

SESSION

Studio Demo

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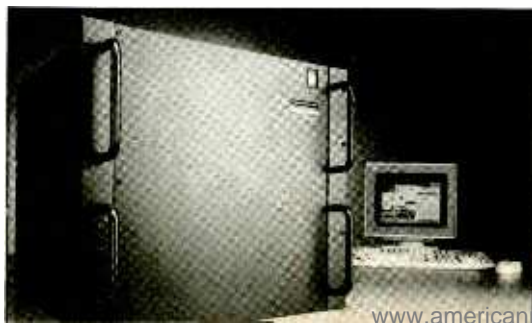
STUDIO SOUND

AND BROADCAST ENGINEERING

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EDITORIAL

I want to return to a topic that I have discussed several times before—usually around this time of year. I make no excuses: as nothing has changed and I believe the situation is worsening each year.

I have waited until the second paragraph of this piece before I mention the topic of this column because if the subject has the same effect on you as it does on me then the only readers of this column would be the typesetter and the proof readers. Let's face it, training is just not a very exciting subject. Almost every piece that I have ever read about the subject for the audio industry has been about the need for it within the industry. This is largely because about the only people currently interested in training are those who make their living from it. Exactly the same happens when we mention training anywhere in the magazine; from whatever viewpoint, the only people who we will hear from are just more people who earn their living from training who suggest that we might have some interest in their particular training course. I am afraid that generally we are just not interested.

And not interested for very good reasons.

There are certain indisputable facts that can be laid down about the direction of our industry. Firstly equipment is getting more complex. The expected level of audio quality to be achieved is increasing all the time. Aside from the traditional engineers' skills of mic technique and mastering analogue technology, we now add computer literacy, advanced synthesis and digital audio. There will be many quite different ways of doing any job in audio and each will have their advantages and disadvantages and an error of judgement will be very expensive indeed. The crunch point is that there is now no longer any way of being sure that the youngster straight out of school will develop into the quality of person capable of handling the demands of this pro-audio future.

We must look to some signs that the potential employee has the ability to develop fully within the unknown parameters that the industry may lay down for its future. Some feel that we should look to only recruiting those with some training already. This is a definite non-starter. There is really no reason why this would offer any advantage over the tried and trusted method studios have worked by for years of talking to the more interesting kids that walk through their front door.

Let's face it, there can be few jobs as intense in the client relationship as that of the engineer and his client. The engineer must be able to relate to the client and the needs of the musicians and have a sympathy for their aims. If he doesn't have these abilities then there is very little hope for him within the studio environment. The best judge of this personality aspect is obviously the studio employer and no amount of pre-training should colour his opinion about the importance of this aspect. I have yet to hear of any training course that will turn away potential attendees for not being suitable in this way, or even enlighten them about the realities of the business in this sense.

If we just look at many of these courses for a moment we see a real mixture of standards and aims in the teaching. I cannot help but think that many of these courses are run by those that belong to that strange group of people that we identified as 'aliens' a few years ago. If the recording industry has the space for only x number of new employees each year, what is the point of training 100x—it can only lead to disappointment and wasted valuable years for those attending at such a crucial time in their life. I am reluctant to say it but there seem to be large amounts of blatant self interest among many running these courses. Recruiting students for a recording course is possibly the easiest thing in the world and for all the wrong reasons. Unfortunately a dose of the truth would be very bad for business in most of their cases.

The NY AES Convention held a workshop asking 'Where the jobs are' chaired by our US columnist Martin Polon. I felt for many of the audience who were asking the same question over and over—where can I get a job? Most had had several years on this that or another course and were now finding that the industry just did not want to know them. Surprise, surprise.

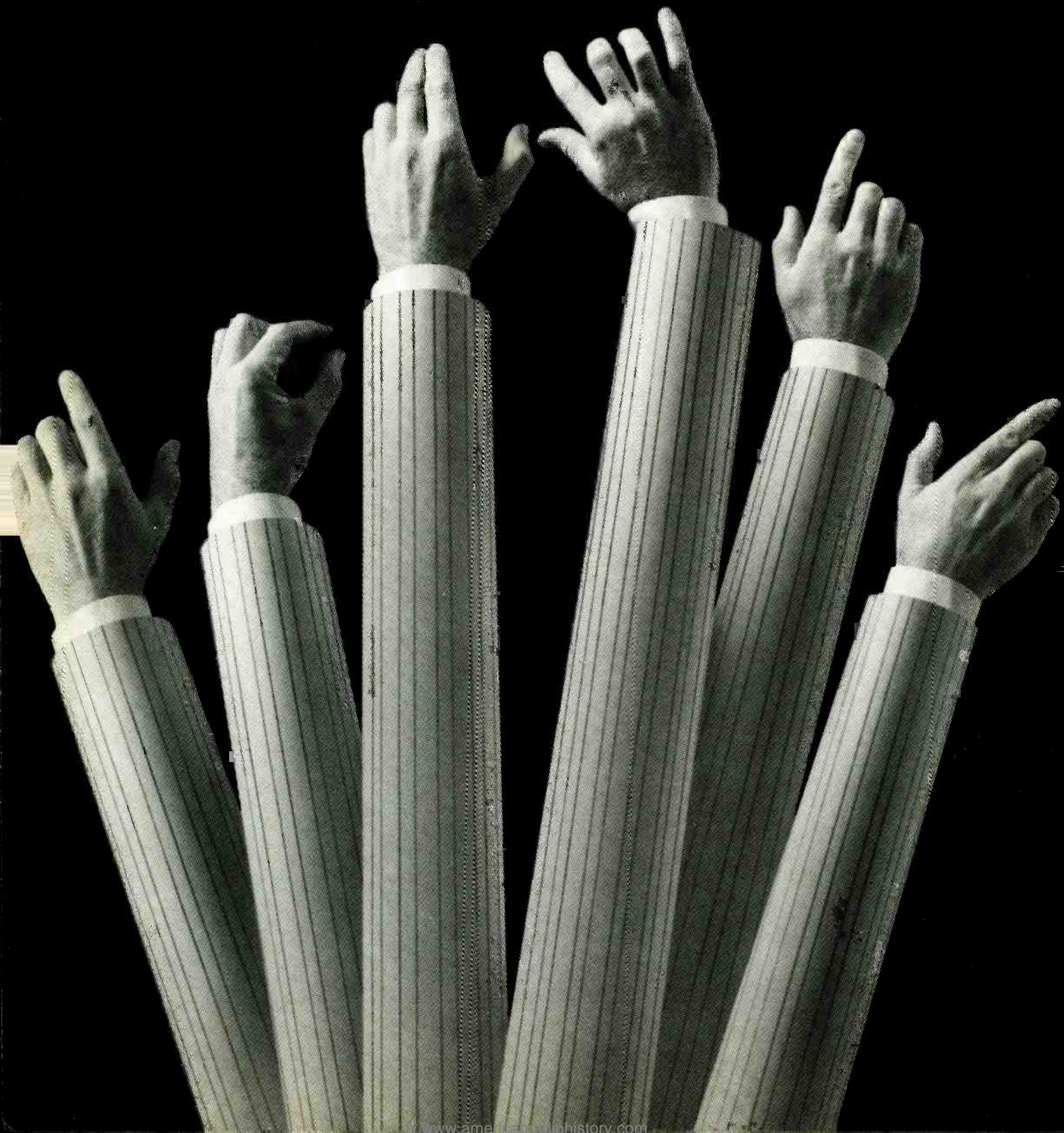
I should point out that there are some worthwhile courses—mainly those that attempt to give you a wider background to the subject and generally steer clear of specifics but most of these are usually to be found within a more traditional academic framework. Training is most likely the wrong term for a formal education in the physics of audio but such a course does have its advantages. It gives you a very good basis to build on if you wish to enter the audio profession. It will not really help you find that coveted engineer's job but it may mean that you have employment potential beyond the age of 30.

It became increasingly clear to me that responsibility for training of employees has to be a responsibility of the industry itself. It may be that the industry trade associations are ill-equipped to deal with this aspect of the industry but I really can see no alternative than such organisations taking on the responsibility for management of training of the future members of our industry. Studios should continue their existing employment techniques that still seem quite capable of generating those occasional engineering greats, and then once employed give their staff all the assistance they need to develop their skills in different areas. A centralised training scheme could consist of many short courses at convenient intervals and could be organised in conjunction with manufacturers (where much of the real knowledge remains these days) and perhaps those running the more reputable training courses will work closely with the industry associations. And the industry associations are going to *have* to work with them even if just from a matter of available resources.

We have to look at training as an integral part of the industry in all senses. How can a mature industry, such as we say we now are, leave whatever training there is to those *outside* and who may pursue quite different aims. There are a small number who do consider these points but we all have to remember that firstly we are a people industry and therefore we all have to care about those who will be our future.

Keith Spencer-Allen

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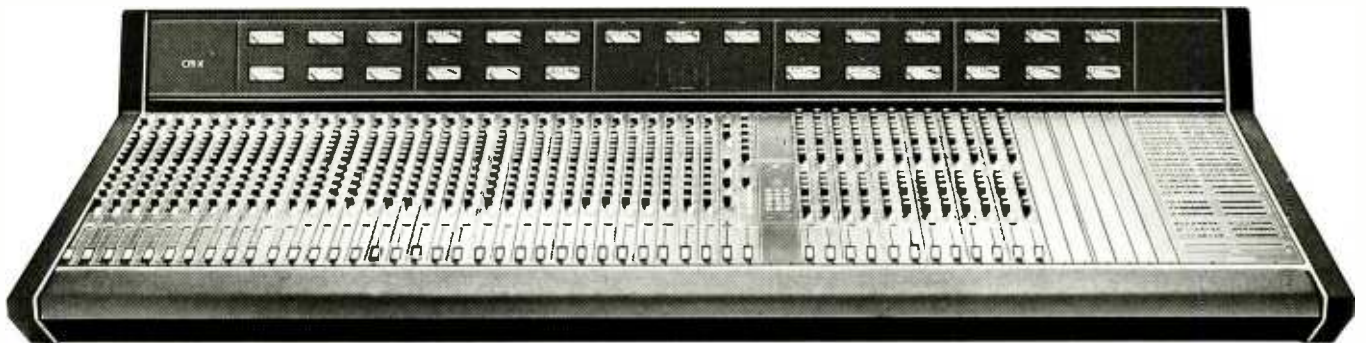
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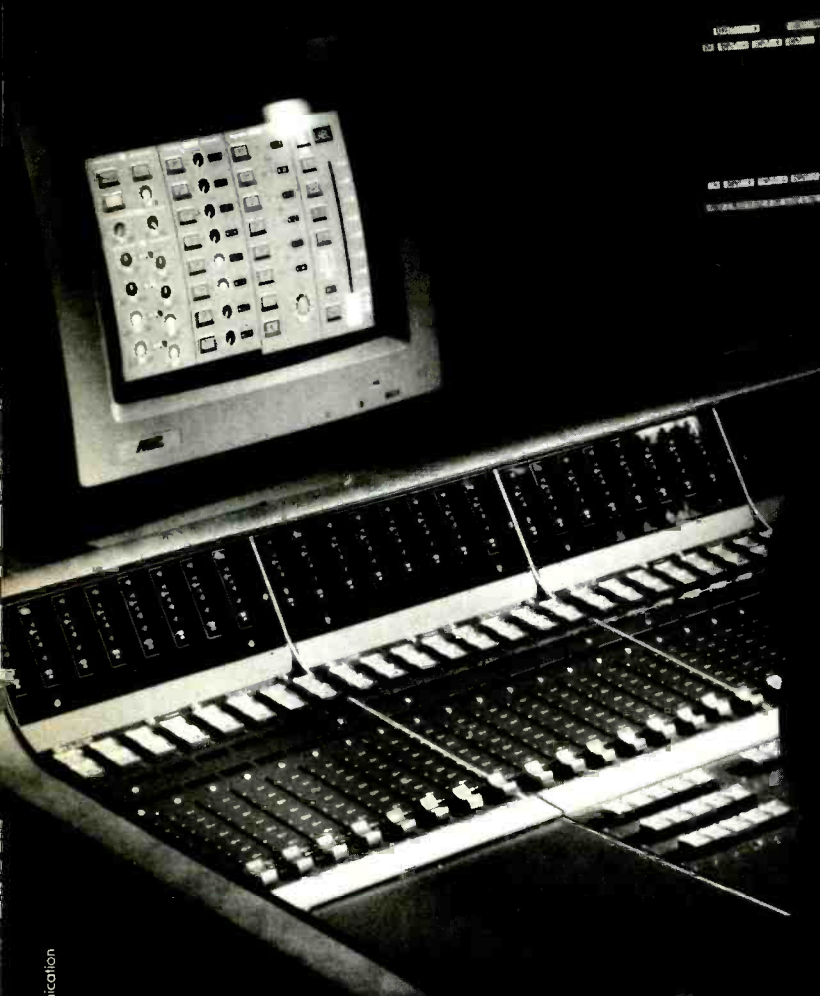
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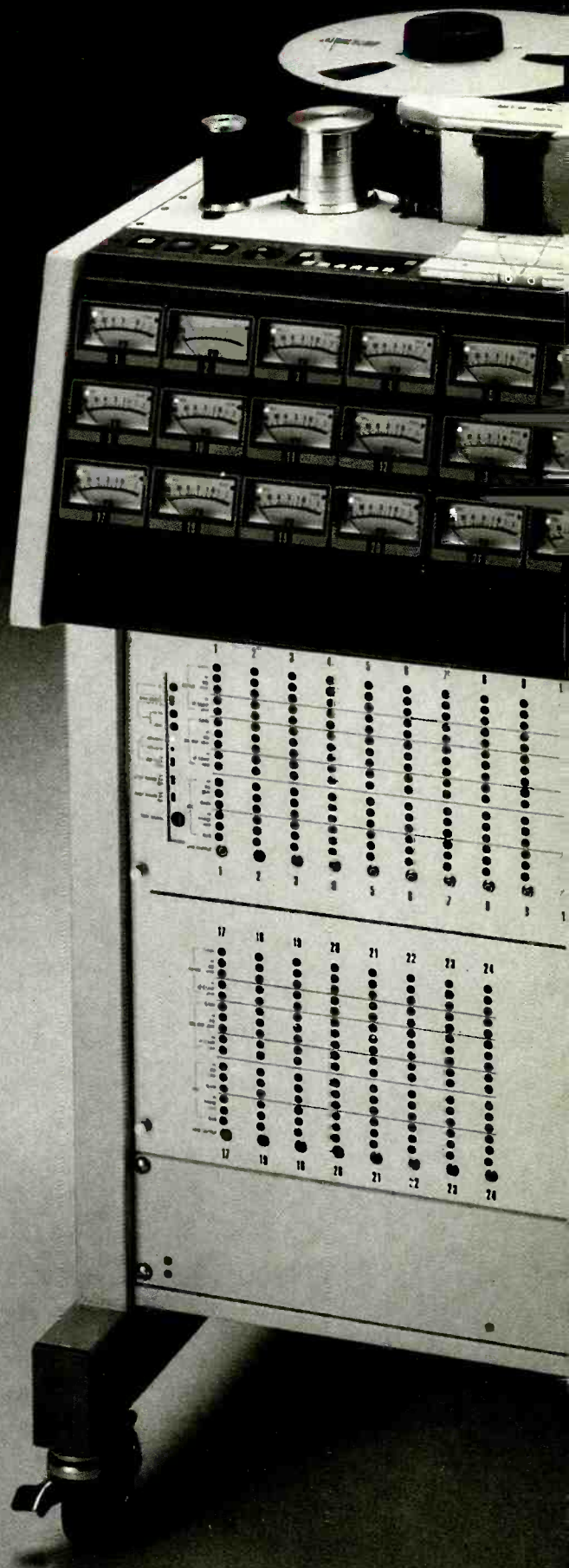
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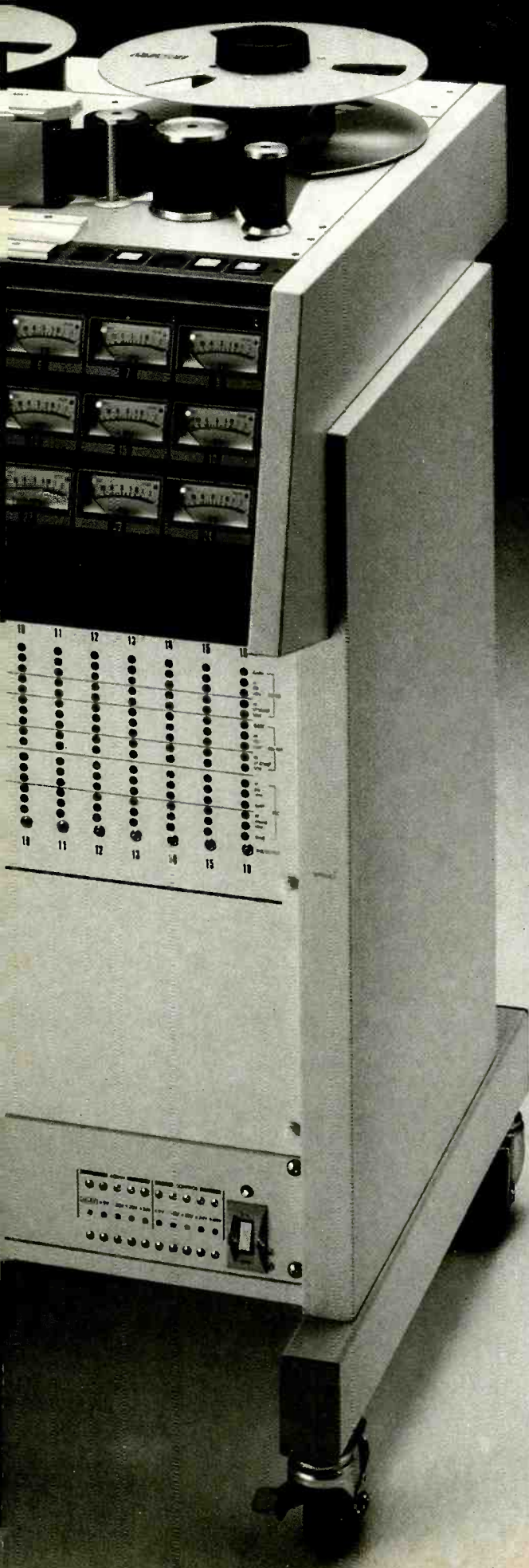
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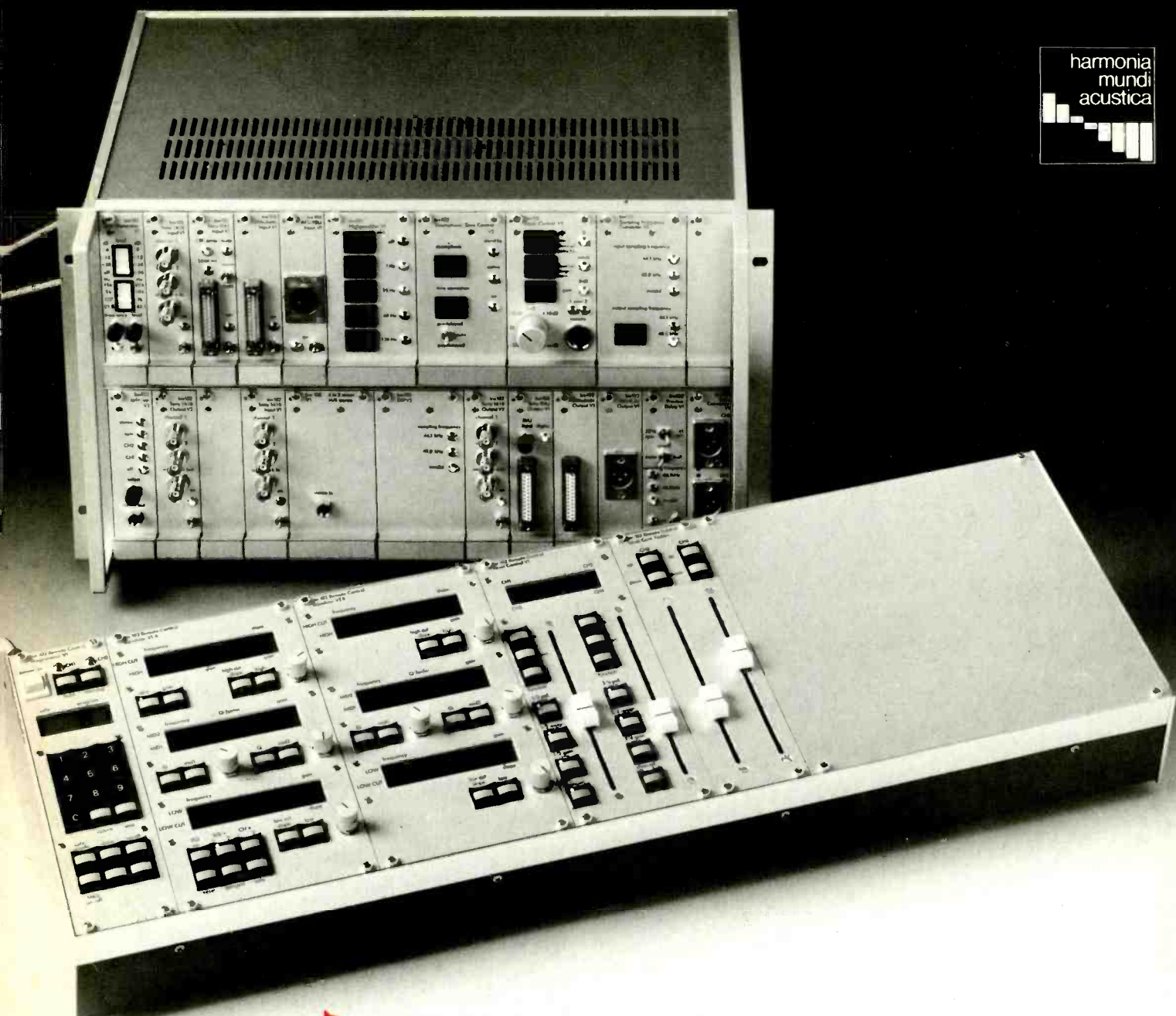
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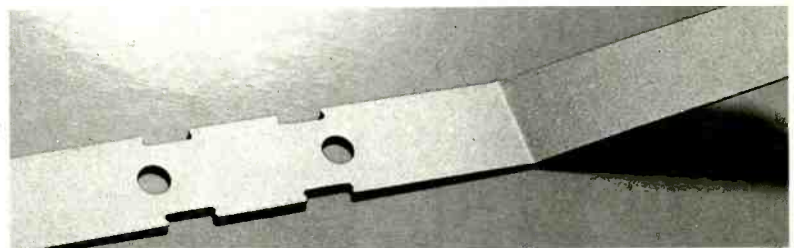
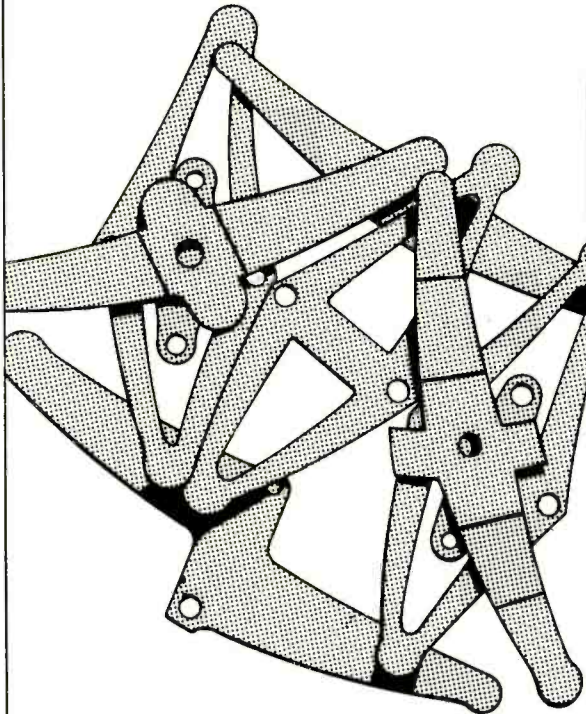
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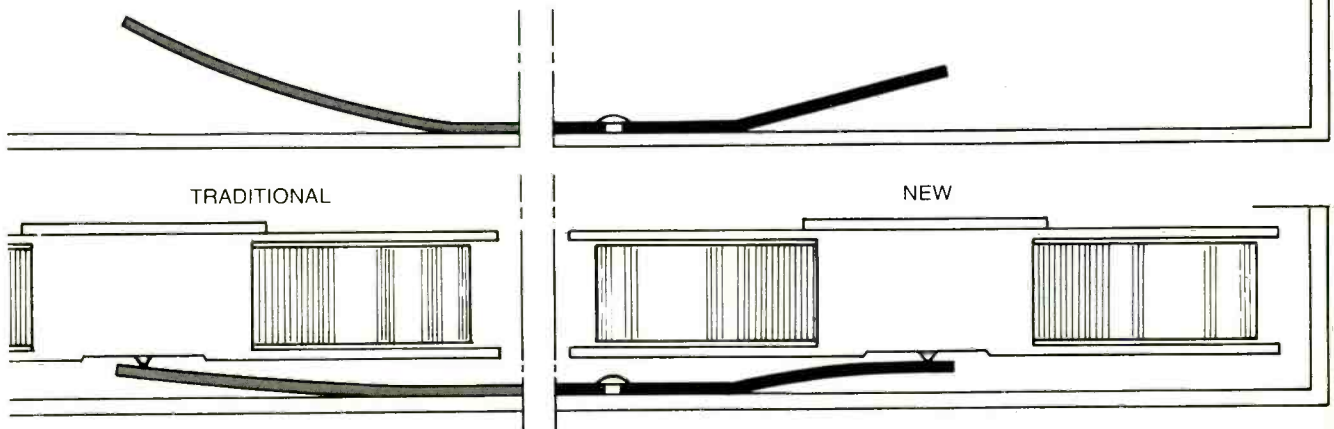
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NEWS

Contracts

- Neve have been awarded the contract to supply five consoles for the new Hong Kong Cultural Centre, which comprises a 2,250-seat concert hall, an 1,860-seat grand theatre, and a 5,000-seat studio theatre. Neve will also supply associated distribution amps and limiter/compressors.
- FWO Bauch have received orders for two Studer 902, 26-input mixing consoles, from London Weekend Television. Bauch have also been selling the A820 multitrack successfully, with orders coming from Great Linford Manor and Real World Studios (each ordering their second), Townhouse/Olympic (a total of six), two each to Molinare and the Music Room, and one each to Central Television in Nottingham, Central Television in Birmingham, Paul Young and Vector Television.
- Studer Revox America have completed delivery of 57 A810 recorders to the US Information Agency's Voice of America. Studer have also announced the delivery of over a dozen of their new A820 24-track recorders to studios in the States.
- Soundtracs have announced their first console sale to the BBC, an FME 16/4/2 for the TV producers training centre in Hertfordshire.
- Abbey Road Studios have taken delivery of eight AKG C414B-TL mics, the transformerless version of the C414B-ULS.
- S W Davies have been made responsible for acoustically treating all post-production facilities at CBS Studios in London. And a new control room has been completed for MMP Studios in Waalwijk, Holland, who also installed the Davies 841 monitors with an additional low frequency system giving response down to 20 Hz. Amplification is six Yamaha PD2500s in bridged mode, supplied by Harder BV of Utrecht, giving a total power of 6 kW.
- Monster Cable of San Francisco have supplied Nashville's Georgetown Masters, a digital-to-analogue LP mastering facility, with their Alpha Genesis 1000 moving coil

cartridge, the first to such a studio.

- FWO Bauch have delivered Harrison Series 10 to Advision Studios, London.
- Recent NED sales include: a Direct-to-Disk systems to Benny Andersson, Eel Pie and Harold Faltermeyer; a Synclavier system to Polygon, one of France's major studios; and a complete Synclavier to John Wood Studio London.
- AMS have announced 19 AudioFile sales following the introduction of the latest upgrades. These include eight to the USA, three to the UK, two to Spain, three to France, and one each to Denmark, Sweden and Italy.
- A Mitsubishi X-850 has gone to Stevie Winwood for his private studio in Gloucestershire.
- Bruel & Kjaer mics have been sold to Olympic Studios (10 4006s, six 4007s and six cardioids), The Music Station (two cardioids), Sam Therapy (two cardioids), Audio FX (a 4003 and 4004), and CTS Studios (two 4006s).
- Audio Kinetics have received an order from their Spanish dealer, Telco SA, for three Q.Locks to be delivered to TV Valencia, bringing the total number of Spanish sales to 90 in less than two years.
- Goldsmiths College at the University of London have had installed a Soundcraft TS12 console, as part of the College's update of their studio engineering course facilities.
- A fourth Sony PCM-1630/DMR-4000 with DTA-2000 digital mastering system for CD preparation has been sold to Frankford/Wayne Mastering Labs in New York City. They have also acquired a PCM-2500 pro R-DAT recorder along with a Harmonia Mundi complete digital transfer system/console.
- HH Electronics of Cambridgeshire have been selected by the Entec Light & Sound hire company of Shepperton to provide replacement power amplifiers, including the VX1200 MOSFET.
- Fairlight have sold a Series III CMI to Allan Eaton Sound of Australia, who are the first

Melbourne-based studio to acquire one.

- Recent DDA sales include AMR 24s to Sigma Studios in Norway, a Spanish order through Auprosa, and one to Akai through Studer Japan. DCM 232s have been sold to the Andre Perry Group in Washington, and a 48-module desk to a church in Atlanta. D Series have been supplied to the Royal Scottish Academy of Music & Drama in Glasgow, and Abbey Road. An S Series console has gone to After Image.
- Soundcraft have installed the first production model of their Series 200B/VE 'audio-follow-video' editing console at The Island Video Room.
- Opus Studios of Hackney, London, are the first UK facility to have had installed the new Tascam ATR-80 24-track recorder. Opus also are the first facility to use the AHB Sigma in-line console. Another Tascam ATR-80 has been sold to Pyramid Studios in Dublin.
- A Harrison Series 10 and a second Harrison MR-4 has been ordered by the Minneapolis Production Studios

of Flyte Time. Other MR-4s have gone to Titan Sport Inc of Connecticut, the Government of Thailand, Belgium Television & Radio, and a second 40-input version to the Australian Broadcasting Company.

- Recent sales by Amek include a second G2520 to Molinare, five BCIIIs for Thames TV, a Classic to HTV Wales, an Angela to Icelandic band Messoforte, another Classic to the municipality of Athens, a 40-input G2520 to Germany's Harder Music, a 56-input G2520 to Studio Biper of Paris, and a BCH each to Captain Video and Theatre La Crie, both in France.
- On the TAC front, six SR9000s have been supplied to Hibino-Electrosound of Tokyo, a Scorpion has gone to Roger Glover of Deep Purple, and a 24-track Matchless has gone to Bob Seger's home studio.
- Lyrec have presented a gold-plated FRED audio tape editor to the BBC, following the delivery to Broadcasting House of the 150th unit brought by the BBC.

Papal transmission

News from HME is that during Pope John Paul II's visit to the US last year, a radio mic was used by a Pope 'for the first time in history' during a Los Angeles visit with some 6,000 schoolchildren, and that the Series 50 was supplied by Mayhew & Company in Burbank.

The body pac unit was 'concealed under the Pope's cassock, where it transmitted to HME's new RX520 switching diversity receiver, located under the stage'. Despite a 3/8 in piece of steel in front of the stage risers for the Pope's protection, the mic apparently performed flawlessly.

Disctronics buys LaserVideo

In a cash and stock deal worth US\$55.5 million, US CD manufacturers, LaserVideo Inc, have been acquired by international manufacturers Disctronics Ltd, based in Melbourne, Australia. The LaserVideo plants in Huntsville, Alabama; Anaheim, California; and Southwater in the UK are expected to produce a total of 65 million units a year, making Disctronics the world's third largest producer of CDs, behind Philips Dupont Optical and Sony, by capturing some 20% of worldwide production.

Disctronics' original Australian plant construction began only 18 months before the buy-out was announced. At that time, they had already set up customer support offices in LA and London, and in July 1987 acquired Disctec Ltd, providing them with a production base in the UK and European markets. LaserVideo has an annual capacity of 25 million units with provisions for doubling that, and their Anaheim plant specialises in R&D and manufacturing videodisks, CD-ROM and mastering equipment.

Pete Harris leaves CTS

Managing director Peter Harris of CTS Studios has decided to take early retirement, effective from Christmas 1987. After 26 years with the studio, Harris has relinquished his position to Adrian Kerridge but he expects to maintain links with CTS by acting in an advisory

capacity. One of the most respected figures in the recording industry, Harris left with business at CTS looking more forward than it has for a number of years, after a succession of ownership changes and uncertainties.



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NEWS

In brief

- We recently published the wrong telephone number for **HIT**. The correct number is 0223 871711.
- **Mitsubishi UK** have introduced their first official RCM training programme, designed to inform technicians and studio engineers on the maintenance and operation of the X-850, X-400 and X-86. Technical operations manager David Ward is running the courses, which are at

Mitsubishi's Headquarters in St Albans and which are free to all European Mitsubishi users. Non-users pay £120 per course. The next courses are in April (12th to 14th). Further information from David Ward, tel: 0727 40584.

- On November 25, **Bruel & Kjaer's** Danish headquarters were visited by chief engineers Olga Kostantinova Khryapova and Leonid Ivanovich

Menyalin of the Soviet state-owned Melodiya, which presses, releases and distributes 120 million albums a year. Mrs Khryapova is overall head of Melodiya and Mr Menyalin is chief engineer for all recording studios in the USSR. As well as the interesting exchange of information, Melodiya have agreed to purchase a number of B&K mics.

- The Association of Sound & Communications Engineers is now called **Sound and Communications Industries Federation**, to more accurately reflect their work. In addition, the in-house magazine *Public Address* will be replaced by *Sound and Communication Engineering*, whose principles will be Keith Ellis of Keith Ellis Advertising, and Jim Evans, most recently editor of the European edition of *Pro-Sound News*.

- **Yamaha** have announced the opening of their 17,000 ft² New York R&D-Showroom Centre, situated in

Metropolitan Tower, 142 West 57th Street. This follows the openings of the London R&D Centre and the Paris facility earlier in 1987.

- The **APRS** recently held a combined business meeting and technical forum in Scotland. It was hosted by chairman Ken Townsend and attended by 30 recording industry representatives from Glasgow, Edinburgh and other centres. It became clear during the meeting that closer contacts would be of benefit, and the APRS is now actively exploring the establishment of a Scottish Group.

- **E-mu Systems** of California have formed a UK subsidiary, located in East Lothian, Scotland, which is expected to act as a hub for E-mu's European and international sales. E-mu Systems Ltd has, as its directors, Scott Wedge, president; Stephen V Tritto, chief operating officer; and Roy Goudie, managing director.

Agencies

- **API Audio Products** of Springfield, VA, have appointed Syco of London (UK and most of Europe) and Milam Audio of Pekin, IL (mid-USA), as dealer/representatives for their products.

- **West Hyde Developments** of Aylesbury have announced their sole UK distributorship with two of West Germany's leading panelware manufacturers, **Rhode** and **Leonhardy**.

Digital Reverberation



• **DDA** have appointed dealers in Greece and Mexico to handle their consoles and crossovers. Sound Control, 30 Sp Trioupi Street, Athens, Greece. Tel: 1 883 7630. Vari, Lago Azul No 241, Col.5 de Mayo, 11470 Mexico. Tel: 250 7394.

• **Tascam Professional** have appointed five professional product dealers. Scenic Sounds and Raper & Wyman of London, Audio Services of Stockport, Sound Control in Belfast, and Control Techniques Ireland of Dublin.

• **Platinum** of Surrey have announced a distributor agreement for Japan. Kawamura, No 34 Yurai-Cho, Shinjuko-ku, Tokyo 162, Japan. Tel: (03) 260 0401.

• **FWO Bauch** have been appointed exclusive UK distributor for **Harmonia Mundi Acustica** of West Germany.

• **Studio World** of St Albans, Herts, have been appointed distributors for the **EQuator** automated mix system. Tel: 0727 58977.

Literature

• **Alpha Electronics'** latest full-colour catalogue is now available. A wide range of test equipment is featured from an equally wide range of manufacturers. Also included is information on Alpha's repair, maintenance, calibration and test equipment hire facilities. For a copy of the free catalogue, phone (UK) 0942 873434.

• **The Institute of Acoustics** have published their *Acoustics Index 1987-88*, containing chapters on basic ideas in acoustics, review articles, information sources, acoustical

standards, UK laboratory reports, acoustics—UK and worldwide, and a commercial section. Free updates will be made available on January 31st and August 31st. The price for the index is £55.00. Further information from Institute of Acoustics, 25 Chambers Street, Edinburgh EH1 1HU. UK.

A list of their most recent books and publications is now available from the Institution of Electrical Engineers, PO Box 26, Hitchin, Herts SG5 1SA, UK. Tel: 0462 53331.

Change of address

• While celebrating their 10th anniversary, Ken Dibble Acoustic Facilities have moved to new premises and changed their trading name to **The Sound Practice**. The address is: The Studio, Spring Street, Rugby, Warwickshire CV21 3HH, UK. Tel: 0788 541133 (multi-line).

• **Amek** have concluded negotiations on the purchase of the 4-acre industrial estate, where they've been based since 1976. Immediate plans include complete refurbishment of a 15,000 ft² industrial unit to house new testing facilities, wiring bays, module assembly and metalwork area, plus a new shipping department, open-plan office area and staff rest facilities. The original

Amek building will house R&D, admin, sales and accounts departments. The new address is: New Islington Mill, Regent Trading Estate, Oldfield Road, Salford M5 4SX, UK.

• **Fabritrak** have moved to: Fabritrak House, 21 High Street, Redbourn, St Albans, Herts AL3 7LE, UK. Tel: 058 285 4626.

• **FM Music Ltd** have moved to their new offices at: 129 Walham Green Court, Moore Park Road, Fulham Broadway, London SW6 2DG, UK. Tel: 01-381 0108.

• **The Sound Department Ltd** have moved to: Unit A1, Askew Crescent Workshops, Askew Crescent, London W12, UK. Tel: 01-740 1313.

John Bowers

John Bowers, founder and chairman of B&W Loudspeakers, died on Sunday, December 20th, at the age of 65. After serving in the second world war, he opened a retail shop in Sussex with Roy Wilkins, specialising in radio, television and, later, hi-fi. He began experimenting at this point in loudspeaker design, and in 1966 left the retail business to team up with Peter Hayward to form B&W Loudspeakers.

B&W went on to collect Queen's Awards for both technological and export achievement, and among

Bowers British firsts were linear-phase loudspeakers, the use of laser interferometry in audio technology and the use of digital testing techniques for quality control. The model 801 alone has become one of the most famous and respected loudspeakers in the world. Bowers' love for music was most evident in the care with which he chose his technical team, and with which he set up what has become a major European acoustical research laboratory.

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Amek/TAC London office at HHB

Amek/TAC have set up a London sales office based at HHB Hire & Sales' premises able to take advantage of HHB's service facilities and recently-opened demonstration areas.

Chas Rowden becomes UK sales manager based in London. Rowden has several years experience selling Amek products.

Distributor HHB now becomes sole UK outlet for Amek mixing consoles for the recording industry. The distribution network for the TAC range will be maintained and broadcast products will continue to be managed from Amek/TAC's Salford office.

Amek/TAC, London, can be reached on 01-960 2144.

NEWS

Harman/Bandive explained

Following the Harman UK/Bandive merger, some confusion has ensued about who does what and where. The following information is intended to clarify things. Harman Audio UK are sole UK distributors for JBL, UREI. Harman Kardon, New England Digital, Rauch, ART, Azden and

That's Tape. Bandive are the sole UK distributors for Fostex and Seck. Harman UK also distribute products from B&K, Focusrite and Otari. Both Harman and Bandive are at Mill Street, Slough, Berkshire SL2 5DD UK. Tel: 0753 76911.

Forthcoming events

February 23rd to 24th Sound Eighty-Eight, Heathrow Penta Hotel, London Heathrow Airport, UK.

March 1st to 4th AES 84th Convention. Palais des Congrès, Paris, France.

March 9th to 10th Syn-Aud-Con, Orlando, Florida, USA.

March 9th to 13th Frankfurt Musik Messe '88, Frankfurt, West Germany.

March 17th to 19th Master Loudspeaker Designer's Workshop, Atlanta, Georgia, USA.

March 21st to 24th 7th International Conference on Video, Audio and Data Recording, University of York, UK.

March 22nd to 24th Digital Audio Signal Processing. The Institute of Sound and Vibration Research, Southampton University, UK.

March 22nd to 26th 28th USITT (United State Institute for Theatre Technology) Annual Conference and Stage Expo '88, Disneyland Hotel, Anaheim, California, USA.

April 5th to 8th Acoustics '88, University of Cambridge, UK.

April 8th to 12th NAB, Las Vegas, USA.

April 14th to 16th ABTT Trade Show '88, Riverside Studios, London, UK.

April 25th to 28th Audio Visual '88, Wembley Exhibition Centre, UK.

May 17th to 18th Sound with

Pictures (AES), Independent Broadcasting Authority, London.

May 18th to 20th ShowTech Berlin '88, Berlin Exhibition

Grounds/International Congress Centre, Berlin, West Germany.

June 22nd to 24th APRS '88, Olympia 2, London, UK.

September 20th to 22nd Digital Processing of Signals in

Communications, Institution of Electronic and Radio Engineers, Loughborough University of Technology, UK.

September 23rd to 27th International Broadcasting Convention '88, Metropole Conference and Exhibition Centre, Brighton, UK.

September 29th to October 3rd Italian Broadcasting and

Telecommunications Show, South Pavilion, Milan Trade Fair, Italy.

September 30th to October 9th BBC Radio Show, Earls Court, London, UK.

1989

April 28th to May 2nd NAB, Las Vegas, USA.

June 17th to 23rd ITS, Montreux Switzerland.

1990

March 30th to April 3rd NAB, Atlanta, USA.

