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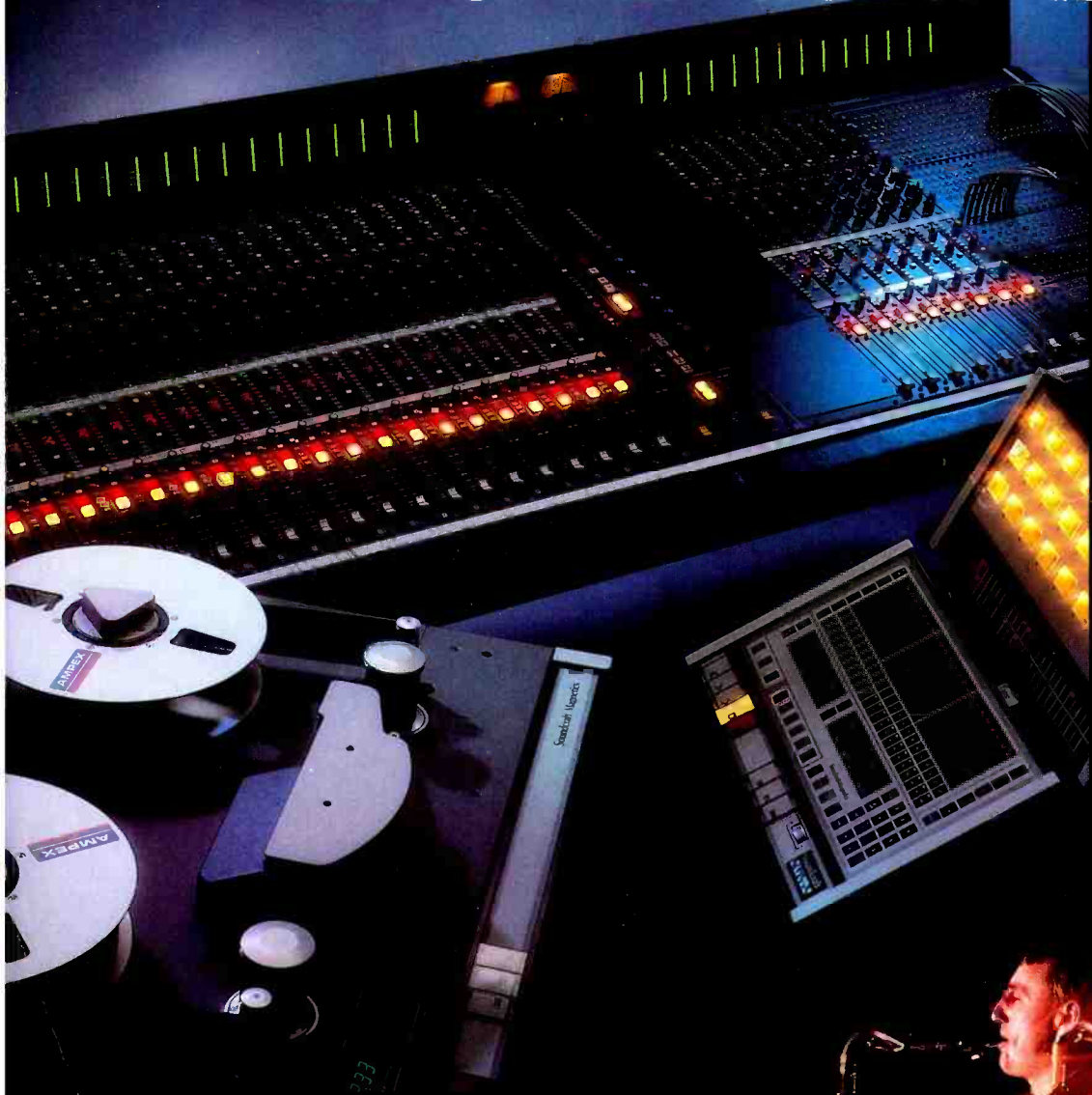
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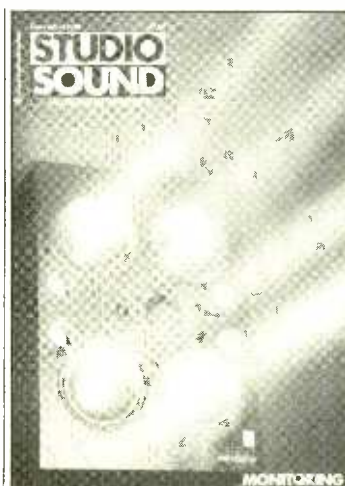
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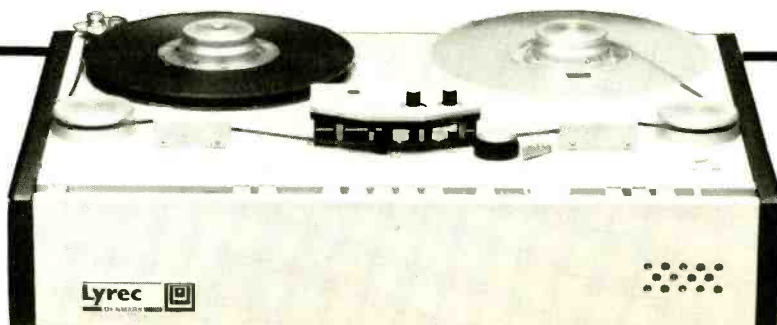
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EDITORIAL

This month's comment from Keith Spencer-Allen

Let's See Action

Just over one year ago we announced our intention to carry reviews of monitor speaker systems. In the November issue of *Studio Sound* we carried our introductory article on the style that the reviews would take.

It was nearly three years ago that we considered the time was right to start monitor loudspeaker reviews. We started approaching the major manufacturers with the idea and the response was mixed to say the least. But the one reply they had in common, regardless of their attitude was their parting shot, "We will be interested to see what you do."

Slowly the approach we wanted to take to the reviews became clear. We felt the 'traditional' approach to speaker measurements was not what we wanted as there did not appear to be a full correlation between what we were hearing and the measured response. The measurements definitely had to be time related. Further discussions with manufacturers, designers, et al, led us to the conclusion that whatever we did there was no pleasing everybody. However, our original feeling that there was a need for such reviews was still valid. Studio owners in locations remote from suitable dealers or suppliers were still asking us for information about different monitors and we were only able to refer them to the manufacturers as there was no independent comment available—anywhere!

Just over a year ago in the November issue we laid out our proposal for the reviews and set about seeking the participation of the major manufacturers. Again the flak rolled in and we made our rounds of the interested parties and they went away and considered our proposals. Gradually they came back to us agreeing to participate or not as the case may be.

This issue sees the first of the reviews. It has been a long time coming but I believe that they will be worthwhile. The first review is the Tannoy *FSM*—Tannoy was the first to respond positively and for this we thank them as it revived our slightly flagging enthusiasm when it seemed nobody

wanted to agree with us. Tannoy is not alone as we have now completed reviews of monitors from UREI, Westlake and JBL and these will be appearing in the near future. We will continue to review as many of the large monitor systems that are available to us.

One thing we have always said about the reviews is that our procedures are not cast in stone—we are open to modifying them should there appear to be a need although we are confident we are right at the moment.

Finally, I would like to say to all those manufacturers who have not agreed, as yet, to submit their products for review that we fully understand their caution about such ventures—we have felt the same at certain times in the formulation of this review procedure. Please look at the way we are reviewing and the type of conclusions that are drawn and then think again.

To readers who may wonder why certain monitors have not been reviewed we must say that in general the manufacturers of these systems have very understandable reasons for not wishing to participate at the present and this should not really be seen as any reflection upon their products, just on their feelings about our own ideas.

In an editorial last year I stated that we have never reviewed loudspeakers before. Several long time readers with excellent memories then wrote and telephoned to say "Oh yes, you have." Therefore, please accept my apologies to all of you who may have been misled because in 1972 we did actually review a couple of speakers and so I was technically wrong.

This really brings us to the subject of end of the year, this being the December issue. May I suggest a good dictum for 1987—Nothing is ever that certain. A feeling that is very appropriate for the year ahead and the continuously altering attitudes to recording and the technological changes that we can expect in the coming year—almost for sure (or certain?).

STUDIO SOUND

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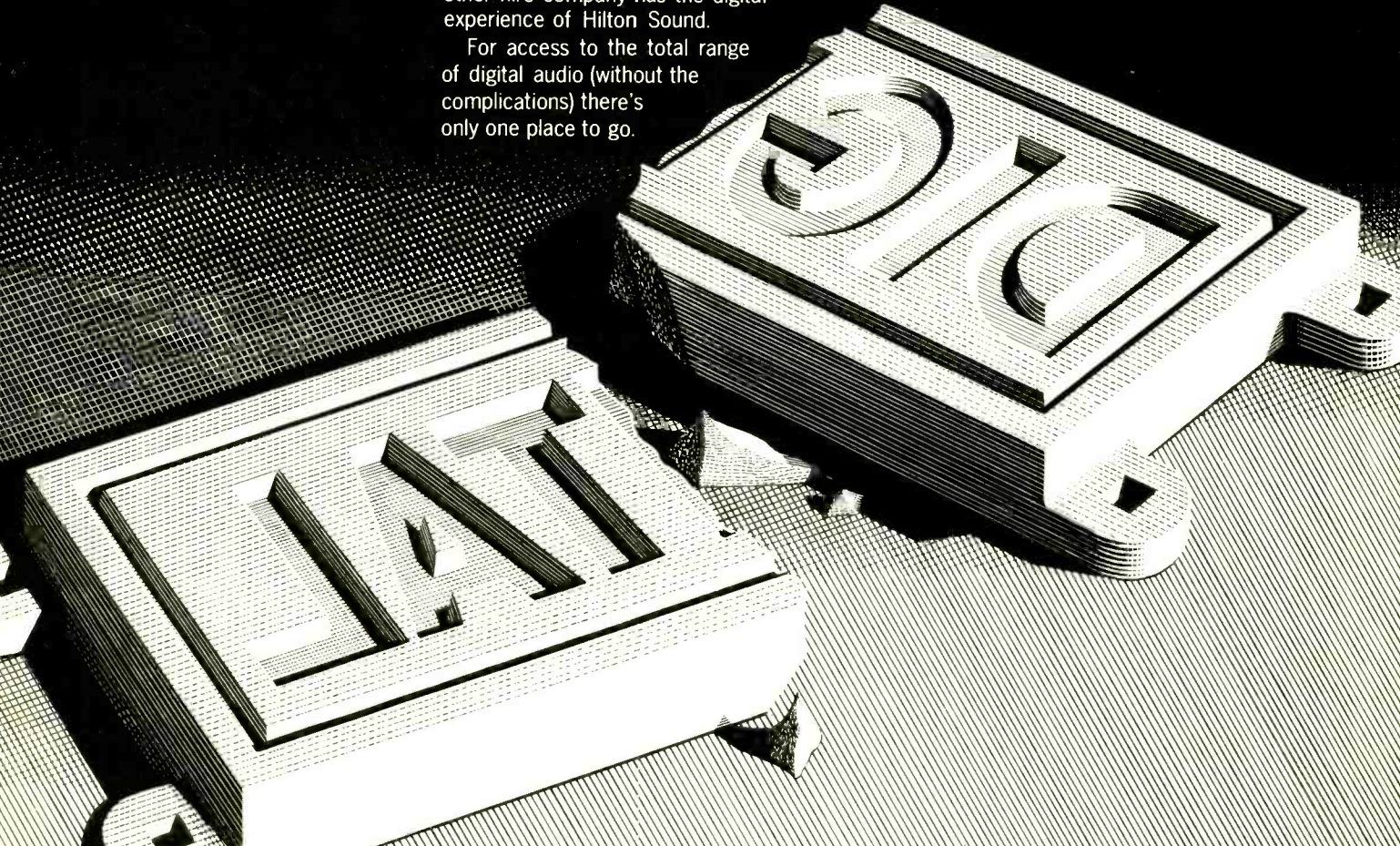
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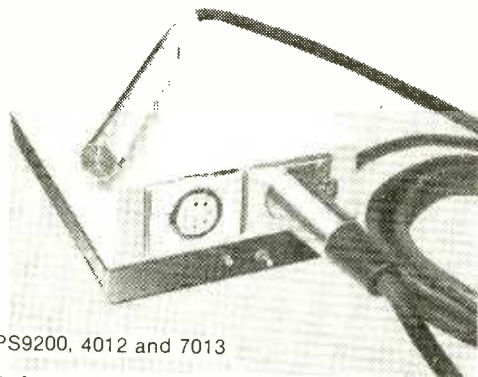


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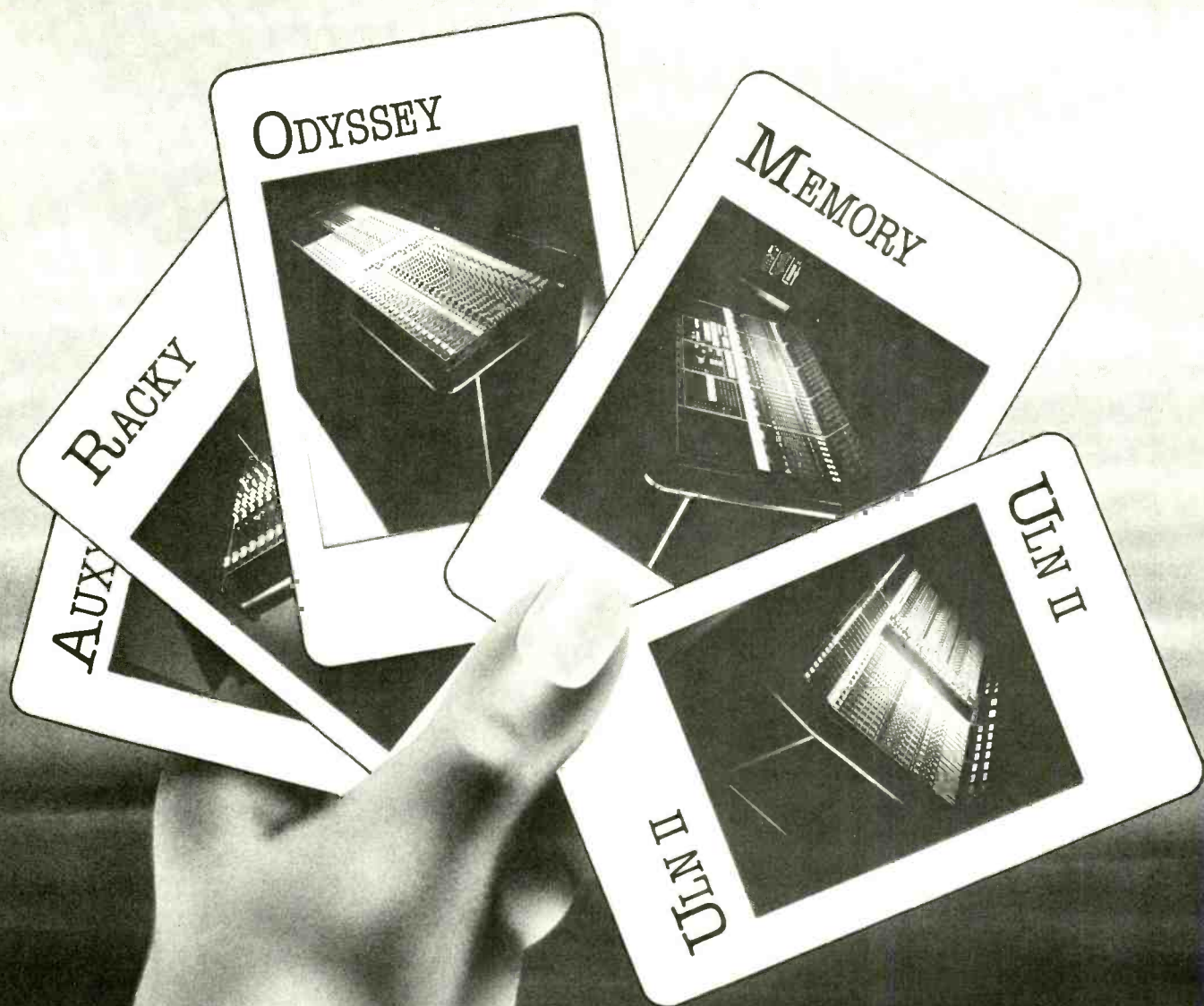
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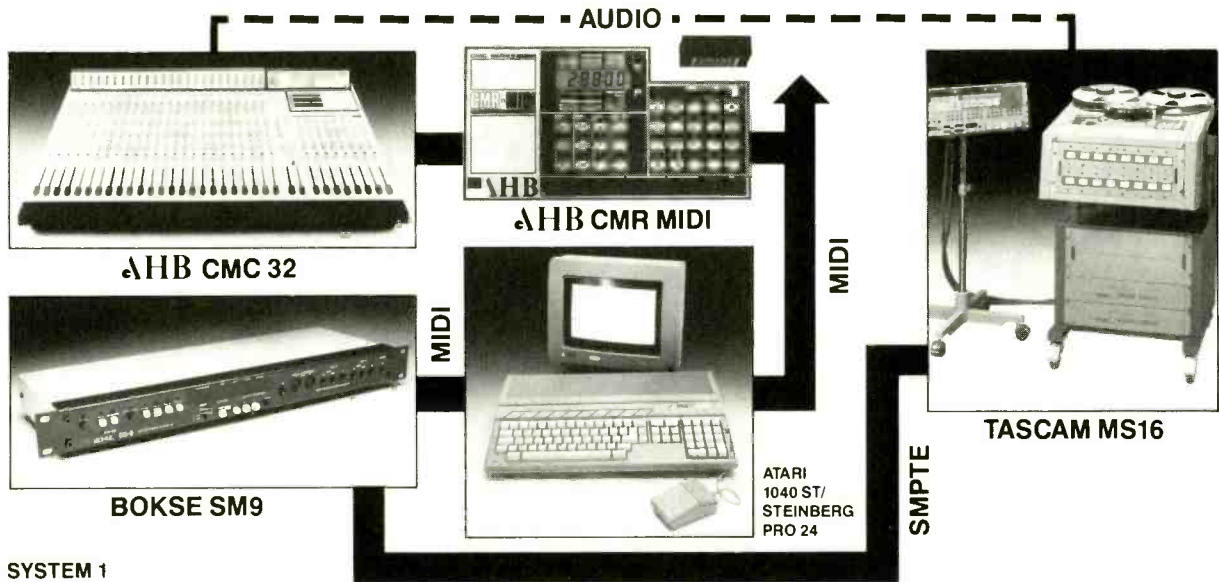
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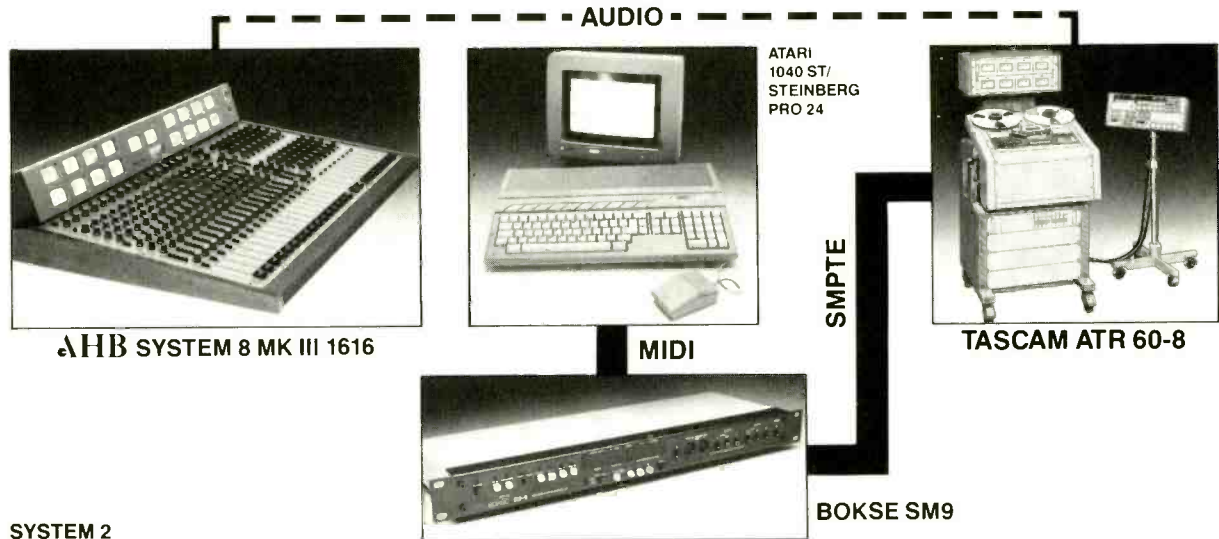
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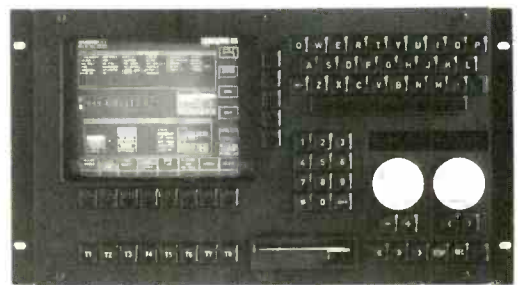
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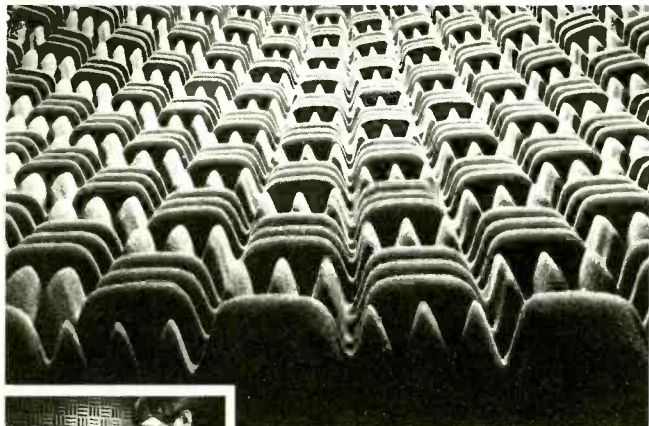
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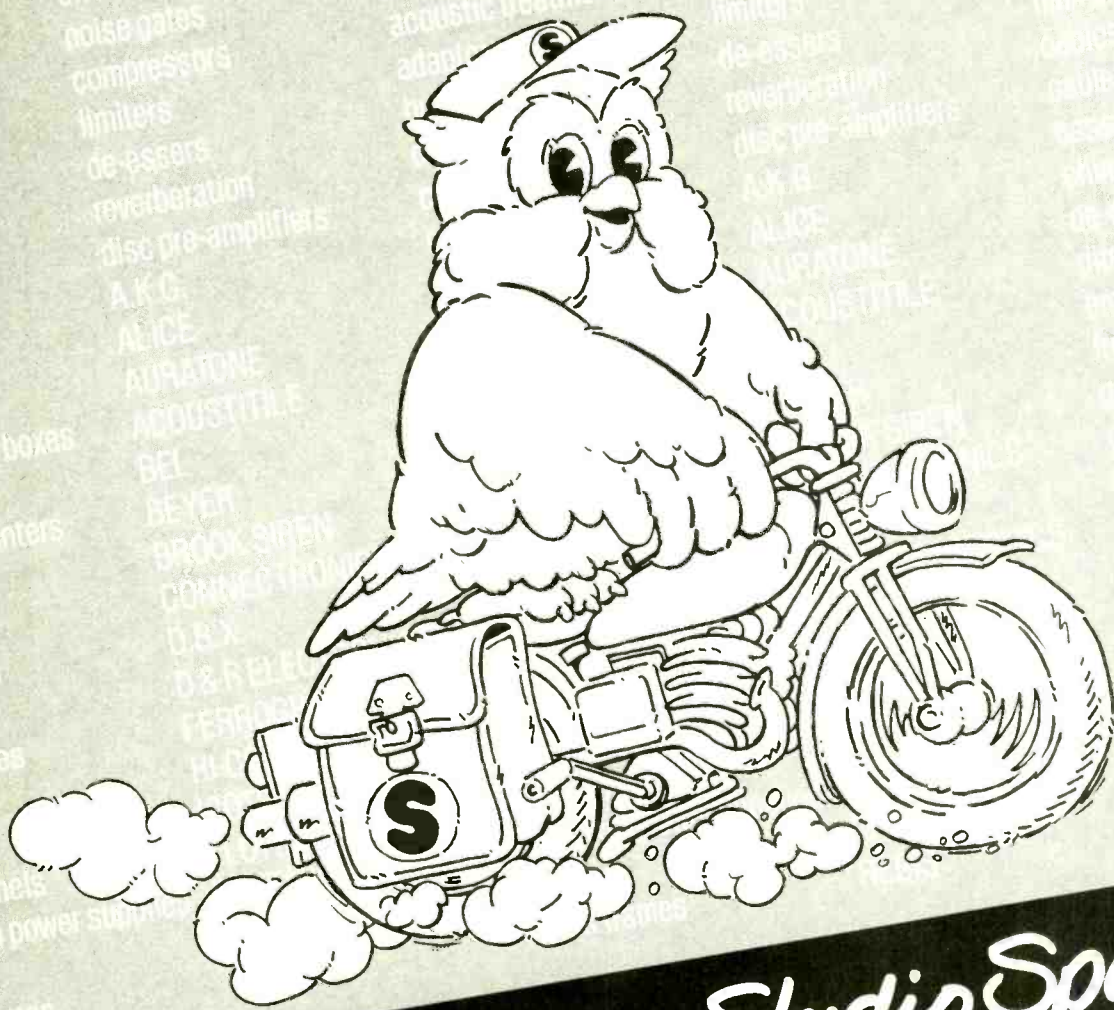


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Sony Professional Audio Department, Sony Broadcast Products Company, 1600 Queen Anne Rd., Teaneck, NJ 07666.
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IF ANY OTHER "ONE BOX" SYSTEM WAS THIS ADVANCED, AND THIS COST EFFECTIVE, AND THIS WELL BUILT, WE MIGHT HAVE SOME COMPETITION.

HOW ADVANCED?

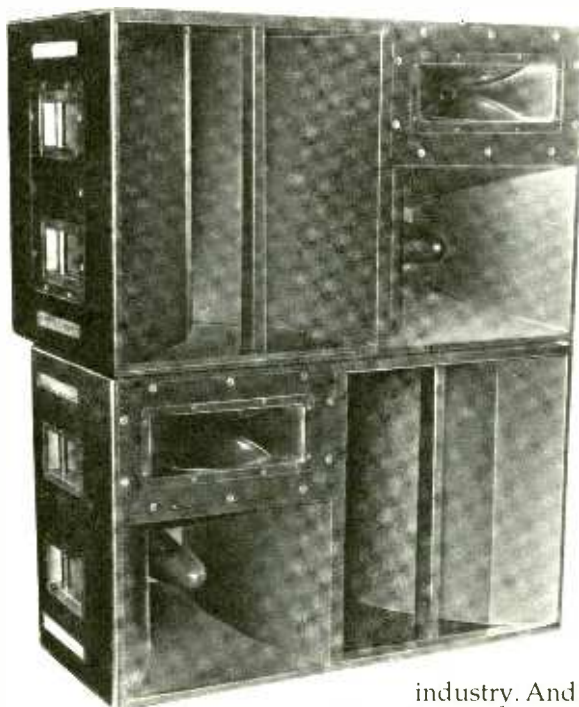
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EAW is the largest manufacturer of "One Box" systems in the United States and our large computer controlled wood working stations enable us economies of scale no other system manufacturer can compete with. As a result EAW's KF Series "One Box" systems offer more performance per dollar than any competitive system. But the real bottom line for rental companies is return on investment, and this is where EAW has no competition. As a result of our reliance on sound engineering, not fad design techniques, our systems remain competitive for a long time. In fact EAW's first "One Box" systems built in 1978 for Carlo Sound are still in demand today, and Carlo Sound is still getting returns on their investment while lesser competitive systems have been long retired.

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EAW KF Series are built from the finest materials available, including - exterior surfaces made from 18 ply to the inch cross-grain laminated European birch with the highest sheer strength of any commercially available wood product - horn flares injected with high density polyurethane foam for absolute acoustical integrity - high



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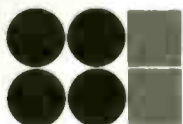
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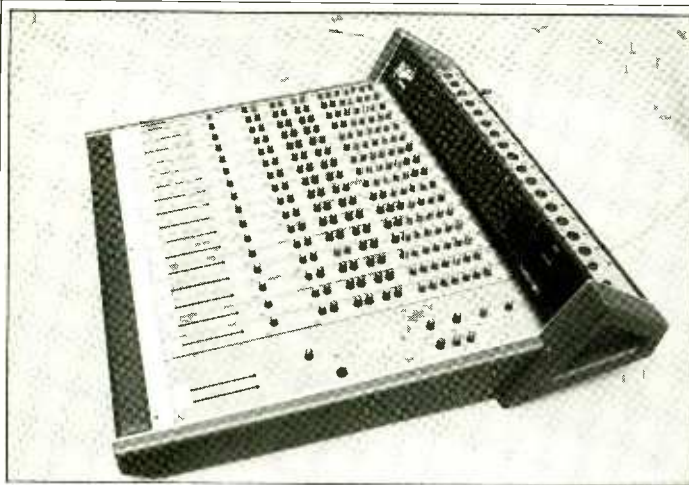


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Soundtracs Midi series

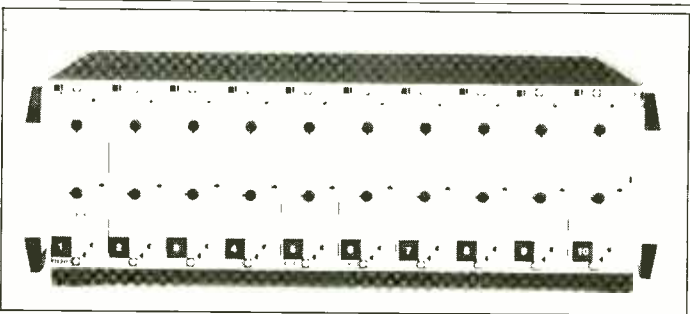
Claimed to be the first of its kind the Soundtracs *Midi* series is a MIDI intelligent in-line console with either a 16- or 24-input/output module mainframe with 16-track monitoring and 16 subgroups. The *Midi* series has 32 or 48 MIDI controlled inputs with additional MIDI control on four auxiliaries, plus eight optional MIDI controlled effects returns.

Unlike some currently available consoles which claim to be MIDI compatible the *Midi* series does not require

an external computer. The built in microprocessor enables straightforward programming of the console and can be designated to any of the 16 MIDI channels currently available. Additionally control of external MIDI effects may also be programmed from the console.

Soundtracs plc, 91 Ewell Road, Surbiton, Surrey KT6 6AH, UK. Tel: 01-399 3392.

USA: MCI-Intertek Inc, 745 109th Street, Arlington TX 76011. Tel: (817) 640-6447.



EMS DAC interface

EMS has introduced a DAC/voltage processor system which makes computer control of any voltage-controlled equipment possible. The system has been designed to overcome the problems encountered when trying to match the different voltage control characteristics of equipment. This is achieved by providing a comprehensive voltage processing facility which gives the user total control of parameters.

The system is housed in a freestanding or rack-mounted 3U case which will hold up to

10 fully independent DAC/processor plug-in modules, multiple regulated power supplies and buffer protected interface inputs. Each unit can be daisy-chained to provide as many control voltage outputs as required and any 8 bit computer possessing an interface connector can be used to control the system via an interface lead and box.

EMS-Rehberg, Finkenstrasse 4, 7257 Ditzingen-Heimerdingen, West Germany.

Sony PCM-3402 digital recorder

Sony has recently introduced the first 2-speed/2-channel ¼ in DASH recorder. The machine provides extended playing time at 19.05 cm/s (DASH-S) format and standard play in the 38.1 cm/s (TWIN DASH) format. In addition to the digital audio tracks there are two cue tracks for manual editing, a track for timecode and one for reference and control signals. Sampling is at 44.1 and 48 kHz with a claimed frequency response of 20 Hz to 20 kHz (+0.5 dB, -1 dB) and a dynamic range of over 90 dB.

By connecting two machines it is possible to achieve high precision electronic editing with better than 1 ms accuracy. Additionally the 3402 incorporates a 16 Mbyte solid state memory which allows 12 s portions of 16 bit linear stereo to be used to rehearse editing points. Level changes during dubbing and editing are achieved in the digital domain.

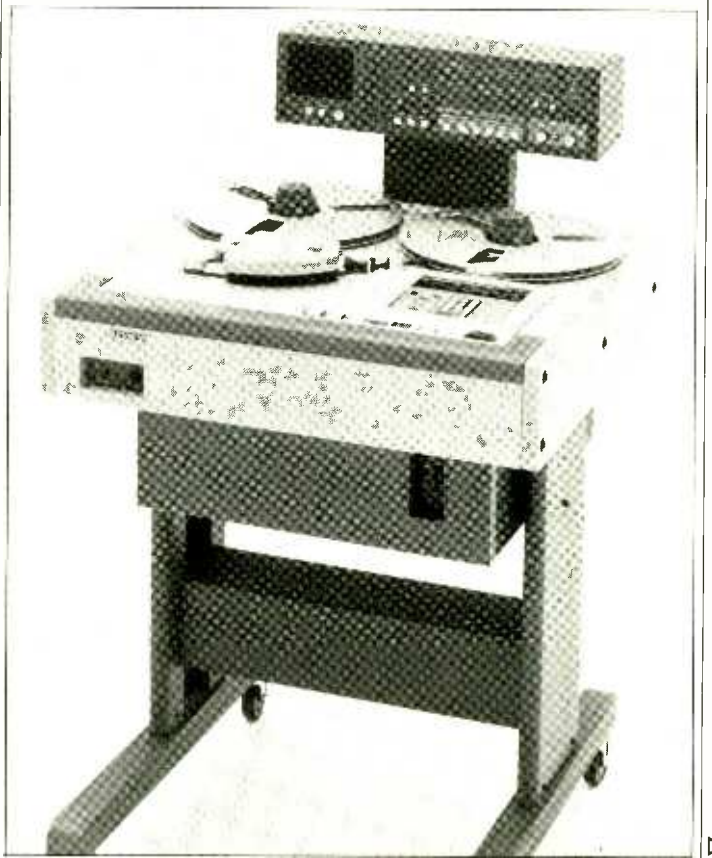
The *PCM-3402* has been designed for flexible

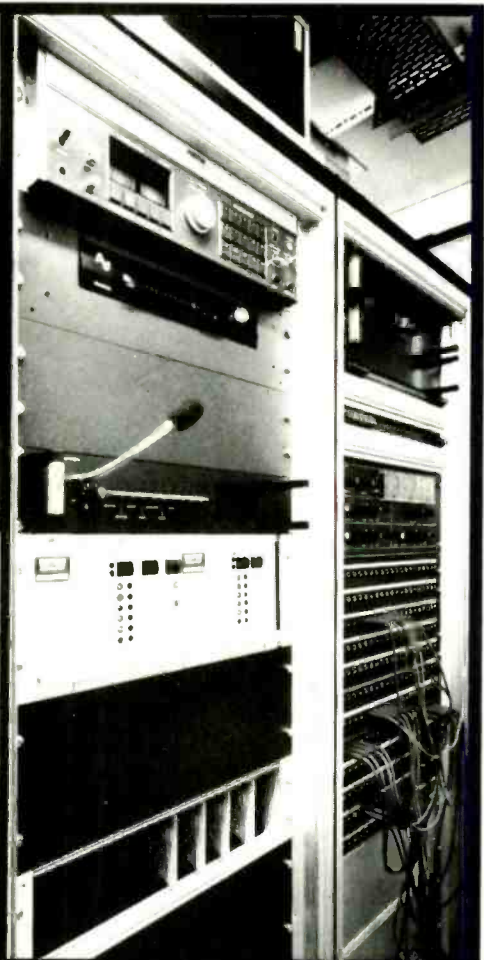
synchronising and includes a built in timecode reader and generator. Synchronisation accuracy (using the built in synchroniser) is better than 0.4 ms. The machine can be used for chase synchronisation in addition to synchronisation between two different types of timecode. Other features include composite inputs for NTSC, PAL and SECAM; nearly three hours of record/playing time with 12½ in reels; two remote control inputs (parallel and serial) ensuring compatibility with existing control systems and various analogue and digital (AES/EBU, Sony 1610/30 format) inputs/outputs.

