on conditions running for 20-24 hours on standard batteries.

UK: Canford Audio plc, Crowther Road, Washington, Tyne & Wear NE38 0BW Tel: 091 417 0057.

CRL events sequencer

CRL have introduced a new Real Time Event Sequencer. This is a 1U rack mount programmable event timer that can control any combination of eight or one of 255 outputs via a rear panel connector.

The outputs are selectable to latch on or provide half or one second contact closures. Programming is via a key pad and is displayed on a back-lit LCD using a circular menu approach. A seven day clock program, security keylock and battery back-up are included.

Circuit Research Labs, 2522W Geneva Drive, Tempe, AZ 85282, USA. Tel: (602) 438 0888. Fax: (602) 438 8227.

TAC B2 channel options

● TAC have introduced a new option for their *B2* range of compact consoles. The *B2* will now be available in 10/2, 18/2 or 30/2 formats, making it suitable for applications where subgrouping is not required, such as keyboard mixes or for some video post-production applications.

Total Audio Concepts Ltd, Unit 17, Bar Lane Industrial Park, Bar Lane, Basford, Nottingham, NG6 0HU, UK. Tel: 0602 783306. Fax: 0602 785112.
USA: Amek/TAC, 10815 Burbank Boulevard, North Hollywood, CA 91601. Tel: (818) 508-9788. Fax: (818) 508-8619.

Serious users the world over are reaping the rewards that the DAT format brings: cost-efficiency, convenience, reliability and audio excellence. As you might expect from the world's No1 DAT Centre, HHB has been working closely along-side the 'World Leader in Digital Audio' to build a DAT product range that really delivers the goods. And the briefest glance at our latest Sony DAT line-up is all it takes to see that there is a solution for every application, from the simplest audio recording to the most advanced audio-for-video post-production.

TCD D3 DAT WALKMAN

Even digital recording on the move can now be a serious business. There's the ultra-compact TCD-D3 DAT Walkman, combining low cost with a superb design and an inpressive four hour recording capability. Consider the highly successful TCD-D10 portable family. As well as balanced XLRs, the rugged TCD-D10 PRO MkII adds 'absolute time' recording, with HHB offering the exclusive option of a 48v phantom power modification. We can even supply the original TCD-D10, modified

TCD D10 PROII

for DC recording.

But as anyone will tell you, DAT excellence is not based on hardware performance alone.

That's why – following a period of exhaustive worldwide research – we've launched our own range of 'Professional Quality' DAT tapes. Available in the following lengths – 15, 30, 48, 62, 92 and 122 minutes – the HHB 'PQ Series' is the first tape range that really responds to all the requirements of the serious recording professional.

DAT from Sony. For the serious, the very serious and the seriously serious.

PCM-7030/7050
Timecode, Synchronisation & Editing Capabilities

Both recorders can provide the following features: 4 heads for confidence monitoring & insert editing • Modular design with a wide range of card options • Built-in chase synchroniser/Externally Suncable • SMPTE/EBU Timecode Read/Record Capability • Absolute Time to Timecode Conversion • Parallel Remote Interface • Instant Start Memory • Varispeed • Fader Start Capability • Digital Input/Output • 9 pin serial connector/BVE Series video editor control • PCM-7050 offers millisecond accurate editing when used with RMD-7300 Edit Controller

DTC-750ES
Low-Cost, Entry Level DAT

• Time & Date Record Feature • Long Play Mode
• SCMS equipped • Digital Fade In/Fade Out

DTC-1000ES PRO
The Industry Standard

No-compromise first generation build quality • SCMS free
• Switchable 44.1/48 kHz • Balanced XLR Inputs/Outputs (+4dB)

PCM-2700
Affordable 4/Head Technology

• Confidence monitoring/read-after-write • 44.1 kHz record/
playback • Time & Date Record Feature • Balanced XLR Input/
Output (+4dB) • IEC 958 Digital Port • Long play mode.

Zoom 9030

Zoom's half-rack width *9030* instrument effects processor continues the theme of miniaturisation started by the company's products for guitarists to mount on the guitar strap. But rather than being 'just small enough', the *9030* is actually 'just big enough' with mini pots that can be gripped easily; and small flush mounted switches.

The unit is well built and also extremely pretty with a blue fluorescent display, bright LED patch number display and a red, yellow and amber matrix corresponding to the device's nine effects modules. The front panel is finished in a pale grey matt coating, which while pleasant to the touch is guaranteed to mark beautifully.

Running off an external power supply, all audio connections for front panel high impedance input, stereo phones with volume control, rear panel input, left and right output and an effects loop send and return are on standard jack. MIDI in/out and an 8 pin remote socket for the optional *8050* pedalboard complete the picture. Front panel pushbuttons access patches, the edit mode, the utility mode, scroll through pages, control cursor movement and increment/decrement values. Dedicated buttons also serve to bypass the effects section, exit any mode and store a patch.

Input signal level is controlled by a pot which works in conjunction with two pinhead LEDs one of which glows green to amber as signal increases and the other flashes red before overload. Once inside the unit the signal is free to flow through up to seven of the nine programmable effects modules that the device has to offer — each module supplies one effect from its categorised portfolio. Thus we have a compressor section with a limiter and a section dedicated to switching in and controlling the send level to the effects loop. The *9030* does not allow you to place a module anywhere you like in the chain of processing; four combinations of routing are selected by default depending on the nature of the effects incorporated in the various modules and their stereo/mono status.

The Distortion section uses analogue circuitry and offers three distinct distortion types each with EQ control. These cater for the searing lead line sounds so beloved of the penny-per-note brigade to classic creamy tones and more curtailed, better defined timbres for chordal work. The EQ section provides a standard low, mid, high and presence guitar amp type set up, a three band EQ with swept mid and the nowadays ubiquitous enhancer which remains man's best attempt at accentuating the noise of single coils to date.

An ingenious amp simulator section allows the user to choose the character of a combo or a stack with variable responses and to convert the rig to a convincing stereo. From here we proceed into two similar and complementary effects modules which offer modulation effects such as chorus, flanging, phasing, panning and tremolo together with delays and a beautifully tonesome wah collection. Pitch shifting on the *9030* is really something else. Good bandwidth, a consistent performance across the range and pretty damn fast, it shames many MIDI guitar synths for speed.

Still on the subject of pitch shifting, programs from the two effects sections can be forfeited for the use of a special effects module. Sitting uncomfortably next to more esoteric processing like a poor representation of a sitar and an explosion (synth players had to put up with chirping birds and helicopters for years, now it seems it's the guitarist's turn) is an intelligent pitch shifter that actually works. The key, the interval and higher or lower harmonies are selected and the Zoom handles the rest competently and without asking you to play the fiddly bit over and over.

Finally a high quality reverb module supplies room and hall characteristics alongside early reflections and multitap delays adding the touch of realism required to bring the capabilities of the amp simulator to the fore.

In all cases editing of each module is achieved by four soft knobs that control separate program parameters shown on the display over a number of screens. These are not continuously rotatable pots but have fixed top and bottom limits and as such are more suitable for the functions they perform. And editing is extremely simple and effective — you select which processors you want from the information on the display and the module matrix, you tweak the knobs, you save and you name.

Real-time MIDI control of one parameter per program means that a seven program patch can have seven MIDI continuous controllers influencing it and that includes control of the volume on the external effects loop which on reflection would have been better if it were stereo and movable. That's more controllers than a guitarist is likely to have MIDI pedals or feet but it certainly illustrates the device's versatility. There is some zipper noise but it is relatively low in what is intrinsically a very silent unit.

So what does it sound like? The collection of presets supplied with the unit are for the most part outstanding. There is a polished and finished quality about the sounds and the unit almost has a signature of its own. Let's hope that the temptation to edit will banish the likelihood of *9030* presets becoming as easily recognisable as each generation's flagship synth has been.

For clean contemporary guitar sounds just add six strings — it is all there. The dirtier stuff is equally well represented although mildly distorted tones, in line with most processors of this type, are less convincing. I would have liked to have seen delays in both effects sections for stacking purposes but this is more than made up for by a truly working pitch shifter. While positively geared for the recorded guitar sounds of the 1990s, the *9030* would also hold its own in a studio rack and has a range of patches specifically designed for the bass player including a stunning fretless approximation.

Quiet, compact, versatile, smooth, instant, low cost and presented in a way that will not scare even the most technophobic guitarist.
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> Studio Sound's Music News is compiled by Zenon Schoepe

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Classical Renkus-Heinz

The sound hire arm of R G Jones has been helping to raise the presence of Renkus-Heinz *Smart* SR systems in the UK market with a string of classical concerts since early summer.

The two Leeds Castle concerts featured Renkus-Heinz's latest *C1A* cabinets. Those shows sandwiched a performance of Verdi's *Attila* at the Royal Opera House using *M-1, SR-2* and *SR-121A* delay speakers, and were followed by the Henley Arts Festival (with the RPO, LPO and SCO). Their latest concert, say R G Jones, featured Placido Domingo and Maria Ewing in a Royal Opera House performance of *Tosca* at Kenwood.

Finally, Renkus-Heinz have announced the appointment of Frank E Ostrander as chief engineer in charge of acoustic and electronic research and development projects.

JBL Sound Power on ice

The six-month-old Blackburn Ice Arena has been re-equipped by Venuetech with a new 24 kW sound system, whose major feature is a JBL *Sound Power* cluster. Part of a sound, lights, video and lasers installation costing £150,000 (approx $250,000), the system was designed by Venuetech using JBL's *SRDS* CAD software to cover the 78 x 54 m hall, which besides skating events is also used for discos, rock concerts and sporting events.

Making up the JBL cluster are 12 *Sound Power 4771A* cabinets, six *2360* horns with *2450* compression drivers and two *4730A* cabinets for in-fill. The rig is augmented by four *Sound Power 4788A* subwoofers above the bar area and an outer delay of eight *Sound Power 4726AP* cabinets. The control side includes 20 Hill Audio *Chameleon* amplifiers, a Toa *Saori* digital signal processor, two BSS MIDI noise gates and a BSS compressor/limiter.

Marquee in the theatre

Spencer Brooks, Marquee Audio MD, says the company has dramatically increased its business in the UK theatre installation market — citing four major contracts in recent months by way of evidence.

For the revamped Oxford Playhouse Theatre Marquee provided a 32-channel DDA *Q* series desk and a Martin Audio speaker system including *PM3* 3-way monitors and *CTX* sub-bass cabinets, powered by C-Audio *RA3000* amplifiers. Another *Q* series (again with DDA's theatre inputs) went into Theatre Clwyd along with Tascam *DA30* DAT and *34B* ¼ inch recorders.

Northampton's Royal Theatre and the Sedgwick Centre's Conference Forum both took 16-channel DDA *S* series FOH consoles amongst other items — the latter venue's control room also being fully re-wired by Marquee in the process.

Kelsey launch Trouper hire

Kelsey Acoustics, export agents for Trouper Cable Crossovers of Los Angeles, have set up a Cable Crossover hire department. The product in question is a tough plastic cable ducting system — similar in profile to those familiar 'sleeping policemen' traffic-calming bumps — which slot together to provide unlimited lengths of cable protection against anything from festival-goers' feet to a fully-loaded tractor/trailer.

According to Kelsey's Richard Vickers sales in Europe have surpassed 600 pieces in the last four months. Details are available from Gary Davies at Kelsey Acoustics on 071 727 1046.

Studio Sound's Live Sound News is compiled by Mike Lethby

On tour

● **Audiolease's** September highlight was the Philip Glass Ensemble's Royal Festival Hall dates, with an 11-piece band, a backstage rack full of MIDI samplers and sound modules and a Meyer *MSL-3* SRS. They were touring effectively, a live version of his two Godfrey Reggio movies — *Koyaanisqatsi* and *Powaqqatsi*, which were screened above the band.

● **Britannia Row Productions** have lately been working with Marillion, Magnum, Frank Sinatra, Liza Minelli, the Gypsy Kings, ex-Adamski singer Seal, Whitney Houston (including a massive 17-night stint at Wembley Arena in September) ending mid October. Says Mike Lowe of the Autumn season: "We've been absolutely stacked out; we've even had to pass on a couple of regulars." Around November 18 and 19, the company's crew and a planeload of *Flashlight* SR head for Oman, on behalf of that country's annual celebration of the Sultan's birthday and the anniversary of his accession to the throne. The 25th anniversary — in five years' time — will, it seems, be something of a monster bash. Lowe adds prosaically: "Our quote for the *Flashlight* was the same as our nearest competitor — but we had half their freight weight for the same power."

● **Canegreen's** most recent shows have been with rising singing star Beverley Craven, the equally hot Black Crowes (concluding a UK tour with Hammersmith Odeon shows in mid October), Nigel Kennedy, monitors for Julio Iglesias — and David Bowie's Tin Machine tour.

● **Encore's** John Tinline espoused a familiar theme in noting the difficulty of supplying advance information on tours. "Everyone is booking late and confirming late," he said. "Promoters are waiting until the last possible moment to see how ticket sales go. But we will be very busy by November — business is definitely improving overall."

● For **Entec**, Steve King echoed Tinline's observations on late bookings. His faith in a market upturn, however, is reflected in the purchase of further stocks of JBL *Concert* series SR.

● **Malcolm Hill Audio's** September/October UK tour with Gary Numan featured the company's latest passive 2x10 inch wedge monitor. As yet unnamed, it employs a 10 inch Volt driver and a Tannoy Dual Concentric. MHA say the secret of the monitor's sound lies in partnering it with their new *Chameleon* 1U-high power amplifier. MHA also provided all the monitors, and the Wembley Arena SRS, for Status Quo's record-breaking 'Rock Till You Drop' charity marathon, featuring four shows around the UK in one day.

● **SSE** have put the 2nd Russian Revolution through its stiffest test. Controlled chaos ensued when an extra date was added to the Monsters of Rock tour — in Moscow on September 28, four days after the 'final' show in Barcelona. Says Beale: "It meant shipping everything to Moscow, including generators; the telephone was leaping off the hook and we had people flying back and forth to Moscow — crazy. It was a free show, sponsored by the Government."

Which Government?

"Ahhh . . . Boris's, I suppose." An audience of up to 1 million was expected, though the venue was unconfirmed at press date. The SSE/dB Sound *MT-4* SRS was due to be supplemented by Hanover-based Rock Sound's proprietary cabinets (since there were no less than 12 outfield delays).

Also on the Monsters theme, *The Sun* newspaper, in a bizarre twist, reported that Donington actually restored one fan's hearing! The youth, whose auditory nerves were damaged in a Rugby accident, stood 10 yards from SSE's SR. In the tautological statement of the year, the paper said AC/DC's deafening music blasted his hearing back into action. The shock must have been mind-boggling.

Renkus-Heinz UK close

Renkus-Heinz is closing its UK sales and marketing office in an effort to curb its European sales and marketing overheads, following a downturn is sales over the past year.

Ironically, the closure comes at the end of a year in which Graehme Harrison, sales and marketing manager of the UK operation, and hire company R.G. Jones have managed to raise the profile of Renkus-Heinz's latest SRS system, the C-1A. According to Renkus-Heinz, the move will not affect R.G. Jones whose system is effectively the company's European flagship.

Speaking from the corporate headquarters in Irvine, California, founder Harro Heinz said: "Sales in Europe have not been up to expectations, and we have had to face the reality that in opening a UK office we have doubled our European costs without increasing sales." His son Ralph — Renkus-Heinz's manufacturing operations manager — added that the European division had returned to its size of two years ago: "The whole operation will be managed by Karl Brunboll, once again from our Norwegian office."

US SR workshop

The third Concert Sound Reinforcement Workshop takes place on January 14-16 1992 in Orange, CA. Sponsored by Synergetic Audio Concepts (SAC), the Workshop is hosted by Don and Carolyn Davis, chaired by Will Parry of Maryland Sound, and has Concert Sound Consultants' David Sheirman as its facilities co-ordinator.

SAC say the previous workshops made audio history by allowing the concert sound industry's leading lights to co-operate in sharing the best elements of their business philosophies and technical expertise.

Since 1992's participants include representatives from top US SR hire firms Audio Analysts, Clair Brothers, Electrotec and ShowCo, this should be an interesting event — perhaps even enlightening if the spirit of altruism is all it's claimed to be. "The staff of this workshop," say SAC, "represents the pinnacle of success in an arduous industry. These men feel that major changes are on the horizon."

More information on the 1992 Concert Sound Reinforcement Workshop can be obtained from SAC on (812) 995-8212.

Celestion on video

Celestion International has announced a technical promotional video aimed, it appears, at potential customers or less experienced users for their *SR* series of speaker enclosures.

The video contains information and advice on using any *SR* system with a variety of ancillary equipment including consoles, graphic equalisers and amplifiers — with the object of maximising the whole system's performance.

Interested companies can obtain copies directly from Celestion International Ltd on 0473 723131.

ShowCo: correction

In our review of George Michael's Wembley show (*Studio Sound*, June) it was stated that ShowCo had used Harrison consoles since the '70s. We are happy to point out that ShowCo in fact acquired their first Harrison desk in 1983.

THE NON-ENVIRONMENT CONTROL ROOM

The concept of the sound-absorbing acoustic trap has become closely identified with specific styles of acoustic design. In this article Philip Newell looks at how and why they work. He then proceeds to the concept of the 'non-environment' control room and the experience with the rooms built so far

The concept of the recently emerging 'all-trap' or 'non-environment' room was discussed in 'Monitor systems — part 11' (*Studio Sound* March 1991). Suggestions that bass traps had no mathematically proven acoustic basis have been rife for years but recent research by Brazilian acoustician Luis Soares has begun to throw more light on the subject. The fact that they do work is patently obvious to all who have ears to listen but one problem with their academic acceptance has been their empirical origins and complex nature of operation. Within the recording industry, the term 'bass trap' can usually be traced back to Tom Hidley in the late '60s.

In the '50s, Hidley worked for JBL in Los Angeles, and on one particular occasion, a loudspeaker was taken into a listening/testing room known to have low frequency problems. Upon setting the system up, it was noticed that the LF response was smoother than usual and this was initially put down to the new loudspeaker design. When this loudspeaker was auditioned elsewhere, the benefits were no longer apparent, so other loudspeakers were taken into the test room, where once again, a smoother LF response was noticed. Something had clearly happened to the test room,

but the only change to the room was that a group of blackboards and screens had been moved into the room for temporary storage. When these were removed, the bass problems returned, so Hidley asked colleague Bart Locanthi what was happening. Locanthi, whose knowledge of acoustics was at that time significantly greater than Hidley's, replied that the boards were acting as traps, the low frequencies effectively went in but did not appreciably re-appear.

Some years later, Hidley was working in New York, when the Record Plant asked him to look at some LF problems in a room. Remembering the earlier traps he decided to try a system of angled, free hanging baffles in a giant contrivance on wheels (which proved too heavy to be movable) that dramatically improved the acoustics of the room. Such traps and Tom Hidley became almost synonymous over the next 20 years. After a brief retirement from studio design in the early '80s, Hidley returned with a new all-trap approach around 1984. As discussed in 'Monitor Systems' the concept was intended to achieve the monitoring performance of a large anechoic chamber, effective down to very low frequencies, while retaining an acceptably live acoustic for speech and other activities within the room. The

answer was the 'monitor dead' approach where the monitors could 'see' no reflective surfaces other than the hard floor, while the occupants of the room could perceive reflexions from their own voices and activities via a hard front wall, much of the equipment, and again, the floor. It was from the psychoacoustic viewpoint of the relatively low perceived imaging disturbance caused by vertical reflexions that the floor was chosen as the main reflective surface. It could provide some desirable reflexions with minimal, unwanted, side effects. The full development of the principle led to rooms with hard front walls and floors, with every other surface trapped to as low a frequency as possible given the size of the space available.

The trapping system has developed over the years to a high degree of effectiveness and predictability, but although the free-hanging, fluff-covered baffles look simple, the acoustic manipulations that enable them to be effective have proved hideously complex. When the traps form the bulk of a room, they act as absorbers, diffusers and waveguides, reducing very significantly the broadband energy, which can return to the listening area after the first pass from the monitors. The empirical evolution of trap design has passed through many phases on its way to current thinking. During this process, many designers have used the concepts 'parrot fashion' with varying degrees of success, frequently achieving a success rate greater than would be expected from mere fluke by virtue of the fact that the traps work in such multifunctional ways. On the other hand, the inappropriate use of such systems had also led some designers, whose applications have been unsuccessful, to suggest that the whole concept is flawed and inappropriate for the studio design application.

In their current forms, the all-trap, or non-environment rooms originating from Hidley's mid '80s ideas are highly effective in the control of low frequency reverberation times. While the fine detail of the construction concepts still require a degree of practical experience in their fine tuning, the basic concepts are now quite well understood. There is no deliberate vagueness here to protect trade secrets, it is just that the overall complex inter-reactions take some understanding, and where compromises are required experience has no substitute. In essence, however, heavily trapped rooms show modal characteristics that are firstly typical of physically larger rooms, and secondly, much broader than the modes of a similar, untrapped room.

Theory of operation

Fig 1 shows a section of a typical Hidley-trapped wall. The flanking panel, which hangs parallel to the wall, is extremely important in terms of the
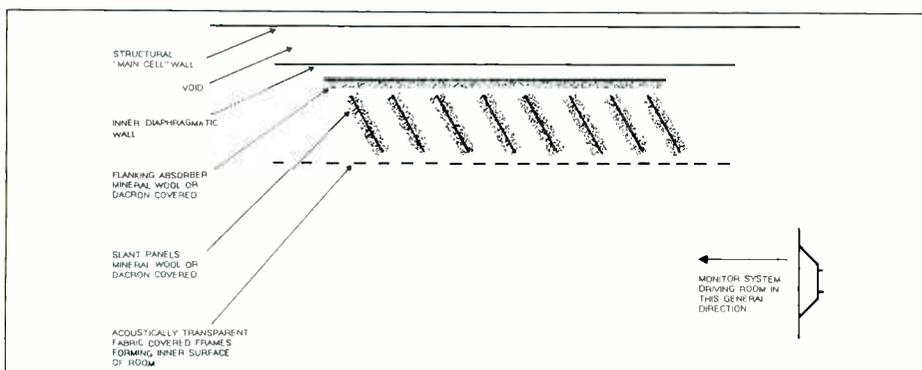
FIG 1: Plan view of full development of a Hidley style wall trap

STRUCTURAL 'MAIN CELL' WALL

VOID

INNER DIAPHRAGMATIC WALL

FLANKING ABSORBER MINERAL WOOL OR DACRON COVERED

SLANT PANELS MINERAL WOOL OR DACRON COVERED

MONITOR SYSTEM DRIVING ROOM IN THIS GENERAL DIRECTION

ACOUSTICALLY TRANSPARENT FABRIC COVERED FRAMES FORMING INNER SURFACE OF ROOM

effectiveness of the overall system. The 'chip cutter' slant panels in front act partially as waveguides, bending the low frequency incident waves to cause them to strike the flanking panels at an angle of around 45°. The 45° angle renders the absorption more effective than would be the case for a too shallow or too direct strike. This is akin to the use of wedges in anechoic chambers where the wavefronts largely strike the absorbent materials in a gradual manner. Three feet of foam wedges, although containing less absorbent material than a 3 ft thick solid foam block, are more effective in terms of absorption. Again, the destructive power of an ocean wave striking a sheer cliff is greater than that same wave could achieve when rolling up a sloping beach. It is thus important that the slant panels are orientated such that they capture the wavefront at an optimum angle to steer that wave towards the flanking absorbers at an angle of maximum absorption.