Victorian Rock Foundation

In Australia, the Victorian Rock Foundation has been set up as an industry advocacy body for the contemporary music industry in Victoria. Among its objectives are fostering the creation of opportunities for training in all aspects of popular music, encouraging investment and innovation, representing further interests, promoting, managing a trust fund, and helping to develop the music industry nationally. Based in Port Melbourne, and with seeding

funds from the Victoria Council of the Australian Bicentennial Authority, the Foundation's first endeavour is to stage the Melbourne Music Show between February 13th and 21st. It will highlight not only current music in Australia, but with numerous conferences and exhibitions, celebrate Australia's past 200 years.

Victorian Rock Foundation, PO Box 297, Port Melbourne, VIC 3207, Australia. Tel: (03) 645 1111.

People

● **Tannoy** have announced three new appointments. David Lockie joins as managing director, from Westclox where he was manufacturing director. Charles Kelly becomes general manager, systems division, after working as UK sales and marketing manager for C W Cameron in Glasgow. And Rosemary Hanley joins as marketing manager, after finishing post graduate work at University College, Dublin.

● **HH Electronics** of Cambridgeshire have appointed Greg N Wealthall-Perry sales director. He was formerly sales and marketing director with Graff Electronic Machines.

● **Paul Farrah Sound** have appointed Trish Ashton sales co-ordinator. Ashton had previously been with Hayden Laboratories since 1976.

● **Molinare** have appointed Chris Long sound dubbing engineer, Long's freelance work for the last four years included West End musicals, session playing and location recording.

● **Audio Developments Ltd** have appointed Tony Pitchford marketing manager. He comes from a division of Marconi Communication Systems where he was sales manager.

● **The Joiner-Rose Group** of Dallas have promoted Ron Baker to senior consultant of the Dallas office. He'll be responsible for overseeing the sound system designs for many of the firm's larger projects.

● **The Ampex Corporation's** magnetic tape division have appointed George Armes to the position of general manager, instrumentation and data tape, responsible for worldwide sales and marketing.

● **Solid State Logic** have appointed two area sales managers. Nick Cook is responsible for studios in the UK and Germany, while Peter Woolliscroft will handle the Latin countries and the Middle East.

● **Pro Audio Recording** of Maryland have appointed Mark Greenhouse as studio manager. Coming from Track Recorders, he will handle bookings, project planning, correspondence and promotions.

● **Mitsubishi UK** have appointed Martin Wallace to their service and support team, where he will be responsible for servicing and maintaining both digital recorders and consoles. Wallace comes from Neve where he was an engineer.

● **Amek** have appointed Jan Walmsley as exhibition co-ordinator. Walmsley has worked in the pro-audio industry for 10 years.

● **Electro-Voice** have appointed Ivan C Schwartz as broadcast/production marketing specialist, responsible for marketing all products related to TV, radio, film/video production, post-production and broadcast.

NEWS

Sound reinforcement at NY AES

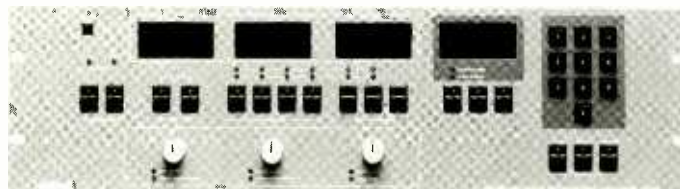
The 83rd AES in New York at the end of last year continued to confirm the demand for high quality audio in sound reinforcement and the following is a selection of interesting new products. Items have been grouped so certain brand names may appear twice.

Countryman Associates now offer the *Isomax 3* and *4* microphones in four different colours (to keep set designers happy) and the *Isomax 4* microphone will now accept SPLs of up to 150 dB without difficulty. The *TVH* hypercardioid lavalier microphone is also now compatible with wireless systems.

Audio-Technica introduced several new condenser microphones that have been designed for the rigours of stage and location use as well as for the recording studio. The *AT4031* is a cardioid microphone with a flat frequency response—bar a slight high frequency rise—from 30 Hz to 20 kHz. The microphone is designed to take hard knocks and high SPLs with the



Orban 642B ▲



▼ Orban 764B

case being made out of turned brass coated with black chrome and the capsule accepting 140 dB SPL for less than 1% THD. The *AT4071/4073* are shotgun microphones with again an essentially flat response to 20 kHz

and very little off-axis colouration, thus making them very suitable as spot microphones. SPL handling is 124 dB and 126 dB respectively.

Sennheiser introduced a computer-based visual display system for multichannel wireless microphone installations. The system provides visual status information for up to 54 channels on one CRT and shows RF signal strength, audio modulation, carrier frequency error and diversity operation for each channel. The system requires an interface unit for each receiver, CPU and colour monitor. Additional monitors may be placed in remote locations as required. The video monitor system was specially developed for the Broadway version of *Starlight Express* and has already been ordered for *The Phantom of the Opera* in 1988.

Orban introduced two new parametric equalisers, the *642B* and the *764B* programmable. The *642B* is a dual-channel equaliser with four parametric bands per channel and a

'Cascade' switch converts it to 8-band single-channel. For overall tailoring, each channel has tunable high and lowpass filters (18 dB/octave and 12 dB/octave 'Automatic Sliding Besselworth'). In/out switches are

provided for each filter and band and the constant Q equaliser design provides +16 dB of boost and -40 dB of cut, making the equaliser a true infinite-depth notch filter. The notch function of the equaliser has been enhanced by the addition of a frequency vernier control ($\pm 10\%$) for precise centring on troublesome frequencies. Careful attention has been paid to circuit design for extremely low noise operation (-110 dB) and capacitors have been eliminated from the audio path. Other features include a tuning range of 25:1 per overlapping equaliser section, Q variable from 0.29 to 5, overload indicators and active balanced inputs and outputs (transformers on option).

The dbx *1531P* can either be used as a single-channel $\frac{1}{3}$ -octave or dual-channel $\frac{1}{3}$ -octave equaliser and features balanced inputs and outputs, constant Q filters with switchable range settings between ± 7.5 dB and 15 dB and switchable highpass filters (20, 60, 120 Hz, 18 dB/octave). The circuitry features minimum phase shift and low noise performance for use in critical applications as well as being discrete in a 1U rack space.

The TDM Design *30GE-1* graphic equaliser features 30 ISO bands with constant Q filters and an advanced design to minimise interaction between the centre frequencies to 0.5 dB. Cut and boost is selectable between ± 6 dB and 12 dB. Other features include balanced differential input and balanced output with line driver, an internal insertion connector on the output for use with a filter, delay, EQ circuit, etc, and three $\frac{1}{3}$ -octave sweepable notch filters (50 to 500 Hz, 400 Hz to 4 kHz, 1 to 10 kHz) for tuning out 'hot' frequencies. (*More next month.*)

Audio Pro '87

Last December saw the first Audio Pro show at the Palais des Congrès, Paris, replacing the CTEAP show held in former years. This was also the first show by the organisers APA (Association des Professionnels de l'Audio), formed in 1987 and grouping most of the manufacturers and importers of professional audio equipment in France.

National exhibitions are growing in importance as calendar events (eg APRS, Tonmeisteragung, etc) and Audio Pro established itself straightaway as the French event of the year. However, it was interesting to note the presence of a large non-French contingent—both visitors and manufacturers—including from the States. Many exhibits were of an international flavour and had already been shown at trade shows around the world during the past year.

However, certain French manufacturers are more geared for the home market and several interesting products were to be seen.

As well as the exhibition, Audio Pro also organised three workshops, which were very ably chaired by

Denis Fortier. M Fortier has the knack of keeping things moving along as well as getting people to speak one at a time when there are numerous comments and questions from the floor.

Three subjects were presented: The Realities of Audio Maintenance and its Future, Digital Storage: R-DAT and CD and Digital Mastering, these being chosen on the basis of a questionnaire that had been sent out to interested parties.

The maintenance workshop featured four engineers on the panel and it is worth mentioning that staff maintenance engineers were more common some years ago than they are today.

The first subject of discussion was

'what goes down—and associated problems' with the following conclusions. Few faults are due to mishandling or abuse and mechanical systems are the most prone to failure. Bad cabling is often a source of problems and time-wasting, as are service manuals whose circuit diagrams differ from the equipment. One point raised was that the recording industry tended to stand apart from others by waiting for faults to happen, rather than investing in a lot of preventive maintenance. The fact that a lot of 'old' machines are still in use also means that engineers are expected to have a lot of knowledge at their fingertips. A question was raised as to how many studio engineers were interested in—and capable of—maintenance and it was felt that very few wanted to know what was going on 'under the bonnet'. Paul Jarvis said that most recording engineers did not know how to troubleshoot and that small maintenance operations, such as

replacing modules, etc, could only help engineers get to know a bit more about the equipment they were using.

Another major point was 'good maintenance starts with a good installation' and that most studios do not allow enough time for proper installation, fault-finding and running in. Whereas it was agreed that finances almost demand that the clients wait while the last plugs go in; shaky operation at the start does not do much good for a studio's image. Though documentation was felt to be 50:50 between good and bad with more and more equipment using chip updates, the paperwork often had a hard time keeping up. The importance of maintenance engineers was recognised though doubts were raised about the possibility of making a suitable living from maintenance work in France, especially in view of the continually rising cost of test equipment.

Training was felt to be by and large limited. Most people felt that

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NEWS

experience coupled with manufacturers' training schemes was the most satisfactory, though obviously some formal education in electronics is essential.

The panel thought future studios will have central machine rooms, service will be by highly trained specialists with back-up from the manufacturers, equipment will be fitted with more self-test routines, though there was a warning that microprocessors do tend to have wills of their own. The final sobering thought was from a senior engineer from Europe 1 who said, "Like it or not, the audio world will be pushed by the video/telecommunications industries into using equipment/formats that we may not particularly like—or want!"

The second workshop almost ended up as a prolonged discussion on DAT though questions such as standardisation between digital formats did get a look in. There still appears to be much confusion concerning DAT, especially with the threat of large-scale piracy, and it was emphasised once again that quality industrial piracy of CDs means a professional CD player with digital I/O port, professional DAT recorder(s) and a CD pressing plant. (It is a pity that press officers from the record companies are not informed about this—perhaps we

might get less hysteria in the popular press.)

DAT, as a storage medium, was generally welcomed though it was felt that digital recording in the near future would be a combination of tape and hard disk systems, the latter being used increasingly for editing.

The digital mastering workshop featured representatives from the leading French mastering studios as well as freelance engineer Francois Eckert who has been highly involved with digital recording.

Mastering studios are obliged to have machines in every format going though 1610/1630 is the CD format. "However, many studios do not want the expense of a 1630 and use F1, 701, etc." M Eckert raised the hoary subject of standards and said, "no real standard exists rather a collection with EIAJ, 1610/1630, DASH, PD, AES/EBU, etc. The problem is also to stay in digital once the signal has been converted. A/D converters are still the weak link."

EIAJ is a non-professional format and sounds different: "Try comparing F1 and 1630." It was also noted that the AES/EBU interface, though a long time coming, was designed so that digital equipment could communicate.

Digital also means high investment requiring two digital machines, a

ASF formed

The Audio Pro 87 show in December in Paris coincided with the formation of the Association des Studios Francais (ASF) and secretary Elisabeth Lochen was able to explain some of the aims of the new association.

"There are really two main objectives: to get French studios working together towards a common goal and to present a united front to the manufacturers. The latter, or commercial, aspect means that the association could make centralised orders for its members for things such as tape, equipment, etc. and present a 'voice of the industry' in discussions with manufacturers. This would embrace subjects such as after-sales service, user feedback, the offer of 'test bed facilities', and so on.

"On matters such as discussions with public authorities (VAT, etc) and insurance companies, the ASF will have the weight of an association rather than individuals trying to make themselves heard—and often without success!

"We also want to launch a general public relations campaign for French studios and this is where the general interest should take precedence over the attitude of people just looking out for themselves: a healthy recording industry in France will be to everybody's benefit.

"Whereas it will probably be difficult to agree on things such as standard rates, we need to be able to crack down on what I call 'pirate' studios who are a definite detriment to the market by being underpriced, and who are not registered as a business. Small studios, yes, but official ones!"

It is early days yet for the ASF to draw any conclusions but judging from the response at Audio Pro, a lot of studios seemed to think it was a good idea and were signing up. The first official outing of the ASF as an association will be at MIDEM 88 and they will be presenting the following objectives:

- promotion of French studios
- good relations between studios and producers
- reduction of VAT (now at 33½%) on equipment
- helping musicians and their problems
- promoting relations with suppliers and services
- rentability of studio installation and equipment
- relative importance of the technical and human sides of studios
- training
- status of freelance engineers
- insurance problems
- responsibility of EDF (French Electricity Company)
- possibility of joint stands at international exhibitions
- studio rates and terms
- the problem of different price structures of equipment in Europe.

The ASF is open to all French studios and can be contacted at: Marie-Christine Fontenit, SNEP, 48 blvd des Batignolles, 75017 Paris. Tel: (1) 43.87.22.66. Terry Nelson

digital editing system and a digital mastering console as opposed to a razor blade and splicing block for analogue tape editing.

Francois Eckert warned of the differences between digital and analogue recording techniques: "A bit of over-modulation on analogue tape results in some tape compression—on digital it turns the signal into garbage."

An interesting reminder was that CDs are pre-produced by the master tape and that this is what you get. The final sound of an analogue disc depends on the cut, pressing, etc, and is only an approximation of the master tape.

Finally it was suggested that one should "aim for the expensive! The vast majority of good record sales are those of well-produced records—not the ones where costs have been skimmed for reasons of so-called economy!"

Exhibits comprised studio, broadcast and sound reinforcement equipment and while the exhibition was obviously a showcase for products, the show also provided an opportunity to kindle interest for major launches at the March AES in

Paris (also in the Palais de Congrès). Let's look at some items of interest.

Studio gear

Aldo Lab of Corsica are now producing a console first shown several years ago. One of the latest developments has been the colour graphics for the computer system for automation and console status, ie previous control settings, etc. Changes in fader level, EQ, switches, etc, are clearly depicted by high quality graphics that make it easy to see what is going on during mixdown or to reset the console as per a previous session.

The Abac-Rustin programmable console—first shown at APRS—has now reached the production stage and can be configured according to requirements—multitrack recording, film and television post-production, live sound for theatre and concerts, etc. The system comprises a control console with digital control over remote audio racks, which are opto-coupled to the controller (maximum distance 50 metres). A fibre-optics option allows the audio racks to be at a maximum distance of 500 metres.



J P Lafont's Producer console

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All console parameters can be recalled and eight static mixes can be stored in the buffer memory. Reset time for a console with 32 input channels is about 14 ms.

Ateis have been developing their computer-based automation system (IBM AT or compatible), which can be interfaced with existing consoles and now features the *TRAME* for studio work (record/post-production) and the *SCENE* for theatre and sound reinforcement. Input channel capacity is now 128.

Kertec showed the *TPA 6086* dual-channel valve (tube) preamplifier, which is destined for very high quality recording purposes, as a microphone preamp, line booster, active DI, etc. The inputs and outputs are transformer balanced and

are of a proprietary design fully protected from RF and stray magnetic fields. Each unit is hand-built and calibrated to order to ensure uniformity.

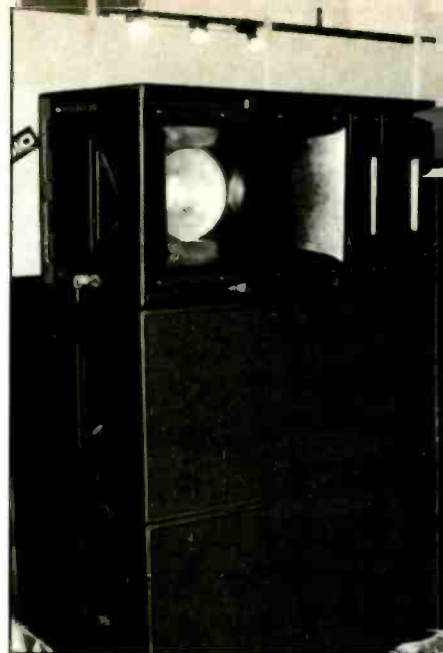
JP Lafont introduced the *Producer* console, which is reasonably priced but does not skimp on the components or technology (1% metal resistors, latest ICs, etc). The console is available in two standard frame sizes, 32- and 56-channel, and can be configured in two ways: using *901* mic/line modules for in-line operation together with *904* line return modules as required; or each module features 24-track bussing and 10 auxiliary send buses that are switch-selectable to six send controls on the module. The mic/line module features 3-band sweep EQ with variable Q on

the mid band and switchable peaking/shelving on the high and low bands, while the return module has Baxandall high and low EQ with two sweep mid bands. The mic/line module can also be fitted with an optional Record Ready remote command.

The second configuration uses the *940* mic/line module, which differs from the *901* by having a sweep highpass filter and no in-line monitoring. The *940* is intended for use with the *941* group send/tape return module, which features Tape1/Tape 2 switching for 48-track working, 4-band EQ with two parametric mid bands, in-line monitor section and Record Ready remote.

Standard features of the console include two mute buses, fader reverse and the facility to pan between channel/group out signal and tape return signal. The *Producer* is fitted with VCAs and can be supplied automation ready or equipped with *Optifile* disk automation. The master section includes full monitoring, eight echo returns that can be routed into the stereo buses and/or the cue buses and two machine remote controls. It offers a lot of useful features for a modest price and has already been installed in A/V and recording studios in France.

EAA presented the first details of their *Hendicott* consoles destined for

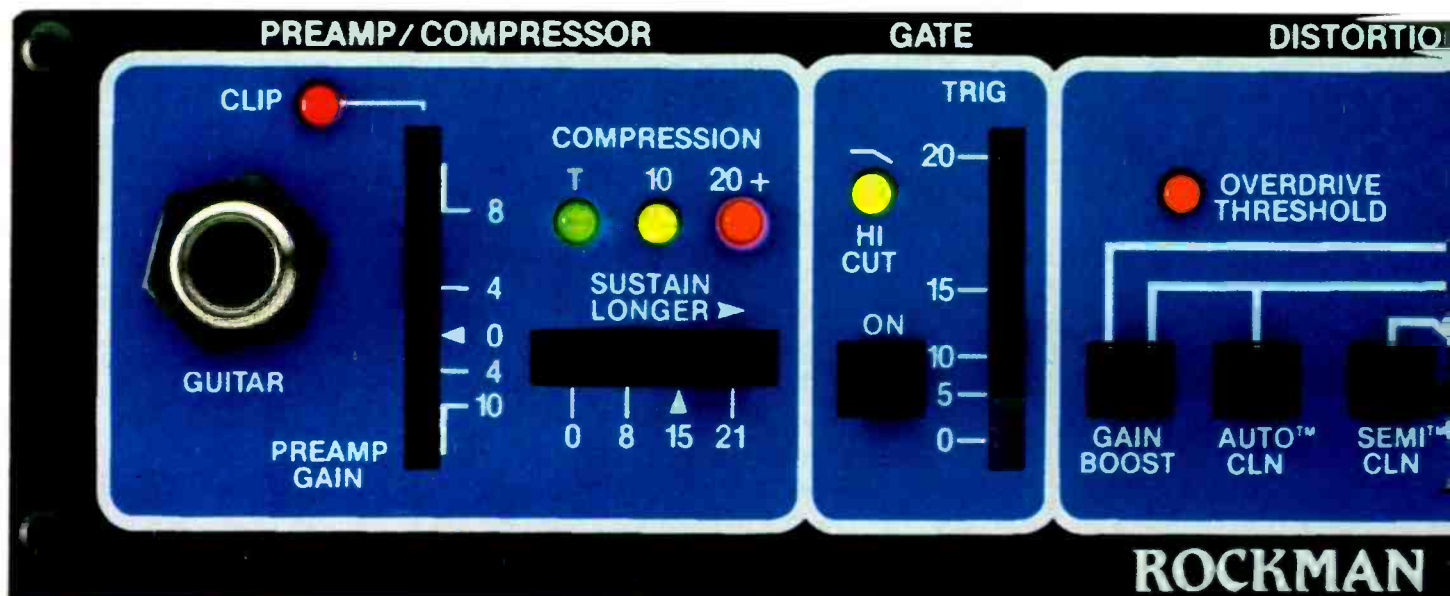


Solstice system from 33 Audio

A/V and live sound applications and available in a variety of module widths and depths. The basic frame is 19 in rackmount with larger consoles being configured by bolting frame sections together. EAA have developed a sophisticated semi-rigid form of interconnection between modules for maximum reliability, this includes double contact points.

Mondial Electronique released the *5001* editing tape machine, which features automatic brake release on reel handling, high precision tape counter, variable cueing, automatic tape dump, high speed wind and constant tape tension in all modes.

The Next Stage...





Sound reinforcement

Audio Concept Bourgogne have continued to refine their modular amplifiers and presented the *ACB 1200* MOSFET which is rated at 1200 W RMS/channel into 1 Ω . The amplifier features balanced inputs, fast slew rate, low THD and extensive protection circuitry.

EMB presented several new lines including two floor monitors with three operating positions. The systems have been designed for flat

response for anti-feedback and are available in left and right versions for stereo monitoring. The *MR152* is equipped with a 12 inch (30 cm) bass driver and horn/driver for mid/treble and the *MR102* has a 10 inch (25 cm) bass driver and horn/driver.

Several new speaker systems were on show and these were presented by Heil, Swann and 33 Audio.

Heil showed the Incremental System, which comprises of mid/high, bass and sub-bass cabinets of the same dimensions for ease of stacking and transport. One system consists of a mid/high array with sixteen 7 inch speakers and three 2 inch compression drivers/horns, two bass cabinets each with two front horn-loaded 12 inch speakers and a sub-bass reflex cabinet with two 18 inch speakers. Power requirements for one stack are 4 kW.

Swann introduced the Wotan 3-way compact enclosure using a specially developed tuning for two 15 inch bass driver, two 10 inch mid drivers each feeding a compression driver horn and four high power dome tweeters for the high frequencies. Special attention has been paid to phase response when stacking and cabinets are fitted with Socapex multipins for speaker connections and flying hardware.

33 Audio introduced the *Solstice* compact system, which features two 18 inch subwoofers, a 15 inch midbass

driver, a 2 inch high mid driver/horn and four high frequency drivers in a manifold arrangement.

An interesting feature of the 4-way system is that the low mid/high mid crossover point at 2 kHz is effected passively; 33 Audio feel this gives a smoother transition from one band to the next.

International

Though not a French product, Akai France were much more interested in showing the new *DR1200* digital multitrack than their American counterparts in New York. The *DR1200* comprises of a rackmount recorder unit using *Video 8* cassettes with helical scan, and containing the essential electronics. Sampling rate is 44.1/48 kHz 16 bit thus providing compatibility between professional DAT and CD equipment. Inputs and outputs are balanced together with a digital I/O port for all tracks. Recording is 12 digital tracks (17 minutes on C-90 cassette) with an analogue track for timecode, etc.

The recorder comes complete with separate rackmountable remote control unit and meter bridge. The *DR1200* has a built-in autolocator for drop in/out functions, muting, track bouncing, etc. Other features include programmable crossfade times for drop-in/drop-out and delayed playback start for individual tracks.

The *DR1200* can control two additional units for 36-track recording, only the master machine requiring the synchroniser circuitry. The system can also be interfaced with external systems via timecode with the VTR becoming the master in A/V applications. In a multimachine configuration, the master *DR1200* follows the external synchroniser with timecode and the slave *DR1200*'s follow the master.

Summary

The exhibition featured sensible—though for some, long—opening hours (10am to 7pm) with one late night (10am to 10pm) and attendance was remarkably consistent throughout. The APA president, Patrick Afour of SAJE, felt the show had been a success: "especially in view of the short time that the APA has been in existence. We have already had comments and suggestions from visitors and exhibitors alike and we hope the next Audio Pro show will reflect what we have learned from this first outing. I think our aim of making this a professional show has been fulfilled and that is most gratifying."

Unfortunately the air conditioning at the Palais des Congrès resulted in lots of runny noses and sore throats. Perhaps things will be better for the AES!
Terry Nelson

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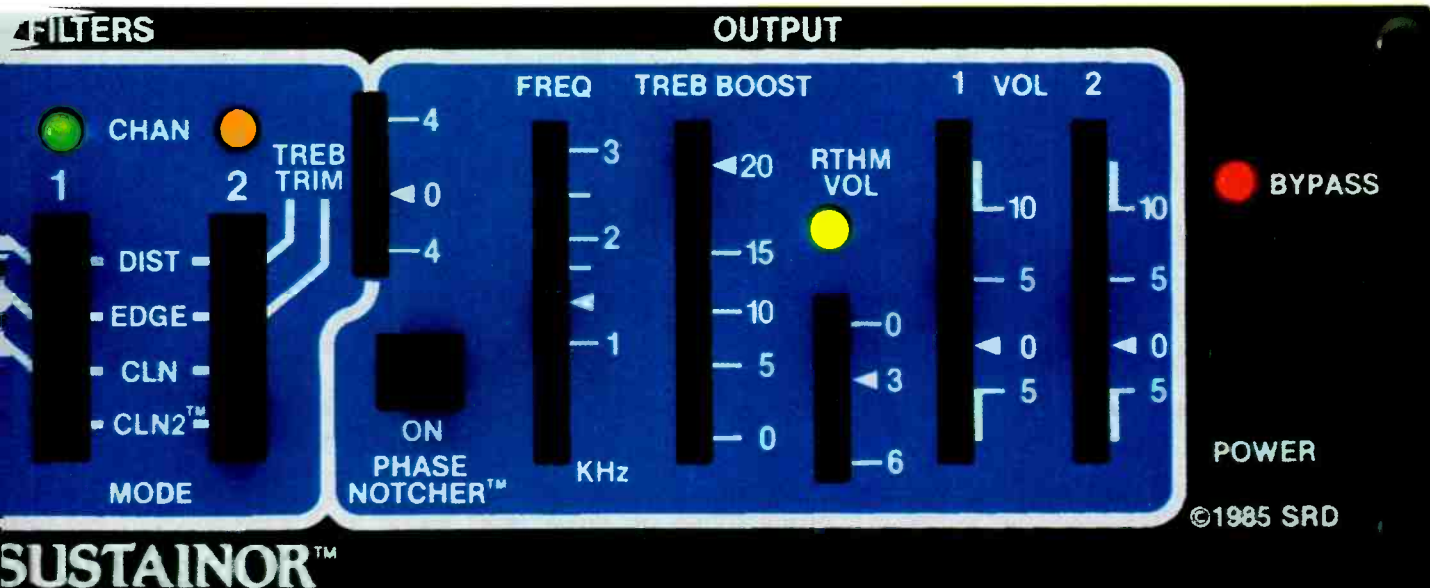
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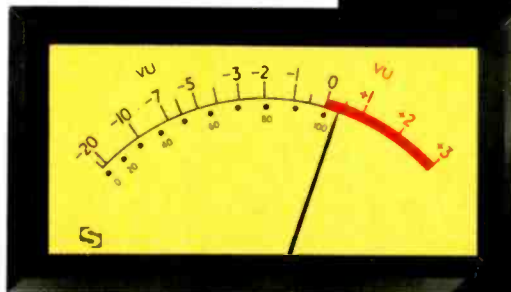


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ments and ambient environments.

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New products from Totalsystems

NEWS

Focusrite mic amp

The *ISA 116* uses identical gain structure to the *ISA* equalisers for optimum noise and headroom performance. Inputs and outputs are transformer-balanced with a maximum output of +24 dBu into a 600 Ω load (though this will usually prove unnecessary unless extremely long lines are used where there may be some marginal advantages in loading the destination end with 600 Ω). The amplifier fits into a 3 U rack (maximum 12 channels) and 48 V phantom power supplies are available as an option. The front panel of each module has 11 LEDs indicating which gain step has been

chosen at the remote position together with overload and phantom LEDs. A balanced jack output is fitted for on-site monitoring. Remote control is effected via a passive resistor chain for 11 switched gain steps of 6 dB (-60 to 0 dB) plus a toggle switch for phantom on/off. Sole requirements for the system are that balanced lines are used and multipin connectors can be fitted to the amplifier racks instead of/as well as *XLRs* for easy interface into systems. **Focusrite Ltd, Newmarket, Suffolk, UK, tel: 0638 730696. USA: Focusrite USA Ltd, Wheaton, IL 60187, tel: (312) 653-1919.**

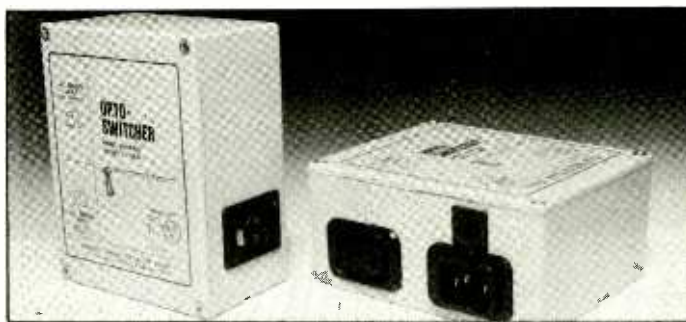
Totalsystems have announced the availability of three new products. The first is a compact phase correlation meter in a self-contained format housed in a DIN-sized panel mounting case. The dual display can be switched on the front panel between bargraph or moving dot indication. The unit is 240 V powered and the inputs are *XLR*-type balanced audio. The meter is available as a horizontal or vertical unit.

The second new product is an opto-switcher in the form of a small rugged box that allows optically isolated remote switching of mains-operated devices such as cue lights, etc. Up to 6 A may be controlled with

an input of 5 to 24 V at 10 mA. The switching is zero crossing and is suppressed to virtually eliminate interference. Mains power in and out is on IEC 3-pole connector and signal input is via female *XLR*-type connector.

Lastly there is a wall panel system in four parts that allows the user to produce and install custom wall panels. The parts are chassis, blank panels, cable support bars and a wooden sleeve. The system is available in four sizes to handle different requirements.

Totalsystems, 41 Windermere Avenue, Kempshott, Basingstoke, Hants RG22 5JH, UK. Tel: 0256 468555.



Sony new products

Sony have recently announced a large number of updates and new products for their pro-audio lines. New software for the *PCM-3324* to be used with the *RM-3310* remote controller, makes it possible to change crossfades within a range of 1½ ms to 370 ms, which is useful when electronically editing or punching in and out of record. The enhanced remote allows varispeed control of the *PCM-3324* within a $\pm 12\%$ range. There is also a special mode to allow more direct commands during the editing process.

The *DMU-30* is a remote meter allowing the monitor of digital audio

levels. It features a 32-segment LED-type metering section as found on the *1630*. This section provides a reference marker capable of setting a reference signal level within the range of -10 dB to -20 dB; a meter fine display mode capable of reading signal level in steps as large as 0.2 dB; and peak hold/auto peak hold. When data is fed through the Status input, indicators show CRS, parity, average, hold, mute, emphasis, sampling frequencies. When fed from the AES/EBU input, indicators show emphasis and sampling frequencies.

New operating software for the *APR-5000* analogue tape machines

has been introduced. Enhancements include a self-optimisation capability that improves the recorder's performance in establishing sync and in chase operations. A new timecode output feature allows timecode recorded on an *APR-5003* to be simultaneously output to any other longitudinally corrected device without the need for offset adjustment. The punch in/out operations have also been enhanced to allow virtual elimination of residual audio gaps in punch-in applications. Sony have also designed editing platforms for the *5000* series to increase the available work area.

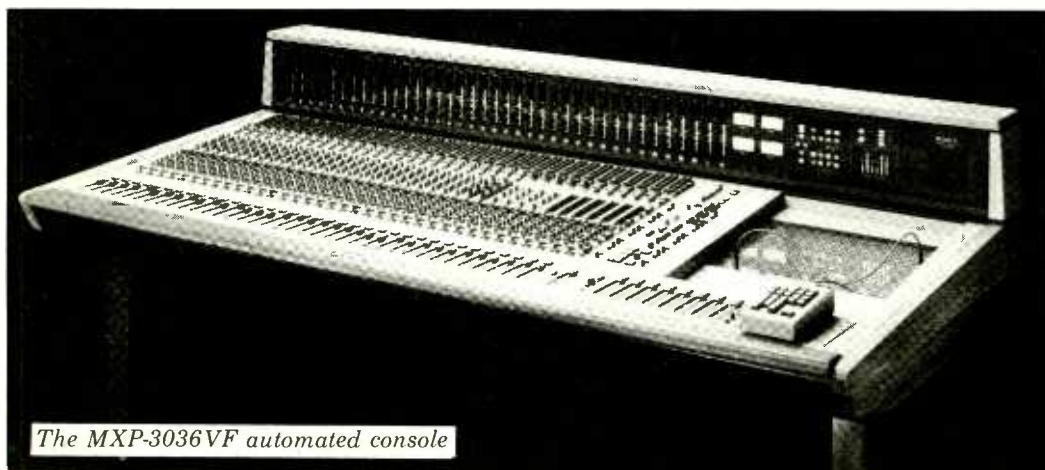
There has also been a new addition to the *5000* series in the form of the *APR-5002W*. The main difference is

in the area of the headblock. The heads are of a wide profile design that reduces the LF losses experienced when running a tape machine at high speed. The headblock construction uses a special type of amorphous metal that Sony claim will increase head life by up to five times.

There have also been new software and options announced for the *MX-3036* console. Vacuum fluorescent light meters are now an option with the meter offering four different ballistic types—VU, BBC, DIN and Nordic. It also displays DC levels for VCA fader status, a peak hold facility and an overload indicator. The colour is a bright blue-green light.

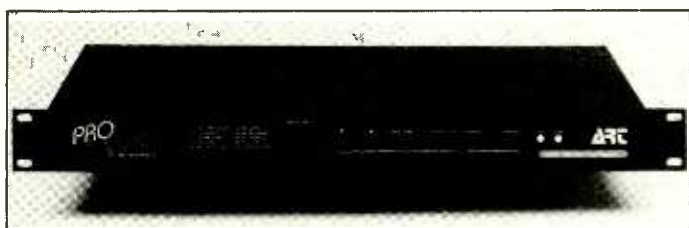
The *Version 2.0* software to be used with the *ADS-3000* hard disk automation allows the use of a 20 Mbyte disk increasing the data capacity to 122 mins. The menu has been condensed to a single page and the introduction of a rehearsal mode allows the mix to be previewed before writing to disk.

On the hardware side, wild faders have been added with four inputs in each module and the ability to control level under the console automation system. The desk can accommodate two wild fader modules. **UK: Sony Broadcast Ltd, Basingstoke, Hants, tel: 0256 55011 USA: Sony Corp of America, Park Ridge, NJ, tel: (201) 930-6432.**



The *MXP-3036 VF* automated console

NEWS



In brief

• DDA have issued details of the smaller desks that they have available for applications where space is at a premium. The standard *S series* mixer can be supplied in a rack mounting 8/2 format taking up 14 U of rack space. This is complete with input modules, masters and two VU meters. The *D series* console can now be obtained in a frame length of just 24 inches comprising 16 modules. These frames can be configured as 12 in/2 masters or 8 in/4 group/2 masters. Dearden Davis Associates Ltd, Hounslow, Middx, UK, tel: 01-570 7161. USA: Klark-Teknik Electronics Inc, Farmingdale, NY, tel: (516) 249-3660.

• Sennheiser have announced a special version of their *HD 540* headphones to be known as the *HD 540 Reference Gold*. The units feature very closely matched components and the tolerances are set higher than the standard units. The transformer systems are combined as pairs and have identical frequency drift. They are then fine tuned by the use of absorbent materials. There are also some

cosmetic changes over the standard units with each unit being supplied with a test number and in a wooden box. Sennheiser Electronic, West Germany, tel: 05130 583-0. UK: Hayden Laboratories Ltd, Chalfont St Peter, Bucks, tel: 0753 888447. USA: Sennheiser Electronic Corp, New York, NY, tel: (212) 944-9440.

• The Applied Research & Technology *ProVerb* multi effects unit has developed into three distinct new product configurations. The basic *ProVerb* will now include a level control. The *ProVerb II* offers battery back-up, remote jack, level selector and a number of new presets. *ProVerb III* is a completely new digital signal processor with the ability to produce multiple simultaneous effects using 16-bit electronics. The unit features over 200 presets, programmability, adjustable parameters, memory, battery back-up, level control and remote footswitch. Applied Research & Technology, Rochester, NY, USA, tel: (716) 436-2720; UK: Harman (Audio) UK Ltd, Slough, Bucks, tel: 0753 76911.

Similar in appearance to the *SPX90*, the *DEQ7* is a 2-channel digital equaliser with MIDI, which can be configured as follows: graphic—1-octave, 1/2-octave, 2/3-octave, 1/3-octave (mono only); parametric—4-band or 2-band with high and low shelving filters; tone control—a variety of bass and treble controls; filters—variable high/low pass, 3-band notch filters, band pass and band reject filters; dynamic equaliser and filter for sweeping peak EQ or filter effects.

The *DEQ7* features electronically-

Yamaha DEQ7 digital equaliser

balanced inputs and outputs (with *XLRs*) for the analogue section together with digital I/O port for interfacing to digital equipment with the Yamaha format such as the *DMP7*. Sampling rate is 44.1 kHz/16 bit. The equaliser is supplied with 30 factory programs with 60 positions

Revox professional recorder

Revox have introduced a professional reel-to-reel tape machine designated the *C270*. Revox describe the *C270* as only their second machine in 40 years designed specifically for the professional market, the first being the *PR99*.

The 2-track machine will be available in 3 3/4/7 1/2 and 7 1/2/15 in/s versions with NAB and IEC in either. Additionally there will be mono and 1/4-track versions and speed options of 1%, 1 1/10, 1 2/3, in/s.

The transport features a brushless DC capstan motor, varispeed, capability of ±7 semitones, a tape dump mode, and a digital realtime counter that also displays selected tape speed, A and Z location, loop and search modes. An 'Easy Edit' mode activates the left hand spool when the right hand spool is manually moved and thereby maintains tape tension in both directions.

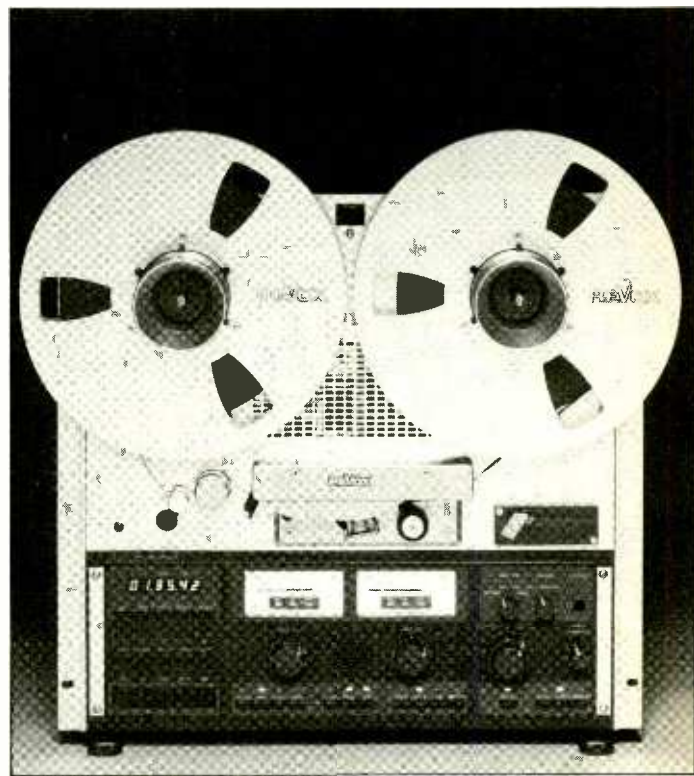
On the electronics side there are large VU meters with +6, +9 and +12 dB peak LED indicators; built-in monitor speaker, independent channel switching for input, replay, sync and record ready; optional balanced mic inputs, cal/uncal input and output selectors; Dolby *HX Pro* headroom extension, and linear phase record/replay circuitry.

The *C270* is the basic model of a much wider range that will become available in the near future. Future models will include the *C274* 1/4 inch 4-track and the *C278* 1/2 inch 8-track although dates for the availability of these machines have not been confirmed.

Revox ELA AG, Regensdorf, Switzerland. Tel: 840.29.60.

UK: FWO Bauch Ltd, Borehamwood, Herts. Tel: 01-953 0091.

USA: Studer Revox America Inc, Nashville, TN. Tel: (615) 245-5651.



parameters into each channel. The delay function can be used for time-aligning arrays, clusters, etc. with a maximum delay time of 738 ms and the readout can be displayed in milliseconds or in metric (0 millimetres to 251 m) or imperial (0 inches to 822 feet) distances. UK: Yamaha-Kemble (UK) Ltd, Milton Keynes, Bucks, tel: 0908 71771.

USA: Yamaha International Corp, Buena Park, CA, tel: (714) 522-9105.

for user programs and programming is as the *SPX90* with an LCD display for status information. A program 'Protect' function has also been included.

An extremely useful feature of the *DEQ7* is the ability to program independent delay and level

NEWS

Hanson Production Software

Hanson Software, a Los Angeles-based software developer has announced the release of *The Music Production Package*, a software system designed to streamline and simplify the preparation of pre-production and production budgets. Written by Erik B Hanson, the package comprises a set of customised templates compatible with the ForThought *FileMaker Plus* database program for the Apple *Macintosh*. Primary advantages offered by the package include easy creation of budgets and proposals; tracking of actual expenses during a

project; generation of budget versus actual expenses and costs; automatic look-up and calculation of expenses and production costs. The various screens include budget worksheet, budget proposal, budget itemisation, studio call list, talent call list, actual expenses, budget versus actual costs and phone directory.

The package consists of a *Macintosh* compatible floppy disk and a fully annotated manual. **Hanson Software, 7985 Santa Monica Boulevard, Suite 109, West Hollywood, CA 90069, USA. Tel: (213) 461-8601.**



Studio Magnetics Omega 32-track

British pro-audio equipment manufacturer Studio Magnetics has launched a new multitrack analogue tape machine employing a rather different approach to machine design. The *Omega* is a 24-track machine that has been prewired for 32-track use. The transport is a 2 inch tape width design with 14 inch reel capacity. The transport can be illuminated from below the overhanging meter bridge. Tape speeds are 15 and 30 in/s switchable with varispeed adjustment coarse and fine up to approx 48 in/s. All channel electronics are positioned in the penthouse area for easy user access. Channel metering has been moved to the remote control that also houses the transport functions and

autolocator. The machine has a meter for machine line-up and an internal 6-frequency oscillator.