Sony Corporation, PO Box 10 Tokyo AP, Tokyo 149, Japan.

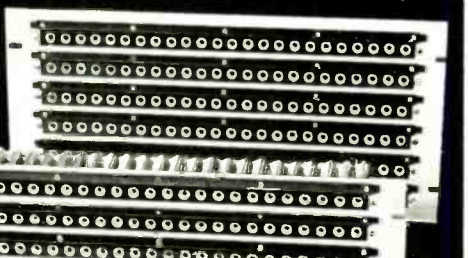
UK: Sony Broadcast Ltd, Belgrave House, Basing View, Basingstoke, Hampshire RG21 2LA. Tel: 0256 55011.

USA: Sony Corp of America, Professional Audio Division, Sony Drive, Park Ridge, NJ 07656. Tel: (201) 930-1000.





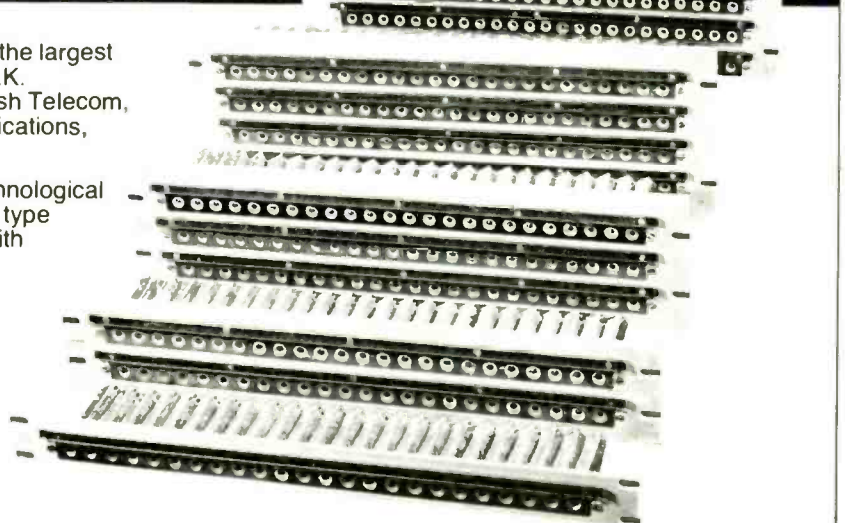
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Equipment, modifications, options, software

Richmond automation systems

Canadian-based Richmond Sound Design has created an automation system that provides both real time and disk-based memory control of volume level, fade up/down rate and analogue switch settings in up to 4096 separate audio channels. According to the manufacturer, virtually thousands of external devices such as tape machines and intelligent peripherals, can be controlled using the proper interface. Operation is extremely friendly and is optimised for both theatre applications involving large software configurable input/output matrices with rapid sequential cue changes, and commercial systems with relatively dedicated configurations requiring widely distributed, flexible real time control.

Command/Cue software is disk-based. Two versions are available, the 4096 for use with the Commodore *Amiga* and the 1024 for the 64. The complete system comprises computer, CF-20 card frame, power supply, digital bus decoder/driver (DBD-24) and various automation system modules.

Digital modules currently available include Auto-Pan, attenuator (DCA-8); master fader (DMF-8) and switch modules (DSM-16 and

DSM-128). Among the analogue devices are a distribution amplifier (ADA-6); mic splitter (ADA-6M); dual splitter (ADA-6S); Auto-Pan (AP-3); equaliser (EQ-** customer specification); graphic (CEQ-14); line amp (LA-8) and various voltage controlled amps, crossover and 4-input mixers.

The system allows for a 90 dB level range either in 60x1.5 dB steps or 240x0.375 dB steps in addition to fully muted. Sixty different fade times (from 0.1 to 94.5 s) are available within the software. Signal to noise is quoted as better than 100 dB and distortion less than 0.03%. Analogue switching and level changes are noiseless, glitch-free and are directly controllable within microseconds from software controlled by manual or programmed instructions. A special demonstration disk (for the Commodore 64) is available which provides examples of all the basic software functions.

Richmond Sound Design Ltd, 1234 W 6th Avenue, Vancouver, British Columbia V6H 1A5, Canada. Tel: (604) 734-1217.

USA: Listec Television Equipment Corp, 30 Cain Drive, Plainview, NY 11803. Tel: (516) 694-8963.

Platinum monitor console

Platinum has introduced a monitor console option to the *Level IV* range. The new development incorporates the P53 12-bus monitor mixing module and is available in three frame sizes (16/12, 24/12 and 32/12). An optional meter bridge with individual input bargraphs is also available.

Standard features include 48 V phantom powering, -30 dB pad, phase reverse, solo on all inputs and a -6 dB

feedback chaser button. The EQ has been specially tailored for monitoring and includes ± 16 dB, 3-band, all peaking parametrics. Each channel has separate mic and line inputs which can be actively mixed on the channel if required before the signal is routed to the active balanced output.

Platinum, 159 Park Road, Kingston-upon-Thames, Surrey KT2 6DQ, UK. Tel: 01-549 9130.

Software prototypes and updates

• A free update of software (Level 1, Revision 2.0) is available to all existing customers of the Audio Kinetics *Eclipse* system. The

new software allows a more comprehensive loop editing mode, recall and event listings giving more flexibility to the user.

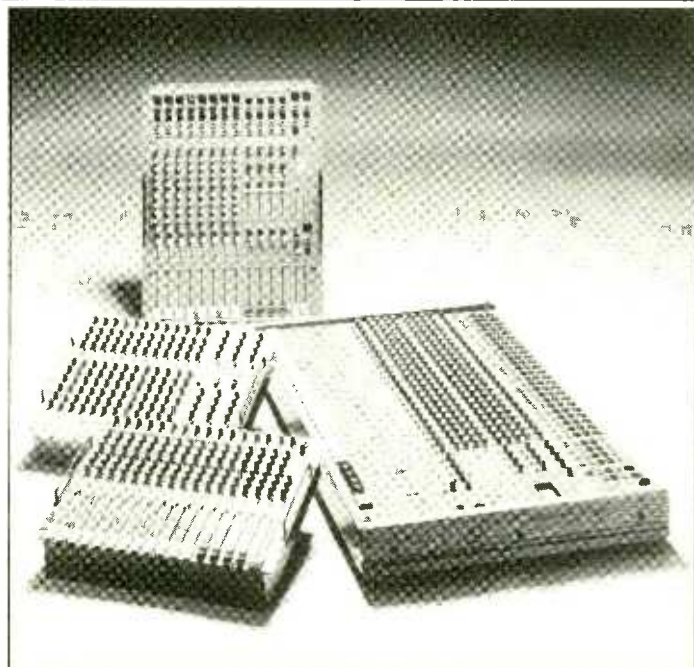
Pro Co TT-448 patchbay

Pro Co Sound has introduced a new 19 in rack-mounting TT (Bantam) patchbay for 8-, 16-, 24- or 32-track applications. The TT-448 provides full patching facilities for up to 32 inputs/groups/tape tracks, the left/right stereo masters, up to three stereo tape machines and aux sends/returns. There are also 36 sets of sends and returns for external processing equipment or effects. All required cabling for console interfacing, multitrack and 2-track connections, monitor amps and external effects are included.

All patch points are PC-mounted 3-conductor Switchcraft TT jacks permitting a fully balanced

system where required. A 3-channel 'mini snake' plugs into the line inputs, insert points and direct outs, etc. of each console input channel or output group and connects it to its patchbay card via KK series Molex connectors. Left and right master sections and effects tie lines are also PCB constructed and other equipment is similarly cabled with various snakes thus making installation simpler and modification easier than a conventional hard-wired system.

Pro Co Sound Inc, 135 East Kalamazoo Avenue, Kalamazoo, MI 49007, USA. Tel: (616) 388-9675.



Hill Rakmix & Soundmix consoles

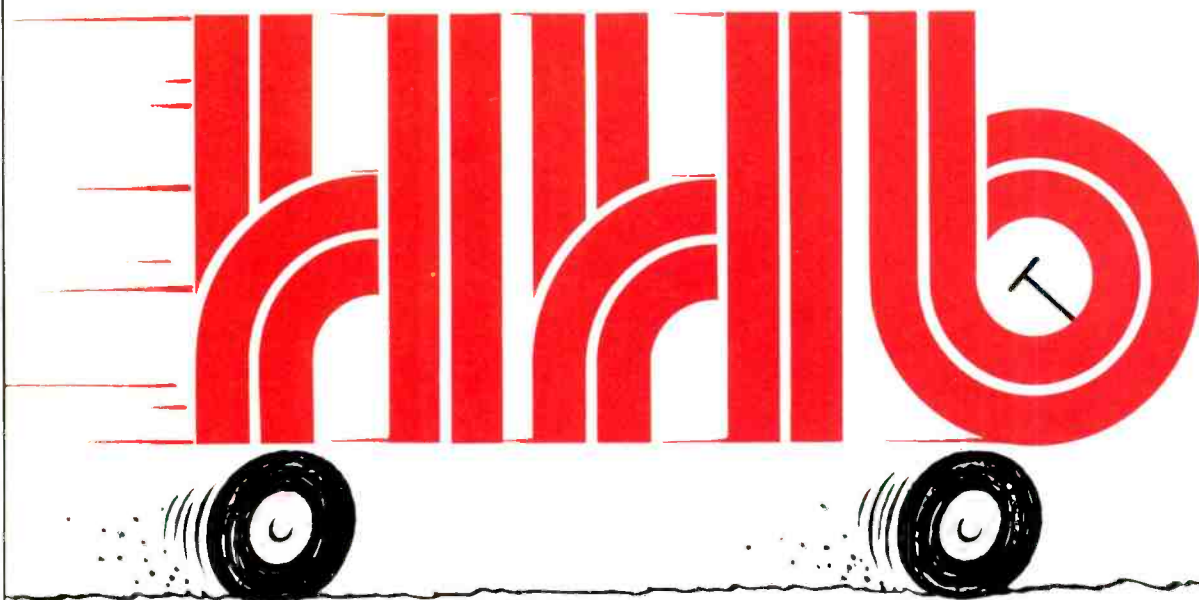
Hill Audio has introduced two new mixing desks in the *Mix* range of non-modular consoles. The *Soundmix* is available in either 16/4/2 or 24/4/2 formats and the *Rakmix* (a rack-mounting option) in 8/4/2. The consoles feature four aux sends with four returns, 12-way LED and VU metering, 100 mm Alps faders (optional carbon track version), insert points, direct outs throughout and both balanced and unbalanced transformerless input/outputs.

Other features include 48 V

phantom powering, 4-band EQ, 20 dB pad, pan, mute, PFL, peak LED and a fully regulated 115/230 VAC 1U high rack-mounted power supply with ground lift facility.

Hill Audio Ltd, Hollingbourne House, Hollingbourne, Maidstone, Kent ME17 1QJ. UK: Tel: 062 780 555.

USA: Hill Audio Inc, 5002 B N Royal Atlanta Drive, Tucker, GA 30084. Tel: (404) 934-1851.



We're on the move

We've all come a long way in ten years... And while many of you have enjoyed successful projects and opened up bigger and better studios, we've had an increasing struggle against decreasing space, landlords, motor traders, rag traders and so forth in our delightful premises in New Crescent Works.

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suite, as well as far greater levels of comfort for staff and visitors alike.

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So to make sure you don't lose us and we don't lose you, please make a note of **our new address and telephone number.**

Here's to the next ten...

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Equipment, modifications, options, software

Bruel & Kjaer stereo pairs

Bruel & Kjaer has introduced the 3529 and 3530 stereo microphone sets which consist of carefully selected pairs of omni condenser mics, various accessories, a type 2812 power supply in the case of the 3529 set and a Samsonite carrying case.

The matched pairs are hand picked from microphones that have already undergone numerous stringent QC procedures, final testing and individual calibration. The amplitude response of each pair of mics is matched to within 1 dB over the entire frequency range of 20 Hz to 20 kHz and are within 10° in phase over the range 50 Hz to 20 kHz.

In addition to standard accessories such as cable clips, windscreens and a sonically designed mounting boom,

there are two additional types of protection grid which allow the frequency response of the microphones to be tailored to individual needs.

Bruel & Kjaer A/S, DK-2850 Naerum, Denmark. Tel: 02 80.05.00.

UK: Turnkey, Brent View Road, London NW9 7EL. Tel: 01-202 4366.

USA: Bruel & Kjaer Instruments Inc, 185 Forest Street, Marlborough, MA 01752. Tel: (617) 481-7000.

ADA effects

ADA has released two effects units—the *Pitchraq* pitch transposer and the *2FX*, a digital multi-effects unit. The *Pitchraq* is a programmable unit with 16 user definable and 16 factory preset programs. Pitch can be specified as cents, ratio or intervals and there is a regeneration mode for creating harmonically related arpeggios and sweep (0.1 to 10 s) and

regeneration for octave shifting, detune chorusing and synthesised effects. Range is from 0.5 to 2.00 (up or down one octave).

The *2FX* multi-effects unit can provide flange (0.5 to 5 ms), chorus (2.5 to 20 ms) and delay (16 to 1024 ms) effects. Memory storage is 256 k and the unit has a dynamic range of 90 dB. In common with the other ADA units input and output level is +20 dBm (ref 0.775 VRMS) with a single ¼ in jack input and two (Dry and Effect) ¼ in output jacks.

ADA, 7303D Edgewater Drive, Oakland CA 94621, USA. Tel: (415) 632-1323.

UK: Music Lab Sales, 72-74 Eversholt Street, London NW1 1BY. Tel: 01-388 5392.

AKG C410 microphone

AKG has developed a new condenser mic specifically for

on-stage or studio use. Specifically tailored for vocal use the *C410* is mounted on an ultra lightweight head boom thereby allowing greater freedom of movement for musicians such as drummers, keyboard players and guitarists. Both head boom and mic are made from non-reflective matt black, flexible plastic. Specifications include pre-polarised transducer element, frequency range of 20 Hz to 20 kHz and an impedance of 300 Ω. The *C410* has a phantom powered operating voltage of 9 to 52 V. **AKG Akustische U Kino-Gerate GmbH, Brunhildengasse 1, A-1150 Wien, Austria. Tel: (43222) 956517-0.**

UK: AKG Acoustics Ltd, Vienna Court, Catteshall Wharf, Catteshall Lane, Godalming, Surrey GU7 1JG. Tel: 04868 25702.

USA: AKG Acoustics Inc, 77 Selleck Street, Stamford, CT 06902. Tel: (203) 348-2121. □

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The Swiss have a special talent for making great things small. A case in point: the new 961/962 Series mixers from Studer. In video editing suites, EFP vans, remote recording, and radio production, these compact Studers are setting higher standards for quality audio.

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The 961/962 Series is fully modular, so you can mix-and-match modules to meet your requirements. The 961/962 features

stereo line level input modules with or without 3-band EQ, plus mono mic/line inputs and master module with compressor/limiter. Other choices include a variety of monitor, talkback, auxiliary, and communication functions. The 961 frame holds up to 14 modules, the 962 accepts up to 20.

Other new features in the 961/962 Series include improved extruded guide faders, balanced insert points, FET switching, electronic muting, Littlite[®] socket, and multi-frequency oscillator.

Thanks to its light weight, DC converter option, and sturdy transport cover, you can

put a 961/962 mixer on the job anywhere. And, with Studer ruggedness and reliability, you can be sure the job will get done when you get there.

Packed with performance and features, 961/962 consoles will surely make a big splash in audio production circles. Small wonder. Call your nearest Studer representative for more details.

With special thanks to Mike and Fran, at the C.I.P.

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MUSIC PAGE

MUSIC PAGE

Mark Jenkins and Carl A Snape

Premier 8313 head & 2009 snare

The Premier 8313 studio batter head has a laminated construction and the top ply is coated for brush work. The head is claimed to provide an exceptionally thick sound making it much more controllable than single ply heads. It is also claimed to work well in live situations giving a thick, meaty, 'studio' sound with the minimum of doctoring on the console.

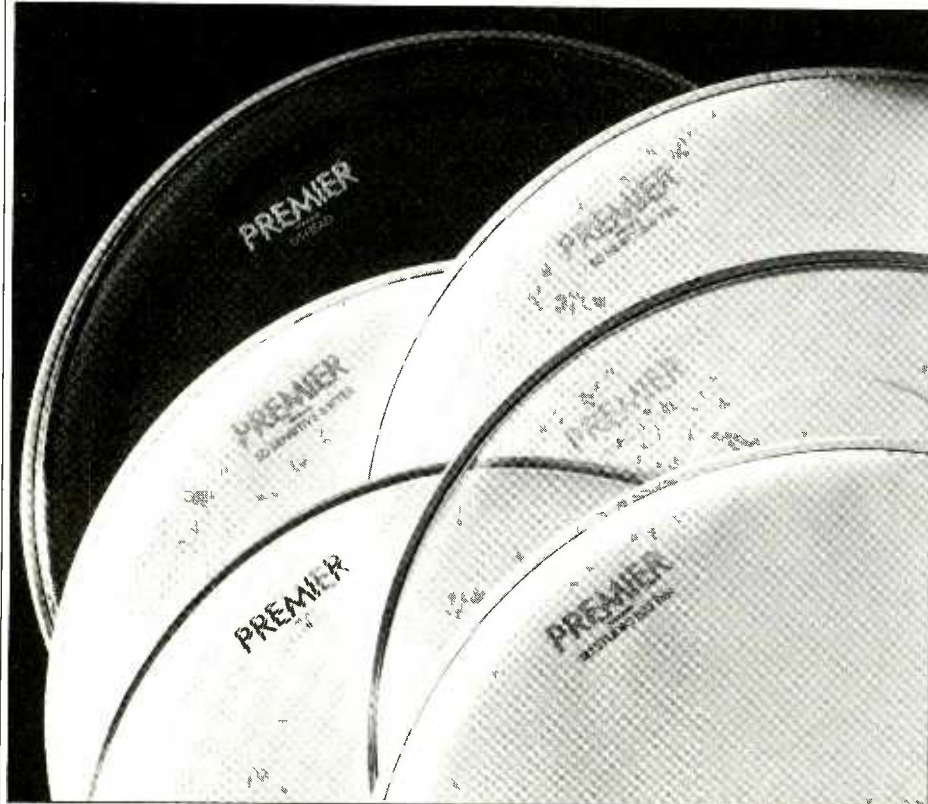
The 2009 snare is available in two sizes—6½ and 8 in deep. Designed with recording and live engineers in mind, both snares feature a unique secondary sound chamber which enables a mic to be placed 'inside' the drum. Because the snare drum has a much smaller internal diameter (the outside is normal size) the drum has a much tighter sound than usual.

Internal miking is facilitated by a large rubber grommeted hole in the outer shell. Combined with a batter head mic and out-of-phase snare mic Premier claims that exceptional sounds are easy to obtain without the drummer needing to detune or damp down below his or her normal level of comfort and response. Other features include an external damper and a snare buzz control that dampens resonant vibrations created by other instruments.

Premier Percussion Ltd, Blaby Road, Wigston, Leicester LE8 2DF, UK. Tel: 0533 773121.

(CAS)

Premier drum heads



Instant Music

Ariolasoft's *Instant Music* is the first commercially available composition package for the Commodore *Amiga* micro. The package uses only the *Amiga*'s internal sounds, which are of the FM synthesis variety and which are generated in stereo by an internal 4-voice sound chip.

The screen display shows a variable number of measures of music with each voice indicated in coloured blocks. Demo pieces include rock, pop, jazz, blues, folk, classical and even minimalist styles plus some example chord progressions to help inexperienced composers.

The package is mouse-operated and menus which can be pulled down from the top of the screen include Draw (entering notes with the mouse using pitch and rhythm guides marked at the side of the screen), Edit (moving voices or sections of voices around the screen), Sound (calling up new sounds which cannot be altered using this software), Jam (playing live with the mouse with variable degrees of rhythm and scale auto-correction), Project (loading and saving songs and sounds) and Options (changing song size or sound menus).

Assessment

Instant Music offers an odd combination of 'play-along' and 'easy composition' features together with quite advanced handling of complex chords and

inversions which the user needn't entirely understand to exploit quite fully. Note editing and transposition are available but since the package is limited to four voices it could only be used for sketchpad work. The sound quality is equal to that of the Yamaha *CX5* FM micro (some sampled sounds such as electric guitar chord and drum kit are also included in the software) but since the package is available through computer games shops it's to be seen more as an entertainment than as a professional product. Hopefully someone will market an *Amiga* MIDI interface with multi-tasking software before long. (Generally available through computer games shops)

(MJ)

Ensoniq SDP-1 piano

The *SDP-1* has a weighted 6-octave, E to G, keyboard, instant selection of 10 sampled sounds, key transpose, two sampled bass sounds and full MIDI.

The velocity response is lifelike and decay on the basic Grand sound (Piano 1) is around 13 s on low notes, with no audible glitching or looping. A Sustain/Sostenuto double pedal is supplied along with a music stand.

Sounds are Piano 1 (Grand), Piano 2 (detuned), Piano 3 ("a close-miked rock and roll piano sound voiced for amplified music and recording"), E-Piano 1 (Fender Rhodes), E-Piano 2 (detuned Rhodes), Marimba 1 (hard mallets), Marimba 2 (soft mallets for slow attack), Vibes, Clavinet 1 and Clavinet 2 (detuned).

The 2-note polyphonic bass sounds are Upright Bass and Electric Bass and can be programmed to function up to B3 (key 32) if selected. Stereo chorus is provided and an Octave switch will lower the pitch of the main part of the keyboard by one octave if the Bass function is switched on.

The Bass and Piano sections of the *SDP-1* can work on the same or different MIDI channels and the unit will respond to patch change commands.

Assessment

Piano substitutes are very much a matter of taste but the *SDP-1* fills most requirements adequately. The review model had a slightly noisy output particularly with the chorus on; the MIDI implementation could be more powerful and some of the sounds (particularly Marimba 2) are of dubious use. Ensoniq does not indicate that either alternative sound chips or an output modification will be available but this is not out of the question.

Ensoniq Corp, 263 Great Valley Parkway, Malvern, PA 19355, USA.

UK: Ensoniq, 14 Back Lane, London NW3 1HL. Tel: 01-435 2434.

(MJ)

Low-cost digital audio comes of age.

The Sony PCM series has now been available for several years. In this time recording and broadcast organisations, government, educational and industrial establishments, as well as individual users have all acknowledged the unique value of these units, and made them a new standard. It is the superlative quality of Sony PCM digital, coupled with extremely low cost that has brought about this professional acceptance of the range. This is borne out by the number of new ancillary products from other manufacturers, that have further increased the flexibility and versatility of the range. Examples of these products are the 'CLUE' logging and editing system from HHB, as well as various interfaces which allow digital communication with the PCM 1610.

Sony has acknowledged that this acceptance by professional users necessitates a change of

policy towards these products. Accordingly they have upgraded them from the domestic catalogue, and, realising the need for professional support and all that that entails, have appointed HHB as specialist dealers to represent them in the pro-audio market.

We are proud to announce this appointment, and happy to assure our customers of continued availability of the PCM range. The re-instatement of the PCM production line has been very largely due to pressure from end-users, who are after all the motivating force in the audio world. So if you are involved with audio recording and are still unfamiliar with Sony digital, then you owe it to yourself to call HHB - the No. 1 name in Digital Audio.

SONY FROM 

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THE SONY PCM71 AND PCM701ES DIGITAL AUDIO PROCESSORS.

DIARY DIARY

People, events, services

Scottish recording association

A Scottish Association of Recording Arts—a get together of studios, recording engineers and other interested parties working north of the border—is in the offing for the new year. The idea comes from Sirocco Studio's Clark Sorley and recording engineer John Turner who are out to redress the imbalance which sees a wealth of Scottish talent make money for what is largely a London-based industry.

The main aim is to gain recognition for Scottish operations by a two pronged attack on the status quo. In the first place, Sorley would like to formalise the advice and training aspects of the Scottish scene which he and other operators are coping with already. He has for example been consulted by the Scottish Development Agency about their plans for possible investment in a Glasgow recording centre. He is already negotiating Sirocco into playing an active educational role providing modular courses on recording and recording equipment for the local technical college in Kilmarnock.

As these avenues develop the plan is that control and standards for both consultation and training should remain within the industry. But principally the association would supply a 'forum of communication in a response to an explosion in the number of people involved in music'. In the long run, Sorley and Turner see the association providing a 'pool of knowledge', acting as a 'clearing house for studio availability and expertise' propagating members' interests and protecting them against the rip off and general exploitation by everyone from the bad debt risk to record companies and equipment manufacturers.

The immediate response has been warm. Recently Clark Sorley has been visiting Scottish studios to explain his ideas in depth. This will be followed by a general meeting. The chances are that this will coincide with an SDA sponsored seminar on the Scottish recording industry scheduled for February.

Bill Melville

APRS '87 dates

The APRS, having sent out a special questionnaire to 149 exhibitors, has decided that the 1987 exhibition will remain a three day event. Of the 65 replies, 56

exhibitors were in favour of three days and nine exhibitors in favour of four. In view of this the dates for the '87 APRS will be June 24th to 26th.

Roland customer support

Roland UK has announced the setting up of a customer support team to be headed by their product and press liaison manager, Alan Townsend. Joining the team will be Chris Simpson who will act as the team's overall product specialist responsible for MI and keyboard products. Marguerite de la Harpe will

act as marketing assistant and Alistair Jones will continue to specialise in promoting Roland keyboards and the new Musicom computer software in the educational field.

The new support team will concentrate on providing service and back-up for customers both at retail and end user level.

Forthcoming events

November 12 to 16 81st AES Convention, Los Angeles, USA.

November 19 to 22 14th Tonmeistertagung Munchen 86, Deutsche Museum, Munich, West Germany. 1987

March 28 to April 1 NAB

Convention, Dallas, Texas.

April 13 to 16 Acoustics '87, Management Centre, Portsmouth Polytechnic.

June 24 to 26 APRS '87, Olympia 2, London.

October 18 to 21 IVAC '87, Metropole Exhibition Centre, Brighton, Sussex.

Improved Type C Exciter

A number of engineering changes have been made to the Aphex Type C *Aural Exciter*. The first change is in the basic circuitry which the company claims has improved the overall sound quality providing a more open and natural effect with greater enhancement of detail. These improvements are covered by patent applications. The improved circuitry is now being used in the professional

Type II *Aural Exciter* and older units can be upgraded for around \$200.

Additional changes resulting in an additional 14 dB drop in noise levels became effective with all units shipped after July 1st, 1986. Although the company will not upgrade earlier Type C *Aural Exciters* schematics of the changes can be provided to dealers or customers who wish to make the necessary improvements.

Address changes

- HHB Hire & Sales has moved to 73-75 Scrubs Lane, London NW10 6QU, UK. The new telephone number is 01-960 2144. The telex number (923393) remains unchanged.
- Inhouse Studio, Cambridge MA, USA, has changed its name to Media Sync Studio.
- Audio Engineering Services, Chelmer House, Woodham Walter, Maldon, Essex CM9 6RZ, UK, has a new 24 hr

telephone line (0245 415083).

● Newcastle-based STUK Sound Reinforcement has moved to larger premises. The company is now based in a listed building in the city centre.

STUK Sound Reinforcement, Unit 4, Pandon Gate House, 5 City Road, Newcastle upon Tyne NE1 2AF, UK. Tel: 091-261 2324 or 091-284 7829 (after hours).

Agencies

- AMS Industries has announced the appointed Stirling Audio Systems and Applied Digital Technology as UK dealers for the AMS *AudioFile*.
- Dolby Laboratories has appointed Syntec International Pty as its distributor for studio products in Australia. Syntec will be responsible for all Dolby equipment for sound recording and post-production, including its noise reduction systems and the new Dolby SR system. Syntec will also be taking over the role of liaison office for Dolby *Stereo* film productions previously handled by Magnatechtronics.
- A/V Technology International has been appointed exclusive distributor for Aphex Systems in India, Central and Southern America. A/V has also become the exclusive Far East distributor for Eventide and will also be handling exclusively, international sales and distribution for Pacific Recorders & Engineering Co.
- Audio Kinetics has appointed Stirling Audio Systems as the only dealer in England for the *MasterMix* automation system and KGM Studio Specialist in Wakefield

and Samuelson Video Equipment Sales, London, have been appointed to distribute and promote the *Pacer* chase synchroniser.

Audio Kinetics has also appointed three new overseas agents bringing the number to 26. The new representatives are Studiotechnik, West Germany; Sonic HF, Iceland; and Blank International, Thailand.

● Audio Intervisual Design, the Los Angeles company specialising in custom audio systems for film, TV and compact disc, has been named a Sony Professional Audio dealer and will now supply Sony analogue equipment in addition to the current range of digital equipment. AID has also become one of four US dealers handling the Sanken range of microphones.

● Paul Farrah Sound has been appointed sole distributor of the C Audio range of amplifiers. In addition to the SR professional series, Paul Farrah Sound will also be stocking the CAM range and crossovers.

● Transco Products Corp has appointed Stanley Productions as UK distributor of its products.

*Just when you thought the future
couldn't shock you any more.*

Introducing the Lexicon PCM 70, our extraordinary new digital effects processor with dynamic MIDI. Designed, creatively speaking, to thrust you into the future.

To begin with, the PCM 70 gives you access to the same astonishing Lexicon digital effects used by the world's top artists and studios. With complete, variable parameter control, and registers that let you create and store your own programs.

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There's more. The Lexicon PCM 70 digital effects processor is also a full-fledged digital reverb, with a complete selection of Lexicon reverb programs. And the price? Shockingly reasonable.



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Telex: 27939 SCENIC G



AUDIO EXPORT,
Badstr 14, 7100 Heilbronn,
Germany,
Tel: 07131 82275

lexicon

DIARY DIARY

People, events, services

Contracts

● AMS Industries has completed installation of the first of three digitally controlled Calrec consoles at Thames Television. The system provides 84 faders with sophisticated instantaneous total memory reset and disk memory storage.

● The Mitsubishi Pro Audio Group has been busy selling the X-850 PD digital multitrack with Linford Manor Studios in Milton Keynes, London Sound Hire and an unnamed privately owned studio in London purchasing the machine. Two other European deliveries, one to Denmark and one to Norway, have also been arranged.

● Audio Intervisual Design has recently sold Sony digital systems for CD production to MCA, A&M and Capitol Records and Harmonia Mundi digital conversion units to EMI and CMS. Sales of the Lynx timecode modules has

also been good with over 250 units sold in the past year.

● Trident Audio has confirmed *Di-An* orders for Music Room Studios in Hampshire, and Keith Olsen's Goodnight Studios and George Tobin Production in Los Angeles.

● HHB Hire & Sales recently supplied 38 Sony PCM-701s to Capital Radio. These were used throughout the independent radio network in the UK for a special simulcast of Queen's headlining rock concert in July at Wembley Stadium.

● Sony Broadcast has announced sales of the JH24-24 multitrack machine to Red Bus, Chris Rea and Tyne-Tees Television (primarily for *The Tube* rock show). HHB has also sold the multitrack to Steve Lillywhite, Jamie Lane and Don Larking Audio.

● Harrison Systems continue to be busy with rentals of

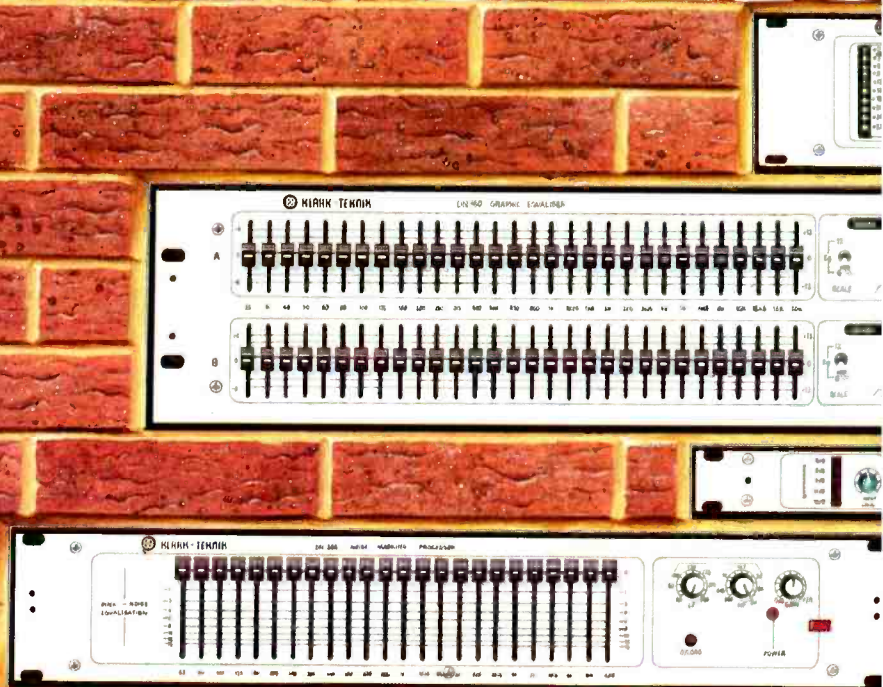
consoles for live sound applications. Recent shows include the *Volunteer Jam* in Nashville using a 32-input SM-4 and 40-input HM-4 extender which provided a 72-input stage monitor console with eight main mix sends plus eight additional matrix mixes. Clair Brothers also used the HM-4 for the Amnesty International Tour (and the SM-4 for Amy Grant) and will continue using the HM-4 for further projects through the autumn. On the radio production side Harrison has recently delivered the AIR-7 on-air broadcast console to the People's Republic of China; KPWR in Los Angeles; WHK in Cleveland; KBZE, KSHE-KM and KADI in St Louis and WMOT in Murfreesboro, Tennessee.