The waveguide effect can clearly be shown by hanging baffles consisting only of dense *Rockwool* or similar absorbent in the position of the normal slant panels. When this is done, the absorption is greatly reduced at low frequencies. Inserting a thin solid panel within the absorbent baffle will begin to improve the low frequency absorption, which will continue to improve as the solid panel is thickened, thus becoming less transparent to the low frequencies. Once the panel thickness becomes sufficient for the waveguide effect to be significant, then no further increase in thickness will show any benefit in terms of LF control. Indeed, as far as the low frequencies are concerned, the solid panels alone will show a marked improvement in the performance of the trap than would be the case for the absorbent panel alone.

When the panels are formed from a combination of solid core and absorbent covering, the absorbent covering has entirely different modes of operation in terms of the low frequency, and the mid/high frequency absorption. At middle and high frequencies, the absorption is a function of density, porosity and thickness, and is entirely conventional in operation. At low frequencies, where the wave is directed between the panels, the wavefront entering the slant array will follow the waveguide panels. The sections of the wavefront passing immediately adjacent to the surface of the panels will have to 'drag' their way through possibly several feet of absorbent. **Fig 2** shows how the wavefront will be distorted in shape as the absorbent slows down and reduces the amplitude of the sections of the wave which are forced to pass through the absorbent material. Bearing in mind the complex path that the wavefront must follow in order to re-enter the listening room, especially in the light of the effect of the absorption of the flanking panels and a certain degree of absorption in the slant panels themselves, it is not too hard to see the potential for reflexion suppression.

The effective low frequency limit of the trapping is partially a function of the size of the flanking panels, where the largest dimension of the panel determines the half wavelength of the lowest frequency, which can be effectively absorbed. The room design itself also has a bearing upon the overall operation. Were the room to be considered a duct, then an absorber placed in that duct can be expected to achieve a certain degree of absorption. It is a well known acoustical principle that an absorber placed at the end of a side branch off that duct can achieve greater absorption than when placed directly in the duct itself. If one imagines the slant panels as producing a series of side
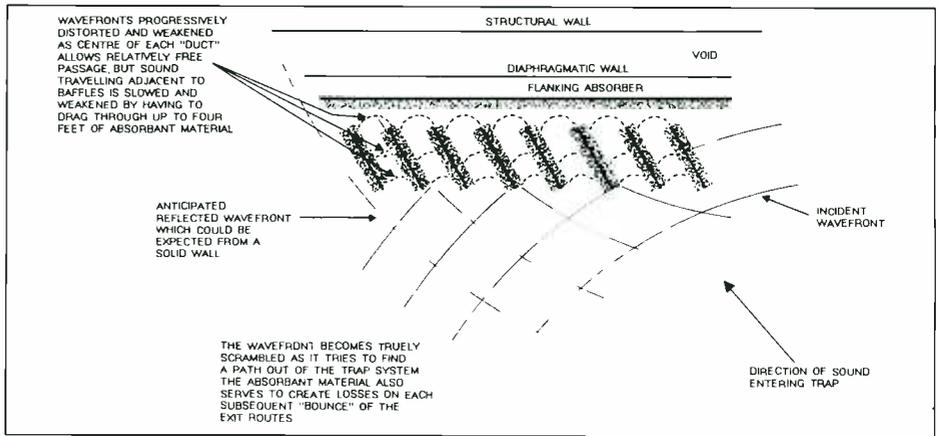
FIG 2a: Mid/high frequency absorption in a typical trap system

FIG 2b: Low frequency absorption in a typical trap system

(a) WITHOUT CEILING TRAPS   (b) WITH CEILING TRAPS
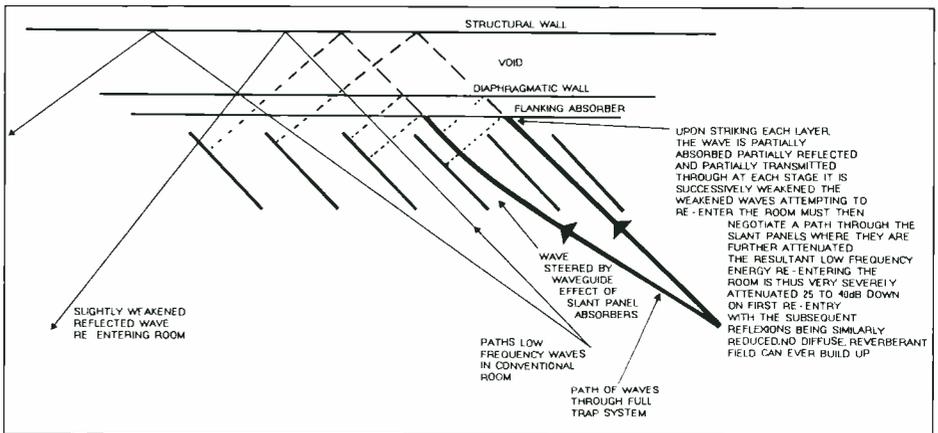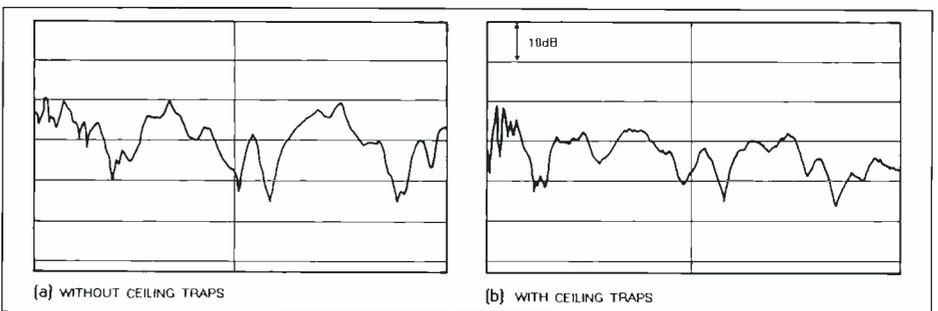
FIG 3: Effect of ceiling traps on modal pattern of room

branches off the main duct (the room) then the greater effectiveness of the flanking absorbers when placed behind the slant panels can be more readily understood. Some of the complexity of the systems can now be seen, as things are happening on several different scales simultaneously.

When these Hidley traps are enclosed within a diaphragmatic shell, the effect on low frequency reverberation time is even more noticeable. Reverberation is in fact a misnomer under such circumstances as no diffuse field ever develops. Individual reflexions decay before any truly diffuse field can be realised. Such a diaphragmatic shell would typically consist of a 4×2 inch timber frame, boarded on one side with a plasterboard/insulation board/plasterboard covering (somewhat similar to the old BBC 'Camden partitioning'). Where a significant gap can be left between this shell and an outer, sound containment wall, the low frequencies are even further controlled. The low frequencies will see the inner wall as being relatively transparent and hence will see the larger room of the sound containment shell. Even so, some attenuation will take place as the LF travels once each way through the wall, subsequently reducing yet again

the LF energy returning into the room. As can be seen, the different mechanisms keep nibbling away at the potential reverberant energy, gradually taking it down to insignificant levels.

A further aspect of such systems is that sound passing over such a series of side branches can be slowed down by the highly dispersive nature of the multiple slant panels and the gaps in between. This is another means by which the room appears to be acoustically larger than its physical size. Typical modal patterns are shown in **Fig 3(a)** with **Fig 3(b)** showing the very even overall response after the addition of full ceiling traps; in this case the ceiling baffles were 24 ft long. Experience has shown that for the greatest sonic spaciousness, the slant panels should be in the order of 12 to 18 inches apart. Both extremes of spacing would yield flat walls, as one at each end would expose the flanking panel to only random incidence absorption, while too many panels, taken to the extreme, would yield a solid mass of panels, see **Fig 4**. Two to 4 ft appears to be the optimum range for overall trap depth; below 2 ft, audible effectiveness drops off rapidly whereas over 4 ft, further increases produce little significant effect and would generally be

considered wasteful of both materials and available floor space.

Fig 5 shows a Schroeder plot of a typical decay curve for such a room. As can be seen, unlike a conventional room with a linear reverberation decay, the non-environment rooms lose their energy very rapidly in the initial stages of their decay. The rapid removal of energy, particularly when the room is excited from the direction of the monitor loudspeakers, allows much more 'space' for the perception of fine detail in the sound immediately following any transient excitation. Such a decay curve renders normal reverberation time measurement all but meaningless as we are no longer dealing with a room in any acoustically conventional sense of the word. Fig 6 shows the decay tail of a 20 Hz highpass filtered step function for the first critical 20 ms after excitation from a well designed monitor system. The lack of resonant/reverberant overhang is clearly apparent, rendering insignificant the amount of masking energy available to muddy or smear the audible clarity of the monitor response. Strictly in terms of definition, imaging, a general clarity and the overall ability to show fine detail; when equipped with a suitable monitor system, such rooms are appearing to achieve results which have hitherto rarely been realised.

Aims, priorities and early reactions

Ever since the early days of Westlake Audio, Hidley had a goal of achieving a commonality of control room performance from room to room and country to country. Looking back on it, given the variability in shapes, sizes and installed equipment, the goal was probably unachievable given the technology of the day. In 1970 I built a

super-dead control room for a client who agreed with the general idea. Again, because of the dead acoustic giving no help to the monitor loudness, I had to install four specially designed, electronically crossed over loudspeakers using 18 inch bass drivers of relatively high efficiency. Many people liked the monitoring but the room as a whole was not well received and was rebuilt within months on more conventional lines, though the studio recording areas remained the same for almost 20 years. The super-dead room was an early attempt to remove the room from the monitoring equation. Had I realised then what I know now, the addition of a hard front wall surface and a hard instead of carpeted floor would have rendered this room an early version of something remarkably similar to some of my current thinking.

There has always been a great deal of common philosophical ground between Hidley and myself, ever since I met him in 1974 and asked him to re-build the control room at The Manor, Oxford, UK. On the other hand, we have always had a differing order of priority for many of the aspects involved. The first great digging in of heels came with the proposals for the stone room in Townhouse 2, London, in 1978 where I opted for a far from controlled acoustic to break the grip of trends towards ever more 'neutral' studio areas as well as control rooms. One cannot however, deny Hidley's worldwide success with many, well satisfied clients, myself included. As technical director and a staff engineer/producer of the Virgin Recording Studio operation, I had already been designing studios for six years or more; why should I bring in another designer, Hidley, from 6,000 miles away? In a word, marketing. The fledgling Virgin organisation was trying to throw off its early image and needed something radical. It is hard now to visualise just how radical a development it was but I can still see the looks of stunned

disbelief on the faces of so many people at the re-opening party in August '75.

I flooded daylight into the studio and we used glass doors between the studio and control room; there were so many departures from the norms of the day that I alone would have really been sticking my neck out in attempting to take such radical steps. Remember, I had nearly just lost my neck five years earlier with the super dead room at Majestic. David Hawkins, then owner of Scenic Sounds who were the Westlake agents in the UK, had done an excellent job of preparing the industry to expect something new from California. It took not only a viable new concept, but also a customer who was willing to take a risk and a well prepared marketing exercise in order to achieve a successful relaunch. But shouldn't the performance of the room have been able to sell itself in a 'technical' industry? Good question! The relevance of all of this will become apparent in later paragraphs.

Shortly after the completion of the Manor, Hidley sold his part of Westlake and came to Europe to form Eastlake. Around the time of the Townhouse construction in 1978/9, he then sold Eastlake to David Hawkins and retired to Hawaii. I effectively lost touch with Tom till he read some of my articles in 1989. Realising the commonality of some of our needs, we co-sponsored ¹⁄₁₀ scale modelling, carried out by Luis Soares at the UK Institute of Sound and Vibration Research (ISVR) on the full implications of the trapping systems.

Practical realisations

Eventually, I built a modified full scale model at the UK's Liverpool Music House (LMH), also incorporating a new monitor system using Keith
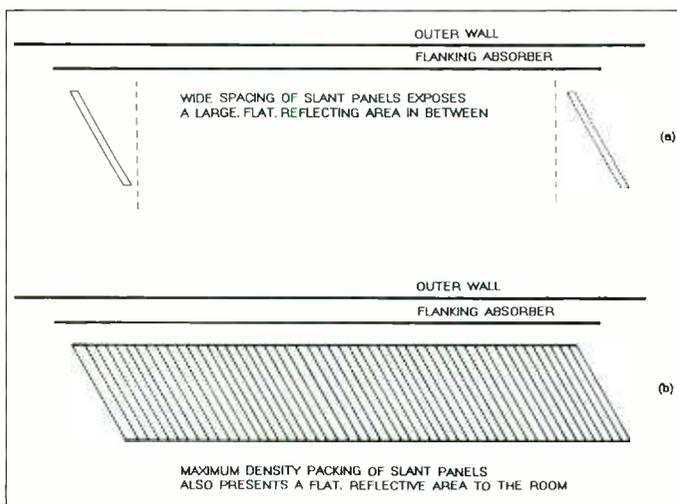

FIG 4: Effects of extremes of slant panel spacing
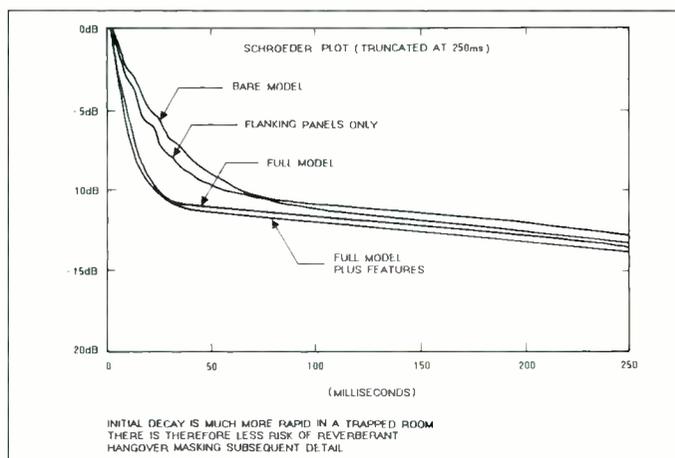

FIG 5: Schroeder plots of impulse decay curves of a modal room as trapping system is installed step-by-step (Courtesy Luis Soares)
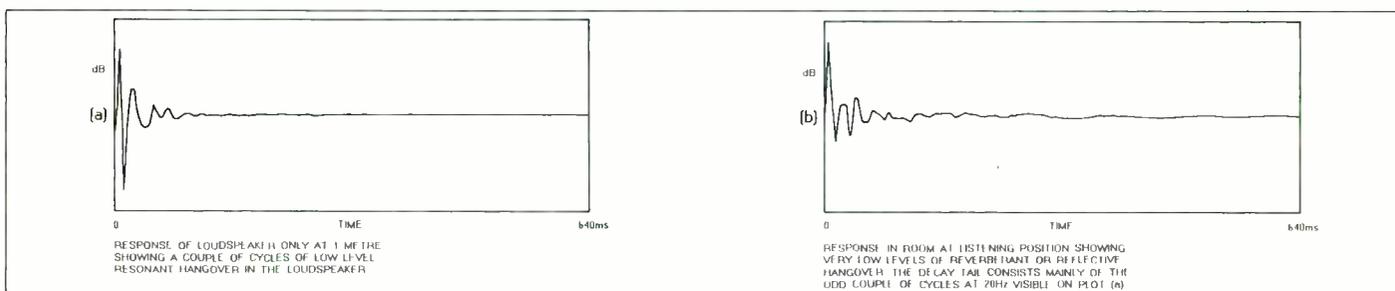
FIG 6: Impulse response of monitor system and room at Liverpool Music House 0 to 200 Hz
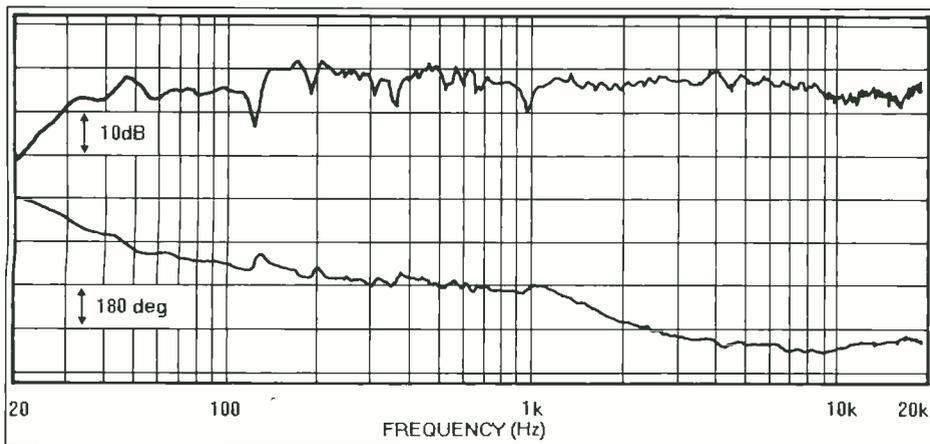
FIG 7a: 2-way monitor measured on-axis at 2 metres in situ in Liverpool Music House
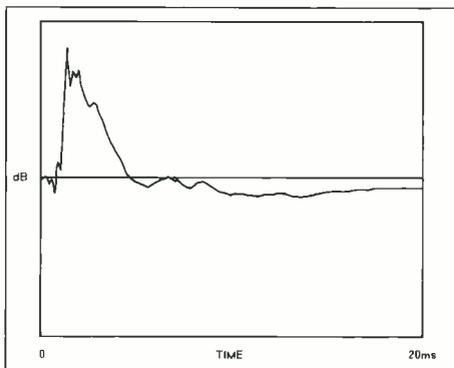

FIG 7b: Decay tail of step function — first 20 ms at Liverpool Music House (20 Hz and 20 kHz filtered)

Holland's (of the ISVR) newly developed axisymmetric horn, which was optimally matched to a TAD *2001* compression driver. The whole place was one giant test rig. Holland and I had in the past couple of years made presentations at the Institute of Acoustics (I of A) conferences, on developments in horn designs, and also on our feelings that transient accuracy, as defined by a plot of a step function response, was the key to sonic neutrality (*Studio Sound*, August 1989). Some comments at the time were to the effect that we were trying to re-invent the square wheel.

The new, large, highly absorbent rooms, however, would give no help in terms of loudness to the loudspeaker output. Indeed, they would be so similar to free-field conditions as far as the monitors were concerned that a 6 dB fall off per doubling of distance could quite reasonably be expected. We realised that high SPL monitors would be necessary, and a good step function response would require a minimum number of crossover points if amplitude and phase were to be maximally linearised. At the time, a superior horn and driver system appeared to be our only hope of achieving these goals on a reliable basis. In order to support such transient accuracy at the listening position, especially in terms of the reduction of the masking of further detail in the transient tail, a relatively dead room, even at low frequencies, was a further, seemingly mandatory requirement.

Once again, there was a strong link with Hidley's thinking, as he has been expounding the need for phase accuracy for 15 years or more. Without accuracy of both amplitude and phase responses, there is no hope of any system following a squarewave or a step function. Before the conclusion of the research projects of Soares and Holland, I cannot deny having to borrow a number of Hidley's techniques for the construction of the LMH. The results are shown in **Fig 7**. Plot (a)

shows the amplitude and phase responses of the initially installed system with a temporary 20 Hz highpass filter, while (b) shows the step function response. Both these measurements were taken via multipoint Fast Fourier Transforms, in the room. There is no smoothing or ⅓-octave averaging they are raw plots. Everybody involved was delighted with the performance of the room and monitor system, both sonically and in terms of measurements: the two do not always coincide. The new horn was a revelation, maintaining its response with the TAD *2001* to around 22 kHz and yielding an exceptionally smooth directivity. The horn performance details had been first announced and published at the November 1990 I of A 'Reproduced Sound' conference.

When Hidley had launched his new room concept in the mid '80s, he was deemed by some, mostly in the UK, to be saying that his old rooms were a mistake. This was, of course, not so but merely the result of further experience and revised concepts. Anyhow, forewarned is forearmed so I decided to try to avoid falling into a similar trap by taking a stream of my former clients and colleagues to see and hear the new room in order to gain their comments and general opinions.

The acid test

The outcome, while most revealing, was not what I had anticipated. Some typical comments were "the biggest hi-fi I have ever heard", "I have heard for the first time what I always thought true stereo ought to sound like", "the best imaging I have ever heard" and so forth. A general consensus was that the bass was exceptionally clear and tight; the top was sweet, fat, clear and smooth, and most definitely not archetypal horn sounding. I could not have been more pleased with the visitors' reactions, in fact it was six weeks before LMH finally hooked up their *NS10*s; everybody had been happy with the main system and tapes taken away showed few surprises. Mixing was proving easy, as the overall clarity allowed clear cut decisions on positioning, equalisation and relative level.

The only significant questions from the auditioners were as to whether one would tend to mix with too much bass and too much reverberation in a room that was without a conventional reverb time, especially at low frequencies. The comments and questions coincided with the general reactions to the new style Hidley rooms upon their launch in the mid '80s. Once again, the answer seemed to be that one very rapidly accustoms oneself to the general characteristics, and as the reverb times of control rooms are generally of a much shorter nature than

those added for musical effect, in practice there is no problem. In any case, the use of nearfield monitors on the mixing console would be generally similar to their use in a well designed studio of more conventional form. After all, one of the purposes of nearfield monitors such as *NS10s* is to eliminate as far as possible the room from the overall equation. The new non-environment rooms provided in effect a full range, 20 Hz to 20 kHz nearfield monitoring situation. Apart from the aspect of a more general reference to the frequency range of a typical, domestic system, the large monitors would seem to be generally restating their claim to be the main reference for a mix.