Other features include *XLR* and multipin ins and outs; motorised deck lift; roller guide tape lifter; remote power supply option; edit/tool kit storage drawer; AES/IEC switchable equalisation with optional NAB at 15 in/s; and full matrix channel status switching on remote with status LEDs on machine. **Studio Magnetics Ltd, PO Box 111, Shrewsbury, Shropshire SY1 4NJ, UK. Tel: 0743 236672. USA: Power Studio Supply, 13453 Hollo Oval, Strongsville, OH 44136. Tel: (216) 238-9426. Rock Studio Supply, 430 Kansas Street, Norman, OK 73069. Tel: (405) 329-8431.**

Orban 764B equaliser

The *764B* programmable equaliser provides 99 memory positions for complete recall of all parameters and up to 14, 2-channel slave units can be addressed by a master unit. Operation can be stereo or independent 2-channel. Performance capabilities are very similar to the *642B* though the *Q* is wider, ranging from 0.3 to 15 (5 to 0.1 octaves), and the audio path uses no VCAs. Front panel LED displays show the status of parameters for each filter section and each memory position will store complete settings for both channels.

A lock-out code facility is provided to stop unauthorised tampering and the equaliser is MIDI-controllable and fitted with a remote control port. Provision has also been made for the future inclusion of serial interfaces. Programming the *764B* is simple with each parameter being controlled by a knob for fast operation. **Orban Associates Inc, San Francisco, CA, USA, tel: (415) 957-1063. UK: Scenic Sounds Equipment Ltd, London, tel: 01-387 1262.**



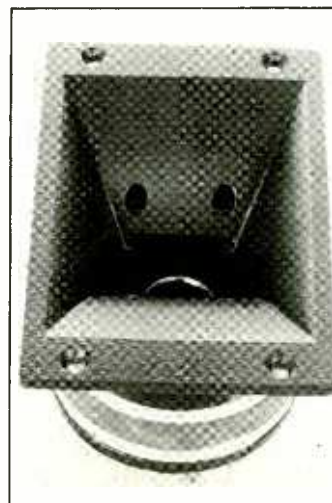
Ashly Audio CG-85

Ashly Audio has introduced the *CG-85* gated limiter compressor. Features include a new detector section incorporating gated release. An internal gate monitors the audio signal and interrupts changes in gain during periods of silence, distinguishing between changes of programme level and mere pauses.

Controls include input gain, attack threshold, ratio, attack time, release threshold, release time and output level. **Ashly Audio Inc, Rochester, NY, USA. Tel: (716) 544-5191. UK: Sound Technology plc, Letchworth, Herts. Tel: 0462 480000.**

Fane horns

Fane Acoustics have announced two new constant directivity horns with integral driver, the *HT100* (30 WRMS) and *HT150* (40 WRMS). Specifications quoted are 8 Ω impedance, crossover frequency 4 kHz @ 18 dB/octave and polar response 15 kHz 70° (h) x 70° (v). Sensitivity at 1 W/m is given as 100 dB (*HT100*) and 103 dB (*HT150*). Features include a composite Kapton-Titanium diaphragm and edgewound aluminium/glassfibre voice coil. **Fane Acoustics Ltd, Batley, W Yorks, UK. Tel: 0924 476431. UK: Audio Factors, Leeds, Yorks. Tel: 0532 561949.**



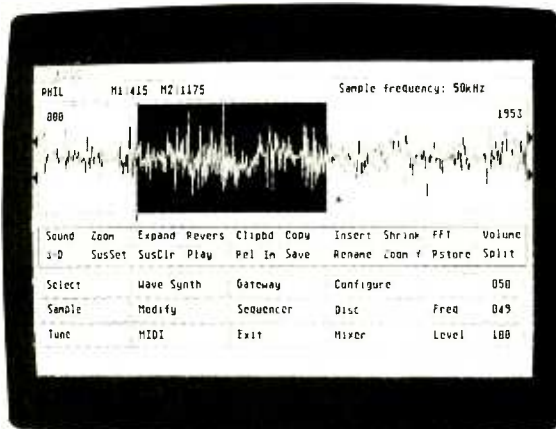
Lynex

sixteen bit stereo sampling system



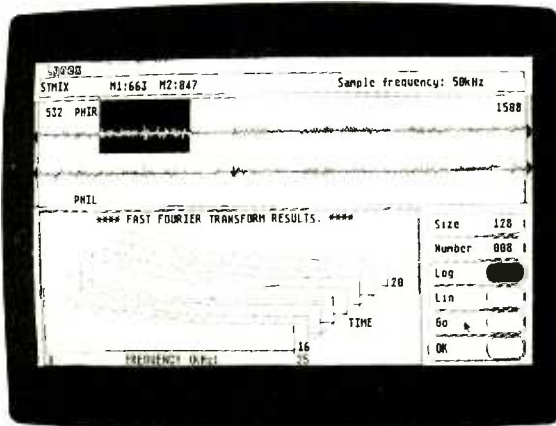
“...a British unit designed and developed in Cambridge that could ultimately be as big as the Fairlight!...”

Sound on Sound



A powerful and sophisticated stereo sampling system whose most complicated feature is the power switch! Packaged in a slim 1U rackmount module, it is designed to interface with the Atari range of ST computers.

True stereo 16-bit sampling at 50KHz, 8 or 16-voice polyphony with 8 separate outputs and a built in 8 channel digital mixer. 1Mb RAM expandable to 32Mb. Standard software offers extensive mouse-controlled sample viewing, editing, waveform restructuring, sound creation, and comprehensive MIDI parameter assignment facilities.



Unique design leaves the host computer free to run additional software simultaneously, allowing an already formidable pro quality sampling instrument to be used as a sequencer, studio post processor and digital effects processor on the same computer...in as little time as it takes to load the discs. If you have to ask, you can probably afford it!

For further information contact:

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F i c t

Digital taping may wipe out compact discs



CONTRACT DISCS are about to be replaced by a new format called Digital Audio Tapes (DAT). Sony is leading the way in this new format, which is expected to be introduced in the next few months. The new format is expected to be a major competitor to compact discs.

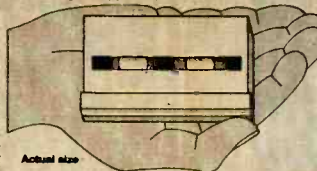
Another revolution in hi-fi recording is being proposed by the Japanese NCC. The NCC is a consortium of Japanese manufacturers, including Sony, Philips, and Matsushita. They are working on a new format called Digital Audio Tapes (DAT). The NCC is expected to introduce DAT in the next few months.

DAT is a new format for digital audio recording. It is expected to be a major competitor to compact discs. The NCC is working on a new format called Digital Audio Tapes (DAT). The NCC is expected to introduce DAT in the next few months.

DIGITAL AUDIO TAPES

The tiny challenger

By Colin Ross and David Thomas in London



Actual size

The tiny challenger is a digital audio tape (DAT) that is only 1.5 inches long. It is expected to be a major competitor to compact discs. The NCC is working on a new format called Digital Audio Tapes (DAT). The NCC is expected to introduce DAT in the next few months.

Bill

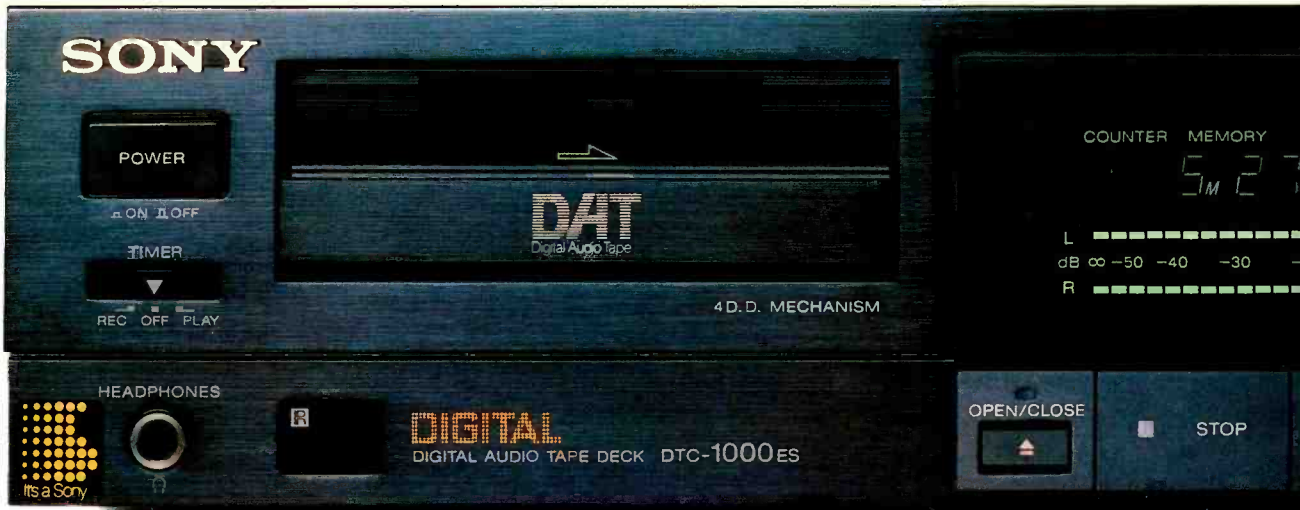
VOLUME 99 NO. 41

Sony's DAT Raises Ire Of E

BY PETER JONES

LONDON Leading members of the European Parliament are expressing deep concerns over the decision by Sony to market DAT recorders in Europe later this year. The officials are stressing the potential damage, as they view it, to the European music industry of widespread use of DAT equipment to copy recordings. One British MP, James Moorhouse of the European Democrats, says that 600,000 jobs in the industry could be at risk. He is seeking a European Commission statement telling Japan that the launch of DAT in the European Economic Community would "not be tolerated before protection is afforded copyright owners."

F a



From its very conception, Digital Audio Tape has been the subject of hype and controversy. Much of the hysteria has stemmed from the use in which some consumers may choose to put DAT equipment. Be that as it may, HHB has always believed that digits point the way forward in both professional and consumer audio. Quality must always be king.



It is quality that will guarantee a successful future of the music business as well as the studio industry. Forget the hype. Ignore the controversy. DAT is highly convenient and it works. And it can provide professionals everywhere with the extra quality they seek. Professional format DAT equipment can record and playback on 48 KHz or 44.1 KHz.

Hopes rise of accord on digital audio tape

By David Thomas

HOPE has risen in Japan and the US about the prospect of a satisfactory agreement with the Japanese electronics industry on the introduction of digital audio tape, a new format system developed by the Japanese which could sweep the music industry.

The record music industry believes that an early introduction of digital audio tape would displace the sales of compact discs and increase the production of high quality priced records.

However, the Electronic Industry Association of Japan (EIAJ) has agreed to discuss this proposal with the International Federation of Phonogram and Videogram Producers, the international trade association representing the music companies in Vancouver, Canada.

Leading figures in the music industry have indicated that digital audio tape is not yet ready to be introduced in the US market.

They believe that agreement in the music industry will be reached by the end of the year.

They also think that the music industry will be pleased to see that Japan has agreed to discuss the proposal.

Compensation, which has been a major issue in the DAT negotiations, is being discussed with the International Federation of Phonogram and Videogram Producers, the international trade association representing the music companies in Vancouver, Canada.

The Federation has also studied the possibility of introducing DAT tape and is expected to report on it.

Japanese likely to launch digital tape despite outcry

BY CARLA RAPAPORT IN TOKYO AND DAVID THOMAS IN LONDON

JAPAN AND its Western trading partners are heading for a trade dispute after the Japanese Ministry of International Trade and Commerce announced last week that it is likely to change a new audio system which the music industry finds threatens its survival.

The Japanese now look set to launch the digital audio tape system next year, but the Western music industry will press the US Government and the European Commission for laws forcing the safeguards it wants.

The system will allow music reproduction on a set with compact discs. The Western music industry fears that compact discs will be copied onto the digital tapes which they carry a "spoiler" to prevent this.

The industry believes that combined compact disc-DAT players, which the Japanese have already exhibited, will encourage consumers to tape compact discs with out paying royalties, undermining its copyright earnings.

Senior executives from both sides met in Vancouver, Canada, this week to solve the problem. However, the meeting broke down after the Japanese rejected the demands.

For the music industry, Mr. Neishi Etsuro, head of Warner Brothers Records, told the meeting that because of the copying problem, "DAT is clearly an enormous threat to the survival of the music industry."

He argued that it was to consumers' long-term interests that copyrights should be protected. "It is false to assume that the consumers should get whatever they want."

He asked the Japanese to support the music industry's quest for US and European legislation requiring DAT machines and tapes to be fitted with an anti-copying device.

However, the Japanese rejected the request, saying an anti-copying device would "destroy the major functions of this promising product."

"They told the meeting: 'We strongly believe that it is a duty of the hardware industry to let the consumer enjoy the result of his epoch-making new technology as soon as possible.'"

The Japanese said they opposed commercial piracy and would cooperate with the music industry to stamp it out, but their sole concession in the Vancouver talks, chairman Mr. Schouchi Suga, said home taping.

The Federation, which has at-

TECHNOLOGY Don't panic over DAT

Michael Cross

THE record industry's arguments against digital audio tape (DAT) are beginning to sound a little hollow. The latest position from the British Phonographic Industry (BPI) makes this clear, especially when the new system is compared with the compact disc. The record business is not a future-looking lot at all, some say.

The introduction of the technology is not all from the company of the early 1980s, in the compact disc. Some 4 million compact discs were shipped in the first 10 months of 1984. At the end of the year, sales of compact discs had reached 10 million.

This means, the statistics show, that the record business is not a future-looking lot at all, some say.

The recording industry association of America, the US music trade association, will try to get a bill introduced in the next session of Congress imposing a 35 per cent duty on all imported DAT machines with-out a spoiler.

The International Federation of Phonogram and Videogram Producers, the international music trade association, will press for speedy European legislation requiring all imported machines to have a spoiler and for tariffs on machines as an interim measure.

The Federation, which has at-

Japanese companies ready to sell digital audio tape systems

BY CARLA RAPAPORT IN TOKYO

THE JAPANESE launch of a revolutionary audio technology, digital audio tape (DAT), is gathering pace as Matsushita Electric and Sony, two heavyweights in the world consumer electronics industry, are set to unveil marketing plans for the product this week.

DAT, which will both record and play back music with almost perfect quality, has been attacked by the international music industry. It claims that the technology would undermine the industry by allowing music pirates to record copyrighted material, such as compact discs, without penalty. As a result, it is seeking to modify the product or tax its sales heavily in the US and Europe.

Matsushita, which will announce its plans today, is expected to put DAT on sale in Japan on March 1, the same day which Aivis, a medium-sized electronics company, has already said it will begin sales.

Mitsubishi, the world's largest consumer electronics company, follows the National Panasonic and Technics brands, is not a native within the Japanese industry for being late or late into a new market. Its performance on DAT underlines the high expectations that Japanese companies have for the product.

Despite the controversy surrounding it overseas, Sony, which is expected to make its marketing plans known tomorrow, is normally among the first to enter a new market. Both companies, along with several marketing plans for the product, are expected to limit sales to the Japanese market for the time being, but industry analysts expect that exports of the products will begin in the second half of this year.

The Sony and Matsushita machines are expected to have a copyguard device which will charge the user to record compact discs through a conventional amplifier. This will reduce the quality of the finished tape, but industry executives say that the device can be easily removed by an audio shop clerk.

Matsushita yesterday said it would manufacture audio DAT recorders and video tape recorders (VTR) in France. VTR production will start at Loudrev, Lorraine, in August, reaching about 60 jobs. Initial production will be 30,000 units a year. Production of DAT recorders has already begun, and will reach 24,000 units a year. The company stressed yesterday that it aimed to achieve a high rate of local component content.

**der Intro
-pan MP3**

semi Party's Gipsy de Vries, to to REC Commissioner Kild, says that the launch could be another aspect of time onslaught on the European electronics market for the commission to (Continued on page 100)



It's now available at HHB in the shape of the Sony PCM 2500.

The DTC 1000ES is designed primarily as a domestic device at a domestic price, but we see it as an every-day tool in any professional recording environment.

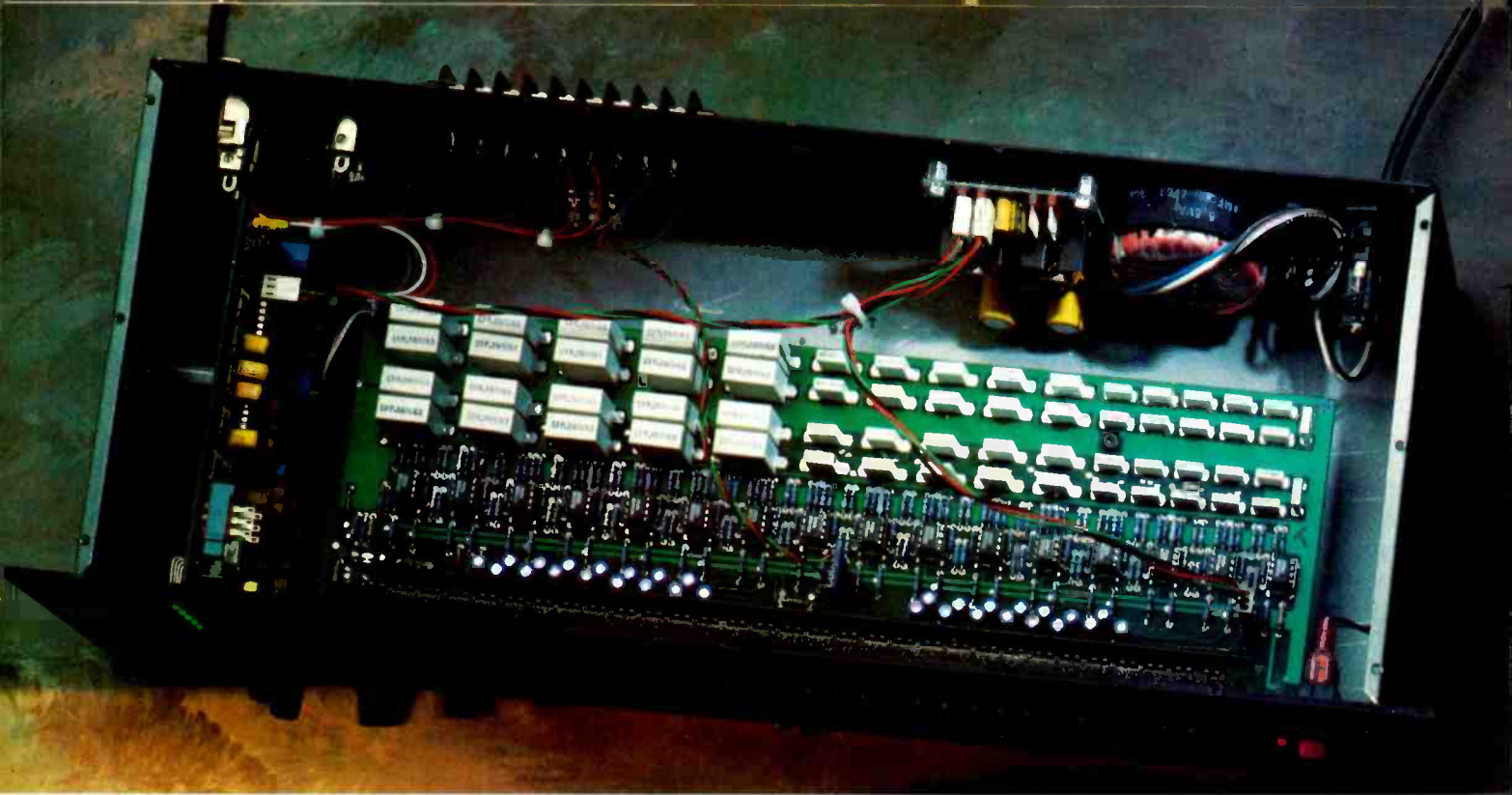
HHB should know. The company created a massive pro-audio role for the EIAJ digital format.



Of course, both machines are well supported by HHB's legendary expertise and back-up service. That's the special reward for those that choose Europe's leading pro-audio centre for their digital technology.

You've read the fiction and you've got the facts. Now buy the product. There's no turning back.

SONY/HHB



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Of course, when you offer the quality and features found inside the Audio Logic SC31 Graphic Equalizer, it's easy to display more than a little extra intestinal fortitude.

The SC31 is a powerful signal processing tool designed for professional use. It features 31- $\frac{1}{3}$ octave centered bands of equalization with selectable 6 dB or 12 dB of boost and cut. But that's just for starters.

Take a look at the chart. It shows how the SC31 stacks up against the competition in the specs most important to audio engineers and sound contractors.

Maximum output. Dynamic Range.

*All specifications taken from manufacturer's published literature.

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	Audio Logic SC 31	RANE GE 30	JBL/Urei 5547A	Klark-Teknik DN 300
Noise	Less than -90 dBm	Less than -90 dBm	Less than -90 dBm	Less than -90 dBm
Maximum Output	+27 dBm	+24 dBm	+22 dBm	+22 dBm
Dynamic Range	+117 dBm	+114 dBm	+112 dBm	+112 dBm
Frequency Response	18 Hz to 30 kHz +/-0.5 dB	10 Hz to 40 kHz +0/-3 dB	20 Hz to 20 kHz +1/-2 dB	20 Hz to 20 kHz +/-0.5 dB
Number of Bands	31	30	30	30
THD plus noise	Less than .005% @ +22 dBm @ 1 kHz	Less than .01% @ +4 dBm	Less than .5% @ +22 dBm	Less than .01% @ +4 @ 1 kHz
Suggested Retail Price Excluding VAT	£390.00	£498.00	£705.00	£595.00

Frequency response. Number of bands. Total Harmonic Distortion plus noise. In every category, the SC31 comes out even or on top.

In every category, that is, except price. Because the SC31 gives you all that capability, plus

incomparable sound quality, for considerably less than any other professional graphic equalizer. And that's what galls the competition most of all.

For a hands-on demonstration of the SC31, visit your professional audio dealer.



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* What made the Neve V-Series the top console of 1987?



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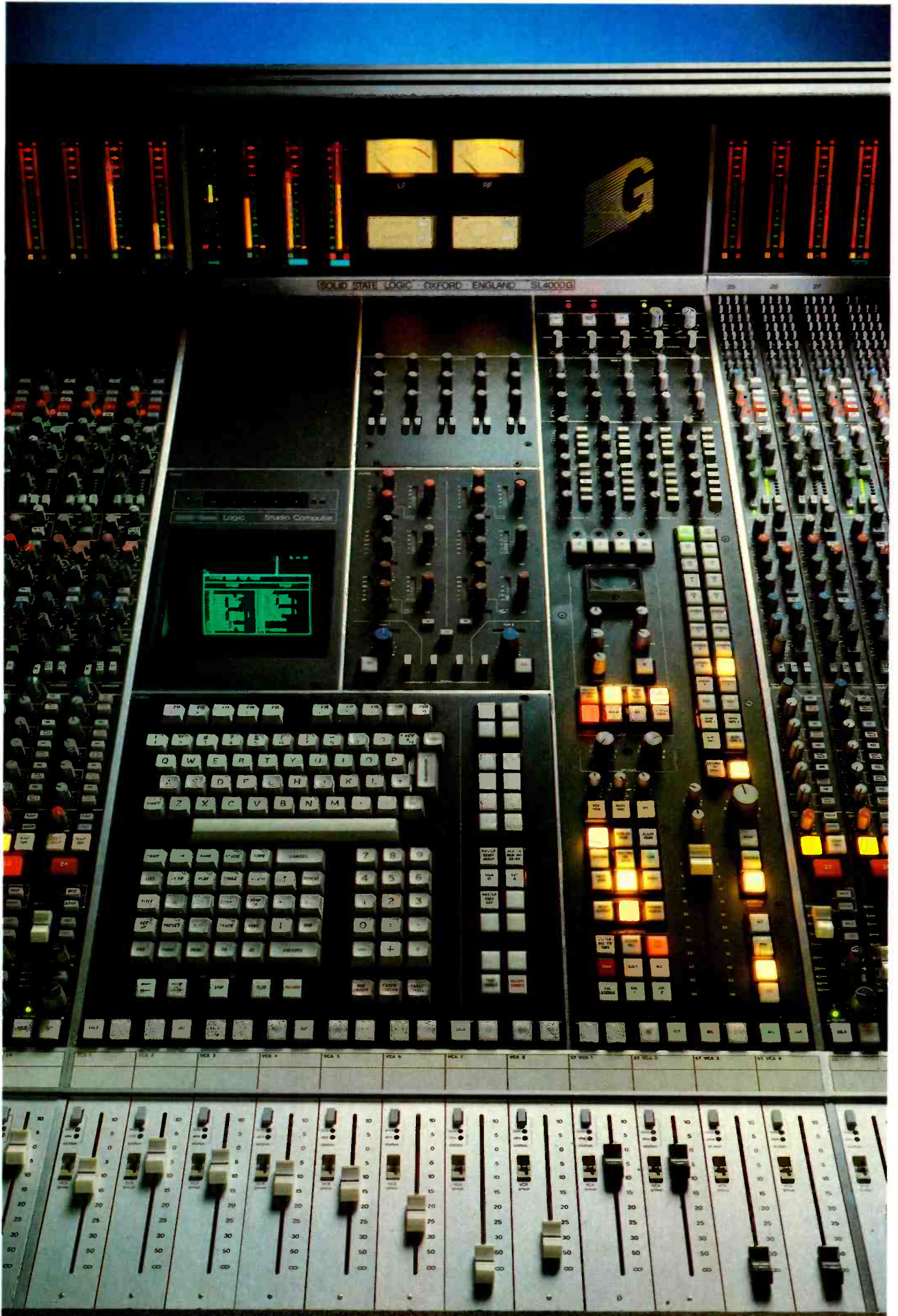
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Now, and for many years to come, the G Series Master Studio System will have no equal.



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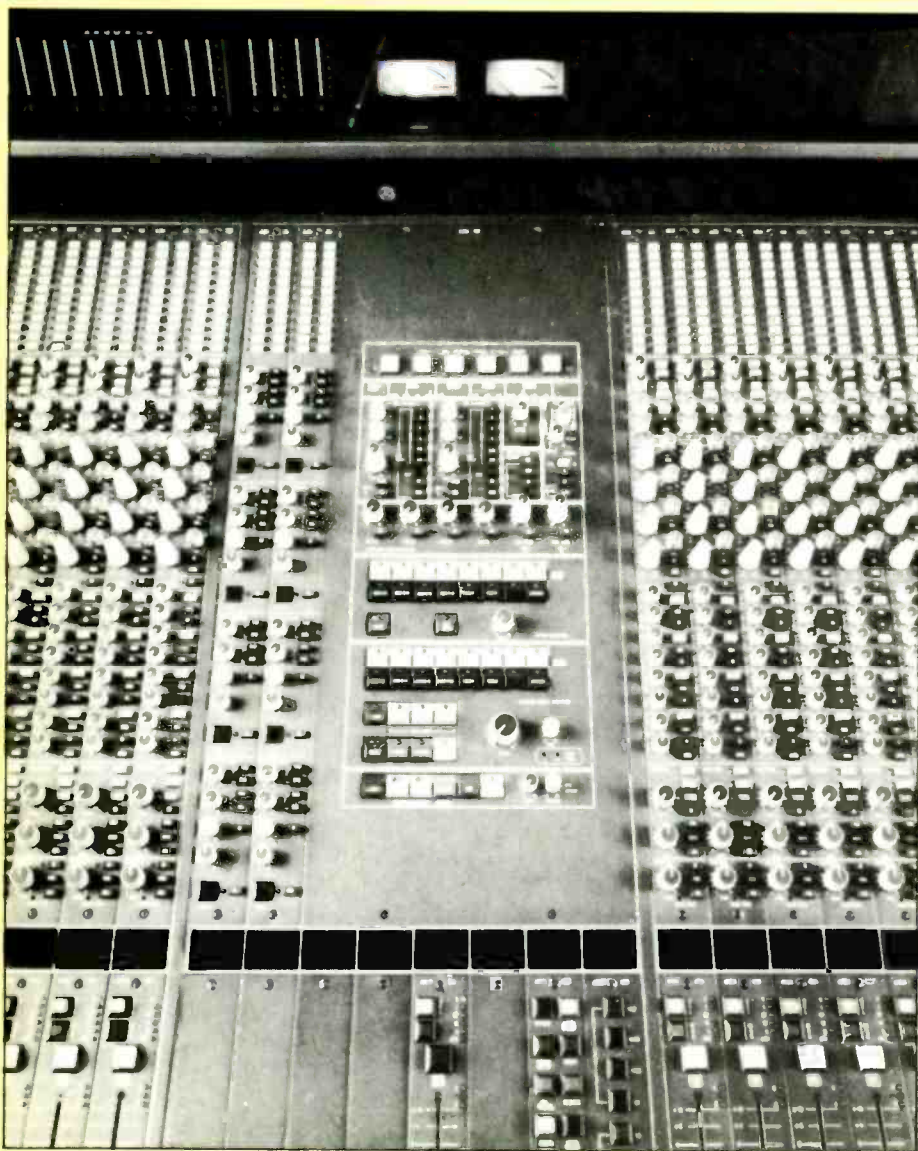
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AES CONVENTION PREVIEW

The 84th Convention of the Audio Engineering Society will be held at the Palais des Congrès, Paris, March 1st to 4th, 1988. As usual the convention will consist of a wide range of technical papers with an associated exhibition. In this preview we have concentrated on the new items on show from details available to us at the time of writing.



Amek G2520 monitor section

Studio Sound is based on stand T81 where we will display current issues of the magazine, subscription forms and copies of our sister publications *Broadcast Systems Engineering* and *One to One*. Both editorial and advertising staff will be present on the booth and around the exhibition throughout the Convention.

A

- **Acoustic Design Group:** will have full information on their acoustic design services.
- **Adams Smith:** will be showing the *C:Sound* audio graphic editing system that is now a standard feature for the 2600 editor in addition to the full range of other synchroniser products.
- **AEG:** will be showing their range of analogue tape machines from ¼ inch to multitrack as well as the *PD* format digital multitrack.
- **AEQ:** no information available.
- **AGAP:** range of broadcast products.
- **Agfa Gevaert:** the full range of audio, video and duplicating tape and cassette products.
- **AHB:** Celebrating their 20th year as console manufacturers, AHB will highlight their in-line *Sigma* with a fully operational 44-channel, 32-track monitor version. They will also introduce a new range of consoles for sound reinforcement: the *SRC Modular* series comes in three frame sizes: 16/4/2, 24/4/2 and 32/4/2.
- **Akai:** featured exhibit will be a demonstration of a 24-track digital recording system comprising two *DR1200* 12-track recorders.
- **AKG:** will launch a number of new products including optional software for the *ADR 68 (V4.00)* with additional reverb and effects programs, sampling facilities, MIDI features, and more than 150 factory presets in EPROM. Also the small *C747* pencil-type hypercardioid mic for use in many different recording situations. A range of mini condenser mics will also be in view.
- **Alpha Audio:** is introducing the *Boss* programmable keyboard accessory enabling any key or group of keys on the main *Boss* keyboard to be assigned to a user-customised mini keyboard which features new Jog Knob providing editor search and frame jog control over the video transport. The *Boss* computer-based audio for video editing system will itself be shown. Other applications include control of MIDI devices, cart machines, compact disc players and certain video transports.
- **Alphaton:** full range of transformers and transformer-based products.
- **Altec Lansing:** will show examples of their wide range of products including microphones, mixers, signal processors, amplifiers, loudspeaker components and systems and accessories.
- **Amcron:** will be showing examples from the range of Amcron/Crown microphones, amplifiers and the *Techron TEF-12* analyser. Featured will be the *M2400* amplifier, the *CM* mic series and the *Power Base 2*.
- **Amek:** centrepiece will be the *APC1000* assignable audio console with advanced automation and digital control of analogue signal paths. Also being featured is the *G2520* multitrack production console with new interface for Digital Creations *Diskmix* automation system plus *GII* stereo module to facilitate broadcast and post production applications. *BCII* and *Classic* consoles will also be on full demonstration.
- **AMI/Concept Design:** represented by Audiomatic is introducing to Europe its *Digital Audio Analogue Duplication System (DAAD)* high speed duplicator using a tapeless master.
- **Amix:** wide range of mixing consoles, power amplifiers and signal processors.
- **Ampex Magnetic Tape:** complete range of magnetic tape products for professional digital and analogue applications.
- **AMS:** will exhibit

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AES PREVIEW



ROH model 300 intercom station from Anchor Audio

the latest version of *AudioFile* which includes eight simultaneous outputs, reel rocking throughout cues, varispeed location of edit points, and cut and paste edit page which allows all normal edit functions available on tape-based systems as well as those available only on hard disk units. Also on show will be the complete range of digital audio processing equipment, including the *RMX16* reverberation system; the *Timeflex* stereo time compressor/expander with SMPTE control and machine interfaces for a variety of equipment; and the *DMX15-80S* delay/pitch changer/sampler, now available with dual channel sampling. ● **Anchor Audio:** is introducing the *Ensign* tabletop lectern with integral 50 W MOSFET power amp and a dual speaker array with condenser microphone and two phantom powered mic inputs. They will also show the ROH model 302 intercom station. ● **ANT:** will display and demonstrate the full range of *telcom c4* noise reduction systems including the 2- and 4-channel units, the *cat 22* compatible card and the Eurocard *c4E*. The new 24-track *E413* unit will also be displayed. ● **Apex:** is exhibiting, with *Audiomatic*, an automatic cassette printer with first European showing of Alcohol Scrubbing System, Automatic Eject System and Ultraviolet Drying system. The *Tapex T8* platemaking system for Apex printers is also being shown. ● **APG:** no information available. ● **Aphex:** will be launching the model 602 2-channel expander/gate/ducker. This unit utilises the Aphex VCA for fast click-free operation with negligible noise or distortion. Existing product also being shown includes the *Dominator* multiband peak limiter, the *Compellor* 'invisible' automatic gain control/compressor and the *Aural Exciter* audio presence enhancer. ● **Ashley Audio:** wide range of signal processing equipment. ● **ASL (Ampco):** will be showing its range of intercom stations including masterstations, belt packs, speakerstations, matrix switchers, PSUs, interfaces and accessories. ● **Asona:** will show its range of duplicating equipment and accessories including the *2015* winder and *301* twin slave unit. ● **ATB:** will have details of their audio and video cassette components for the duplicating industry. ● **Audio+Design:** will show a fully operational production version of the *Soundmaestro* digital recording and editing system, operating under *GEM* software and handling 16-bit digital audio (with update to 24-bit planned). Hard disk storage plus provision for future alternatives, with CPU capable of handling 64 hard disks. Also being shown is the *DIGI-4* 4-channel digital recording system working in the *F2* format with low-band PAL or NTSC video machines as well as other Audio+Design digital and signal processing equipment. ● **Audio Developments:** new products are the *AD110 Micro-Mix*, a digitally-based edit system offering complete keyboard control of play and record machines, as well as containing its own 6- or 12-channel audio mixer and programmable graphic equaliser with two

curves. Also on show will be the full range of portable mixers plus the new range of derivatives for editing: the *AD145-E* and *AD062-M*, along with the range of *Porta-flex* audio tools and range of distribution amplifiers. ● **Audio FX:** details of their audio equipment hire services from both their London and Netherlands offices. They will also show the *Voyetra* range of MIDI software and hardware for IBM PC and compatibles. ● **Audio Kinetics:** will show its wide range of synchroniser and timecode-based products. They will also be making a major product announcement. ● **Audio Precision:** will exhibit the *System One* audio test system (demonstrated making automatic alignments of a Studer A820) along with the new *DCX-127* multi-function module (shown testing VCA characteristics and linearity of D/A and A/D converters) and *SWR-122* switchers; they will also introduce new computer interfaces for *System One* and will demonstrate a number of new software features. ● **Audio Technica:** is exhibiting a range of microphones including *AT4051* unidirectional condenser, *AT4031* unidirectional condenser, *AT4071* and *AT4073* shot-gun condensers and the *AT871 UniPlate* boundary mic. The *AT4462* stereo portable ENG mixer will also be shown along with a selection of radio microphones, headphones and microphone accessories. ● **Audiologic:** range of signal processing equipment. ● **Audiomatic:** is introducing the Concept Design *Digital Audio Analogue Duplication System (DADD)* high speed duplicator using a tapeless master. The *DAAD* is compatible with Electro Sound slave recorders. Also showing from Electro Sound the *ES8000* master and electronics with built-in test signal generator, the *ES48000* digitally-controlled slave recorder, *ES8000* slave recorder and *4300* automated quality control system as well as Apex cassette printer with new ultraviolet drying system and *Tapex T8* platemaking system. ● **Auditem:** no information available. ● **Audix:** will be showing its range of broadcast equipment including the *AAT3000* digital control mixer, *Access* digital studio talkback and a series of digital audio sampling rate converters. ● **Auratone:** range of reference monitor products.

B

● **BASF:** will show their full range of professional audio and video tapes, cassettes, magnetic film and calibration test tapes. ● **Beyer Dynamic:** will show a full range of condenser and dynamic microphones, studio headphones, wireless microphone systems and headphones. ● **BNS:** will show monitor speakers developed in conjunction with the Dutch Broadcasting Corporation NOS. These include the *Professional Monitor 1* active 2-way system for smaller control rooms and OB vans, and the active *Mini Monitor* for nearfield monitoring applications. ● **Boom Shadow:** no information available. ● **Brady:** will have a new video splicing tape-polyester film with acrylic

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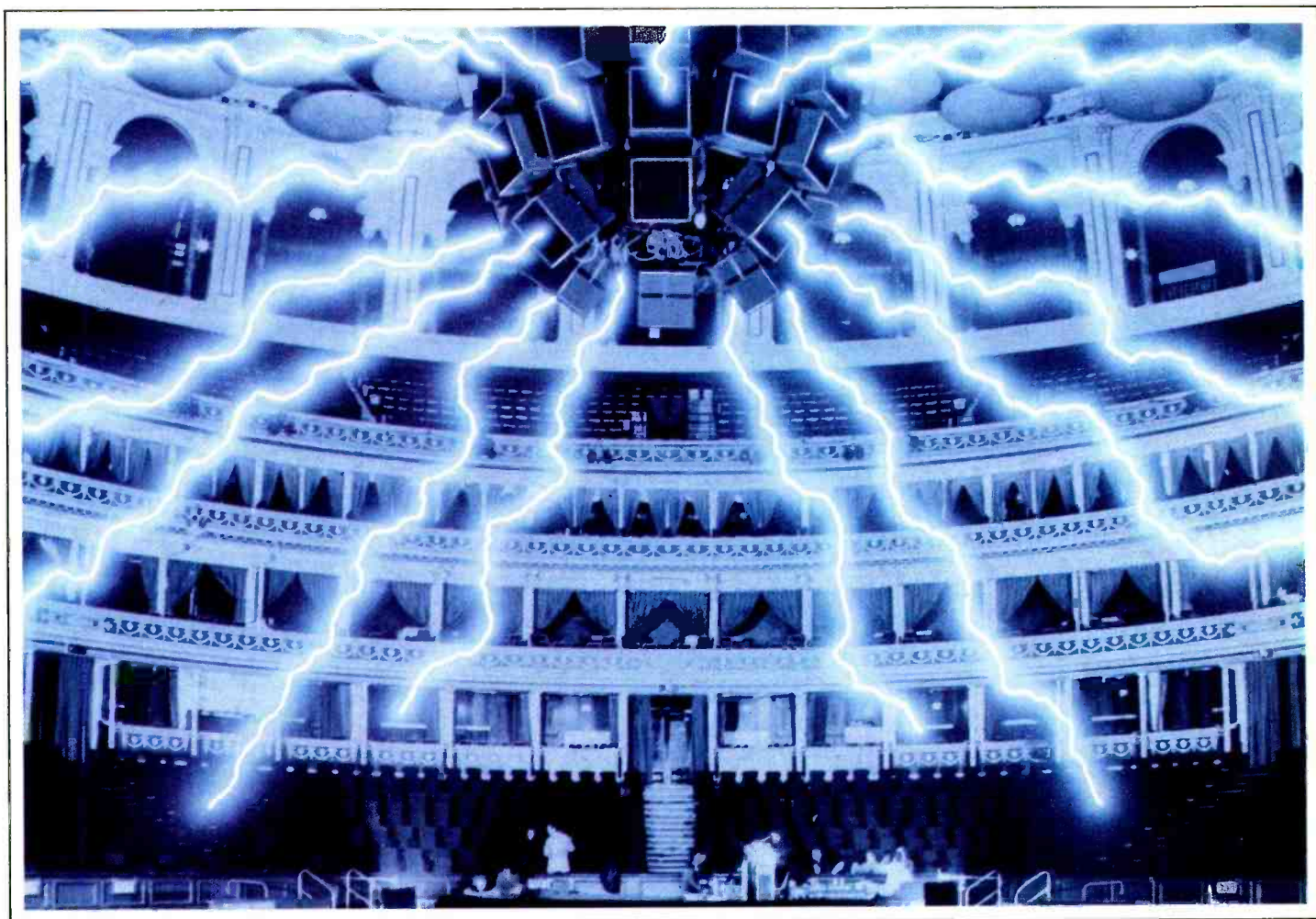
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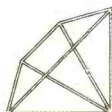
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converters, digital 16x16 switching matrix, D2 Mac Packets and a Telesignaller. There will also be a new version of the UPS6500 series mixing consoles as well as the full range of UPS6000 series consoles and F500 tape recorders.