● DDA has recently delivered a number of AMR consoles to UK studios. A 28-input version has been bought by Tone Deaf

Studios in Oxfordshire and Ambience Recording in Sussex has purchased a 36-input console. Turnkey has supplied a 36-input DDA AMR console with custom modifications to Unit 3 Studios in Utopia Village. This latter console has subsequently been fitted with 60 channels of Audio Kinetics' *MasterMix*, the first such installation anywhere. Turnkey has also supplied a 28-input DDA console to Paul Hardcastle in a package that includes the *Synclavier* hard disk recording system, and a customised 36-input console for Dave Gilmour for use on his houseboat. A 36-input console with 60 channels of *MasterMix* has also been purchased by Surrey Sound.

● Martin Audio is supplying bins and cabinets for the main speaker system at the Prince of Wales theatre production of *Seven Brides for Seven Brothers*.

Sound archite



EQUALISATION/SPECTRUM ANALYSIS/SOUND CONDITIONING/DIGITAL REVERBERATION/DIGITAL DELAY

DIARY DIARY

Stolen equipment

• Thieves broke into Quad in September and stole three 405 power amps. They were part of a consignment going to Japan and were therefore fitted with 100 V transformers. The serial numbers are 87043, 87119 and 87120. If you are offered any of these units contact Quad or the police.

• On September 4th over 50

Schoeps

Capsules	Serial no
1×MK-8	3878
1×MK-40	11778
2×MK-41	19279, 16831
6×MK-2	15926, 23572 (rest unknown)
10×MK-4	16908, 14715, 12513, 26463, 26468, 17511, 28432, 25644 (two unknown)

Mic amps

17×CMC-5	3632, 3633, 5062, 5063, 5064, 5456, 5457, 5923, 5924, 5925, 7098, 7101, 7928, 8125, 8770, 8771, 11431.
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Mic

1×MSTC-5	16291, 16292
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Bruel & Kjaer

2×4007	1040151, 1040152
10×4006	1039538, 1039539, 1039931, 1023377, 1023378, 1023379, 1023380, 1085224, 1085225, 1085226.

Neumann (no serial nos)

6×U-89, 2×U-87, 2×KM-83i, 2×KM-84i, 1×KM-84 (mini-tuchel), 2×KM-85i, 2×KM-86, 2×KM-88

mics were stolen from a studio in Holland. They were stored in three aluminium cases and removed during a recording session. If you are offered any or have seen the empty cases please contact: Studio van Schuppen, Nieuweweg Noord 257, Veenendaal, Netherlands. Tel: (0)8385-12575.

Discrete division

As the breadth of services continue to grow Discrete Research Ltd has decided to divide the company's operations into two specific trading areas. In future all acoustic and specialist consultancy work will be undertaken by Harris Grant Associates.

The sale of RPG Diffusor Systems, the *Boxer* integrated monitor, EAA amplifiers along with other associated acoustic products and isolation systems will be undertaken by DRL

London.

DRL London represents RPG Diffusors Inc throughout Europe and these systems are also available from approved acoustic consultants. These now include Edward Veale of EJ Veale Associates, UK and Tom Hidley of Cote D'Azur Ltd, Montreux, Switzerland.

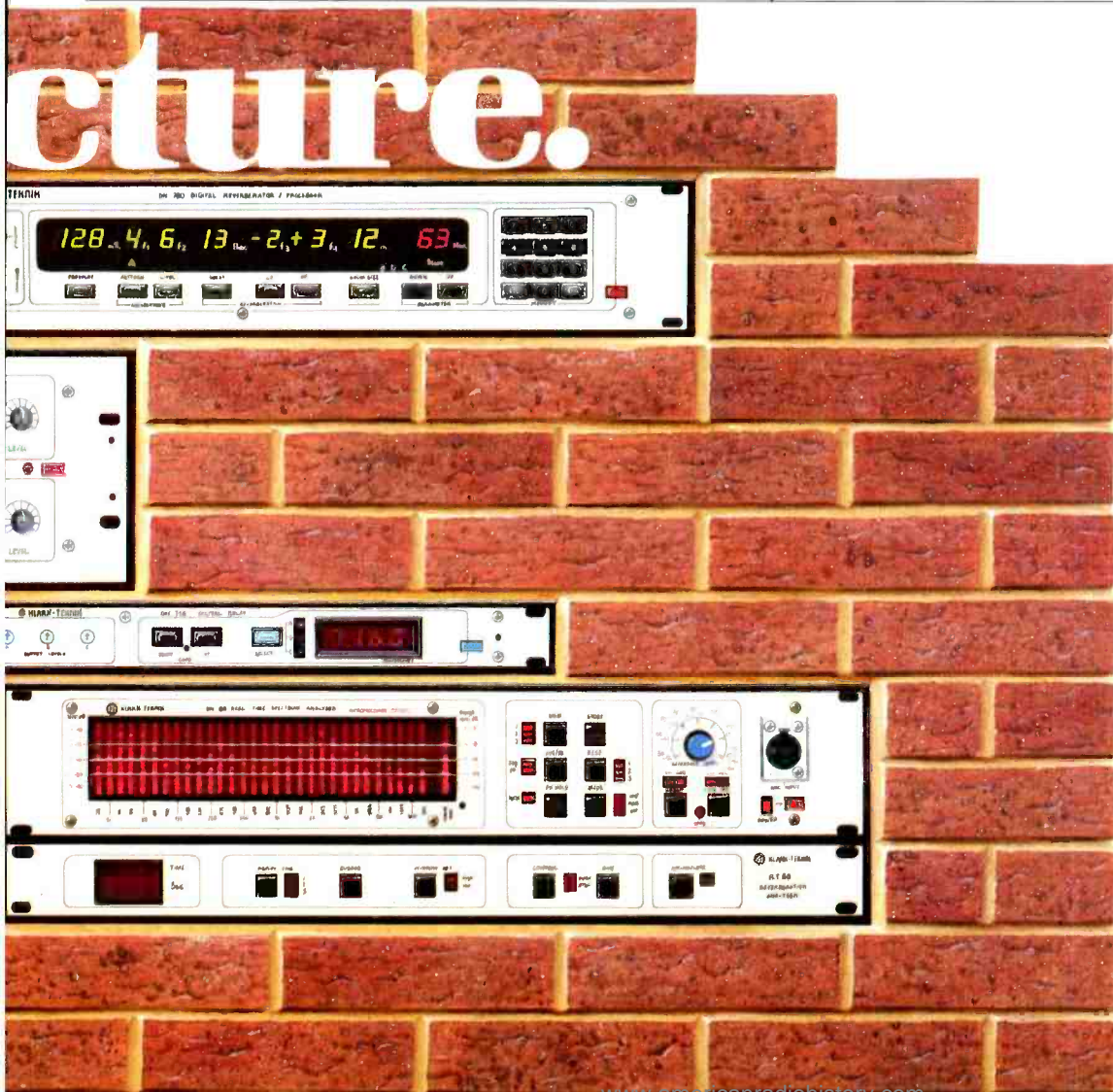
Both Harris Grant Associates and DRL London are trading names for Discrete Research Ltd, a subsidiary of the Cetec Corporation, Los Angeles.

100,000th Dolby

Over 100,000 Dolby A channels have been installed worldwide since its introduction 20 years ago. In addition to multitrack and mastering nearly 3,000 1 in C-format broadcast VTRs have been equipped with A-type NR and it is also used for noise reduction on landlines and

microwave links.

Cinemas are using more Dolby systems (Dolby A forms an essential part of the encoding process) with currently over 1,200 films for theatrical release available and 9,000 cinemas in 46 countries equipped to show them in Dolby Stereo. □



The first name with sound system designers

Whether it's for Concert Sound, Broadcast, Public Address Sound Reinforcement, or the staging of a complex theatre spectacular, sound system designers who rely on equipment performing to specification have come to trust Klark-Teknik's commitment to the professional sound engineering industry.

Klark-Teknik's Graphic Equalisers, Digital Audio Delay Lines and Spectrum Analysers are living up to their reputation for reliable and dependable standards of operation in sound systems throughout the world.

Klark-Teknik's progressive electronic design and industrial grade engineering practices, have given these products an unrivalled price/performance ratio and meet specifications as accurately as they reflect the professional intentions of those who use them.

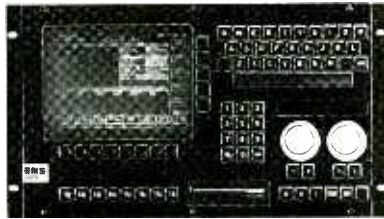
Klark-Teknik.....products you can specify and build into your sound systems with confidence.

Klark-Teknik Plc

Klark Industrial Park, Walter Nash Road West, Kidderminster, Worcestershire DY11 7HJ, England.
Telephone: (0562) 741515 Telex: 339821
Fax: (0562) 745371



AMS AUDIOFILE



This is it. A brave new frontier. A giant leap for recording studios. And so on. To hear some people talk you'd think a move to digital audio was on a par with re-inventing the wheel. We're taking a slightly more down-to-earth view of it all at Stirling Audio Systems. With good reason.

AN ACCEPTED STANDARD

People talk about the changes in techniques involved in 'going digital'. Yet almost every studio is already working with those techniques, with digital delays and reverbs and samplers. We say that digital technology is here to provide better creative control.

Control that helps you keep a step ahead.

OTARI DTR900

The DTR900 digital multitrack redefines the over-used term 'state of the art'.

Its audio clarity and dynamics are as impressive as the revolution in control it represents.

Because both synchronising and editing use the same SMPTE "markers," precisely controlled track bouncing becomes simpler and more accurate. A more creative multitrack – all at the touch of a few buttons.

AMS AUDIOFILE

Almost a studio in itself, Audiofile combines the advantages of digital multitracking with revolutionary creative flexibility.

The signal is stored on winchester hard disks for instant access and pinpoint editing precision. Adding a new creative edge with the ability to copy and move sections of music and handle track slipping, level changes and edits, without touching the original (think how much easier life would be).

It's as big as your imagination. And with an internal SMPTE synchroniser it's as perfect for post video and film as it is in a recording studio.

AUDIO KINETICS MASTERMIX

Digital's also about simplifying your work, and MasterMix console automation has proved a very successful alternative to big, expensive automated desks.

It's a fast, reliable disc-based session controller, allowing you to store and re-create complex 'live' mixes complete with fades and mutes. And it's easier to use than a REV-7.

Most leading consoles are available fitted with MasterMix (the new automated Angela is just one example). Alternatively, we could upgrade your present desk. Either way, you get the creative

control and time saving benefits of automation. And once again, you move all those digits simply by exercising yours.

THE LYNX SYNCHRONISER

SMPTE is bringing a host of studio equipment closer together, creating more opportunities for studios.

The most versatile and reliable system yet developed to control today's array of audio and video recording

hardware is the Timeline 'Lynx' synchroniser.

Try it and you'll understand why, as one top studio put it, you can forget synchronisation.

It links virtually anything with ridiculous ease. And its SMPTE/EBU protocol means Lynx will accommodate future upgrades too.

ALL UNDER ONE ROOF

The best way to get a clear picture of all the new options is to spend a few hours with the hardware and pick our brains.

You'll find an open-minded view of studio automation and digital audio, and how it enhances your creative control.

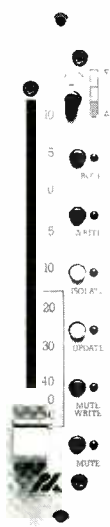
A combination that definitely makes a lot of sense.

**WE MAKE
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SENSE**



THE LYNX SYNCHRONISER

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OTARI DTR900

Since our last monitoring survey a number of new main studio monitors, nearfield monitors and drive units have appeared. In this brief résumé we have compiled details of new products and updates based on information received from manufacturers in response to our enquiries. All specifications are those quoted by the manufacturer

Altec Lansing

Latest product from Altec Lansing is the 906-8A high frequency compression driver. It is suitable for use with a wide variety of the current Altec Lansing horns and can be retrofitted to older Altec sectorial horns. Crossover frequency is 500 Hz or higher. The driver uses a 3 in voice coil constructed of edgewound ribbon aluminium wire, bonded to an aluminium dome with Kapton suspension.

The 906-8A has a sensitivity of 109 dB SPL (1 W/m), an impedance of 8 Ω and a power rating of 80 W programme, 40 WRMS. The entire diaphragm and voice coil assembly can be replaced without special tools.

Altec Lansing Corporation, PO Box 26105, Oklahoma City, OK 73126-0105, USA. Tel: (405) 324-5311.

UK: Audix Ltd, Station Road, Wenden, Saffron Walden, Essex CB11 4LG. Tel: 0799 40888.

BNS

Designed for small or medium sized control rooms, the BNS *Professional Monitor 1* is a ported 2-way active design. Input sensitivity is 0.775 V for 100 dB SPL and according to the manufacturer one pair is capable of producing 115 dB SPL in an 80 m³ control room. On axis frequency response is quoted at 60 Hz to 20 kHz (± 2.5 dB) and the Linkwitz-Riley filter crosses over at 800 Hz. The tweeter features a glass fibre cone with the response corrected by active filters to achieve a flat on-axis response.

Special attention has been paid to the cabinet design (developed in conjunction with NOS, the Dutch Broadcasting Foundation) in order to provide a useful bass response down to 35 Hz and improved transient performance. Gold plated switches and connections, metal film resistors, low tolerance capacitors and specially selected low noise ICs are used throughout the input amplifiers and filters.

Vandenberghe BV, De Hoogt 8-5175, Ax Loon op Zand, Netherlands. Tel: 041 166-2434.

Dentalab

Recently introduced is a new 2-way nearfield monitor the *M1*. The speaker is housed in an aluminium cabinet and features a 4 in bass driver and a 1 in soft dome tweeter. Thermal and electrical overload protection is provided with a 20 s auto reset facility. Power handling is 30 WRMS (150 W peak), sensitivity 88 dB (1 W/m) and frequency response, 85 Hz to 20 kHz.

Analogue & Digital Systems Inc, Pro Audio Division, One Progress Way, Wilmington, MA 01887, USA. Tel: (617)

658-5100.

UK: Sound Technology Ltd, 6 Letchworth Business Centre, Letchworth, Herts SG6 2HR. Tel: 0462 675675.

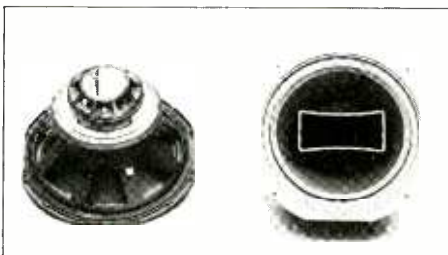


Electro-Voice

A new mirror imaged monitor has been added to the *Sentry* range. The *500E* features a wood-sculptured constant directivity horn coupled to a high frequency *Super Dome* tweeter. The extra mass of the wooden horn is claimed to greatly reduce colouration across all frequencies. High frequency attenuation is provided on the front panel. The improved components are all flush mounted within the cabinet.

Electro-Voice Inc, 600 Cecil Street, Buchanan, MI 49107, USA. Tel: (616) 695-6831.

UK: Shuttlesound Ltd, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-871 0966.



Fane

Recent introductions include two new professional co-axial drive units. The *CX12* is a 12 in unit and the *CX15*, 15 in. Both use a rigid cast alloy chassis and include fixing holes to both European and US standards. The constant coverage 60° x 40° horn is driven by a new *MD2050* compression driver mounted on the magnet system of the bass unit. The *MD2050* employs a low mass 45 mm diaphragm with an edgewound coil and frequency response to 22 kHz. Bass response is down to 32 Hz for the *CX15* and 40 Hz for the *CX12*. Power ratings of both models is 150 W.

Fane Acoustics Ltd, 286 Bradford Road, Batley WF17 5PW, West Yorkshire, UK. Tel: 0924 476431.

UK: Audio Factors, Robin Lane, Pudsey, Leeds LS28 9HY. Tel: 0532 561949.

Gauss

The 7258 monitor uses the latest 200 W coaxial speaker introduced by Gauss last year. The ducted loudspeaker is a symmetrical design for easy installation and includes HF roll-off and HF balance controls. Frequency response is 35 Hz to 18 kHz and sensitivity 95 dB (1 W/m).

Cetec Gauss, 9130 Glenoaks Boulevard, Sun Valley, CA 91352, USA. Tel: (213) 875-1900.

UK: HHB Hire & Sales, 73-75 Scrubs Lane, London NW10 6QU. Tel: 01-960 2144.



Control One

JBL/UREI

JBL has been fairly busy this year with the release of five new loudspeakers, a new midrange unit and a new UREI monitor. Among the five new loudspeakers in the professional range are the *4406* and *4408* 2-way monitors, *4410* and *4412* 3-way units and the very latest loudspeaker, the *Control One*. Both the *4406* and the *Control One* are designed for nearfield applications.

The *Control One* features a magnetically shielded 5.25 in low frequency unit and a 0.75 in polycarbonate dome tweeter. Power handling is 150 W and various optional mounting kits are available. The *4408* has been designed specifically for broadcast use. The *4410* and *4412* include a 5 in midrange unit and laminated bass driver. All the new models in the *4400* series feature JBL's pure titanium diamond surround tweeter, low diffraction grille designs, cast aluminium frame transducers and



IN THE PAST WE HAD A BIG ADVANTAGE OVER THE COMPETITION. NOW WE'VE GOT A SMALL ONE.

Until UREI's 813 Time Align® Monitor entered the studio, speaker systems had become a "smear" on the industry. A "time smear," in which high and low frequencies subtly assaulted the ear because they arrived out of sync. The results were general listener fatigue and unrealistic sound, particularly on lead instruments and vocals.

The UREI 813 solved the "time smear" problem with Time Alignment™, unifying sound into a single point source. This dramatic breakthrough, along with other major technical advances, soon established the 813 as the industry standard.

Now UREI introduces less of a good thing: the 809 Time Align® Studio Monitor. The 809 delivers all the engineering depth of its big brother, but at a compact size and price that's ideal for small control rooms and near-field applications.

UREI's 809 features a remarkable, all-new 300mm (12") coaxial driver that achieves a true one-point sound source, superior stereo imaging, and tight bass. It incorporates a unique titanium diaphragm compression driver that unleashes unequalled high frequency response.

The 809 has exceptional power handling capabilities, high sound sensitivity, and low distortion. It accomplishes precise acoustic impedance matching and smooth out-of-band response with UREI's patented high-frequency horn with diffraction buffer. And its ferrite magnet structures assure the system's high sensitivity drivers will not degrade with time and use.

UREI's Model 809 Time Align® Studio Monitor. Smaller package. Smaller price. Same impeccable "813" sound quality. See how it fits into your studio today.

JBL Professional
8500 Balboa Boulevard
Northridge, CA 91329

UREI

Continuing our brief résumé of recently introduced monitors and drive units

continuously variable calibrated reference controls.

The new *2123H* is a 10 in midrange unit capable of delivering high sound pressure levels in sound reinforcement and custom studio monitor applications. It uses a 3 in voice coil and frequency response is 200 Hz to 5 kHz; sensitivity, 101 dB (1 W/m).

Also new is the UREI *813c* monitor. **JBL Professional, 8500 Balboa Boulevard, PO Box 2200, Northridge, CA 91329, USA. Tel: (818) 893-8411.** **UK: Harman (Audio) UK Ltd, Mill Street, Slough, Berks SL2 5DD. Tel: 0753 76911.**

Jones

Claimed to offer a new design concept, the Jones speaker measures just 8×6×8 in and features a small diameter metal cone bass driver that is reputed to handle 300 WRMS and produce an effective SPL of 110 dB at 1 m. The 2-way system also uses a metal domed, liquid cooled tweeter and third order crossover. All the drive units are hand built and feature edgewound ribbon voice coils.

In addition to solving the problem of low SPL and poor LF response in miniature monitors the Jones loudspeaker is claimed to offer improved stereo imaging and audio transparency due to the small size of the sound source.

Jones Loudspeakers, 48 Tamworth Lane, Mitcham, CR4 1DA. Tel: 01-648 2510.

UK: Marquee Electronics, 90 Wardour Street, London W1V 3LE. Tel: 01-439 8421.



Klark-Teknik

In a Joint Acoustic Development Enterprise the *Jade 1* is a linear phase active monitor developed by Klark-Teknik and Munro Associates. Designed for accurate speech and music programming monitoring, the loudspeaker offers a totally self-contained

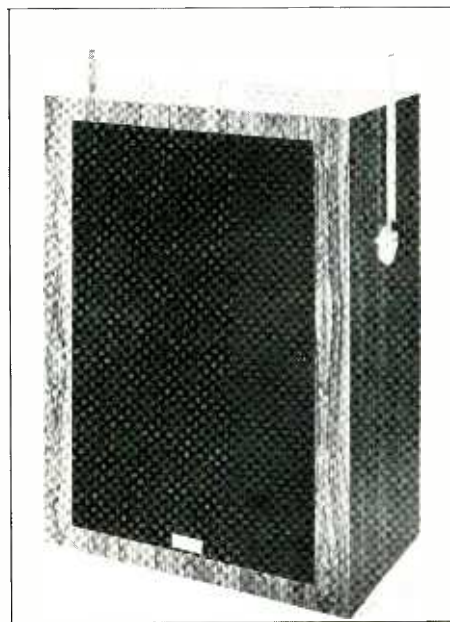
sound reproduction system requiring only a line level audio and mains connection. The 2-way ported system has a frequency response of 55 Hz to 17 kHz (± 3 dB) and a peak acoustic output of 110 dB SPL and 105 dB continuous at 1 m.

The *Jade 1* uses a 7 in Neoflex coned bass driver and a 1.25 in soft dome tweeter. The crossover point is 2.5 kHz (24 dB/octave Butterworth) and the system includes low and high frequency compensation controls and input level calibration.

All the electronics (amplifier, PSU, protection and signal processing circuits) are located in an acoustically separate compartment constructed on a flush fitting hinged construction for easy access. Options include control panel security cover, mounting brackets and loudspeaker stands.

Klark-Teknik plc, Klark Industrial Park, Walter Nash Road, Kidderminster, Worcestershire DY11 7HJ, UK. Tel: 0562 741515.

USA: Klark-Teknik Electronics Inc, 30B Banfi Plaza North, Farmingdale, NY 11735. Tel: (516) 249-3660.



Lockwood

Drive units currently used in Lockwood monitors are now Tannoy *DC296 (Mini)*; *DC386 (Academy I)*; *DC316 (Academy II)*; and the *K3808/K3838 (Universal Major)*. This latter loudspeaker is shortly to be relaunched.

Lockwood, Lowlands Road, Harrow HA1 3AW, UK. Tel: 01-422 3704 & 0768.

USA: Randy's Roost, RCA Buildings, 30 Music Square West, Nashville, TN 37203. Tel: (615) 254-8825.

Quested

Updates include a sub bass unit that can be used when, for example, space for monitors is restricted, the control room is very large or there are plans to enlarge the control room at some future date. A new nearfield monitor—the *H405*—should

also be available by the end of the year. **Quested Monitoring Systems Ltd, 59 Maltings Place, Bagleys Lane, London SW6 2BX, UK. Tel: 01-731 7434.** **USA: Apogee Electronics Corp, 1517 20th Street, Santa Monica, CA 90404. Tel: (213) 828-1930.**



RCF

Three monitors are currently available from this Italian manufacturer. The *SCD 6000* and *SCD 6010* are 3-way units, the *SCD 6020* is 2-way. The latter speaker features a 6.5 in low frequency driver and a wide dispersion 1 in soft dome. Power rating is 40 W continuous (80 W programme) with a sensitivity of 86 dB (1 W/m). The tweeter has thermal protection with auto reset.

The *6000* and the *6010* feature a single magnet assembly for the midrange and tweeter. The acoustic centres are only 2.5 in apart which is claimed to provide unaltered phase linearity between drivers at the crossover point. This mid/top assembly is mounted on a modular baffle that enables the drivers to be mounted vertically or horizontally. The *6000* uses a 10 in bass unit and the *6010* a 12 in. Power handling is 150 W continuous (300 W programme) for the *6000* and 200 W continuous (400 W programme) for the *6010*. All the loudspeakers feature round edged front baffles to minimise reflections.

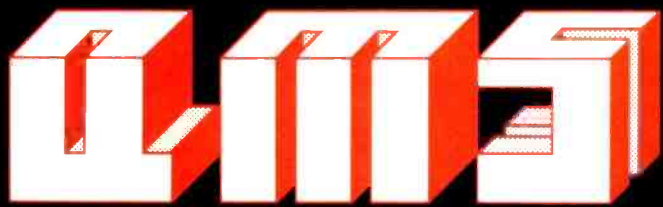
Radio Cine Forniture, 42029 S Maurizio (Reggio Emilia), Via G Notari, 1/a, Italy. Tel: 0522 485441.

UK: Court Acoustic Sales Ltd, 29 Beethoven Street, London W10 4LG. Tel: 01-960 8178.



Reflexion Arts

There are three models in the current range: the *235* (2×15 in, 1×10 in, mid



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Continuing our brief résumé of recently introduced monitors and drive units

and slot); the 233 (1×15 in, 1×10 in, mid and slot) and the 238 (1×15 in, mid and slot). Specific drivers used include JBL 15 and 10 in units, JBL 2405 slot tweeter and Gauss 15 in 4583F or 5831F. Mid range units include Emilar, Coral/JBL or TAD with the interesting option to fit a cone midrange unit in place of the compression driver once the speaker is installed.

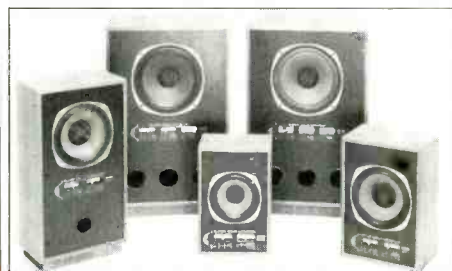
With the provision of preset amplifier gain control levels conversion is claimed to be quick and effective. All speakers can be used free standing or supplied for built in use.

Reflexion Arts, 15 Grandison Road, London SW11 6LS, UK. Tel: 01-350 1208

SOTA

Designed for clear and accurate monitoring at high sound pressure levels the CF-1000 and CF-2000 monitors are 4-way, time aligned loudspeakers with all cone drivers. Sensitivity is 96 dB at 1 W/m and acoustic output is 120 dB SPL programme, 130 dB SPL peak. The CF-2000 has two bass units for use in control rooms greater than 120 m³. The CF-1000 is a single bass unit system for rooms 120 m³ or smaller.

State Of The Art Electronik Inc, 43-1010 Polytek Street, Ottawa, Ontario, Canada K1J 8Z2. Tel: (613) 744-1003.



Tannoy

Five new monitors comprise the latest SGM series from Tannoy. The SGM 1000 replacing both the SRM 15X and M1000, and the SGM 3000 replacing the 15XB and M3000.

Other speakers in the series are the Little Gold Monitor, the SGM 10B and the SGM 12X. Smallest of the range is the SGM 10B which uses a 10 in drive unit. Sensitivity is 93 dB (1 W/m) and power handling 150 WRMS. Two 12 in models are available, the Little Gold Monitor and the SGM 12X. These have a sensitivity of 95 dB (1 W/m) and a power rating of 200 WRMS. The SGM 1000 and the SGM 3000 both use 15 in drive units. Power handling is 300 WRMS and sensitivity is 95 dB (SGM 3000) and 97 dB (SGM 1000), 1 W at 1 m.

Tannoy Ltd, The Bilton Centre, Coronation Road, Cressex Industrial Estate, High Wycombe, Bucks HP12 3SB, UK. Tel: 0494 450606.

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

USA: Tannoy North America Inc, 97 Victoria Street, North Kitchener, Ontario, Canada N2H 5C1. Tel: (519) 745-1158.

TOA

Four new speakers are available in the ME range, the 280-ME and the 312-ME 3-way nearfield monitors, the 2-way 265-ME and the full range 22-ME. The largest speaker is the ported 312-ME.

UK: TOA Electronics Ltd, Hutton Industrial Estate, Tallon Road, Brentwood, Essex CM13 1TG. Tel: 0277 233882.

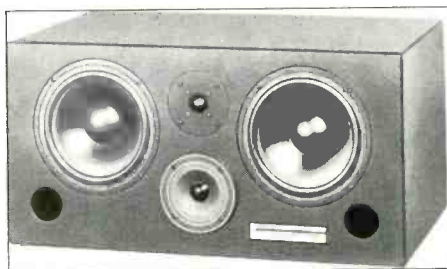
USA: TOA Electronics Inc, 480 Carlton Court, South San Francisco, CA 94080. Tel: (415) 588-2538.

TVM

The Electradyn JX-500 is a 15 in high sensitivity bass driver with a 12.5 in ferrite magnet for improved thermal cooling and increased sensitivity. Power rating is 400 W continuous sine wave and 800 W programme. The driver has a maximum useful excursion of 9.5 to 19 mm, solid cast chassis and a 3 in voice coil. Frequency response is 18 Hz to 1.5 kHz with an average sensitivity of 100 dB (1 W/m). The impedance is 8 Ω and the fundamental resonance 23 Hz.

Recommended enclosures include full horn loading (7 to 12 ft³) and ported cabinets (5 to 10 ft³). The unit is also suitable for use in a high power low-mid horn system.

Tranvex Music Ltd, 89 Old Snow Hill, Birmingham B4, UK. Tel: 021-236 9260.



Westlake Audio

Westlake continues to expand the BBSM range of monitors—there are plans for a 15 in version (BBSM 15) and the latest model to be introduced is the BBSM 8. This is a 3-way, medium power, phase coherent monitor using two 8 in bass units, 3.5 in mid unit and 1 in soft dome tweeter. The enclosure is ported with a separate enclosure for the midrange.

Nominal power rating is 100 W below 600 Hz, 50 W 600 Hz to 5 kHz and 30 W above 5 kHz. Sensitivity is 85 dB SPL. Each pair of monitors is made as a matched pair with strong internal bracing, heavy gauge wiring and driver time alignment to ensure phase coherence and pinpoint stereo imaging. Westlake Audio, 7265 Santa Monica Boulevard, Los Angeles, CA 90046, USA. Tel: (213) 851-9800.

UK: Professional Audio Ltd, Professional Audio House, 52 Corsica Street, London N5 1JT. Tel: 01-226 1226.

UK: Stirling Audio Systems Ltd, 1 Canfield Place, Swiss Cottage, London NW6. Tel: 01-625 4515. □

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A SPEAKER CONNECTOR THREE YEARS ON

The *XLR/3* is intended for use on low level audio circuits and is recognised by an International Standard (IEC-268 Pt 12) and an identical British Standard (BS5428 Pt 5:3) both setting out the way it is intended to be used. The standards clearly state the pin connections to be used for balanced and unbalanced low level applications. They specify contact 1 as the screen, contact 2 as the in-phase signal connection and contact 3 as the anti-phase connection when used with balanced circuits. The standards say nothing about its use as a loudspeaker connector, however, and the electrical design is such that for an amplifier output above 150 W RMS into a 4 Ω load, the *XLR/3*-type connector would constitute a live terminal under the IEC-65 and BS415 equipment safety standards and therefore contravene the Electrical Safety Regulations. Under certain circumstances this could leave an equipment supplier or installer open to prosecution in the event of an incident.

There is no doubt that the mechanical form and electrical reliability of the *XLR*-type connectors render them an

Following two articles in *Studio Sound* and something of a campaign, Ken Dibble believes we are now near a standard for speaker connectors but there are two contenders

ideal tool for the job. But why use the *XLR/3* when it is already so widely used on low level circuits, it contravenes the safety regulations in certain circumstances and when there are a whole range of alternative *XLR*-type contact configurations to choose from?

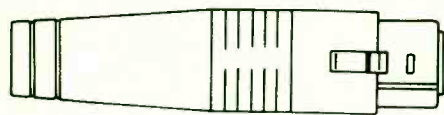
The answer is simple: ever tried to get a 4 mm CSA cable into an *XLR/4* or *XLR/5*? It doesn't even fit into an *XLR/3* without pairing off some of the strands in order to get the conductors into the

solder buckets. Even 2.5 mm cable is a struggle, so why has no one thought of making an *XLR/2* with larger diameter contacts? At least that could be used the right way round with the female half as the amplifier output receptacle so the live contacts are shrouded. This would go some way to comply with the safety standards, whilst differentiating between the input and output connectors. But we are told there is no demand.

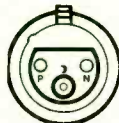
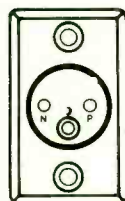
Enter the Aussies

This was covered in 'Standard? What standard?' *Studio Sound* February 1982. About the same time it seems Robert Grunberg and Mike Dixon in New South Wales were moving in a similar direction and in response to the article Mike Dixon sent over details of his proposals to combat the problem. After some correspondence to clarify one or two technical points and to allow time for the patents to be filed to protect the design, these details were published in a follow-up article 'A Loudspeaker Connector at Last?' December 1983.