A few weeks later I began to receive some unexpected comments from a number of the people I had taken to the LMH, to the effect, "If you can give my studio some of the properties of LMH, then I would like to speak to you about it." Unfortunately, they were asking for some mutually exclusive characteristics such as a warm, wrapped around, low frequency character with the definition and clarity of the LMH system. Obviously, if the all-encompassing, warm, low frequency response were a function of the low frequency reverberation characteristics of their room, then it could not be achieved in conjunction with the clarity of the LMH system, as the clarity of that system had been achieved by the effective removal of any low frequency room reverberation. In 'Monitor systems — part 10', (*Studio Sound* February 1991) I discussed the concept that given the weaknesses in the electro-mechanical monitoring systems, it was not unreasonable to expect exponents of very differing types of music to opt for different systems. In Part 11, I expanded this further by suggesting that no single control room design could necessarily provide optimum conditions for music of either acoustic or electronic origins. The article concluded with a proposal for a room of a 'non-environment' type with dual monitoring and an artificial reverberation system distributed along the side walls, which could be switched in at will. I did not fully appreciate just how much of a necessity that may be until I received the delayed responses from the LMH auditioners.

What are our objectives?

Control rooms are no longer just control rooms. Often they are now the performing studios and it is the 'vibe value' of the conventional monitor system in a conventional control room that has now become such an established part of the performing side of a recording process. A neutral environment is by no means always desirable in a performing room. Possibly my concept of a multi-monitored, optionally artificially reverberated room may well be the only way out if one room is intended to cater for all tastes.

Returning to the purpose of a control room, if we restrict ourselves initially to the classical concept of a reference room, then among other things, one of the assessment aims will be to check the suitability of the mixes for domestic consumption. Concepts of control rooms having domestic-type reverberation times are waning as so many people now listen either on headphones or in cars, where conventional room reverberation times are not evident. Consequently, the non-environment rooms may well relate more appropriately to such listening conditions than would the conventional designs of control rooms. The question would seem to be, if no one type of room can be representative

of all typical listening environments, then which design concept will produce the best end results on the types of listening systems for which those rooms were not optimised? The new non-environment rooms, with suitable monitor systems, are almost certainly capable of high definition of fine detail due to their greatly reduced masking of low level sounds by the reverberant hang-over from any immediately proceeding high level signals. Undoubtedly, there are many people who are excited by the detail and clarity of these rooms.

On the other hand, as a performing room, especially as so much of the music is now performed in the control rooms, there are other people who equally undoubtedly respond to the power and wash of a more reverberant room. Given these individual preferences, it is becoming apparent to me that each control room must be tailored to proposed usage to a degree never before apparent. Not only the acoustics but the overall feel of the environment must be optimised to the requirements of individual owners and users.

It is difficult to work to standards in such a subjective area. Taking things to an extreme, if a studio with poor monitoring were consistently producing big selling recordings, could it be considered a poor studio? It is not beyond the realms of reason that the success could be down to the effect of a couple of members of staff spurring on the bands to new heights of performance. Yes, it certainly can come down to such non-engineering criteria, but while we cannot define it, then nor can we deny it.

I have now built three rooms in Liverpool only a very short distance from each other. There is an old style room with an old style monitor system, a new style room with an old style monitor system, and a new style room with a new style monitor system. Each has developed partisan clientele who opt for whichever studio provides them with their specific needs. The three studios are not even in effective competition with each other, as there is little movement of work from one to another. While I can now achieve a great degree of predictability in the performance of any given room design, unfortunately I cannot box the sound and post it to people. When a client now asks me which approach to recommend, I still prefer sending the client, with his or her respective clients, to listen to the various approaches before final discussions take place.

The pro-conventional room lobby cite the warmth, the power, and the intimacy as pro's for their rooms. They complain about lack of intimacy in the non-environment rooms, as if the music were a separate happening in which they were only observers and not fully involved. The 'non-environment' followers claim superior imaging, definition, clarity, ease of decision making and general 'accuracy' for their rooms. They all seem to have satisfied and partisan clients who tell them that their room is the most representative that they have used. Even I must admit that with my old producer's hat on as opposed to my studio designer's hat, my choice would be dependent upon the type of music, the band and possibly which side of the bed I had just fallen out of.

And with my studio designer's hat on? If I think about it too hard I'll probably end up being arrested for taking my clothes off in the public library or something similar. Maybe the magazine should go and do some interviews on the subject, to find out what the industry wants, especially as I am now finding that many potential acoustic 'improvements' may well be retrograde steps in terms of the operational compromises for everyday use. ▶

29

DESIGN PROJECTS

We asked a selection of studio design companies what they had been up to recently

Recording Architecture have recently completed this Portuguese studio complex in the centre of Lisbon, called Exit. There are three live areas, control room, machine room, programming suite and recreational areas. Special attention to glazing and careful planning allows vision from every space into every corner. Other recent contracts include Studio Three at CTS, Wembley, UK, and a new test chamber and listening/evaluation suite incorporating Black Box Acoustic Conditioning System elements for Canon Audio in Woking, UK

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A recently completed project from Harris Grant Associates was Studio Four at the BBC Maida Vale Centre, London (left). Neil Grant commented that his company had never been busier, but most of the work was outside the UK. Other recent projects include the complete acoustic and technical design of Hit Factory New York. HGA finished Hit Factory London earlier this year

Harris Grant Associates
The Property Building
Pinewood Film Studios, Pinewood
Road, Iver, Bucks SL0 0NH, UK.
Tel: 0753 631022 Fax: 0753 651528

He said, RECORD "You can write almost anything you want about this machine and put my name under it." SO WE DID.

Dan McCoy was the first production director in radio to use the DSE 7000, and he saw it revolutionize the way production is done at WZOU-FM, PLAY one of the top stations in Boston. A spot that used to take an hour to produce now takes 20 minutes. Without tape. Without razors. Without a single dB of generation loss. Even agency dubs now go right to the DSE for levels, sound enhancement CUE

THE DIGITAL SOUND EDITOR. STATIONS FROM BOSTON TO SAN DIEGO ARE MAKING IT THE HOTTEST BOX IN RADIO.

and tags; then onto carts. Creativity has exploded, too. With the DSE's instant UNDO feature, the fear of trying new things is gone. You simply try another take, assemble a different edit, or test a new effect. If you don't like the results, UNDO it instantly. No wonder WZOU has designed their production facility around the DSE. STOP And no wonder Dan McCoy calls this machine "the most impressive thing that's ever happened to radio." His words, not ours.

REWIND DSE 7000 • THE NEW SPEED OF SOUND™ FFWD

AKG®

The Acoustics Design Group completed this audio-for-video suite recently for Eurosonic studios in Madrid, Spain. The facility includes a remotely and pneumatically operated variable reverberation time system in the recording area. The location within a roof space at the top of Eurosonic's complex gave rise to the ceiling profile and incorporation of skylights. Other current projects for ADG include Abbey Road's Studio Two; a major studio in California, the owner of which is remaining nameless at the moment; and a major recording studio in Port of Spain, Trinidad

Russ Berger Design Group of Dallas, TX, recently completed the design of a 6800 ft² building addition for General Television Network (GTN), in Oak Park, MI. This 3D CAD drawing was developed in order to give GTN a conceptual idea of what the final facility would look like.
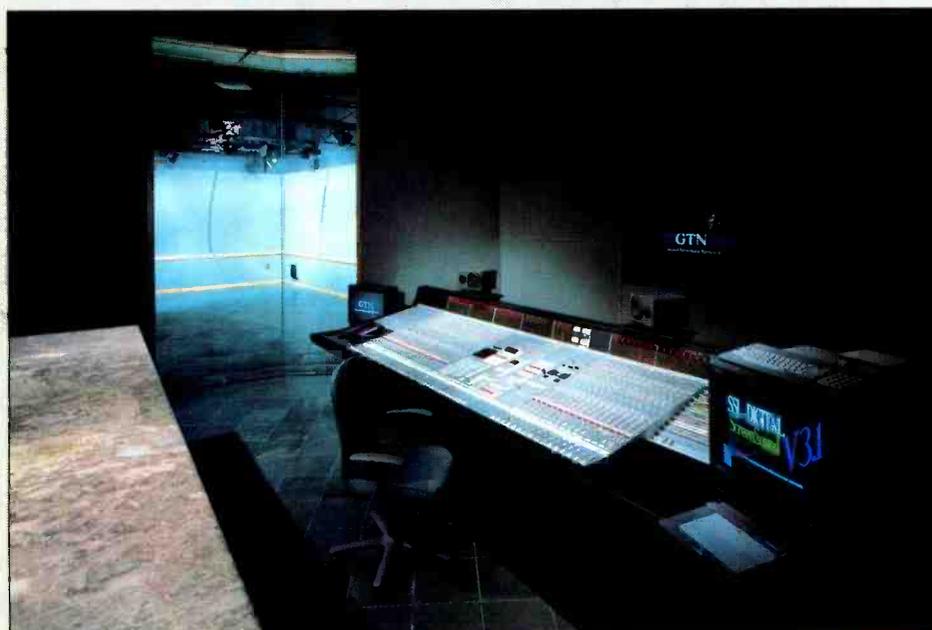
The finished surround sound audio post-production control room and studio

Eastlake Audio commissioned this model for a six-studio complex plus drama and broadcast studio facilities they are designing and building for the Government of Lagos state, Nigeria. The model is lying on part of the proposed building site. Other recent work includes the design and construction of a new 24-track Spanish facility in Barcelona; a personal recording studio for Italian superstar Antonello Venditti, at his house just outside Rome; and the completion of a state run 100-man orchestral studio in Tripoli, Libya

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Unit 2, 10 William Road,
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Fax: 071 706 1918

A recent project from the Walters-Storyk Design Group was this five room post-production facility in Los Angeles, USA, Margarita Mix. Just for a change all the rooms are named after women, like Studio Barbara and Studio Anna. Other projects include a commission from The Sony Business and Professional Group to design a reference-quality corporate demo room for their professional products. WSDG has also developed a new AutoCAD-compatible acoustic design program called CART (Computerised Acoustic Ray Tracing). The process automatically calculates and graphically displays acoustic ray behaviour. Recent projects using the system includes Studio 9 at Howard Schwartz Recording and JSM Music, a new multi-studio complex, both in New York

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SL 8000 G Series
New Multi-Format Production System

G Series flies into
Capri (Page 2)

Solid State Logic · Oxford · England   SL8000G

'Beyond Stereo' - New SL 8000 Multi-Format System

A new SSL console, aimed at audio post-production users worldwide, made its debut at the AES, New York. The SL 8000 has been named the 'Multi-Format Production System' because of its ability to work in any current or proposed format, from stereo music to multi-channel discrete digital cinema formats, like those recently proposed by Dolby and Kodak.

The SL 8000 combines the sound quality, signal processing and automation capabilities of SSL's respected G Series consoles, with advanced post-production features only previously available to users of custom film consoles. This combination makes the Multi-Format Production System equally suitable for everything from music scoring and mixing, to stereo surround sound mixing.

The operational flexibility of the SL 8000 is achieved by the provision of an exceptionally versatile output bus structure. The system has a master mix bus which can be 2-channel or 4-channel (Left, Centre, Right and Surround) stereo; 2-channel or 4-channel panning modes are selected centrally. In addition, the console has four separate stereo mix busses, designated A, B, C and D.

This comprehensive bus structure enables the creation of separate music, dialogue, effects and audience/Foley mixes, as well as a stereo or 4-channel surround sound mix. In live broadcast applications, this arrangement allows for a variety of mix and mix-minus feeds.

"The SL 8000 is an important statement from SSL about the future significance of audio-to-picture formats," says Dave Collie, Manager of SSL's Los Angeles office and instigator of the new console design. "It provides the capability to work in all current

▲ *The SL 8000 G Series Multi-Format Production System*

and future formats with a single console. The SL 8000 is the result of detailed discussions about the future of audio-post with our leading US clients."

The multi-channel stereo audio formats used in cinemas have proved that sound is commercially important. Good soundtracks can bring audiences back. Now video and television are getting ready to deliver those formats to viewers at home.

Audio and video are becoming tightly linked together. Rather than devaluing the audio element, this linkage has created a major opportunity to develop domestic audio beyond stereo.

Cable distribution, advanced VCRs, and combined CD, CDV and Laserdisc players will provide the medium for theatrical sound formats to come into the home. There is no doubt that better audio will be a major feature of future programming. The SL 8000 provides the facilities to help realise this exciting opportunity for the entertainment industry.

The SL 8000 is particularly suitable for:

- TV post-production with up to 4 stereo stripes.

- Dolby™ Surround TV post-production - with Left, Centre, Right and Surround panning on each channel.

- Film post-production, from 4-stripe LCRS to multiple DMEF dubs.

- 5/6 channel discrete mixes for HDTV and Dolby SR.D or Kodak™ CDS multi-channel digital film sound formats.

Capri Digital Opens with Sting Session

S ting was recently the first artist to record at the new Capri Digital Studio, working with Zucchero Fornaciari on *Muoio Per Te*, the Italian version of *Mad About You*.

The Tom Hidley designed studio is situated literally on top of a mountain on the Italian island of Capri. The narrow streets and roads of this beautiful island necessitated a helicopter airlift of the SL 4000 G Series console into the studio (see our front cover inset photo).

The studio, which is owned by record company proprietor, and Capri resident, Carloquinto Talamona, is the first multitrack studio to be opened on the island and is aimed at attracting the very top level of the international recording market.

The SL 4072 G Series console was one of the first European consoles to be fitted with the Ultimation system. Capri also has the Real World Automated Send Matrix fitted to the console, providing an additional four effects sends per channel, to give a total of eight mono and four stereo.

▲ *Sting relaxes between sessions in the control room at Capri Digital*

2

Ultimation - Moving Faders Take Off

The 'Ultimate Automation' system has proved an over-whelming success, with over 25 systems sold since its introduction at AES Montreux in February.

Ultimation's unique dual signal path circuitry allows the system to work as either a dedicated VCA system, a dedicated moving fader system, or in a way which combines the best features of both systems.

Studio owners around the world have been quick to realise the advantages of a dual automation system that leaves the engineer free to decide which style of operation is used.

Among those to have ordered consoles with Ultimation or retrofits are, Astron (the home studio of Vangelis) and Mega Studios in France, Capri Digital in Italy, and ICP Studios in Belgium. US studios ordering Ultimation-equipped consoles or retrofits include East Side (3 consoles), Right Track, Manhattan Center, NBC, the Hit Factory, and Marly Marl's House of Hitz in New York, plus Encore and The Enterprise Studios, both in Burbank.

In Japan, For Life Studios (2 consoles); Keystone; Nichion; Onkio House and Welt Studios have all purchased new consoles with Ultimation, while Yamaha studios in Tokyo has purchased Ultimation systems for retrofit to its two SSL consoles.

▲ *The Enterprise Studios, Los Angeles - one of the first Ultimation installations*

What Users Say About Ultimation

Bob Clearmountain (as quoted in *Audio Media*). "I've been working on SSLs for 10 years and I like the way they sound. With the new Ultimation fader automation, it's going to be brilliant."

Frank Filipetti. "I liked it so much that I suggested Right Track Studios buy one. I think it's an incredible mixture of the best of both worlds, a seamless integration of Moving Fader and VCA automation."

Craig Huxley, The Enterprise Studios. "It's a new frontier in console automation that gives SSL studios an additional and significant edge."

Daryl Caseine, Encore Studios. "It will appeal to anyone who has ever used an SSL, as well as anyone who is comfortable with a moving fader

system. It offers studios and engineers the choice."

Glen Laredo, East Side Film & Video. "The interface between the moving faders and the VCA is incredible - easy to operate and easy to understand."

Roy Clark, Manhattan Center Studios. "Ultimation is the only way to automate today's advanced consoles. Its intelligence and flexibility are incredible."

Simon Andrews, Right Track Recording. "SSL has led the industry in providing creative options. Ultimation is the ultimate option for studios to provide."

Artists and Producers choose SSL Consoles

Many of the world's most successful artists and producers have chosen SSL consoles when setting up their private studios. Stevie Wonder, Prince, Peter Gabriel, Bryan Adams, Kate Bush and Eddy Grant are among those to have SSL-equipped studios.

Now, a new wave of major artists and producers is selecting SL 4000 consoles for their personal project studios. These new SSL purchasers cover the complete range of musical styles, from the funk of Bobby Brown, through the synthesiser-based productions of Vangelis, to the modern classical music of Philip Glass.

Since our Spring '91 newsletter, nine Artists and Producers have purchased SL 4000s. These are Bobby Brown, Maurice Starr (of NKOTB fame), Marly Marl, Teddy Riley, Jean-Michel Jarre, Vangelis, Steve Miller, Ric Wake and Philip Glass.

Jon Marett, Studio Manager at Bobby Brown's Soundscape studio comments, "The SL 4000 G Series has helped us create a room that is compatible with mix rooms in all major markets."

Rap artist/producer Marly Marl recently selected an SL 4000 G Series with Ultimation for his new upstate New York studio, House of Hitz. "I was already very familiar with the auto-mation," Marl explains. "The studios I used to use all had SSLs, so I was brought up on mixing with SSL. It seemed natural for me to own one."

▲ *Producer Kevin Killen at Looking Glass Studios, New York, owned by modern classical composer Philip Glass*

Teddy Riley's SL 4000 G Series-equipped studio at Virginia Beach was built to resemble the facilities and electronics of Larrabee North in Los Angeles, where Riley became familiar with SSL operation, and where he recently finished work on the forthcoming Michael Jackson album *Dangerous*, along with Bruce Swedien (see page 8).

New Advanced Features for ScreenSound

A range of important new additions to the ScreenSound digital audio editing and mixing system is now available. These are the first major additions to the integrated post-production system since the launch of the SoundNet digital audio networking system.

This latest package of features is designed to extend ScreenSound's role as the centre of the audio post-production studio still further. The features include:

Public Domain Interface - provides control interface and protocol to allow third party users to make custom extensions to ScreenSound.

EDL Scan - takes CMX EDL files and imports them into ScreenSound. The system can distribute source material across any number of reels on the ScreenSound desk to allow automatic checkerboarding of audio clips.

Autoconform - controls external machines to load programme material with reference to source timecode, either for a single channel, or a whole project file.

VariTime - time compression and expansion of audio clips, while maintaining pitch.

IEdit - 'Interactive Editing' provides variable control of crossfade edits. Assemble and Insert edit modes offer rehearsal of In and Out points and Crossfade rates before committing the edit.

Magneto-Optical Drives - now available for use as Library storage medium with ScreenSound. The digitally recorded ScreenSound/Sound Ideas Sound Effects Library is now also available as a set of seven Magneto-Optical Discs.

Disk Store - new disk store expansion packs are available to provide compact and economical hard disk audio expansion for use with either ScreenSound or SoundNet.

EDL files can now be imported into ScreenSound systems
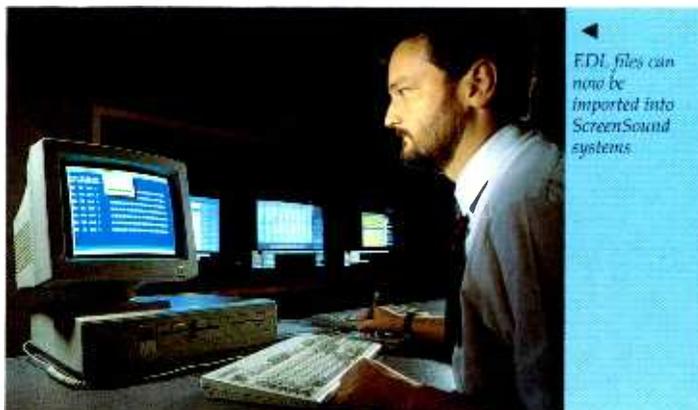
Commercial Benefits of SoundNet Recognised

Designed to work in conjunction with multiple ScreenSound digital audio-for-video systems, SoundNet allows up to seven operators to share and copy work without the need to download or upload projects. In addition, SoundNet also provides central mass storage of audio and a complete database of sound clips.

More and more studios are recognising the creative and logistical advantages that SoundNet can bring to the modern multi-studio recording and post-production facility.

In Los Angeles, **Soundcastle/Post Modern** has purchased its second ScreenSound and the city's first SoundNet digital audio network to meet its rapidly expanding post-production demands. "We have a tremendous amount of work, and the two ScreenSounds and SoundNet offers us the technology to get the job done, very fast," says Tom Maydeck, head of post production. "ScreenSound makes critical dialogue synchronisation to animation adjustments quickly and, with SoundNet, we have enough drives to work on multiple shows at once. Both ScreenSound operators also have access to the same sound files, and with the back-ups taking place off-line, there are considerable time savings."

The first ScreenSound/SoundNet installation on America's east coast is at the eight studio complex of **Musifex Video** in Arlington, Virginia. Vice President and Chief Audio Engineer Craig Maniglia says, "I have clients that prefer analogue who originally didn't want me to look into digital, but when I showed them ScreenSound, they said they couldn't work without it!"

It was for archiving and accessing its music/sound effects library - the largest in the Washington DC area - that Musifex decided to install SoundNet, which not only allows easy off-line back-up, but also avoids the time consuming task of uploading sound effects from CD or tape, by tracking these libraries on WORM disks.

Using the ScreenSound/SoundNet system, Musifex has recently completed a commercial campaign for NFL/United Way, corporate videos for Federal Express and the US Postal Service, as well as a film drama for General Electric.

Fox TV, in Los Angeles has purchased an initial two ScreenSounds and SoundNet with the intention of adding further ScreenSounds to the network next year.

In Canada, two of the country's busiest recording facilities have also purchased SoundNet systems. **Vancouver Studios** of Burnaby, British Columbia, has 3 recording studios, 2 edit suites, 3 music production suites and 4 film editing suites. SoundNet networks their two ScreenSounds together and has been used on the production of two feature films as well as two television series for the Japanese national broadcaster NHK. Two of Vancouver Studio's recording studios are equipped with SL 4000 G Series consoles.

Sounds Interchange in Toronto is one of the world's largest privately owned production facilities, with 10 recording studios, four of which are equipped with G Series consoles. The studio has recently purchased a SoundNet to complement its two ScreenSound systems. SoundNet has already been used to help production of the audio on *The Kids in the Hall* television series.