- **Discrete Research:** will have full details of acoustic design services, the *Boxer* monitor system and examples of RPG acoustic control products.
- **Dolby:** will exhibit their range of SR (Spectral Recording) processors, including the XP24SR multitrack unit which holds 24 *Cat 431* modules, each with complete SR circuit for one channel. Also being shown are products from their range of signal processing and noise reduction equipment, including the new SDU4 Dolby surround decoder kit. The SDU4 has been designed to monitor (off-air or on-tape) stereo signals which originated from Dolby stereo film soundtracks or Dolby Surround material encoded for video or TV. It has facilities to check compatibility with mono, 2-channel stereo or fully decoded Surround reproduction.
- **Dorrough Electronics:** are to show their full range of audio metering products for loudness indication.
- **Drake Electronics:** new products include additional control panels for the 6000 processor-controlled intercom/talkback system; 7200 series of audio distribution amplifiers; 8900 series belt-pack systems and 8020 compact conference control unit. Also rest of product range.
- **Dynaudio:** will be showing a selection of their monitor products including the professional monitoring system *Accent 3* active 3-way monitor, plus a small 2-way studio monitor.

E

- **EAA:** range of high-powered amplifiers and mixing equipment.
- **Eastlake Audio:** will be meeting past, present and future clients and discussing details of projects currently underway worldwide including the Far East and Europe.
- **Editron:** will display a range of timecode synchronisation equipment.
- **Eela Audio:** is launching two new broadcast mixers. The 19 in rack mounting 8/2 *S120* production mixer for OB and audio video studio applications features 105 mm VCA-controlled faders, frame size up to 24/4. The *S240* is for both production and on air application and may be self-operated, engineer-operated, used for manual control, remote control and/or automation or computer-controlled. A selection of existing mixers will also be shown.
- **Electro Sound:** is represented by Audiomatic, featuring the digitally-controlled *ES4800* slave recorder, *ES8000* high-speed tape duplication system-master and electronics with built-in test signal generator, powered loopbin and *ES8000* slave plus *4300* automated quality control system.

AES PREVIEW

- **Electro-Voice:** will be showing a selection of its microphones, monitor speakers, signal processors, sound reinforcement systems, drive units, etc. Three new speaker product designs are to be launched.
- **Electroimpex:** equipment exhibited will include a selection of studio tape machines of all sizes, mixing consoles, broadcast studio systems and studio monitors.
- **Elison:** no information available.
- **EMT:** are showing a wide range of products including EMT 455 digital audio delay with optional remote, EMT 448 *Unimatic* digital audio spot recorder, *Multiooutput Mixsystem* transportable mixer, broadcast turntables, the 266X transient limiter, and the range of modules including compact limiter, noise filter, compact filter/limiter, compact compressor/limiter and a rackmount frame for the modules.
- **Eventide:** the full range of sound processing products. Featured will be the *H3000 Harmonizer* with the ability to create true musical harmony.

F

- **Fairlight:** hardware enhancements to the *Series III* include the *MPX* keyboard dedicated post-production tool designed to allow control of sound, effects and tape machines to editors, etc, with a non-musical background. It features touch- and position-sensitive sound keys and a jogger wheel, which can be used as a master incremental controller or combined with transport switches to form locator for any ES-bus-driven transports and synchronisers; *Series III* can be driven entirely from *MPX*'s control panel or any combination of keyboards. The *Waveform Supervisor* is a replacement card for the *Waveform Processor*, which offers improved loading speed from hard disk, and faster page changes. New analogue/digital sampling card provides AES/EBU digital input, and will form part of Fairlight's stereo Disk Recorder/Editor. Also new are ESDI-based 380 Mbyte hard disks and optical WORM drives with 400 Mbytes per side for large sound



FM 214 precision balanced line driver

- **Fane:** will exhibit their new series of professional loudspeaker enclosures, plus their *HT100* and *150* horns, the *Colossus 24* bass sub woofer, the *Co-axial* series plus their *Studio*, *Mudusa*, *Crescendo M*, *Classic* and *Specialist* series, along with other glassfibre horns, compression drivers, tweeters and crossovers.

- **Ferroglyph:** will be highlighting the 9000 optical digital audio recorder with WORM drives storing 90 minutes each of stereo music (up to 8 hours mono speech); up to 12,000 edit instructions which can be stored alongside audio without reducing available recording time. Also on show is the 9500 digital cartridge recorder/reproducer with erasable magnetic disk intended to replace NAB cartridge systems and the *AVM 77* range of reel-to-reel recorders, the *RTS2* and *ATU1* audio test measuring system, plus Ferroglyph's range of defluxers.

- **Fidelipac:** the new *Dynamax* cobalt NAB tape cartridge will be on demonstration—additional HF headroom is provided by the cobalt formula while a new cartridge shell features lower wow and flutter, longer tape life and improved uniformity. Also being shown are *Dynamax* NAB cart machines, *ESD10* eraser/splice detector, cartridge racks, handheld and table top bulk tape erasers and various accessories.
- **FM Acoustics:** range of power amplifiers, speaker cable and audio interface units. Featured will be *Forceline 7* transfer cable with square section of 10.3 mm² with resistance of 19 Ω per km. Also new *FM214* balanced line driver and *FM216* line level interface.

- **Focusrite:** will be showing a new 7U rackmounting dynamics unit with compressor/limiter, noise gate, full access to sidechains, balanced and floating inputs and outputs. The original *ISA 110* and dynamics units have a new version of their 7U rackmounting frame which has a new modular psu. Established product on show will include the *ISA* channel amplifiers and rackmounted *ISA 116* remote controlled microphone amplifier.
- **For.A:** is showing the *Sirius-100* hard disk-based digital audio memory providing 1,000 minutes of recording. Its multichannel system allows up to eight remote units to access one memory source simultaneously and record/playback. A fully computer-controlled system will also be introduced.
- **Fostex:** will exhibit the full range of Fostex products including audio/video synchronisers, compact multitracks, mixers, mics, headphones and speakers.
- **Fougerolle:** no information available.
- **France Cables et Radio:** no information available.
- **Future Film Developments:** will be showing comprehensive variety of cables, connectors, jackfields, wiring aids and associated components plus a wide range of audio accessories.



Optical digital audio recorder from Ferroglyph



Focusrite's ISA 116 remote-controlled mic amp

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AES PREVIEW



HES engineering frame

G

• **Genelec:** new will be the *1018A* tiny biamplified nearfield monitor, the *1022B* triamplified reference monitor for music studios, and the *1035* huge control room main monitor with sound pressure +130 dB SPL for music and rock studios. Other products on show include the biamped *1019A*, and the triamped *S30*, *S30NF*, *1024B* and *1025A*. • **Ghielmetti:** matrix programming equipment for routing/switching audio and video signals. • **Giese:** the full range of synchronisers and timecode equipment including the *TAKER* ADR system. • **Girardin:** no information available. • **Gotham:** will show their complete range of double-shielded pro-audio cables, featuring the new *GAC-2* mini foil-shielded balanced cable; the *GAC-2/1* 2-conductor double-shielded cable; the *GAC-3/1* 3-conductor cable available in eight colours; the *GAC-4/1* quad cable with RF protection of 130 dB; plus their range of multipairs, the multiple audiolines, each balanced and double Reussen shielded, individually colour-sheathed for easy identification; available as 10x2, 19x2, 27x2 and the new 34x2 conductor multipair *GAC-34*. • **Graff Electronic Machines:** will show the *Crystal* high-speed copier produced in stereo and mono with 8x or 16x normal speed options; also first showing of new heavy duty bulk eraser. Also on show is the *Diamond* with improved preamp and 8x or 16x speed option, along with the *Sapphire* dedicated master and slave stereocopier for cassette production. • **gte:** synchroniser and timecode products.

H

• **Harmonia Mundi:** will be showing the range of digital interface and processing modules. • **Harrison Systems:** will be showing selection of consoles including the *Series X*. • **Harrison Information Technology:** are displaying the *DSA* series of amplifiers ranging from 150 W/channel into 4 Ω to 600 W/channel into 4 Ω with built-in limiters; the *Xi* series of MOSFET amplifiers (ranging from 75 W/channel to 1000 W/channel into 4 Ω), the *GP* series of equalisers and the *AC* series of active crossovers with built-in limiters, subsonic filters and selectable crossover frequencies. • **Haufe:** no information available. • **Head Acoustics:** no information available. • **Heil:** no information available. • **Hes Electronics:** are showing their

19 in rack system comprising the 19 in 3 U modular Engineering Frame for the Hes Engineering modules. The system is designed to provide ease of installation and optimum use of rack space. Includes wide range of ancillary modules with broadcast applications.

• **Heyna:** will show the *AMB 480* high-speed master loopbin for cassette duplication at 480, 240 and 120 in/s on 1 or 1/2 inch; test equipment for CD production including the *CDP 3500* universal control disc player that controls every step of production; and the *CD check 2001* consisting of two modified players, a printer and a PC-compatible computer to measure two CDs in realtime. • **HBB Hire & Sales:** will be showing for the full range of Sony DAT recorders from the consumer *DTC1000ES* to the *PCM2000* pro portable and the *Casio DA1* low cost portable.

Also on show will be Apogee filters in use on Sony *PCM 1630* CD mastering system and the *3324* digital multitrack. New from Amcron is the *MacroTech 2400*. Further exhibits are Sony *PCM F1* and *701* digital audio processors as well as other digital products from AMS, Yamaha and Sony, Wellard *Middle Monitors* and a selection of equipment from Amek, AMS, Drawmer and others. • **Hill Audio:** introducing the *Remix 24/8/16/2* mixing console which features low phase-shift, 4-band sweep EQ section, six aux sends, tape inputs on each input channel electronically routed to the monitor section during recording, EQ and aux on monitor section, talkback and oscillator facilities. Also on show will be the *00* and *000* range of power amplifiers.

• **Hilton Sound:** in addition to having details of the company's services Hilton will be showing a P-DASH digital transfer bus. Details of a new rental strategy and pricing theory will be available which is designed to help record companies in equipment rental and to help studios to get the best out of rental. • **HM Electronics:** a new generation of wireless microphones will be shown. The *50* series features 2-channel *Body Pac* transmitter, new design handheld transmitter, 2-channel switching diversity receiver. A new RF link provides improved capture ratio and new *NRX-II* noise reduction system is specifically designed for wireless microphones. • **Hybrid Arts:** computer hardware and software for music production.

I

• **ICM:** will have information about their

Recently a few dealers have complained about our second-hand and ex-demo list - It seems they are losing too many customers. Being the largest single supplier of 8 and 16 track equipment in Britain we've decided we can afford to give away a few secrets!

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BOKSE USB Universal synchroniser	£199
Fostex E16 w/remote - Mint	£3,550
Siapback scintillator (exciter) (new)	£125
Yamaha 31 band graphic eq. (2 only)	£160 each
Symetrix quad expander gates	£325
Drawmer DS221 compressor/limiter	£275
AHB Keymix computer mix down system (fits any desk - routing & muting - 16T)	£750
24 channels Bel Noise Reduction	£1,000
Electrospace time Matrix Multitap Delay	£699
Yamaha NS10's	£160
Drawmer DS201 Gates	£245
Tascam 38	£1,299
Symetrix 511 Noise Reduction	£350
MXR 31 Band Graphic	£150
Aphex Dominator	£875
Digitech 1900 delay 2 seconds full bandwidth	£165
Seck 18 8/2	£1,100
Tascam 3340S mint	£500
Yamaha RX5	£699
Art pitchtransposer inc. display	£399
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Sony PCM 701	£750
Linn LNI	£500
Midiverb 2	£299
Tascam 48 mint	£1,599
Korg DRV 3000 multiprocessor (20k bandwidth)	£599
Roland D50	£950
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John Porter (The Smiths, The Alarm)
Mike Howlett (OMD, Joan Armatrading)
JJ (Art of Noise)

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AES PREVIEW

pressing plant available on the stand as well as audio cassette C-0s, library boxes and various products for the tape duplication industry.

● **Ilseemann:** will be showing labelling, sorting, packaging and foil-wrapping machines for audio cassettes, packaging and foil-wrapping machines for video cassettes, packaging machines and handling systems for compact discs. ● **ITC-3M:** full line of broadcast cartridge machines and accessories. ● **Ivo Lola Ribar:** range of audio products including small production console, power amplifiers and graphic equaliser.

J

● **Jackson:** details of used equipment sales services. ● **JB Electronics:** no information available. ● **JBL:** will launch the 2450 compression driver featuring a Neodymium magnetic structure to reduce its weight (less than



JBL 2450 compression driver

5 kg), a diaphragm with 10 cm voice coil, a claimed higher magnetic strength than previous models and a new *Coherent Wave* phasing plug for improved HF response. Other products on show include the *Control 5* compact utility system, the *4828 Concert* series stage monitor, the *6210* and *6211* power amplifiers, the *7110* compressor/limiter and the *7510B* automatic microphone mixer.

K

● **Kenwood:** is demonstrating a small PCM audio laboratory with test and measurement instruments including jitter analysers, error rate counter, encoders, decoders for R-DAT tape deck and BS equipment, CD mastering and optical disc playback machines. Error detection, encoding, decoding, measurement of jitter distribution and error rate counting will all be demonstrated. ● **King Industries:** tape loading equipment for the audio and video duplicating industries. ● **Kintek:** is showing its *904* stereo converter, available in four models, for unattended mono/stereo or stereo/mono conversion for TV stations. Designed for integration into post-production systems it features remote width control, bypass switching. ● **Klark-Teknik:** is showing the series *300* graphic equalisers, *DN60* realtime spectrum analyser, *DN773* broadcast digital delay unit, *DN716* multiple output audio delay, *DN780* digital reverb with latest software

and new MIDI/computer interface and a new series *400* range of parametric equalisers. Also on display will be the new *Jade 1 MkII* range of active monitor loudspeakers. ● **Klein & Hummel:** will exhibit line of self-powered studio monitors, equaliser product and headphone amplifier.

● **Klotz:** a wide variety of studio/broadcast cables, including multicores, loudspeaker, microphone and single screen cables as well as a selection of products from the Audio Interface Systems division. ● **Kudelski-Nagra:** range of portable and studio-based tape machines.

L

● **Lafont Audio:** no information available. ● **LEM:** no information available. ● **Lexicon:** full range of products including the *PCM-70* digital effects processor and its associated latest software, the *480L* digital effects system, *2400* stereo audio time compressor/expander and *Opus* audio production system. ● **Littlite/CAE:** range of low powered lighting for equipment illumination and other accessory products. ● **LPS-Lazare:** distributors for, Drawmer, Tubetech, Soundtracs. ● **Lyrec:** latest 16-/24-track 2 in analogue multitrack recorder *TR533* designed for audio-video synchronising, now featuring a new tape deck and transport electronics. It is also now available with Dolby *HX Pro* bias system incorporated into the record electronics. Other products being shown include the Lyrec duplication equipment range and *FRED* editing tape deck (with new dump mode kit and lightweight glassfibre flightcase).

M

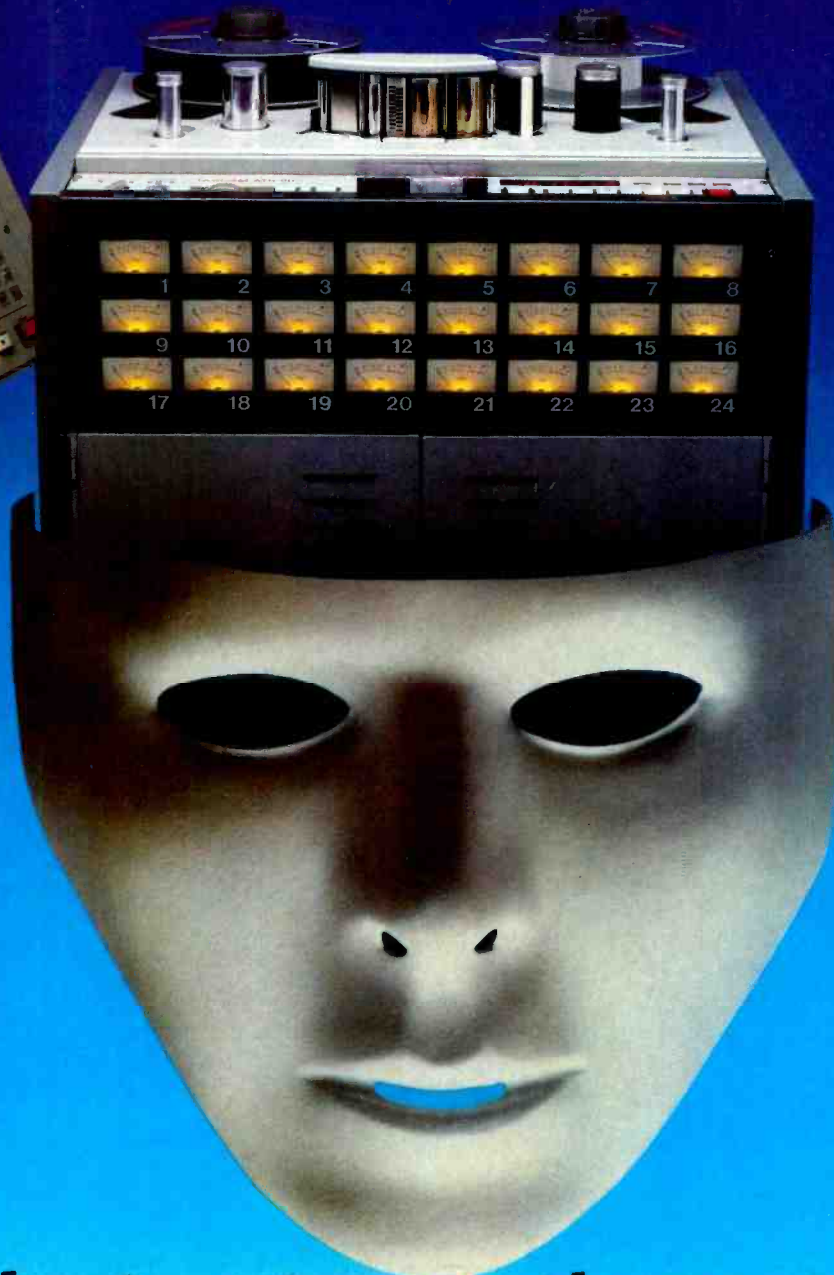
● **MBI:** will be launching a number of new control modules for use in their *24 Series* mixers, plus a new computerised studio mixing system for self-op broadcasting. The full range of broadcast mixers and ancillary equipment will be on display along with details of MBI services for design, installation and commissioning of complete radio studio projects. ● **Media Touch Systems:** no information available. ● **Meyer Sound Labs:** full range of live sound products including speaker and amplification systems, parametric equalisers and studio monitors. ● **Milab:** full range of microphone products. ● **Minim Electronics:** are showing their range of presenters' clocks, studio clock systems and Ambisonic decoding equipment, with new products being launched in all three categories. ● **Mitsubishi:** will be showing their range of multitrack and mastering digital recorders, editing systems and mixing consoles. ● **Mondial Electronique:** no information available. ● **Mosses & Mitchell:** full range of jacks and jackfields including the *440* mini jack sockets and PCB mounting jacks. All jackfields can now be pre-wired with full and half normalising options with optional connection to Christmas-tree tag blocks. Also new are 1U high panel strips containing two rows of up to 26x¼ in jacks per row as well as a 2U version with three rows. ● **MRL:** are displaying their range of precision calibration test tapes including new cartridge test tapes for Otari *CTM-10* cartridge recorder/reproducer in 3¾, 7½ and 15 in/s for cart cue tones, flutter and speed, multifrequency, and level testing. ● **Musik Week:** weekly record industry magazine. ● **Musicbox:** wide range of C-0 cassette shells, library cases, boxes and blank cassette tapes. ● **Musitech:** range of precision equipment for CD production and quality

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TASCAM

THE ATR80-24



Don't just note check out

the good looks, the features!

The ATR80-24 is more than just a pretty face.

Yet with all the features you would expect of a Professional 24 track recorder/reproducer, it is easy to overlook one of the most essential: the quality of the heads.

The fact is that we don't trust anyone else to make them for us. So for the last 30 years, we have designed and manufactured our own record/sync, reproduce and erase heads.

This resulted in TASCAM being the first multitrack manufacturer to achieve full playback frequency response in sync mode.

SYNC EQUALS REPRO – means no quality loss during track bouncing or overdubbing.

- * High density permalloy record/sync and repro heads with contourless configuration for hard wearing heads and optimum tape to head contact.
- * Erase head with overlapping tracks and glassbonded gaps for erasure precision.
- * Non magnetic ceramic capstan with high torque motor.
- * Smooth transport, controlled by three 8 bit D to A converters, even in varispeed.

- * 14 inch reel capacity and a wind speed of 375 ips.
- * Interface for external noise reduction system.
- * Optional serial interface for external control.
- * Sophisticated remote includes rotary shuttle, rehearsal and "sync lock" function enabling simple use of reference codes, such as timecode.

Run in to the '90s with an ATR80!

For a demonstration or more detailed information, contact your nearest TASCAM Professional dealer or TEAC UK Limited.

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control—Universal Optical Disc Tester, *MI 1203* plating equipment, *Interline* integrated production line. Musitech also supply turnkey plants to customer specifications and consultancy service.

N

● **Neotek:** range of mixing console for multitrack use. ● **Neumann:** showing for the first time a direct metal mastering CD mastering system which eliminates the need for cleanroom environment. The complete range of studio condenser microphones will also be shown with emphasis on the *RMS190*, plus a demonstration model of conventional and digitally-controlled automated studio mixing consoles. ● **Neutrik:** will exhibit the *TT402* audio transmission test set which is an enhanced version of the *TP401*, the *Audiograph 3300* modular measuring system for audio and electroacoustic applications, plus the entire range of Neutrik pro-audio connectors, including the *Speakon* amp to speaker connector system. New developments include an extended range of connector modules for added flexibility in user-designed adaptors, and new patch cables incorporating the *NP3TT* 'tiny telephone' and *NP3TB* B-gauge plugs. ● **Neve:** will exhibit a fully working multichannel *DSP* digital audio mixing console, utilising fibre-optical transmission and complete reconfiguration for different applications. Also showing will be the *DTC 1* digital audio transfer console which features snapshot recall of all parameters, up to 250 memories with instant access, and a new 4-band equaliser aimed at disc mastering applications. The *V* series analogue multitrack console will be combined with *NECAM 96* automation in a TV audio post-production demonstration. ● **New England Digital:** the complete *Synclavier* system with new upgraded *Release N* software will be continuously demonstrated. The stand alone *Direct-to-Disk* recorder offers editing and manipulation functions plus internal SMPTE timecode systems. The *NED* optical disk package is an add-on unit for *Synclavier* systems, features include 2 Gbyte storage using *WORM* optical disk. A single 12 in optical disk will store over 23,4000 5 second samples. ● **Nexo:** will be displaying their integrated loudspeaker systems for sound reinforcement. Featured will be the *SI2* integrated system and a new electronic controller. ● **NTP:** will be showing a new stereo audio monitor instrument featuring stereophase



Direct-to-Disk system from New England Digital

AES PREVIEW

oscilloscope with fixed or automatic gain control and adjustable compression ratio; dual PPM with selectable integration time; PPM or VU M and S switchable; and compatibility meter for average indication of phase relations. Also on display will be the full range of PPMs, VUs, compressor/expander/limiter amplifiers, automatic balancing telephone hybrids, remote controlled pre-mixer system for OB and mixing console extension applications, audio routing switchers and line equaliser.

O

● **Optical Disc Corp:** compact disc mastering system. ● **Optical Disc Mastering:** no information available. ● **Optimix:** console automation systems. ● **Orban:** will exhibit a number of new products. The *222A* stereo spacial enhancer detects and enhances psychoacoustic directional cues that are present in stereo programme material, increasing spacial definition, brightness and impact. The *624B* is a parametric EQ/notch filter with switchable 4-band stereo or 8-band parametric EQ/notch filtering, and a new tunable 12 dB/octave 'Automatic Sliding Besselworth' lowpass filter and tunable 18 dB/octave highpass filter. The *764B* is a fully programmable stereo analogue parametric EQ/notch filter which memorises up to 99 full sets of control settings for instant recall (MIDI and other interfaces are available). The *787A* is a programmable parametric equaliser, de-esser, noise and compressor gate, which also stores 99 settings with MIDI and other control interfaces. And the *9105A Optimod-SW* short wave audio processing system designed for international broadcasting. Existing products on show include the *8100A/1 Optimod-FM* audio processor/stereo generator, *464A* co-operator level control system and the *8100A/XT2* 6-band limiter accessory for *Optimod-FM*. ● **Ortiplas:** wide selection of audio and video cassettes and magnetic tape products. ● **Otari:** will highlight two new products. The *MTR100A* is a 24-track multitrack with fully automatic record and reproduce alignment and accepts noise reduction modules for internal mounting; a single switchable Dolby card offering both *A* and *SR* is planned. The 24-track *MTR100A* will later be

joined by *MTR100M* in 24-, 16- and 1 in 8-track versions. Also new is the *MX30*, their lowest cost recorder using ¼ in tape, 15 and 7½ in/s, and max spool capacity of 10½ ins and switchable NAB/IEC playback EQ. The *MX55* is now available with centre-track timecode (*MX55-T*) and will be on working display.

P

● **Penny & Giles:** motorised faders for moving fader automation, studio faders from 45 mm to 128 mm travel, *T-bar* video and A/V controllers, *Systel* range of audio transformers, plus jacks and jackfields from Mosses and Mitchell. ● **Pro Sound News:** professional audio news magazine. ● **Publison:** will be showing their *Infernal Machine 90* with the current range of software options, SMPTE and hard disk interfaces. ● **Pyral/Rhone:** range of magnetic tape products.

Q

● **Quad Electroacoustics:** full range of power amplifiers including the *520F*, *510*, *606*, *306* and *405/2* plus the studio version of the *ESL-63* electrostatic loudspeaker. ● **Quatec:** will be featuring latest software for the *QRS/XL* including stereo 9-band graphic linear phase equaliser, stereo noise gate with 0 attack time and threshold hysteresis and voice eliminator. A further new development is compatibility of the *XL's* control program with the *Macintosh* PC. ● **Queted:** will be showing their range of studio monitor systems and design services.

R

● **RCF:** range of loudspeaker drive units and monitor systems. ● **RE Instruments:** will premiere the *RE505* FM/FMX programmable stereo generator for laboratory and automated testing of high quality stereo equipment. Also new are two software packages for the *RE201* dual channel audio analyser: a tape and tape recorder test program running on any *PC*, *AT* or *XT* compatible with window-driven software, and a fully automated transmission link test that performs high-speed tests of analogue and satellite-based links plus AM, FM and TV transmitters in seconds. ● **Revox:** examples from the *Revox* range of products including the new professional tape machine *C270*. ● **Rood:** will be showing the *BAX 2010* (bandwidth extension system for OB broadcast via telephone lines) plus an enhanced version of the *BAX 114* mobile bandwidth extension system. Existing products being shown are the complete range of digital stereo generators, stereo measuring decoder, multiplex systems for UHF links and the range of existing *BAX* products. ● **RTS:** is introducing the *BP317* single-channel headset user station, *MSA325* modular loudspeaker for use with *810* master station or *410* monitor amplifier and other monitoring applications. Also being shown for the first time will be the *848A* programmable matrix intercom station. ● **RTW:** first exhibition showing of the new series *1140* multichannel metering system for use in consoles, multitrack recorders and similar applications. The system provides up to 16 channels per unit and is signal processor-controlled; system software allows metering according to various standards and can be factory adapted to customers' needs. A full range of meters will also be exhibited.

S

● **SAJE:** variety of consoles suitable for radio, television, recording, theatre and stage applications. ● **Saki:** line of long life ferrite heads for Ampex, MCI, Otari, Scully, Sony and Studer tape machines. ● **Samson:** will launch their *Broadcast* series of wireless mics. Features 10 selectable frequencies on receiver and transmitter, true diversity and dbx noise reduction. ● **Sanken:** will be showing their *CMS-7 MS* stereo portable condenser microphone as well as the full range of other Sanken condenser mic products. ● **Schmid Telecommunications:** range of audio frequency transmission measuring instruments. ● **Schoeps:** will show the *Colette* series of studio condenser microphones, a modular mic system with 16 capsules with different directional patterns and frequency response curves. This series features a new sub cardioid capsule, *MK 21* which has a good off-axis response with only rear sound being attenuated by 10 dB. ● **SCV Audio:** range of signal processing equipment including dual compressor/limiter, 13- and 18-band graphic equalisers, spring reverb and frequency selective



Schoeps MK21

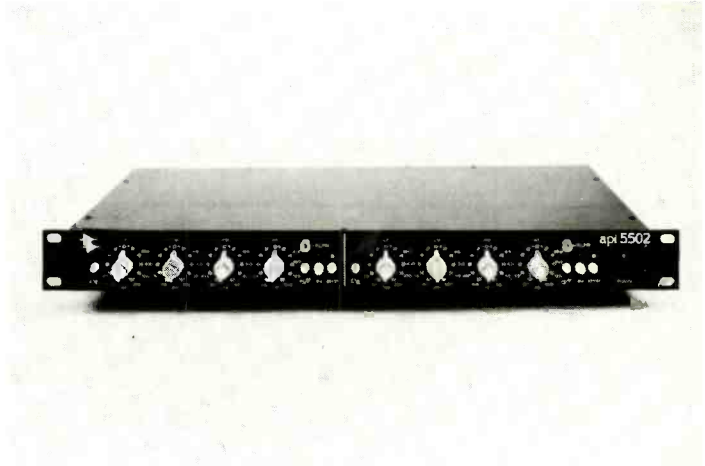
noise gate, active and passive DI boxes, crossover, phased checker, buffer and microphone splitter. ● **Seem Audio:** range of broadcast audio mixers. ● **Sennheiser:** is introducing a new *SER20* mobile 10 W transmitter for high quality audio transmission (VHF or UHF operation), and a new version of the *EM 2003 TV* single-channel UHF diversity receiver in compact size for Mikroport devices in wireless microphone systems, as well as the *MKH20, 30* and *40* condenser microphones. ● **Shape:** wide range of products for cassette and CD duplication—accessories and services. ● **Shep:** specialists in restoration and customisation of Neve consoles. Also own products and consultancy. ● **Shure:** wide range of microphones for all applications, radio mics, head sets, small audio mixers and phono cartridges. ● **Siemens:** broadcast audio products. ● **Sifam:** is showing their full range of VU meters, peak programme indicators, audio level meters plus an extensive range of equipment knobs. ● **Solid State Logic:** will be demonstrating the new *G* series Master Studio System. The new *G* series computer provides fast processors, large on-board memory and high capacity disk cartridges. There is also an optional *G* series remote keyboard. The *G* series EQ and input cards may be retrofitted to any *SL 4000 E* console. SSL will also show the *SL 5000 M* series modular audio production system. ● **Sonifex:** will feature their *micro HS* series cartridge recorders, available as record/players, players, mono or stereo, supplied in double, triple or quadruple vertical stacks. Other products on show include the *CQ* series NAB cartridge recorders in mono or stereo; the fully automatic *CQ HSE* eraser-splicefinder that works on all A and AA cartridges; and the new *FX* series NAB cartridge recorders, featuring phase correction techniques and noise reduction circuitry, available

Analogue INPUTS

At Syco, we have assembled a range of high-quality analogue signal processors to provide a choice of input signal paths, each different in character.

Regardless of whether the recording medium is analogue or digital tape, hard disc or the memory of a sampling device, the audio must first pass through an initial analogue stage. This will consist of either a microphone and mic pre-amp or a line amp and perhaps an equaliser, and it is these signal paths which define the basic character and quality of the sound.

Comprising B & K, API, EAR and GML, we think this is the most exciting range of input devices in the UK...



API 5502, two channel, proportional 'Q' equaliser.

B & K

Bruel and Kjaer's range of 4000 microphones now comprises four omni's and the new 4011 cardioid. The careful attention paid to optimising both on- and off-axis response results in a sound which is clean, transparent and well-balanced.

API

Renowned during previous decades for their "proportional Q" equalisers and mixing consoles, API has launched a new range of products built to the same specifications as the originals. Amongst the range is the 3124 mic/line pre-amp, 3124M mic/line mixer and 5502 two channel, 4 band equaliser as well as the famous 550A parametric and 560A 10 band graphic.

EAR

Esoteric Audio Research manufacture a range of valve products which includes the 822Q programme and 822MQ mid equalisers, based on Pultec's EQPIA and EQP3, and the 660 Limiting Amplifier based on the Fairchild 660. EAR's models benefit from transformer enhancements and improved signal-to-noise ratios without altering the character of the sound.

GML

George Massenburg Labs 8200 Parametric Equaliser is a dual channel, five band parametric whose quality and versatility has made it an industry standard. The 8300 microphone pre-amplifier, available in either 2 or 4 channel versions, uses the same design philosophy and provides similar throughput quality.

Syco

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in triple stacks and 19 inch rackmounts.

● **Sonosax:** range of small portable mixers designed for broadcast, fixed or mobile studios and post-production. ● **Sony Broadcast:** are launching the *DAE 3000* digital editing system for existing CD mastering systems, *PCM3324* and *3402 DASH* format recorders. Along with current professional *PCM-2500* and portable *PCM-2000* DAT machines, there will be the first European showing of the realtime DAT duplicating system. The *PCM3324* digital multitrack has new software updates which improve all round performance of the *RM-3310* remote control unit and give faster and more efficient machine edits. The analogue *JH-24/24* multitrack recorder will be shown along with the *APR-5000* 2-track range which features enhanced software. *APR-5002W* is the first to offer new Sony wide profile heads giving LF response and extended head life. The *MXP-3036* mixing console will feature new vacuum-fluorescent displays plus wild faders, hard disk backup and full automation options. Sony's *Sound Technology* range of amplifiers, equalisers, reverbs, compressors and monitor are being shown along with *CDK-006* multi-disc CD changer with new computer interface and dedicated controller, plus the full range of microphones including a new VHF synthesised radio microphone system, the *400 series*. ● **Soundcraft:** will launch their *SAC200* modular console for broadcast and A/V production, available in 16- and 24-input module formats. Debuting in Europe, the *Digitor* tapeless audio editing system uses up to 64 Mbytes RAM to store 6 mins of stereo. Also on show will be the series *200 BVE* editing console for the video post-production market, which Soundcraft intend to interface with virtually any currently available editing system. The series *6000* mixing console will also have its European launch—available in 16- or 24-bus split earth-cancelling summing system and low crosstalk routing matrix. Other products will include the *TS12* in-line console with *FAME* automation and the *Saturn* analogue multitrack tape machine. ● **Soundmaster:** will exhibit their full range of components and software for their Integrated Editing System, including *Smart Sync* (Soundmaster Auto Restored Timebase Synchronisation), video edit decision list download (which transfers CMX and other videotape editing format lists from their disks on to Soundmaster format files), a microcontroller-based intelligent film dubber interface that controls a sprocketed film dubber and synchronises it much like a multitrack recorder, and timecode synthesis for the film dubber interface, which produces system timecode, numerically set by the operator, from the film dubber's bi-phase signal. Also on show will be their range of existing and new machine interfaces, handling everything from PD and DASH multitracks to Ampex *M1200* and pre-bi-phased dubbers. ● **Soundtracs:** are exhibiting in conjunction with their French distributor Lazare Electronic. They will be unveiling a new 32-bus in-line console for studio use, along with a new budget console aimed at installation contractors and rental companies. Other products on show include *ERIC* multitrack console, the *PC Midi* series used in programming suites for disk-based systems and tracklaying with synthesised instruments and the *CMX* series mixing console. ● **Stage Accompany:** will be showing the *Blue Box* system and a new range of studio monitors. ● **Stanton Magnetics:** will be displaying selections from their range of professional cartridges and styli, professional preamp equaliser and disco headphones. ● **Steenbeck:** no information available. ● **Stellavox:** will be

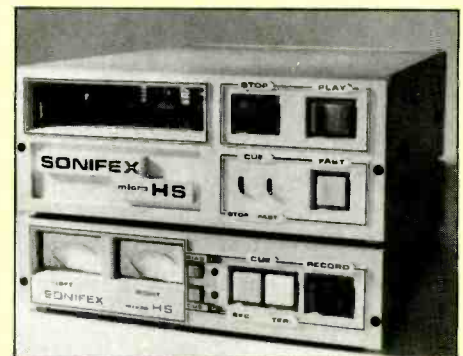
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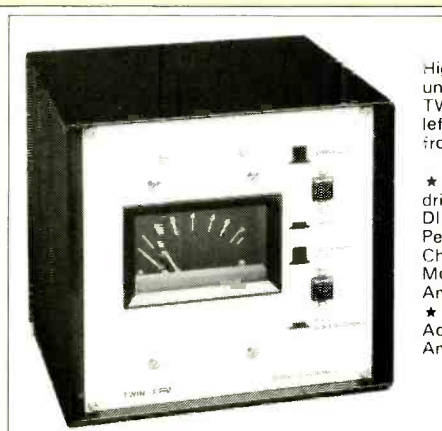
Soundcraft's TS12 with FAME automation



Stanton ST-PRO headphones



Sonifex Micro Hs



TWIN PPM BOX

High quality TWIN movement in a mains-powered unit. The illuminated coaxially-mounted pointers of the TWIN offer an unrivalled method of monitoring stereo left and right or sum and difference controlled by a front panel switch. Meets IEC65-2, BS415 safety

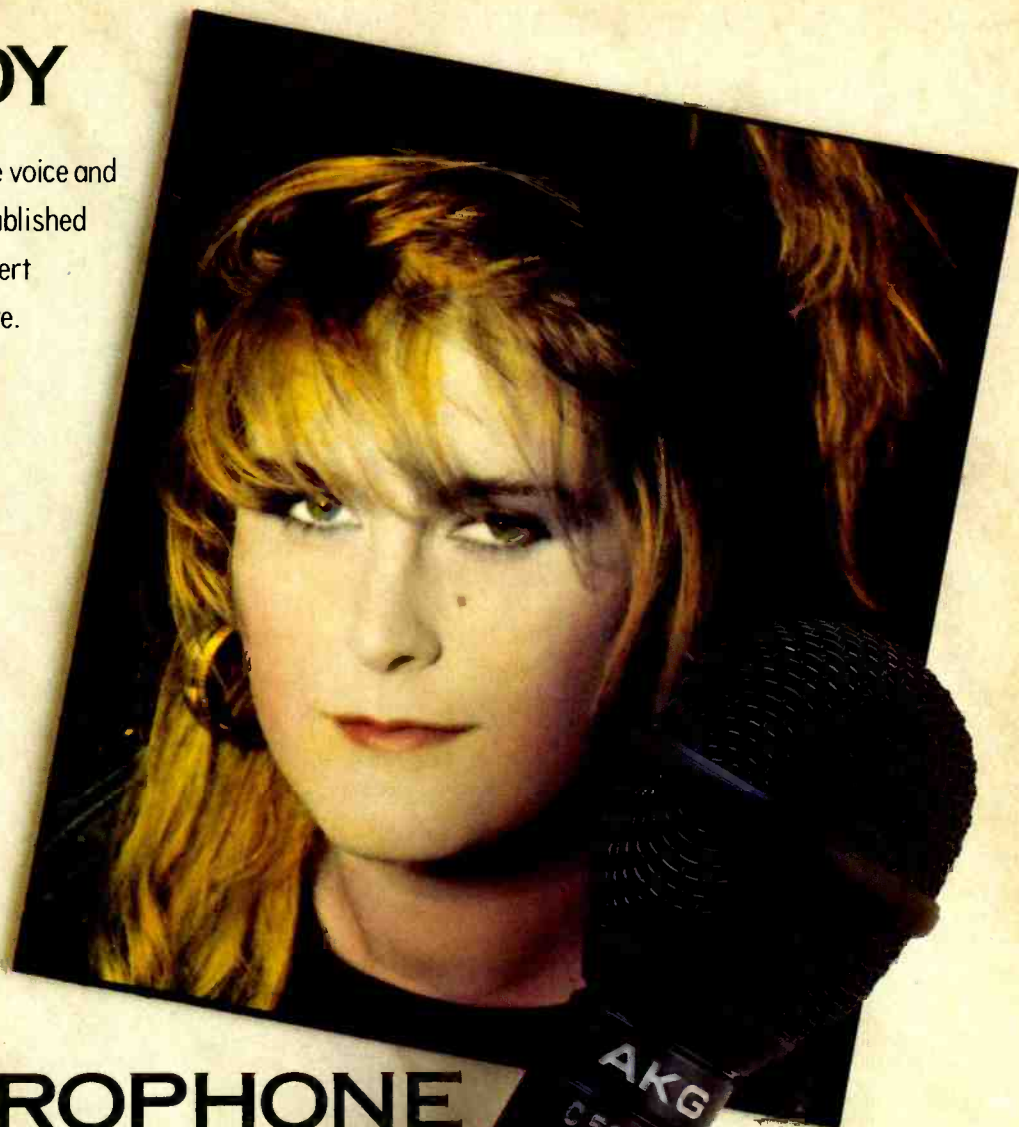
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The C535EB, chosen by Alison and her engineer for its combination of absolute clarity and sound transparency, its tough construction and its complete rejection of handling and ambient noise.

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A state of the art, 16 bit computer controlled multi-tasking sound processor, versatile, user friendly and capable of opening many new creative horizons, being used for Alison's current concert commitments.