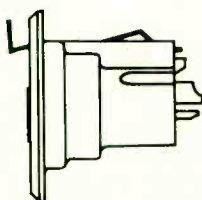
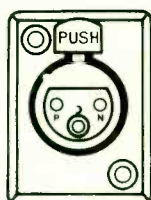
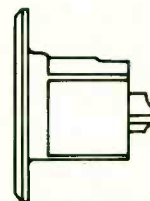
After a frustrating two years touting



AXR-PDN-11
STRAIGHT CORD PLUG
2 SOCKET CONTACTS
1 DRAIN PIN CONTACT



AXR-PDN-32
WALL MOUNTING RECEPTACLE
2 PIN CONTACTS
1 DRAIN SOCKET CONTACT



AXR-PDN-31
WALL MOUNTING RECEPTACLE
2 SOCKET CONTACTS
1 DRAIN PIN CONTACT



AXR-PDN-12
STRAIGHT CORD PLUG
2 PIN CONTACTS
1 DRAIN SOCKET CONTACT

the design around the international connector circuit, picking up a few red herrings here and there, suffering outright rejection and one or two minor design changes Mike was eventually able to convince an Australian connector manufacturer, hitherto unknown in the pro-audio business, that there was a market for such a connector. So enter Utilux Pty of Sydney, Australia and the UX high power audio connector.

That was by no means the end of the story. At the same time STC Cannon Components Pty, the Australian manufacturing arm of ITT-Cannon, announced the introduction of the AXR-PDN—a new high power loudspeaker connector.

Negotiations with Neutrik had come to nothing. Then Switchcraft became interested but decided that if it were to recognise a market need in this area it would be with a product of its own design. After much deliberation, Switchcraft concluded that there was insufficient international demand to justify the R&D and tooling commitment,

especially as much of any new market created would reduce sales of its own equivalent of the XLR/3, the QG series. Switchcraft decided instead to concentrate on a new jack plug with increased current carrying capacity to be targeted at the semi-pro loudspeaker market for use on combos, smaller PA systems, etc. So as far as is known at present then, there is no further activity in this connection from these two.

So after all this time, here we are with two totally different and incompatible connector systems both about to be launched on to the same market and both obviously hoping to establish a new industry standard and get it officially recognised.

The market place

The first obstacle to be faced is the extensive and widespread use of the XLR/3, with virtually every professional (and not so professional) power amplifier, and a large proportion of pro and semi-pro loudspeaker systems worldwide

currently fitted with the XLR/3 connector used the opposite way round to the signal convention, ie the male half with its exposed and unshrouded pin contacts is used as the source component.

It will be interesting to see which manufacturer will be bold enough to change to a new and untried connector which, to start with at least, will not be widely available at street level and will not be carried in the spares box of every service engineer. Then which hire company will be the first to change their rig to the new system—and how many adaptor leads will need to be carried to get them out of trouble should part of the rig go down and amp racks be hired in from another company?

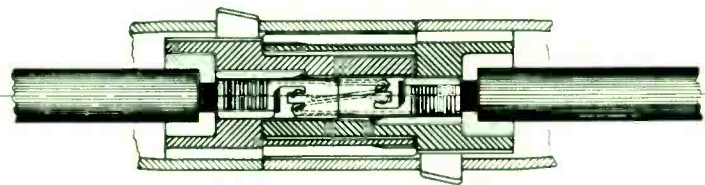
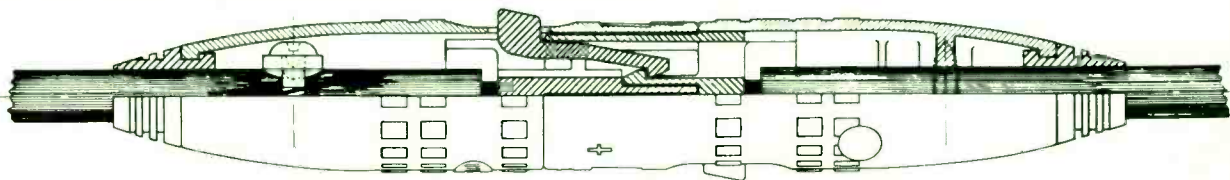
Which system will be accepted anyway? Far from solving a problem, the existence of two new systems will surely result in utter chaos.

Utilux UX series

This is a completely new connector design quite unlike anything else on the

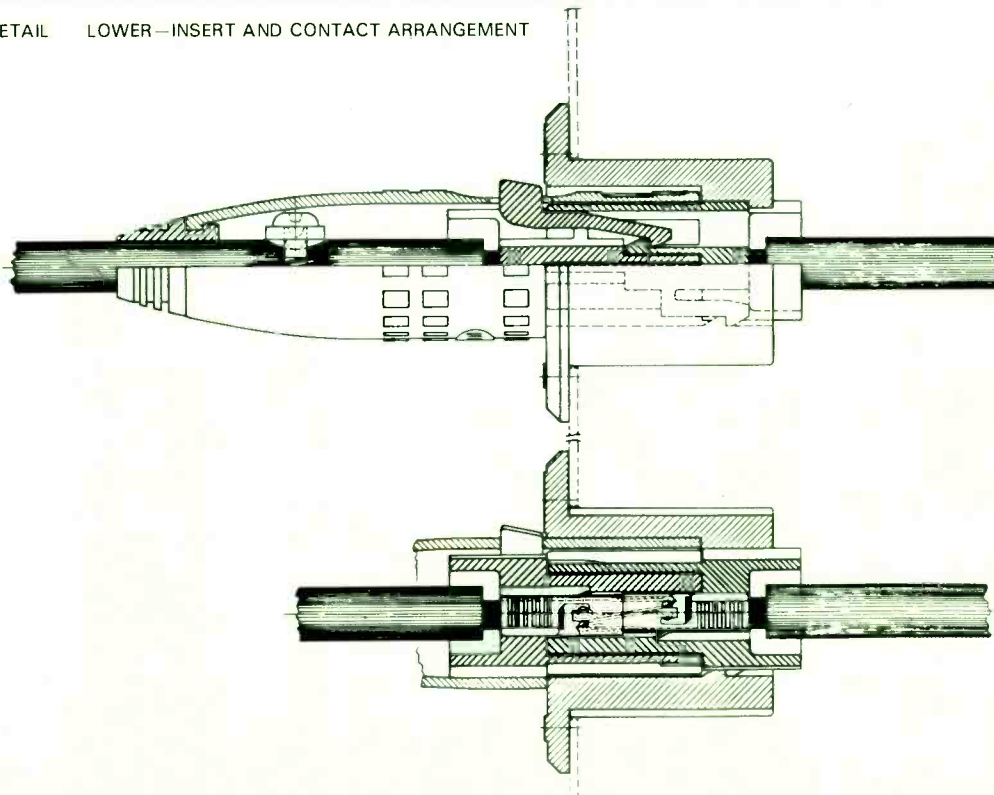
SECTIONAL DETAIL SHOWING MATED PAIR OF UTILUX UX100 CABLEMOUNT CONNECTORS

UPPER—SHELL DETAIL LOWER—INSERT AND CONTACT ARRANGEMENT



SECTIONAL DETAIL SHOWING UTILUX UX100 CABLEMOUNT CONNECTOR MATED WITH UX500 PANELMOUNT RECEPTACLE

UPPER—SHELL DETAIL LOWER—INSERT AND CONTACT ARRANGEMENT



A SPEAKER CONNECTOR THREE YEARS ON

market. It is a truly hermaphroditic system using only two component parts:

- *UX100* unisex cable-mount connector;
- *UX500* unisex panel-mount connector.

The design is such that the *UX100* cable-mount mates with itself or with the *UX500* panel-mount, it is self polarising and latches. Made-up cables can be used either way round in a totally sexless system.

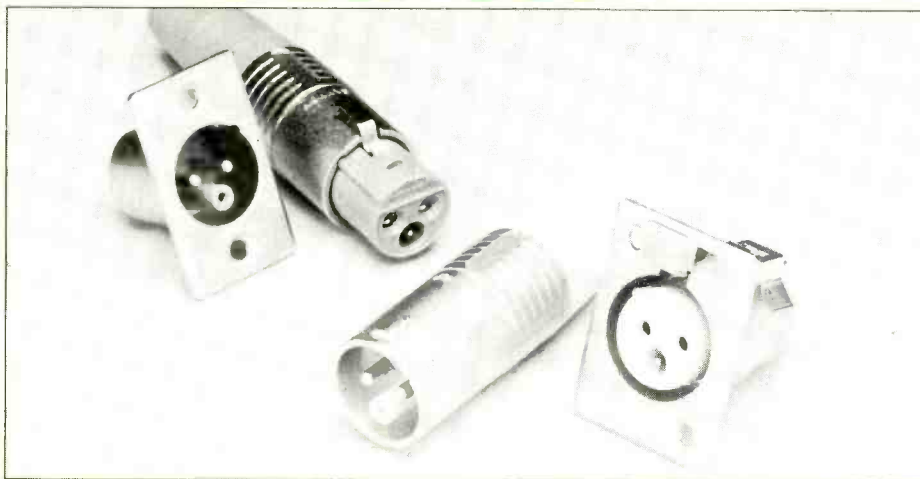
It is a 2-pole connector with flat self wipe, spring loaded contacts of a special silver plated copper-iron alloy, which are soldered or crimped to the cable outside the connector housing and inserted into a black thermoplastic polyester insert moulding, where the contacts are irretrievably latched in place.

Gold plated contacts are available to special order. The contacts are rated at 30 A RMS continuous at 100 V RMS AC and from basic AC theory one can calculate that it should therefore be capable of handling the output of a 1 kW amplifier channel into a 2, 4 or 8 Ω load or a 2 kW channel into 2 or 4 Ω within the rating parameters. 1 kW into 16 Ω or 2 kW into 8 Ω will generate a voltage swing of 126 V which, although outside the contact voltage rating, represents only one quarter and one half respectively of the current rating so there should not be any problems—especially when allowance is made for the transient nature and high crest factor characteristics of an unclipped and not overly compressed audio signal.

The casing is a 2-part zinc alloy diecasting, oval in section and just a little larger than an *XLR*-type connector. Because of its larger size it does provide ample space to access and terminate a 2x10 AWG jumbo speaker cable. A conventional bridge-type stainless steel cable clamp is fitted within the body shell and a rubber strain relief gland is provided at the tail end.

The *UX500* panel-mount component employs exactly the same insert assembly within a diecast zinc alloy housing which, although the mounting plate is slightly larger than an *XLR*, mounts into a standard rectangle flange *XLR* female panel hole and shares the same fixing centres.

Another original feature is the ingenious latching system. Whilst latching either two *UX100* cable-mount components or one *UX100* and one *UX500* panel-mount with firm resolve under normal circumstances, a pull in excess of 30 Newtons will disengage the latch and release the connector, thus providing the benefit of a securely latched termination whilst avoiding the risk of expensive equipment being pulled on to the floor or looms being destroyed in the event of an unexpected cable snag. This mechanism is part of the insulator insert moulding, is in effect flush fitting and is carried in the cable-mount component only, thus avoiding any protruding clips or retainers from the panel-mount connector and providing a double latch when cable-mount



AXR PDN power amp to loudspeaker connector range from ITT Cannon

connectors are used in-line. This really is a very worthwhile feature which works very well in practice.

The connector is very well engineered and finished, and wholly practical in concept. Although new to pro-audio, Utilux is internationally known as a connector specialist in the construction and machine tool industries. Besides maintaining three manufacturing operations in Australia—in Sydney, Victoria and South Australia—the company has a UK base in Bungay, Suffolk, and offices in New Zealand, Singapore, Malaysia and Thailand. So whilst possibly not as large as the ITT-Cannon organisation, Utilux does appear to be a sizeable international concern with the resources to effectively penetrate the market.

ITT-Cannon AXR-PDN

On the other hand, Cannon, as the originators of the *XLR* design concept has been around as long as the industry they serve and has grown up with it as a household name. Cannon is to audio connectors what Hoover is to vacuum cleaners, with the result that Cannon and *XLR* have become generic terms. Also, the *XLR* type of connector, now manufactured by many companies internationally, is widely accepted not only as an audio signal and loudspeaker connector but also for communications, power supply and control applications in its multi-contact forms, and as a mains connector in its *LNE* format. So any Cannon *XLR*-type product must have a head start.

Now, Cannon Australia has introduced the *AXR-PDN* range.

The *AXR* body style is the latest, smaller size version of the traditional *XLR* series, featuring a greatly simplified cable clamp arrangement and is far less fiddly to assemble than its forebears. Most of the Cannon range, including the familiar *XLR/3*, the multi-contact versions and the *LNE* mains connectors are now available in the *AXR* housing. The PDN (Phase, Drain, Neutral) insert is a 3-pole connector. It is

in effect a reversed version of the *LNE* but with the insulating sleeves the other way round and of increased current carrying capacity. The additional drain wire contact is to accommodate screened loudspeaker cables or to provide an earth continuity circuit for use with speaker enclosures which are not double insulated. Like its *LNE* derivative, the drain contact is grounded to the body shell when the retaining screw is inserted. Despite the apparent similarities, however, it is in no way interchangeable with the *LNE* system.

The *AXR* system, of course, is not hermaphroditic and has the usual four component parts:

- *AXR-PDN-11* cable-mount female component having fully shrouded socket contacts for the phase and neutral lines and a pin contact for the drain connection;
- *AXR-PDN-31* panel-mount equivalent and the version intended for use at the source end of the circuit, ie on the back panel of the power amplifier, on the termination panel of an amplifier rack or as a link-out facility on the back of a loudspeaker enclosure;
- *AXR-PDN-12* cable-mount male component having exposed pin contacts for the phase and neutral lines and a shrouded socket contact for the drain wire;
- *AXR-PDN-32* panel-mount equivalent and the version that would be used as the input connector to the loudspeaker enclosure.

So the system follows the usual *XLR* format.

The shells are all of satin nickel finished diecast zinc alloy and the cable-mount components have a clamp screw type cable retainer with a flexible strain relief boot. The usual *AXR* latching system has been fitted even though the majority of users dislike this arrangement and usually throw away the latch mechanism on the *XLR-31* panelmount component. The contacts are of bright tin plated machined copper alloy and are set in an unusually hard moulded polyester insulator which has something of the feel of ceramic about it

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A SPEAKER CONNECTOR THREE YEARS ON

rather than the suppleness usually associated with polyester. All four components are available with either blue or white coloured inserts and boots, the intention being that white connectors would be used for the left-hand channel and blue for the right. Alternatively, a range of 10 resistor coded coloured boots are available to further identify circuits, eg bass, mid and hi in the case of active systems.

The *AXR-PDN* contacts are rated at 200 V RMS and 25 A RMS continuous current and the contact solder buckets will just accept a 12 AWG or 4 mm CSA cable. Interpreting the voltage and current ratings into equivalent amplifier ratings we find that the *AXR-PDN* should be able to handle a 1 kW amplifier channel into 2, 4, 8 or 16 Ω loads or a 2 kW channel into 4, 8 or 16 Ω without exceeding the contact ratings. 2 kW into 2 Ω will considerably exceed the current limitations.

Because of its higher voltage rating, the *AXR-PDN* would be well suited to the 100 V constant voltage line distribution systems widely used in commercial and industrial public address and paging installations were it not for the problem of differentiation between low impedance and CV line systems.

The manufacturing quality and standard of finish is as good as seen on a connector product for a long time, it is attractive, compact, has good feel and is convenient to use. And of course, has the advantage of being of a familiar form.

Comparisons and observations

The Utilux *UX* looks and feels the more robust of the two, and because it is

physically larger and the body shell splits in half it is by far the easiest to wire up and assemble—especially when the larger 12 or 10 AWG or 4 mm CSA cables are being used. It also uses fewer parts in the assembly and offers the significant advantages of the hermaphroditic design and a logical and workable strain release latching system.

One disadvantage is the surprisingly low voltage limitation of 100 V which restricts its use at high power levels into higher impedance loads, and for which I can see no possible reason. I would have expected that the contact spacing and layout arrangement employed would be quite adequate for use at least at the same voltage rating as the *AXR-PDN* connector.

Another problem might be that the connector is not re-usable, as once the contacts have been soldered or crimped to the cable and inserted into the insulator moulding they are firmly held in place and cannot be withdrawn. Re-use of the connector, therefore, involves replacement of the insulator and contacts.

A further consideration is that the panel-mount component is honeycombed with holes which go right through the insert moulding so that when mounted in a loudspeaker enclosure, some form of sealing box would be required behind to prevent de-tuning of the speaker enclosure and whistling due to windage through the holes.

Also, whilst totally practical, very well thought out and of excellent manufacturing quality and finish, there is something not quite right about the visual aspects and overall feel. The insert moulding looks somehow cumbersome and untidy with lots of

protruding bits, giving the whole connector an ungainly first impression. Maybe I have become too familiar with the *XLR*-type format and this may prove to be the biggest stumbling block.

One final point. Although stated by the manufacturers that it meets the contact shrouding requirements to comply with the IEC-65 'finger test', the contacts appear fairly open and accessible when pushed fully home into the insulating insert. It would be interesting to get an independent test report on whether the *UX* connector would in fact satisfy BS415 or IEC-65 as regards the shrouding of the live terminals, even though the IEC flash has been incorporated into the shell diecasting.

The Cannon *AXR-PDN* is of a smaller and neater design altogether, with fully shrouded contacts and a higher voltage rating but it lacks that robustness and sense of purpose of the Utilux product. As previously stated, it is not as easy to terminate when employing large CSA cables.

Conclusions

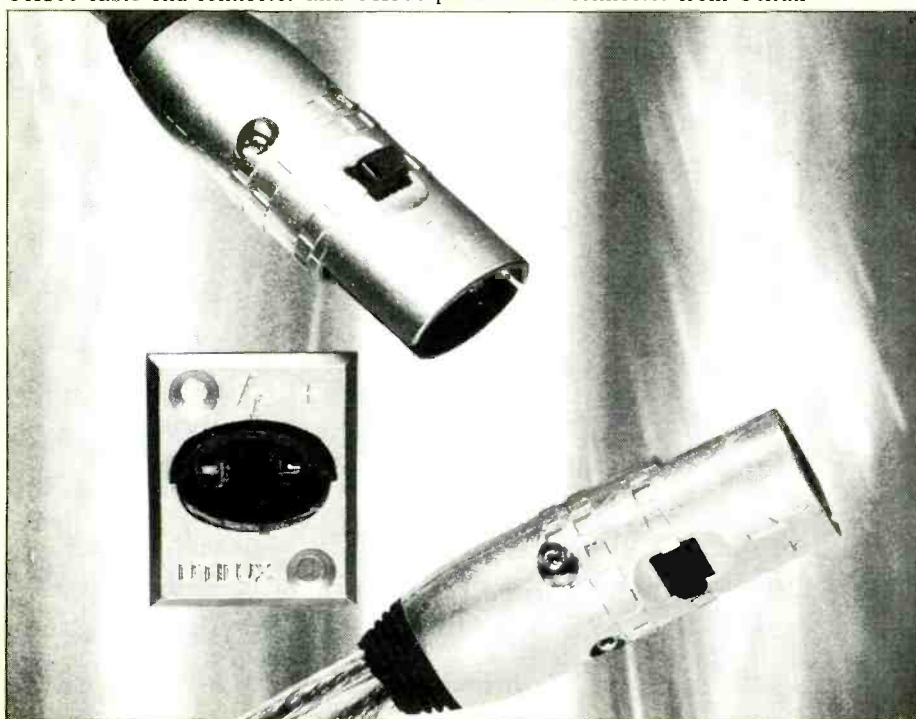
Notwithstanding the criticisms made of both products either connector would do the job and do it far better than the present system. If I were in the business of hiring out PAs or trucking rigs around the world I would prefer the Utilux *UX* because of its robustness, durability and terminating convenience, and hermaphroditic system. I think I would be quite happy with it as a roadworthy connector system. If, on the other hand, I were installing studio monitoring or other music playback systems into theatre type situations, or concerned with more compact mobile PA or music playback systems where the wear and tear is less arduous and neatness may be a consideration, I would go for the Cannon *AXR-PDN*. So maybe there is a case for two different systems after all.

Alternatively, having already alluded to the requirement for a standardised 100 V CV line connector, the various technical committees of the ASCE and ABTT have been searching for a suitable connector for this purpose for years and this may indeed be a valid solution—use the Utilux *UX* for low impedance circuits and the Cannon *AXR-PDN* on CV line distribution systems.

But why hasn't Cannon done the obvious? All that is required, surely, for low impedance applications, is an *XLR/2* with two larger contacts and built just like the old *XLR/3* used to be with that excellent resilient rubber insulator insert. That should satisfy everyone's requirements for low impedance applications leaving the new *AXR-PDN* to meet the requirement for 100 V CV line systems. □

For further details of these connectors in the UK please contact:

Utilux (UK) Ltd, Hillside Road East, Bungay, Suffolk NR35 1JX. UK. Tel: 0986 2963.
Cannon Electric (GB) Ltd, Jays Close, Viabes Estate, Basingstoke, Hampshire RG22 4BW. UK. Tel: 0256 473171.



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The MX70's option list lets you choose between 1" 8-track and 1" 16-track formats. Convert to 1/2" 8-track. Or even switch between all three options on the same machine.

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TAPE OR DISK AND A MANUFACTURER'S SOLUTION

As interest in disk-based recording systems increases there is perhaps a tendency to see such an approach as solving all ills. As marketing manager of Mitsubishi Pro Audio Group UK, Adrian Bailey could be expected to have a somewhat different point of view although in this article he compares the disk and tape approaches and describes a possible future alternative

A lot has been said in print and at shows about the concept of a 'Tapeless Studio', where an entire sound production is digitally recorded, mixed and edited on Winchester disks. As anybody attending exhibitions this year will have seen, hard disk audio for post-production is an area which is developing fast.

As the UK marketing manager for a major manufacturer of digital tape recorders, a lot of people ask about the company's attitudes to these developments, and how we intend to respond to what some have described as the challenge of disk versus tape.

As with so many of these instant comparisons prompted by something new, it's important to paint in a little perspective before trying to draw, much less recommend, any conclusions. For a start, is it actually a question of tape versus disk? We believe the real question is how the two media are going to work together in the future.

Storage factors

The best way to reveal the folly of making a direct comparison is to do just that. Tape is a long term storage medium which can be freely exchanged with other studios and plant, edited with fast and familiar splicing techniques, and is relatively cheap. Hardware costs also compare in tape's favour on a simple

comparison. For example an X-850 will record an almost unlimited number of tapes in 32-track for an investment less than that for a top disk system which will accommodate less than 15 minutes of 16-channel sound (*in basic form—Ed*).

Such systems are useful as a transient editing tool but as the disks are sealed in their drives, data has to be cleared before new work can commence. Although commercials directors and some dubbing producers may be prepared to scrap the component tracks once a mix is complete, a music producer will always want to retain individual elements of a master for subsequent remixes.

So a back-up medium of one kind or another is essential. Some manufacturers are recommending that data be loaded and saved on digital audio mastering tape formats such as the Sony PCM-F1, while others prefer the 9-track tape streamer cartridges used in the data processing industry. With a digital audio transport, loading and saving theoretically takes as long as the duration of the programme material and up to three times real time on a tape streamer.

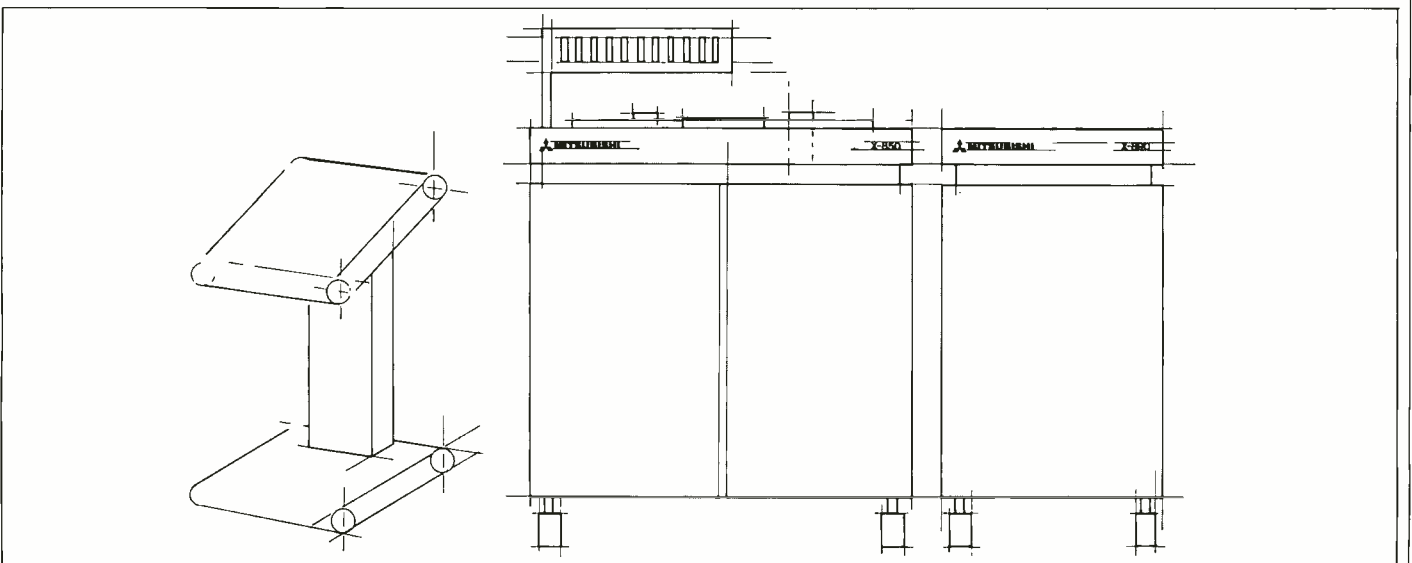
In practice, some time is saved by the fact that gaps of silence are stored as sequencing commands rather than an interval of blank space thus reducing the effective duration of a spot effects or chorus track. But whichever medium is used to save data, only two tracks can be

stored at a time. This means that a pile of eight cartridges or cassettes would be necessary to store a 16-track recording for instance, with each loaded in turn. This is a serious drawback for international programme exchange in the areas of manpower, convenience and compatibility.

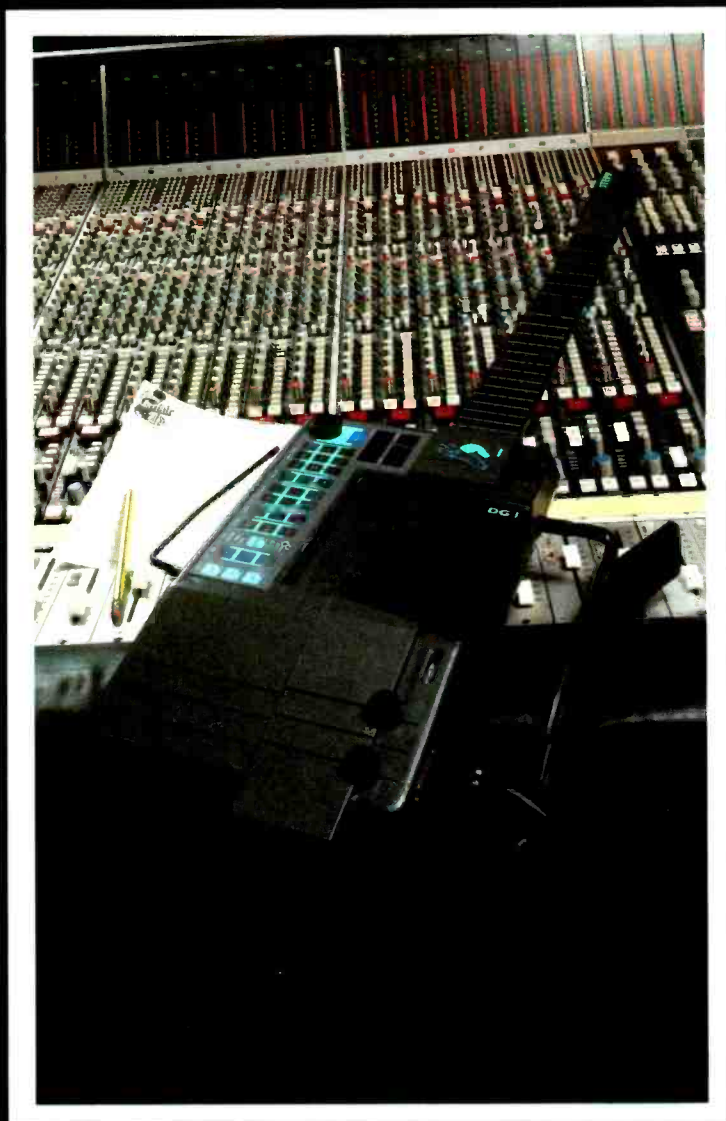
By comparison 32 simultaneous tracks of digital audio can be loaded on to a multitrack machine in the time it takes to thread a spool of tape through the transport. Fast interchangeability between studios is a crucial requirement for music production and tape is likely to be the answer for a long time. Indeed all major computer systems use tape for security back-up or archive storage. So much for the tapeless studio! Furthermore, not all disk systems currently allow selective loading and saving, which is something that can be easily achieved by copying between two digital multitracks.

Simultaneous inputs and outputs

There are also inherent difficulties in matching tape's simultaneous track capacity on a stand alone disk storage system—in particular the 32 tracks available for spontaneous mixing and processing at any one time on a machine such as the X-850 multitrack. Although a virtually infinite number of sources can be montaged on a disk store without



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generation loss—as with 'track bouncing' on digital tape—the number which can be recorded and indeed played back at the same time is restricted, for a number of reasons.

Disk systems rely on storing and retrieving data to and from the drives at high speed in order to enable editing during playback. The data is read off at a multiple of real time and loaded into RAM, where the information is rearranged for playback in real time. This technique gives the disk head time to look for the next section due to be played.

Always assuming that enough RAM capacity was made available to keep pace with disk data rates, the reading speed must be made high enough and the radial search time low enough to obviate any necessity to impose conditions on edit validity. For instance, if search and retrieval took too long, it would be impossible to retain continuity during the 'worst case' edit—in other words when data on the innermost track has to follow outermost track data, or vice versa.

As the capacity for simultaneous

TAPE OR DISK AND A MANUFACTURER'S SOLUTION

recording and output—or 'tracks' in tape parlance—is increased, so the effective search and retrieval time must be increased to protect worst case editing capability. The demand on read/write speed in particular is arithmetically related to the simultaneous track capacity but, as with any data storage medium, hard disks have a physical performance ceiling.

The upshot is that the number of spontaneously accessible recording inputs and playback outputs has to be restrained within the confines of system capability. As with tape machines, disk systems can be chained together to increase track capacity but track access also impacts on the total recording capacity of a disk system—as the number of separately assigned tracks is

increased, so the available running time is reduced in direct proportion. Neither of these characteristics, which make disk systems unsuitable for protracted and/or multi-take orchestral or concert recording, apply to digital multitrack tape.

An integrated system

What has been discussed so far illustrates some of the fundamental errors in the notion of disk systems replacing tape proposed in less erudite circles—a point with which many manufacturers of stand alone disk production systems would probably agree, to a lesser or greater extent. This doesn't mean to say, however, that disk technology has no contribution to make in the recording industry. Far from it. At Mitsubishi we believe that disk's fast access and editing capabilities can be usefully integrated with tape, to create an extremely powerful recording and post-production system not only for music recording but also film and video soundtrack dubbing.

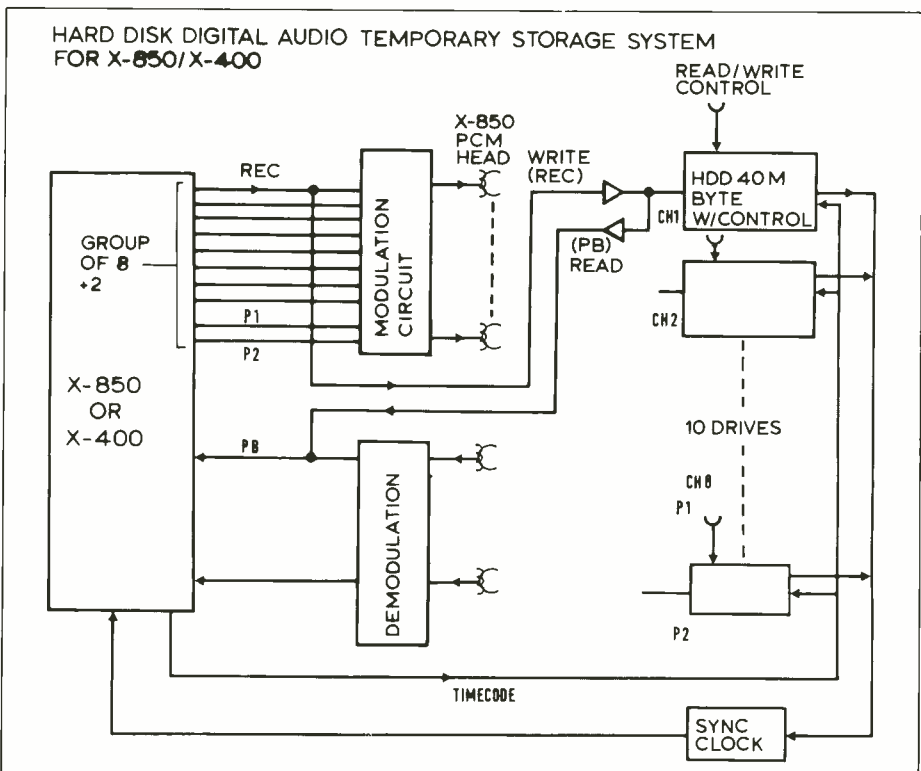
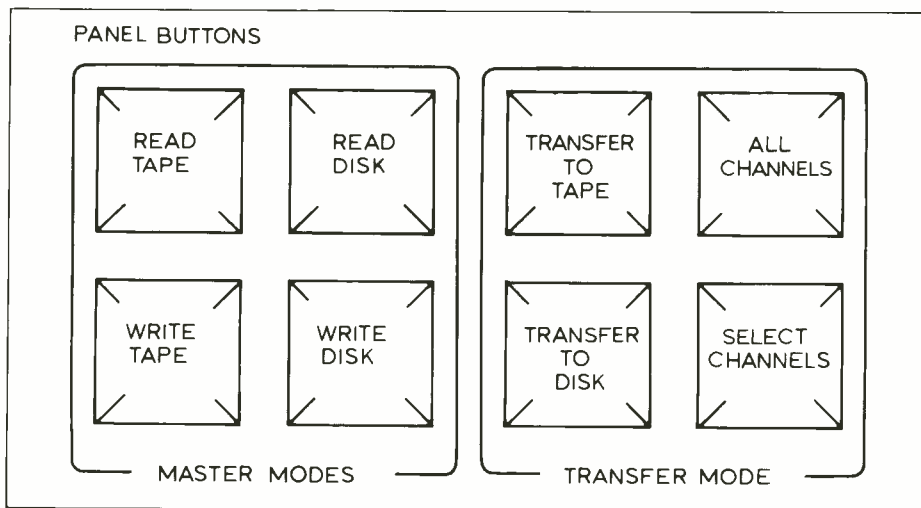
At present, tape/disk interchange is inhibited by the lack of a common protocol between the various digital tape and disk formats. Mitsubishi's system approach will ensure that a disk-based temporary storage area will interface with tape without any of the error accumulation associated with the conversion of data to and from a common language of analogue.