Sounds Interchange is also responsible for Alannah Myles' Grammy Award-winning album, *Black Velvet* and the *Superdave* television series.

ScreenSound In Use Around the World

The ScreenSound digital audio-for-video system continues to win new friends around the world in post-production for video, advertising and feature films. Amongst the latest to specify ScreenSound are:

Nutmeg Recording, New York
Nutmeg is a four-studio facility in New York specialising in radio and television commercials.

Mike Levesque, co-owner of Nutmeg says, "ScreenSound has such a user-friendly interface that our clients can see what's happening on-screen and immediately get involved in the process. Of all the systems that we looked at, ScreenSound is the best in terms of client communications."

B&B Studios, Burbank
B&B handles a wide variety of post-production assignments for clients such as Walt Disney, Warner Bros and Paramount.

ScreenSound has brought B&B the increased flexibility of a digital audio environment. Post-production supervisor, Steve Williams comments, "We wanted to bring in more work without having to limit our creativity - to get an increased working capacity that was simply less labour intensive. ScreenSound provides us with that capability."

M2 Audio, London
One of England's most prestigious post-production studios, M2 has recently formed a new division - M2 Audio. A ScreenSound system has been purchased by the new division of the company to add a digital audio capability.

Richard Lambert, co-owner of M2 Audio, explains that having worked on other digital audio systems he was particularly impressed with ScreenSound. "The tablet and pen interface is especially easy to use," he says. "It's fast, flexible and our clients can see exactly what's happening. They

get more involved than in a conventional session because ScreenSound encourages the whole production team to take an active role."

Pomann Sound, New York
Robert Pomann, owner of Pomann Sound, has used ScreenSound on DOUG, the first animated series produced by the Nickelodeon cable network. "ScreenSound is what you wished technology was years ago, and now its finally here. We originally decided to go with ScreenSound because a lot of producers are extremely comfortable with the way it works. We're finding now that having the system is actually bringing in business."

John Alberts Sound Design, New York
John Alberts, the award winning sound designer/mixer whose credits include Saturday Night Live has completed a new audio-for-video room for his projects at VCA Teletronics. "My whole concept involved building a room around the ScreenSound system, and producing every job on the system, from beginning to end," says Alberts. "ScreenSound is so versatile that you spend more time being creative - and that makes the whole post-production process a lot faster."

SoundVision, Cologne
Although only opened in July, SoundVision already has an impressive list of credits for film and advertising work in Germany. Lothar Segeler of SoundVision says, "ScreenSound has been helpful in many areas. Since the system is slaved to the mag machines, I very often record parts of the mag reels onto the hard disk and edit. Those last minute edits while mixing would traditionally take up a lot of time, or would be skipped completely because of time restraints."

1. Mike Levesque and partner Tony Spaneo at Nutmeg
2. Steve Williams, B&B Studios
3. John Alberts, John Alberts Sound Design
4. Robert Pomann, Pomann Sound
5. Richard Lambert, M2 Audio
6. SoundVision
7. Craig Maniglia, Musifex Video

5

Canada's Premier Post Facility Expands with SSL

S ounds Interchange in Toronto is now Canada's largest full service audio/video production and post-production facility, with the construction of a new 80,000 square foot, seven story building. The studio complex is so large that it requires its own
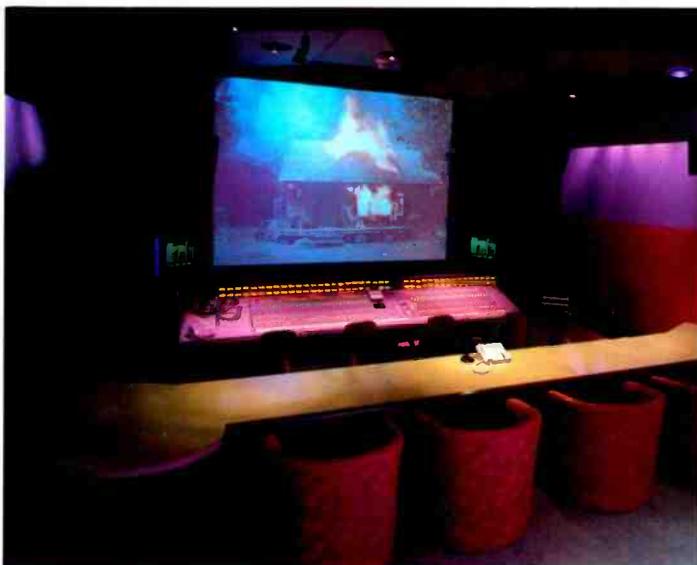
▲ One of four SL 4000 G Series consoles at Sounds Interchange

self-contained transformer station and a 180 ton chilling plant for air conditioning.

Within the thirteen room complex, Sounds Interchange has added four SL 4000 G Series consoles, two ScreenSound digital audio-for-video systems and a SoundNet digital audio network. In addition, Sounds Interchange is making an across-the-board commitment to leading edge audio and video equipment and acoustic design.

Acoustic designer Claude Fortier has designed fully floating studios and control rooms to ensure total acoustic isolation. All studios have adjustable walls, while the ceilings feature adjustable triangular acoustic panels.

"We purchased SSL consoles and production equipment to satisfy the demands of our clients," says General Manager, Peter Mann. "A decision to buy SSL is just like a decision to bring in more business."

According to Mann, the SSL G Series EQ was selected because of engineering preference for the sound quality over the optional E Series EQ. ScreenSound was selected for use in the digital editing suites, he adds, because of its simplicity of operation.

"We're using ScreenSound with the G Series console," says Director of Engineering, Les Bateman. "One slick thing is that with ScreenSound's eight tracks, you can have eight different tracks in line and in sync at once. You can see what cuts aren't going to work - even before you put them down."

According to Mann, the majority of all commercials produced in Canada are done at Sounds Interchange, with a client list that includes Coca-Cola, Pepsi and Ford. The studio also recently worked on the Rolling Stones' *Steel Wheels* IMAX film.

The SL 5496 M Series console at Pinewood Film Studios has, according to Head of Post-Production, Graham Hartsone, "Hardly stopped working since it was installed." Among the recent successes and forthcoming releases on which the console has been used are: *Thelma and Louise; The Projectionist; Buddy's Song; The Field; Never Ending Story 2; Dancin' Thru The Dark; Tie Me Up, Tie Me Down; Company Business; A Kiss Before Dying; The Favour, The Watch, and The Very Big Fish; Shuttlecock; The Railway Station Man;* and *Rebecca's Daughters*.

East Side Upgrades with G Series & ScreenSound

E ast Side Film and Video has announced a major upgrade of its audio facilities in New York with three SL 4000 G Series consoles and two ScreenSound digital audio-for-video systems.

East Side, along with two other New York post-production houses - Superdupe and Post Perfect - is owned by Gordon Media Companies Ltd. Vice President, Scott Gordon says, "We wanted to buy three similar consoles - even though we have three engineers with different styles of recording - because it allows us to transfer projects from room to room and maintain data compatibility. We currently have three Neve consoles but decided that the SSLs were the most suited to our needs."

The consoles are part of a major renovation of Studios A, B and C at the East Side facility. Studio A will be a theatre-style projection room with Dolby™ monitoring, while B and C will be more traditional audio-for-video post-production suites.

Studios B and C are also the sites for two new ScreenSound systems. "I like the way that ScreenSound controls other audio and video machines," says East Side engineer, Glen Laredo. "It's a versatile tool that will interface nicely with the new consoles. With ScreenSound, clients can visually understand the audio editing process, even without a lot of technical expertise."

▲ Glen Laredo, with one of the ScreenSound systems at East Side

6

US Broadcaster Installs 'Winged' Console

N BC affiliate broadcasting station WMAQ-TV in Chicago has recently upgraded its facilities with the installation of a 64-input 'winged' SL 4000 G Series console.

Spanning more than twenty feet from end to end, the new console is equipped with 48 mono and 16 stereo inputs, G Series automation and G Series Studio Computer with Total Recall™.

"We reviewed all the leading consoles before we decided to go with SSL," says Michael Englehaupt, project engineer for the recently completed Studio A at WMAQ-TV. "The SL 4000 offered us a number of features that were important to us, such as LCRS mixing and monitoring capabilities, Total Recall™, and the G Series automation. SSL's excellent reputation for support and service was also a significant factor."

The console is currently in use for the audio mixing on Warner Telepictures' nationally-syndicated variety/talk show *Jenny Jones*, which airs on over 165 stations across America. Though the show is currently being produced in stereo, the new room has been designed as a 'LCRS' (Left, Centre, Right, Surround) mixing environment by leading acoustic designer, Chips Davis.

"This control room is one of the few rooms in a TV facility that has both LCRS monitoring, and a console that is capable of true LCRS mixing," adds Englehaupt. "The requirements of the *Jenny Jones* show are complex and varied, yet we still haven't tapped many of the powerful capabilities of the SL 4000."

Other North American broadcasters to have ordered SSL are, ABC which has purchased a new SL 5000 console for use in a 48-foot mobile that it uses to broadcast *Monday Night Football*. This is the second SL 5000 in use at ABC.

▲ *Mike Boch of WMAQ-TV with the winged SL 4000 G Series console*

CBC in Toronto has installed a 32-channel SL 4000 G Series in Studio 4S, to be used for both radio and television production. CBC already operates a 40-channel SL 6000 G Series console in Studio 7S.

SSL Chosen for a Variety of Broadcast Applications

▲ *One of six 16-channel SL 4000 G Series consoles for post-production suites at TVE, Madrid*

B roadcasters throughout Europe are increasingly specifying SSL consoles. Spain's national broadcasting company, TVE, has recently taken delivery of a number of small SL 4000 consoles for post-production use. The BBC has added a further SL 4000 console to its Maida Vale radio studios. In Berlin, RIAS has also installed an SL 5000 console.

TVE's six 16-channel SL 4000 G Series consoles are for small post-production suites in the station's main premises in Prado del Rey, Madrid. These 16-input consoles are tailored to provide the most important G Series elements for the demands of TV sound. The consoles were supplied without automation and were chosen because of their signal processing capabilities, sound quality and flexible routing.

TVE has also installed an SL 6000 G Series console for music recording and post-production. This is the station's third SL 6000, the others are a 32-channel version in a TVE mobile and a SL 6024, which has recently been expanded to 48 channels, in Studio 1.

BBC Radio's new SL 4000 G Series console has 48 mono and 8 stereo channels plus bargraph metering. The system, which is located in Studio 4 at the BBC's Maida Vale facility, is the fifth SSL console to be installed at this location.

RIAS (Radio In American Sector) in Berlin has taken delivery of an SL 5000 audio production console with Instant Reset™, 32 mono inputs, 4 stereo inputs, 4 subgroups and dual main monitoring. The console is fitted in an OB unit.

Mr. Brunschen, head of planning at RIAS, explains the station's choice of SSL. "In the mobile we needed a console which offered a maximum of flexibility in the minimum space. Also, as a breakdown means that live transmission stops, the console had to be completely reliable."

7

Solid State Logic

SSL Commended for Sales in Japan

S olid State Logic has recently received a special commend-ation award for its outstanding sales success in Japan.

'Opportunity Japan', supported by the Department of Trade and Industry and the British Overseas Trade Board, was set up in 1988 to encourage British exports to Japan. Of the 150-plus companies that entered, a shortlist of twelve were selected on their export performance to Japan during the campaign.

At a presentation in London, Solid State Logic received its Special Commendation for Success in Japan from HRH The Duke of Kent. Among the other successful exporters to Japan to attend the presentation were representatives from ICI Pharmaceuticals and the Rover Group.

SSL's outstanding export success has been recognised before. The company is already a two-times winner of the prestigious 'Queen's Award for Export Achievement'.

▲ *G Series consoles and ScreenSound - a powerful combination in Japan*

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From the Desk of...

Bruce Swedien
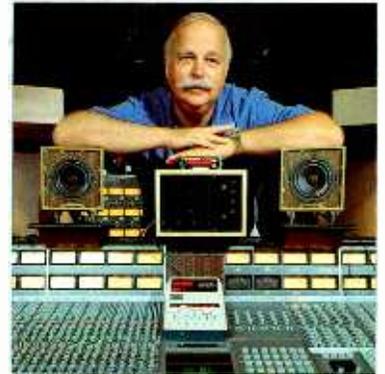
A t Larrabee North Studios in Universal City, California, Bruce Swedien has been recording lead vocals, overdubs and final mixes for the upcoming Michael Jackson album *Dangerous* for Sony Music. The project occupies all three rooms in the studio.

"Larrabee has a distinguished reputation. The people here are absolutely great," says Swedien. "For the ultra-modern, techno type of music that we're doing as part of this album, the SSL console was the only choice for me. I needed a desk with great sound and an extremely versatile, highly accurate computer system. This big SSL at Larrabee is very dramatic in what it has helped me to accomplish."

Swedien, who is co-producing four songs on the album, has also co-written a song with Michael, Teddy Riley and Rene Moore.

Swedien has used some of his personal recording equipment for the project, including mics from his famed collection of 105 microphones; among which is the rare Telefunken U47 that he used in his legendary August 1960 recording sessions with Joe Williams and Count Basie. Other mics that Bruce has been using include a spectacular pair of Neumann M49s, several AKG 414EBs, 451s and 452s. Several of the beautiful RCA ribbon mics in the collection have been in use as well.

"To me, microphones are the engineer/producer's magic wand - almost like mystical voodoo - we take them out, set them up, and use them to create magic and unique sounds. Then we put them back in their little, velvet-lined mahogany boxes," says Swedien. "In addition, having all my very own mics protects the integrity of the sounds that I record. They are a major part of my sonic image. When I put one in front of Michael Jackson, James Ingram, Barbra Streisand or George Benson, I know exactly what the result will be."

APT Sales Success

I n markets around the world there is an increasing uptake of the apt-X™ 100 digital audio data compression system.

Dr. Stephen Smyth, Founder and Managing Director of APT, says, "The acceptance of apt-X™ 100's technological superiority is seen in its increasing number of applications in broadcast and communications environments. To cater for the continuing demand, we have centralised our international marketing operation in Belfast under new Sales and Marketing Manager Steve Cheung. We are currently recruiting sales personnel to cover the USA and Europe, and have appointed SSL Japan as our Japanese distributor."

The APT DSM100 Stereo Digital Audio Transceiver has been well received in Japan. Takeo Asano, Managing Director of SSL Japan comments, "Since its introduction at the AES Tokyo Convention in July, DSM100 has attracted a lot of attention. We have confirmed orders from Japan Broadcasting Corporation (NHK), Tokyo Broadcasting Systems and Japan Radio Broadcasting (Nippon Hoso), with orders expected from another three stations."

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Rear wall at Real World

DIFFUSED ACOUSTICS

Patrick Stapley talks to Dr Peter
D'Antonio about the concept of diffusion
and how his products derived from these
ideas can be of practical use

New tools for the control of acoustics are few and far between. One area that has yielded interesting results is the application of the mathematical Quadratic-Residue Sequence to acoustic diffusion products. Dr Peter D'Antonio has been responsible for the realisation of many different practical acoustic products leading from this research and other associated directions. His company, RPG Diffusor Systems Inc, has a unique approach reflecting the diverse background of D'Antonio as both a scientist and musician. His first involvement with acoustics followed the building of a studio in 1972, Underground Sound in Maryland.

"At that time there was pitifully little in the way of literature on studio design — what information there was tended to be in a few articles in trade magazines which really surprised me. However, what I did manage to find, and this is some time after the initial studio had been put together, was the research for the *Live End, Dead End* approach. The prevailing approach to control room design was to have a very hard front end made from brick, stone and all kinds of exotic reflective surfaces, including of course the window, and then at the back of the room build a bass trap. There was also what was called the 'teardrop ceiling' which hung down above the console and was designed for a variety of reasons none of which

have really withstood the test of time. So when we began looking at the *Live End, Dead End* it became apparent that what you really wanted to do was to essentially have an anechoic chamber for part of the time, and then a reverberation chamber for part of the time — in other words the way to look at building a room is to examine the extremes — the anechoic chamber with no reflections and the reverberation chamber with a multitude of reflections. Clearly neither of these is appropriate for a listening room, but what the research indicated was the need for an anechoic region in the front of the room to make the listening area devoid of early reflections — early reflections are symptomatic of the room and not what's on tape. There are two fundamental ways in which to achieve this. First of all you can put absorption on the walls to absorb them, and secondly you can simply change the geometry of the walls to direct the early reflections away from the listener — this creates what we refer to as a Reflection Free Zone or *RFZ*. The main point is that you simply don't want to put just absorptive material in the front of the room to deal with reflections, you need to play with the geometry as well, and that's what we did at Underground Sound by splaying the front walls so that the reflections were directed away from the listening area to the back of the room. Ceiling reflections are dealt with by splaying the ceiling away from the listener and by making the ceiling soft or by hanging an absorptive 'cloud'. Floor reflections in the listening area are usually controlled by the mixing console — consoles cause a lot of acoustic problems in control rooms but they also help in that they disperse floor reflections.

"We were also aware that we had to do something significant to the back of the room itself to diffuse the sound — we didn't want an acoustical black hole there because we wanted the room to represent a listening environment with a sense of space and ambience — we didn't want it acting like a sponge. The word *Diffusor* didn't really exist at that time, so I went to the literature once again and found a very interesting approach that Manfred Schroeder was suggesting — Schroeder is a brilliant mathematician who has been involved in a lot of aspects of audio, he's developed reverberation algorithms, acoustical theories, number encoding schemes and so on — he's a genius. Schroeder was looking at some of the work done back in the 18th century by Karl Friederick Gauss on number sequences, and realised that one of these, the Quadratic-Residue Sequence, was important to acoustics. This fascinated me because that's what I was trying to do — something innovative to diffuse sound.

"To understand the concept of diffusion and these number sequences it's useful to make the analogy with light — if a beam of light is shone into a mirror it will bounce off in one direction at a specular angle where the angle of incidence equals the angle of deflection. Although the light appears to be reflecting at one angle, it is in fact being reradiated over a much broader area, but due to destructive interference in these other directions, we don't see it. Now the same thing happens when sound hits a wall. What we were trying to determine was what type of surface variation would make sound appear in these other directions in a phase coherent manner — that's really what a *Diffusor* does and where number theory sequences come in. If you were to take a wall and divide it into a number of equal longitudinal segments, then displace those segments by different depths — you have the basis of what's become known as an *RPG* (Reflection Phase Grating) which causes the sound to be scattered in all directions rather than just the specular direction. If you then use

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Ken Townsend – "Abbey Road"

EMI CLASSICS

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Abbey Road has become the first UK studio to pioneer Mitsubishi 20 bit technology, installing four **PDX-8620 two-track digital recorders.**

The decision to buy the **PDX-8620** machines is linked closely with EMI Classics' new policy of raising digital recording standards from 16 bit to 20 bit.

EMI have plans for an extensive catalogue and are now releasing their first commercial 20 bit recordings.

If you want to know why this represents one of the most important developments in recent pro audio history, call Mitsubishi Pro Audio – and stay ahead of the times.
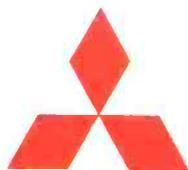
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Quadratic-Residue Number Sequences to determine the depths of these individual wells, you have a *QRD* (Quadratic Residue Diffusor).

"The situation with the original specular reflection was that all the energy was, so to speak, in phase in one direction resulting in a very strong signal. Now when sound hits a *Diffusor*, the phase relationships of the scattered waves are very different, and because nothing is at a quarter wave length, due to the *QRD* sequence, phase cancellation is avoided — so what you end up with is a surface irregularity that ideally scatters sound in all directions with equal energy. Sound will of course still appear in the specular direction but its energy will have been reduced — so in this respect the *Diffusor* is also acting as an attenuator.

"That's great but it's not very useful if it only works at a certain frequency, and a lot of the early attempts at diffusion were very frequency specific. If we go way back to the surface ornamentation used in old theatres — fluted columns, balustrades, cornicing and so on — they all made effective diffusors, but only at high frequencies — to get broadband diffusion there must be an irregularity that is comparable to the wavelength — for 100 Hz the wavelength is about 10 ft, for 1 kHz about 10 in, and for 10 kHz about an inch, so scattering 10 kHz is pretty easy, you put a small bump on the wall, but if you want to scatter 100 Hz you're going to need a 10 ft bump on the wall. The first broad bandwidth product we developed to do this was the *QRD 4311*, which incorporates 43 wells with a spacing of about 1.1 in — the reason that we came up with such a complicated surface was because at that point we were still in the realm of the ideal, we wanted to get a single surface with a tremendous bandwidth and a significant wide angle scattering — in fact this first *Diffusor* operated from around 300 Hz up to 12 kHz. The very low-end content of the sound was partially being reflected back and partly being absorbed due to the diaphragmatic nature of the *Diffusor*.

"So going back to Underground Sound we had created the *RFZ* in the listening area through room geometry and absorption, but instead of soaking up the energy at the back of the room with further absorption, we diffused it back again. This means that the *RFZ* only exists for a short period of time — as I said earlier you have an anechoic chamber for part of the time and a reverberation chamber for part of the time. With early reflections eliminated at the console the listener perceives a very accurate soundfield with very stable imaging just the way it's coming out of the loudspeakers. Once the auditory system has done all this critical perceiving, the sound then returns from the back of the room in a neutral kind of wash and within the time period needed for the ear to re-integrate it naturally with the direct sound. The immediate psycho-acoustical perception is that the listener is now immersed in the sound experience, you are involved and interlocked in the sound — it's like the difference between a bad and a good concert hall. In a bad concert hall there is the sensation that everyone is up on stage and you're out there observing it, in a good hall you feel as though you're part of the experience — another way of looking at it is that it's the difference between listening to a pair of nearfields and a surround sound system. The *Diffusors* are in effect acoustic surround sound, you get energy appearing at the back of you in as optimal a way as possible, so that you feel enveloped in the energy rather than just feeling the sound is coming from in front of you."

What happens in a very large space, like the control room at Real World where there is a huge

Rear wall at the BBC's Studio Four at Maida Vale, London

distance from the listener to the back wall — does this cause problems with the diffuse sound

appearing disembodied from the direct signal?