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showing its full range of tape machines. ● **STR: Standard Telephon:** broadcast switching and transmission control systems. ● **Strand Precision Technology:** is giving the first European showing of its latest video cassette loaders. The *SPT350* has dual pancakes with autochanger (manual or computer-controlled), auto-thread through, double vacuum trough which accurately controls tape length and reduces damage. A full range of configurations include cassette-print station, cue tone and first and second length dispatch. ● **Studer:** will feature the *A820* (available with internal Dolby *SR* or *A*, or telcom *c4 E* or *c4 DM*) in 24-, 16-, 8-, 4-, 2- and 2-channel plus timecode versions, as well as the *D820X* 2-channel digital version; also the *A807 VUK* version of the *A807* with new meter overbridge and in a floor trolley. Also at AES will be the full range of existing products including the *A727* professional CD player, mixing consoles, portable mixers, synchronisers and system controllers. ● **Sunkyong:** details of range of tape products and CD manufacturing facilities. ● **Sycologic:** is showing the *M16* 16×16 digital MIDI matrix which features remote keypad with LCD, 32 user-definable patches, assignable instrument labels and MIDI program changes, 16 MIDI indicator LEDs and intelligent patching. The matrix is designed to relieve the problems of configuring a large MIDI system. The *M16X* is a further 16×16 matrix which expands the system's capabilities to 16×32 or even 16×48. The availability of more destinations than sources

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allows more MIDI voice modules and MIDI-controlled effects to be connected than MIDI controllers. ● **Sescom:** Several new products will be launched. The *Test-1* all-in-one audio test equipment featuring audio oscillator, DMM including frequency counter, volts DC and AC, ohms, and dBs, automated distortion analyser which reads to 0.1% and 3 in oscilloscope; four mini-console mixers for A/V production houses; five new mic/line drivers; a line level active combiner, and a monitor amplifier with speaker. There will also be several improved existing products.

T

● **TAC:** are introducing a new optional universal automation interface for the *Scorpion* and *Matchless* console ranges. Also new *Scorpion* formats—40 inputs, eight auxs and VU options, plus a new stereo module the *SI200* for broadcast/post-production applications, as well as established products, the *SR9000* for sound reinforcement applications and the *Matchless* multitrack recording console. ● **TAM:** will be showing the full range of *Micro-Point* master recording styli and master recording lacquers as well as selected items of used disc cutting

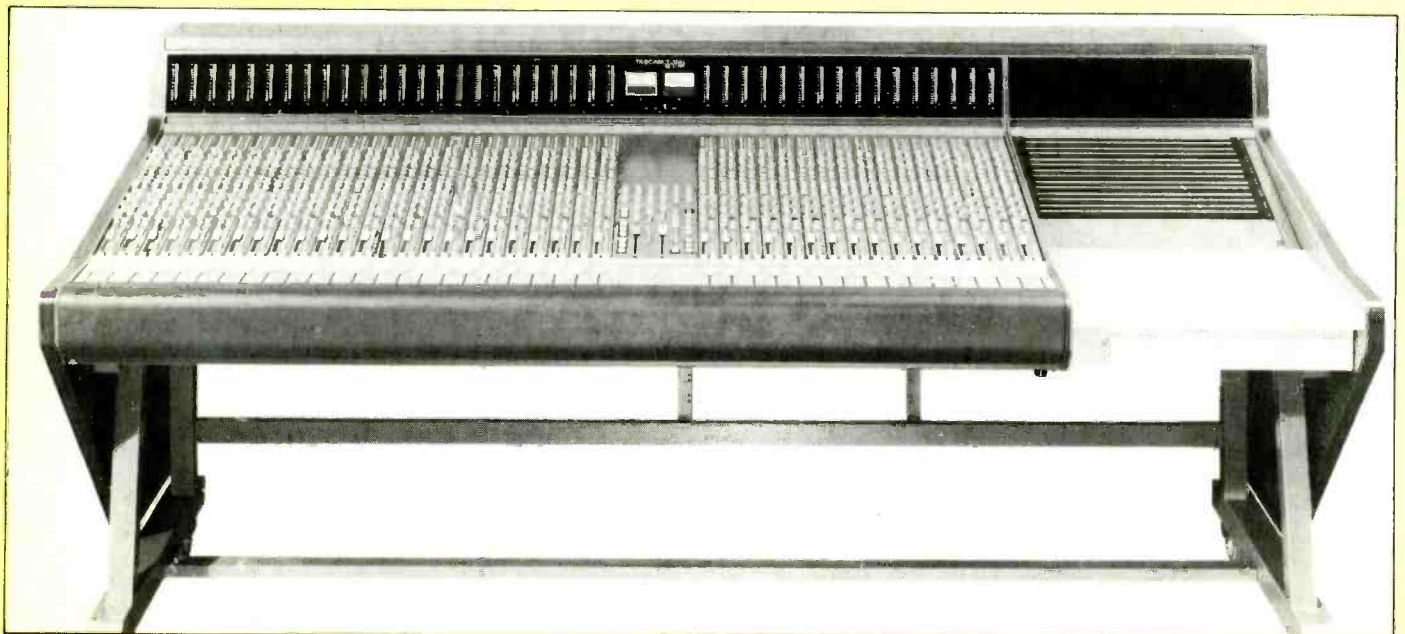
equipment and systems. ● **Tannoy:** will be launching the *Eclipse* nearfield monitor—a compact (15 in high) speaker with 90 W power handling. Studio monitors being shown are the established dual concentric *Super Gold* series. The *Wildcat* live music PA speakers and the *SR840* power amplifier (delivering over 1.2 kW into 4 Ω) will also be on show. ● **Tape Automation:** range of duplicating equipment including master transports, slaves and loaders. ● **Tapematic:** will be showing the range of duplicating equipment including tape winders, video loaders, automated cassette feeding devices, the 480 in/s duplicating system and quality control equipment for audio duplicating systems. ● **Tascam:** will introduce the *M-700*, the first Japanese-made in-line custom console with 40 I/Os, a 32-group bus, 12 auxs, bargraph metering, 4-band EQ, switchable bell/shelf-type LF and HF with 2-band parametric midrange. Other new products are the *R-1* professional R-DAT recorder/reproducer with twin A/D and D/A converters, oversampling digital filter and separate power supplies for digital and analogue sections; plus the *ATR60-16* 16-track recorder with built-in dbx *Type I* noise reduction, gapless punch in/out, spot erase and optional transport remote control and autolocator units. Also full range of other products including multitrack and mastering tape machines, consoles, the *ES50* synchroniser and *CD-501* professional CD player. ● **tc electronic:** new products on show are the *TC 8201* digital audio interface test generator and analyser for testing



TAC Scorpion with automation interface

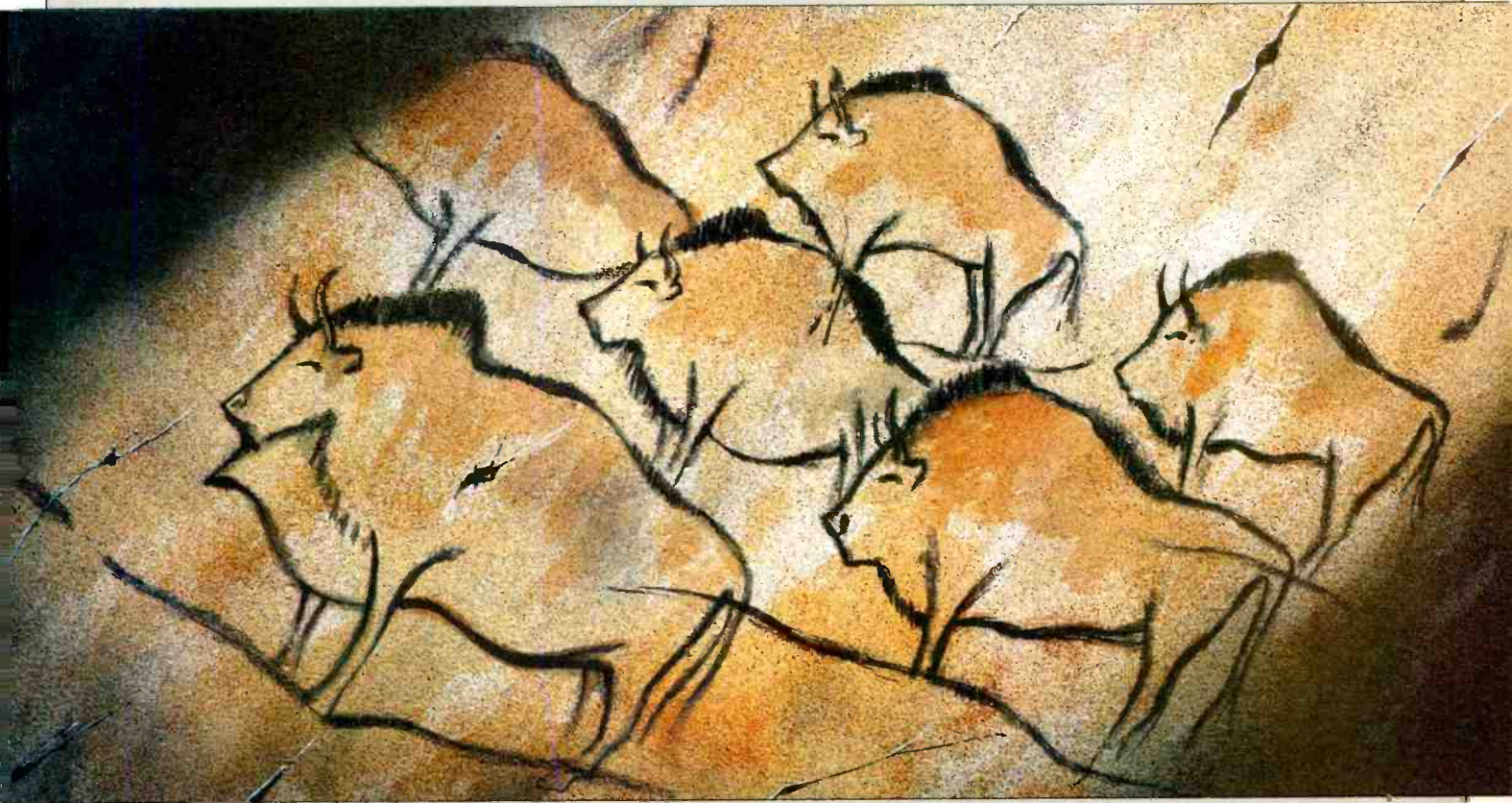


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digital audio output on both professional and consumer equipment conforming to AES/EBU and IEC specifications, and the 1128 graphic/analyser in stereo and mono versions. ● **TESLA:** no information available. ● **TFT:** will display examples of their solid state aural microwave links (STL) operating from 100 MHz to 1 GHz either mono or stereo; power levels are 4 W to over 20 W. Additionally, a complete FM broadcast aural modulation monitor will be displayed: the 844 can monitor and analyse all major signal components off-air or directly from a transmitter, comprising a 2-channel preselector, peak counter, baseband and stereo monitoring capabilities. ● **33 Audio:** no information available. ● **Trident:** will display the *Di-An* digitally-controlled analogue console on which every function can be reset up to 500 times during a mix. The *Di-An* has 4-band EQ on inputs and monitors incorporating four memories and 24 aux buses per channel. Also a range of their consoles, which includes the *Series 75* 24-track with full patching abilities, the *Series 80C* with ability to monitor up to 48 tracks through a separate monitor section, 56 EQ'd inputs are available during mixdown on standard 32/24/48 frame size. ● **Turbosound:** four new additions to the *TSE* series of discrete enclosures are being shown: *TSE-260* (HF), *TSE-211*

AES PREVIEW

(mid/high) and *TSE-115* and *TSE-215* (bass). The full range of established products will also be displayed including the *TMS* full range enclosures, *TSW* sub-bass enclosure, *TFM-2* and *TMW* floor monitors and TP loudspeaker phase checker system.

● **Valley International:** is showing the 800 series, which allows combination of *Kepex II*, *Gain Brain II*, *Maxi Q*, *DSP* and its two most recent modules the *Leveller* and *Comander*. *Leveller* is an audio level controller which facilitates optimum output loudness for each note, syllable or accent with automated programme dependency optimising attack and release times as programme content changes. *Comander* compresses the audio signal utilising symmetrical release coupling; linear integration detection maintains correct musical relationships and peak reversion correction eliminates pumping and breathing. Also to be shown are the existing 400

microphone processor, 415 dynamic sibilance processor, 430 compressor/limiter/expander/gate, 440 limiter/compressor/DSP, 610 dual compressor/expander, *Auto Gate* frequency selective noise gate expander, *PR2* and *PR10* rackmount enclosures.

W

● **Wellard:** will be showing their range of monitor systems including the *Middle Monitor*. ● **Westec:** will be showing their *LT3000* SMPTE-based console. ● **Westlake Audio:** will be showing the *BBSM* range of studio monitors. ● **Windmill Munro Design:** details of design services for recording and video production facilities and range of monitor systems. ● **Woelke:** range of professional audio heads and test equipment.

Y

● **Yamaha:** is introducing the *DEQ-7* programmable digital equaliser which offers 30 configurations including parametric, graphic, notch, band pass, dynamic filter; is programmable as separate left and right channels; 60 memory locations for front panel or MIDI selection and analogue and Yamaha digital inputs and outputs are provided. Also new is the 3-way *NS40M* studio monitor; *P2040* 4-channel amplifier with 2-channel option giving 4x20 W into 8 Ω or 2x40 W into 8 Ω; the *MV422* multi-source mixer, *S50X* speaker for clubs and pubs and the *MSS-1* MIDI/SMPTE synchroniser and event controller plus recently introduced microphones: the *MZ106S*, the *MZ203Be* and the *MZ204/205Be*. The full range of existing signal processors, mixers, amplifiers, speakers and microphones will be displayed.

Z

● **Zonal:** new will be the 920/960 series mag film which is coated on a grey polyester base, the 830 broadcast tape, and a new range of voice logging tapes. Also on show will be their full range of magnetic products, including the 900 and 950 mag film, the 675 and 610 audio mastering and broadcast tapes, a selection of long play tapes for studio, film and TV applications and full range of cassette products.



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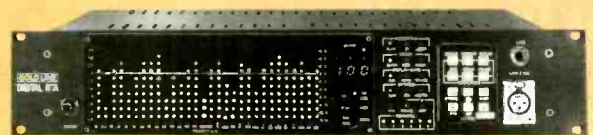


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If 1987 was the year that recording digital audio on to hard disk came out of the commercial

pioneering stages and began to be considered a practical tool, then 1988 will see a continued maturity and a large number of new systems entering the market. Many of these will be different implementations of existing technology and designers' criteria may differ considerably.

SoundStation II is one such product, first shown in pre-production form at the New York AES Convention last October. The first production units will be available in March this year when the first software release is defined.

Digital Audio Research started in 1984 with their first product *Wordfit*, an automatic dialogue synchronisation system that assists the dialogue replacement phase of film post-production by comparing the replacement dialogue with the original. *Wordfit* digitally samples, splices, time compresses and expands the replacement dialogue to match the original without any change of pitch. It has a high degree of accuracy and can correct elements that could be over one second out of sync. The system has become established with units in use at The Burbank Studios and Universal Studios since 1985.

The 'II' aspect of the *SoundStation* title is a reference to the fact that there was a 'I' developed as a test bed although the system was never commercially available and the II gained from what was learnt on that project.

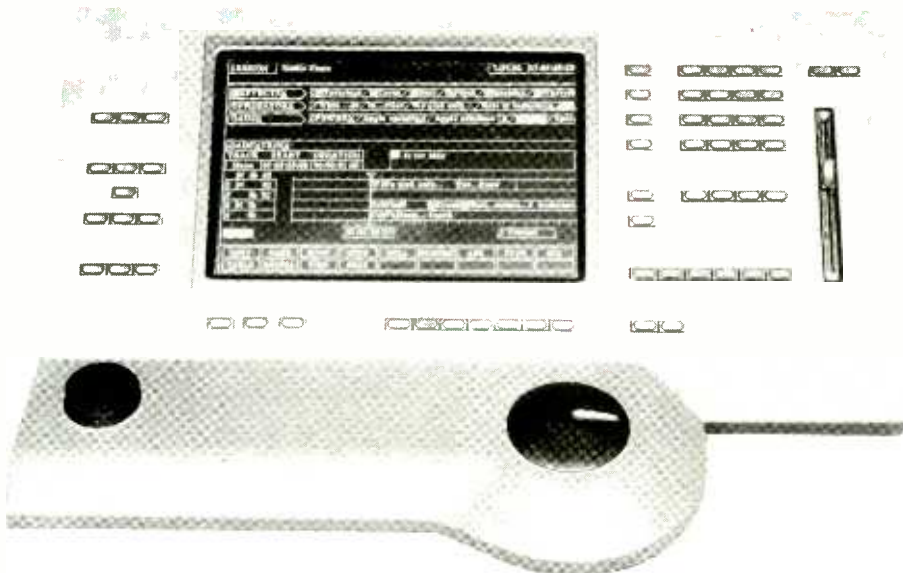
The complete *SoundStation II* system comprises two hardware units: the Control Console with its touch screen and control functions, and the Processor and Storage Unit, which is a 9U rackmount frame containing the signal processing hardware, hard disk drives, applications software, power supplies and interface connections.

The Control Console looks quite different from other systems. Its striking design is practical first and designer licence second. What is immediately obvious is the large touch screen that glows orange red and forms an active part of the system instead of being a passive indicator. There is no audio in this unit and it is very light although not really the right shape to refer to as portable. Connection between this and the rack is by a single umbilical that provides everything the console needs to function except mains power. Surrounding the screen area are nearly 60 switches that are a combination of hard keys (the ones most needed to edit audio) and soft keys (which are largely related to the touch screen) and are mostly grouped by function. The two rotary controls at the foot of the console—the Vernier and the Locator controls—are used for functions that depend on the selected operating status. The only other connections are a network extension port, a video output and the option to connect an IBM-type keyboard. This keyboard is not essential as there is a screen display allowing you to touch a screen keyboard to create names.

The amount of equipment that the Processor and Storage Unit houses depends on configuration. The basic *SoundStation II* is a 4-channel system with two disk drives each holding one track/hour of audio. The same sized frame can hold up to four drives—Winchester hard disks (360 or 760 Mbyte) or optical WORM drives—although at least one drive must be a Winchester. There is also provision for a 3.5 inch floppy disk drive within the frame with an unformatted capacity of 1 Mbyte. The A/D and D/A converters are all 18 bit and the inputs and output of the device may be any combination of analogue and digital interfaces.

EDITING BY TOUCH

The Digital Audio Research SoundStation II is a disk-based recording and editing system that uses a touch-sensitive screen as an integral part of the control. Keith Spencer-Allen describes the present system



The screen and its uses

Perhaps the simplest way to describe *SoundStation* is to look at the screen. There are several screen displays currently available. The two that will be used most are the Record screen and the Playback & Edit screen. They are in fact very similar—the top sections of both are the same but the Record page has some graphics in the middle section that are needed for the recording process.

The screen itself is a red plasma display that gently glows. The top left hand corner displays the session name and the indication of local or remote timecode sourcing. Below this the first of the major areas is a concept that may seem a little difficult to grasp but once understood, the rest of the system falls into place quite easily. There are three lists of names running in horizontal rows (Fig 1). At the left hand side there is a Group name in a window. The titles to the right of it are known as Segments. A segment is a piece of audio that has length (duration in time) and may have width (in tracks). It could be just a single note or an hour or more but this is the unit that *SoundStation II* works in. It is possible that your segment can be edited and then renamed and added to the segment lists alongside the unedited version or wherever you wish to put it. After an edited segment name a graphic of a pair of scissors will appear.

The definition of Group is, therefore, a segment that contains other segments. This name may also carry graphics: the scissors to show it has been edited; a 'tape reel' will show that the group or

segment list is also a Reel; and a book indicates the group or segment list is a Library segment. These are just different ways of arranging the audio segments within *SoundStation*. The user can easily move segments around within the system to create collections or grouping of segments that suit him best to carry out certain functions. So it would be wise to keep all music together and so on. The only difference between a reel and library is that you can move and erase segments from a reel but those in a library may only be copied.

The segment lists give no indication of the segment length. The lists are arranged by the user in different levels or a kind of friendly hierarchy. When a single segment name may actually be a list of segments itself, the value of the touch screen becomes more obvious as such an indexing system would be unwieldy using a QWERTY and standard screen. To investigate a segment you touch that segment name, which is then displayed highlighted. You then touch one of the soft keys displayed on the screen, in this case PULL, and then you touch the area of the screen that you wish your information to appear. This could be one of the group windows should you wish the data to be displayed as a segment list. If this is the case then the group window will take on the name of the segment you selected and the segment list will display the contents.

I found this approach a little difficult to understand at first but once I did it seems to be a straightforward way of working. It is up to the user to arrange these segments and segment lists to suit his needs for the work in hand. It is possible to play any of these segments at any

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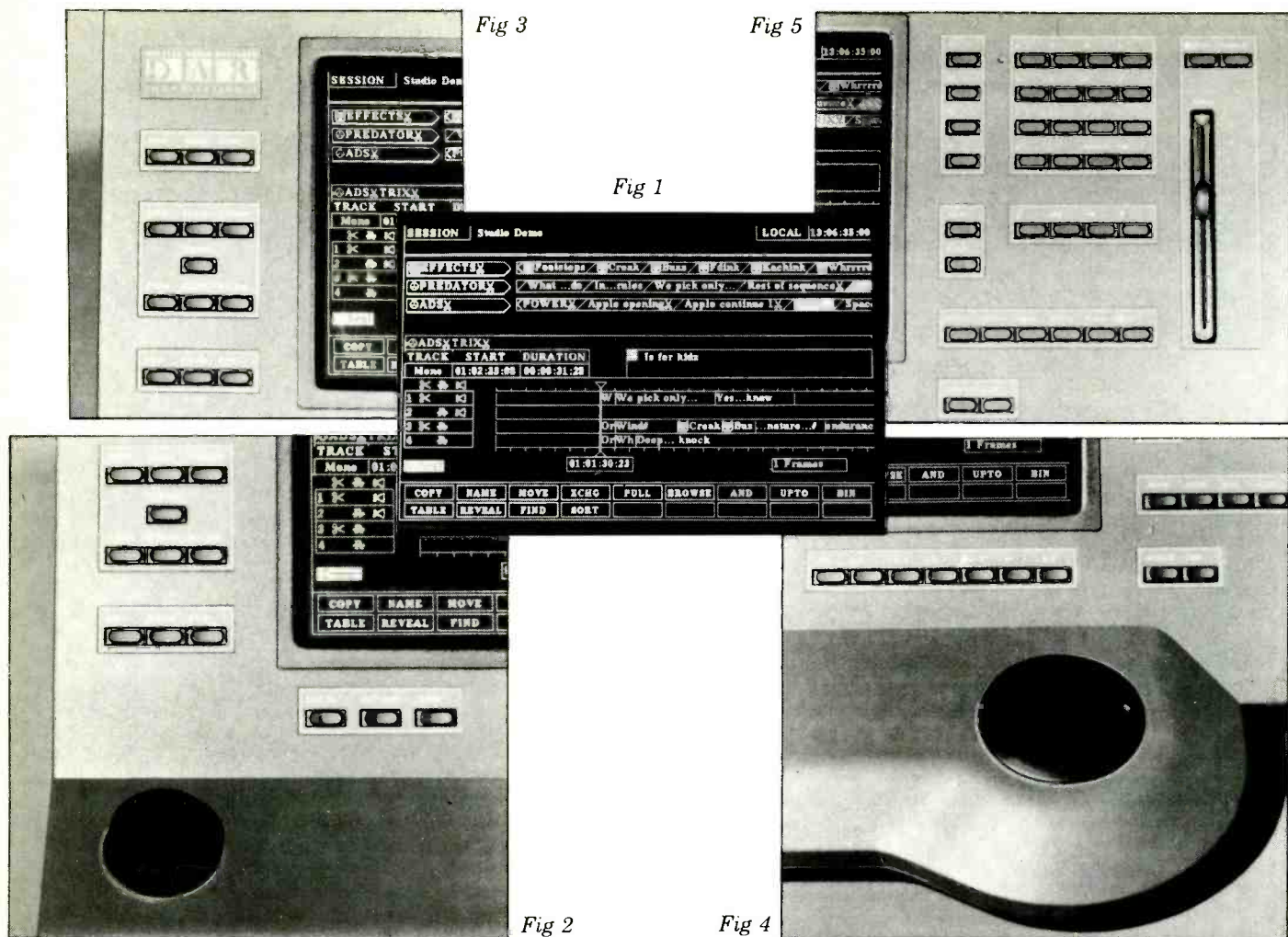
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time just by touching them. Complete segment lists may also be played by touching the group window. It may suit the user to have one segment list on display at the top of the screen and then a segment selected from that list displayed on the line below that and so on. One of the real advantages of this system is that it allows grouping of segments according to your working methods. I was told that the key to successful use of this system is to try to use as few high levels as possible—that is to work close to the basic segment level rather than going to the library or reel level and then working down the chain. One advantage is that the system always returns you to the level at which you were working in the last session. Good housekeeping is needed.

The real work area begins below the segment lists with a graphic representation of a 4-track piece of tape described as the Playback Sequence. This corresponds to the four outputs of *SoundStation*. An audio segment is simply placed in the required track by touching the segment, touch MOVE or COPY and then touch the desired track and position. To the left hand side of this 'tape' are windows with graphics showing what these tracks are allowed to do, ie that they can be monitored, recorded upon or that they may be edited. Just above this is information about the selected segment—how many tracks it has, its start time selected on the playback sequence against timecode and its duration. There is also provision for user comments about the segment to the right of this.

Across the Playback Sequence runs a Now Line. This is the point the system has reached in replaying the sequence and the precise timecode value is shown in the window below it.

The very bottom of the screen contains all the

touch soft keys. These are all commands designed to be obvious and actually do what their English name says they do: NAME is used to name a segment; XCHG allows the user to exchange any segment for another; COPY and MOVE do just that; BROWSE gives you the ability to play about approximately a second from each segment; AND and UPTO mean exactly that; BIN is a reel where segments can be collected before they get erased; TABLE is a temporary storage place for segments that you don't know where to put; REVEAL gives more information if there is any; FIND will allow you to type in some information to help you find something that has been recorded; SORT could give you alphabetical or timecode sort on segment or other lists.

It takes a little while to realise that three touches can complete many of these operations without looking outside the screen area until fine control or a major change of function is required.

Recording

The Record screen is quite similar to the Playback & Edit page but the middle section has been replaced by a window detailing the external record sources, metering level for the four tracks and a disk-space free indicator. It is still possible to play back segments while recording as well as tracks already recorded that have been enabled for playback. It is also possible to create edited segments while recording by hitting the Cut In and Cut Out hard keys that are below the screen on the left hand side (Fig 2). This means that you have created segments 'on the fly' and this could be useful for quick working. If you have already titled these segments (eg Noise) they will automatically appear as Noise.1, Noise.2, etc. If

these are then edited themselves they will be known as Noise.1.1, etc, until fully renamed.

Editing

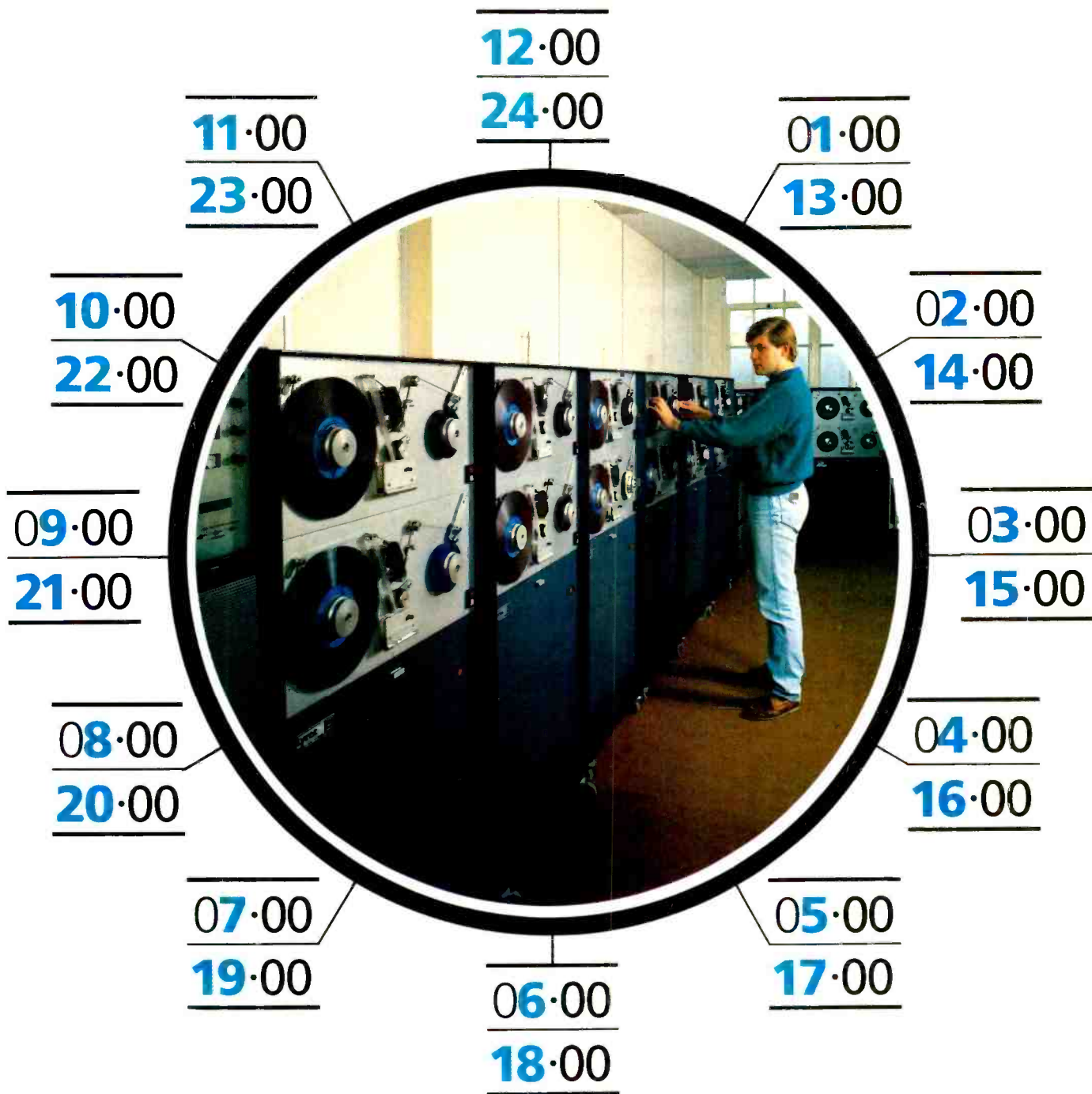
There are several tools for editing segments. We have to look at some of the controls outside the screen at this point. To the left hand front of *SoundStation* is a rotary control with slight detents in the rotation. This is known as the Vernier control and is used for fine adjustment of various functions. As its light brown coloured border suggests its function is tied to the box of switches similarly coloured halfway up the left hand side of the screen. These are largely the edit functions and we will cover them in a little more depth later.

Below this are three buttons labelled P and with arrows (Fig 3). These are special play keys, the centre key only plays the selected segment and the other two play the selected segment but either before or after the edit point. These are very useful in auditioning edits in progress.

To the right, we have already mentioned the cut in/out buttons used for creating edits on the fly. The Mark button is used for placing temporary marks in a segment to define the limit of a segment that you wish to hear when editing.

Next along are the transport controls, which are fairly self-explanatory and include the additional facility of being able to play backwards (Fig 4). The fader on the far right of the console (Fig 5) can be assigned to all or individual channels and digitally controls the level. The keys to the lower left of this, control the function of the other rotary control on *SoundStation* known as the Locator Wheel. These functions include Rock for

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rock'n'roll editing of segments using the wheel. The audio remains full 16 bit and constant sampling rate and therefore good quality. The wheel can also be used to drive through segments, cues or numbers, eg for timecode depending on the selected buttons.

Having made a sample edit there are several options open to the user to correct or improve it (Fig 2). First, the gain of an individual segment can be set using the Gain key plus the Vernier control. Then there are crossfade possibilities and the more precise Slip, Trim and Slide. Using the Vernier control, trim will allow you to trim audio on or off just one side of the edit point. Slide allows you to add signal to one side of the edit point while taking off the other. In this mode the total duration of the edit remains fixed. The zoom control affects the scaling of the playback sequence so that you can see what is happening more easily. This also affects the accuracy of the Vernier, ie with more zoom, smaller adjustments are possible.

Param allows other adjustments. At the moment it allows segments to be repeated and can be

EDITING BY TOUCH

useful for creating loops when dialogue editing and in the near future there will be a menu that will allow pitch control, speed and time compression.

Remaining facilities

There are a number of facilities on *SoundStation* not so far covered. The numeric keypad is used for changing timecode values although it need not be used as there are several other ways of doing it. Using Slip Key and the Vernier segments can be slipped in time after positioning within the playback sequence. If you want to place something at a particular point in time you can touch COPY and then the Now Line and you then have it precisely at that point.

The cancel function is used to drop back a level if you have touched something that you don't want. OK is for occasions where the command may not seem complete to *SoundStation* and the system is waiting for further commands. OK then completes the command chain.

Jump is used to move to the beginnings or ends of lists of segments or sequences and the Again command can repeat a fairly complex sequence. The assignable buttons along the upper right hand side of the screen—F1 to F4 are programmable function keys that will remember a sequence of key strokes and repeat it every time they are pressed.

Lower down the panel we have XFER, which will put *SoundStation* into record with a single button for the operation connected to the sources already programmed in the configuration menu. It will also transfer information from *SoundStation* if that is what it was programmed to do.

On the other side of the screen are the more general buttons—Help to assist the user with information about the selected operations; Menu for the point at which you want to open or close a session and Undo can take you back one whole operation. The Cancel button restores the middle of an operation to its previous state but Undo will return after the unwanted operation is actually completed.

Other points

One of the points I would have liked to investigate further was the multichannel aspects of segments and editing. The ability to control multiple tracks with single operations seems quite a powerful tool.

The future

There is much development remaining within *SoundStation* but at the time of publication it will be able to do most of what we have discussed here. There are also plans that cover such development areas as equalisation and mixing but these are some way off. I was interested to know how expandable the system was in the current configuration. Apparently, the system as it stands now will support up to 28 disk drives although only four drives within the existing box frame—you will need multiple add-on units. As a little bit of mind boggling information, it would be possible to write an extra piece of software to give extended addressing allowing *SoundStation* to talk to 20,780 disk drives all of which could be 760 Mbyte—two track hours each and distributed over 128 audio channels.

DAR are currently looking at optical disks for backup. They feel it is not wise to use the lower performance WORM drives—disks should be of sufficiently high performance that you can edit off them directly. The single WORM will be used to store all edit and system information as well as audio required. Multiple WORM handling systems for large sound effects libraries have also been considered, but that for the moment is still in the future.

SoundStation II represents another interesting digital audio product that also contains some quite unique operating systems and elements. It just shows one of the future directions that practical digital audio products are taking right now. That future is getting closer. □

The Definitive Gate



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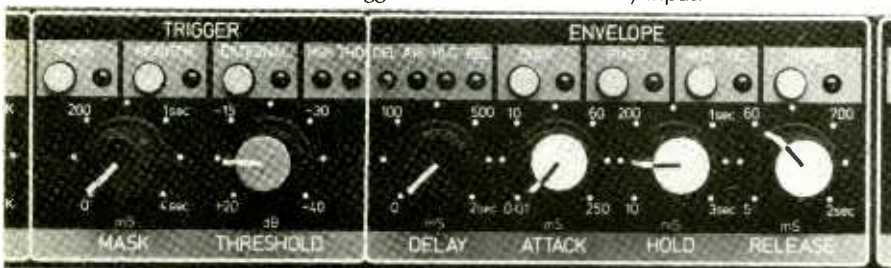
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the SoundField did for us was to allow us to record Pete Burns vocals. It's the only mic that could do it!

A.M.S.: Besides not distorting, what other benefits did SoundField have?

P.W.: SoundField is the only microphone that doesn't colour sound. If you work with Neuman or AKG they all have a sound which you either love or hate. For me, every other mic gives a misty sort of shroud to vocals and no matter what you do you'll never get rid of that. For anyone else who has had that feeling I'll tell you now, the only way to be rid of that shroud is by using a SoundField.

A.M.S.: You obviously are very proud of your recorded vocals using SoundField, so going back to A&R people how do they react to your approach?

P.W.: Well, we've sold about eleven and a half million singles by the end of the summer this year, and of the four biggest singles in the UK so far - three of them are ours. So A&R people can't complain!

A.M.S.: Do you keep your eye on new audio processors and mics that keep appearing?

P.W.: Of course we do, we're as interested as anyone else in new toys but it keeps coming back to the same thing - with SoundFields and four AMS units in each room we are absolutely covered and nothing can beat that combination. Trends come and go with equipment but any studio that doesn't work with AMS units is not in the real world! I could work without AMS units but it would make life very difficult. We're in the position now where manufacturers like Akai, Yamaha and Roland send everything down to us for our comments, just in terms of samplers we must have hundreds of the things. We've got the most up-to-date Fairlight Series III and a Synclavier - but just in terms of sampling nothing can compare to the combined quality and ease of use of the AMS DMX 15-80S. When you are making hit records for a living that sort of thing becomes very important.

A.M.S.: With Stock, Aitken and Waterman and PWL Studios it seems your personal philosophy and approach has worked extremely well. What do you say to any other producers and engineers who want to know your secret?!

P.W.: There certainly seems to be an air of disbelief. Probably the funniest story is the one asked by many world famous engineers or producers who know the work we've done and want to look round the studios and ask questions on mic techniques. The first question always asked is what's your range of microphones? The answer I always give is we've got two and they're SoundFields. Usually they have never heard of Calrec SoundFields and so the question then comes back - No, but what do you use for vocals? Calrec SoundFields. No, but haven't you got 87's or 47's? No, No, No - we've got SoundFields! But what do you use for the drum kit? We use a SoundField! No, I mean what do you use for the bass drum? A SoundField, we use one SoundField for the whole kit. But how do you get that fantastic horn section sound? We use a SoundField - I don't think you quite understand - we use one microphone for everything! But what about that string section of about twenty players on the Dead or Alive track? Yep! One microphone, the SoundField.

A.M.S.: Did you enlighten anybody?

P.W.: I don't think so, but there again none of them have worked with a SoundField. I've done interviews where I always get asked why am I so excited about using a SoundField? When you have worked with one it's like changing from a black and white TV set to a colour. You realise that people aren't shades of grey but they are made up of colours. You ask

anybody that's worked with a SoundField - nobody that's worked with one can understand why there isn't one in every studio.

A.M.S.: Do you think the price puts people off?

P.W.: This is another of those crazy things about the record industry. When you put a studio together it's common to spend a quarter of a million pounds on a console, a hundred and ten thousand pounds on a digital tape machine and stick a microphone up that's 50 years old and expect it to record the best sound in the world! Test it for yourself, anyone who has made the sort of investment we've just talked about will still think that a four hundred pound microphone is expensive! My little boy just bought a forty pound sampling keyboard - you might as well rip the mic out of that thing and use that if you think four hundred pounds is expensive when it comes to making the most of a half million pound investment.

A.M.S.: Microphone technique is still probably one of the few remaining areas of 'black art' when it comes to modern recording. Is the SoundField difficult to get into?

P.W.: No not really. It's like anything else though, if you've worked with anybody that has experienced the SoundField you'll definitely learn faster. You wouldn't stick an SSL in the hands of anyone who's just come off a Trident and expect immediate results. My 17 year old kids who are working as tape op's can use it so it can't be that difficult! You obviously get better and better results as you get used to it and the most exciting thing is you keep improving your technique. There is no limit, the microphone is beyond the individual's capabilities and not the other way round which is usually the case with all other mics.

A.M.S.: Do you have any special tricks?

P.W.: One thing I enjoy doing is recording vocals in the control room whilst monitoring at a normal level. I've done this with Mel and Kim and Bananarama. The SoundField can be tuned to allow vocals to be recorded without recording spillage from the monitors which seems unbelievable but is a very valuable technique once you've mastered it: Let's face it, the thing that comes through most on a record should be the human voice and the recording engineer's job is to record that human voice better than anybody else. The key to that is not the console or the tape machine - it's the microphone and in our case it's the SoundField. We have a sound booth with a SoundField that keeps our studios busy 7 days a week, 24 hours a day!

A.M.S.: Surely you have salesmen who visit you with new products that they claim are better?

P.W.: Oh all the time, and I say - fine, and I go and get two secretaries and sit them in front of the speakers and I tell them that every time they hear a vocal they like to put a tick. Every time they hear one they don't they put a cross. I switch from SoundField to the other mic and every time I can see a cross being put down. I even try and fool the girls but every time the SoundField gets a tick. Even the salesman eventually had to admit that his mic sounded harsh and cruel compared to the SoundField. The girls picked the sound they liked - as simple as that.

A.M.S.: And your success record?

P.W.: We've produced 83 chart hits in 3 years, we've mixed 31 number 1's this year so far, we've sold world-wide about 80 million singles, we're building studio 4 and we've got studios 5, 6, 7 and 8 on the drawing board. Last month 18 of the top 40 singles were mixed by us! The SoundField has been the best three thousand pounds I ever spent in my life! It's made me a multi-millionaire. Anybody that spends the time on a SoundField will be more than rewarded.

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

USA, AMS/Calrec, AMS Industries Inc. 3827, Stone Way North, Seattle, WA 98103. USA. Tel: (206) 633 1956. Fax: (206) 547 6890. Telex: 4900001180 CAL UI. E-mail: IMC 889.

SPAIN – TRADITIONAL INDUSTRY UPGRADES TO AUDIOFILE

Although AMS has had international success with many of its products worldwide, countries such as Spain – because of population – have never been high on the AMS distributor sales chart. Now however, with AudioFile, the success and promise of sales in countries like Spain shows just how quickly the acceptance of disc based audio manipulation is growing. Pictured right is Mr. Jim Kashishian, owner of the first AudioFile in Madrid, Spain. Alongside Jim is sound engineer Ruben Raposo sitting in front of the second AudioFile installed in Madrid at Estudios Exa.

Jim Kashishian said “Spain has a well established dubbing and post-synching industry which has successfully employed a very traditional approach. High technology solutions to combining sound and vision in these areas usually fall short of the requirement and fail to stimulate the



interest of the engineers. Not so with AudioFile! There are a lot of companies here getting very excited about this new way of working and already this excitement is turning into investment because, for once, a product like AudioFile can show, even after a very short demonstration, how it is

possible to get the right sort of returns on that investment.

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ATA NOR VIDEO CENTRO TO RECEIVE THIRD AUDIOFILE IN MADRID FEB 88.