By 1988 the company plans to have completed what we see as the three diamonds in the digital recording and editing process. The first of these components—high integrity multitrack recording—is already in place with the X-850 and X-400 digital tape machines. These are to be augmented by a modular temporary storage unit and a digital Westar mixing console.

The disk-based storage rack stands alongside either of the tape machines to provide eight channels of random access. Capacity can be increased by adding extra disk drives and controller cards. As part of a complete package, we believe the disk facility will be easier to use than any existing equipment of this type. Just eight extra buttons on our familiar autolocator will control all read, write, transfer and channel select functions, with numeric commands entered on the existing locator control pad.

Because a multitrack machine represents a more versatile investment, Mitsubishi believes that open reel tapes will remain the only widely exchangeable medium for data back-up as well as for straight recording. By using a multitrack for back-up (with editing commands on floppy disk and optional connection to an edit list management computer) the engineer will be able not only to load and save up to 32 tracks of data in real time but retain the capability to record or overdub particular tracks directly on to tape.

We feel this is a better way of handling data exchange—apart from only storing two tracks at once, data cartridges save information in a standard computer processing language and cannot accept digital audio data direct. It also substantially beats on a cost basis the option of installing a rack of eight





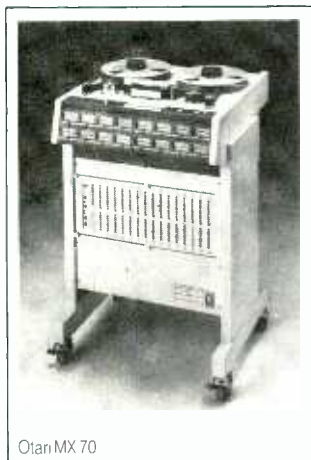
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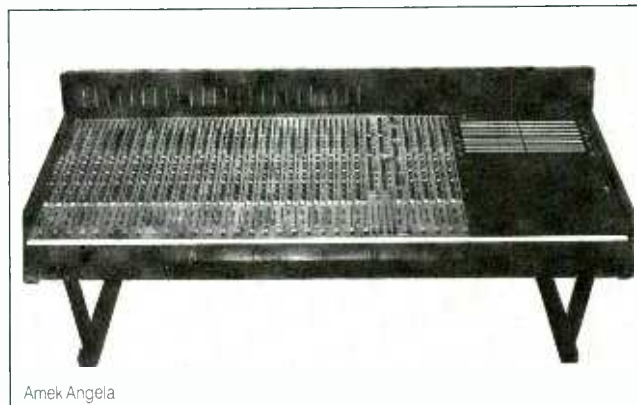
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cartridge back-up machines, which has been suggested as a means of reducing disk loading/saving time to and from tape streamers.

For those opting to retain mixing facilities in the analogue domain, further savings can be made on a disk system designed to work specifically with tape; the multitrack's existing A/D and D/A converters are also employed for processing sounds stored on disk. An additional set dedicated to disk only becomes necessary when the total number of output tracks exceeds 32. Boards will be available to permit up to 40-track working with the standard disk complement running parallel to tape, or more with expanded versions.

Applications

The key to running disk and tape media together as a system lies in ensuring that data remains in the digital domain while passing between tape and a hard disk, either direct or via the digital console, and that each medium is linked by timecode. Once this is achieved, the engineer has at his disposal an extremely powerful, synchronous on-board editing system, with virtually no

TAPE OR DISK AND A MANUFACTURER'S SOLUTION

sound quality trade-off as signal is passed around the system.

For example if a chorus had to be repeated throughout a song, a stereo sub-mix of the refrain could be loaded into disk memory and dropped in at appropriate timecode points flagged on the multitrack. Up to eight component tracks could be loaded instead of a sub-mix, perhaps to allow the engineer to introduce variation between each refrain.

Similarly a single could be 'stretched' for the 12 in market—which after all accounts for some 30% of singles sales—by dumping the entire backing mix on to disk and recording the suitably edited version back on to fresh tape further down the reel, without another tape machine or a razor blade in sight. Vocals could also be processed or re-recorded by using the same dump, edit and put-back

technique, with synchrony guaranteed through timecode interlock.

Perhaps one of the most valuable contributions of the disk memory during day-to-day recording will be overdubbing, particularly while making delicate drop-ins. The original attempt can be retained while any number of drop-ins are recorded on disk, for eventual recall under timecode. Hunting for tracks which happen to be vacant at the drop-in point to achieve the same luxury will no longer be necessary.

If the engineer decides he wants to add some extra overdubs but has run out of tracks, existing tracks can be dumped either intact or as a pre-mix on to disk and put back as a stereo pair, so liberating track capacity formerly occupied by individual instruments—an identical technique to traditional track bouncing but with the important distinction that it applies to a multitrack tape which is already full. By the same token, more could be put back than was taken off, if the original dump occupied less than eight tracks.

Given this capability to build up extremely complex constructions in sound, the integrated tape/disk system is likely to have considerable appeal as a soundtrack dubbing tool. Here the disk could be loaded with an enormous number of instantly accessible sound effects by way of a default library or customised user file, while the tape handles music and dialogue—with component tracks slipped against timecode or edited via the disk store to match the finest degree of subtlety demanded by on-screen action. □

Performance comparison

Parameter	Multitrack tape	Disk/RAM
Access	slow	fast
Data storage costs	low	high
Editing	razor or electronic	electronic
Load/Save time	short	real time per 2-track
Multitrack exchange	single tape	many streamers/cassettes
Multitrack recording duration	long	short
Parallel trackage per machine	up to 32-track	up to 16-track
Power failure data loss	none	RAM contents
Sub-code storage	yes	software-dependent
Track slipping	no	yes

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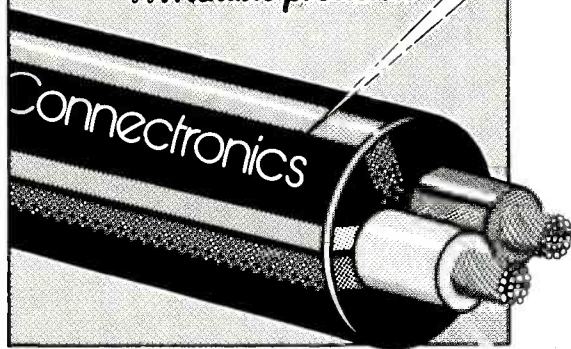
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IN PERSPECTIVE

IN PERSPECTIVE

Comment from Martin Polon, our US columnist

It seems impossible to conceive of thousands of intelligent, well-dressed people spending three days inside a convention facility with 85°F heat and 80% humidity. Yet that is exactly what took place during the APRS exhibition at Olympia II in London this past June. Please don't misunderstand what I am saying. The APRS meeting is a valuable experience each year and this year's activity seemed to have even greater vitality than past shows. It's just that London was in the midst of a record heat wave, with the thermometer soaring beyond the 80s for a full week. Add to that record humidity outside a hall designed to keep the heat in (not out) and you ended up with an atmosphere inside similar to that of Zamboanga.

One American visitor opined, "This is great! It's just like being in a sauna with all of these great people to talk to and all of this swell equipment. And I didn't open my umbrella for the whole week."

A British exhibitor complained, "I can save a lot of money not having to test my equipment for the tropics if I sell to the MOD (Ministry of Defence). If it works here at Olympia, it will work anywhere."

It is important to recognise that London is one of the great cities of the world. Buildings are constructed with an eye towards the way weather is 95% of the time. I was especially taken with those loyal Britons who felt compelled to inform me, "This just doesn't happen here normally." Why they complained I don't know since if London were to be this Mediterranean normally the French could build a Club Med in the docklands. But the catch phrase here is 'this never happens' or 'it's never like this'. These phrases along with that cryptic warning, "It's no problem," bring dread and fear to the heart of the convention goer.

And the problem is: it is a problem attending conventions! You are in a strange place on a time frame that you cannot control depending upon arrangements made for you by others. Convention attendance gives new meaning to the phrase 'Murphy's Law Of Unfortunate Coincidences'. I happen to believe that there was a Murphy and that he died with his boots on at a convention or trade exhibition—because he couldn't fall down since he was pinned in a line to register in 100° heat. With so many people in the audio industry expressing strong feelings pro and con the number of conventions we all have to attend it seems appropriate to look at the dynamics of convention attendance.

In terms of the intensity of scheduling, the audio-related convention industry seems to think that major meetings are best held in the spring or autumn. So most meetings avoid the summer and almost everybody disdains the winter—at least in theory. There are so many professional audio shows today that one could attend a conference every month or nearly every week if one could tolerate

The only one we don't attend is the Geneva Convention

the wear and tear. The 'spring' cycle begins with the SMPTE (Society of Motion Picture and Television Engineers) 'winter' conference rotating around the US and Canada each year in February and is quickly followed by the ASCE (Association of Sound and Communications Engineers) 'sound' show in London, the Festival of Sound in Paris and the European AES (Audio Engineering Society) Convention at the beginning of March. The season gets into full swing at the beginning of April and is marked by the gigantic NAB (National Association of Broadcasters) Convention in Dallas or Las Vegas and continues on with the NSCA (National Sound and Communications Association) show in Las Vegas at the beginning of May. The AES has a US conference in mid-May (this year in Chicago) and there is Showtech in Berlin, followed at the beginning of June by the behemoth summer CES (Consumer Electronics Show) in Chicago. Later in June comes the NAMM (National Association of Music Merchants) again in Chicago, followed on by the London APRS (Association of Professional Recording Studios) at the end of the month. July offers some respite but still holds the Speech Recognition meeting in Montreal and Inter-Noise in Boston. August brings the British Music Fair in London, the International Congress of Audiology (this year in Prague) and the Background Music Show (this year in Traverse City, Michigan). September yields a Photokina in Germany, a SPARS (Society of Professional Audio Recording Studios) conference in New York and the International Broadcasting Conference (IBC) in Brighton while October looks forward to the Tokyo Audio Show, the SMPTE Convention in New York or Los Angeles and the SBES (Sound Broadcasting Equipment Show) in Birmingham, UK. October or November finds the AES annual meeting in New York or Los Angeles. The cold winds of November greet the Tonmeisterstagung in Munich and InterBEE in Tokyo. The year ends and the new cycle begins in January with the Winter CES in Las Vegas, Nevada and the Winter NAMM show in Anaheim.

The above list has 27 shows, meetings, conventions or exhibits important to the professional audio industry. The best news is that the list is relatively complete but in the interest of keeping this article under 10 pages numerous related shows were omitted. The task of attending even half of these events poses considerable logistic challenges to the convention goer.

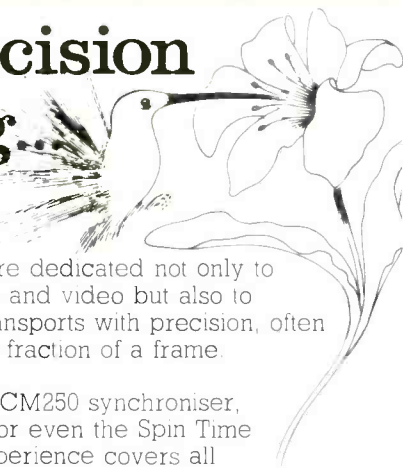
Air travel and airports pose the

greatest challenge to convention attendees today. The interlocking rules of the various discount airfares make inexpensive travel difficult at best: 50% cancellation penalties, Saturday night stay overs and advanced purchasing rules sound like a standup comedy routine. "You may fly Air Transylvania at a substantial discount if you choose to fly on a Thursday night with a full moon and expose your neck to the cabin staff." Unfortunately, the functional penalty for not using the discount schemes is to occupy the same narrow seat with absolute minimum leg room and eat an airline meal produced at an average of under \$1.04 (no kidding—according to a recent study) for twice the ticketed price of a discount fare. International carriers offer improved amenities but with a substantially higher passenger-per-mile price tag.

On the other hand, the dynamics of air travel provide significant options for quiet time for the travel weary audio professional. Consider this story of a simple flight between New York and Boston (about 204 miles). "I was flying to Boston to attend a small conference on electro-acoustics. I left my home in New York at 6am, arriving at La Guardia airport at 7am for a 7.30am flight which actually left at 9am due to thunderstorms. I arrived at Logan airport in Boston at 10.30am since we had to wait 30 min for a takeoff slot in New York. We then waited 30 min for a gate in Boston. It was now 11am and a cab got me to MIT at 11.30am—2½ hr late. The conference finished at 4pm. It took a cab 90 min to get to the airport due to traffic congestion. I missed my 5.30pm flight and the 6.30pm flight to New York was delayed until 8pm when they had to disembark us to refuel since they were sitting and idling the engines while we were waiting. We finally took off at 9.30pm. We landed at 10.30pm and got into a gate at 11pm. I got home by 12 midnight. It had taken me 8 hr door to door—the same time I might add for me to go to London which is 3,000 miles away." This does not happen all the time but audio travellers should consider all their options when travelling.

Being in the audio business, one frequently attempts to carry equipment on board or ship it as luggage. The use of special cases has become commonplace but so has the targeting of such cases by the aboriginals who handle such luggage. One sales manager complained, "If they don't break it—they steal it." Another audio executive described his company's testing of prospective cases. "We test drop from 22 ft which approximates the effect of a kick out of a cargo door." That seems a bit of an overreaction today with most luggage placed in aluminium containers by the airlines and yet...? The theft of luggage or containers of obvious value from unsecured baggage claim areas is another major problem

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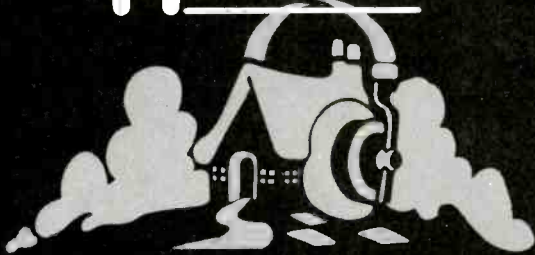
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around the world, with most airports functioning like the giant Dallas-Fort Worth Regional Airport and avoiding the expense of staff to check claim tags.

Carrying items on board provides a special excitement for today's audio traveller in an era of paranoia over terrorism. My favourite story is told by a freelance recordist stopped at the security check of a large US regional airport. "I was carrying a Sony portable stereo cassette recorder, several condenser microphones, cables and headphones and lots of batteries. The recorder was in a black plastic case that fit very tightly. The young woman at the X-ray machine became alarmed and set in motion a security alert. Four huge officers loomed over me, their huge bellies cosseted in by tooled leather belts carrying what looked to me to be artillery pieces. They were attracted by the large number of batteries and only my anguished screams to an airlines manager prevented all of my equipment from being submerged in a bucket of water."

Once the audio conventioner has arrived at his or her destination, the question of registration looms large. It is fascinating in this era of computers-in-a-chip how most registration systems are housed in huge racks with peeling paint. The computers used are usually state-of-the-art for 1971, when in fact such systems were first put into use. The noise level of the registration system exceeds that of your average boiler factory. Add to that the fact that nearly all the trained professionals in your industry have done what you did: they did not register by mail. So the lines for registration exceed those found in Moscow to buy potatoes. Then Murphy's Laws take hold. Invariably, the line that you are in will include an audio engineer from Ulan Bator who needs a translator to register. The translator is coming from the UN—and turns out to be two translators who conduct a 15 min discussion on whether registering at an AES convention might jeopardise most favoured nation status. Lastly, as your turn to register finally becomes a reality—the plastic card embosser for your line gives a mighty wheeze (smelling of burnt resistors) and dies. You are told to go to another line. And please note: this is not a criticism of any one show but of most shows. As they say—registration is hell.

Bring up the question of hotels at any gathering of more than two members of the professional audio industry and you will be treated to a series of reminiscences that make the Black Hole of Calcutta seem like a Hilton. The complaint most frequently heard is about high prices and low levels of service. New York City is frequently singled out for its dearth of rooms under \$100 per night. London and Tokyo are also identified for overpriced lodging. But it is possible to

have difficulties anywhere. The traveller coming in late in the day or into the evening runs the risk of not having a room. Night desk clerks have been known to sell reserved rooms out after midnight during especially hectic periods, in exchange for some special 'compensation'.

Never eat in a restaurant that is more than 20 ft off the ground or that revolves. Use extreme caution with any restaurant advertising 'Continental'

Certain dining rules seem to be virtually immutable for the convention traveller. Never eat in a restaurant that is more than 20 ft off the ground or that revolves. Use extreme caution with any restaurant advertising 'Continental'. The question is, which continent? Never eat Italian food in any town that does not have a 'Family'. Avoid ethnic food in a restaurant owned by anyone not of that specific ethnicity. There has been a trend around the Western world of Korean and other Asian newcomers buying existing businesses, such as restaurants. These are lovely people but often the enthusiasm for a new enterprise exceeds their grasp of the culinary vernacular. You have no idea what it can be like eating a pastrami (or salt beef) sandwich in Los Angeles in a Korean-owned Jewish-styled delicatessen, but suffice it to say that the pastrami was a shade of green much favoured by Van Gogh. Equally difficult are other transplanted

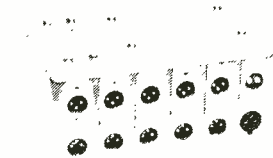
residents who feel the need to mix their former and adopted cultures, at least culinarily. Mexican-Chinese, Argentinian-Italian, Cuban-Chinese and the ominously anonymous Canadian-Chinese are but a few of the cross cultural treats that await the unwary convention goer. Hotel restaurants offer another challenge. Trying to compete with 1,000 other professional audiophiles for breakfast can be a real treat.

Best of all is room service. The scientific methodology used to ensure that your breakfast is delivered both late and cold explains the hotel industry's current fascination with computers. No other device could explain the consistency. Bottom line: eat away from the convention 'scene' if at all possible especially for breakfast. Try to find out about dining spots popular locally. You will spend less money on better food and be able to discuss business without getting a sore neck from looking over your shoulder to see who is listening at convention 'hot spots'. Best bet at finding local 'gems' is to ask a policeman. They are invariably delighted that you ask and most have learned to enjoy their victuals.

The question of weather brings us to the one place where the local residents frequently protest that 'this just doesn't happen here'. If it doesn't, why am I standing in 3 ft of water watching an oddly shaped wooden craft float past me and, say, . . . isn't that a pair of giraffes and do I hear lions? The following rules for convention weather seem to work. First, bring a range of clothes. Do you trust weather forecasters at home? Absolutely not. Then why trust them in a strange place. Bring a raincoat and an umbrella. Your lugging these items without loss through airline hubs will cast a positive aura preventing rain. Don't bring them and you will need an amphibious vehicle to get to the convention centre.

It is with a positive note that I end this simple guide to surviving audio conventions, shows, exhibits and conferences. You must only remember that the Geneva Convention prevents prisoners-of-war from being subject to any of this. Bon Appetit!☐

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"We want to stay a top of the league studio and that means keeping the right mix of equipment, facilities, service and, most difficult, ambience. You have to offer whatever producers and artists see as being the best equipment at the time. For example, we offer full 48-track facilities in both studios."

Piers Ford-Crush is one of a three-man partnership, along with Mike Gardner and Philip Love, that owns and runs Eden Studios. In an increasingly competitive market Eden are not only consistently busy, they are continually expanding. They recently completed a second SSL 48-track studio, a new games room, restaurant and copy/pre-production room. A 40 ft long live stone walled room is about to be initiated.

"When we equipped Studio Two we decided we should buy two Studer A-800s and not compromise with an Otari as second machine. We bought a second Adams-Smith synchroniser, they are really excellent. The fact is that, except when mixing, not many people want to work continually with the two machines locked together but it's important that they know the facility is there and that there will be absolutely no problem in using it. Even if

Eden Studios, London

they do only a few days of an album project in lock, at least they don't have to go somewhere else, it's all kept in-house. It's all part of providing a complete service and making the client feel that if there's anything they need to do, the facility is there."

Piers has some very definite and positive opinions concerning the business of running a studio and the reasons for Eden's success.

"There are plenty of well-equipped SSL studios competing for business; there must be a limit to how many the market place can stand, and it's more apparent than ever that building a nice looking room and filling it with expensive equipment is in no way going to guarantee success. The days of studios being a neat way of a producer or artist avoiding tax on royalty income and turning the money into a pension at the end have gone. Without steady business at the right price the constant investment required can't be made and the studio's reputation will slip."

"A client is paying a lot of money to have a well equipped studio but they'll be able to

work far more efficiently if everything around them is well taken care of. It does cost money to employ the right number of engineers and assistants, secretarial staff, cook, etc, but it seems to work going by the feedback we get from people. That's why it makes sense to buy the best equipment because, a couple of years in, it doesn't matter that you saved a few thousand on cheaper hardware; that's not the main expense anymore, it's the running costs that take over. Then you can start to regret that you didn't invest in the best because you now have to compete with other studios that did, and there's nothing worse than feeling you have to apologise slightly for your choice of gear. It also means that you can't justify charging enough to allow that four-year cycle of profit and re-equipping that will help keep you on top."

Studios One and Two are both housed in the same pleasantly unpretentious white-walled building in a tree-lined side street in Chiswick. Visiting Eden feels more like entering someone's home than a 48-track 2-studio complex. Such a low-key approach could work against

the studio in that some clients may want to feel they're in a larger-than-life environment but these studios are high-tech enough and adding the comfort of the domestic environment is a very welcome balance.

"When it came to building the second studio, we wanted to avoid turning the place into a 'complex' with a livery man on the door and registration numbers in the car park and all that, which may have been good for our egos but would have lost the original feel. We wanted to keep the intimacy of Studio One and so we've built a second lounge, toilet and kitchen so that you can eat and relax in your own studio area. We felt it important that bands don't have to mingle with other musicians if they want to avoid it. Actually, what happens when there are two bands here who know each other, is they arrange to party. That's great but they don't have to."

"Taking that further, upstairs we've moved our offices, to the other side of the building and built a third lounge—a games room with a snooker table—so that people can get right away from the studios and relax. It's ideal for interviews, photo sessions, seeing record company people, or maybe just meeting friends or family without getting involved with the rest of the band. There's also another kitchen up there where our cook can prepare any size of meal. Life goes on whether or not you're making a record. The days of bands turning up at 5 pm and working all night seem to have largely gone. A lot of our clients eat yogurt and go jogging to the gym, preferring to finish around 11 or midnight. I'm not sure what this says about the business!"

Studio One, designed by Ken Shearer, was completed back in 1975 and with minor modification has remained structurally and acoustically the same since that time. One exception is the covering of the studio floor with parquet tiles as longer reverb times became more in demand and there is less need for separation (see also *Studio Sound*, September 1983).

The equipment list has been continually updated and today includes a 48-channel Solid State Logic 4000 series console

Equipment room looking through to Control Room Two



STUDIO FILE

STUDIO FILE

with *Total Recall*. Eden was the first independent studio to run to the expense of an SSL with *Total Recall*. There are Studer A800 and Ampex M1200 multitracks with an Adams Smith synchroniser to tie them together. The M1200 may seem rather at odds with the 'nothing but the best' policy, indeed it is a remnant of the past, but it has been kept on because of its powerful capstan motor and its consequentially fast lock-up time for 48-track work—about 1½ s from start.

The monitors are Questeds with the two 15 in bass drivers to give extra power at low frequencies. The Questeds replaced a pair of JBL 4350s which they'd had for some time but which they found rather bass light for the room which was particularly absorptive at the bottom end. Though not huge, the studio is capable of accommodating a 30-piece orchestra in comfort and plays host to a wide

variety of sessions. Piers explains why they decided against building another full size studio.

"About 70% of our work is adding final overdubs and remixing tapes recorded at less expensive, non-SSL studios. I have to agree that for some bands it doesn't always make sense to pay for tens of thousands of pounds worth of outboard equipment and computer that you simply don't need when recording basic backing tracks. So when it came to designing Studio Two, we decided what we didn't need was another full size recording studio but that it was more important to have a large control room (25×23 ft) to cope with any number of synths for overdubbing and in which a whole band plus producer, etc, could feel comfortable during mixing. We'd been more than happy with Ken's work on Studio One and so we called him in again for the new

project and we're extremely pleased with the results."

The project was completed in October 1985 after 18 months work. In place of a full size studio is a 12×12 ft overdub booth with parquet floor and variable high/mid-band acoustics provided by a system of 3 ft wide angled hinged panels that can provide a hard reflective surface of wood covered with vibrant green Formica, or a softer absorptive side consisting of expanded metal mesh over Rockwool, covered with a grey stretch fabric.

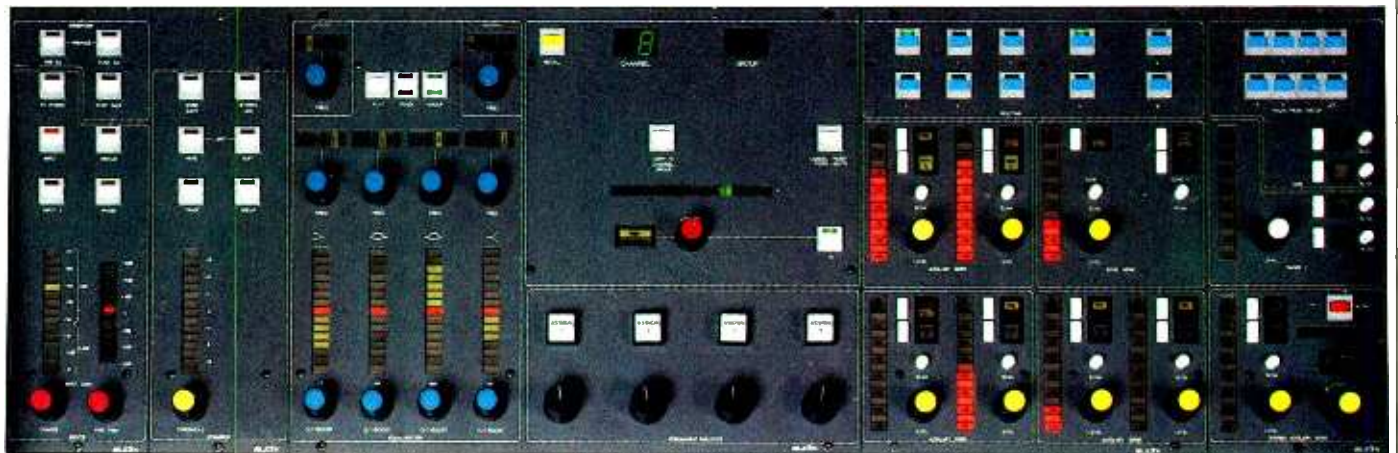
In each corner of the booth are five vertically stacked brass absorbers which, for purely cosmetic reasons, have been slatted with ½ in square-section timber treated with grey stain. This gives a striking finish somewhere between metal and a natural wood. There is a shallow convex, false ceiling of plywood peppered with holes, behind which are the air

conditioning intakes.

Both the overdub booth and the control room are physically decoupled 'rooms within a room'. The booth is floated on Neoprene pads. The control room acoustic is of a modular design consisting of over 100 similarly proportioned boxes (approximately 2×1½ ft) of varying absorption characteristics distributed around the walls of the room.

This method was originally used by the BBC and hence has been seen over the years as being somewhat passé.

There can be no doubt, however, that a distributed system such as this works well, avoids unpleasant peaks or dips in response and gives unending scope for adjustments. It could be argued that having a variety of separate wooden boxes stuck on the wall does tend to look cosmetically dated, however, the creative use of grey-stained wooden slatting has produced a thoroughly unique



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STUDIO FILE

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and fetching appearance and an acoustic that was apparently acceptable without adjustment. Undoubtedly a credit to the work of Ken Shearer.

The desk is another 48-channel SSL console with *Total Recall*. In front of it is a large projection screen and above it, emerging from the false ceiling, is a Barco colour video projector that will not only show the SSL computer display but also any video input for VAPP sessions or normal television for particularly boring sessions.

Curiously, for a studio so well appointed for VAPP work, there is no permanent facility for doing music to picture. Piers says this is mainly because the studio is fully booked without it and they don't receive any great demand. Occasionally, a U-matic is hired in when required, and of course the Adams Smith synchroniser is there for lock-up. They are

Eden, continued

open to such work and intend to invest in their own U-matic in the near future.

Again, the monitors are 2x15 Questeds and as in Studio One they are mounted some distance from the wall on large concrete pillars. This, Piers believes (under guidance from Ken) gives a far cleaner and more controllable bass response. Though he would agree that mounting monitors in a completely solid infinite baffle wall may theoretically offer some advantages, he suggests that in practice the materials that can be used actually flap about with the bass and cause resonances and thus low frequency colouration. Also, the monitors are positioned some distance in from the corners to avoid exciting room modes and ensure a more even low frequency coverage of the room.

All the lights are low voltage, low heat output lamps on a theatrical system of servo-controlled, pushbutton dimmers, so a number of lighting presets can be set up and faded in and out according to the mood of the session. The presets can be overridden to control any individual circuit. "The clients tend to play with it for a while when they first come in, and then just leave it at a comfortable setting," explains Piers.

There's a separate machine room containing the two A800s plus a couple of A820 ½ in stereo machines for mastering at 30 in/s and a couple of Revoxes for tape echo, etc.

Few artists can command budgets for digital recording and although Eden hire in machines about once a month Piers' experience is that record companies are more interested

in saving money on making records rather than paying the extra for what they feel to be a small quality improvement. In fact clients are often not interested in taking the time to put their masters on to Sony F-1 in addition to the Studer ½ in. Clients tend to prefer the Studers, he suggests, because they like the sound and can edit with confidence. Currently, then, digital doesn't figure too largely at Eden, and the directors are shrewdly waiting to see if the new Dolby SR noise reduction system is going to close the gap between digital and analogue before even considering reaching for the company cheque book.

There's just a chance, suggests Piers ironically, that digital could be dead before it's properly begun.

James Betteridge
Eden Studios, 20-24
Beaumont Road, London
W4 5AP, UK.
Tel: 01-995 5432.

Bath is possibly the most 'English' English place you'll find west of Westminster or east of Petticoat Lane. The streets aren't paved with gold but lined with awe inspiring crescents and terraces of fine 18th Century Regency mansions built of local golden coloured stone. The Roman baths are still there where long ago legionnaires soaked away the cold damp English winters, easing their creaking knee joints and aching elbows no doubt serenaded into oblivion to the tones of some imported aeolian harp and flute band.

By the mid 18th Century the 'band' (sic) had grown to the size of a small orchestra, in fact the famous Pump Room Orchestra, longest surviving orchestra in the world. And due to the influence of one Beau Nash, their celebrated Master of Ceremonies, Bath had become the fashionable place to be, haunt of royalty, aristocrats and gents who graced the Pump Room and promenaded the wide town centre streets of exquisite shops and lawned banks of the River Avon. In present day Bath the air of Regency gentility prevails and the musical tradition continues.

Which road brought David Lord to Bath is not quite

Crescent Studios, Bath

certain, it is rumoured that it should have been the hippie's trail but an appalling sense of direction sent him in the opposite direction. Either that or he'd seen his destiny written in the clouds, for in reality, he arrived in 1970 to conduct several of his own compositions in the famed Bath Festival of Music (started by Yehudi Menuhin in 1950). An event which, perhaps rightly, has earned Bath the reputation of being the musical centre of England, and David Lord, being a composer who graduated from London's Royal Academy of Music had probably found himself in his own personal Mecca. Whatever the reason, he decided to stay.

"I'm really a classical musician, I came up through the Royal Academy of Music and earned my living composing for a while, with odd bits of playing here and there, recording was just a hobby. I had some stuff performed in the Bath Festival and I liked the place and thought I'd like to live here. I met a friend who was also interested in recording, he had a Nagra, I had a small mixer and between us we started recording the local choirs and concerts. We had an idea to do

records for tourists, featuring The Pump Room Trio. They play everyday in the Pump Room.

"We did a record with them which was very successful, still is, we've just finished the third volume of it. That was initially the idea that started our own label, Crescent Records. We only issued about 12 records. They were all 'purist' recordings made with a Blumlein pair and Nagra IV-S. Folk music, organ recitals, a series with Bath University of historic music played on old keyboards. We'd go all over the country recording harpsichords and other old keyboards. The usual thing was having to record overnight because of the traffic noise. But the recordings were very well received. Both commercially and technically. We ended up issuing mainstream commercial records which were distributed worldwide. Many of them were featured as records of the month in *Gramophone* and other mags. Ironic how you're not selling any records but they'll be featured as records of the month. We also sold copies taken direct from the master tapes to manufacturers such as Quad and Kef who

would use the tapes for equipment analysis. We'd go to some trade fair and hear our music filling the air. Some of our tapes were also sold to John Boyden at Enigma Records. Some of them are still on general release.

"That folded up but by that time I had accumulated quite a bit of equipment so I started doing demos in my rather large flat in Camden Crescent, which is the third largest crescent in Bath. Luckily, no one else lived in the house and my flat was on the top floor so noise in or out wasn't a problem. I did quite a lot of things then. Two Pentangle albums, early Tears for Fears, all through connections. Y'know how it is, start doing demos, the record companies like the sound of them and suggest that you might as well do the masters. Which is what happens. All of the early Korgis stuff was done there too. Sort of put us on the map really.

"I was the graduate who gradually drifted into the rock world. Not really what I originally intended doing. I thought when I set all this up that I would have time to compose, split my time between writing and recording but recording has taken over totally. Gradually, I outgrew



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the flat. It was never really big enough anyway, if we needed drums we'd have to put them down in a church hall and then overdub. My partner is Eda Pomeroy. I met up with her husband who had acquired this building and jokingly I said I'd move my studio into it. A couple of days later the phone rang and he asked me if I was serious and here we are."

Though the Crescent Recording Studios' name has been retained the building is actually in Walcot Street close to the point where in 1947 the local council had decided to sink a tunnel under Bath to alleviate traffic congestion. Eda tells the story.