"It could cause a problem. Actually we realised that as control rooms got larger and larger the role of the *Diffusor* became more important. One of the problems with a very large control room is getting a decent level at the back of the room without blowing the head off the engineer in the process. It's less of a problem using *Diffusors* because they're returning energy back into the room and so increase efficiency, but when you do that in a large space, like Real World, there is, as you say, a danger that the diffuse sound will be perceived as a delayed signal. This is addressed by having additional *Diffusors* in the ceiling and the sides of the room that reflect diffuse energy back to the listening area before the rear wall reflection. You end up with banks of diffuse energy returning to the listener as a function of time and amplitude — the rear *Diffusors* would be the last to come in but their level would be low in relation to the other *Diffusors* resulting in a more integrated sound. The key factor with larger spaces is to have diffusion but staggering different time zones."

Almost as a contemporary development of his acoustic work in the control room. D'Antonio

Quadratic equation

The quadratic residue sequence is represented as $n^2 \bmod N$ where N equals a prime number (a number only divisible by itself or 1) and n is a number from 0 to N–1. Modulo arithmetic determines the sequence of numbers: this works by taking the remainder of $n^2 \div N$ or a multiple of N: for example if n=4 and N=7, the remainder is 2 ($n^2=16$, 16–14=2). Where n^2 does not exceed N the value of n^2 is used in the sequence. So the

number sequence where N=7 is 0,1,4,2,2,4,1 (see below).

n = 0	1	2	3	4	5	6
$n^2 = 0$	1	4	9	16	25	36
N multiple = 7	7	7	14	21	35	
remainder and resulting sequence = 0	1	4	2	2	4	1

What is immediately apparent is that quadratic residue sequences have mirror image symmetry. The numbers are directly translated to the relative depths of the *Diffusor* wells, and their depth is related to the design frequency.

experimented with *Diffusors* in the studio to see how they could benefit recording.

"At Underground we had a very small recording space, into which we built a drum riser with *Diffusors* hung above it — early drum booths were intentionally designed as dead spaces and I wondered why anyone should want to do such a thing, especially as the 'Grand Canyon' snare drum sound was becoming increasingly prevalent. So we started playing with this approach and it was dramatic, because not only did it produce a much bigger sound, but it also blended very naturally with electronic reverb. *Diffusors* are now becoming more common in drum booths — Rhinoceros studios in Australia being a good example. Another technique we used was with fig-of-8 mics. When you have a room with a low ceiling and close walls, as we did, the fig-of-8 mic has a plane of insensitivity which in effect eliminates the ceiling and the side wall reflection — by placing the mic between the performer and the *Diffusor* you get the direct sound followed by the diffuse sound — the results we were getting with this combination made our small room sound

huge — its a phenomenal sensation. Actually *Diffusors* effectively make walls disappear — if you shut your eyes and walk towards a wall while speaking, you'll get a pretty good idea of when you're about to bump into it, but if you do the same thing with a *Diffusor*, you'll go crashing into it.

"The next thing we found in a small room was that rather than having fixed absorption and diffusion why not have a variable acoustic surface that could offer reflection, absorption and diffusion. This lead onto the *Triffusor* which is a three sided rotating structure that resembles a triangular column — by incorporating *Triffusors* into a wall it can be transformed into any of these acoustical surfaces, or indeed a mixture of all three Tent Records is an excellent example of *Triffusor* application.

"So at Underground Sound the early developmental work was done to create the *RFZ*, develop the *Diffusors*, develop the use of *Diffusors* in the recording area, and experiment with variable acoustics. As I mentioned, the first product from RPG was the *QRD 4311 Diffusor*, and when this started to become successful, we

quickly realised that we needed lower priced items for smaller studios as well as a complete system, and this developed into the idea of a acoustical palette where a complete range of acoustic products were made available in modular form. The system involves not only diffusion, which has grown from one dimensional to two dimensional diffusion with the *Omniffusor*, but also incorporates absorbing products, variable acoustics products and performance products. A problem we've had as a company is that people imagine we only make *Diffusors,* which is far from the case.

"One of the more architectural products we developed was *FlutterFree* — it's a 1 in thick acoustical moulding made usually from hardwoods like mahogany, oak, cherry, but can be supplied in other materials as well. What it does is eliminate flutter echo without using absorption which is a unique approach, and means that although the flutter is eliminated, the energy still remains in the space — it's the same idea of removing the reflection problem whilst keeping the energy in the room. *FlutterFree* panels can also be spaced from a wall to create a Helmholtz absorber — so not only can you eliminate flutter but you can also absorb low frequencies.

"Getting back to the subject of broadband diffusion — we started looking at fractal surfaces. A fractal surface is one which looks the same at every magnification — so no matter what size window you examine it through you still see the same shape. Now we wanted to use this principle in diffusion to build a *Diffusor* that scattered across a very wide frequency range. If you take a *Diffusor* and reduce it in scale so it fits into one of its own wells you end up with a *Diffusor* within a *Diffusor*, take it another step and you've got a *Diffusor* within a *Diffusor* within a *Diffusor*. From a sound perspective, no matter what wavelength looks at that surface it sees the same surface — low frequencies see the larger irregularities, and higher frequencies the smaller irregularities. The product that came out of this is called the *Diffractal* and this is what's installed at Peter Gabriel's Real World studios where it is a two-way system operating from around 50 Hz to 10 kHz. One of the beauties of this design is that it can look like a million different surfaces — if you compare Real World with say Crawford Post in Atlanta, they look completely different, but the same principles are being used.

"It became apparent to us after supplying a number of *Diffusor* systems in certain circumstances — why build a wall that's flat and then add *Diffusors* to it, why not build a wall that is a *Diffusor* in the first place? and that we've done by designing structural concrete building blocks called *DiffusorBlox,* these blocks can also contain low frequency Helmholtz resonators.

"So far we've talked about one-dimensional frequency *Diffusors,* but we also make *Diffusors* where the depth varies along two planes. One dimensional *Diffusors* have a mirror plane symmetry parallel to the dividers in the centre of the sequence, two dimensional have fourfold rotational symmetry. The two-dimensional *Diffusors,* or *Omniffusors* as we call them, scatter sound into a hemisphere and so produce twice the attenuation of the one-dimensional version. We make slatted and unslatted versions, the slats tend to work as wave guides so the slatted version is more effective, although the unslatted version, called the *Terrace,* is perhaps more aesthetic. The 2-D *QRD* surface is the only surface that provides equivalent vertical and horizontal diffusion.

"*Diffusors* can be made in wood, melamine which is particle board with a thin photographic finish on

Studio at Tent Records, Berkshire, UK

it, GRG, glass *(Diviewsor)*, and recently we've started using a new thermo-plastic formulation called *Kydex*, which is tough, lightweight and relatively inexpensive."

Absorption

Having created a very distinctive *Diffusor* design, RPG were keen to build an absorptive surface that complemented it, and they came up with the APG (Absorption Phase Grating). The *Abffusor* looks like a fabric covered *Diffusor*, and a 4 in thick panel has an absorption coefficient of about 85% at 100 Hz. It produces diffusion in the nearfield but further away it functions as a broadband absorber. What makes it so efficient?

"There are three elements that are important here — the porous absorption of the *Fibreglass*, the disposition of it and the use of the quadratic equation. With an absorber what you really want is a lot of surface area, and the irregular shape of the *APG* takes advantage of that, but the depth sequence is also very important and produces various phase combinations which help to make a very efficient absorber. Most people simply put *Fibreglass* on a wall to create absorption, and six to seven pounds density *Rockwool* has a good random incidence absorption coefficient, which means if you measure it in a reverberation chamber it will appear pretty efficient, but this is irrespective of an angle at which the sound hits the surface — it turns out that at certain frequencies a semi rigid *Fibreglass* surface can react as a reflector. The approach we've taken is to make a graduated density *Rockwool* or *Fibreglass* panel, and we start off with something that is very fluffy on the face, then the next layer is a little more dense and so on — this way you get good absorption from glancing incidence that you don't normally have with high density surfaces."

D'Antonio has recently come across a new material that displays excellent absorption properties which he is already using in a number of new products. It's a porous sintered aluminium material called *Almute* that was originally developed for use in brake linings, motor housings, bushings, etc, where its heat dissipation properties made it very suitable.

"I had been looking for a material to perform as a dedicated low frequency absorber for some time, and this is going to play an important part in our designs. An 3mm thick sheet of *Almute* has an absorption coefficient of 95% at 100 Hz which is pretty incredible — to get a similar absorption coefficient with *Rockwool* at 100 Hz, you would require a thickness of about 5 in. *Almute* is a membrane absorber that operates on two principles — the frictional principle of *Fibreglass*, where the sound goes through the material and creates friction and heat as the energy gets absorbed, and the principle of a Helmholtz resonator. The other advantage of *Almute* is that it's a very environmental material, it has no particulate matter like *Rockwool*, and is totally incombustable — it also has an attractive appearance, so it can be used uncovered.

Performance applications

"We wanted to move into performance spaces and all these products we've been talking about have applications in concert hall type environments. *Diffusors* can be very effectively used on stage as a performance shell, but rather than let that be a haphazard development, we wanted to develop the appropriate mix between reflecting and diffusing surfaces, and this led to the development of

VAMPS (Variable Acoustics Modular Performance Shell).

What we did was to start from basics and ask the question — if we have a group of musicians on a stage what is the most appropriate surface to have behind them? So what we did was to vary the acoustic surface behind the performers whilst making a series of recordings using several different types of microphone. We used a probe microphone that goes deep into the ear, just in front of the eardrum, to record what the performer hears not only from their own instrument but also from the rest of the group — the idea being to see if changes to the acoustic surface would alter the way the performer hears other musicians. We placed an *Aachen Head* (dummy) amongst the musicians to record what the ensemble sounds like without the sound of the generating instrument. Then we positioned an omnidirectional mic just in front of the shell to record impulse responses, and in the hall itself we placed two mics to get an impression of what the audience is hearing. In these series of experiments we varied the surface from being all-reflective to all-diffusive with vertical wells and horizontal wells, and tried all the different combinations. By far the preferred orientation was to have a reflective base section, followed by a vertically welled *Diffusor* at earheight and then a horizontally welled *Diffusor* placed at the top. The direction a one-dimensional *Diffusor* scatters is always perpendicular to the direction of the wells — so a *Diffusor* with vertical wells scatters in a horizontal plane. Subsequent to those early tests we discovered that having a canteliver placed above the top *Diffusor* was important because it helped to project the sound out into the audience. At this place in time we have several of these shells out undergoing tests in the USA.

"We also ran a larger scale experiment with the Baltimore Symphony Orchestra, where we constructed a full stage acoustic shell and asked the musicians to answer questions on a scale of one to four relating to their experiences with and without the shell. The questions were — How well can you play in rhythmic timing? How well can you hear the pitch of the other instruments? How well can you produce the tone of your instrument? How well can you hear an instrument across stage? How well can you hear an instrument in an adjacent section? How well can you hear your own instrument? So if they felt they could do all of these things perfectly we'd end up with a score of 24. All the sections in the orchestra registered a substantial preference for playing with the shell, and we worked out an average percentage improvement for the whole orchestra at about 82%.

"In concert halls our products can be used both on stage and in the auditorium — in the auditorium it would be typical to do things like rear wall treatment to get rid of slap echo, side wall diffusion, and *Clouds* — *Clouds* are very effective. Taking another space — this time an arena — imagine you have a solid concrete wall that the sound system is bouncing off, now you can apply absorption there and the *Almute* panel we've talked about would certainly be useful, there is the case to be made of taking the energy from the sound system and utilising it constructively — it's almost like putting additional loudspeakers around the walls to get more coverage, because when you have *Diffusors* on the walls they are essentially acting as loudspeakers re-radiating the sound uniformly and at reduced level, so you improve your coverage. The goal in some of these large spaces is to decrease the reverberation time and to introduce early reflections in a zone sense

just as we did in a large control room, so in addition what we do is to make a structure with diffusion on the front and absorption on the back — a *Diffsorbor*. These are hung from the ceiling like *Clouds* where they work by diffusing sound back and absorbing sound reflecting from the ceiling. Now we're going to be using some of these products at Expo 92 in Seville.

Other applications

"So we've taken what started out as a scientific curiosity and evolved it into a complete acoustical system. We started out in the recording studio market and the products quickly spread into broadcast where they have become widely used. The domestic market is another area in which we operate — listening rooms, audiophile rooms, home theatre — we see home theatre becoming a big market in the future with the advent of large screen TV and surround sound systems — rather than designing a totally dead room which is reliant on the speakers, we recommend the use of *Diffusors* to create a more realistic sound, and instead of facing the rear speakers to the front of the room we point them backwards into a *Diffusor* to create a diffuse ambient sound — the effect is to lose the speakers which produces an even greater sense of realism. We have also developed a line of acoustic furnishing for the home, for example we have a wall cabinet which acts as both a diffusor and absorber, the shelves are organised at different depths to form wells in which you can keep books, CDs, ornaments and so on, and the cabinet surfaces are made from *Almute* — although every aspect of the design performs an acoustic function, no one would think it had the slightest acoustic functionality whatsoever — furniture for audiophiles if you like. We're also making acoustic sculpture as an additional element for the domestic market — acoustic art. We do a lot of work in the corporate area where our designs help to increase intelligibility of speech in board rooms for example. Public spaces are becoming a significant market for us, hotels, restaurants, etc, environments where music needs to be integrated without sacrificing conversation. Our *DiffusorBlox* are going to be used as a highway barrier to keep sound away from housing where they have all the advantages of a concrete wall whilst providing diffusion and low frequency absorption — at a cost of a million dollars a mile! Music education is another big market — essentially a school is a microcosm of our market because they contain auditoriums, little recording studios, rehearsal spaces and so on. Churches are also a big user of our products.

In instances where the budget prevents the clients from using the services of an acoustical designer, RPG will supply an inexpensive system that can be installed by the client in kit form.

"We call it *The Studio In A Box*. It contains 2 x 2 ft panels that provide broadband absorption, diffusion and low end absorption. The average package could contain four *Diffusors* for the back wall, nine broadband absorbers — two for each side wall, three for the front of the room and two in the ceiling, and two bass absorption panels placed front and rear. It's very straightforward to set up, requiring two people, a listener and a helper with an 8 × 11 in mirror. The helper finds the critical reflection points by moving the mirror across the walls until the listener sitting at the console can see the speakers reflected. The system provides an affordable way to acoustically treat a room to a professional standard, but I should stress we're not trying to dissuade people from using an acoustical consultant, because in the long term I think the project eventually comes out better if you have an acoustician looking at the whole design even if it's a small design.

Future

"We're constantly refining and rethinking our designs. For example, just recently we've utilised a new set of number sequences that are more effective in terms of response per unit depth — the obvious problem is that to get low frequency response you have to have very deep structures — we now have a much shallower panel that is capable of dealing with low frequencies. Another area we're looking at is console acoustics, where we intend to reduce the adverse effects the console has on the direct sound."

With the recent appointment of Siderise as UK distributor, and RPG's presence for the first time at this year's APRS, the company are keen to see more European designers and architects using their products in the future. In Britain RPG's name does seem to have become inextricably linked with Harris-Grant Associates, and although D'Antonio is delighted with the relationship between the companies, he is at pains to point out that his products are available to all.

"RPG has no affiliation with any consultancy, we're manufacturers who supply acoustical building blocks to acousticians."

PRO TOOLS

David Miles Huber takes a look at Digidesign's new multichannel hard disk system

Recently, Digidesign unveiled their new flagship digital audio system that will be the basis for this successful company's business strategy over the course of the next three years. This system, known as *Pro Tools*, combines multitrack digital audio recording and editing, digital signal processing, MIDI sequencing and automated digital mixing into a single *Macintosh II*-based workstation.

The system has been designed to offer up to 16 independent digital audio channels in upgradable 4-channel increments. In addition, it has been designed from the ground up to fully incorporate MIDI sequencing and edit capabilities, which can, of course, be synchronised to existing digital audio tracks.

The digital soundfile language that is spoken by *Pro Tools* is Digidesign's own *Sound Designer II* (SDII) mono and stereo digital audio file format (at sample rates of 44.1 and 48 kHz). This makes the import and export of soundfile data entirely compatible with *Sound Tools*, *SampleCell*, *Deck* and other Digidesign digital audio products.

Software file interchange from compatible third party developers (such as Opcode's *Studio Vision* and Mark of the Unicorn's upcoming *Digital Performer*) is also supported.

The *Pro Tools* system consists of four entirely new components and includes two software applications — ProDECK and ProEDIT — as well as two hardware applications — the Audio Card and Audio Interface.

ProDECK

ProDECK includes a number of integrated software windows, which are used for the recording of multitrack digital audio and MIDI information. It features a main transport window that, in addition to standard transport functions, offers full punch-in/out, loop and a programmable autolocation keypad. A rather comprehensive realtime digital mixer has also been implemented into the system, allowing any number of internal digital audio sources (such as output channels,

internal effects returns, etc) to be assigned to an input module. Each channel strip offers such provisions as channel fader, metering, solo/mute, panning, record status indicator and two independent effects sends.

The mixer's two auxiliary sends offer a rather interesting design twist. When performing a realtime mix to any or all of the four (or more) channel outputs, it's a simple matter to route the two independent auxiliary sends through either of the system's AES/EBU or SPDIF digital ports. In this way, signals can be routed to an effects processor equipped with digital input ports (such as the Lexicon *300*) or they can be converted to analogue for use as a standard effects send pair.

ProDECK also offers an internal signal processing section, which allows realtime DSP functions to be assigned to any one of the mixer's input modules. The current software release version includes realtime parametric EQ, however, rumour has it that the next ProDECK release version is scheduled to include such programmable DSP options as digital delay, chorus, distortion. The automation control window may be used to automate both the digital mixer and DSP functions. This can be accomplished by capturing static setting 'snapshots' of all ProDECK level and control settings. Dynamic automation can also be employed to automate moving control settings in realtime. Both snapshot and dynamic automation information may be performed within a mix.

Finally, a comprehensive MIDI sequencer has been designed into the system, which allows for the recording and playback of MIDI data in a standard multitrack linear fashion. Individual MIDI tracks can also be easily punched in, out or looped by the user.

ProEDIT

The ProEDIT software provides the system with a comprehensive approach to non-destructive graphic editing of both audio and MIDI information.

Upon booting up the program window, ProEDIT will list a number of icons at the top of the screen that will be readily recognisable to *Sound Tools* users. These provide tools for viewing, auditioning, scrubbing and defining regions. After this, as one might expect, the rest of the screen's layout and features are different from its 2-channel counterpart, although I find ProEDIT's screen layout to be straightforward and powerful in nature.

Although the basic *Pro Tools* configuration can handle up to four channels, any number of 'virtual tracks' can be opened on a screen at any one time. Not to be confused with channel outputs, a virtual track can be composed of one or more digital audio regions, which can then be assigned to an output channel. In much the same manner by which a voice on a synth or sampler can be assigned to an output, any number of virtual tracks can be routed to an output channel. It must be kept in mind, however, that only one sound file can be played on the designated channel at a time (although multiple sound files could be digitally mixed together to create a single, combined sound file). This approach of opening any number of independent regions or virtual tracks, allows the user to exercise greater control over such track functions as edit clean-ups, time shifting, etc.

Standard MIDI track windows may also be opened into ProEDIT's display screen. Once a MIDI track is opened, a rough representation of the MIDI note data is shown. However, at any time a high resolution, standard piano roll edit

window can be opened, which provides the user with standard tools for performing standard pattern-based note, controller and filter editing.

A useful MIDI sequencer feature, allows for tempo map information to be entered into the system. This feature makes it possible for associated MIDI sequences to be quantised (adjusted in time to the nearest beat) to the digital audio track's set or varying tempo.

ProEDIT can be used to edit multichannel digital audio or MIDI data through the use of on-screen graphic waveform editing.

In addition to the standard cut and paste tool functions, the editing of either audio or MIDI data can be carried out in one of two modes: Slip or Shuffle. When slipping a region, the selected block (which can include data spanning over any number of tracks) can be moved in time without affecting the reproduction time of other track events. Shuffle, on the other hand, will correspondingly move the audio or MIDI data, which was initially located after a selected region, to a point immediately following the newly inserted or cut segment point. For example, the copy and insertion of a repeated audio segment will cause all audio tracks following the original region block to be shuffled to their new point, just after the repeated insert.

ProEDIT offers a wide range of in and out crossfade ramp and time duration options. Unlike *Sound Tools*, which calculates and performs crossfades in realtime, *Pro Tools* writes its crossfades directly to disk, and are accessed from disk at the appropriate playback time. Using this method, crossfades need to fit into RAM only once and will not tie up valuable processing time. In a manner that is similar to other *Mac*-based workstation systems, once an on-screen crossfade has been performed, a graphic 'X' marker is drawn over the effected region area for easy identification.

On the hardware side of things, *Pro Tools* is comprised of two components: the Audio Card and the Audio Interface.

Audio Card

The Audio Card is a high speed, 4-channel processor card designed to take up a single *Macintosh II*-type computer slot. When operating with one Audio Card, *Pro Tools* can only be configured as a basic 4-channel system, however, Digidesign is set to release a system accelerator card that will free up this constraint, allowing the system to be configured in 4-channel increments up to 16 channels.

This optional accelerator card will serve to speed up the overall system and avoid data bottlenecks by providing a direct path from the audio cards to the hard disk drives, thus bypassing the *Mac*'s internal processors. In this way, the *Mac* computer itself can be freed up to perform less number-intensive tasks (such as faster screen redrawing).

Audio Interface

The Audio Interface is *Pro Tools*' link with the outside digital and analogue world. It is a 1U high, rackmountable external I/O analogue and digital interface, whose front panel includes a power switch, an array of front panel indicators (showing sync, sample rate and digital status information) and recessed multiturn level pots. I/O ports include four electronically-balanced *XLR* analogue inputs and outputs (+4 dBm) along with

two digital I/O
channels (AES/EBU and
SPDIF), MIDI I/O and various other computer
periphery connections.

General information

Audio data, using *Pro Tools* can be backed up
using any conventional *Mac*-compatible media;
including hard disk, optical disk or Exabyte tape
back-up drive. Back-up of audio data and playlist
edit information can also be backed up to DATa
back-up program. This program is used to encode
playlist edit information (in a modulated form)
onto DAT tape, and is immediately followed by the
raw unedited audio data. Upon the reloading of a
sound file, DATa will reconstruct the playlist and
reproduce the audio in its intended edited form.