THE SOUNDFIELD INTERVIEW

“WE’VE PRODUCED 83 CHART HITS IN 3 YEARS, WE’VE MIXED 31 NUMBER 1’S THIS YEAR SO FAR AND SOLD 80 MILLION SINGLES WORLDWIDE – AND WE OWN TWO MICROPHONES.”

– **PETE WATERMAN.**

Talk to anybody who has worked with a Calrec SoundField and not only will you find total support for claims ‘The Best Microphone In The World’, but also a total inability to explain how any studio can record without one!

A strong claim for ‘just a microphone!’ Maybe not! What owners rave about is not that the SoundField can record ambisonically, not even that it is the cleanest sounding microphone in the world.

The truly unique thing about SoundField is that it can be used as a post production system. The SoundField microphone can be placed anywhere for a stereo recording: once everyone has gone home the ‘black box’ that is an integral part of the system can be used to zoom-in, or zoom-out, zoom-left or zoom-right, even zoom-up or zoom-down.

No wonder you are about to hear why Pete Waterman, in all his hit-making empire, only has need for two microphones – of course both SoundFields!

Nobody raises an eyebrow now when every week a newer, cheaper, supposedly ‘far better’ digital delay line or digital reverb hits the streets. If you want to find out how a microphone could give your studio the edge that used to be the difference between owning a digital reverb or not – read on . . .

PETE WATERMAN

Pete Waterman was born in Coventry and although his working week is spent in his London studio, his home is now in Warrington. Pete started as a Disc Jockey and whilst trying to get into radio he stumbled into the record industry and landed a job in A&R at CBS and then Magnet Records.

A.M.S.: *So did the job in A&R result in you seeing the inside of a studio for the first time?*



Pete Waterman: Yes it did and I found myself more and more having to go to the studio when a band was recording. That’s really what puzzled me. Why anyone would employ a D.J. to make decisions in a studio when everything there was so far beyond his comprehension. I was being paid to make decisions that were affecting professional musicians and engineers when I didn’t understand what the desk did or what a 24 track tape machine was! People had to listen to me and respond to my whims and fancies.

A.M.S.: *But obviously you were successful at doing this?*

P.W.: Yes but that made me realise how sorry the record industry was and as I became more successful I set myself on the idea that if anybody can employ really talented people in the studio situation, along with record producers and have a whole ‘locked-in’ family set up, they wouldn’t allow a young renegade A&R guy to come and and tell them how to do things.

A.M.S.: *But it worked for you!*

P.W.: Yes, but just think of record companies sending producers from one studio to another where they didn’t know the monitoring, they didn’t know the room and they’d even have to hire in mountains of missing outboard gear.

A.M.S.: *So not only a good recipe for disaster, but very expensive too?*

P.W.: It just didn’t make sense. When we started Stock, Aitken and Waterman, studios didn’t own AMS DMX or RMX units. If they did, they had one unit maximum. The first thing we bought were three AMS DMX 15-80S units, all with almost maximum delay and dual pitch changers. People were amazed when we turned up at outside studios with an effects rack that was probably worth more than all the equipment in the studio! But at least the record companies didn’t have to go to rental companies and pay their prices for the equipment. It wasn’t uncommon in London for the record companies to be stuck with a bill for the studio per day, and an even bigger one for the AMS rental.

A.M.S.: *So is that what prompted you to build your own studio?*

P.W.: We seriously made the decision to go the whole hog. Strangely enough that is where we first bumped into Calrec because we wanted a UA 8000. The only reason we didn’t end up with a UA 8000 was because we needed a console immediately and we would have had a six-month wait for our UA 8000 to be built. Whilst we were up at the Calrec factory in Hebden Bridge we saw the SoundField microphone which was timely because we’d just been having a problem with Pete Burns of Dead or Alive’s vocals. He was distorting every microphone we put in front of him and we just kept having to ask him to stand further back and we therefore couldn’t get the sound we wanted.

A.M.S.: *So how did you get on with SoundField?*

P.W.: We borrowed one and bought it immediately after the first time we used it. We had tried every mic there was and the first thing

AMS DMX'S AND RMX'S GO DOWN BIG DOWN UNDER

Chase Music Pty, Ltd., the largest outboard studio rental company in Australia has recently experienced a large growth in demand for AMS outboard equipment, particularly the RMX 16 digital reverberator and the DMX 15-80S dual channel digital delay line/pitch changer/sampler.

Although the demand has focused on recording studios, the number of foreign bands touring Australia who are now specifying AMS audio processors has also seen a significant increase.

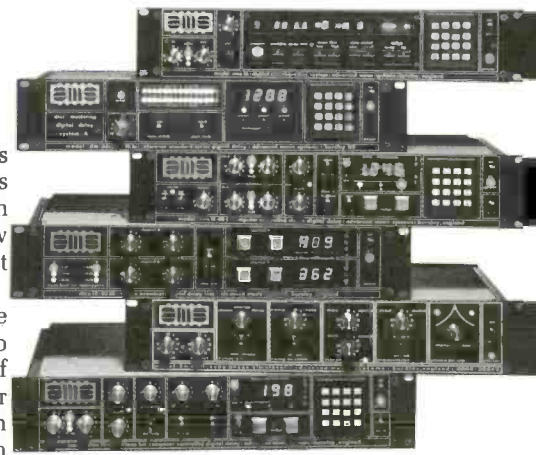
Jim Taig, managing director of Chase, puts this increase in demand for AMS effects systems down to the recent chart success of several black American artistes such as Janet Jackson and other groups produced by Jimmy Jam and Terry Lewis in Minneapolis. "My clients specify the RMX 16 because they prefer the warmth of sound that the system provides and seem less interested in many of the fancy gimmicks offered by the glut of the newer reverbs that have been coming out of America and Japan" says Jim Taig. "Just as gimmicks don't seem to point the way as to what makes a good reverb, price doesn't either - my clients seem to prefer the RMX 16 to the more expensive 480L or the less expensive REV-5".

"Many manufacturers have blatantly tried to

copy AMS sounds, however, my clients include most of Australia's top producers and although I am sure they are familiar with every new device that comes along I know that the RMX 16 reigns supreme when it comes to the sounds people prefer."

Jim Taig and his partner Peter Cobbin are themselves Producer/Engineers and seem to be continually impressed by the number of new and varied possibilities they discover whilst working on projects of their own with the DMX 15-80S. Jim currently has an album called "Wa Wa Nee" on Epic Sony sitting at number 35 in the U.S. charts and one trick used by Jim may well prove of interest to many other DMX owners out there:

"Many of the vocals on the album were flown-in to different choruses using the DMX 15-80S. What I discovered was that by hitting the reset button, both channels started recording at the same time and that is the way I captured all the stereo samples from my F1 before flying them in. It didn't stop there though because once you really get into sampling like this you soon find you run out of time - no matter how much storage you have! The solution I've found and used successfully is to load my samples onto a Studer A800, varispeed it up by 3 or 4 half tones and then load the time-compressed sample into the AMS.



Once it is in the unit I then use my MIDI interface to a DX 7 which I can then play the sample back down 3 or 4 half tones to restore it to its original pitch!"

And why go to all this trouble? Well as Jim (like many other converts to using the DMX 15-80S as a sampler) says - "There are a lot of samplers and sampling keyboards out there at a range of prices, but again nothing so far gives the richness of sound quality that can be achieved by using the AMS."

Chase Music can supply a selection of Yamaha Reverbs and Delays as well as 2 Lexicon 480L's and 2 PCM 70's. In terms of AMS units, Chase owns 7 AMS units and will currently increase that to 8 by adding another RMX 16.

Chase Music can be contacted in New South Wales on 61-2-957-2929.



ROYAL VISIT

The 12th of November 1987 was an historic day for the area of England where AMS is based. Her Majesty Queen Elizabeth II and His Royal Highness Prince Philip, Duke of Edinburgh visited the town for the first time in over 20 years.

The Duke of Edinburgh's reason for visiting the town was to be shown round the AMS operation and officially to open the company's new headquarters building.

Over 100 guests, comprising customers and foreign distributors, were delighted by His Royal Highness taking time to chat informally with many of them before officially

unveiling a plaque and signing the visitor's book to commemorate the opening.

Although the AMS Research and Development building and production wing had been in operation for some time, the new 22,000 square foot Calrec production wing had only been occupied by the Calrec workforce some 14 days earlier.

In a letter of thanks from His Royal Highness following the event, the Duke had said he had had a most enjoyable and worthwhile visit and had been delighted to have the opportunity to see such a thrusting young company on home ground.

AMS-USA

With the increasing interest in both AMS and Calrec products in the United States of America comes the opening of a distribution and support office for the entire range of AMS and Calrec products.

The office will supply all AMS and Calrec reps and dealers across the United States and become the service centre for everything from AMS audio processors and AudioFile to Calrec consoles and the SoundField microphone.

In charge of AMS Industries Inc., will be Mr. Nigel Branwell who has been handling Calrec sales for some 6 years and has also been a dealer for AMS audio processors for three years.

Nigel commented on his appointment "There are no two companies in the entire industry that could be more complementary to each other. Although AMS have achieved a great deal of success in America, people here are only just beginning to discover for themselves why Calrec is such a highly respected name in Europe. Whether you talk about the AMS AudioFile, the UA 8000 music console with TASC automation, the digitally assignable console, the SoundField Microphone or AMS audio processors - there isn't a single product range from the company that isn't impacting very positively in the U.S. at this very moment. With this new commitment to the American market I believe every customer, new and old, has just got themselves a hidden bonus and as far as I am concerned, I feel my experience with both AMS and Calrec landed me the most exciting position in the American pro audio business."

ECHO TIMES

ams AUDIOFILE POWER INCREASED YET AGAIN

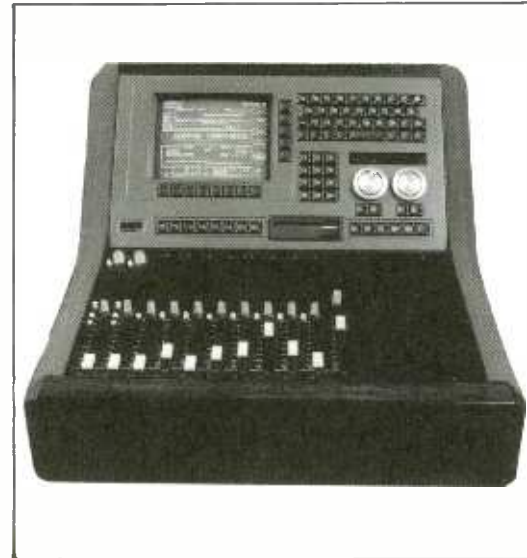
For over 2 years now, AudioFile owners in the field have been receiving both hardware and software enhancements to their systems. Usually these upgrades are a direct result of collaboration with users on how to improve the AudioFile system for their particular requirements, allowing work to be completed more easily, faster and more accurately.

The latest series of modifications available for AudioFile have significantly expanded the scope of the system and attracted an extremely positive response from existing owners as well as a wave of new orders from recording studios and CD pre mastering facilities.

The latest enhancements can be summarised as follows:

- * Full emulation of analogue tape Reel-Rocking, and between 2x and zero varispeed backwards or forwards.
- * All 8 outputs of the system can be selected simultaneously, alternatively 6 can be output whilst two record, either against the system's internal clock or against external timecode.
- * A significant increase in the processing power of the system allows even faster access and screen changes.
- * Once any piece of material has been recorded, programmable adjustment within AudioFile can provide either a level cut or a level boost to a maximum of 6dB on playback from AudioFile.
- * Any recordings made on AudioFile can be digitally mixed within the system for output on any one (or pair) of the 8 channels.
- * Any stereo recordings on AudioFile can be digitally panned left or right within the system.

The significance of this first set of modifications means that a single recording can be used in a particular scene several times with adjustment to level and position in the stereo image being made. These features can negate the costly requirement for a console automation system when dubbing and mixing to picture.



Finally, a new and very powerful Digital Signal Processing (DSP) card has been made available. The first of a series of software addressable features on this card now permits a highly realistic emulation of tape Reel-Rocking which is most valuable when used in the Cut-and-Splice page of AudioFile.

Particularly since the implementation of Cut and Splice, in conjunction with Reel-Rock and internal digital mixing, AudioFile has seen a strong commitment to the system from a group of the world's most respected CD pre-mastering facilities.

AMPEX INTERFACE PROVIDES FOR AUTOMATIC ON-LINE EDITING OF AUDIO BY VIDEO EDIT CONTROLLERS

AMS and AMPEX agreed almost twelve months ago to co-operate on the development of an interface that would allow AudioFile to be controlled automatically by a video editor.

This interface is now available for AudioFile and effectively causes AudioFile to emulate either a VPR 3 or VPR 6 machine.

During on-line video editing sessions, a VPR-3 or VPR-6 port on the video editor may be assigned to AudioFile. By setting pre-roll and post-roll default on the video editor, AudioFile will automatically record audio 'tops and tails' at either side of all video edit points.

AudioFile is then able, either on or off line, to take advantage of its disc storage technology to sweeten any or all audio edits. The powerful (Cut and Splice) editing software in AudioFile can accommodate track slipping, programmable cross fades up to 10 seconds, level adjustments at edit

points from cut to +6dB and even pan. The entire edit splice point can also be moved backwards or forwards, and audio pre or post the video edit point can individually be made to key point the edit point in order to achieve the best possible audio edit. One more thing that AudioFile can do that proves very difficult, if not impossible, to do with tape:-

Once the audio edits have been corrected, the 8 track capability of AudioFile can still be used off line for dialogue replacement, adding music tracks or synching of additional sound effects.

The finished result can be laid back to the video master without the audio degradation associated with multiple tape generations which result from conventional treatment of audio during video editing.

Further information and a demonstration may be booked from any AMS distributor listed on the back of this issue of Echo Times.

UA 8000 UPDATE

Music Factory are installing a Calrec UA8000 console in their recently expanded and refurbished Studio 1 in Cardiff. The 48 channel console is fitted with the AMS TASC Automation/Machine Control System. Music Factory, who record all kinds of music chose the Calrec UA8000 because of its unrivalled combination of Audio Performance and flexibility of operation, features which have long been acclaimed by users of the UA8000 at PUK in Denmark, Abbey Road and Mastermix in Nashville. Studio Manager, John Davies, said the UA8000 had been chosen so they could offer a facility which was uniquely superior to their competitors and which would put them in the company of world class studios. The new studio is already heavily booked for 1988 on the strength of the Calrec UA8000 console.

help in azimuth

CORRUGATED LINER: TWO DIFFERENT ELASTIC FLEXIBILITY OF WAVES



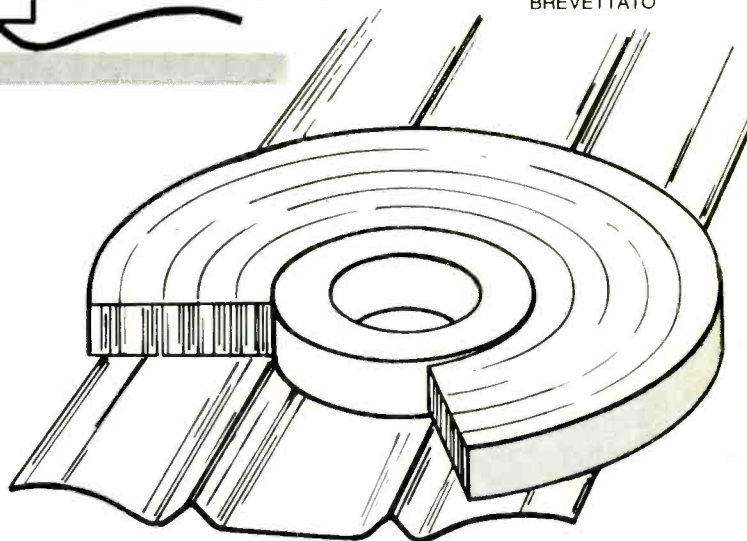
BREVETTATO

Inner wave: low flexibility

- simultaneous centering of both empty hub and full reel as to the cassette middle axis
- reel total mass supported by the hub
- maximum reduction of friction torque.

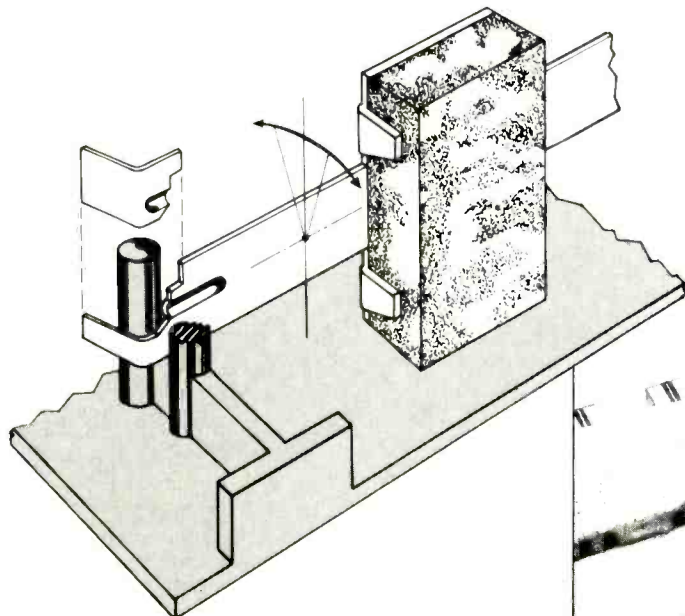
Outer wave: high flexibility

- loop by loop parallel tape alignment
- maximum reduction of telescopic effects (crests)
- minimum additional friction torque
- possible to omit graphite coating.



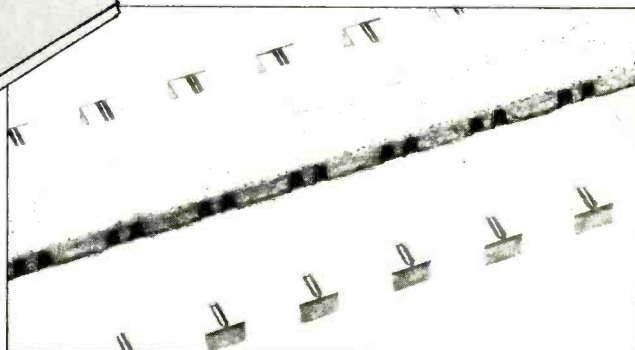
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On an historic autumnal October day in 1970, AIR studios in London opened its doors to the world. AIR (Associated Independent Record producers) represented the teaming up of four successful record producers who had taken the unprecedented step of fighting for personal recognition in a record industry where formerly only the record companies themselves were making any significant profit.

Having achieved financial recognition, they pooled their resources and put another historic foot forward by going independent. The four were George Martin, John Burgess, Ron Richards and Peter Sullivan. Of the original team only Martin and Burgess remain at the helm of a company which has

responsibility over to Malcolm Atkin in 1985. (Atkin's first task was to host a party for the Prince and Princess of Wales for the Prince's Trust album of that year.) John Burgess managing director takes an active interest in the day to day running of the studios and shoulders the responsibility for Montserrat and management company, AIR Management Services.

When the studios were first conceived, George Martin, in spite of his huge success in the record charts was very keen on working in film and to this end the facilities and equipment at Air had a heavy bias towards that medium. The first two studios to appear each had projection rooms; a third studio for mixing with film editing facilities followed and finally a fourth mixing and projection studio completed the picture. But Martin and his colleagues were too successful in the music world for their own good in this respect and the film facilities never really paid for their keep. They were eventually dismantled at the end of the '70s.

Air's home is on the fourth floor of an impressive 1926 Neo-Romanesque building in the very heart of London—Oxford Circus. Although in those early days the fact that Oxford Circus is recognised all over the world and therefore offers built-in attractions to overseas clients was hardly relevant, Burgess believes that is one of the reasons why, in spite of fierce studio competition, they have no problems filling the bookings diary. It is sometimes not enough to simply offer the best equipment and recording studios within your power; a studio's reputation so often encompasses other factors.

Back in the '70s however central London was the hub of a small and very exciting music industry. Malcolm Atkin reminisces: "Those early '70s were lunatic days really. There was a lot more messing around in studios, and the Speakeasy was just round the corner, which provided quite a lot of distractions! Everybody used to meet up there after sessions, and sometimes during sessions, too.

"The Oxford Circus location was ideal. It is very central with access to everything you would want in the way of sustenance and entertainment. Considering we are on the corner of two of the busiest streets in London and above three underground train lines it's amazing how well the rooms have been isolated. You really wouldn't know where you are."

The building was originally Peter Robinson's department store. The one thing which most recording studios in central London feel distinctly restricted in is space. Not so Air. The fourth floor of Peter Robinson's was a studio designer's dream, not only because of its spaciousness and high ceilings but its construction made it ideal. Malcolm Atkin explains: "There was a huge banqueting hall which had four marble steps going down three feet to the banqueting hall floor, making the installation of a floating studio floor a piece of cake."

This hall proved large enough to accommodate two studios, including Studio One which on its own has a reputation as an exceptionally large recording room. The original room designs were by Ken Shearer. Over the years as control room acoustic ideas progressed so the control rooms at Air have been updated, although the recording areas themselves have not seen much change. "We have fine-tuned the studios over the years. The fashion through the '70s was for deader and deader rooms. Then at the beginning of the 1980s live acoustics became the vogue and so we stripped off the padding and bass absorbers in Studio One and it was an instant success. The drums came out of the drum booth and on to a drum riser in the middle of the room and the piano moved into the drum room."

Since those original studio designs, Air have reworked the rooms in-house—often under the guidance of Dave Harries. "In those days there were a lot fewer people out there building the sort of studios and the only way to get what you wanted was to do it yourself," explains Atkin.

All four of the present day control rooms are built on the same design principle, produced by Angus McPherson. "Below 200 Hz is where most of the acoustic problems are; above that the problems can be solved without consuming the volume of the room. The principle acoustic treatment in all four control rooms is in the ceiling. The walls perform mid range absorption, whilst the ceiling takes care of the bass end, comprising a series of tuned panel absorbers at varying frequencies. When we did Control Room One we had hundreds of 2x4 boxes and we tuned each one until we had what we wanted."

The absorbers sit above an acoustically transparent but

UP IN THE AIR

With eighteen years as a major studio, Air has an established position in the international market. Janet Angus looks at this five-studio facility in central London and hears about Montserrat

spawned a number of other music/video/film and television-related concerns. Richards and Sullivan pulled out in 1974 when the controlling interest in AIR was sold to Chrysalis which in turn became a public limited company in 1985 in a reverse takeover of MAM records.

In the restructured organisation Air studios (London) today forms part of the facilities wing of Chrysalis plc which includes Air Studios, Wessex Studios, AIRtv facilities house, Audio International studios, AIR-Edel Associates (a commercial jingle company), and newly acquired Record Plant Studios in Los Angeles, plus Air Montserrat, although not part of Chrysalis, being wholly owned by George Martin and John Burgess, as a separate company in its own right.

The opening party at the London studios on October 5th, 1970 lasted two days. A wealth of famous names have since passed through its doors; not only artists but producers and engineers too. Air personnel have often gone on to make their mark in related fields. The studio's first manager was Keith Slaughter. He was followed by Dave Harries who has been responsible for much of the present studios' designs and monitoring and has since gone on to bigger and more diverse things within the Chrysalis group. He handed the studio management



visually effective black Formalux grid, flanked by wood slats, which allow complete access to the full ceiling volume above. One of the more tiresome problems of building a studio above a shop is that you become classified as class 20 fire risk: every single piece of wood in the facility had to be flame proofed, and all mains cable specified mineral cable.

Another problem was that because of its historical architecture the building itself is Grade 1 listed: "You can't even poke air conditioning out on the side of the building because the facades belong to the Crown." The air conditioning therefore had to be routed up to the roof.

McPherson worked on the interior designs for Studios One and Two, all the offices, corridors and canteen and then emigrated—no connection. Dave Harries provided the acoustics. Studio Four's interior was designed by Malcolm Atkin and Dave Harries while interior designer John Ricketts came up with an imaginative design for Studio Three, which was later brought into line with the rest of the facility.

Of the recording areas, Studio One's is the largest at 58×32 ft. The main area can hold up to 60 musicians and has a hardwood floor with plaster walls and ceilings.

"The drum riser in here is very popular," says Atkin. "A lot of clients come specifically to use that room for drums."

Custom built large screens were constructed in the room and feature both soft and hard surfaces for varying acoustics. There are two isolation booths—one large enough to house the 9 ft Bosendorfer grand piano. Both have hardwood floors beneath removeable carpets and are fairly dead. A large entrance lobby has been wired up to provide a third booth area.

By means of a complicated engineering feat, the large scale lighting in this studio is on a dimmer system that alone comprises as much machinery as an ordinary studio machine room.

Microphone amps are located in the studio area and are controlled from the gain on the channel amp in the custom Neve mixing console. When designing the desk Rupert Neve calculated that runs over 20 m long could make a significant difference to the signal. Atkin is of the opinion that this feature certainly contributes to the sound.

Studio Two is also acoustically brighter than when first built. To one side of the control room is a private television and telephone room which is made available to clients using the room.

Atkin explains why, when space in central London is at a premium, Air decided to provide such a luxury for each of the four studios.

"It was first requested by Paul McCartney, so we built a room on to Studio Two where he could have meetings and make telephone calls, etc, in private. It paid off because he subsequently did three albums with us and a film. We thought it was such a good idea we decided to do it in all the studios."

The overdub room is shared with Studio Five (a wholly different facility which will be detailed later on) as there is currently little demand for it in Two. Control Room Two is very similar to Control Room One, but houses an SSL *SL 4000 E*



Studio One



Studio One's control room

with *Total Recall*, customised for use with cue mixers.

Studio Three is an overdub/mixing facility that has seen dramatic changes—at one point featuring a John Ricketts design, which earned it the label 'the galvanised room' as it had metal wall finishes. However, since April 1987 it has gone in for a more conventional look with fabric wall and ceiling coverings in greys and blues.

The console is a Neve *V* series with GML moving fader automation. Air studios was the first UK studio to install the Massenburg automation. Atkin explains their decision:

"When *Necam 96* came in here it didn't work as it should do—it was a very early version which, at that time, did not meet with our approval. I understand that other London studios, for example PRT and CTS are now using it and are very happy with it.

"The Massenburg system is in some respects a lot simpler in that it is a slave system. *Necam* and the SSL master control tape machines, cue list autolocation, etc. The Massenburg simply chases wherever you send the tape machine. In other respects it is more sophisticated. It uses a 40 Mbyte hard disk drive and is capable of taking in a lot of data more quickly than the other systems. It can run 128 faders at ¼-frame accuracy and is generally a very fast system.

"It was the only other system I could see that was a serious moving fader automation at the time and it is building up a very good reputation in the States. We were getting a lot of feedback about it and certainly, after playing with it, I had to agree."

Studio Three also uses the *Lynx* synchroniser. "The *Lynx* is the first truly rock and roll synchroniser. If you did that with *Q.Lock* it would have brain damage. It cues in really fast. As far as we are concerned it has completely solved the problems of running to video."

When in 1982 Studio Four took delivery of its 48-channel SSL *SL 4000 E*, it became the first purpose-built 48-track room in London. Primarily intended for overdubbing and mixing it has a 12×10 ft live studio area. The rooms are finished in very traditional, non-hi-tech style with Tudor-look oak panelling and brick walls with a few mirrors dotted around.

All the rooms have full 46-track capability with *Q.Lock* or *Lynx* synchronisers. Console choice has posed difficult decisions—more so because Air has so many facilities to equip—mistakes with that number of large investments would certainly prove costly. Out at Air Montserrat a compromise was reached when their SSL was fitted with Focusrite sub mixer in order to offer both alternatives.

Atkin: "Air has always been a staunch Neve stronghold and so they were very upset when we bought an SSL. I would never have believed that anyone would be able to design a standard item for anything like a console, but SSL did it. Neve custom built every single desk; it is such a completely different approach."

Multitrack tape machinery in the London facility comprises five Studer *A800* 24-tracks and four Mitsubishi *X850* 32-tracks (Sony *1630* mastering)—no small investment.

"We are a very honest studio," explains Atkin. "We say we don't cut rates below a certain level and we don't. You get your money's worth. I think it is true to say that Air is really one of only a few studios which have been properly funded and put together. You have to charge a certain rate in order to properly equip the facility."

Why digital multitrack machines, and why all Mitsubishi? "Digital is inevitable. The thing that has been holding it back for many years is the different formats. Mitsubishi came along with a machine which was designed five years after the first efforts and therefore theirs gave better error correction figures. Plus, of course, Mitsubishi gives you eight extra channels.

"Studios had got very comfortable with analogue tapes—no compatibility problems there—and they are still very loathe to

UP IN THE AIR

lose this standard format. Digital multitrack is a very small market. A lot of it is due to the fact that digital 2-track mastering formats are in a state of chaos. The 1630 is the only acceptable CD mastering medium at the moment. We are being presented with DASH, PD and R-DAT, which is showing some signs of being the true winner. It is a true digital machine whereas the 1630 is something we inherited from video; the technology is quite horrendous."

Analogue mastering is on Studer A80 or Ampex ATR102 (¼ or ½ in).

At the other end of the tape machine spectrum is the bane of Atkin's life: "I hate cassette machines. People will happily spend thousands of pounds recording something and then complain when it doesn't sound so good on something that Philips designed as a dictaphone. They are the bane of my life; maybe R-DAT will put paid to that."

Control room monitoring has seen a few changes over the years. "We used to be all Tannoys in the '70s—Golds and then HPDs. I still think they have a wonderful sound but unfortunately they were not powerful enough for rock and roll. So then we went to JBL 4350s in Studios One and Three, and 4335s in Studio Four. Studio Two has Dave Harries' designed monitors, which utilise a beryllium ribbon HF unit, Dynaudio softdome mid range, four 12 inch Dynaudio bass units, BSS crossover and HH 800 W amps. We will probably build the same monitors for the other rooms eventually. If you are not careful with them the JBLs can be quite a peaky speaker.

"Having said all that, most albums these days seem to be mixed on nearfield monitors anyway which I find in some ways quite frightening. The idea of basing your overall album quality on a £200 pair of speakers and only going back to the main monitors for quick reference is frightening. There seems to be a growing number of engineers who bring their own monitors, although we provide Yamaha NS10s and Auratones in all the rooms. You can't find that many people who actually love

NS10s and yet the industry seems to refer to them as standard. Seems to be a pretty makeshift sort of standard to have. They all have their own brand of toilet paper... at the end of the day it is just a bit of cardboard flapping around in a box."

All the Air studios feature a unique foldback system which provides individual stereo mixes for each band member. The system was designed for Montserrat using 8-channel mixers with integral 400 W headphone amplifier. "Seeing what each musician chose to mix for himself showed us just what a compromise and struggle traditional foldback had been. SSL modified the consoles to incorporate it. Over the years the only person to complain that the system wasn't loud enough was Lemmy!"

Each control room has a fixed complement of outboard equipment which includes AMS RMX16 and 15.80S, Yamaha REV7, Eventide 949, Drawmer and Kepex II noise gates, UREI 1176 limiters, Neve compressors, AMS phasers, Neve 2254 and 33609, Roland SDE3000, Yamaha SPX90 Mk II and dbx 902. Supplementing the fixed equipment is a central bank of equipment from which any of the studios may draw as required.

Studio Five is a MIDI programming room with a difference, which opened in the Autumn of 1986. "We started with a plan to build a MIDI studio but didn't have a lot of space and there were time constraints. The equipment was changing so quickly and we weren't 100% sure how it would integrate with the rest of the facility. For example we didn't really think people would want a tape recorder. We soon found out that they did! We were trying to identify a facility which would not conflict with the other rooms," says Atkin. "We felt a strong need to get involved if only in order to keep up with the rapidly changing technology."

Programmers and Canadians Dee Long and John Jones became involved in the project and set to work to create what they see as a wholly unique facility.

John Jones explains: "We moved to the UK specifically to set up Studio Five. Although it is called a programming room it is really a MIDI studio. Music is becoming more MIDI oriented every day. People tend to think of MIDI as a programming tool but we think of it as something much greater.

"We believe it is where recording is going. More and more producers and artists are working at home using MIDI. It is just a matter of time. I am convinced that this type of studio is what will survive. Of course you will always need big studios too but this is the way to come.

"In a normal studio you record the sound not the mechanical performance. With MIDI you are recording the performance not the sounds; they can be altered as much as you want in any way you want afterwards."

The equipment list is long and because of the nature of the room, constantly changing and being updated. It includes Akai S900 12-bit sampler, 64-way digital patch, 820 MIDI mixer and MX73 master keyboard; Dynacord Add-One drum sampler and Power Drum Kit; MacII/MacPlus and Atari ST PC with Performer/Composer, SoundDesign, Upbeat, M, Jam Factory,



Studio Three



Studio Two



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.

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UREI

Master Tracks, Q-Sheet software; complete Opcode *Librarians* and Opcode *Editors*; Oberheim Sample Player (Mirage, Emulator II, Akai S900; Prophet 2002+ and 3000 samplers and VS synthesiser; Roland D-50, Super Jupiter, MKS50, GM70/GK1 guitar synth, and GP8 guitar effects processor; Sycologic M16 MIDI patch (32-way); Yamaha DX7 II FD with disk drive, TS816 and 802 multivoice TX.

"We are not saying that MIDI is a band in a box although of course it can be. It is not only keyboards. We don't think of MIDI as playing things that human beings can play. By utilising the *Performer 2.0* software we can now record a whole band in MIDI."

The room offers over 100 voices on 32 MIDI channels, simultaneously recorded, enabling live recording without

UP IN THE AIR

necessitating quantisation. Additional desk outputs and inputs are controlled by the Akai digital patchbay and all sounds, sound path, music notation, music performance and mixing can be saved for near total recall.

During Autumn '87 the room was redesigned to accommodate this vast array of equipment as well as to incorporate the overdub/sampling booth which it shares with Studio Two.

Atkin: "Some clients felt that the original room was too small for 12-hour days, three to four weeks on end. Now there is plenty of room to set everything up.

"We felt that pre-production/programming was something that we needed to get into. I couldn't afford the time and expense of getting involved directly so we invited Dee Long and John Jones to set up a room in conjunction with Air. That is how we were able to set up a specialised experienced room. Obviously it is not an area you can just jump straight into."

During the '70s George Martin suddenly got a bee in his bonnet about building an off-shore studio, Malcolm Atkin takes up the story:

"Keith Slaughter stepped down as studio manager because they were going to build the studio on a boat which caused a lot of people a lot of grey hairs. There were problems with the size and weight of the necessary generators and they got to the point where they were considering towing the generator behind them on another boat! It got so complicated that in the end they decided it was a bit of a non-starter.

"George Martin had been looking at Caribbean islands for two or three years before he found Montserrat. He wanted a British colony with stable politics; there are only 12,000 people on Montserrat so it doesn't have that many internal politics to worry about.

"The studio has 30 acres of prime site—the whole side of a hill

with the villa at the top and a view right across the Caribbean. George just saw the view and said, 'This is it, I'll take it.' It is fabulous and unspoilt. Montserrat has been extremely lucky to avoid the tourist boom of the '60s and '70s—mainly because it is a little hilly and they couldn't get a long runway on to it but also because the beaches have black volcanic sand. So nowadays it is very special.

"As for the studio, we had *carte blanche* to do whatever we liked. There is a very large live area (about 30 ft²) and a dead area 20x10 ft. There is an unusual piano booth out of which the keyboard sticks into the main room enabling the player to sit with the rest of the band. There is also a large iso booth about 10 ft². The control room is 25x20 ft—huge. Dave Harries designed the rooms with a bit of interference from me.

"At the time we put in a 52-strip Neve console and then two years ago updated with a 48-strip SSL *SL 4000 E* with 12/8 Focusrite mixer built in. We very nearly started with a Cadac. Rupert Neve had left Neve but was commissioned to design the desk. Everything was customised; different. I was a bit nervous about having a complete prototype and in fact when we first switched it on it went bang and blew up! Anyway everything was sorted out and engineer Geoff Emerick, old Golden Ears, said it was brilliant.

"However, this country is so SSL orientated that we couldn't sell time on it. The desk in Studio Two is a copy of it. Studio One had the third one and it still sounds wonderful. Mark Knopfler and people like that come here because they like the Neve desk. So it was in order to accommodate those people as well as the SSL fans that we put the Focusrite channels in.

"We originally installed MCI machines, because they sounded good apart from anything else but also because MCI were relatively handy in nearby Florida. We changed one MCI for a Studer A800 in 1981 and then two years ago put in two Mitsubishi X850s. The monitors are JBL 4350s. Tannoys. UREI *Time Aligned* and Yamaha NS10s. We are always messing about with monitors."

Air Montserrat was originally designed for the American market because of its location but over the years they have attracted mainly UK artists.

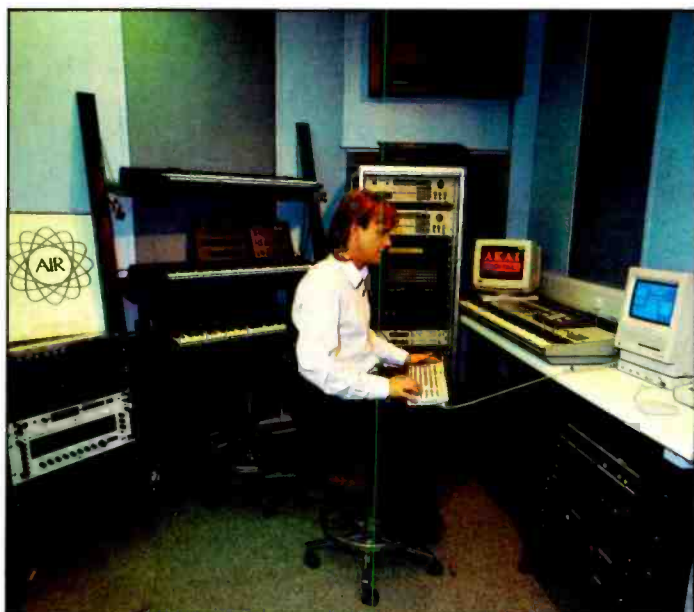
"Because it is part of Air London and is run from here we are in a position to look after the equipment properly. We change the maintenance engineer and tape up every four months or so, when they look as if they are starting to crack! A lot of people thought that you wouldn't get anything done out there because of all the distractions but (a) you haven't got A&R people breathing down your neck and (b) contrary to popular opinion most famous musicians are in fact workaholics; there isn't really very much night life and people do tend to get a lot done."

I can't think of many people who would object to being given the chance to try. □

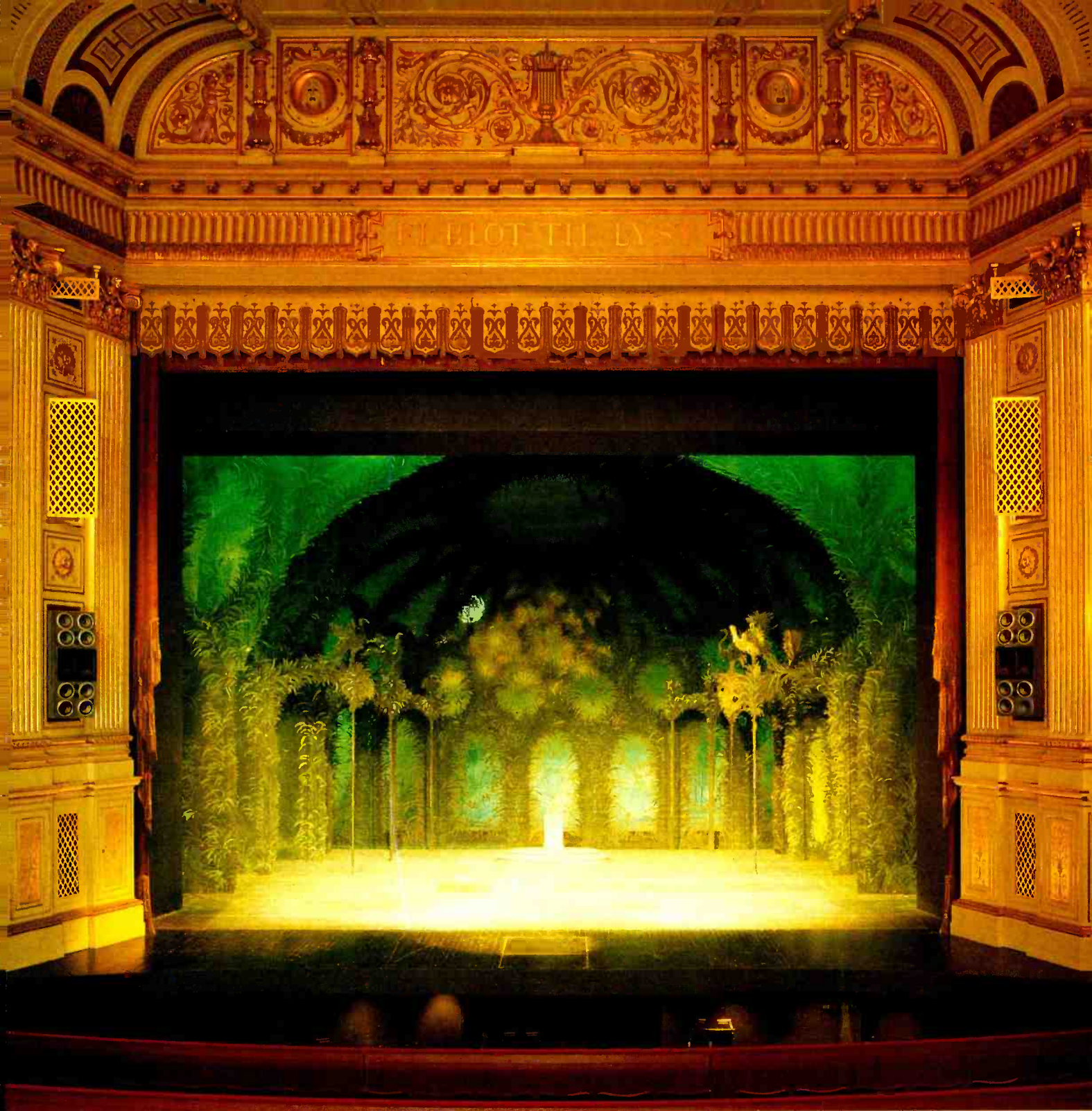
**AIR Studios, 214 Oxford Street, London W1N 9DF, UK.
Tel: 01-637 2758.**



Studio Four



Studio Five



THERE'S MORE TO OUR PERFORMANCE THAN MEETS THE EYE.