"Originally the area had been one of pretty cottages running off Walcot Street down towards the river but the scheme caused a 'planning blight' in which no one could buy or sell. Many houses were demolished or just left empty. So during the psychedelic '60s the place was a magnet to hippies from all over who would find perfectly enviable squats in a very beautiful place. Also, the local Social Security Office was very lenient and, of course, there were the 'vibes', y'know, from Glastonbury, Stonehenge and Avebury all of which are very close by. It's rumoured that David is one of the relics. The council started tunnelling but every few feet an

Crescent, continued

archaeological remnant would be found and they'd have to stop while it was investigated. Eventually they just gave up and packed the scheme in. Many of the cottages though were pulled down to stop squatters but what remains has given this particular area of Bath the flavour it has. In fact many of the hippies have now become perfectly respectable.

"The hippies still play gigs in the local church hall. You look through the window and see everyone dressed in hippie costumes—psychedelic grandads.

"The pub is the last remaining relic really."

The Crescent Studios building dates from about 1700. There is an old stone slab fireplace in the control room.

David Lord continues, "Before we had the place it was a furniture stripping shop. There was a big caustic tank and in here wasn't here, it was outside. So we just built a wall and put a roof over it and Hey Presto! Reception. We needed the extra space. Initially I brought in an 8-track Scully tape machine from my flat and we bought an old API mixing desk from Vangelis which looked towards the fireplace. It gave a very homely atmosphere to the control room. We'd record three bands

during the day, end at midnight and then the reggae lot would come in and work all night. Pretty hard work. Now we're more relaxed in as much as we know we're doing big projects so you know that you're booked for four or six months. There was more of a sense of fun with 8-track, producing as you record. These days you've got no excuse for not getting it right what with the budgets and the time that's spent."

Unlike most studios the piano, guitar, drum and vocal booths are above the control room presenting problems not only with sound insulation but also with line of sight between the engineer and performer.

"In the 8-track days this place was more than we wanted but obviously now it's inadequate. A lot of our work is mixing, or keyboards and synths which are DI'd straight into the board so the studio area is used less these days.

"As for sound insulation, we never had any problems until we installed the SSL. We decided to face it the other way looking toward the the window side of the control room. One side of the control room is glass doors and window and to gain extra height and install recessed lighting and cable trunking we took a layer of ceiling out which resulted in some sound

leakage but it's no great problem.

"Most people working in the control room prefer the atmosphere of daylight through the window, it gives a feeling of space, sunshine and healthiness. The glass doors are especially useful. When for instance the Mitsubishi X-850 comes down we just wheel it straight in through the door and away you go."

There is also a double glass partition between the control room area and reception but not just for the obvious reason of protecting secretaries from too much noise. Firstly, the SSL computer is in a broom cupboard just off the control room door, so the door and the glass partition effectively isolate that. Secondly, live drum sounds are often recorded in the reception area where plain brick surfaces and a very high ceiling allow creative flexibility in microphone positioning. So the double door arrangement forms a booth for the secretary/receptionist and SSL computer between the two 'noise' areas.

"However, by this autumn we will have rebuilt the roof of the main studio making it much higher and more ambient. I think it will make an excellent drum room."

Though initially starting as an 8-track studio 16-track was soon installed but it was working with Peter Gabriel that prompted David to install 24-track.

"At first I didn't know who Peter Gabriel was. I did things for him in the early days when we were 16-track. We remixed *Biko* and the German version of the third album. Then Peter asked me to do some live sound for some tours and then co-produce his fourth album which was done partly here and at his own studio in his home but we mixed it here. That was when we had Neve. On the strength of that we became internationally known. It was Peter's fourth album which nudged us into 24-track. I always felt it was sort of downgrading going from 16- to 24-track. Y'know—you get so used to the better quality with the wider track width. All those jumps seem like terribly big risks when you do them, and getting the Solid State Logic too. Well, it was the

David Lord seated at his console



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obvious thing to do, either keep up or lag behind, now it's the norm, everyone has SSL but at that stage we could say we were one of the very few small studios with SSL. We hoped to pick up more mixing work. I think that's the way we were looking at the time and we have an enormous range of effects equipment too. We now get a lot of bands from Canada, Germany and Australia. There is a flat that sleeps six people in the top floor of the building so it's ideal. Accommodation and recording are booked in one deal."

The line of sight problem between musos and engineer is solved with video closed circuit TV.

"The musicians prefer it, they can sit up there and read the paper, no one is breathing down their necks to get on with something, consequently they really get into what they're doing in a relaxed way and so perform better."

Installing the SSL meant redesigning the studio totally from what had hitherto evolved out of the earliest beginnings.

"A guy called Paul Jarvis designed the acoustic treatments. He used to be manager at Compass Point I think and then he returned to England working for SSL and now he's running a studio in France. SSL suggested him because we couldn't afford a fully fledged acoustic designer. Paul had completed a studio in London for Island Records called the Fallout Shelter, I think, and that was quite successful. So he came here and put a design together which wasn't beyond the realms of the local builder. It's a big improvement and everyone is very happy with it.

"It would be nice to have a wonderfully designed control

Crescent, continued

room but we've got quite a good track record with the major albums we've done and the tapes always sound good in the cutting room. Fortunes are spent on control rooms and you hear horror stories about the results sometimes. We haven't got room for traps that's the problem."

Paul Jarvis designed a mini live end/dead end control room with curved back wall panelling inside on which were hung sandwiches of Rockwool, selloflex, chipboard and blockboard. Frequencies below 150 Hz are absorbed while those above are reflected randomly back into the room by the hardwood strips facing the panels.

"I think we should have had a hard floor too, except that we decided to keep the carpets. It has humanity, that's the main thing. You have to balance that with something which is highly efficient. When American producers visit they expect these great lush plus studios. They walk in here and say, 'Gee, that's the smallest SSL I've ever seen.' But of course it's balanced against our rates which are about £4,500 per week or an on-paper rate of about £750 a day. But that's sort of academic really."

Crescent control room also features free standing UREI 813 *Time Align* monitoring.

"I've never heard a big speaker which I really like. At the time everyone said that was the one to consider, Questeds weren't ready then. But everyone likes working with them and if you can do that then you've solved the problem. Paul's acoustic design allowed for the fact that the monitoring would be free standing and the frequency response graph of the room looks fine. We'd like to have

the speakers recessed into the wall but it's not possible with the shape and inherent features of the room. We retained the rough surface of the old stone walls in the upper studio as the acoustic suits vocals and other live instruments."

Next door to the control room is a garage housing two echo plates. Although the studio is 24-track most often it is worked in 48-track and digital using the 32-track Mitsubishi X-850. Just completed was the all-digital Icehouse album *Measure For Measure* which was recorded on the X-850, mixed with the X-80 and cut in Tape One's, new digital mastering suite. The album is on release in Australia and at time of writing the single was number nine. David Lord produced it with Rhett Davies.

"Digital seems just like working with analogue except there are none of the disadvantages like ping-ponging and crosstalk from adjacent tracks."

The studio is very well equipped with microphones which sit on their stands ready for immediate use should creativity call them into service.

"In the Crescent Records days I used a Schoeps twin capsule stereo mic. I was very anti-Neumann being a classical recordist, I didn't like anything that sounded too coloured, but in this business you've got to have everything, or nearly, which we have."

As is the case with most other studios, as the track capability increases so do the demands on space, and Crescent Studios is currently suffering the mid-track crisis. But its needs for expansion are hampered by the local

council who, having given up on the idea of digging a tunnel, are 'thinking' of building a new road a few yards from the studio, virtually across the studio car park.

"It's a sort of cleft stick, we don't want to spend money on expansion and then have to leave. And also, the council are obligated to find us somewhere similar to what we've got which is quite difficult. They don't realise what it takes to set up and soundproof a studio. There is a really nice old chapel just along the road which would make a wonderful studio, it was an organ factory for a while. The cost of converting it into a studio would be absolutely enormous and it's difficult to know whether it's worth taking the step. Councils take ages sorting themselves out. Were hanging on really."

After working on over 300 records, amongst them Echo and the Bunnymen, Jean Michel Jarre, XTC, Vice Squad, M+M, Finbar Fury as well as those earlier mentioned how had a classical composer become so successful in the rock business?

"I was a fairly serious composer, I used to write for the London Symphony Orchestra, mainstream classical works, I was commissioned by the BBC quite often and still hear some of my music on Radio Three. It doesn't sound like me at all. I could be listening to someone else's music. It's all like another world that I used to be in. People ask me if having a classical training has helped me in my work as a recording engineer and producer. They say it has, I say it hasn't."

David Hastilow
Crescent Studios, 144
Walcot Street, Bath BA1
5BL. Tel: 0225 62286. □

40-channel SSL 4000E console with *Total Recall*
Otari MTR90-II 24-track,
Dolby M24 noise reduction
Otari MTR10 2-track with full autolocate and Dolby 361
Studer B62 with Dolby 361
Sony PCM F1 with CTC
Revox A77 2-track
Denon cassette decks
UREI 813 monitors, HH V800 amp, Court graphics (alternatives available)

Equipment

Mini monitors Wellard,
Yamaha NS 10, Auratone, etc, HH V200 amp
Mitsubishi X-850 32-track and X-80 stereo digital machines
AMS RMX-16
Klark-Teknik DN 780 and DN 34
Lexicon PCM 60 and PCM 70
Roland SRV 2000
Yamaha SPX 90

EMT 140 valve plate and 240 Gold Foil stereo plates
AMS DMX 15.80s
Eventide 910 Harmonizer
Delta Lab DL2 with memory module
Roland SDE 3000, SDE 2000, Dimension 'D', 555 chorus echo, SBF 325 stereo flanger
Gelf Autophaser
Audio and Design de-esser

Rebis rack with auto pler, de-esser, digital sampler
UREI LA4 comp/limiter
Drawmer 231 dual comp/limiter/expander
dbx 165 comp/limiter
UREI 527A graphic
EAR 822Q valve EQ and 660 valve limiting amp
Rebis RA 402 stereo parametrics
Drawmer 221 dual gates
Aphex B and Scintillator



The fact that we don't want to mention digital recording in this advert is no reflection on its undoubted merits, or the merits of Brüel & Kjær Series 4000 Professional Microphones.

The thing is, we've seen enough adverts claiming that the ultimate microphone for digital recording has arrived; too many in fact. To paraphrase Shakespeare, "methinks they do protest too much". And he was acknowledged as a genius without mentioning digital recording once....

All we'd like to say is: don't listen to us, listen to our microphones. They speak for themselves.

Contact **turnkey** at 01-202-4366 and ask Ralph Dunlop
for a demo microphone and make your own evaluation.

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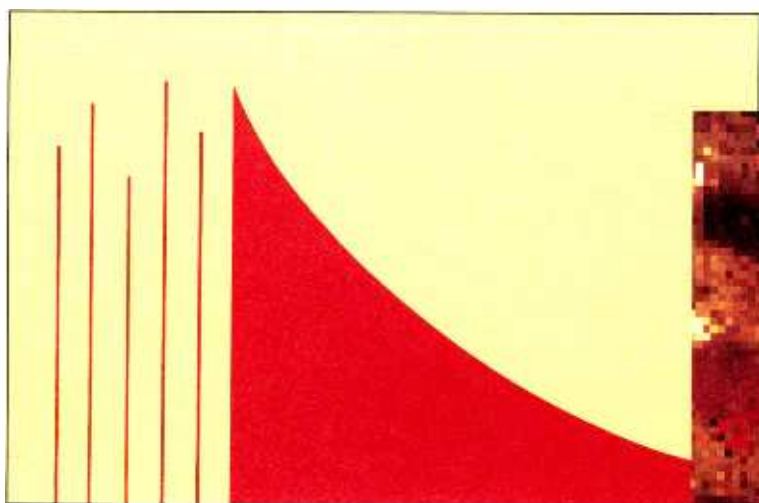
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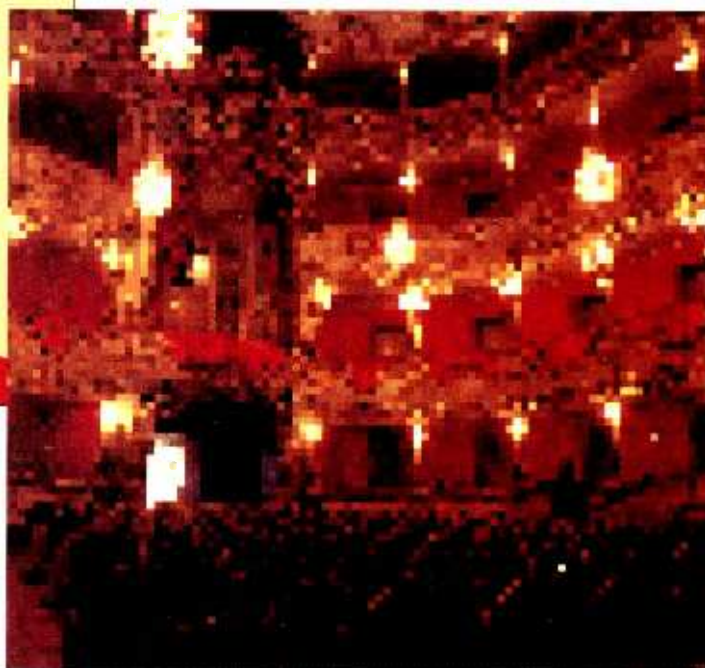
86-348

New sounds only change what we hear.



Digital reverb sounded like this.

First generation digital reverb offers control over a few discrete pre-echos. These are followed by the exponentially decaying reverb envelope typical of plates or small chambers.



New approaches to ambience, imaging and sampling

The new 480L digital effects system from Lexicon was created to produce more accurate room simulations. However, within its innovative software and hardware are possibilities that extend far beyond the limits of realism: combinations of plate, gated and ambient reverbs, unique cascaded time-based effects, sampling. Personal settings can be stored and transported on RAM cartridges.

Controlled from the familiar LARC, the 480L's multiple high speed processors operate in several configurations. Samples can be processed with reverb and time-based effects, all in the digital domain. Two control rooms can use one 480L. Or two 480Ls can be connected through their digital I/O ports. A 480L can even be connected to a 224XL and both units operated from a single LARC.

Moving forward by looking back

The 480L is a generation beyond other digital processors in both hardware and software. Yet many of its advances were conceived in centuries-old con-

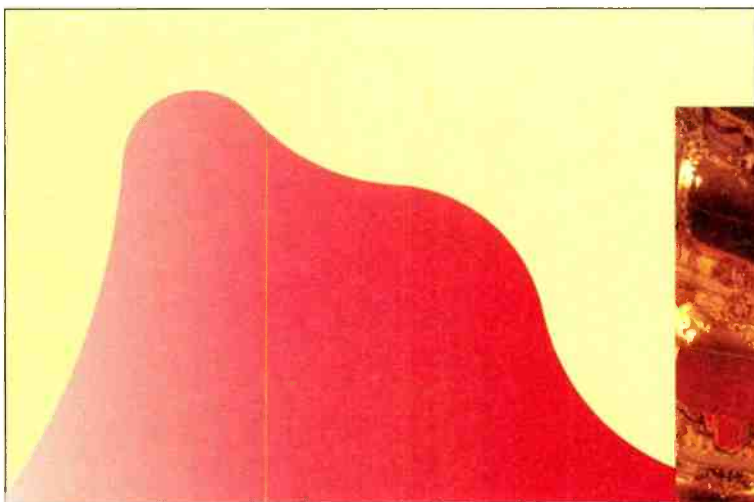
cert halls. Close analysis uncovered basic flaws in the usual digital techniques of ambient simulation.

In real halls, the rate of the first 15 dB of decay is crucial to the perception of spaciousness and ambience. For many listening positions, this initial decay is longer than the measurement of total reverb time would suggest. To emulate these fine old halls, it is necessary to control the initial decay independently of the overall reverb time.

Hall programs of unprecedented realism

The initial reverb envelope defines apparent room size and ambience to the ear. In real spaces, this buildup and decay is gradual, with a complex, non-exponential profile. The use of digital pre-delays does increase apparent room size, but adds unnaturally defined attacks that make the sound artificial. The 480L's SHAPE and SPREAD parameters emulate the complex profile of natural reverb. SHAPE affects the contour of the reverb envelope, while SPREAD controls the time factor for that contour. When balanced with SIZE (reverb density) and RT60 MID, SHAPE and SPREAD create deep, warm, spacious ambience without excessive decay times.

Only new ideas change the way we listen.



Now we have a clearer picture.

The 480L's innovative SHAPE and SPREAD controls continuously adjust the diffused reverb profile to match the ideal ambience characteristics of a real hall — with uniquely natural pre-delay.

Digital processing for digital production

The 480L is engineered for the unforgiving all-digital audio environment, with its higher standards of accuracy and dynamic range. The PCM 1610/1630 compatible *digital I/O interface* lets you add true stereo ambience and sampling, *all in the digital domain*. 18 bit linear internal architecture and converters produce a wet signal dynamic range of 98 dB. Now you can add reverb without adding noise — even on a digital master.

The next stage — and beyond

Right now, the 480L is a powerful and dramatic step forward in digital signal processing technology. Yet its present software doesn't strain the architecture, which is itself designed for future hardware additions. If you need continually expanding creative options more than disposable packages of cliché sounds, experience new possibilities. Treat your ears — and your imagination — to an hour with the new 480L Digital Effects System from Lexicon.



Gexco International Inc. is the worldwide distributor of the Lexicon 480L and other high quality products for the recording, broadcast and postproduction industries.

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The past few years have seen not only the advent of digital recording but also the proliferation of computer generated keyboard instruments, with the shift of personnel from the studio to the control room.

The many hours of preparation and programming of these instruments, together with the necessity for close communication between the musician, programmer, engineer and producer, has inevitably led to larger control rooms, where keyboard rigs can be set up with sufficient space for everybody involved to move about freely.

Larger control rooms require greater output capability from the monitors, in order to achieve similar acoustic levels as would be produced in smaller rooms. Digital recording has preserved transients which would be lost on analogue tape, hence the dynamic range of the monitoring and its ability to handle repeated and higher transient signals must be correspondingly greater. Keyboards produce two further problems. Firstly, computer and digitally generated sounds can produce signals of a very unnatural nature, often with extraordinarily high intensity signals, concentrated in very narrow frequency bands. Secondly, with the control room now becoming the studio in which the musicians are playing, the monitoring system must be able to produce, when required, "live" volume levels. As many musicians "play off the volume" for inspiration, so these monitors must be able to recreate the levels of a concert stage. It's the frame of mind of the musician at the time when the music is recorded that dictates the overall feel of the track.

What do we need? A system with a high output capability, fast response to large transients, relative indestructibility to cope with keyboard accidents (they don't always put out the level that you were expecting), flat acoustic output to the extremes of the audio spectrum, low distortion, and a well balanced tonal character, independent of level. Let's look at these things in more detail.

Low distortion and high power handling will largely be down to the choice of individual drivers. Flat acoustic output could be achieved by equalisation, or attenuation of the more efficient units, however, these factors could work against us in other ways. If we choose a system for use with a single amplifier and high level crossover, we would be required to match the efficiencies of the drivers. A midrange driver with a 6 dB greater sensitivity than the bass driver, would produce a peak in the middle unless attenuated. Any attenuation used would waste amplifier headroom and potentially increase distortion at high levels.

If we drove each individual driver, or pair of drivers, from their own independent amplifiers, no constraints would then be placed upon our choice of drive units. The optimum units could be chosen purely for their desired characteristics. Furthermore, any components, either attenuators or crossover components, which may come between the loudspeaker and the amplifier, serve to reduce the motional feedback control which the amplifier's damping factor may exert upon any cone or diaphragm excursions. Tight control

STUDIO MONITORING DESIGN

Three years ago Reflexion Arts started work on a monitor system for use in rooms of their own design and as independent systems.

Designer Philip Newell describes the development philosophy which considered more than just the system components

over the cone movements of the bass drivers especially, may well be severely impaired by passive, high level crossovers.

By separating the amplifiers, absolute maximum use is made of their headroom and transient handling ability. A further advantage is somewhat less apparent. Observe a sudden, low frequency peak, when fed into a system driven by one amplifier. Should the peak exceed the amplifier's output ability, harmonic distortion will be produced. The harmonics, of a higher frequency than the fundamental, will pass through the crossover into the high frequency drivers. This will not only produce unpleasant audible distortion but will introduce high level, spikey overload signals which the HF drivers may have difficulty in handling. Such repeated overloads can cause listening fatigue and also may cause premature failure of the driver.

Should a similar overload occur in a multi-amplifier system, such low frequency overloads cannot enter the HF drivers as they are not coupled to the same amplifier output. This results in three beneficial effects. One, the highs continue to be heard as clearly as ever, untainted by the LF distortion. Two, no unnecessary strain is put on the HF drivers, which helps towards long and consistent life, reducing diaphragm fatigue. Three, a bonus, the LF drivers, having a response severely limited at the higher frequencies, cannot reproduce the majority of their own distortion. In effect, the sudden LF overload passes through the system almost imperceptibly and without the risk of straining or damaging the drivers.

On the subject of flat acoustic output and well balanced, non volume-dependent tonal character, the two are to some degree linked. The aim was to choose drive units which performed effortlessly in their specified frequency ranges, with the intention of avoiding any requirement for compensation by monitor equalisation.

The whole subject of monitor equalisation can be a minefield. Unless applied in very smooth and gentle sweeps, equalisation rarely reflects the true situation. For example, suppose a room has a bump at say 58 Hz which shows at 63 Hz on the analyser (if

1/2-octave). If the nearest available frequency on the equaliser is 63 Hz, this would be pulled down till the real 58 Hz was flat on the analyser (at 63 Hz). The result of this would be a dip at the next highest frequency which would need to be boosted. This in turn would create a peak at the next frequency, which would need to be cut... and so on.

From a single 58 Hz hump, we end up having a flat picture on the analyser alright. However, this is achieved by the drawing of a roller coaster on the graphics. All we started off with in reality was a minor hump at 58 Hz. In no way is the picture painted by the graphics, the inverse of our original situation, and as such, it has no justification in being there. After all, when the music is playing, we are intending to listen to the speakers, not look at the analyser.

Despite the reading on the analyser, acoustically we would quite categorically not have a flat response in the room. Put the equalisers back where they belong... in the mixing console's effects rack! Has anyone yet seen a monitor graphic which was truly reflecting the inverse of the room/loudspeaker combination? Switch out the equalisation and see just how much more natural and clear, things sound (except possibly in extreme problem cases). You can actually hear if you're over equalising something on the console, it's not masked by unnatural, equalised monitors—try it!

Equalisers also tend to introduce phase shifts, especially when we're getting the alternating up/down pattern. This makes a mockery of achieving minimum phase shift in crossovers, or time aligning, of drivers. There's even more! Headroom at any boosted frequency is correspondingly reduced by that amount of boost for any note striking that frequency. A 3 dB boost will call upon the amplifier to double its output at that frequency, as compared with an unequalised system. A 6 dB boost would require quadruple power, hence higher distortion from the over-worked loudspeakers, and if you've got it up loud, ears too! The peaks can really be unpleasant.

When a large studio in London was completed in 1978, the rooms were fitted with equalisers and set up from scratch.

These were re-checked every few days but after a few months, strange things were noticed about the sounds. The technicians checked and double checked but the prescribed curve was still visible on the analyser. It ultimately transpired that with gradual adjustment, compensation made every few days had resulted in a totally different set of equaliser settings to those noted upon first installation. We went back to square one and started again. This time all was well. The upshot of all this is that two or more entirely different settings of the equaliser can achieve a flat response on the analysers. Clearly they can't all be right. In all probability none of them are. They never accurately correspond with what's really happening. To cap it all, even the different makes of analyser and microphones rarely correspond; or even the mics used. . . grazing, free-field, omni and cardioid. It all depends what you're measuring but they do seem to get transposed rather a lot.

In terms of tonal characteristics, analysers really don't help. Even when set flat in the same room, Altecs, Tannoys, JBLs, EVs, etc. still have their own individually recognisable sounds. You can't (as yet) make a cheap violin sound like a Stradivarius just by equalising the resonances and reverberations. Similarly, purely by electronic means, different loudspeakers cannot be made to sound the same. Analyser and graphics tell about 0.1% of the story. . . there's an awful lot more to it.

However, with a system driven from a suitable electronic crossover and with up to four individual amplifiers, smooth adjustments can be made to relatively small frequency bands by adjustment of gain controls only. To the ear, this seems to sound much more natural and lifelike, and much less fatiguing than correction by means of equalisers.

Limiting can also be dangerous on monitors. What's limiting, your monitors or your mix? It may well be imprudent to mix at ridiculous levels but occasionally, in practice, that may be what the circumstances demand. Even if it's only on peaks, monitor limiting will suppress transients and you may find yourself

putting too much top on tape to help compensate for the lost peaks. Given the flexibility of the split amplifier system, careful choice of drivers and amplifiers should alleviate the need for limiters, while still not putting these ample drivers at risk.

Obviously, with excessive amplifier output capability, some damage can be done. However, with the appropriate choice, this risk can be reduced whilst still allowing for transient headroom. To achieve the full power bandwidth down to 20 Hz, and for good bass transient ability, DC amplifiers would be the first choice. Output power would depend upon the power handling and efficiency of the driver, so this choice should be left till last. The response of the crossover should also exhibit 20 dB of headroom over loud working levels, and respond down to at least 10 Hz as its 3 dB down point.

Now we have the basis of an integrated monitor system. Electronic crossover, DC amplifiers for minimum phase shift and great instantaneous LF transient surge capability. So, to investigate the specific choice of drivers, but how many and which ones?

Choice of drivers

At low frequencies, the tightest bottom end tends to be that produced by a bass reflex cabinet of suitable design, loaded with the appropriate driver(s). The choice of size of bass drivers, within normal limitations, provides the options of 12 in, 15 in or 18 in units, either used alone, in multiples of one size, or even mixed. The apparently obvious choice would be to use 18 in units, with their ability to produce great, low frequency outputs. One drawback frequently found in 18 in units, however, is the difficulty in preventing such a large cone from flexing under high level transient inputs. This serves to reduce the "punch" from the loudspeaker and, together with the resulting harmonics from the flexing cone, tend to produce a boom rather than a thud from the bass end.

By contrast, 12 in drivers, require far greater cone excursions to move the same volume of air, and there are drawbacks to having a small surface area for the

generation of the low frequency sound. As the suspension systems for 12 in and 15 in cones tend to be similar, it can be appreciated that the 12 in driver receives far greater long term punishment, than the 15 in driver. Furthermore, in order to achieve a very low resonance, the 12 in cone must be either more heavily built than its 15 in counterpart or its suspension system must be even more compliant. The first option reduces efficiency and requires greater output capability from the amplifier. It also produces a lower total acoustic output per watt of power handling capacity. The second option reduces the driver's ability to cope with transient overloads without damage or strain.

Musical instruments with large, low frequency content tend to be large. Natural sounding low frequencies usually come from sources which produce a relatively low air pressure from a large source area. Even though it may produce a similar reading on the spectrum analyser, moving air in this way undoubtedly sounds different from the high pressure small source area, approach of 12 in or smaller cones. This once again refers back to the frequently misleading results gleaned from 1/3-octave analysers.

In practice, 15 in drivers tend to achieve the best compromise for low frequency use. The use of a 2x15 in system gives a further increase in output due to the mutual coupling achieved when the units are positioned relatively close together. This gives us a large sound source area, a relatively rigid cone, reasonable efficiency, high power handling, a good transient response, and a long, stable, life expectation.

Midrange drivers

The midrange is the most critical and most contentious area of monitor design. The choice of drivers mainly falls between cones, domes and compression horns. Cones and domes are more generally considered to produce a softer, less harsh sound than compression horns which, strictly speaking, are two separate components—the driver and the flare. When very high output levels are required, the more efficient compression horns are capable of much greater acoustic output. Thus, at high levels, they may actually be sweeter than a hard pushed cone or dome driver.

To achieve good high frequencies and fast transients, the moving mass of a midrange driver must be rigid yet light. As increase in size means increase in weight for any given material, cone and dome midrange units cannot just be made larger in order to be louder. It is also difficult for a small mass to dissipate the heat which is generated in the unit at high output levels. For a typical efficiency of say 10% for a cone unit, for every 20 W supplied by the amplifier, 18 W are turned into heat within the driver, only around 2 W being transmitted to the room as sound energy.

Doubling up the number of units obviously doubles the power handling but each doubling of output power only provides an additional 3 dB of headroom. Another problem is that unlike at low frequencies, at higher frequencies a point source is desirable as the sound wavelengths involved become shorter as



235 monitor

STUDIO MONITORING DESIGN

frequencies rise. Unless the listener is equidistant from the drive units, some phase cancellation will occur, blurring the sound and impairing stereo imaging.

For high output levels therefore, the compression horn would seem to be most suitable, subject to the reduction of the characteristic harshness. Several options are available to help reduce any undesirable effects. Firstly, use cone drivers as far up as possible, whilst still on the good side of the efficiency/frequency response curve. Secondly, do not attempt to drive the horn beyond the

point where the driver response begins to tail off, or the directional characteristics of the flare begin to beam and lose their even distribution over the required listening area. Thirdly, in order to maintain the output within the lowest distortion range of the compression horn, provide adequate power handling and efficiency for the desired acoustic output. Fourthly, the design of the flare itself can contribute significantly to the timbre of the sound, although frequently, this cannot be easily determined by instrumentation.

If the output of the cone drivers can be maintained up to at least 1200 Hz, this allows the use of a 1 in instead of a 2 in compression driver. In general, 1 in drivers have better transient response, improved high frequency output and generally smoother response with less tendency to the barking character of compression horns used at lower frequencies. The smaller horn throat also improves high frequency dispersion, with

far less tendency to beam than larger diaphragm/horn-throat combinations.

The flare itself can be contoured to cover the desired listening area, giving a sufficiently wide dispersion to allow all concerned to be in the same sound field. Furthermore, the flare can control the dispersion to prevent unwanted reflections from points in the room where sound need not be beamed. The general requirement to achieve this would be in the order of 100° to 120° horizontal dispersion, with say, 40° vertical dispersion, presuming that most ears in the appointed listening area will be between 3 and 7 ft from the ground. The highest frequencies which can be smoothly and comfortably reached by such a combination of 1 in driver and flare, still maintaining adequate dispersion, would be around 8 kHz.

The optimum format is now beginning to unravel itself. Cones to 1200 Hz, low distortion, flat, high output, 1 in compression horn to 7 kHz and a separate unit for the top octave or so... 7 kHz to 20 kHz.

ON
ANTHONY JACKSON

FM ACOUSTICS

In the studio and in concert, Anthony Jackson is world famous for his artistry on the contrabass guitar. Less known, but essential to his standard, is his uncompromising dedication to the accuracy with which the sound of his instrument is reproduced. His musicianship is always complimented by the most precise amplification available so we are pleased when he says:

"This instrument is perhaps more demanding on a sound system than any other and your amplifiers are nothing short of awesome. The FM 1000's reproduction of low-frequency transients is unmatched. There is no detectable sound of stress, no sense of thermal stress either..."

"There is nothing to compare to lifting the lid on a piece of equipment and realising that it has been designed and constructed with no regard to cost."

"I've owned many power amps, and heard and played through many more, and as far as I am concerned, the search for the ultimate has stopped here. Thanks for your most inspiring performance!"

Anthony Jackson

Anthony Jackson, New York

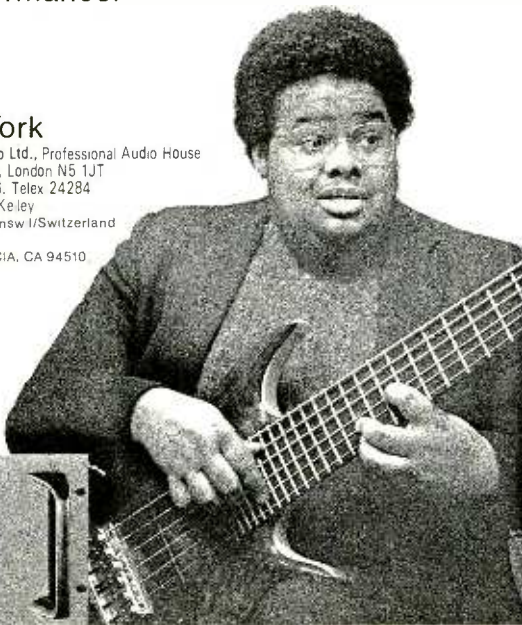
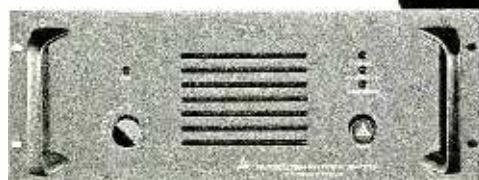


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FM ACOUSTICS LTD



Specific choice of driver units

At the very bottom end of the frequency spectrum, two 15 in Gauss 5831F/4583F drivers were chosen. A 4x12 in Gauss 2831 option was considered, to give a similar source area, but with 8 Ω coils, a parallel arrangement would produce 2 Ω which is unacceptably low for most conventional power amplifiers to produce their best. Individual amplifiers could be provided for each pair but this was considered cumbersome. A series parallel arrangement was considered unsuitable, for then not one of the drivers would be directly connected across the amplifier terminals as it would be in series with at least 4 Ω from the other drivers in the group. This would reduce the ability of the amplifiers' high damping factor to control cone excursions, and once again, the tightness of the bass response would be unacceptably compromised.

So, a pair of 4583Fs (or 5831Fs) would give 4 Ω in parallel which is ideal for most power amplifiers to produce full potential output power. The voice coils are rated at 400 W each, though, with the roll surround of the 19 Hz units, the RMS power handling of each driver is rated at 300 W. 600 W RMS was duly considered adequate power handling for the bottom end of each speaker system... 1200 W RMS down to 20 Hz for a stereo pair. Unfortunately, by 800 Hz the Gauss 15s are giving out, so 300 Hz was chosen for the upper crossover point of the bass drivers.