Currently, *Pro Tools* will sync to all
SMPTE/EBU timecode frame rates, through the
use of MIDI timecode (MTC). As a further
addition, Digidesign is planning to release a 1U
rackmount hardware option that will be designed
to lock *Pro Tools* to house video and other video
sync protocols.

Another hardware periphery, the *CS-10* control
station from JL Cooper Electronics has been
designed as a hardware control surface interface
for such workstations as *Pro Tools*. The *CS-10*
provides the user with direct control over
transport function buttons, programmable
multifunction keys, a jog/shuttlewheel control and
eight MIDI faders (which can be assigned to
directly control *Pro Tools'* digital mixer functions).

Price-wise, the basic 4-channel *Pro Tools* system
has a suggested list price of $5995.00. In their
continued effort to support users, Digidesign is
offering a special trade-in offer for current *Sound
Tools* owners, that allows for a rebate before the
date of December 1st, 1991. One press release
from their offices makes mention of an agressive
$2000.00 rebate (US only) for owners of many
familiar competing DAW systems. For further
information on these offers, contact Digidesign or
your local dealer.

Master list

One final significant Digidesign development of
note is the recently updated version of Master
List, known as Master List PDS. This program,
which allows for the standalone reproduction of a
Sound Tools or *Pro Tools* events playlist, is now
capable of writing PQ subcodes directly to the new
Yamaha *PDR* write-once compact disc recorder
system. When using this program, a final
mastering list can be created that can be used
to directly cut a limited run of Red Book
standard CDs.

When using Master List PDS,
digital audio is output from *Pro
Tools'* or *Sound Tools'* AES/EBU
outputs directly to the PDS's encoding
and recording units — with complete control
over sequence, start times, adjustments in track
volume and CD subcode/index parameters. Simply
stated, its ability to write up to a maximum of 14
compact discs in a single realtime sitting, makes
this an attractive option for recording and
mastering facilities who would like to offer final,
on-site test pressings to their clients. □

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DIGITS MEET SPROCKETS

Francis Rumsey discusses recent developments in digital film sound and looks at the potential for change in technology.

There are now clear moves towards the adoption of digital audio in film sound production and distribution. A number of systems have been developed with the intention of allowing digital soundtracks to accompany release prints, and there is growing use of digital equipment in the production and post-production of films. Could improvements in cinema sound affect audiences?

Origination

The Nagra ¼ inch tape recorder has held its place firmly in the film sound industry as the machine of choice for portable high quality work in the most inhospitable conditions. This analogue recorder has a reputation for reliability and solidity inspiring confidence in film sound recordists for a number of years, although the weight of all this solidity has affected many a shoulder. Machines such as this can stripe the tape with pilot tone or timecode and there are vital facilities such as confidence replay, phantom power in all forms and good metering. You simply never hear of a recording coming back from the field with a bit missing, unless the recordist did something silly like forgetting to put the machine into record.

Despite the sound quality advantages of digital recording, the question has to be asked: how can digital machines ever gain the same trust as this? This is not a question delved into deeply here, since it was discussed at some length in another article ('ProDAT practicality', *Studio Sound*, December 1990) but the point is raised because it is a question that may overshadow any other considerations concerning a digital origination format for film sound.

Two principal formats currently have a place in this discussion, these being the DAT and the Nagra-D format; the latter is not yet established commercially but has considerable potential. DAT recorders have most certainly been used for field recording of film sound, and their speed stability makes them useful for medium-term lock to a film camera in some applications, even with no link between the two machines, using a clapperboard as a sync point. The sound can be copied from DAT source tapes onto sprocketed mag film for editing, or onto a hard disk recorder. Timecode could be used as a means of providing a sync reference on pictures and soundtracks but the use of timecode in the film industry is not by any means universally established.

Fostex have recently introduced an interesting product, the *PD-2* DAT recorder, clearly intended to challenge the Nagra as a portable sound recorder. It incorporates all the features that most professional applications would require, such as confidence replay, phantom powering to multiple standards, timecode, sync references and battery powering, as mentioned above, and will record for some 90 minutes from a standard Sony *NP-1A* battery pack, or around 25% longer with the long-life PAG batteries. The machine is also priced to compete with the analogue Nagra, being in the region of £5-7,000, although this is not fixed at the time of writing. The long awaited Stellavox *StellaDAT* is also now available with a range of modules to meet various user needs.

The question of whether DAT as a format will prove trustworthy enough to be used as the sole origination format for film sound will only be answerable after a number of years of careful assessment, since recent feedback from a number of American film sound recordists suggested that even if they had been told to use DAT for a particular job, many of them would still take a Nagra as well and run it in parallel, just in case of a problem with the DAT recording. Clearly this is not a situation that can continue, since the benefits of DAT are soon overshadowed if it is always necessary to take another older and heavier machine as a backup.

Editing and post-production

Traditionally, original sound on ¼ inch pilot-toned tapes has been copied onto sprocket-holed magnetic film for editing and post-production. It can then be cut in synchronism with the picture, with editing being performed on a cutting table using a Steenbeck flatbed editor where tracks are mechanically sync'ed with each other, able to be slipped in time (**Fig 1**) and able to have blank spacer sections inserted to make all tracks physically the same length even if they have nothing on them for much of the time. Each audio track is physically separate and more tracks can be added in parallel if required. A dubbing chart is compiled during editing to show what is contained on each track at each point in time (**Fig 2**). Music and effects are added on further tracks during dubbing, and the tracks can all be loaded onto individual magnetic film reproducers, such as those produced by Albrecht, to be synchronised electrically. Visual cues are pencilled onto the picture film to warn the dubbing mixer of impending cuts or fades, in the form of a stripe moving from left to right.

There seem to be no moves towards a digital equivalent of sprocketed mag film that can be splice edited, and this is probably not surprising when one considers the treatment it would receive on the cutting table. Any digital format designed for this purpose would need to have an utterly bulletproof error-correction system and be designed for regular physical handling. It would also need all the significant advantages of sprocket holes, many of which have never been completely emulated by electronic systems using timecode. Digital mag film, if well designed, would allow conventional film editing skills to be retained while improving sound quality enormously.

Since this appears not to be happening, the alternative lies in the adoption of disk-based workstations that emulate film sound editing techniques much more closely than multitrack tape recorders ever did. Timecode can be striped onto picture films to allow for synchronisation with the workstation. The potential objection of having to copy source material onto disks before it can be edited does not really arise, since source material previously had to be copied onto mag film anyway. Using workstations, mag film tracks are replaced by sound files on a disk, and the user
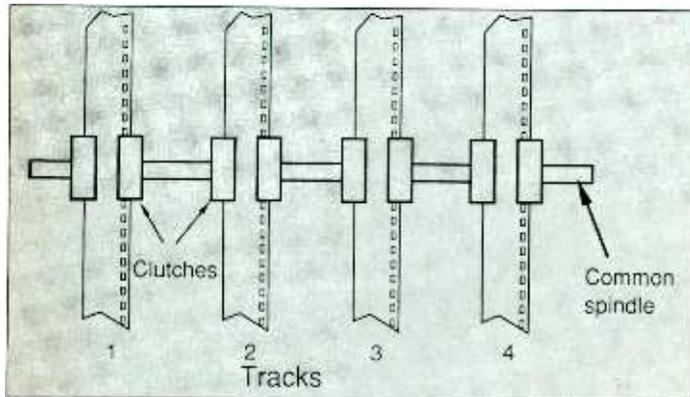
FIG 1: On a flatbed film editor tracks are locked mechanically, but may be 'slipped' with relation to each other by means of clutches

FIG 2: A notional and fictitious dubbing chart.

FIG 3: SSL's Screen Sound

interface emulates the cutting and copying of these files into individual 'tracks' which can be slipped in relation to each other. SSL's *ScreenSound* system takes this concept very close to the film-like situation, by displaying a number of independent 'reels' side-by-side on the screen, with a virtual replay head over which each reel passes (**Fig 3**). DAR's *SoundStation* also seems to be getting itself established in the film sound world, having recently announced sales to film production companies such as Norsk Film Studio A/S in Norway who claim that film editors like working with the system because it is simple to assimilate in operation, and uses their existing skills.

Now that such workstations are available with a number of tracks, which makes them suitable for medium-scale productions (or even large productions if multiple systems are networked and synchronised) the attraction of using digital audio in film post-production may increase. The disk-based systems allow for libraries of effects and music to be stored on and off line, using either fixed or removable disks, and the networking facilities, which are now being developed by such companies as New England Digital and SSL, among others, are making it possible for operators at different stages in the production chain to work on a specific aspect of a project, such as dialogue replacement, Foley, effects, and so forth, with the results all being brought together in a synchronised mix. Such techniques are in their infancy but clearly point the future direction.

It is probable that workstations will develop over the next few years to the point where it no longer becomes necessary to consider the development of a digital replacement for sprocketed mag film, although it is just possible that some savings in cost could be achieved in this area over the cost of a large networked disk-based system. That said, film dubbing systems were never cheap, and synchronisable mag film reproducers, such as the Albrecht equipment mentioned above, costs many tens of thousands of pounds — and one reproducer is required for each track in the dub!

Large feature film productions may be post-produced using workstations if the systems problems of large networks can be accommodated. This, in fact, is not a new concept, since many may remember the development of the Lucasfilm editing systems — the *SoundDroid* and *EditDroid*, in the early '80s, designed for feature film post-production on a massive scale using computers and hard disks as storage, with a graphical interface for editing and dubbing. The problem at the time was the vast cost of the technology but this is now less of a stumbling block. NED have recently implemented revised *SoundDroid* software on their workstation products at a considerably lower cost than that originally proposed by Lucasfilm.

Distribution

Significant developments are taking place in the field of digital sound options for release prints of feature films in 35 and 70 mm formats. The two leading contenders in the standardisation race are Kodak/ORC and Dolby Labs, both prime movers in the film world, but coming from different backgrounds — the former in film stock manufacture and the latter in the development of sound systems. The Kodak system is called *CDS* (Cinema Digital Sound) and the Dolby system is called *SR-D*, since the format supports analogue

Dolby *SR* tracks and digital sound on the same film. There are also two other propositions, the disk-based *LC Concept* from Tacc et Cinelume in France, and a research project initiated in 1988 by the Department of Supply and Services in Canada, and carried out by National Film Board (NFB) of Canada in conjunction with other Canadian companies. The latter proposition does not seem to have appeared as a commercial entity.

All the digital film sound options, except for the *LC Concept*, work on the principle of recording digital audio optically on the same film as the picture, in a matrix pattern of tiny dots, which are light and dark. A CCD array, which is wider than the soundtrack (to accommodate weave), scans the light and dark patterns produced by the digital data, and the decoding process resamples the resulting analogue waveform at a very high frequency to determine the presence of synchronising patterns and data transitions in the information. It seems likely that the CCD scanner and decoders could be retrofitted to existing projection equipment.

Compression of the audio data to varying degrees is also required, in order to accommodate the required number of audio channels at the required quality within the space and therefore bandwidth available. Concentrating on the two principal contenders for the time being, both offer the number and type of audio channels suggested by the SMPTE study group on Digital Audio for Motion Picture Distribution, that is five full-bandwidth channels with an accompanying sub-bass channel for lifting the audience out of their seats in earthquake scenes, etc. The five channels are to be used as shown in **Fig 4**, that is Left, Centre, Right, Stereo Surround and Sub-Bass. This is a great improvement over conventional 35 mm Dolby *Stereo*, which offers L, C, R and mono surround but matrixed into two variable-area analogue optical tracks. The digital system will maintain the independence between channels, obviating the need for a matrix, and carry superior sound quality.

Kodak/ORC CDS: CDS was first on the scene and the first films have already been released in *CDS* format, which is suitable for 35 and 70 mm prints. The *CDS* format differs from the Dolby format in that it also incorporates three additional data channels, for timecode, automation data and effects control, although the real value of these is not particularly clear at the time of writing. The audio data replaces the analogue optical tracks on 35 mm film and magnetic audio Track 4 on 70 mm film.

Audio for the five main tracks is basically 16 bit, 44.1 kHz PCM, compressed by about 24% using a hybrid delta-modulation technique in blocks of 32 samples, the first of which provides a full-range 16 bit level reference and the remainder of which are reduced to 12 bits per sample.

Dolby SR-D: Dolby, although later to arrive, have a lot of experience in film sound, and their systems are in use throughout the world's cinemas. Dolby *Stereo*, used for 35 mm optical analogue sound, uses either Dolby *A* or Dolby *SR* noise reduction to increase the dynamic range of the optical stereo-variable-area (SVA) soundtracks. The new *SR-D* format for incorporating digital sound on 35 mm prints maintains compatibility with SVA analogue tracks, thus one release print may serve both purposes (**Fig 5**). The digital audio information is stored in between the sprocket holes, rather than in a complete optical stripe, severely reducing the available area for data.

SR-D involves the same number of audio channels as *CDS*, but with only additional data channel and, so far as can be determined (in advance of detailed technical information from the company), uses the very efficient AC-2 adaptive transform coding algorithm to compress the data rate of the audio by a much larger factor than is involved in *CDS*. AC-2 reduces the data rate of a 48 kHz, 16 bit channel to one-sixth its original rate, whereas *CDS* only compresses by 24%. It is, therefore, fairly easy to see how Dolby have squeezed the same number of audio tracks and equivalent sound quality out of the smaller space.

LC Concept: the *LC Concept*, developed by Tacc et Cinelume in France, uses a timecode track on the film to synchronise an optical disk system, which replays the digital soundtracks with a maximum playing time of 150 minutes. Compatibility with SVA tracks is maintained because the timecode track does not overwrite these. The approach appears cumbersome when compared with *SR-D*, which also maintains compatibility with SVA tracks without requiring additional optical disk equipment. Further, the film-based systems have the advantage that only one item is required — the reel of film — whereas the *LC Concept* requires that every film is released with an accompanying disk, which could become separated from its pictures.

Cinema sound quality

The question remains as to whether the public will appreciate the enhancements offered with this improved signal chain from original material through post-production to final release. The sad fact is that the greater proportion of the cinemas in the world still live in the days of Academy Mono, with only a limited number offering Dolby *Stereo*. Quality of sound has not been a major feature pushed by cinemas to attract audiences at local 'fleapits', although the large entertainment centres and major city cinemas are beginning to catch on.

Lucasfilm's *THX* process, designed to improve the sound quality in cinemas may have an effect on the future of sound in this field, since *THX* is a comprehensive set of measures involving acoustic treatment, stringent controls over noise levels and distortion, and careful attention to factors such as the reverb time of the auditorium and the speaker directivity patterns, to ensure that the sound you hear is as close to what the dubbing mixer intended as possible. Dubbing theatres are also offered *THX* treatment for this reason.

Obviously Lucasfilm intend that cinemas should pay for this extensive treatment, which might well involve knocking the building down and starting again in some cases. And it is expected that the theatre will pay for the privilege of calling itself a *THX* theatre, purchasing the special *THX* crossover units for the loudspeakers and having the Lucasfilm engineers out once a year to verify the continued performance specifications of the auditorium. The results are impressive, admittedly, and something needs to be done to revive the pastime of going to the local cinema. If sound on the large screen can offer an experience far in excess of that provided by renting a video and staying at home then perhaps people will be attracted away from their TVs again. ⌐
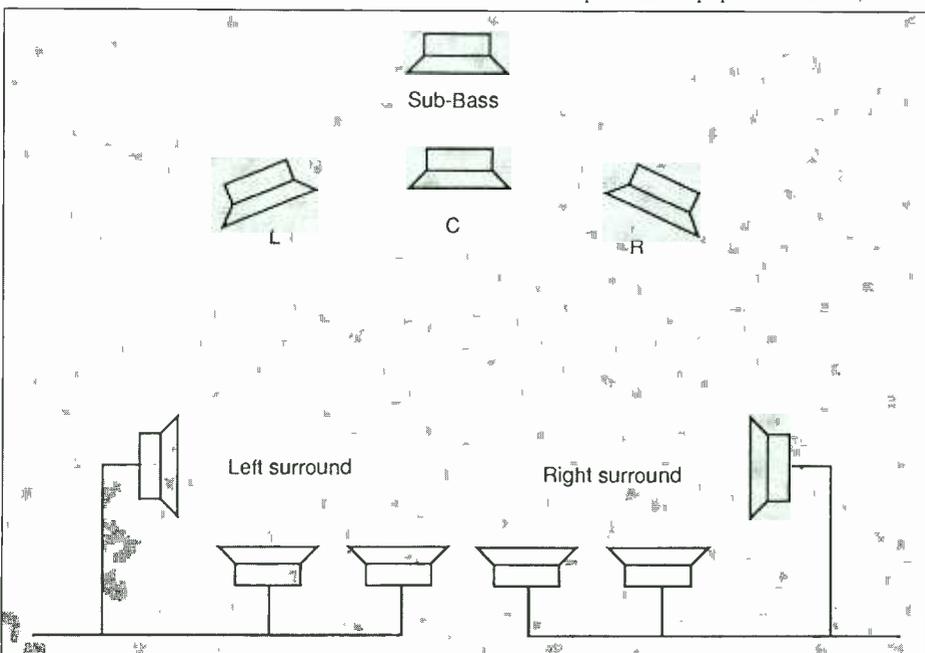
FIG 4: Six sound channels are involved in the SMPTE recommendations for digital film sound formats, as shown. Sub-bass is limited to <100 Hz
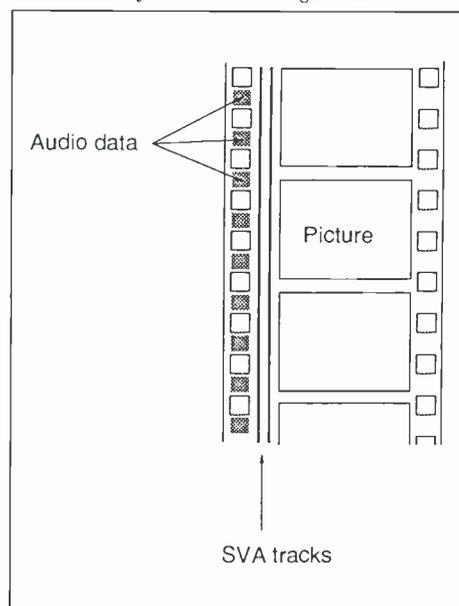

FIG 5: Dolby SR-D places optically recorded digital audio data patterns in between sprocket holes, leaving the SVA tracks of 35 mm Dolby Stereo intact

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Main control room with DDA DCM-232

MG SOUND

Julian Mitchell visits Vienna, site of next year's European AES Convention, and finds an interesting mix of studios including MG Sound, a tracking and post-production facility in the city's centre

The Austrian music recording scene has a problem that most other countries are thankfully without. The biggest selling music in Austria is what's called Volksmusic, the traditional *oom-pah-pah* sound that goes along with Tyrol hats and lots of thigh slapping. The problem is that this music takes about three days to record an entire album and ends up selling an average of 50,000 units, in a country of only 7 million people. There is therefore no heavy re-investment in recording studios as the Volksmusic producers on the whole don't worry too much about quality.

But having said that there is a long tradition of artists trekking to Vienna to make their music, a tradition that goes back to the days of Mozart and the powerful Austrian Opera. At the moment the travelling artists mostly come from Germany but as the Eastern Bloc countries start beginning to enjoy their freedom, clients from Hungary and Czechoslovakia are crossing the border to record.

A relatively new recording studio in Vienna, it was opened last November, is MG Sound. The people there are keen to present a quality studio that anybody from whatever recording centre would feel happy working in. To that end their main equipment supplier Audiosales, introduced them to designer Andy Munro.

Munro commented on the slightly unusual studio layout, "I think with the Austrian market being so fragmented MG Sound had to be a bit flexible, so they went for video and audio post with the choice of music recording if it came up. So we had the quite unusual situation of two control rooms and one live room. The main problem with this type of set up is the isolation; while you're recording something you don't want any spill from the other control room.

"The studio was funded by a major bank in Vienna and when I met them they were incredibly positive about the whole thing, something you wouldn't get from a UK bank at the moment. The bank actually own the whole building and have become effectively partners with MG Sound. They lease the penthouse to them too."

Glorious past

The studio is in what the Viennese called the First District, which is a bit like saying London's Soho with its studios and advertising agencies. The buildings here are tall and

architecturally majestic, with grand entrances and facades. MG Sound's building is no different, as you walk in you're in a spacious and decorative hall with columns reaching through high ceilings, and a caged lift in the centre.

This is old Vienna with echoes of a glorious past. MG Sound is on the ground floor past the hall. Walking in brings you back to the 1990s, with its typical Munro wood finishes. A small corridor opens out into a larger reception area. There are naked air conditioning ducts running the length of this ceiling causing an obvious industrial look which is not unpleasant.

The reception area has its leather couches and bar with a large partition window looking into the machine room. MG Sound gives nothing away to its Viennese historic surroundings, and you feel that you could be in any European studio in any city (so perhaps the initial brief has been reached). This feeling of familiarity is of course a two-edged sword and will please as many clients as it will disappoint. Some foreign clients might

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Large programming suite with DDA AMR-24 console

want a touch of Viennese 'kitsch' or idiosyncrasy to record with, but here is where the split between different types of clients is important.

Martin Böhm, co-owner of MG Sound talks about his customers, "We do a lot of commercials here, mostly post-production but also jingle work. The agencies love it here because it's so modern. It's something they are not used to in Vienna. We get more agency work than band work at the moment but we know the recording room is good because we've had bands in there recording live without overdubs."

Equipment

The studio boasts three rooms. A large programming suite and a standard size control room with a quite large recording area (approx 25 × 15 ft). There is also a small isolation booth off the programming suite and a central machine room which is off the reception area.

The equipment stock is of a high standard. The main console is a DDA *DCM-232* with 56 channels and automation (moving fader Uptown automation is planned). The programming suite is in fact about the same size as the main control room but squarer and has a DDA *AMR-24* console and numerous sound modules and sequencing software. Multitracks include a Sony *PCM-3324* and a Studer *A827* with Dolby *SR*. Monitoring is Genelec in all control rooms including the small voiceover room.

A lot of the equipment including the desks and most of the outboard was supplied to MG Sound by local pro-audio company Audiosales. The company also handled all of the wiring. Audiosales MD Reinhard Brummer explains his thoughts on the studio, "MG Sound are getting a lot of the work from the advertising agencies, they work very professionally and are starting to get work from Germany too.