When the historic Royal Danish Theater in Copenhagen underwent modernization in 1983, plans called for a new sound reinforcement and stage monitor system. The designers found themselves faced with critically tight acoustical, spatial and visual requirements. Flexibility was essential: the theater needed a sound system that could deliver the full range of audio frequencies under all manner of theatrical applications, from ballet to musicals to pre-recorded accompaniment. At the same time, sight lines from every seat had to be maintained and leakage between the house and stage had to be controlled. The solution was an innovative custom design centered around standard JBL components.

JBL's exclusive Central Array Design Program (CADP) was employed to aid in designing and aiming the loudspeaker arrays.

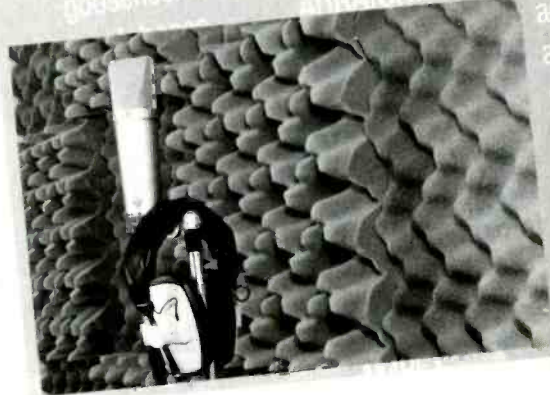
Coupled with extensive on-site testing, this resulted in a highly individualized sound system that specifically addresses the needs and requirements of the theater. Meticulous selection of components and professional installation are reflected in the system's superior performance, which has received consistently positive reactions from the public and performers alike, ensuring that the Royal Danish Theater will go on thrilling audiences for another 100 years.

To find out how JBL can be a part of the solution to your sound problems, and for a reprint giving the full story behind the design and installation of the critically acclaimed sound system at the Royal Danish Theater, contact your JBL distributor. Whatever your loudspeaker and electronics needs, there's more to our performance. JBL.



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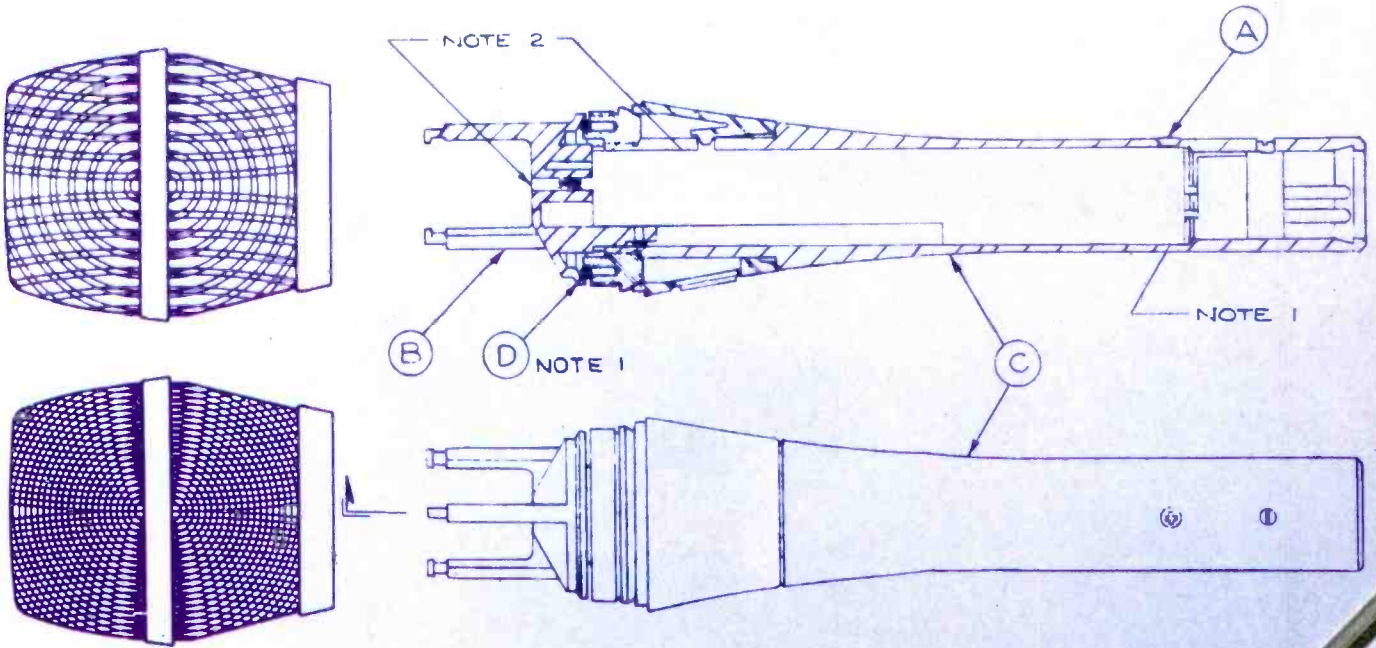
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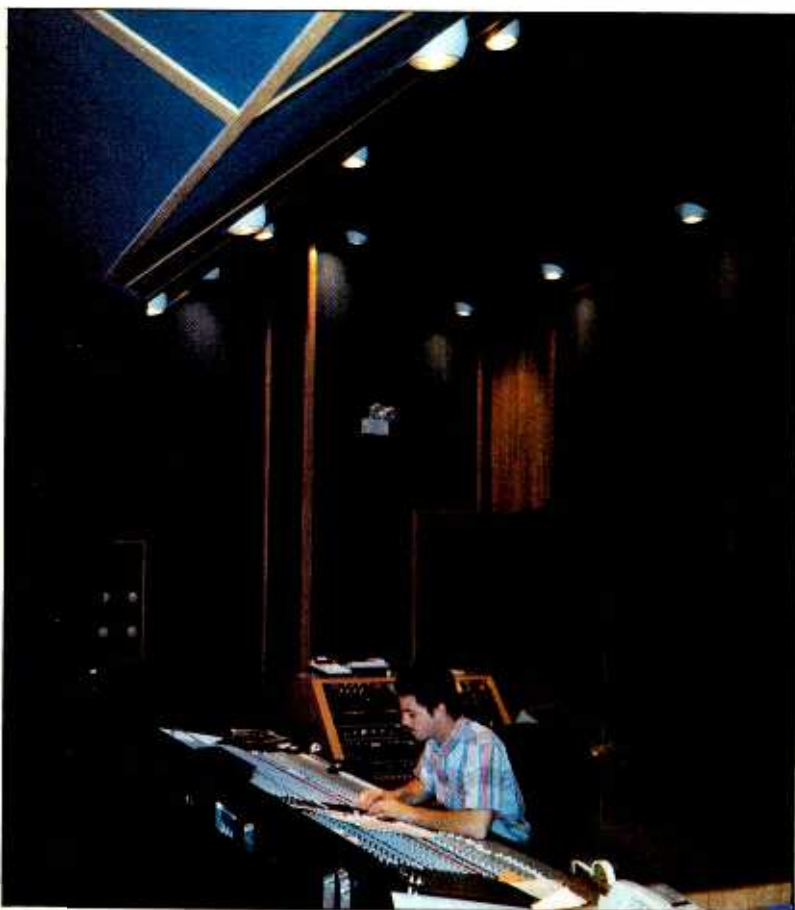
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SOUND STAGE

It is not very often that we have the chance to write about a studio that is truly different. It is even more unusual to find such a facility in one of the most competitive studio markets in the world but then again maybe this is the only place you could find it. Sound Stage in Nashville is the facility and they have recently completed a studio that many have wondered about—does the concept work and how? Keith Spencer-Allen reports

Sound Stage is situated in an attractive building on Music Circle, just off Music Row, whose frontage would, in any other city, pass as just a large and rather fancy private home. But in the varied building styles of the centre of the Nashville studio industry you just assume that it contains at least one multitrack studio.

Originally the Nashville studio for Mercury, the facility was



Frontstage: with no front wall

acquired in the mid '70s by a group of investors whose prime members involved on a daily basis include gospel music producer Bob McKenzie and businessman Ron Kerr. As Mercury, the studio consisted of a large room with a ceiling height in the region of 20 ft and was quite capable of holding 40 musicians although they would have been tightly packed in. In mid 86, the old room was completely stripped down to the concrete shell and two new rooms were built. The largest was completed in late November 86 and the second some months later. Tom Hidley designed the large room and it was constructed by the same crew he had in Nashville in 86 that built rooms for Masterfonics and remodelled Emerald. Sound Stage, is however, quite different.

As you walk into the large room at the front of the building (referred to quite properly as Frontstage following a nickname that stuck) you cannot help but notice that there is no control room wall and window. The control room is fully open to the musicians' area with no sliding partitions or other dividing walls at all. It is the kind of arrangement that most studio owners have seen merit in at some time but few have taken further.

Ron Treat is the studio manager although his office door shows his preference for being known as the stage manager. So who was actually brave enough to propose the lack of a control room wall as a viable concept?

Ron Treat: "It is not really a situation where we designed the room like this and then had to worry about people accepting it. MCA Records leases a major amount of time in this room and they were for it as were our studio owners. So people will have to understand about working in a particular way. In this town, when tracks are going down, the monitor mix is really secondary—this is the way that all of our engineers work as well as all the producers that we work with. The cue system and what the musicians are hearing is most important. The main monitors are usually turned down anyway."

Nashville is a town where you still see a lot of musicians playing together at the same time in the studio. But the influence of electronics has also helped the studio design concept become more realistic as sampling and synthesis has taken its place in the musician's tool kit.

"On our typical sessions we have mostly direct guitars; drums are playing D-Drums and the Wendel Juniors with real cymbals and real hi-hat. A lot of the time these may be the only mics in the main room. There is an iso room at the back of the control room for acoustic guitars and fiddles, etc. You find that on country dates the set-ups for track laying will change from track to track as the instrumentation changes—the fiddle player on Wednesday and the steel player on Thursday."

So if the room design does not cause problems for the musician, what about the engineers and producers even though they may already be working in a way more suited to the studio design? There are obviously limitations to accurately monitoring sound at a high level during recording but there is apparently a considerable advantage in the design for both sides of the production team.

"We have found that is far better to be in the same room as the musicians rather than looking at them through a window. If you are in the same room as the musician you can relate much better. I have learnt so much more on sessions about the banter and the things that are going on between musicians that you would not normally know about."

So to summarise this aspect of the design, it would appear that provided the producer is sympathetic to this style of working there are very few problems on the technical side, and the ability of the engineers and producer to just walk across to the musicians without crossing 'the great divide' as well as the better understanding that develops between them, makes this idea quite practical.

The room was quite different before the reconstruction. The control room was at the other end to the current control room. The original desk was a Trident and this, together with the other equipment that was removed, has found a home in two small low budget rooms that the studio owners have in a different area known as Centerstage and Downstage. The original control room area now forms a series of iso rooms—a slightly deader room suited to vocals and a more live one just off the studio floor that contains a Yamaha grand piano.

This room could also support drum recording should the session

Power Station selects t.c.electronic. Installs 6 TC-2290 sampler/delays

“I love the sound, the ease of operation, and the complete control over all parameters. With the three modulation parameters, speed, depth and waveform on the front panel, and the special key functions to access software TC. allows fine tuning of parameters that are predetermined in other units.

The combination of dynamic delay and pan modulation allow quite a variety of effects within a single processing device. T.C. was very smart about this. The 2290 does a lot more, and is more affordable than any other unit we've used.”

Engineer Don Rodenbach
Power Station N.Y.C.

“I mostly use the sampling... flying in vocal parts is easy and great. I can fly in a whole chorus and verse. Error-free, no glitches, easier and more accurate editing of samples, and storing of edited samples in pre-sets are great features.”

Engineer Rob Eaton
Power Station N.Y.C.



A demonstration model of the new TC 2290 was sent to Power Station by Martin Audio. The first engineer to use the 2290 was Don Rodenbach, who was so pleased with the sound, and features of the 2290, as well as "the clarity of the 32 sec. samples," that he bought one for his own rack. His unit then started making the rounds of various sessions at Power Station. Today there are six TC 2290 units at Power Station and no waiting. Each unit has 32 second capability for sampling (and delay), can be looked in perfect synch with a second 2290 for stereo sampling (*The new stereo link update*), and has Sampling 2 software, along with "Fast Trigger," update.

Sampling 2 Features

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SOUND STAGE

require it. From this room to the studio floor is a set of double isolation floors and a ramp upwards which apparently is due to the large amount of concrete poured for the new studio floor.

The physical geometry of the studio is very difficult to describe in detail and almost impossible to capture on picture. The ceiling slopes from the rear of the room getting steeper in three stages until it reaches a low point about the level of the rear console edge where its height is only about 8 ft. It then rises to the monitoring position and down the rear wall of the control area. The ceiling is trapped as are the side walls of the musicians' area, which are arranged as wedges pointing into the room. The rear wall of the musicians' area above the iso rooms is a large expanse of light wood that is angled backwards to fire reflected sound into the trapped ceiling areas. All trapped areas are covered in a dark blue fabric that contrasts pleasantly with the light woods used.

All the flooring is oak parquet running as far as the back line of the console and then becomes carpet. The rear wall contains RPG diffusers, which are normally left covered with curtain. It was found that their use was not beneficial to the stereo image in this particular room.

The console is an SSL *SSL 4048E* with *Total Recall*. The outboard equipment rack to one side of the console contains effects in the form of *Electronics 2290 AMS DMX 15.80S*, *Publison 1M 90*, *Lexicon PCM70*, *Eventide Harmonizer H949*, *Quantec QRS* and a pair of *Lexicon 224 XL* and a *480L*. Equalisation and dynamics control is with *A+D Vocal Stressor*, *dbx 165* and *160*, *Aphex Compellor*, *Teletronix Levelling Amplifier*, pair of *Sontec* parametric equalisers, *Valley People Kepex II*, *Gain Brain II* and *DSP*, and a *Sontex SDRC* dynamic range controller. Additionally there is an *EMT 250*.

There are 48 mic channels running to master panels distributed throughout the musicians' area. As was mentioned earlier, when track laying the musicians' cue is considered one of the most important aspects and so the Frontstage has a custom designed *Formula Sound Que* mix system. Because of the solid concrete wall construction it was not possible to mount the units in the wall so this custom unit was built that contains a power supply and supports eight 8-channel musicians' foldback mixers that can be adjusted by the musician to suit his requirements.

The monitoring is a *Hidley/Kinoshita* model designed for the *Hidley 30 Hz* room. Mounting monitors without a wall presents a few difficulties but in this case they are mounted on hydraulic stands. The base is covered with curtaining that when pulled back reveals the hydraulic pump and *FM Acoustics FM 1000* power amps. One advantage of this arrangement is that it is possible to move the monitoring width should it be needed. The stands allow a certain amount of isolation from the floor but most apparently comes from the 3½ inch poured concrete shell that the speaker cabinet is slipped into on the stand.

Ron Treat: "We discussed going for the 20 Hz design but because of the amount of concrete that you need we felt that you lose far too much 'window area'."

The multitrack is *Mitsubishi X-850* and this is installed with a complete set of *Apogee* filters. *Sound Stage* is fully committed to digital recording and as such does not actually own an analogue multitrack. The use of the *X-850* also allows a continuation of the design and equipment compatibility that has been employed throughout the construction of *Sound Stage*, *Masterfonics* and *Emerald* and to a certain degree a number of other facilities as well. It is easy to hire analogue machines should the need arise but the studio would normally copy to *X-850* to work the session. Mastering is on the *JVC DMS* system that is hired from the nearby *Mastering Technologies* company as needed. A lot of this compatibility comes from the influence of *MCA* clients and *MCA's* commitment to digital audio which is a very important factor in *Nashville* at present.

One of the reasons that allowed *Sound Stage* to be more experimental in the design of *Frontstage* was that there was to be another room completed shortly after known as *Backstage*. This was designed by *Russ Berger* of *Dallas* consultancy *Joiner Rose* and by comparison with the front room it is rather more traditional in that it has four walls on the control room. The approach is also quite different: the room is considerably smaller and more of an *LEDE*-type design. The *SSL SL 4048 E* spans almost the complete width of the control room. Due to the use of the same *Hidley/Kinoshita* monitors as in the *Frontstage* there has been little space for a window to the musicians' area but the layout is such that a large proportion is visible. The monitors are run inverted on free standing pedestals with height adjustment and powered by *FM Acoustics FM 1000* amps as in *Frontstage*.

The machine room is to one side of the control room and houses a *Mitsubishi X-850*. The room uses computer flooring for ease of air ducting and cabling as well as moving machines in and out. Within this room there is space for up to eight or nine machines with the *SSL* computers at one end and the noisier rackmount equipment in racks suspended from the ceiling.

Back in the control room, the finish is in a fabric colour referred to as grey but actually contains some brown. The ceiling rises from a low at the front of the room to a high at the rear. The rear wall contains six horizontal and three vertical diffusers that are a far more integrated part of the design and actually do improve the stereo monitoring area as they were intended. Light oak trim is used for side wall panels and the flooring is the same in parquet form.

Outboard equipment is housed in two racks that are normally towards the rear of the room and can be wheeled forward on umbilicals to the desk area. The equipment is the same as that for *Frontstage* but with a *Lexicon Prime Time* in addition.

The studio area is off the sound lock, which is finished in a very pleasant burgundy colour. The room is designed to hold a five-piece rhythm section in quite close proximity. Six *RPG* diffusers have been mounted in the ceiling as have a set of *Klipsch* monitors firing downwards.

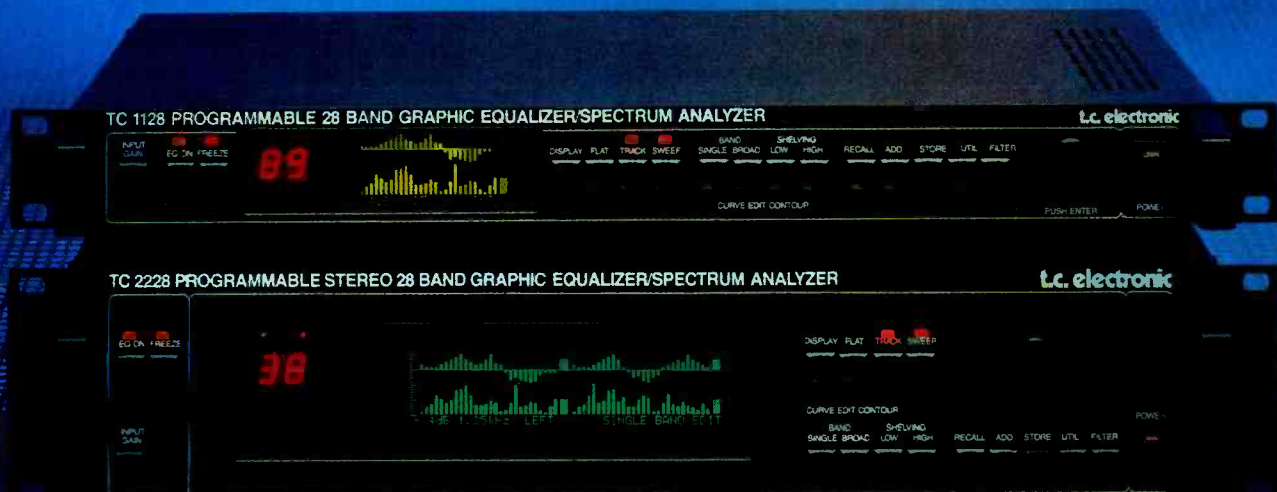


From the outside



Backstage control room is more conventional

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SOUND STAGE



Foam slabs are brought into use for separation.

The floor is divided into a number of different areas that may be partitioned with sliding glass. It has a very good small room feel with the musicians working close together. Large slabs of foam were being used to screen between musicians' amplifiers.

As Ron Treat said they have a minimal effect but they do give a valuable amount of HF attenuation between areas although they are quite transparent at LF. They can therefore also be used to dampen down the room even more if needed. Within the room there is a Yamaha grand and a vocal booth that is just inside the area after you come through the sound lock. Calling the large room running alongside the control room a sound lock,

however, is misleading as it normally doubles as storage space for musicians' cases and instruments and at the time of our visit was being used for the recording of a quite unique pedal steel-type instrument.

The finish throughout the area is a mixture of greys and burgundy and is very restful on the eye. Altogether Backstage is a very different but complementary room to Frontstage and with the advantage of being almost identical in equipment.

The studio is doing a wide variety of work but obviously country-type music is important although a far more hi-tech country than you might assume. Billy Joe Walker Jr, a well-established session guitarist, was in Backstage working on an album for the MCA Masters Series and was playing some tracks and discussing the techniques involved in triggering banjo samples. Sampling is not seen here as a replacement but another aspect of the musicians' abilities.

Sound Stage often works 24 hours and bookings for nearly six months ahead are common. The working pace is, however, faster than most other studio centres.

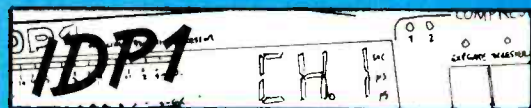
Ron Treat: "We would normally expect to spend four to five days on tracks for an album of 10 songs. I think that this is really quite quick but by Nashville standards where three songs in a session is normal, this is considered extravagant. It reflects, however, the different type of work that we tend to do.

"Many of the session players in Nashville don't read music but use what is referred to as the Nashville number chart, which is a notorious code that is spreading to other areas now. Even LA players seem to be using it. A competent musician can pick it up real quickly and there is no transposing necessary if you need to change key!"

The different approach to design at Sound Stage appears to be working with the Frontstage finding use in both mixing and recording with a more conventional design in Backstage. Also, surprising as it may seem, they have found a fair amount of acoustic compatibility between the two rooms to match the easier equipment compatibility, which has to be almost as unusual as the concept of the rooms themselves. □

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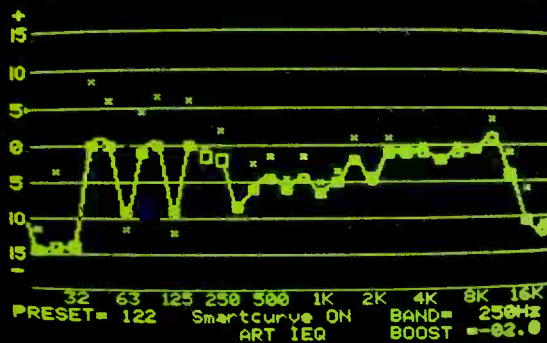
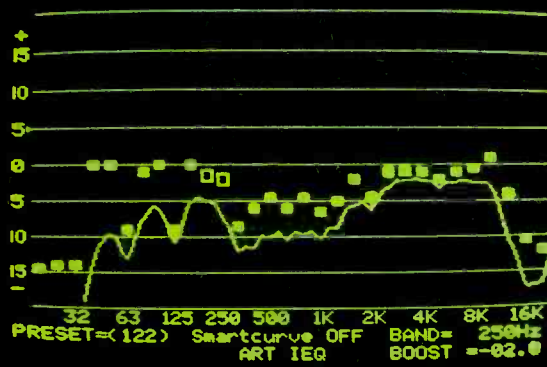
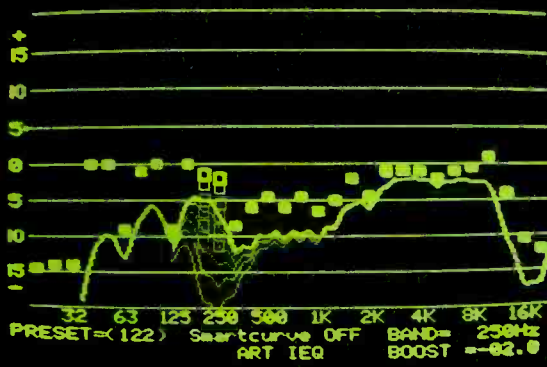
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AUDIOFRAME -THE SYSTEM

Eric Lindemann of WaveFrame Corp describes the AudioFrame system

Audio professionals are steadily increasing their use of digital audio technology. To date, however, they have done so by adding digital-outboard devices to their mostly analogue studios. There has yet to be a comprehensive, integrated approach to all-digital audio production.

WaveFrame Corp in the USA, have developed a system that they see as an entirely digital link between microphone preamplifier and output power amp. The *AudioFrame Digital Audio Workstation* consists of a number of modules and communicate via a powerful digital audio bus. The modules and bus are housed in a 19 inch rackmount unit called the digital audio rack. The modules presently include a 16-voice sampling synthesiser with up to 30 Mbytes of expansion RAM, 2- and 8-channel analogue-to-digital converter modules, an 8-channel digital-to-analogue converter module, and a systems communication processor with interfaces for SMPTE, MIDI, and VITC. The systems communication processor also has a 4 Mbit token ring Local Area Network (LAN) for interfacing to a general purpose desktop computer. This computer, with its high-resolution graphics monitor, provides the user interface for the system. There is provision for adding digital audio racks as the system grows.

Digital audio bus

The key to interconnecting these modules in a flexible manner is the digital audio bus architecture, a design approach that models telephone switching buses. The bus consists of 64 time-division multiplexed channels. Each channel is 24 bits wide, providing for 144 dB dynamic range. A provision is also made to expand beyond this 64-channel limit by providing connections from one digital audio rack to another.

The local area network which connects the control computer with the digital audio rack carries the equivalent of 128 MIDI cables with 16



channels each and allows simultaneous uploading and downloading of audio data to and from disk.

To understand how the workstation can be used, consider the typical application and configuration shown in Fig 1. Here, a 16-voice sampling synthesiser module communicates over the digital audio bus to a digital mixer/equalisation module. The mixer uses two digital audio bus channels as effects sends to communicate to a stereo digital reverberation module. The output of the

reverberation module is sent out over two additional bus channels to the mixer's effects return inputs. More bus channels are used to connect the mixer to the digital to analogue converter module which provides the analogue outputs for the system.

At the output of the sampler, before it interfaces to the digital audio bus, is a flexible voice routing system. In this example, there are eight sampler output channels. These might correspond to stereo piano outputs, stereo bass outputs, two channels of drums and two channels of special effects. At any instant, all 16 sampler voices can be mixed and routed to the stereo piano outputs. At another instant, eight of the voices might be mixed and routed to the drum outputs, four to the stereo piano, two to the stereo bass outputs, and two to the special effects. This configuration is completely arbitrary (dependent upon the user's sound needs or desires) and may change constantly throughout the course of the audio track.

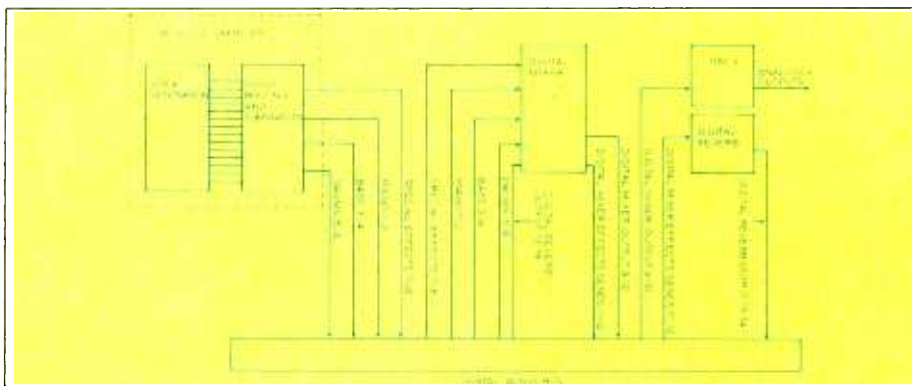


Fig 1. In a typical digital audio workstation application, the sampling synthesiser not only provides voices, but routes them to the digital mixer/equaliser module. Digital signals from the mixer can go to computer mass storage or to digital mastering devices. All the signals are carried by the time multiplexed digital audio bus

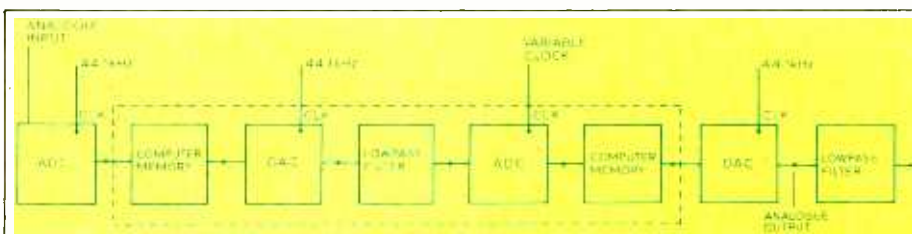


Fig 2. In an all-digital fixed-rate sampling system, the contents of the dotted box are implemented digitally via computer computation

Sampling synthesis

Sampling synthesis has become an increasingly important component in the music studio as well as in video and film post-production houses. In order for WaveFrame to integrate sampling effectively into the digital audio workstation environment, it was necessary to solve some difficult technical problems relating to the way that the sampler shifts the pitch of sampled sounds. Pitch shifting is necessary in musical situations if the sampler is to be used to play melodies without separately sampling every note. Pitch shifting can also be used to alter the character of dialogue, music or sound effects. By overlaying many channels of the same sound effect at different pitches a rich texture can be created. Through the use of such sound overlays, a stampede can be created from the recording of a single horse's hoof beats.



The AudioFrame Digital Audio Workstation presently includes a 19 inch rack that incorporates the digital audio bus, a controller, 2- and 8-channel digital-to-analogue modules, an 8-channel digital-to-analogue module, a sampling synthesiser, with memory expansion module and a systems communication processor

Previously commercial sampling synthesis relied on varispeed sampling to adjust the pitch of a sampled sound on playback. This approach works as follows: the sampled sound is stored in computer memory and output through a digital-to-analogue converter (DAC), followed by an analogue lowpass filter. To raise the pitch of the sound, the frequency of the clock that controls the DAC is increased. To lower the pitch, the clock frequency is decreased. When multiple sampler voices are desired, multiple DACs are used, each with its own variable-frequency clock generator. For example, playing an 8-note chord on a MIDI-keyboard hooked up to a varispeed sampler would usually result in eight DACs, each clocking at a separate rate.

That is the main problem with this approach: there is no way to digitally mix sample streams when they are all clocked at different rates. In the example discussed above, this means that the path between the sampler voice generator and the flexible voice mix-and-route system must be broken and an analogue mixer inserted. Such an insertion would be a severe compromise to the concept of an all-digital audio workstation. Putting an analogue mixer in the path means the digital stream must be converted to analogue before being input to the mixer. The output of the mixer must then be converted back to digital to interface to the digital audio bus. Both steps cause sound degradation. The point of the workstation concept is to avoid this kind of

proliferation of black boxes. With an all-digital audio workstation, a signal remains in the digital domain until the output of the final mix. This leads to superior sound quality and, perhaps even more importantly, it is the only way to maximise system flexibility while maintaining a consistent user interface.

Fixed rate sampling

To solve the problems inherent in varispeed sampling, a means of shifting the pitch of a sampled sound up or down without changing the output sampling rate is needed. A known original sound, A440 on a piano can be sampled at 44.1 kHz. Suppose a sound engineer reconstructs this sound from its samples by outputting it through a DAC, followed by a lowpass filter, and then re-samples it at a new rate, 46.7 kHz, for example. If he outputs his resampled stream again through a DAC but his time at the original rate of 44.1 kHz, the A440 will come out sounding like a G#, one half step lower. This process is demonstrated in Fig 2. While the original and final sample rates are fixed at 44.1 kHz the pitch of the sampled sound has been changed. The intermediate process of reconstructing and resampling the sound at the new rate is called 'sample-rate conversion'.

A way to perform this sample-rate conversion purely digitally without using DACs, analogue

filters or ADCs is needed. If a sampled sound is thought of as a series of points of different amplitudes, then the role of a DAC followed by a lowpass filter is to connect these points to form a smooth, continuous waveform. One way to look at this process is to assume that the spaces between the original samples are being 'filled in' with many, many new 'interpolated' points spaced infinitely close together. Or viewed another way, the sample rate is being boosted from 44.1 kHz to an infinitely high or continuous sample rate so the gap between two digitally sampled points of sound becomes a smooth transition.

A similar effect can be achieved solely within the digital domain. Instead of boosting the sample rate to infinity, it can be boosted to some very high finite rate. This is a two-step process. First, a fixed number of zero values is inserted between each point in the original sample stream. Then this new sample stream with the zeros is passed through a digital lowpass filter. Like the analogue filter at the output of the DAC, the digital lowpass filter smooths the digital sample stream so that the zeros are replaced with points which 'fill in the gaps' between the original sampled points.

The process of resampling this very highly 'oversampled' digital stream at a new lower rate consists of simply discarding most of the samples. Only those at a specified fixed interval determined by the amount of the desired pitch shift are kept.

AUDIOFRAME -THE SYSTEM

Boosting the sample rate higher, that is, inserting more zeros between the original sample points gives the possibility of higher frequency resolution when pitch shifting. The WaveFrame sampler boosts the sample rate high enough so that there is a 0.25 per cent (1/400th of a half step) pitch resolution.

The high internal sample rate seems to imply an extremely high computation rate for the *AudioFrame* sampler. While there are considerable calculations involved, some tricks can be used to bring this computation rate down to a practical level. Most of the number crunching in the sampler takes place in the digital lowpass filter circuit. The operations carried out by the digital filter are simple multiplication and addition. Multiplication by zero produces zero, and zero added to a number leaves the number unchanged. But the input to the digital filter consists mostly of the 'interpolated' or inserted zero values. Recognising this, each time one of these zero values is to be multiplied by another value or added to a sum, the operation can simply be ignored. In addition, since most of the output

values of the digital filter are going to be discarded, they don't need to be computed in the first place. Only the values to be kept are computed.

Audio distortion with varispeed

In addition to systems interconnect problems relating to varispeed samplers, there are also some specific audio distortion problems.

The output of a digital-to-analogue converter looks like a stair-step waveform. This waveform contains many high frequency components. In fact, the stair-step waveform contains scaled 'images' or repetitions of the original analogue signal spectrum at intervals of the sampling frequency. It is the job of the analogue lowpass filter following the digital-to-analogue-converter to remove these spectral images and so restore the original analogue waveform. In a varispeed sampling system, decreasing the clock rate of the

DAC make the high frequency components or spectral images of the DAC output creep lower and lower into the audible frequency range. When these are not filtered out they cause 'aliasing' distortion. To deal with this, the cut-off frequency of the analogue lowpass filter should track the clock rate of the DAC.

Unfortunately, it is quite difficult and expensive to build a hi-fidelity, variable cut-off frequency analogue 'anti-imaging' filter. The approach usually taken is to use a switched-capacitor filter, which typically has poor total harmonic distortion specifications as well as being susceptible to peculiar types of distortion such as 'clock feed-through'.

Some sampling synthesiser manufacturers, concerned with fidelity, have opted for a fixed cut-off frequency anti-imaging filter and have told users that they simply shouldn't shift the pitch of their sampled sounds down 'very far'. This is unfortunate since the sound of a violin, trumpet, or even some sound effects shifted down two or three octaves can be quite useful to sound engineers.

Conclusion

The digital audio bus and the all-digital, fixed-rate sampling synthesiser are two of the elements that make WaveFrame's *AudioFrame Digital Audio Workstation* possible. Together, they open up new possibilities for flexibility and artistic expression in professional audio production. Such advances as these will assure that in the next few years the importance of the digital audio workstation will continue to grow. Eventually such highly integrated all-digital equipment will dominate the modern recording studio. □

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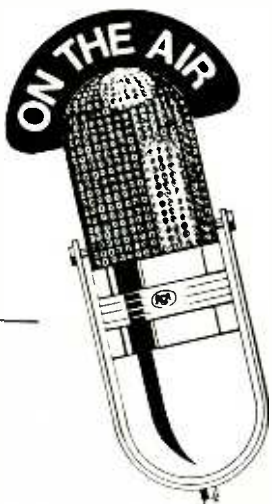


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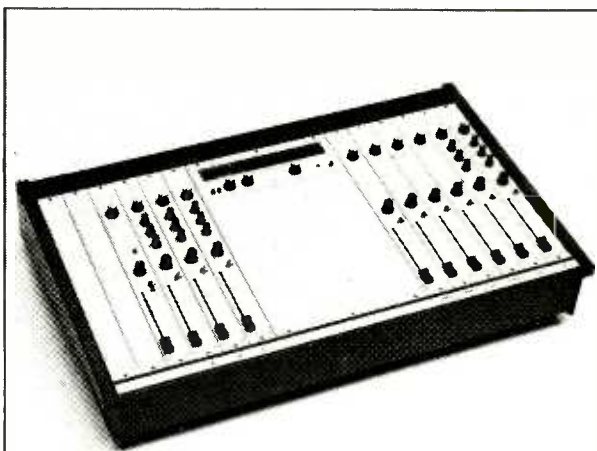
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TRACKS IN THE USSR

The Fleetwood Mobile recently seems to be making a second home of the USSR. Jim Betteridge talked to the crew about the special requirements for recording in this part of the world

In the December 1985 issue of *Studio Sound*, an article appeared detailing the Fleetwood Mobile and its three partners: Andy Rose, Michelle Reynolds and Nick Reynolds. Since then, while their equipment has remained pretty much the same save rebuilt console electronics, their portfolio has recently expanded to include two major sojourns to Moscow. The first was in January 1987 to record the ballet *Golden Age* and the opera *Boris Gudenov* for the BBC at the Bolshoi Opera House. Fleetwood returned in the balmy July conditions to record Billy Joel in the gigantic Olympic Stadiums of Moscow and Leningrad.

Fleetwood's reputation for reliability and Andy's earlier experience in Russia as an engineer with Mobile One in summer and winter made them an obvious choice for the project as Andy Rose explained.

"My experience with Mobile One was invaluable. When we made the first trip in '82 no one we knew had taken a truck as far in as Moscow or Leningrad and there was a lot to find out. For these recent trips we used the same trucking agency, Kepstowe Freight in London, who specialise in Eastern Bloc travel and we took more or less the same route. In fact it was virtually the same crew—Robin Scott was

producing and we had the same interpreters and lighting director."

It also made financial sense to the Billy Joel organisation. Nick Reynolds: "Before hiring us to do the job they'd considered flying in flightcased equipment from The States, but it proved too expensive; they also looked at shipping over an American mobile but that would have meant paying for three weeks' downtime while it was in transit and, again, proved too expensive. It took us only a few days to get there and we were also able to transport the two Mitsubishi multitracks and the various other extra pieces of equipment they needed."

The truck is rigid rather than articulated and as such is a box container mounted on a fixed chassis and cab. Though the console has been partly rebuilt the box and its contents, ie the studio, have remained largely the same since its original rebuild in 1985. A very significant change, however, was the replacing of the old cab and chassis with a much larger, roomier and more powerful Ford Trans-Continental. Nick, who does most of the driving and takes care of all things mechanical, explained how and why the change was made.

"There's a legal limit to the length of four-wheeled vehicles in England, and so when the studio was first built, in order to maximise the length of the control room, they fitted a small and

rather under-powered cab. Then, in August 1986, the Ministry of Transport decided to extend the limit. At that time we were doing a lot of long haul continental work and it just wasn't healthy for body and soul. So when we got confirmation of the first Russian job we decided to upgrade to a larger cab and chassis.

"It was difficult to find the size of unit we wanted built as a rigid rather than an artic. I eventually found one but it needed a lot of modification: it had a second rear axle that had to come off, the remaining one then had to be moved back and consequently the prop shaft had to be extended—it was quite an involved business but I managed to get it done in between recording commitments in about a month. Then we arranged to use five forklift trucks belonging to the Castrol Oil depot in nearby Croydon, to do the change over. Having unbolted the box from the original chassis, we had two trucks on either side and one at the rear; they lifted the box up, we drove the old cab and chassis out and backed the new one into position. It all went very smoothly and we had it bolted-up that evening. The very next day we set off for Russia. Obviously, we had it completely serviced and I went over every nut and bolt myself but it was still a bit nerve-racking because we'd never actually taken it out on a job. It was going through the ultimate test we could give it on its first time out and it performed extremely well, it didn't let us down once.

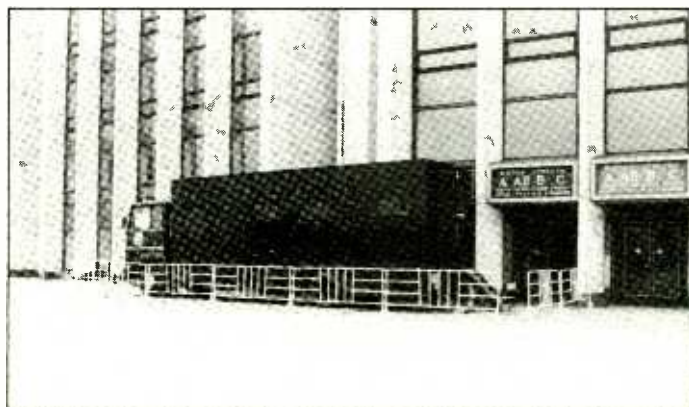
"It's the biggest cab you can get. The engine's a Cummings 280 bhp with a turbocharger that boosts it to 290 bhp, and it's designed to pull up to 44 tons. The most our truck ever weighs is around 16 tons, so there's really no strain at all, it's very fast and relaxing to drive. With the old cab everything was a bit of an effort. Going up a hill with a full load on you'd find yourself mentally willing it on, and even over just a few hundred miles that becomes very tiring, let alone the 2,000 miles each way to Russia and back. The noise from the straining engine was also very wearing for all three of us but now we all arrive at the job feeling 100%."

So what are the main areas of concern when taking a show to Russia?