Whilst still delivering full output at 800 or 1000 Hz, many 15 in drivers have a distinct lack of life in their reproduction above 500 Hz. This is not easily measured, and may be connected with the mass of the moving parts, together with the cabinet linings optimised for bass response. Quite probably, many maligned drivers have been unfairly judged when being used beyond their ideal ranges. Some of this can be down to the driver manufacturers themselves, publishing measured responses within specified limits, then quoting usable frequency range even

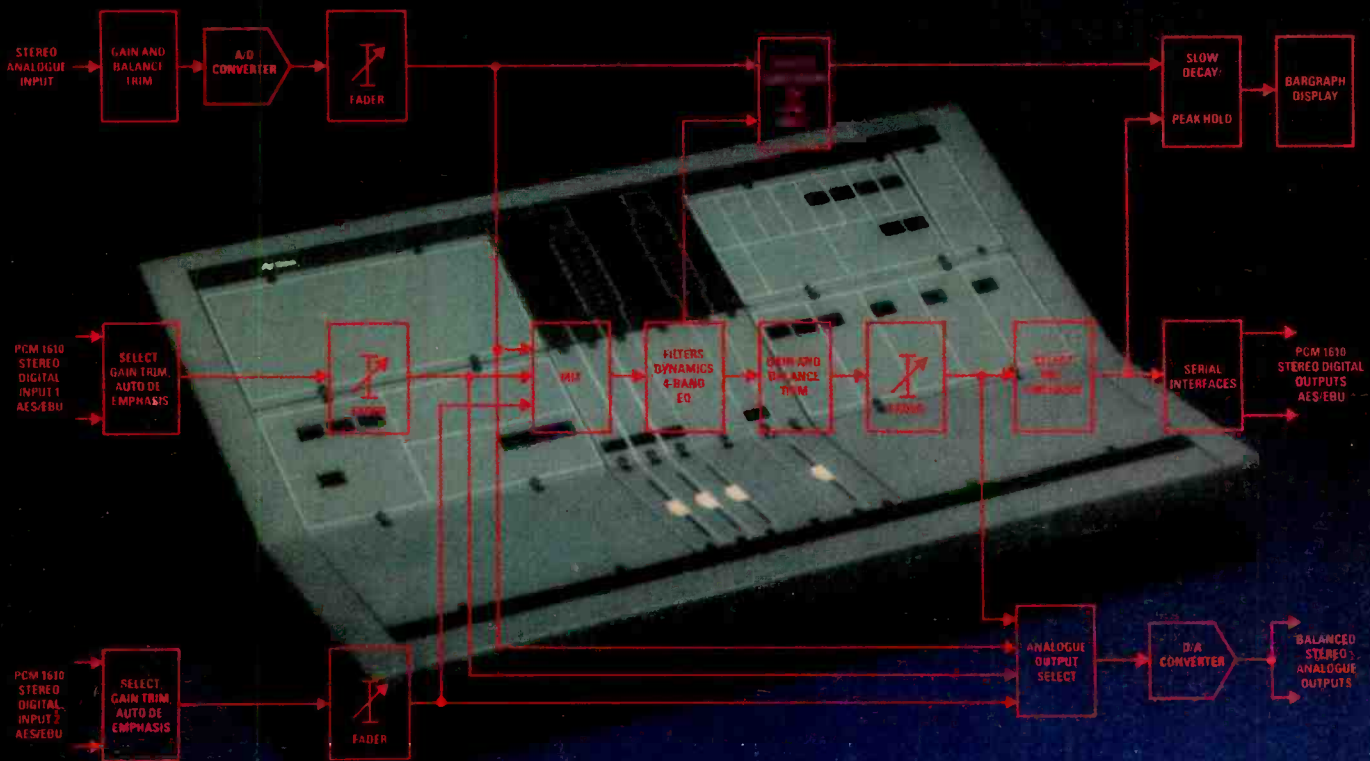
Neve – for the digital experience.

Preparation of master tapes for Compact Disc is a highly exacting process, requiring precise and repeatable control of levels, filtering and equalisation without degrading the original quality.

To achieve these requirements when compiling from digital recordings it is essential to keep the processing in the digital domain, so that the signal remains digital

throughout the whole recording and reproduction chain.

The Neve Digital Transfer Console – designed by the world leaders in digital audio processing – provides a digital stereo mixing and processing chain developed from proven Neve DSP technology, with the unique facility of 'snap shot' automation of all parameters under either manual or SMPTE time code control.



The Neve DTC has two stereo digital inputs accepting either Sony PCM 1610/30 or AES/EBU formats with automatic sensing of pre-emphasis, and one stereo analogue input, all with individual gain and balance trim.

The mixed signal may be processed by the comprehensive Neve Dynamic Range Control and the unique Neve Formant Spectrum equaliser with peaking/shelving selection and variable Q; the EQ may also be used in the Dynamics side chain, and a delay facility is available to give

'zero attack time' dynamics.

Second-order high-pass and low pass filters are structured before the processing section.

Digital output metering is by high-resolution instantaneous-reading bargraphs; a separate digital bargraph provides metering of analogue signal levels and dynamics.

The stereo digital output may be either Sony PCM 1610/30 or AES/EBU, but at the same frequency as the input, with or without pre-emphasis.

A separate stereo analogue output provides monitoring

facilities or a feed to analogue effects units etc.

The console is capable of automated operation of all parameters from SMPTE time-code using up to 200 'memories' which may also be manually accessed; the integral floppy disc system may be used for permanent storage of these 'snap shot' configurations.

Neve

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STUDIO MONITORING DESIGN

beyond these limits. This usable frequency range can probably be interpreted as that range in which there is still some audible output. In reality, this range ought to be less than the published frequency response, as frequently, towards the upper end of the range, the response becomes ragged and the tonal characteristics are no longer desirable. Once again, the provision of monitor equalisation has allowed drivers to be pushed beyond desirable operating envelopes, and well outside the range in which they can produce a natural timbre. Many monitor systems employing 15 in

drivers and 2 in midrange drivers, crossing over at around 800 Hz, suffer the most in this area. The bass driver performance is compromised by the choice having to be made for a unit performing reasonably in the lower mid area. This is then asked to meet a midrange horn, operating below a frequency range which would be considered optimum for studio purposes.

It was for the above reasons that 300 Hz was chosen for the first crossover point. This leaves a gap of two octaves before the midrange horn takes over. Consistent with the overall design philosophy, a cone unit was required to bridge the gap. The JBL 2121 was considered to be probably the finest unit available for this purpose, with a very smooth frequency response, high efficiency, low distortion and 75 W RMS power handling. This 10 in unit was also considered to give an improved attack compared with similar 12 in drivers, the natural yet startling response to a snare drum appearing to confirm this. The

relatively lightweight cone, roll surround, and prodigious magnetic flux, all contribute to the excellent transient response and high acoustic output.

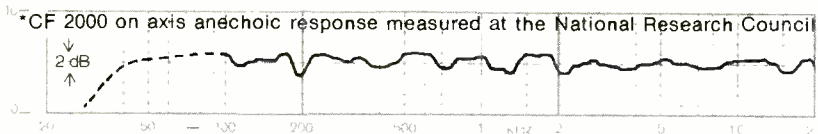
So, at 1200 Hz we arrive at the compression horn. The primary function of the flare is to deliver the output from the compression driver to the listening area, with controlled polar pattern and frequency response. Materials which have been used range from metal to glass fibre, wood, plywood, carbon fibre and many other materials. Although all can be shown to produce satisfactory responses, without question they impart substantially different tonal characteristics to the sound. These are subtle differences, very difficult to determine with instrumentation, yet having significant effect on the overall sound of the system.

The flares chosen were a modified ASS design, manufactured from a glass fibre/resin mix with a high loading of powdered slate. The cavities in the moulding are filled with a resin/silica sand mix, of high density, the whole of the rear surfaces then being coated with a rubbery application to further damp any potential resonances. This flare was chosen for its exceptionally flat frequency response over the range of its intended use. Although constant directivity designs were considered, and offer a wider range of polar pattern control, by their nature, they do not have a flat frequency response. Their subsequent reliance upon equalisation precluded their use with this design philosophy.

The compression driver itself can become the source of endless, quite unfruitful argument on the subject of what is considered to be correct. This is probably the area which produces the most intense likes and dislikes. The two options initially offered for this design were the Emilar *EK175* and a combination of Coral driver with JBL titanium diaphragm. Both drivers can produce a substantially flat response from 1200 Hz to 8000 Hz. Both also have similar 50 W RMS power handling capacity. The choice is entirely down to personal preference. The Emilar produces a slightly softer, more cone-like sound, whilst the Coral/JBL combination produces somewhat more exhilarating transients. A third possible option is the TAD *TD2001*. This driver has a beryllium diaphragm, with characteristics somewhere between the aluminium diaphragm of the Emilar, and the titanium diaphragm of the JBL. It is down to individual producers and engineers to decide precisely which one most helps them to achieve their best end results. Remember, studio monitor loudspeakers are a means to an end, a tool to achieve the optimum, overall, final mix. They are, themselves, sometimes tailored to take into account the human aspects of life in a control room. Although other drivers could, no doubt, be used, the three mentioned above appear to give the smoothest transfer and closest match to the units chosen for the frequencies immediately below and above the mid horn.

By 8 kHz, the natural response of these mid horns is beginning to tail off. Once again, according to the overall design philosophy, no attempt will be made to equalise this falling response, but it will

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be allowed to dovetail neatly into the response of a suitable HF driver.

In order to match the system, the HF driver must have a high acoustic output capability, high reliability, a smooth response from 7 kHz to 20 kHz. It must also have good horizontal dispersion and be as close as possible to a point source. Of all the units available, the JBL 2405 'slot' was considered to be the best suited for this purpose. With its very lightweight diaphragm assembly (much more delicate than that of the 2402 'bullet'), it provides exceptional clarity of highs without the requirement for any additional equalisation. With a 20 W RMS power handling capacity and huge magnet system, the acoustic output capability in the top octave is truly awesome. The dispersion angles of the 2405, also closely match the polar

pattern of the chosen midrange units.

To recap, the final driver choice was as shown in Table 1.

Each unit is essentially flat over the frequency band for which it is being used, eliminating the need for equalisation circuits and producing a very clean, natural, unequalised sound. Small adjustments may be made to the frequency response of the system, by adjusting the gain of the individual amplifiers, providing a "shelving" response adjustment over a frequency band, without introducing any unnecessary circuitry, or phase shifts.

Once the drive units have been chosen, they must be housed in some form of suitable enclosure. The cabinet used was chosen to have a final volume of air, after loading and internal treatment, of around 12 ft³. A tuned port was used with a relatively large surface area, to preclude any tendency towards breathing noises, sometimes accompanying the higher velocity of air, moving through a smaller aperture.

The material chosen for the cabinet was a type of 1 in ply, developed in Galicia, and comprising alternating layers of softwood laminates and compressed Eucalyptus fibre. This material is very dense, exhibits excellent

resistance to warping, and is also easy to work with. Its construction gives good suppression of panel resonances, while maintaining great strength and damage tolerance. The enclosures were heavily cross braced, side to side, front to back, and top to bottom. Each internal surface was also braced, then treated with a series of heavy and compliant substances to prevent unwanted resonances.

The initial treatment consisted of covering all internal surfaces with a mixture of underseal, heavily loaded with silica sand. When this was *thoroughly* dry (an important note as residual fumes given off can affect loudspeaker cone adhesives) the surfaces were treated with a PVA adhesive and covered with ½ in foam rubber. Again, a layer of PVA adhesive, then a layer of mineral covered bituminous felt, additionally supported by large headed galvanised nails. This combination gives remarkable resistance to the onset of structural resonances in the enclosure itself, and also provides an appropriate internal surface to effect the desired tonal qualities from the bass end of the spectrum. For further control of reflections, but avoiding overdamping, one sheet of BAF wadding was applied to the rear surface only.

At very low frequencies, and consequently long wavelengths, the absorbent properties of padding is minimal. Hence the use of the semi-active, high friction lining, to reduce the amount of LF energy vibrating the cabinet walls. All that we are intending to do is to reasonably control any standing waves which may be excited

TABLE 1

20 Hz to 300 Hz:	2 × Gauss 4583F (or 5831F) 15 in bass drivers, each of 300 W RMS power handling.
300 Hz to 1200 Hz:	JBL 2121/2/3 10 in cone, midrange unit of 75 W RMS power handling.
1200 Hz to 7 kHz:	Emilar EK175 or Coral M100/JBL 2425 diaphragm, each capable of handling 50 W RMS or TAD TD 2001 of 30 W RMS power handling.
7 kHz to 20 kHz:	JBL 2405 of 20 W RMS power handling.

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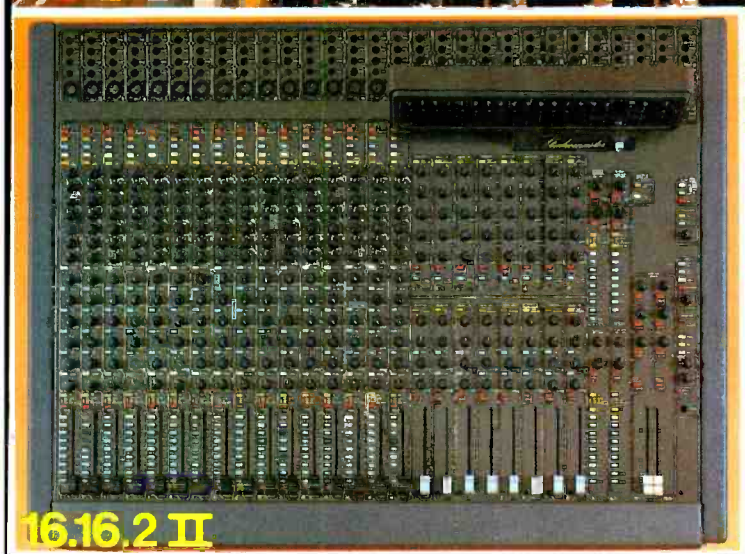
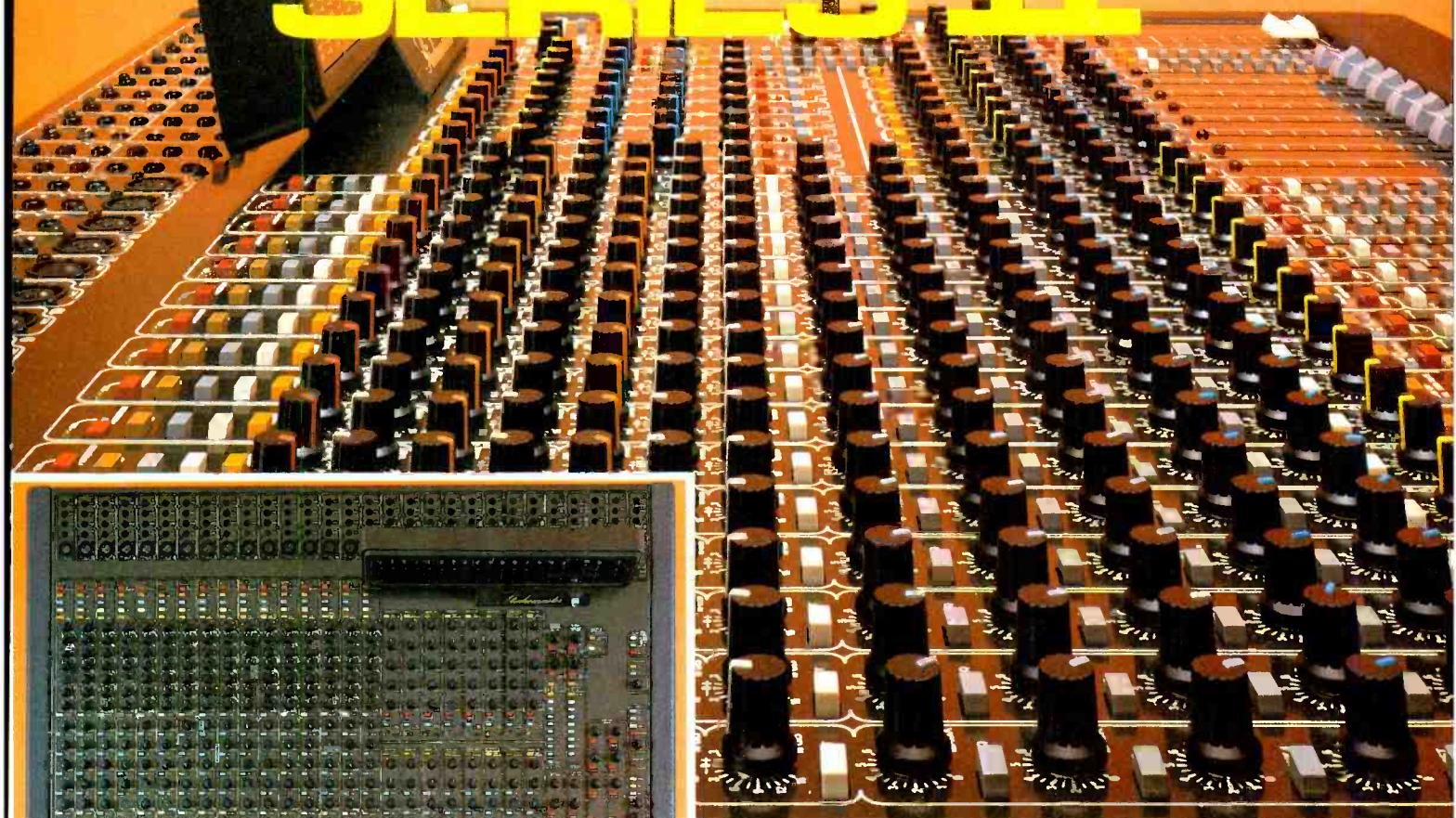
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within the enclosure and prevent them from striking the acoustically, partially transparent loudspeaker cone, and passing through into the listening area. It is in the lower mid region where the timbre of the sound is most readily affected by internal damping, and where more careful consideration must be given to any such damping materials.

One advantage of crossing over at 300 Hz is that, without the compromises which are usually required, the two ends of the bass spectrum can be given their optimum enclosure treatments. Thus, the 10 in lower mid driver was placed in a separate chamber of around $\frac{1}{2}$ ft³. This chamber was mounted on the front baffle and consisted of a roughly 10 in cube. The primary function of this sub-enclosure was to prevent the 10 in cone from going into orbit when the two bass drivers punched inwards. The separate acoustical treatment facility was a further advantage. Although a cube may at first sight, not be the ideal shape from a standing wave point of view, by the time that the cone and magnet assembly had been introduced, the box became far from cubic. This break-up was further enhanced by the addition of a diagonal half-width sub-divider. This small enclosure was then lined with $\frac{1}{2}$ in foam rubber, suppressing undesirable resonances, whilst not absorbing all of the life from the output. The outside of this 10 in box was treated with the same underseal/sand mixture as the main enclosure, in order to reduce any resonant tendency in this wooden sub-assembly. Lead in wires were sealed with silicone rubber.

The compression horn and slot were then mounted in the same vertical plane as the 10 in driver. These were placed as close together as practically and aesthetically possible, in order to maintain the closest approximation to a coincident sound source. Although aesthetics may initially seem a somewhat peripheral subject sight is the sharpest of our senses. It has the ability to distort our other perceptions by overriding them. A great number of the hours worked in a control room, are spent staring towards a pair of loudspeakers. A symmetry of the loudspeaker's physical layout, conditions the brain to expect symmetrical sound sources. It's a point of psychology rather than pure acoustics but these aspects cannot be ignored just because they have no bearing on the measured results.

Finally, the boxes were wired up with cable of sufficient gauge to easily pass the high transient currents associated with such a system. These systems tend to be most effective when mounted so that the front baffles are flush with the front wall of the room. This allows no areas around the cabinet sides for the bass to take any but the direct path to the ears. Enclosures designed for flush mounting have front baffles $\frac{1}{2}$ in proud of

the edges of the cabinet sides. Those designed for free standing installations have their front baffles recessed 1 in. This 1 in lip is of purely visual origins, and whilst the purist may maintain that cabinet edges should chamfer backward from the baffle, extensive listening tests on cabinet designs of this size can determine no audible difference whatsoever. On purely aesthetic grounds, the lip remains.

Crossovers

The lynchpin of the entire system is, of course, the crossover. 12, 18 and 24 dB/octave crossovers were tried and used extensively. The 12 dB/octave units were eventually rejected, as the encroachment of one driver upon the territory of another was distinctly noticeable. The overall design philosophy of this system called for each drive unit to handle its own range effortlessly. The crossover frequencies were chosen to cover the optimum ranges of the selected drivers. One octave beyond the crossover points, however, some of the drivers exhibit some irregularity as the response tails off. With a 12 dB/octave roll-off, a 4 dB peak in the drivers' response, one octave above the 3 dB down crossover point, is only 11 dB below the system's smooth response at that frequency. This could definitely be detected as colouration in the sound, particularly on certain instruments. This problem was all but removed with the use of 24 dB/octave crossovers. Unfortunately though, despite the drive units having been chosen to have characteristics complementing and matching each other as closely as possible, the 24 dB/octave slope was somewhat abrupt. This was noticeable especially at the change from cone to diaphragm at 1200 Hz. It was by no means distressing but a slight change in timbre was noticeable particularly on rising sections of strings. The crossovers with 18 dB/octave were finally adopted, as upon listening, they were generally considered to offer the smoothest and most pleasing overall performance. They also had the advantage over the 12 dB/octave units in their capacity to reduce the fatigue on the compression horns and slots. Indeed, the extra 6 dB increase of slope reducing by 75% the power delivered into the drivers one octave below the crossover point.

Further developments

Accepting that not all control rooms could accommodate monitor loudspeakers of the size of the 235s, two variants were produced. The model 233 is a similar, 4-way system but with one 15 in bass driver; and a more compact model, the 238, dispenses with the 10 in speaker and operates as a 3 way system.

As a further option, a cone midrange unit can be fitted to the systems. The cone option box is fitted to a front plate, identical in size and fixing holes, to the midrange horn. The cone driver is less efficient than the compression horn but by means of preset amplifier gain control levels, the system can be set up for rapid interchange. For orchestral music, or situations where the full output potential of the system is not required, this option may be considered desirable should cone drivers be preferred. □

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BUSINESS BUSINESS



Barry Fox investigates the facts behind the industry news

EMI history

In the audio industry there used to be two 'universities'—the BBC and EMI. Anyone who had trained at either of these places was pretty well guaranteed a job in the industry.

The BBC is cutting back on engineering and things have been unsettled inside EMI since the takeover by Thorn at the end of 1979. Thorn has recently been selling off its video and film interests. A management team tried to buy out TESE (Thorn EMI Screen Entertainment) but couldn't come up with the money. So Thorn sold TESE to Alan Bond's Corporation, who promptly sold it on to Cannon. TVF (Thorn Video Facilities) has been bought by Virgin and most of the cable TV-operations have gone to British Telecom. The REW tape duplication plant, owned by Thorn-EMI since 1979, was bought out by its own management and is called Tapetech. It's all very confusing and small wonder that there are some worried people inside the EMI music division.

The EMI Central Research Laboratories out at Hayes did most of the pioneering work in Britain on audio and TV. After the Thorn takeover CRL went quiet, partly because Thorn suddenly found itself responsible for EMI's secret military work.

But work at CRL continued; new premises for the labs were opened in April 1985 and now there are around 275 people working there. Although much of this work is still secret, either for military or commercial reasons, there is at long last a decent collection of historical relics laid out as an exhibition in the main entrance hall. Although this is not open to the public, it can be viewed by group appointment. What better time to organise a visit than when the AES Convention rolls into London next March?

The '30s were the golden years for EMI. At that time everyone who cut a record had to pay a royalty to Western Electric (the manufacturing division of Bell Labs) because WE owned the master patents on moving iron cutters. Isaac Shoenberg joined EMI in 1928 and the next year hired Alan Blumlein to build a cutter which got round the patents. Blumlein made a moving coil cutter which did the trick. He also built a moving coil microphone because Westrex claimed royalties on condenser mics too.

The cutter moving coil was a single turn of metal which carried very heavy currents. Blumlein used neoprene for the bearing instead of rubber. That way he could get an adequate drive current from relatively low power radio receiver valves, instead of the very high power transmitter valves previously needed. The original lathe has now been beautifully restored in the CRL exhibition.

Blumlein made a stereo cutter and

pick-up with a pair of moving coils, and a ribbon stereo mic. These are also there to see—and you can hear a 1933 stereo recording of the *Ride of the Valkyries* played on three pianos spread across the Abbey Road studio. Although Blumlein had a stereo mic, most of the stereo recordings were made with twin mics and shuffler circuits, on to 10 inch 78 RPM discs.

Particularly fascinating are the clips of stereo sound film made in 1933. After years of nagging Thorn-EMI have finally transferred them from old nitrate stock on to 1 in video. The exhibit uses VHS hi-fi dubs. There is the classic shot of a train going past the EMI Labs, filmed from the building roof. The stereo mic was mounted on a lamp post down below near the railway lines. There is also a piece of film shot inside the labs, which has Blumlein, Vanderlyn and Westlake walking backwards and forwards across a crude stage while talking to give a mobile stereo image.

At Hayes now there is also a collection of TV equipment built by EMI and Marconi for Britain's all electronic TV service. This went on the air from Alexandra Palace 50 years ago, in November 1936. EMI engineers had made the transition from sound film to TV after trying to make movies on paper for home display with an epidiascope. Their first TV system, built around 1930, used 150 lines per picture. The 1936 system used 405 lines. It was almost hopelessly ambitious but the project paid off. The last 405 line transmitters in Britain did not close down until January 1985. The 625 line colour waveform used today is based closely on the 1936 parameters.

It would be a tragically lost opportunity if the AES came to London and left without giving visitors from abroad the chance to see the CRL's reminder of what British engineers were doing 50 years ago.

No split

The BPI and MCPS would both politely like it known that there is "no split" between the BPI and Music Copyright Reform Group on the question of whether a levy on blank tape should compensate the record industry in hard cash for losses from home taping—or whether it should simply establish a legal principle, like buying a licence to record. The MCPS explains there is "merely a difference of emphasis" while the BPI says "compensation for loss has not been central to the BPI's levy argument for a long time".

Yes, the BPI acknowledges, it did once press for compensation. And oh boy, how it pressed.

For many years the central theme of the BPI's case for a levy was a bizarre concoction of figures derived from falling

record sales (claimed as "lost") latched to the price of a blank cassette. Then (in November 1981) there was that ridiculous advertising campaign, with half page spreads signed by struggling artists like James Galway, Elton John, Cliff Richard and Sir Adrian Boult. This followed the scrapping (September 1980) of the MCPS home taping licence scheme. The MCPS had seen the licence as a way of establishing a legal principle; the BPI saw it as confusing the claim for compensation.

In February 1981 another industry body, the IFPI, issued what it described as a "revised policy statement". This explained that whereas previous policy statements had emphasised the need to compensate for the damage done by copying, its new policy was to stress that home copying infringed legal rights. A couple of months later the then director of the IFPI, John Hall QC, told the International Music Industry Conference in Berlin "achieving a levy of a substantial amount was probably more important than deciding how it should be distributed".

This little bit of history shows how the industry finally woke up to the fact that divided they surely fell but united they had a chance of winning a levy.

Quite where a difference in emphasis becomes a difference of opinion becomes a split, I don't know. And it would be a dim-witted observer who did not observe that the willingness to forego a claim for compensation is only a means to an end. Once the legal principle of a levy has been established in law, it's a building block to bigger and better claims. But you have to hand it to this section of the industry for finally getting it's act together. No more nonsensical talk of spoilers, no public whining by underpaid pop stars and polite private approaches to the press instead of public posturing.

All this makes PPL, Phonographic Performance Ltd, begin to stand out like a sore thumb. I think it is safe to say that in all my years of writing about the record industry in general, and the tape levy issue in particular, I have never heard anything from PPL. I assumed they weren't interested. But it seems they are. Recently, out of the blue, up pops a Peter Rogers of the PPL with a published letter (*The Listener*, May 8th, 1986) telling me how "confused" I am and how my comments about "copyright legislation are bound to be less than authoritative, to put it mildly".

I wrote privately to Rogers and the PPL making the point that I had never received any information from the PPL, for instance on its stance on copyright. That was more than four months ago and I've still not heard anything from the PPL about its stance on copyright. Come to think of it, I'm not entirely sure what the PPL does, except restrict the amount of recorded music which the BBC broadcasts. Is it a secret?

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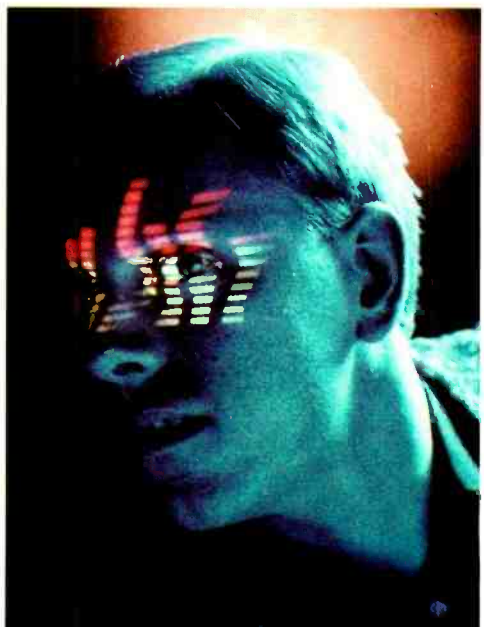
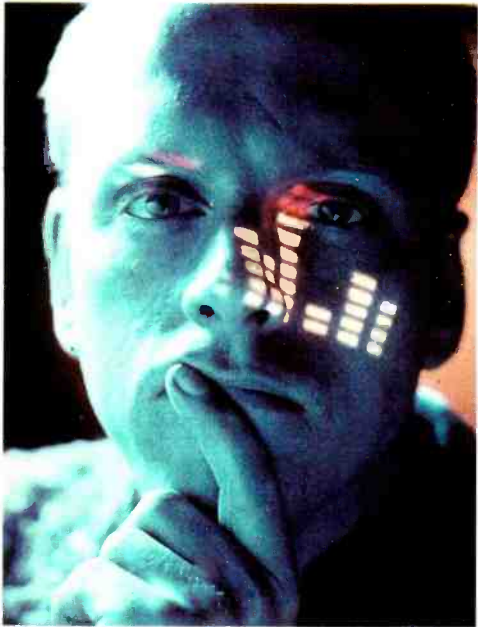
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“In the future,
the time it
takes to
record an album



will be
the time it
takes to
listen to it.”

“Spontaneity produces the best records. The worst thing that can happen in a studio is when you get stuck in a rut,” says Williams. On ‘That Perfect Beat’ he ended up using the backing track off the demo just to get back that fresh, original sound that seems to slide further and further away the longer a session wears on.

“Most control rooms are like Star Trek. The last thing they inspire is that feeling you get when a band walks on to the stage. It’s not surprising there’s a gulf between musicians and technology, like they’re on different sides of the glass.”

Williams, of course, has been on both sides. He used to play bass with The Selecter. He turned producer out of sheer frustration with the studio system. As far as he’s concerned, the producer should be just like one of the band. “Engineer, producer, musician, it’s all the same to me.”

Now, though, times are changing and Williams is optimistic. “Take Yamaha. They’re coming at it from the musical side. Like when I went on an R&D visit to their silicon plant, the first thing they insisted on showing us was their grand piano factory.”

“Yamaha have really pushed and established MIDI and made all their equipment MIDI-compatible. The point about MIDI, it’s a direct connection between the performer and the hardware, so production becomes performance in itself. You see, there’s not the leg-work of hooking up A to B. That’s all gone – or going, anyway.”

“On top of that, most of their hardware’s within musician’s budgets and when you own something, you really get to know it. That’s exactly what musicians have to do.”

He cites the Sweet Dreams tour as an example (Williams co-produced the album with Dave Stewart): “We toured the control room. We were all listening to the finished mix on stage which was fed directly to the PA. Actually, everyone in the audience thought we were miming – it sounded like a professional recording – but everything was totally live.”

“You know, in the Fifties they used to just walk into the studio and do it. Completely off-the-cuff. The recording was as good as the performance and that was it. Well, we’re moving back that way again.”

“Sort of Fifties with knobs on.”



REVIEW REVIEW

A technical report by Neil Grant

TANNOY FSM MONITOR

The Tannoy *FSM* monitor system arrives carefully packed in two double walled cardboard crates. Care is required in removing the cabinets; they are heavy and it is necessary to invert the carton to slide it off the cabinet. This requires at least one assistant, preferably two, in order to prevent the cabinet sliding out as it is re-inverted.

With the sleeve successfully removed, the cabinet is left standing on a small fabricated pallet which also forms one of two protective end caps. There is little doubt that the system will arrive in the same condition as it was shipped from the manufacturers.

Cabinets and drivers

There are three drivers in each cabinet, two are mounted concentrically covering the entire system bandwidth, the third is an extra 380 mm diameter bass driver, reflex loaded in a 210 l chamber. The dual concentric unit is reflex loaded into a 100 l chamber separated from the bass section with a sloping shelf.

Both drivers are set back into a routed check in the front baffle and secured with four M8 socket headed cap screws each. I was initially concerned as these screws use captive T-nuts but the units were removed and replaced many times during the course of the review with no difficulty or lack of security whatsoever.

The cabinets themselves are made of a material known as Medite, or MDF. This is a manufactured timber material, made from machined pine compressed into a dense board. With the proviso that the centre density is somewhat less than the surface density, this is an excellent material for the purpose: dense, rigid and very stable. This particular system was veneered in oiled walnut and



supplied with a timber-framed, blue fabric-covered, grille assembly. The result is a very handsome, albeit somewhat hi-fi, pair of cabinets.

There are two termination panels, the one at the rear allows the user to select full passive operation or to isolate the woofer and actively bi-amplify the system.

The recommended electronic crossover in this mode is an overdamped second order filter with a Q of 0.4 and a cut off frequency of 500 Hz. Filter type and decibels of loss at the summing point are not specified.

Effectively, this provides for a 3-way system, with an electronic crossover at 500 Hz and the internal passive

crossover dividing the bandwidth electrically at 1 kHz.

The second termination panel, mounted on the front baffle of the cabinet, provides not only a slave input but four selectable areas of frequency adjustment to the system. These are enabled by moving gold plated links between terminals mounted on the panel itself, a much more sanitary arrangement than using switches or a fully variable potentiometer-controlled circuit.

Mounted behind this panel is the dual concentric passive crossover, equaliser and impedance correction circuits and the 'Sync Source' time delay all-pass card. All circuitry, with the exception of the delay card, is neatly hard wired, and securely mounted to the board.

The user options available on this panel allow you firstly to select LF Window. This switches the passive high pass filter feeding the dual concentric in and out of circuit. In the open position, the filter is by-passed and the two cone drivers are driven in parallel. In the closed position, the high pass is in circuit and the speaker functions as a 3-way passive system with 500 Hz and 1 kHz crossover points. The intention is to allow mounting of the speaker on a stand in free space with the window open to provide the extra bass energy or soffit mounted in a wall, in half space with the window closed and bass energy reduced. In theory, the response should sum back to flat in both circumstances. In practice, I can see users wall mounting their speakers and still selecting the open window to provide extra low frequency energy.

The other three options are effectively equaliser controls providing: ± 2 dB 3 kHz to 20 kHz treble energy; ± 2 dB 1.5 kHz to 4.7 kHz presence energy; level, -3 dB, or -6 dB treble roll-off.