"In Vienna you are getting a strange mixture of studios. For instance a studio called Sound Design has a library of sound effects in their (Lexicon) *Opus* and just down the road you have a very traditional studio with a guy making all the noise, (here Reinhard imitates someone creating a sound effect that you could only describe as a bagpipe without the pipes!), same time same city and these guys are losing business now because all the big international advertising companies who are used to dealing with maybe Sync Sound in New York had to deal with this kind of studio. So they go to Germany and so MG Sound and Sound Design are getting a lot of business from Germany and Switzerland."

The rooms

When MG Sound bought the *AMR-24* for the pre-production room they were thinking ahead. Martin Böhm, "The room is for MIDI production but for track laying as well, that's why we have the *AMR*. We have access to both main multitracks from here, digital or analogue or a combination of the two. There's only 24 tracks wired in here but 48 in the main room. We wanted to do mixing in the other room and tracklaying in here."

All the rooms are floating floor and have a metallic blue finish on the Munro wood slatting with absorbers behind. The paint

was the studio's idea but was cleared by Munro first. Munro, "They didn't want a fully wooden finish but wanted to mix it with a post-modernist feel, therefore the paint."

The major problem was the danger of overspill into the adjoining room, "Basically what we did was to double everything up and as long as you've got floating floors there shouldn't be a problem. They've got about 90 dB of isolation there. I know it works because I did a lecture in the recording area while Alan Parsons tried to break the monitors in the control room, I didn't hear a thing."

The machine room is central but back from the recording room, Böhm "We wanted a central machine room to be more flexible. It was hard getting used to it at the start. We have low-band video in the big room and hi-band in the small. What we want to do in the future is to operate a D2 machine and buy a 48-track digital machine. In the large control room we have a *DCM-232* with 56 channels in-line. It has VCA fader automation but we are thinking of upgrading to moving fader, the Uptown system that works really well with the *DCM*. You have switch automation as well, so 24 switches automated against timecode, is what people like. We have the Digidesign *SoundTools* systems also in here, which is very good for commercial work, sound effects things like that. We also do a lot of cutting work on it."

In fact the first choice for the large control room was a Soundtracs *ERIC* console, which they saw in America, but the choice widened to include the *DCM*. The new choice proved popular for owners Martin Böhm and Stephen Coss, as they liked the design and the automation.

MG Sound have an ace in the hole in the form of a basement area which is nearly as big as the rooms upstairs. At the moment they use it for storage, ping-pong playing and video watching but there are plans afoot. Böhm "We are planning a third studio down there just for post-production, for film work and ADR, things like that. What we want to do is do the music production up here and all the dubbing down there. We've already had a look at the SSL *ScreenSound* system for the new studio. Its machine control system is very good." The basement area already has a large area for showers and toilets.

MG also plan to become residential and already have a beautiful penthouse flat in the same building with rooftop views. The flat needs some work to get it ready for the hopeful influx of foreign musicians.

Vienna

Austria has only one television channel, ORF, based in Vienna. However, this one commercial channel seems to be enough to keep MG Sound in business as their competition is quite limited. There are only a few other post-production studios in Vienna as most of the work from ORF used to go direct to Munich.

As a place to record, Vienna offers much. It's a beautiful clean city with good transport (there is an underground system although it's not that extensive yet) and one of the lowest city crimes rates in Europe. There are however some strange paradoxes. After 10 o'clock at night restaurants are not allowed to have tables outside, so you won't get any Paris-like alfresco-eats here, especially after 10. Apparently the caring Austrians don't want to keep their old folk up as many of the buildings in Vienna's centre are residential. But there is that kind of respect here.

For MG Sound there is promise of more clients from the Eastern Bloc countries, Böhm: "In the future we are thinking along the lines of a video edit suite to handle more of the work from Hungary and Czechoslovakia. There are now only a few small companies who do off-line editing and three or four bigger ones with D1 or D2 machines doing the on-line. The market is growing and those countries have a lot to produce but they don't know how to produce, right now. It'll take them five or six more years so that's our chance to get work from them."

For the AES Convention next February Vienna will provide an interesting backdrop. It's an opportunity that MG Sound and pro-audio supplier Audiosales are looking forward to, and as far as they are concerned one that's long overdue.

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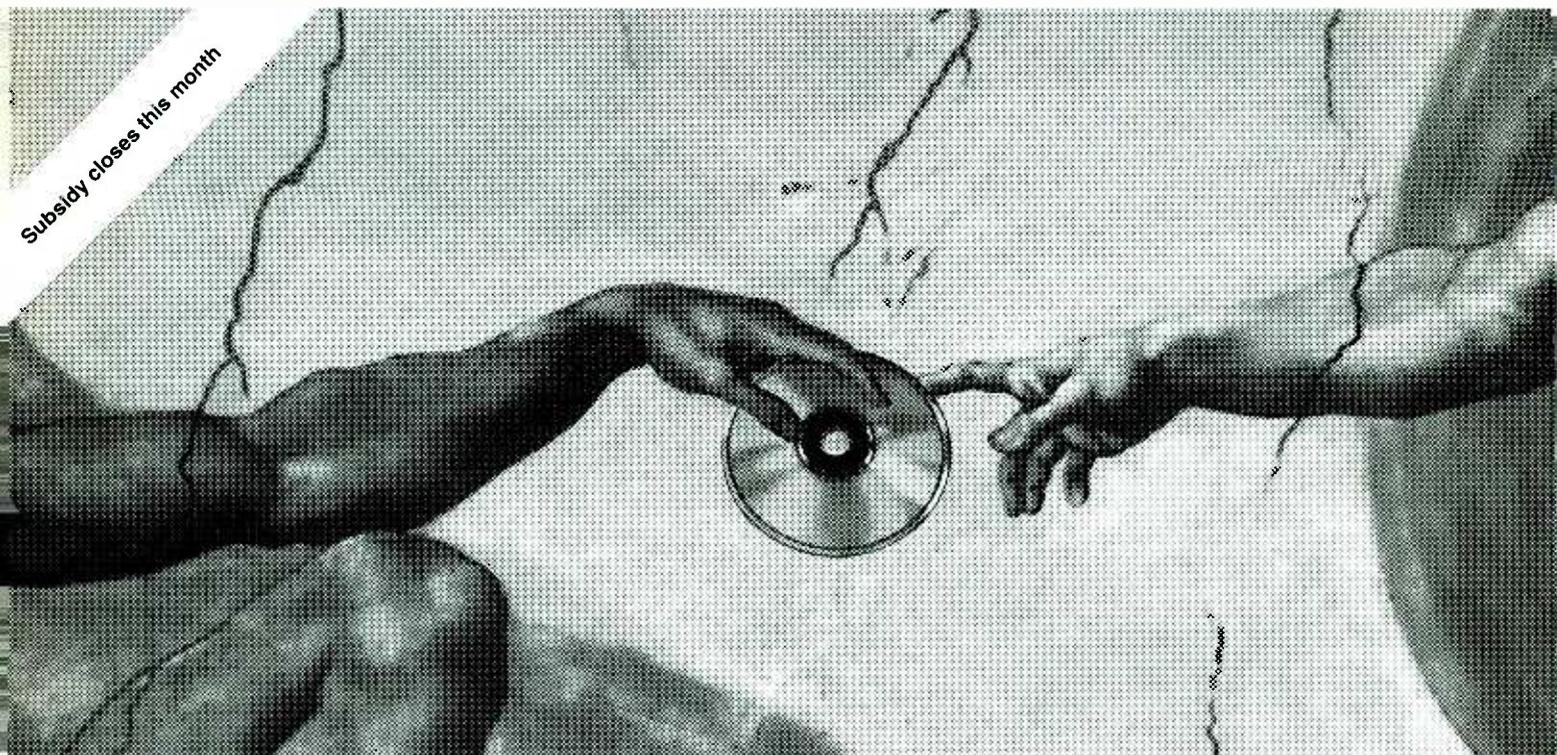
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John Smith felt good, really good, about his recording business. Despite the rather dour economic outlook that the BBC was harping on about every night, he was surviving and perhaps doing a little better than that. He knew that his decision to build his business around the less expensive project studio consoles and tape recorders had been a good one. He was not getting the top drawer customers like the big London studios but nobody wanted to drive out to the not-so-woolly wilds of the stockbroker belt anyway. Amersham was a very nice place to be and he was getting the small audio-visual projects and advertising jobs that he knew he would.

The equipment was terrific: he paid top money for it and all of the companion gear he used. Hi-fi components worked very well for him, too: speakers, amplifiers, cassette decks, DAT decks and CD players all came from the top of the product lines of major consumer audio makers. His latest brainstorm had been to build a portable studio in a van that could be driven to the customer's place of business. Aside from some 'advert' work, it had been used considerably by a local radio station for remotes.

Only one thing bothered John these days. He was sure that something was going on that just wasn't quite right. It seemed that various pieces of equipment were disappearing from the business. That would be fairly easy to deal with, if the police were brought in but the missing items would always re-appear in a day or two, after their absence was noticed. His success had brought with it a staggering amount of audio paraphernalia. The operation of the three rooms, plus the mobile van and the burgeoning rental business had created an impressive inventory. John couldn't be sure if things were 'taking a vacation' or if the situation just reflected sloppy bookkeeping.

Months passed and John's lack of ease grew as fast as his business did. He now had 11 employees and it was impossible to identify just what was going on but he felt clearly that something was out of order. A particular piece of equipment was requested for a session and would turn up missing. Every Friday at 10am, he had a staff meeting. The hue and cry would go out for the errant DAT or submix set but after much gnashing of teeth and mashing of knuckles, the staff would always proclaim ignorance and innocence and the matter would be placed in abeyance. Later, the piece of equipment in question would be found to have returned to the fold . . . like an electronic version of the Prodigal Son.

Finally John felt he had no option but to bring in the police. He felt silly about the whole thing since there was nothing really going on to point at. Nevertheless, Inspector Whyte assured him that bringing in the law was really the only thing that could be done. The trap was planted by spraying a DAT machine with an invisible substance that could be viewed directly with ultraviolet light. This was done on a Thursday evening about dinner time. John had noticed that the 'problems' almost always seemed to occur between Thursday evening and Monday morning.

The next morning, the DAT unit in question was gone. John asked all the staff into the meeting

Martin Polon

Petty pilferage is a source of concern and loss throughout industry. Our US columnist ponders on what can be done

room and introduced Inspector Whyte. John told them to place their hands under the ultraviolet light on the table. He made it very clear to his staff that he did trust them and that his request was voluntary. He wanted to get to the bottom of all of this. He expected this exercise would clear them all. He felt that it was possible for someone from the outside to have made a duplicate set of keys. Mick, the chief engineer, excused himself to go to the loo, pleading extreme need.

Imagine John's shock when Mick's hands, though still wet from being washed during his short excursion, glowed like a blue neon sign. Mick was led into John's office. He was soon in tears, under Inspector Whyte's patient questioning. It seemed that Mick was fielding calls for rentals from studio pals before they reached Myra, the rental co-ordinator. He was letting people that he personally trusted borrow gear over a weekend. He was pocketing the fees himself. When asked why he was doing this, Mick could only reply, "I needed the money." Mick was the best person on the staff and a friend to boot. John finally found out from Mick's mum that Mick's sister had to have some corrective surgery and the wait for the National Health Service would probably kill her. Mick was running a 'midnight' rental service to pay for his sister's private surgery.

John asked Mick, "Why didn't you tell me? I would have helped you find the money." Mick had no answer!

You will probably mutter to yourself, and to anyone within earshot, that real life is not like the minor parable enshrined above. Thieves and other various blackguards and villains must be easily distinguishable. They probably have two heads or horns or goatees or be fat little Iraqis with body odour. And, of course, every one of them would be so maliciously evil that their punishment could be decided by the Spanish Inquisition. Most of all it would never be someone we might know! Oh, that it were true. But in real life, the people who steal might just happen to be our friends or favourite employees or relatives whose act of expropriation might be a one time-slip of conscience. No easy answers here.

Theft, is the name of the game, no matter how it is played. Whether it is called theft, driftage, borrowing, shrinkage, embezzlement or the Midnight Audio Supply, really does not matter.

What does matter is that a major problem exists. And though it usually does not clean an operation out over night, it can prove to be a difficult hole in the cash flow of an audio business to plug. Such losses are not unique to the world of studios or equipment makers. Many businesses, especially at the retail level, build shrinkage 'costs' into their financial planning — inescapable proof of the magnitude the problem has achieved.

None of this is to say that major equipment thefts by outsiders do not happen to recording studios. They clearly do happen. Professional audio retail operations have experienced armed robbery of their cash assets. And sometimes the insiders are really outsiders. Every studio at one time or another learns the hard way about double locks on all doors and equipment cabinets, and that everything but everything is under lock and key during sessions. After all, how many bands have built how many home and project studios with contributions from big studio sessions? But these kinds of criminal activities against studio operations are less frequent than the in-house kind. A veteran detective in the US who has recovered stolen audio gear from time to time opted: "It is rare for most events of pilferage to be from the outside. It is usually an inside job or if you prefer . . . the butler did it. It takes someone inside to known where the gear is . . . to have the necessary keys . . . to know what the equipment is worth . . . to know when the business will be closed and dark . . . to know about alarms and how to defeat them."

It would be a much easier situation if internal 'shrinkage' involved the 'spot-on' disappearance of large serial-numbered units such as tape recorders or consoles. That this happens less often is the result of the easy traceability of such units by police or via the various equipment manufacturers' service and parts network. It does not take a Master's Degree in Business to deduce that the removal of a large unit from one's employer's premises will eventually bring the heavy hand of the law down on one's neck. Second-hand equipment dealers are regulated by the police and the need for service or parts or upgrades eventually bring the current location of a suspected serial number to the attention of all concerned. Recently, the easily moved DAT recorder has been an engaging target at many studios. But service on the units is so complicated a procedure that in almost all cases, the 'lifted' machines have to return 'home' to their maker for service — whether that is in Ohio or Osaka.

Much more difficult is the fact that most inside problems can be characterised as so-called 'petty theft'. It is called 'so-called' because the amount of petty theft that exists in today's audio business world is so substantial as to easily outweight the total cost to studios or other audio businesses of more outrageous illegal ventures. 'Pound and penny' or 'nickle and dime' losses can be either from technical supplies or of more general office and housekeeping items. The continuous removal of studio maintenance stock in microphone connectors, cable and wire, solder and other parts is not an unexpected phenomenon. It can plague

those in any electronics application and also happens with concert reinforcement, sound contractors and broadcast operations, to name a few. But of late the problem has become both more visible and more frequent as studio staff build their own home studios and use the available stock on the job to do the deed at home.

Specific losses in expendable technical supplies or frequently used parts can be very hard to discriminate from legitimate usage. It requires inventory control of the most fastidious kind. In fact, for this kind of shrinkage, the recording studio environment has several legs up over other kinds of audio businesses. The studio environment usually does not engage in substantial and constantly changing parts flow. It should be possible to institute a computer program to keep a simple inventory of all studio items — large and small. Every studio should do exactly that since it can lower insurance rates and frequently guarantees a better settlement with the insurer, in case of loss.

Reimbursement of employee expenses, both for the purposes of doing business and for purchase of needed supplies, represents another area of potential and real abuse. One studio owner fondly trips down memory lane whenever he thinks about his late, lamented mixer-forger: "Jack was one of a kind. He was the best mix engineer I ever had. For some people, mixing is a hard-learned skill. Not for Jack. He had a God-given gift at the console. Unfortunately, he also had a permanent girl friend — blonde, well built, beautiful and bewitching. She wanted everything and Jack tried to give it to her. He would forge receipts for this and for that. The funny thing was that he was a really talented artist. When I caught him on it, he quit. He turned to forging cheques and I think he's still doing time."

Purchasing schemes for technical supplies and components are also not immune to tampering. One audio rental operator tells the story of an employee who simply put an entrepreneurial spirit to work to benefit both employer and employee. "Alan would go out on his days off and shop the surplus electronic parts houses. In our town, because of the aircraft plants and the military activity and all the electronics companies, there is an unbelievable supply of surplus. Alan would find things we really did need. He would pay for them out of his own pocket and then ask for reimbursement. He never had a receipt — just the parts. He would always ask less than the retail price for the parts, so we both prospered . . . sort of. Finally, I sat down with him and indicated that I was not pleased with the *status quo* but that we could work out a compromise. Now Alan works full time for me, 'scouting' parts and equipment. I pay him a commission on whatever he saves us from the retail price on whatever he finds. He's happy . . . I'm happy . . . everybody's happy."

Sometimes loss can include the diversion of revenues for equipment and facilities from employer to employee — either directly or in some cases indirectly. 'You can pay me' is an old story in any kind of retail situation. As in our opening story, employees find ways to circumvent the

system and funnel off both overhead and profit from the business. In a studio setting, one or two enterprising employees have been known to offer bands a 'midnight rate' for recording after the studio has shut down. Studio owners have been known to place sealed and tamperproof usage counters on tape recorders and mixing consoles. These units give an elapsed time reading that can be compared daily to detect the proverbial 'hanky-panky'. One contractor reported that a technician was ordering amplifiers that would be sold privately by said technician but paid for by the business. Any business must have a strong

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Sometimes loss can include the diversion of revenues for equipment and facilities — either directly or indirectly

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accounting function to prevent such situations — not just those in audio.

The itinerant mix engineer is one of those apocryphal horror stories that lurk about a region or an industry. Like the *Hound of the Baskervilles* or *The Green Man*, the Itinerant Engineer is a combination of legend and myth. Supposedly, he or she will come to a studio to "see the city . . . have some good times . . . make some music . . . and then boogie". Unfortunately, the itinerant one has frequently done just exactly that — with enough of a studio's gear to open up a facility of his or her own. The stories have a ring of truth in them just enough times to create a difficult 'row to hoe' for the honest, footloose and fancy free studio mixer, as well as to put a tingle of fear in the back of every studio owner in town.

Staff morale is one of the greatest victim's of insider theft. Motivating a staff — large or small — while constantly engaging in a 'witch hunt' to find a thief (or thieves) is virtually impossible. A thief hurts a studio (or any other) operation in several ways. Aside from the obvious deduction to the financial bottom line, the task of identifying the culprit puts management in an impossible situation *vis-a-vis* employee goodwill while draining energy from other more important projects. Sometimes it is possible to generate enthusiasm for all concerned to pitch in to find the 'rotten apple'.

One veteran UK studio owner put it this way: "It's a lot like raising your kids: if you are affectionate and fair, you hope your kids will do the right things when they grow up. The same with your staff. I happen to run my studio like a family. Someone steals from me . . . — they steal from everybody . . . — and they get nailed."

The decision whether or not to rehabilitate a valued worker caught in the act, is one of the most

difficult conundrums presented to the audio business owner in a theft situation. There is no question that a wrong has been done and that some punishment has to be meted out. But many employees represent a significant investment in time, technical training and attitude. Sometimes theft is a function of family problems, sometimes a cry out against some real or imagined slight at the business and sometimes the thief is just a plain and simple 'scumbag'. The astute manager will try to sort all of that out. The issue is whether or not to give the employee a second chance. Some managers have chosen to make an example of a criminal 'insider' demanding repayment and instituting criminal charges through the courts that can inevitably send the wrongdoer behind bars. That kind of severity can backfire with the rest of the staff or it can serve to stiffen backbones. Another tough call. Again, no easy answers.

It is almost impossible to conduct any kind of investigation in a vacuum. Yet that is what must be done in almost every case of 'mysterious disappearance'. The ability of studio or business management to make an objective decision about a valued employee or colleague requires isolation from the rest of the staff. The ability of an individual to return to productive status is almost always negated by common knowledge of guilt. And, if indeed, a decision is made for redemption — the rest of the staff should not assume it is a signal of management weakness. A mass disregarding of the rules can sometimes occur in such situations.

The proverbial bottom line here is to find the hallowed middle-ground. A state of constant paranoia is not exactly productive to anyone. Some would say that staff tranquility must be maintained at all costs. Even if that means overlooking or downplaying some minor theft to keep the plant humming and the 'family' happy. Another major issue frequently encountered by the studio owner or management in an audio business is whether to salvage the dishonest employee. For some the question is, "just how dishonest?" For others, "just how crucial is the thief to the business?"

There are those who will say that if management does not institute suitable controls, they get what they deserve and that the offence cannot really be blamed on the offender. That probably stretches Yuppie business behaviour past the point of no return, even in the era of distracted management, but there are certain precautions that every audio business should take. These include adequate inventory, engraving each and every item in the facility with the company's name, painting all portable units and parts a distinctive colour, the use of electronic alarms, etc. And the very last point is probably the most relevant: if those who steal were to devote their energies to more conventional pastimes, there is no limit to what their potential could be. There is no end shown by the ingenuity of those who wish to purloin. It seems a shame that they did not place their frequently not insignificant talents to a more honest endeavour.

'Oh, what a tangled web we weave — when at first we try to deceive'.

Dolby Laboratories make no bones about announcing and demonstrating their new digital cinema sound system at an early stage of development. It works but has not yet been tested in the field to find out if there are any hidden flaws.

There are two ways of evaluating Dolby's early move: it could be to stymie Kodak's thrust on *CDS*, Cinema Digital Sound, or to give the film industry advance warning of an alternative system that they would have backed instead of *CDS* if only they had known about it early enough. Take your pick.

To recap, Kodak have worked for the last three years with the Optical Radiation Corporation of Asuza, California, on *CDS*. The area normally occupied by the analogue soundtrack is replaced by tiny black and white spots representing digital code. Both Kodak and ORC found they had been working separately on a similar system, so pooled resources.

CDS is a 6-channel system, like 70 mm magnetic; five channels of sound are spread across the screen and round the cinema, and a sixth channel carries deep bass for music and special effects from all directions. Two extra digital channels convey code for synchronising other equipment, such as screen curtains, laser light shows or even electronic musical instruments. *CDS* sound is coded to a similar standard as domestic compact disc (16 bit words streaming at 44.1 kHz) and all eight code streams are interleaved to create a single digital stream running at 5.5 Mbit/s.

For recording onto film, this single stream is sub-divided into 180 parallel streams, which are recorded in the soundtrack area as 180 very narrow parallel tracks. Each contains tiny black or white dots representing digital ones and zeros. Under a microscope the soundtrack area looks like a chess board.

The projector is fitted with a CCD sensor, with 512 individual light sensitive spots in a line lying across the film. The CCD remains stationary but however much the film weaves sideways while running through the projector, a block of 180 sensors can always align accurately with the 180 film tracks.