Recommended amplifier power: 10 to 500 W (RMS per channel into 8 Ω).

Peak input power: 700 W.

Impedance: Nominal LF window open—4 Ω , closed 8 Ω . Minimum LF window open—3.5 Ω , closed 6 Ω .

Sensitivity: 94 dB (for 1 W, at 1 m).

Frequency response: 40 Hz to 20 kHz ± 4 dB.

Phase response: 500 Hz to 12 kHz $\pm 18^\circ$.

Acoustic source position: 220 mm behind front baffle surface on axis of symmetry of dual concentric unit.

Dispersion: 90° conical (at -6 dB points).

Crossover frequency: LF window open, 1 kHz.

LF window closed, 500 Hz, and 1 kHz.

MANUFACTURER'S SPECIFICATION

Crossover type: First and overdamped second order with parallel impedance compensation and Sync-Source all pass delay.

Crossover control: three position links.

Distortion: (for 90 dB at 1 m) $< 0.5\%$ THD.

Bass loading: double chamber, twin port.

Internal volume: 310 l (bass 210 l, dual 100 l).

Cabinet material: 25 and 32 mm Medite with two shelf braces.

Cabinet finish: oiled walnut.

Grille construction: acoustic cloth over timber frame.

Overall dimensions: (whd)

28.3×41.3×21.1 in/716×1052×541 mm. (Add 65 mm to height for removable plinth.)

Overall weight: 183 lb/83 kilos.

Packed dimensions: 30×52×23 in/765×1315×590 mm.

Packed weight: 209 lb/96 kg.

Tannoy Ltd, The Bilton Centre, Coronation Road, Cressex Industrial Estate, High Wycombe, Bucks HP12 3SB, UK.

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REVIEW

REVIEW

Impedance and the amplifier interface

Fig 1 shows the modulus of impedance with respect to frequency on a logarithmic axis from 10 Hz to 2 kHz. The system response curves with the LF window open and closed have been overlaid on the same plot for comparison.

With the window open, the low impedance point of 4.1Ω is at 134 Hz. Initially, I was concerned that in this mode of operation there might be strain on some types of power amplifier. In reality, you should just use a quality power amplifier; certainly one that is FTC rated down to at least 2Ω in order to prevent there being any possibility of current limiting into the load when the two bass drivers are driven in parallel.

The highest rate of change of impedance with respect to frequency occurs at 91 Hz, a capacitive phase angle

of -39° . This is reasonably benign and should cause no problem to most amplifiers. Electrical phase with respect to frequency is plotted in Fig 1a.

With the window closed, the impedance dipped to only 6.5Ω , conforming with the manufacturer's specification.

Fig 2 shows the modulus of impedance of the entire system, in this case with the extremes of equaliser settings overlaying the modulus of impedance with all controls set level. Frequency is displayed on a logarithmic axis, from 0 Hz to 30 kHz. With all adjustments set to maximum, the impedance drops briefly to 3Ω . This should be of no concern—it is unlikely that you would ever set the system up in this fashion and at these frequencies the phase angle is inductive and rising.

Considering the swings in magnitude of impedance, it would be advisable to use a quality multi-strand speaker cable

of very low impedance to avoid impairing the amplitude response of the system.

Time domain performance

The time response of the speaker is illustrated in Fig 3. Curiously, the first arrival is actually the cone bass section of the system, marked on the plot by X.

Great care was taken to confirm that the difference in arrival times, some $452 \mu\text{s}$, was not due to path length differences between the dual concentric driver and the second microphone 2 m from the geometrical centre of the cabinet's front baffle. It would appear, however, that the bass section of the speaker system arrives before the output of the compression driver. The time difference between the two translates to a distance of some 155 mm. This is not necessarily prejudicial to the system response as a whole though it would obviously be desirable that all sections of the system arrive coincidentally.

The next arrival, Y, is from the compression driver itself, closely followed by the splash from the cabinet sides and edges and a strong reflection from the cabinet grille assembly. This has been marked Z. This disappeared when the grille was removed. The transient response was reasonably good, therefore, marred only by an overlong decay time and the non-coincident first arrival.

All further measurements were taken with the grille assembly removed. If you are mounting the speaker in a wall and away from prying fingers, do remove the grille.

Frequency domain

The broad band amplitude response is shown in Fig 4. Generally, the response is good, with a gently rising characteristic, broken only by a rather aggressive spike at 1.3 kHz, and the rather ragged spikes between 10 kHz and 20 kHz.

With the exception of the lower cut-off point, it was possible to confirm the manufacturer's amplitude specification. It was found, however, that the system was 4 dB down at 62 Hz in free air.

Fig 5 shows the amplitude response, window open and closed, from 0 Hz to 2 kHz. Broadly, the two curves are some 6 dB apart as you would expect from the matching modulus of impedance curves. The spike at 1.3 kHz is now very obvious.

As can be seen, the window increases low frequency extension by over half an octave, somewhat at the expense of the mid-band, the rise substantially decreasing above 400 Hz.

Fig 6 illustrates the range available with the equalisation presets. Again, the centre curve was produced with all the controls set level and the upper and

FIG 1 MODULUS OF IMPEDANCE—OVERLAYS
0 dB is located at 4Ω
Log freq axis: 2.7 decades
Resolution: $1.0552\text{E} + 02 \text{ m}$ and $3.1653\text{E} + 00 \text{ Hz}$
Sweep rate and bandwidth: 10.02 Hz/s
and $3.1653\text{E} + 00 \text{ Hz}$

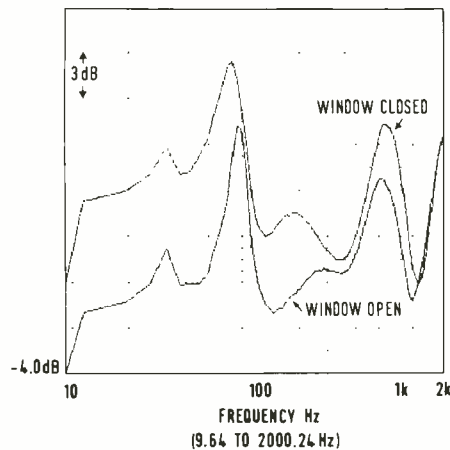


FIG 2 MODULUS OF IMPEDANCE—
HF EQ OVERLAYS
0 dB is located at 4Ω
Log freq axis: 2.7 decades
Resolution: $1.0552\text{E} + 01 \text{ m}$ and $3.1653\text{E} + 01 \text{ Hz}$
Sweep rate and bandwidth: 1001.91 Hz/s and
 $3.1653\text{E} + 01 \text{ Hz}$

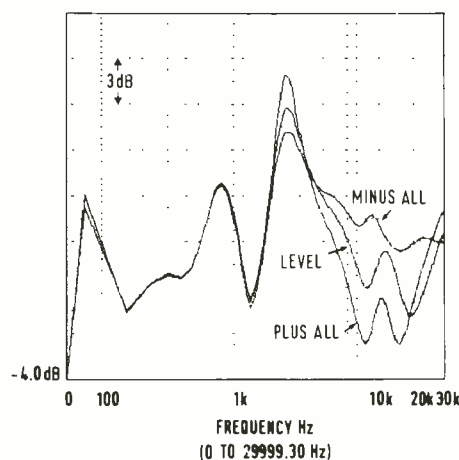


FIG 1a ELECTRICAL PHASE, LF WINDOW OPEN
Log freq axis: 2.7 decades
Resolution: $1.5994\text{E} + 02 \text{ ft}$ and $7.0778\text{E} + 00 \text{ Hz}$
Sweep rate and bandwidth: 50.10 Hz/s
and $7.0778\text{E} + 00 \text{ Hz}$

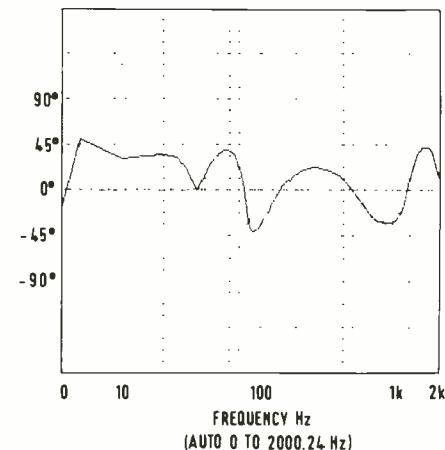
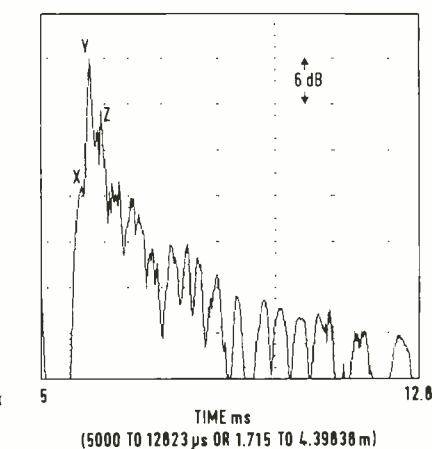


FIG 3 TIME DOMAIN—ENERGY TIME CURVE
0 dB is located at 0.00002 Pascal
Scale: $7.3366\text{E} - 01 \text{ m/in}$ or $2.8884\text{E} - 01 \text{ m/cm}$
 $2138 \mu\text{s/in}$ or $842 \mu\text{s/cm}$
Line spacing: $19.6072 \mu\text{s}$ or $6.72526\text{E} - 03 \text{ m}$
Line width: $26.6658 \mu\text{s}$ or $9.14636\text{E} - 03 \text{ m}$
Window file name: A:HAMMING.W8T



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48 Volt Phantom power, switchable.

The System can be supplied with external patchbay.

Don Larking
audio sales

REVIEW REVIEW

lower traces with all the controls at their extremes. A good range of adjustment is provided. With the frequency scale expanded on this linear plot from 1 kHz to 20 kHz it is possible to see that the compression driver response is generally good, with the exception of spikes at 10 and 14.5 kHz.

In order to examine the internal filters, they were alternately disabled and the plots of the individual units overlaid. Even though the electrical crossover was said to have been at 1 kHz, it can be seen in Fig 7 that the acoustic crossover position is at 1.6 kHz. The bass driver rolls out evenly under the influence of the 500 Hz low pass.

Interestingly, the spike at 1.3 kHz is shown to be a product of the cone driver

in the dual concentric and not the compression driver. The same characteristic can be seen, albeit 30 dB down, in the bass driver.

Unusually, for a speaker manufacturer, Tannoy have supplied figures for the phase shift through the system in their specification. So it was decided that, contrary to the usual practice of measuring each driver separately in order to determine acoustic centres with respect to frequency, while the others in the system have been replaced with dummy loads, an attempt would be made to replicate the measurements made by Tannoy by measuring the system as a whole.

The phase plot against frequency is shown in Fig 8.

Whereas it was possible to confirm Tannoy's claim of $\pm 18^\circ$ phase shift in the pass band of each driver, it was not possible when measuring the complete system integrated together. In fact, as the curve shows, the bass section of the Tannoy FSM is 180° away from absolute polarity and the high frequency section is in absolute polarity. It is quite common to have two sections of a system out of polarity with each other depending on the crossover used but usually the polarities are the other way round, with the bass section being in polarity and the high frequency section being 180° away.

The slanted section of the curve merely indicates transition from one section to the other.

FIG 4 1 W AT 1 m, WINDOW OPEN, FREE AIR MEASUREMENT
0 dB is located at 0.00002 Pascal
Log freq axis: 2.7 decades
Resolution: 7.6111E+00 m and 4.5066E+01 Hz
Time of test: 5960 μ s, 2.0443E+00 m
Sweep rate and bandwidth: 2030.90 Hz/s and 4.5066E+01 Hz

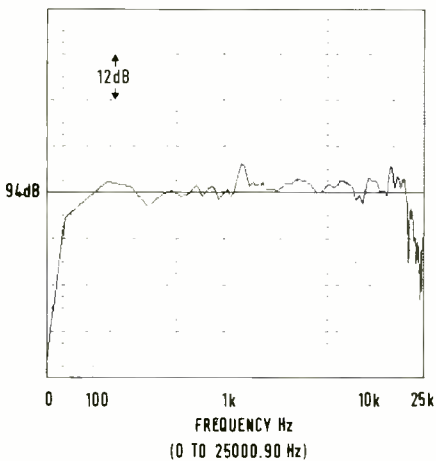


FIG 5 LF OVERLAYS
0 dB is located at 0.00002 Pascal
Log freq axis: 2.7 decades
Resolution: 4.3912E+00 m and 7.8112E+01 Hz
Time of test: 5960 μ s, 2.0443E+00 m
Sweep rate and bandwidth: 2030.90 Hz/s and 2.6000E+01 Hz

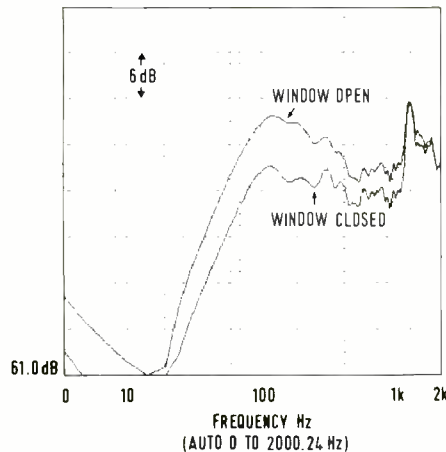


FIG 6 HF EQ OVERLAYS
0 dB is located at 0.00002 Pascal
Scale: 5194.24 Hz/in or 2044.98 Hz/cm
Resolution: 5.7058E-01 m and 6.0115E+02 Hz
Time of test: 5960 μ s, 2.0443E+00 m
Sweep rate and bandwidth: 75143.30 Hz/s and 1.2500E+02 Hz

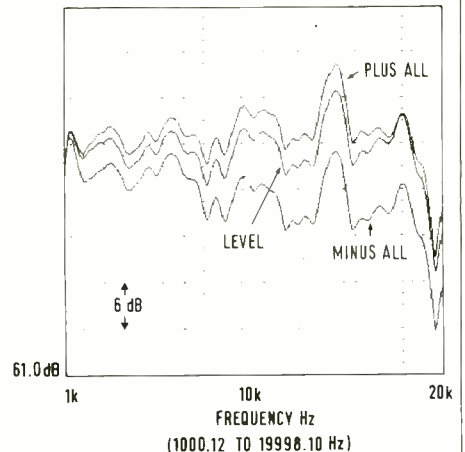


FIG 7 CROSSOVER OVERLAYS
0 dB is located at 0.00002 Pascal
Log freq axis: 2.7 decades
Resolution: 7.6111E+00 m and 4.5066E+01 Hz
Time of test: 5960 μ s, 2.0443E+00 m
Sweep rate and bandwidth: 2030.90 Hz/s and 4.5066E+01 Hz

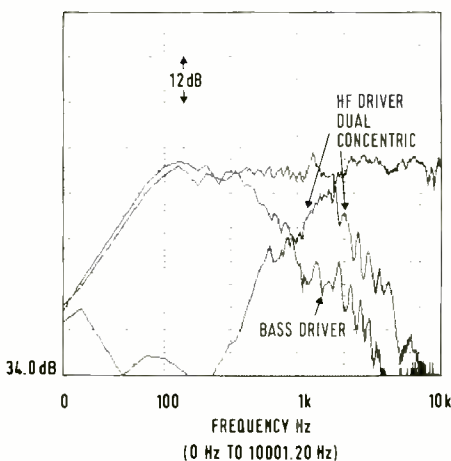


FIG 8 PHASE RESPONSE
Log freq axis: 2.7 decades
Resolution: 2.4198E+01 m and 1.4175E+01 Hz
Time of test: 3213 μ s, 1.1021E+00 m
Sweep rate and bandwidth: 200.92 Hz/s and 1.4175E+01 Hz

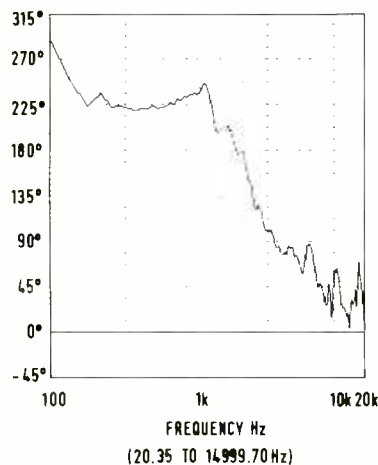
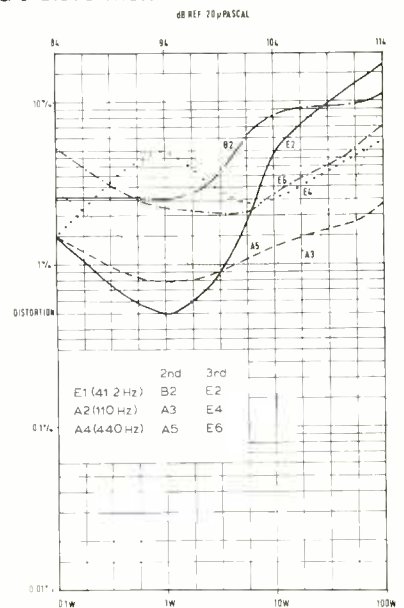


FIG 9 DISTORTION



REVIEW REVIEW

Distortion

Second and third harmonic distortion for the fundamentals E1 (44.12 Hz), A2 (110 Hz) and A4 (440 Hz) are plotted as percentages of the fundamentals against input power in Fig 9. By way of illustration, the equivalent sound pressure levels at 1 m are plotted across the top of the graph.

Generally, the distortion levels are reasonable though the system is obviously showing signs of distress at 100 W, 28.3 V input, and distortion figures rise above this point very sharply.

The second harmonics of the lowest fundamentals, B2 and A3, rise together and most substantially, whereas the third harmonic of A2—E4—and both harmonics of A4—A5 and A6—are handled well.

The one product out of character is the third harmonic of E1. Second harmonic distortion tends to be a product of magnetic field non-linearity or gap misalignment, whereas third harmonic distortion relates to non-linearities in the suspension system. It would appear from this there are some suspension non-linearities in the cone drivers in the bass section of the system.

On the whole, however, the results are average for this class of product.

3D and polar responses

The quasi 3-dimensional plots give an indication of the symmetry with which a system decays and can also provide an excellent visual guide to the dispersion of the system. Fig 10 shows the decay side of the rise and fall of the entire system on a log frequency axis from 25 Hz to 10 kHz.

With the general exception of 100 Hz and 350 Hz, the system is well behaved, shutting down symmetrically.

Note especially the apparent shift in

frequency of the bass section of the system as it decays. This is a well known phenomenon associated with many transducers: frequency shifting with respect to amplitude due to suspension non-linearity.

It occurs because of the differences in stiffness and compliance that exist at different amplitudes. As the driver is driven harder, so stiffness increases, and the associated resonances move upwards.

Conversely as amplitudes decrease or, as here, a transient passes then resonances decrease with diminishing amplitude.

It is easily proven by measuring resonance at differing power inputs and plotting the shift. What does surprise many people, however, is that this can occur at very low levels, as low as the difference between 1 and 10 W. It is one of the many reasons that some monitor systems sound a great deal more interesting at higher levels than when gently driven.

With the Tannoy *FSM*, however, power compression was minimal and apart from the rise in distortion, very little spectral shift was obvious in the range of input power from 0.1 to 100 W.

Figs 11 and 12 show two different views of the polar response of the system. In Fig 11, the polar response is displayed as a conventional 3D on a logarithmic scale.

The centre or tallest curve, is the on-axis response, with the nearest curve being taken a full 180° off-axis. By way of contrast, Fig 12 shows the same file set but converted to an FTC. Now note the four very obvious side lobes, corresponding to frequencies of, from left to right, 100 Hz, 350 Hz, 1.3 kHz and 3.5 kHz. The resonances in the system are very obvious, as is the dividing line between the cone and compression driver sections of the system between 1 and 2 kHz.

Summary

Generally, I was pleased with the Tannoy *FSM* speaker—the cabinets were nicely made, well finished and presented, and very much in the image of the manufacturer. The drivers, though obviously cost engineered, were nevertheless capable of the performance required. All internal wiring was neat and substantial, and I liked the hard wired crossover with the associated gold plated links and terminals.

The ability to modify the response of the system internally is considerable and it would be a problematic room indeed that you could not interface this speaker with, without resorting to an external equaliser for major room correction.

The speaker is capable of generating sufficient sound pressure for most tastes though with reasonable dispersion only.

It was a pleasure to find such a comprehensive and open manual. New users should find little difficulty in setting up their system correctly.

Points of concern, however, would be the frequency domain anomalies at 1.3 kHz and at 14.5 kHz (both sharp enough to be quite audible), the generally rising response and the rather erratic polar plot. I was also not able to confirm the technical specification in terms of the system phase and amplitude response. Trade off has obviously been made against power handling in the interests of cost and efficiency of manufacture.

By way of summary, however, the *FSM* speaker system is a remarkably competitively priced monitor that is capable of providing a good reference in middle market rooms, and will attract those not only familiar with the somewhat idiosyncratic Tannoy approach but also those who would previously have imported their reference monitors. □

FIG 10 TRANSIENT RESPONSE—
3D DECAY CURVE
0 dB is located at 0.00002 Pascal
Scale: 2727.69 Hz/in or 1073.89 Hz/cm
Resolution: 4.8461E+00 m and 7.0778E+01 Hz
Time of test: 32000 μs 1.0976E+01 m (front)
to 0 μs 0.0000E+00 m (back)
1032 μs/step or 0.354064 516129 m
Sweep rate and bandwidth: 5009.55 Hz/s and
7.0778E+01 Hz

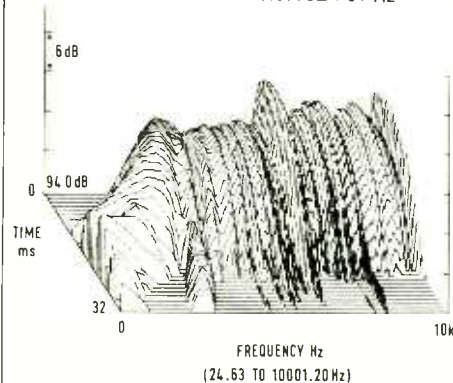


FIG 11 POLAR RESPONSE—2 dB
FREQUENCY TIME CURVE
Resolution: 3.31087 m and 1.03598E+02 Hz
Sweep rate and bandwidth: 10734.76 Hz/s and
1.03619E+02 Hz

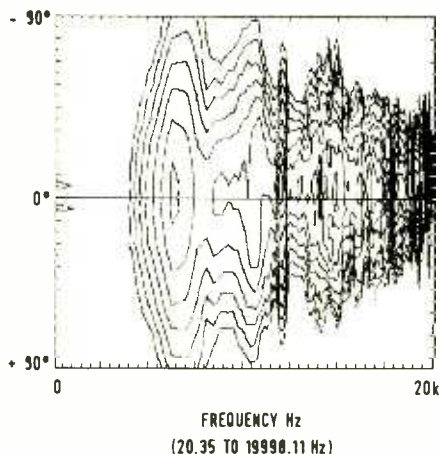
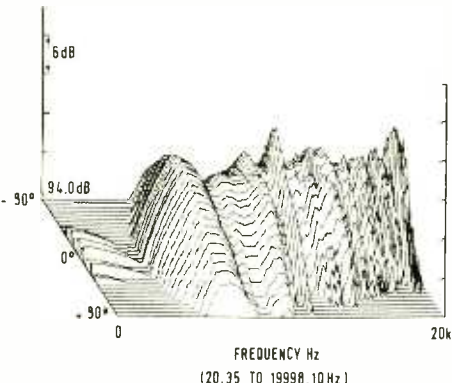


FIG 12 POLAR RESPONSE
0 dB is located at 0.00002 Pascal
Scale: 5462.12 Hz/in or 2150.44 Hz/cm
Resolution: 3.3109E+00 m and 1.0362E+02 Hz
Time of test: 6076 μs 2.0841E+00 m (front) to
6076 μs 2.0841E+00 m (back)
0 μs/step or 0 m
Sweep rate and bandwidth: 10734.80 Hz/s and
1.0362E+02 Hz





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Places are strictly limited and the cost, thanks to the sponsorship of Sony Broadcast and HHB Hire & Sales is very low, especially as it includes lunch and refreshments: £50 + VAT for each day or £120 + VAT for all three days.

DAY 1 Tuesday 25 November DIGITAL TECHNOLOGY IN BROADCASTING & VIDEO

- Audiofile: Digital Audio Recording & Editing on Hard Disk
- Broadcast Applications of Two-Track Digital Audio Tape (R/DAT)
- The Digital VTR
- Digital & Satellite Transmission
- Digital Audio & Video in Post Production
- Digital in the USA

THE PROGRAMME DAY 2 Wednesday 26 November DIGITAL RECORDING & COMPACT DISC

- The Opportunities & Implications of R/DAT
- Audiofile: Music Recording & Editing with Hard Disk
- Digital Reverbs
- The All-Digital Studio
- Compact Disc Market Update
- User's Guide to DASH Multi-Track
- Record Company Analysis of Digital Masters

DAY 3 Thursday 27 November DIGITAL IN SCIENTIFIC RESEARCH – THE NEW OPPORTUNITIES

- R/DAT: the potential and limitations of the technology
- CD ROM & CD I
- The Alvey Project: Voice Recognition & Speech Synthesis
- Data Storage & Data-base Preparation in CD ROM
- Interfacing half-inch digital with VAX/MICRO VAX and IBM PC's

Speakers and participants include senior technical and management personnel from Sony Broadcast, HHB Hire & Sales, AMS Industries, EMI, Solid State Logic, Trilion, Alan Parsons Productions, Philips Interactive Media Systems, Silver Platter, Oros, Editel, Audio FX, Hilton Sound, HMV Shops and the Alvey Project.

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Block capitals please ▶

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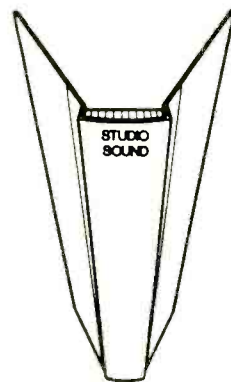
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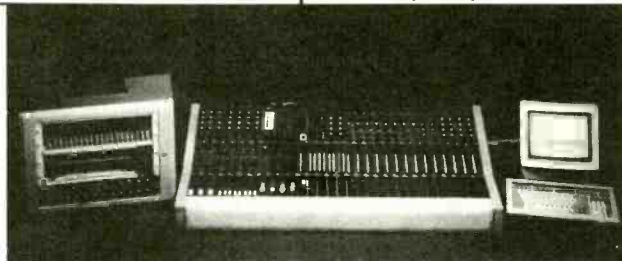
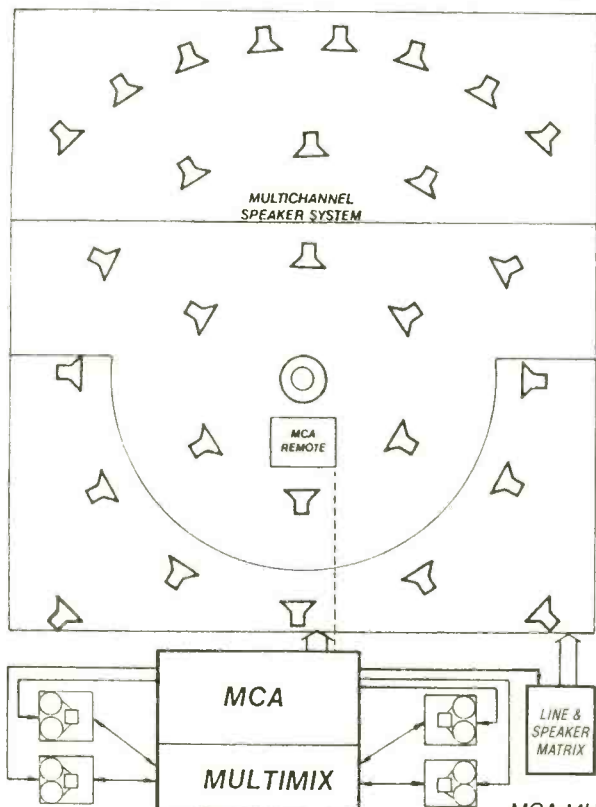
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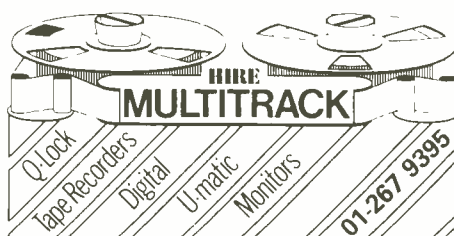
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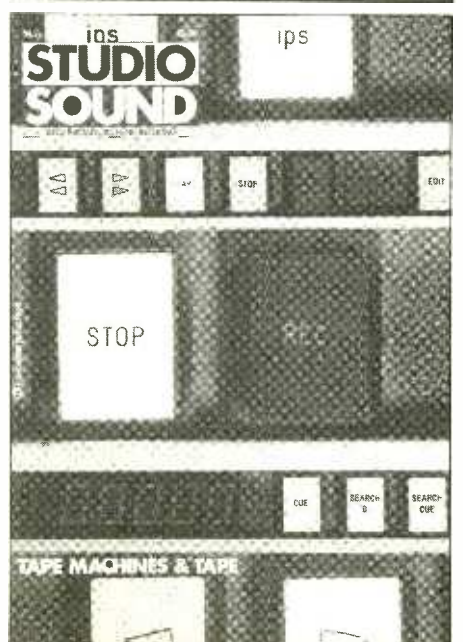
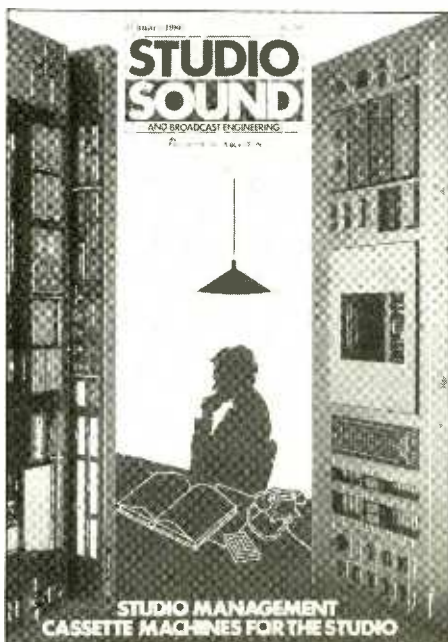
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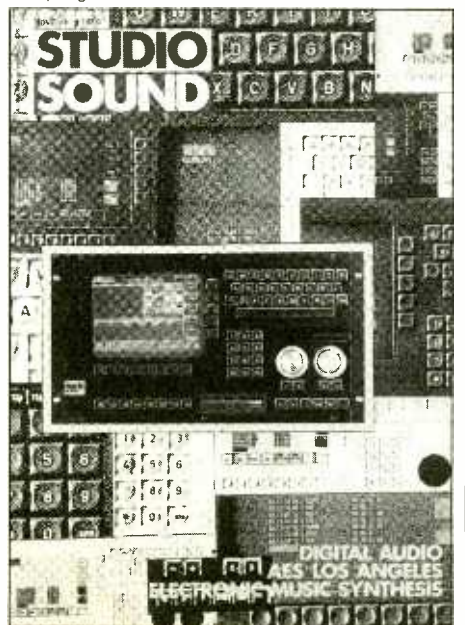
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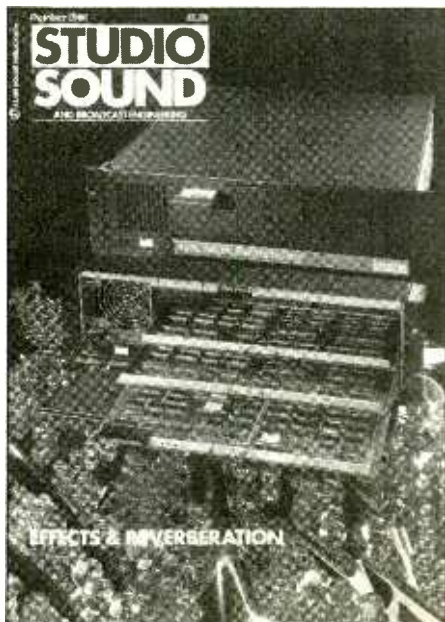
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NEW HIGH-TECHNOLOGY EQUIPMENT

- 24-track sequencer package, comprising: ATARI 1040 ST, monochrome monitor, mouse, word processing & language software plus STEINBERG RESEARCH Pro 24 software. All ready-to-run for the amazing price of £915!

The whole system is absolutely remarkable and can only be appreciated from a demonstration. Be warned - You will be impressed!

- At long last we now have available the SYNCHRONOUS TECHNOLOGIES SMPL System with version 1.5 software. The system comprises SMPL Tu rack mounting lock box providing SMPTE read, write and machine sync plus midi interface, transmitting song position pointer plus TTL logic outputs for event triggering. This clever box of tricks is then controlled from the SMPL console for even greater flexibility. Price (inc. all leads and interfaces but excl. monitor) £1,495.

- Another new product launched recently is the BOKSE SM-9 SMPTE/EBU Event Controller which among many other things can synchronise midi sequencers to tape using SMPTE time code. As long as your midi sequencer is implemented with Midi/Song Position Pointer (such as the Atari/Pro 24) there is no need to laboriously rewind the tape to the beginning every time to drop-in or remix one section. Price, £720.

- New from ALESIS - the MIDIFEX. Same shape, same size and the same price as the MIDIVERB but does a whole host of really useable effects. Put this together in the new Rackit with the Midiverb and you've got a very powerful, creative device.

Special introductory offer Midiverb + Midifex + 19" Rack Kit: £625

- Despite a somewhat up-and-down past, RSD STUDIOMASTER have finally got it together with their new SERIES II consoles. They have every facility you would expect on a board of this price range, plus Midi Muling - when used in conjunction with a C64 or Spectrum - to facilitate really complex mixes. On demonstration now in our Stockport showroom.

- The best drum machine ever to come out of Japan is now on demonstration in our Stockport Showroom. The KORGE DDD-1. It does everything as well as sampling, tuning, midi, etc., etc., Price £599.

- BEL are no newcomers to digital delay and when it comes to making a 24 or 32 sec delay/sampler with full bandwidth and Midi, they came up with the goods in the shape of the new BDE 2400 and BDE 3600 with full editing facilities and disk drive storage of sounds. Both units available now - £2995. Disk drive soon - around £300.

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