When the system was first announced Kodak talked of a new film emulsion, used on new stock *2374*, with resolution to capture the tiny digital bits of code. Kodak now say this is needed only for the negative used for recording (to allow use of red LEDs), and that conventional stock can be used for release prints.

CDS sounded very good when demonstrated with 70 mm film in Brussels in September 1990. The system worked equally well when demonstrated with 35 mm stock in London in July during the BKSTS film and television industry conference.

But right from the start, the Kodak/ORC sales pitch grated: "*CDS* is the ultimate sound experience," we were told in Brussels, "(which) can make every local cinema sound better than today's first-run theatres playing 70 mm Dolby Surround Sound."

The same things were said in London. And the

Barry Fox

Dolby give early demonstrations of their digital cinema sound system

same demonstration film was screened. This was written and features someone called Jerry Kramer who has an infuriating manner. He plays down Dolby's contribution to cinema sound over the last 20 years, states boldly, "*CDS* will be the format of choice for the next 50 years," and declares, "compared to *CDS*, ordinary film systems sound like two tin cans on a string." Kramer also tells how he saw *Apocalypse Now* in the superb *Cinerama* theatre in Hollywood and was stirred by the sound. His message is that when the film lost the power of its meaty soundtrack, it lost its overall impact, too.

True, but all Kramer's comparisons miss the same vital point. It doesn't matter whether a soundtrack is analogue, digital, mono, stereo or surround, if it is played in a theatre with inadequate amplification, budget loudspeakers and poor acoustics, the result would be the same — just as a CD played through a tiny loudspeaker will sound anaemic. Digital sound gives cinemas with the best sound systems the opportunity to make them sound better. It does nothing for cinemas that are cutting corners already. *(Often it makes matters worse — Ed.)*

Kodak/ORC have built CDS on the premise that it is impossible to record both analogue and digital soundtracks on the same print, with compatibility between digital and analogue projectors. Dolby started with the premise that the only way to make digital sound fly is to release single inventory prints that will play on either analogue or digital projectors. And Dolby wanted six tracks to match 70 mm magnetic.

First Dolby engineers tried putting a digital track on the edge of the film outside the sprocket holes, but this area is already used by some cinemas for ancillary equipment control, for instance opening and closing the screen curtains. Then they tried putting digital code in the black frame line at the top and bottom of the picture but in *Cinemascope* format films the frame line is so narrow as to be virtually non-existent. The next idea was to try putting the digital sound in the spaces between the sprocket holes. And this is the basis for Dolby's new *SRD* system.

The six channels of sound are first converted into digital code of studio quality, by sampling at 48 kHz and coding in 16 bit words. The encoder then reduces the data rate with a digital compression system based on psychoacoustic masking, as pioneered for digital audio broadcasting and already used by Dolby for its digital transmission system.

A loud sound at one frequency will always mask quieter sounds of the same or similar frequency. So the encoder splits the audible frequency band into several hundred separate 'frequency bins', each just a few tens of Hz wide. At any instant, some bins will contain no signal, others low level signal and others high level signal. The encoder dissects the sound in each bin, using the technique known as Fourier analysis, which relies on the fact that even the most complex sound signal can always be represented by a series of smooth sinewaves. The encoder then allocates each bin only the number of bits needed to code audible sounds.

This reduces the number of bits needed per second for six channels by at least 85%.

The encoder then breaks the stream of bits down into 96 blocks and records them in the hitherto blank areas of film between the sprocket holes.

The bits on the film appear as constantly changing black and white dots. The only modification needed to run a digital film is attachment of a CCD scanner to the top of the projector, as with *CDS*. The scanner delivers intermittent blocks of data, which the decoder assembles into a continuous stream and splits into six parallel sound channels and a data channel that carries at 9.6 kbit/s of code for automating cinema functions, for instance opening and closing the curtains and starting and stopping projectors.

Dolby Labs claim that existing film recorders can be used to print digital soundtracks, and for mass production these can be run at up to 20 times normal film running speed.

The sound is read 2.5 secs ahead of the picture. Some of this time is used for buffering and processing the blocks. The rest is used as a variable delay so that synchronisation between the picture and sound signals can be adjusted to suit the size of theatre and distance between the audience and screen and loudspeakers.

The system conceals minor digital errors by repeating the last block of data. If a series of blocks is damaged, for instance of the projectionist has wrongly laced the projector and damaged the sprocket holes, the sound system switches automatically to read the analogue soundtracks for as long as the damage lasts.

By running the same loop of film over and over again Dolby has shown that the digital sound is likely to last longer than the picture. Splices cause a brief moment of silence. It has to be said the results are truly remarkable. Dolby say it will soon upgrade the coding system to 18 bits.

Dolby will secretly release a film in digital format this Christmas, without telling anyone, to see if there are any unforeseen problems. The first announced release will be next spring, with the likely start of an industry switch to digital releasing in the autumn of 1992.

Now that Dolby has offered a single inventory digital system, which is compatible with analogue film projectors, it is hard to see how Kodak and ORC can carry on with *CDS*. There just cannot be any future for a double inventory system if similar results are available from a single inventory system.□

Uptown Audiomation

Patrick Stapley reviews a console automation system

Uptown is perhaps not the first name that springs to mind when people talk about moving fader automation, but nevertheless this American based company is beginning to make in-roads into an increasing number of facilities including the prestigious London post facility, Magmasters, who have installed two systems into DDA consoles.

British design consultant David Pope who has been actively involved in the system, explained its background.

"The design began about three years ago, when a studio in Colorado, called Colorado Sound, commissioned a moving fader system from software designer Andy Smith. He and his partner, Richard Shelquist, put the system together to suit Colorado Sound's requirements, which meant that right from the very beginning Uptown had a studio in which to beta test its software. The English company, Audiomation, became involved about six months after the preliminary testing, financing the company and assisting it with marketing and design direction. They were responsible for bringing the product to the marketplace by showing it at exhibitions and getting feedback from prospective users — finding out exactly what people wanted from the system. So over the last two years it's been in a constant state of enhancement and upgrade, and every

single addition to the software has immediately been put into Colorado Sound to test it — this continual appraisal of the software has been a gradual but very necessary process to refine the system into the mature product it is today."

Uptown goes beyond being purely a fader and switch automation system by providing machine and MIDI control features. Machine control including cue points and autolocate functions are available when the system is interfaced with a synchroniser such as Adam Smith's *Zeta III*. The component parts of a standard system are — up to 96 motorised channel fader modules and stereo master fader module, one fader interface PC expansion card per 32 channels, a MIDI interface PC expansion card, 386 *AT* compatible computer with two megabytes of RAM and a 40 megabyte hard disk, a 5.25 in floppy drive, Qwerty keyboard, mouse or tracker ball, 14 in high resolution VGA colour monitor, automation power supply, software and interconnecting cable. Apart from the power rail there is only one small twin screen cable (serial data) per group of eight faders, which results in very compact and lightweight cabling. Uptown uses a distributed processing system which is one of the reasons it can run on a standard *AT* computer due to the processing being spread out per channel rather than being concentrated centrally. The system can be

installed into most consoles in a day, although it will take longer where more complex modifications are required — for example Uptown was recently installed into a Harrison *PP1* film console at Warner Brothers, where the digital logic on the input and group modules had to be totally replaced to accommodate automation of nine switches per channel; also twin motor faders had to be installed in each single group module to match the existing console architecture.

Fader modules and modes

The fader currently being used is made for Audiomation by the Japanese company TKD. It operates using a drum and wire arrangement — the fader is secured to a loop of nylon coated stainless steel wire which in turn wraps around a drum; depending on the direction and speed at which the drum rotates, the fader moves accordingly. The 10 bit fader is divided into 1024 linear segments with a resolution of 0.1 mm, and has a top to bottom speed of 80 ms. Originally the system was to offer a choice of faders — the *System 2000* incorporating the TKDs and the *System 1000* the OmiTrac linear motor fader. Although the OmiTrac had the advantage of containing no wearable parts, it was in the end considered unsuitable due to magnetic field problems and poor fader matching. However, OmiTech, the company manufacturing the fader, has now gone into liquidation and the product is back with the original designers, who have made and are in the process of making further improvements; so there is a good chance that OmiTrac may be used in future systems. Also available is the option of P&G motorised faders.

To the left of each fader, are the local controls and indicators. These comprise an Auto/Ready button, Write button, On and Off buttons which operate on the selected switch bank, and associated LEDs including null indicators. There are five operational modes — Manual, Auto, Ready, Write and Trim (there is also a Trim Controller mode which will be discussed later). All modes can be entered and exited at any time during a mix, either from the local controls or globally (except for Trim). For an explanation of the modes and their associated local switching and indicators see **Table 1**.

When a trim or write mode is exited the fader will automatically null to the previous position at a user specified speed (0-1000 dB/second). A Trim Hold function is provided to enable trimmed levels to be written to the end of a mix without the need to play the tape all the way through.

Channel cuts are controlled, like the other channel switches, by the momentary On and Off buttons on the fader module. These buttons are globally assigned to control one bank of switches at a time — so if the Mute bank has been selected, the On button will activate the cut, and the Off button will de-activate it; the terminology here is at first slightly confusing as the On button actually turns the channel off, but this is one of the trade-offs encountered with assignable

Evaluation system on DDA console at Magmasters, London
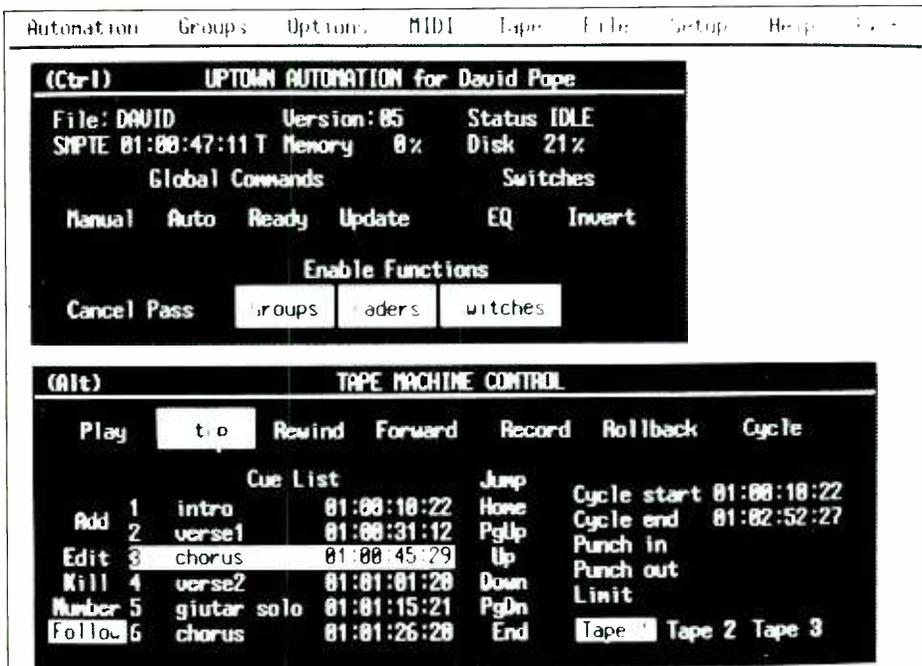
Audiomation point and select screen

controls. Like the fader, switch data can only be written once a channel is in Ready mode, no data will playback nor be written in Manual, and switching can be auditioned in Auto — but in Write, the situation is different and switch data will not be automatically overwritten as with the fader. The reason for this is the rather ingenious way in which the On/Off buttons deal with updates. If for example during a mix, the section of cuts needs to be removed — all that has to be done is to make sure the channel is in Ready, and at the desired point press and hold the Off button for the duration of the section. This Auto-Override function provides an extremely simple method of overwriting/updating switches and avoids having to isolate faders from cuts, and the need to drop in and out of statuses. Switches can also operate in an Inverse mode to produce solo type effects, and an Invert Mask facility allows channels to be removed from this switching.

The standard system has four dedicated switch banks, which apart from channel muting could

typically include EQ in/out, insert in/out, and monitor muting — it's the client's choice when the system is installed. Additional switches can be automated optionally, as illustrated by the Warner Brothers console mentioned earlier. All associated LEDs will operate as normal during automation, and the console switches themselves remain operative in a manual sense, without transmitting data to the computer. Switches are scanned once every quarter frame.

Screens and keys

The majority of the main screen is taken up with two large windows — Automation, and Tape Machine Control — there is also a Time Code display window, and a menu bar that runs across the top of the screen. The Automation and TMC windows, contain a number of small command boxes or 'buttons' that are clicked on/off using the left button on the mouse or by typing in the

		Buttons		LEDs		
MODE	FUNCTION		WRITE	AUTO (Green)	READY (Yellow)	NULL (Red)
MANUAL	Fader disconnected from automation	Long Press	—	Off	Off	Off
AUTO	Plays back moves New moves may be auditioned without overwriting	Brief Press	—	On	Off	Off
READY	As AUTO but new moves are recorded. Fader automatically returns to previous position on release	Brief Press	—	On	On	On
WRITE	Previous moves are overwritten and replaced with current data	—	Press	On	On	On
TRIM	Previous moves are trimmed relative to new position of fader	Hold	Press	On	On	Flash

TABLE 1: Audiomation modes and associated local switching functions

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The Audiomation fader panel

when it is based on tach (TACH). A local zero facility has also been recently added to the system.

These then are the windows that make up the basis of the screen and on top of which the other windows, boxes and menus are overlayed. The menu bar at the top of the screen provides access to the various pull down menus — Automation, Groups, Options, MIDI, Tape, File, Setup, and Help — these menus can only be accessed when the automation is not running.

The F keys on the keyboard, apart from F1 which is mentioned is the Help key, operate as 'smart' keys to which single commands or strings of commands can be assigned (Macros). These macros are itemized in a list and up to 18 can be stored and assigned to F keys. An extension of this is an optional control panel designed to fit into the console which contains 16 buttons that are assigned to perform regularly used functions such as transport control, switch bank selection, etc.

Saving and loading

Mixes are stored as Versions, in Files that represent songs, which are part of Directories which represent projects. A new mix will exist as version 1 in RAM and will be updated by each pass (unless the Cancel Pass key is used); once it is stored to hard disk as Version 1, the working mix in RAM will become version 2 and so on. Mixes are stored to hard disk in two ways, either by a Save Mix command from the Automation Menu, or by Auto-Saving which in turn operates in two ways. The first type of Auto-Save allows the user to program the number of minutes and the number of passes between automatic saves — whichever occurs first will trigger the computer to save the current mix (providing it differs from the previously stored mix) and so automatically build up a store of mixes. A pass is registered each time the tape starts and stops irrespective of length. The second method works in a similar manner although it has a 'safety back up' feature that works by continually updating and saving the mix over the programmed time span at the end of which it is stored as the next Version and the process begins again — this method means that the most recent mix will always have been saved to hard disk. Mixes can also be saved at any time during Auto-Save with the Save Mix command.

Saved mixes are viewed and accessed via the mix file versions list, where they are identified by number, a 12 character name and their precise time and date of storage. When a mix is selected it will be loaded along with its cue list and MIDI patch list. Two mixes can be compared in real time, with almost instant A/B switching.

Groups

Uptown have adopted the 'assignable master and slaves' approach to their moving fader and switch groups. There is no limit to the number of groups the system will support, and sub-groups and overlapping groups are accepted. Groups are created either as fader or switch groups, there is no single operation to create a combined fader and

highlighted letter in the button from the keyboard. This procedure is used throughout the system, and context-sensitive on-line Help is always available by pressing the right button on the mouse or the F1 key on the keyboard.

The Automation window displays the name of the current mix file and the directory to which it belongs, and the name and number of the current mix version that is loaded; also shown are the percentages of used RAM and disk memory, and one of five states of readiness — Off (no mix loaded), Idle (mix loaded but no timecode present), Pre-Roll (mix loaded, timecode present and tape parked before the start of the mix), Chase (mix loaded and program chasing to current timecode position), and Run (automation running). The Automation window contains the global switching for the various automation modes including Trim Hold, and assigns the current switch bank and inverse operation. Groups may be globally disabled from here, and faders and/or switches can be turned off to isolate them from modifications — ie some users prefer to write mute data before entering fader moves. A Cancel Pass button prevents the current pass data from being saved in RAM as long as it is switched before the tape is stopped.

The Tape Machine Control window contains the usual tape transport buttons and includes rollback and cycle; automatic drop-in/out times are displayed as well as the Limit time through which the tape will not be able to pass — to prevent spool-off or timecode run-off. The cue list is permanently displayed here but with only room for six cues at a time, which is a little restrictive considering up to 500 can be entered. To view the list, buttons are provided to move it in either direction by one or six cues, and to locate the beginning and end — the list will also scroll automatically with timecode. Cues are created by 'grabbing' the current timecode; they are automatically given a number and can be named (although not when the automation is running), this name cannot be used to define a cue. Existing cues can be edited both in terms of time and ID,

and off-line cues are created by adding a wild cue to the list and editing its timecode. Cue points are located in two ways — the more usual method is to simply select and click on the desired cue from the list (a double click will instruct the synchroniser to put the machine into play once it is cued); alternatively the Jump button may be selected — this produces a box in which the cue number is entered (if automation is running the tape will stop once Jump is selected). Both methods may also be used to directly transfer cue times to command boxes, and if a box containing a timecode field is present on the screen, this function will take precedence over tape cueing. As the cue list is displayed in timecode order, it's quite likely that the numbering of cues may run out of sequence: to address this, a Number function will renumber the cues in relation to time. Another feature of the TMC window is that it allows up to three machines to be enabled/disabled from synchroniser control.

The timecode display was until recently incorporated in the Automation Window, but a bigger display was felt necessary so it now has its own window. Timecode can be displayed either in h:m:s:f or in feet and frames — both hours and frames can be removed from the readout if required. The system automatically recognises and adjusts to the type of code on tape and displays the format ie EBU, SMPTE, DROP etc; it also alerts the user when the displayed timecode is being generated by the automation system (GEN), and

Manufacturer's comment: The review discusses the Linear Motor fader to be used in our *Series 1000* automation system. The launch of this product has been held up due to the demise of OmiTech Circuits who were manufacturing the product for the patent owners Outboard Electronics. This difficulty has now been resolved as well as the problem with magnetism (by use of newer materials) so we have the latest production samples on test in Colorado now.

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switch group. Once in the Group menu the Auto/Ready switches on the fader modules operate as group master selectors; having designated a channel as master, the fader heads or the On buttons are touched/pressed to attach the slaves. As a group is being set up the null LEDs will provide confirmation — both LEDs lit represent the master and a single LED its slaves. There is also a View Groups feature that identifies all the current groups set up on the console by using the five fader module LEDs to distinguish group type, masters and slaves. Switch groups can contain 'toggle' slaves which switch inversely to the master — these are set by selecting the Off button rather than the On button when forming the group. Groups are deleted by selecting the Auto/Ready button on the master and then pressing it a second time. Unlike some of the more popular systems, the grouping function is not monitor based — that is to say that all fader and switch data is written rather than just the master data; so once a group is disbanded all moves and switching will remain intact without the need to perform a group merge or coalesce operation. The current set of fader groups can be copied to make identical switch groups and vice versa, but in so doing any previous group setups are lost. I have to say that I think the system could be improved by giving the user the option of combining faders and switches when the group is first formed — a simple menu containing Faders and Switches, Faders Only, and Switches Only wouldn't be such a bad idea. Another point to remember is that a switch group will affect all the switch banks, so if a group has been formed to specifically control channel mutes, it will also be operative for the other switch banks once they are selected — it is the on/off buttons that are grouped not the individual functions.

The problem of trimming a fader whilst in motion (VCA style) is addressed by slaving it to a group master fader that has been switched into Trim mode. The master fader now becomes a Trim Controller directly affecting the relative level of the slave, and automatically moves to 0 dB on the fader scale to provide a precise point of reference for positive and negative trimming. The moves made on the Trim Controller are not written to the computer, so any previous movement will be reinstated when the fader is returned to normal operation, but ideally it is better to use free faders as Trim Controllers.

Off-line editing

Both faders and switches can be edited off-line. A switch event list allows switch events to be inserted, moved, or deleted for single channels or groups of channels. Faders can be trimmed off-line between two time code points by a dB value accurate to two decimal places. Different versions of a mix may be edited together to form composites, and sections can be time-slipped but only one edit is possible at a time. Specific faders and/or switches may be included or excluded from mix edits, and a crossfade time entered in frames.

Snapshots of static fader settings are stored like mixes in files within the current directory; they contain only fader information, which limits the usefulness of this facility, especially considering Uptown's multi-switching capability. Snapshots are set either by using the Pre-set function that immediately restores them to the console, or by entering a timecode point. Using the latter method, selected faders may be included or excluded, and a crossfade implemented by entering the start and end times; there is also a programmable Hold time that freezes the faders in their final crossfaded positions at least until this timecode position is reached. Two types of crossfade are available — linear or dB.

Automation data can be swapped or re-assigned between channels via a special matrix found in the Set-up menu — this makes allowances for faulty channels or console re-arrangement.

MIDI

Uptown supports the following MIDI patches — Note On, Note Off, Patch Change, Controller Change, and Raw Patch. A MIDI patch list is stored in each mix file and can be copied to a separate SMF (Standard MIDI Format) file within the system to allow MIDI setups to be transferred to new mixes — stored patches may also be modified or deleted. Any fader will perform as a MIDI controller with its value being translated to 14-bit MIDI instructions for controlling parameters — for example the decay on a reverb unit could be directly controlled from a fader, and thus become automated without the need for a sequencer. Switches will also perform MIDI on/off operations, but only the first 16 are operative — this being a hang-over feature from interfacing the system to Waveframe's *AudioFrame*. Program changes are implemented by entering the time code, MIDI channel, and patch number into a Patch Change screen.

An enhancement to be made available in future software, will provide the ability to translate MIDI volume data created on a sequencer into moving fader data.

Conclusion

In general this is a well designed system; like the best automation systems, the user can be up and running very quickly, and with the aid of the extensive Help pages and the logical way in which the system has been put together, familiarity and a more comprehensive understanding come easily. Uptown also contains some unique and worthwhile features like auto-saving mixes where the user can set up his exact requirements, and the auto-override function which must be the simplest method of updating switch data in any of the professional systems. On the down side, there are a few areas that could be improved, such as incorporating switches into snapshots, and having a more flexible grouping system; but taking into account the company's very open attitude to suggested improvements, and their commitment to refine and enhance the system — I see no reason why Uptown shouldn't become a popular system.

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