Michelle: "Virtually any show that goes on in Russia involves the government at a fundamental level. It isn't possible for a Russian producer simply to decide to put a show on, book the venue, call up the artists and crew he wants and do it. He has to work with the government in a kind of co-production. That doesn't mean there has to be a problem, once the government are on your side all the doors that might otherwise be very firmly shut, miraculously open up, the massive pile of necessary paperwork materialises and everyone is very friendly and helpful. On that

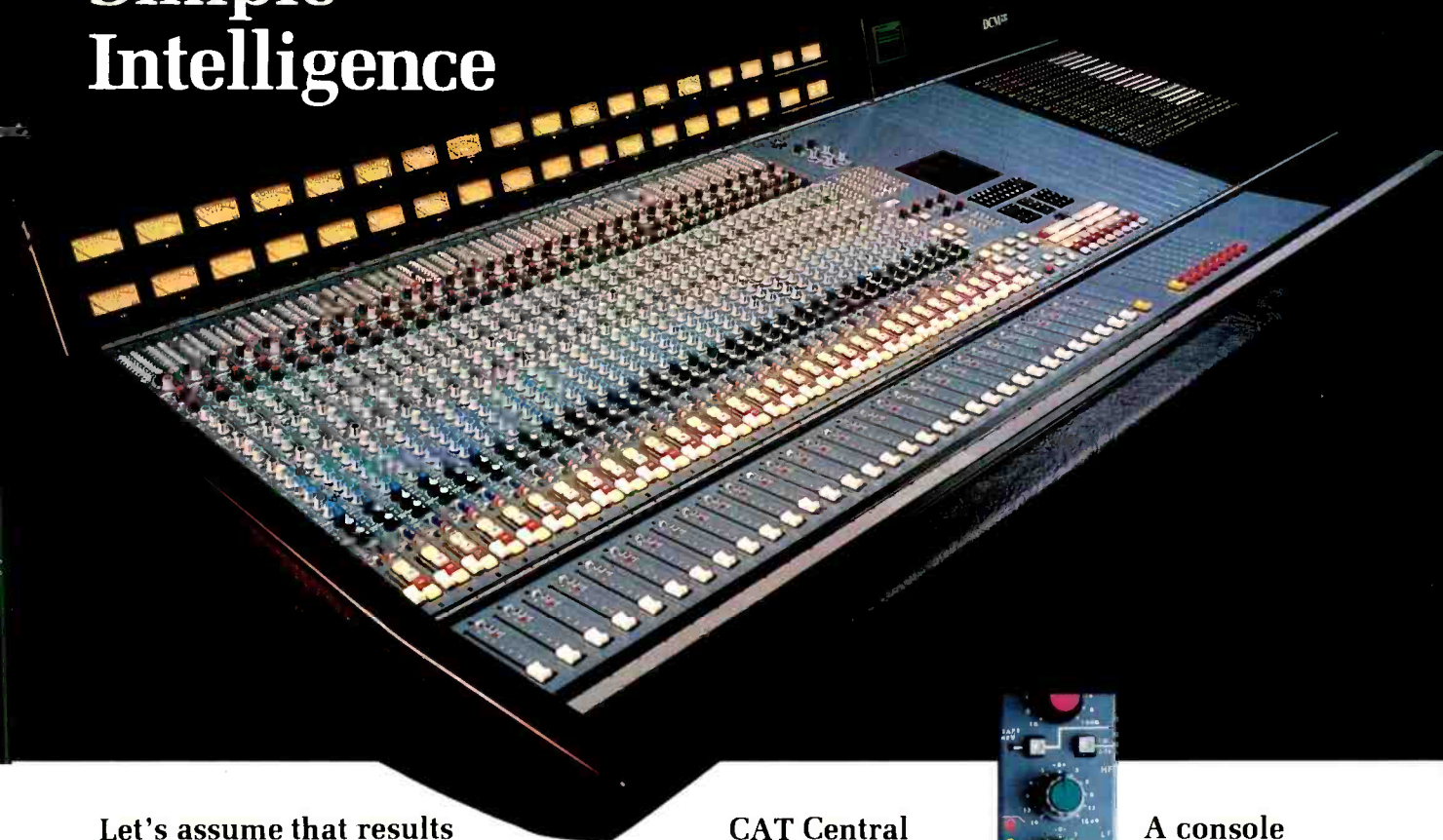


Fleetwood Mobile en route to Moscow in January. . .



. . . and outside the Olympic stadium in warmer weather

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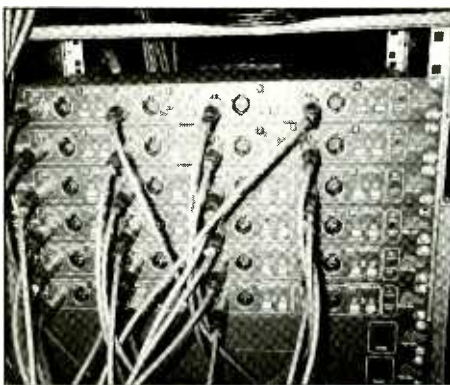
TRACKS IN THE USSR

basis, getting through the borders isn't a problem, although it can be time consuming. A major factor in helping things to run smoothly was the trucking company we used for both trips."

Nick: "Once we have our schedule worked out we simply go to them and tell them where we need to be at what time. They then take care of all the Russian paperwork, translate it into English, duplicate it, map out a route that we have to follow and give us all the permits and information about where to get the various visas and petrol coupons in the countries concerned. It all comes in a folder, stacked in the correct order so that as we reach the next border the relevant document or bit of information is on top of the pile. They charge a very reasonable fee and are incredibly competent and helpful. The only thing they can't get is visas; you have to apply to the Russian Embassy for entry visas into Russia and the Polish Embassy for transit visas. For East Germany you buy them on the border for about £10 as you go through. There's really no problem there if they see you've got transit visas for Poland and entry visas into Russia, it's obvious that you have to go through East Germany. Driving the mile or so between the East and West German borders is a bit uncomfortable. There are watch towers and armed guards with huge searchlights following you across, and massive tank traps (solid metal gates) at either end that can just cut the road off completely. When we did the first run in January the snow was really thick and blinding and we were the only truck driving through. It was pretty unnerving but there were no problems and actually everyone we dealt with was very friendly and efficient."

Michelle: "Getting into Russia isn't difficult either, it's just time consuming. It took us about eight hours and we were five hours out of the truck sorting out money, petrol coupons and, on the winter trip, trying to thaw the padlocks to allow the security men to take a look inside. You have to make sure you're properly equipped to survive in those conditions too. We spent the best part of £2,000 on arctic equipment and installed a diesel heater in the new cab. We just couldn't have done either trip in the old cab, or at least it would have been very uncomfortable. The back of the truck is sealed at customs and you're not allowed to open it, so you have to eat, sleep and live completely in the cab. There are two bunk beds behind the seats, Nick and I shared one and Andy had the other. Nick insulated and soundproofed it, and with the heater and the special arctic sleeping bags, it was reasonably comfortable even in those conditions—minus 40°—it was so cold in January we had to run the truck on 95% anti-freeze."

Andy Rose: "When we arrived in Moscow in



The BSS Audio active stage box system

January and the customs officers opened the back of the truck, it was colder inside than out. The food we'd brought over was completely solid; corks were hanging from their bottles on arcs of wine, and the lubricant I'd used on the console's faders had frozen up leaving the faders completely immovable. We powered up at about seven o'clock in the evening and when we returned at 10.00 the next morning everything was fully operational; we had no problems with any of the equipment at all. We'd lined up the two MCI 24-tracks for a session two weeks earlier in England and, after all the travelling and changes in temperature, they were still in perfect alignment.



Installed in Leningrad for Billy Joel

"Our involvement with the Billy Joel project in the summer was more than just turning up and doing a multitrack recording of the concerts; we also had to supply equipment and all the connectors for a British documentary film crew, an HBO film crew, a live broadcast to New York and film recording in various rock stars' houses along the route as part of the final documentary—our truck was like a travelling workshop. We had a distribution amplifier with 10 stereo outputs, and all the audio feeds for everyone came from us through that. We were just part of a huge operation; I think there were 130 crew in all, including all the lighting, rigging and PA. The complete tour lasted about 18 months and included Europe, America and two visits to Australia, although, of course, we were only involved in the Russian leg."

Nick: "The Billy Joel crew is like a family; I think the FOH and monitor balance engineers have been with him for about 18 years, and Jim Boyer, who was producing the live album of the tour, has engineered and co-produced his last four albums. They had an excellent PA company, Audio Analysts from Canada, and by the time they reached Russia, the crew knew exactly what they were doing and any possible teething troubles had been ironed out. We'd also seen the shows at Wembley and taken time to meet the people concerned, so everybody knew exactly what was going on. We'd spent a lot of time in England making sure we were well prepared because if you find yourself in Russia without the right gear you've had it. At home if you're short of a mic, a connector or piece of cable, you can nip down the road and buy or hire it. In Russia you just haven't got that possibility."

Rather than relying on the more standard transformer-based microphone splitter boxes, Fleetwood hired 72 channels of BSS Audio's Active Stage Box System from agents Wigwam Acoustics, and subsequently bought 24 channels as part of their permanent rig. Andy explained the advantages offered:

"The microphone stage box used by most PA companies simply has one set of inputs and three sets of paralleled outputs to feed the FOH mixer, the foldback mixer and, when necessary, a mobile. Generally these are just hard-wired without any transformer matching, which is no problem with just a couple of consoles, but with a third it starts to really load the mics, and there can be a very audible loss of quality. Each channel on the normal type of splitter box used by most mobiles uses a matching transformer with a single input coil and two separate output coils. Ideally the PA company will plug their mics through the mobile's box before going into their own, so there are no serious losses. This is fine in theory but most PA companies aren't interested in putting their mics through an unknown splitter box and insist that the mobile simply hooks on to their third set of parallels. The BSS system is fully electronic with a 10 k Ω high impedance balanced input that offers virtually no load extra to the PA mics, and two separate electronically buffered balanced outputs offering up to 10 dB of gain, plus a third that is split into two via a transformer. The results are audibly better.

"With the old system, if our cable coming from the lead vocal mic shorts out, it'll simply disappear from the PA, whereas with the BSS system, it will have no effect on the PA sound at all. A 1U 19 inch rackmounting MSR-604 unit from BSS offers four channels and costs in the region of £400. That really isn't a lot of money for what's offered; it's all packaged very neatly and

AMEK AND GML... THE FORMULA

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The GML System is purpose designed for multitrack and audio video post production applications, offering an intelligently advanced 'visual-mixing' environment with versatile automatic timecode recognition and programmable timecode 'off set value' commandability in each mix.

GML programmes are divided into two sections. The outer shell is used in normal mixing operations to enable the various write and read modes for each fader, and for initial storage of mixes. The inner shell contains the 'mix editor', which is the command centre for the editing of all data. The GML mix edit

utility provides the engineer with the capability of advanced mix editing. The user can selectively modify mix data, merging, splicing, copying, swapping, erasing, inserting and deleting as required. Additionally, data for individual tracks or for a whole mix can be shifted back and forwards in SMPTE-time.

GML also has a simple and flexible subgrouping facility, using 6 dedicated faders as submasters.

The GML System uses two Motorola 68000 series microprocessors clocked at 12.5 MHz with the Idris software operating system, 100% compatible with Unix V6 from Bell Labs, residing on a 40 Megabyte Winchester hard disk. A 1-Megabyte Dynamic RAM memory is provided for the 'mix in progress', with finished mixes stored on the hard disk and later, archived to floppy diskette. Provision is made for the structuring of mixes into directories and subdirectories, so that where a number of producers, engineers or clients use the system their mixes can be kept entirely separate and password-protected.

The system is slaved to SMPTE code and has an internal resolution of 8.33mS (quarter frame) and can control up to 128 faders and 7 switches per channel to that accuracy. Necam and Solid State Logic fader and Mute data can be converted to the GML format by way of the floppy disk drive input.

Ongoing software development will continue to hone the edge of the GML System, enabling it to remain at the forefront of technical excellence for the foreseeable future.



PHOTOGRAPHS OF
GML SYSTEM INSTALLED
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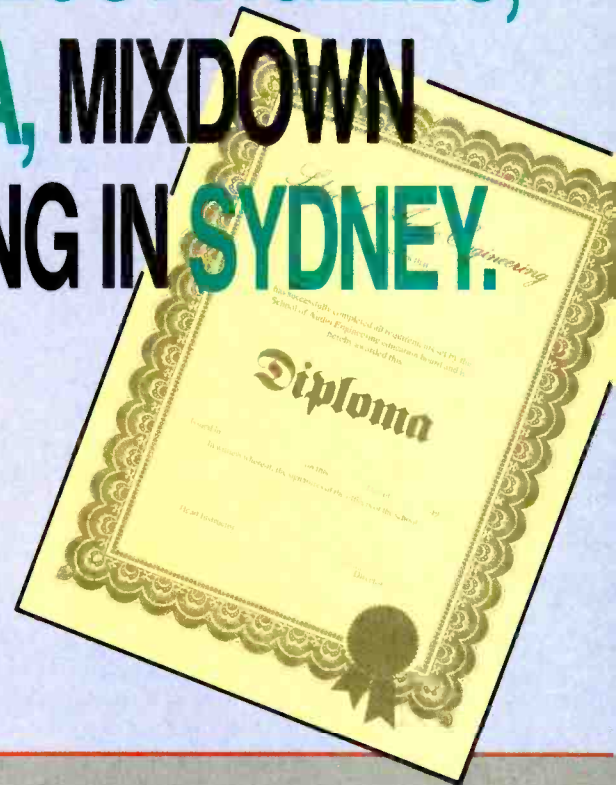
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TRACKS IN THE USSR



Billy Joel beamed from Leningrad to New York to over 400 radio stations

makes provision for almost any eventuality; the PA company may not have a spare set of feeds, or there may be a radio or TV OB truck that also needs a feed. It solves a lot of problems. The only reservation is that there isn't enough headroom. It offers 14 dB over 0.775 V, which is obviously fine for microphones but not enough for line level. The 10 dB gain is before the final output amp and so that eats into the margin. We had a bit of trouble with Billy Joel's radio mic because the output was so high it was distorting but we've since discovered from BSS that the window can be moved up simply by changing a resistor. It's fair

enough, really, when you consider that it was designed exclusively for microphones.

"Going to our truck we had 72 stage feeds through the BSS system plus eight hard-wired audience mics—30 to our normal 50-input, 32-bus Raindirk console, and 40 to the 40-channel, 8-bus Yamaha console that we installed specially for the trip. The Yamaha's eight output groups we patched pre-fade into the last eight of the Raindirk's 32 output buses so that we had final record level control of all 32 tracks from the Raindirk. We also monitored all 32 tracks from the Raindirk.



The Moscow performance

"Hilton Sound supplied the Yamaha console as well as two Mitsubishi digital multitracks, a technical engineer, two Sony F1 digital stereo systems, a couple of Revox B77s and other extraneous bits and pieces of equipment.

"It was apparently the first time a digital multitrack had been used in Russia. The multitracks were offset by five minutes, as were the F1s. We'd start one machine six minutes before the show and the other machine one minute before the show so that apart from 30 seconds for reel changes, each concert was recorded on two multitracks and two stereo digital machines. We used a total of 60 multitrack tapes. In addition the stereo mix was recorded on the two B77s, which we just overlapped by a few minutes. We used all 32 tracks of the Mitsubishis plus timecode and a 60 Hz pulse recorded on two of the spare tracks to allow for post-sync in America. After the three nights in Moscow, and then again after the Leningrad concerts, the producer Jim Boyer took cassettes of the show back to his room and, using a pair of personal stereos, compiled a single cassette with all six versions of each song one after another so that he knew exactly where the best performances were and could give Billy some feedback about how each song had gone for each performance.

"We also supplied a stereo feed to the film soundman who was using a pair of stereo centre-track timecode Nagras. The 18, 35 mm cameras were driven from a 60 Hz crystal clock which was also driving a central SMPTE timecode generator feeding the Mitsubishis, the analogue tracks of the F1s and the Nagras. The clapperboards they used at the start of every new reel of film had an electronic, realtime digital readout of the timecode, so there was an absolute reference for each reel. We also used the user bits of the timecode, so that you could look at any odd reel and know which performance it was from.

"The second night in Leningrad was transmitted live to New York via satellite, and from there it was transmitted live to around 400 radio stations. It was the first time an all-American crew has made satellite contact with America from Russia. It was just a couple of guys with a pile of flightcases. We gave them a stereo feed to their dish—set up just outside the stadium at an angle of 8°—which was just enough to clear the trees on the horizon, and it went off without a hitch. On top of that, one night Russian Television turned up with their scanners and about five cameras for live transmission, and they needed an audio and timecode feed for that. The problem with working in places the size of 60,000-seater Russian Olympic Stadiums is that when somebody asks you for a feed, they could be 200 metres away, and of course we were expected to bring enough cabling for any eventuality. We had over half a mile of multicore cable, let alone all the individual feeds and jumpers. It was a very complex setup and it's a real credit to everyone involved, on all sides, that nothing went seriously wrong."

The way things are going *glasnost*-wise, exchanges such as this will be happening more frequently as relations between the West and the Soviet Union continue to thaw. In just the last few months, news has reached us concerning Soviet installations and contracts with equipment from Bruel & Kjaer, Sondor, SSL, and Ampex—and no doubt more will come to light. Fleetwood's experience, in both technical and international aspects, adds to this growing list, which can only be a good thing for international recording. □
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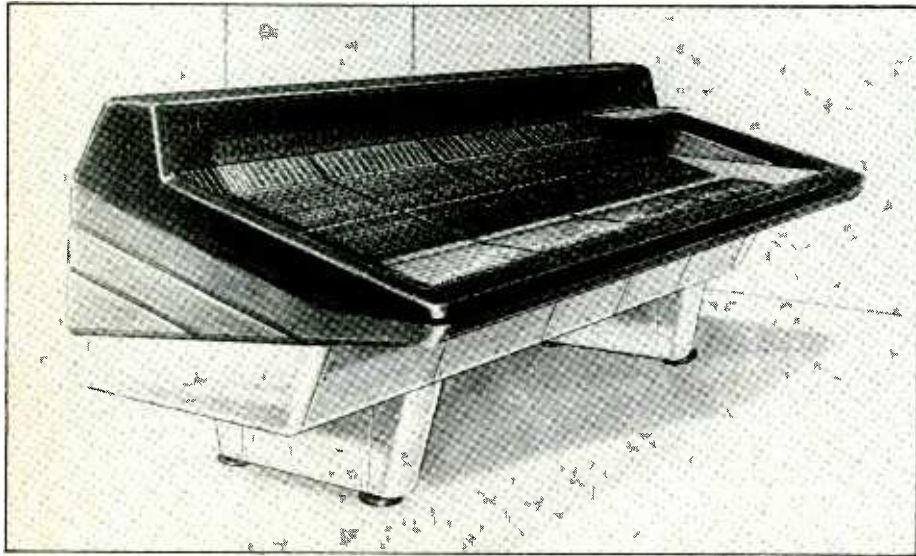
HARRISON—THE X PHILOSOPHY

The Harrison Series X console was a major advance in the area of console automation and it is possibly the most comprehensive digitally controlled analogue system available. In this article Dave Harrison of Harrison Systems talks to Keith Spencer-Allen about the X and its philosophy

On a practical level the Harrison *Series X* offers the recording engineer levels of control automation not previously available on any other console. Its ability to recall and reset virtually every control and switch on the console—not only in a snapshot mode but also dynamically—means that it is now possible to execute complex mixes without edit sections or the help of one hand from everyone in the control room. The benefits on complex mixes are clear but what might not be quite so obvious is the technical achievement of managing to implement the necessary digital control of the analogue signal elements. There

were many who doubted that a small company such as Harrison could fully realise the concept or that the idea of taking a console of 'traditional format' to such a degree of sophistication was the right direction to be heading. With about 11 consoles in service around the world their design approach would appear to be vindicated.

I had the opportunity to talk to Dave Harrison and the R&D team at Harrison Systems about some of these points. Having listened to the tapes of our conversations it was clear that Dave Harrison's explanation of the design processes is so clear and eloquent that aside from asking the questions my own input was superfluous. I have therefore left the article in this form.



Harrison Series X console—the physical concept

KSA: You have taken a very different design approach to that of other console manufacturers. You have largely dispensed with the central processor concept and have opted for a system of distributed intelligence. What are the reasons for this?

DH: Well actually we don't have a central processor at all. We have a central file storage system but that is only for storage of automation data. Modules communicate individually with the central file store via a network that they share with another seven modules. It is still very much a non-central process except for the disk-controller master processor. The console functions without automation as well. You can virtually unplug anything from anything and it keeps working. And why do we arrange it this way? Well frankly we could not handle the amount of data in a dynamically automated console any other way. The trouble begins if you try to use a single processor for increasing amounts of data. For example on a *Series X* module we generate 64 bytes of automation data. Most other desks produce at most 2 bytes of data per module and many are even less. If you take the *Series X* rate of data flow and are trying to get that into a central processor you hit two problems. Number one is that your central processor has got to be at least 64 times more powerful than a processor that would be used in a console of a more standard type; and secondly it is almost impossible to get that data in and out as far as communications between the central processor and the module. So you have a communications bottleneck and a processing bottleneck. The overriding reasons for distributing the processing is so it could be accomplished in a relatively relaxed manner with small but powerful systems rather than a hot machine that may be temperamental and have the capability of taking the whole system with it should it go down. By distributing the processing we eliminate the processing and communications bottlenecks and also provide inherent redundancy. I like to compare the central processor method with a business where one guy tries to make all the decisions and do all the work. Everybody else just sits around waiting on him and if something happens to him then the whole business goes down the tubes. A far more intelligent way is to distribute the workload and decision making amongst a community of people who have the adequate skills and are like minded. Such a system tends to be much more tolerant of disturbances within the system, be more efficient and make the best use of people power. The same benefits occur if you view the *Series X* as a community of like minded processors being used within the most efficient range of their capacity. It is also the direction that most people in any type of data processing and computation activities are going: moving away from single powerful processors to parallel processing.

Further it is based upon the automation structure that we used in our *PPI* film console although at the time there was not the technology available to implement it fully. So with the *Series X* we did not have to reinvent the wheel, just enhance its performance.

KSA: When you started the design of the *Series X* and were working through the basic philosophies how do you draw the distinction between what should appear in hardware and what should remain in software?

DH: We did it very much individually at each and every stage. Even at the point of the digitally-controlled attenuators—this part of the console had more engineering time spent on it

than any other. We started out saying that the console was going to be fully automated with frame-accurate dynamic automation on all functions, not just on a subset of the functions. We absolutely refused to build such a beast with VCAs. Can you imagine a console with 500 VCAs with three trim pots a piece?—forget it. This is the point at which we started.

So the first thing we had to do was find a replacement for the VCA. As we looked at this project we received almost every possible trade-off of hardware versus software to accomplish that replacement. We were trying to balance the



Under construction in the workshop

ultimate cost of the product against the performance against the long term stability, all of which had to be kept in balance. As it ended up there was absolutely no compromise between performance and economy and we arrived at the same answers on both.

We had to develop a lot of proprietary and unique algorithms to do the DCAs like that and that of course is software. So that kept the hardware cost down as the more that you can accomplish in software the less expensive your hardware is. So it became a very good balance there between a high performance and a not so expensive implementation cost in hardware.

The area where we probably have the most hybrid activity is in the dynamics section. We ended up with a real mixture. There is software for the microcontroller that controls the attenuator. On the gate function, the gate comparators are hardware that send a logic signal to the processors when it is under the threshold on the two hysteresis toggle points. And then again on the compressor side we tend to go with more of a software approach although of the three separate filters on the control voltage two are in software and the other is hardware. The choice was always made on the basis of the function at that point in the desk. There is a lot of very serious decision taking in that.

KSA: If we turn to the area of the control surface, many console manufacturers have seen the need to head in the direction of assignability of controls to a far greater extent than you have done?

DH: If by assignability you mean a modality in the controls where a few controls have broader functions, then yes. We have, however, introduced a track ball function that you can use with a *Macintosh* and a mouse and run the whole console. You can reduce control to the simplest element or the more traditional approach.

But now here is the problem. People get very confused when modality is carried more than one



Eric Roe Johnson and Dave Harrison

level deep, that is a switch or knob that does sometimes one thing and sometimes another. It also complicates it from the real world point of view if you have got to go through a number of layers to get to where you want to go. But what you have got to remember is that although the console

operator may be a very good engineer he may not be a very good technician. Even if he is a very good technician the most important thing that he is doing at that point is not a technical job. It is a musically creative job and he uses his ears and needs instinctively to be able to alter what he listens to in order to create the product that is going to satisfy him and his client and ultimately the purchaser of the product. So in all cases when faced with questions of 'Do we make it a little hi-tech or a little more user friendly?' we always went for the user friendly. I'm a pretty technical sort of person and I used to do a lot of mixing but I didn't want to know about the technical aspects when I had a room full of people and I was under the gun to produce. I wanted equipment that I was familiar with, that I didn't have to think about its operation so that I could concentrate on the project and client.

I think that this is what we have on the *Series X*; we have a user interface that virtually any operator who can handle a traditional desk will be able to master in a short span of time. Of course there are people who have built consoles that are little more than a video screen and a track ball but I don't see anyone rushing out to buy them. Henry Ford put steering wheels on his cars and they are still there. There are some things that don't relate to technology but relate to people and I think that the designer of the user interface has to remember that he is dealing with people. You can get so caught up with the fact that I can run the whole world from one track ball and two pushbuttons you are going to end up building something that maybe two people could run. But the rest of the world is going to go out and find something else to work with. So these are the reasons the *Series X* looks the way that it does.

KSA: What about the faders? You use a P&G moving fader. How does this fit?

DH: I said that we needed moving faders 15 years ago long before Rupert Neve ever put them in his

NECAM system. I felt that the moving fader was the optimum user interface for fader automation very simply because the knob or fader on the console is both an input device and an indicator device. You see what it is; you turn it to something else and then you see what it is. When you go to some sort of processor-controlled function you still have to have an input device and an indicator device and ergonomically when you look at a mixing console the operator spends most of his time on the faders. In order to truly do the job right you either have to have a moving fader where the indicator and input device is still the same knob or you have to separate them. If this is the case and the indicator and the input device are independent then you have a positionless input device. There is no way around it.

It is virtually impossible to use a positioned indicator device that doesn't move with the function and have complete freedom of update. We avoided that in our less expensive products for years by using an offset type of approach that everybody else in the business has used and people have put up with that but it is really not the best way to do it. I can tell you in the development of this product we looked at both positionless input devices and moving fader—different types of displays, with and without displays, with and without moving indicate, mechanically moving indicators. We designed prototypes and had them made by our machine shop, played with them and evaluated them but still came to the same conclusion.

KSA: You have gone for a lot of LED indication on the channel itself to show status. Do you think there is a limit to how much the eye can take in in this respect?

DH: Sure. We have a lot of indication towards the top of the module but not down in the operating area of the module, which I would call from the top knob down. The indicators are all above the top knob and they are there for the operator should he want to look up and really see what is happening. It is not cluttering up the operating area.

KSA: If we look at the modules themselves we see the concept of doubling up so that each module is almost capable of two separate signal paths. How did this approach develop?

DH: The module design developed from our approach to stereo modules and our *MR* type module where you had a record side and a monitor side. There were limitations in these

HARRISON—THE X PHILOSOPHY

designs and one area where they would not accommodate complete doubling up was the equaliser where both sides were controlled by the same set of logic elements. This meant that both sides of the EQ did the same thing. The other area that would not double was signal paths. Even though you have two possible signal paths through the module only one of them can go to the main output and only one of them can go to the mix output. Also there were restrictions on the auxiliary sends. We talked long and hard about which course to take, particularly with Glenn Phoenix of Westlake. What we ended up doing was making some modifications to the hardware that would allow two sides of the EQ to be independently addressed and we made some modifications to the data structure that would allow us to carry two sets of data per module for those sections that could be separated. We were still left with the situation where the main outs, the mix outs and each one of the aux pairs could only be sourced from one side or the other in the split mode. After more talking with studio owners and users we decided that this was a proper level of split capability and this is what we have ended up with.

The module does not truly contain two separate signal paths and I think this has been misunderstood by some people. You can run two signals through the module but in the case of a mixdown where you have two completely independent elements, one can go to the mix bus and the other to the main bus and then we can take the pairs of the main and bring them back into the mix bus. In this way you have two fully independent paths for stereo mixing. Each aux pair, however, can be sourced from either the right side or the left side by both.

To have made the module truly capable of handling two independent signals with the equal facility of a stereo signal would have probably required about a 60% increase in the electronics on the module and we did not feel that it was justified by the application.

KSA: I have heard some comment about your decision not to include the mic amp in the automation system. Would you care to comment on this?

DH: There are basically two reasons. The first is that the very essence of automation assumes that if you want to repeat the exact same settings, you

must be repeating the exact same control settings on exactly the same programme material. This means that dynamic automation can really only function on pre-recorded material so that you get exactly the same on each pass. And so when you start talking about microphones from the studio you are talking about a live performance, which is never going to be exactly the same. So this really does not seem to be a valid function for dynamic or preset automation. Secondly, any attempt to control the gain structure of the unit other than direct manipulation of the control element would be to the detriment of the specifications. Additionally the console will find wide application in film and video post where there is no mic requirement. We therefore see the mic pre not so much as part of the console but as part of the studio interface.

KSA: For your automation you chose not only snapshot capability but also full dynamic automation. Do you feel that this offers significant advantages over multiple snapshots?

DH: Our clients wanted all of their control functions to be indistinguishable to the ear from continuously variable functions as far as the operation is concerned. We all moved out of switched EQ 10 or 12 years ago to potentiometer-based swept EQs. Everybody is used to that now. We are not used to having to make a decision between this frequency and that frequency. On the amplitude side the gain is in ½ dB steps. On our fader it is ¼ dB resolution. There are people who claim that they can hear on a fader the difference between ½ dB and ¼ dB resolution. Frankly I can't but I am not building a console for me. I am building it for people who make records. For the man who can hear that difference this accuracy is important.

KSA: Are there going to be any aspects of the software that will be customised?

DH: We intentionally will not. All the consoles carry the same generation of software at the time they are shipped and then updates are made available. One of the benefits of a desk like the X is the ability for a client to take his source material and database and go anywhere in the world and truly recreate that mix and work on it. If we make tweaks for clients then the whole thing becomes invalid. We consider the ultimate user of these consoles to be the producer who will be moving around the world and expects to be

able to work anywhere. We will not be swayed by the studio owner who wants to break the chain and this is made clear in our sales presentations.

We do, however, listen very carefully to our studio owners but you find that they are not really very different and what one guy wants another guy really wants to. Their needs are much the same and so when one starts talking about something we start talking to the others and see if we can create a consensus and then we will implement an update.

The resident software in the desk is in EPROM and the automation file server is disk-based software. We have the ability to distribute software in various ways. We are contracted to a service that allows software to be sent to our representatives by modem link worldwide in a matter of hours.

KSA: Is there any spare space on the console automation system that would enable the studio to control aspects other than the desk?

DH: Absolutely. All they have to do is make themselves look like one of our modules.

Everything that we do within the automation system looks the same to the automation and all it needs is the standard interface and the standard method of operation. We would be very open to any manufacturer of peripherals who wanted to interface. We would show them how to do it, and provide sample software and help with the interface.

KSA: One of the features of the console is its ability for running diagnostics. To what level are these?

DH: We have to make the unit as easy to repair in the field as possible and we have done this with fairly extensive diagnostics in the module. One of the advantages in having a firmware controlled machine is that we can have an extensive diagnostics package in there to help the technician. Currently that diagnostics is at the module and unit level. The module has diagnostics, the global unit has diagnostics in the various processors there. We currently don't have a great deal with regard to systems level diagnostics—on a distributed network system that becomes much more difficult than in a monolithic system. As time goes on we will be developing system level diagnostics particularly in areas where we identify that it would help system maintenance. Our basic software licence for the *Series X* provides software maintenance free of charge for one year and for a further five years at a fee. I like to think that someone is going to be using the *Series X* in 15 years from now but the reality of the market is somewhat different, so five years seems pretty good to me.

KSA: What are your feelings about digital signal paths and do you see this as a worthwhile direction?

DH: The answer is obviously yes but the question is when. We do not have a market plan to do that. At the moment we can produce a far superior console in the analogue domain than digital. What we perceive the market as wanting right now is digital control. The marketplace is predominantly feature driven not by the quality of the signal path.

You do, however, have to look forward and know what studio requirements will be in a few years time and maybe try and build that in. And sometimes you can do it very successfully. Let's take the Harrison 32 *series*—the first console that we built 12 years ago. There are people waiting in the wings to buy these consoles. We would like to think that we have done the same thing with the *Series X*—after all, it was made by the same people, with the same philosophy. □

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Zagreb is Yugoslavia's second largest city and is a famous cultural centre. Opened in 1973, the Lisinski concert and congress complex handles as many as 50 concerts and shows a month, in a music season that lasts from October to May. The main concert hall can hold 2,000 people and a 120-piece symphony orchestra, while its stage features a massive 5,000 pipe, 4-keyboard, Walcker organ.

The Lisinski recording complex comprises four control rooms, an editing room, an electronic composing studio and separate rooms for central electronic distribution and video control. The new main studio control room is equipped with a 32-channel Solid State Logic mixing console as well as Sony and Studer digital tape machines. The entire digital room was put together in a remarkable two months.

In addition to the main auditorium, there is a separate dedicated recording hall that can be used to house either a full symphony orchestra or a live performance of a 20-piece band

with an audience of 300. This smaller hall also has a voiceover or solo instrument recording booth.

Acoustic design of the main control room was carried out by Mr Stamac of TV Zagreb in conjunction with Rudi Kiseljic, Lisinski's chief engineer. The design uses CAD and LEDE-type techniques, ie elaborate absorption and diffusion to create the illusion of a much larger control room as well as sharpening the stereo image. The resultant room has an RT of 0.25 seconds.

The new recording centre is an extension built on to the smaller hall, giving the main control room complete visual access to it. That said, over 100 tie-lines, including video feeds and talkback have been laid between the control room and main concert hall; these were installed at breakneck speed—just under two weeks. Visual access from the control room to any part of the complex, including any number of committee and conference rooms, is provided by several Sony *DXC* cameras, using over 40 km of video and audio lines.

Patching is located in a central distribution room into which all video and audio lines are linked. According to Rudi Kiseljic: "If a concert is taking place in the main hall, then it can be recorded using multitrack feeds to the SSL and simultaneously sent from central distribution to the remaining control rooms. This is a major advantage when we are combining digital recording with live broadcast transmissions."

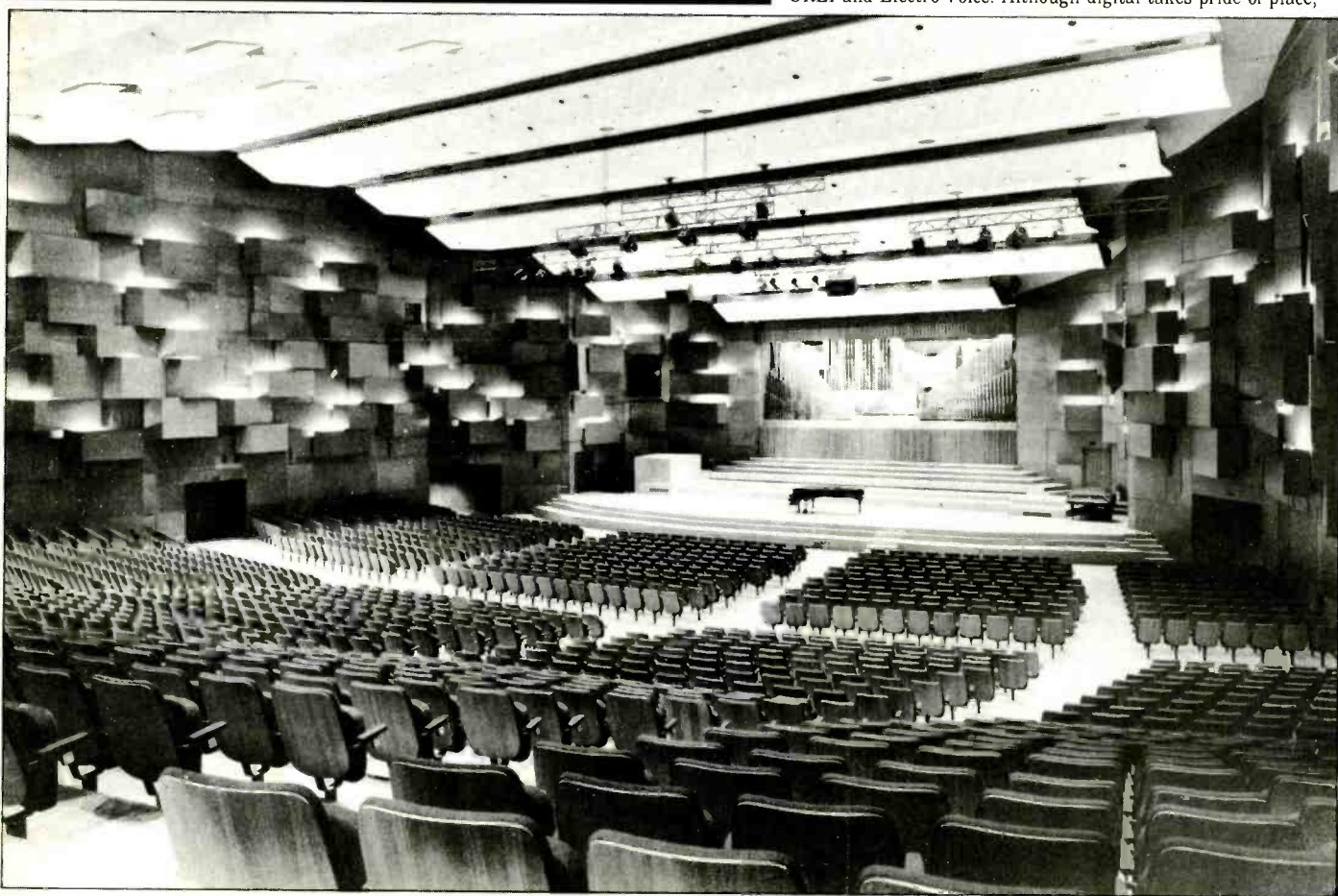
While the main motivation for the creation of the recording centre has been to offer high quality digital facilities to Yugoslavian musicians and artists, there has always been an important secondary objective of attracting a broader range of top musicians, orchestras and conductors to Zagreb.

The Lisinski engineering team first started thinking about digital recording three years ago. They finally decided to opt for the DASH format Sony *PCM 3324* 24-track recorder and a Studer *D820* 2-track. The other major investment was a Solid State Logic *SL 4040 TR* 32-input console, with integral Adams-Smith synchroniser enabling the handling of four separate recorders. There is also provision to accommodate extra *3324s* should the Centre wish to attract larger 48- or 72-track sessions.

Audio monitoring in all control, edit and video rooms comes from a variety of familiar sources with emphasis on Tannoy, UREI and Electro-Voice. Although digital takes pride of place,

LISINSKI

The recent re-development at Zagreb's impressive Lisinski concert and conference centre has given Yugoslavia its first digital multitrack recording facility. Nick Hopewell-Smith reports



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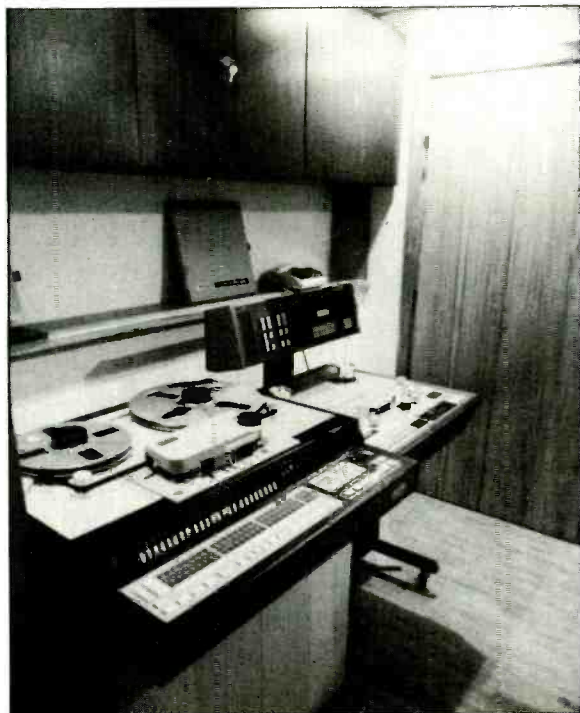
analogue recording is also very much in evidence and the facility is further supplemented with no less than 12 Studer A80 analogue 2-track recorders, two A80 8-tracks, an A800 24-track and four small Siemens consoles, while a Soundcraft series 2 24/8/2 is the central mixer in the electronic composing studio. All control rooms draw on a wide selection of outboard gear including EMT reverb plates, Yamaha REV7, Eventide H969, Klark-Teknik graphic equalisers, Yamaha SPX90 and many others.

From the project's inception, the Lisinski team was assisted from the digital recording aspect by Sony sales manager for East Europe, Africa and the Middle East, Mike Bennett. He also

helped liaise with a variety of Yugoslavian broadcasters to ensure that the facility's design met with their particular requirements. Bennett confirms that due to its size and facilities many live radio concerts are now performed at Lisinski for live broadcast on Radio Zagreb, or recorded for scheduled transmission—hence the emphasis on a multi-feed system.

Video facilities play an important role, ensuring that televised concerts can be handled with consummate ease. Bennett says: "Rudi and his team have always believed that Lisinski should be able to offer the Yugoslavian people the potential to benefit from future broadcast developments as well as the orthodox technology they enjoy at present, ie not only recorded television broadcasts but also DBS when it arrives."

The recording facility is currently being augmented with digital mastering facilities. At present this comprises a Sony PCM 2500 DAT system—one of the first in an Eastern European country—although plans are already afoot to implement a Sony PCM 1630-based CD mastering system. Even so with the PCM 2500, visiting musicians and producers already have the ability



Machine room

LISINSKI

to take away a finalised, edited master tape that can be used for producing CD, DAT, compact cassette or vinyl.

"It's a stunning facility and given the comparatively low cost of recording in Yugoslavia, I believe that Lisinski can be added to many European record labels' lists of first division recording centres," adds Bennett, "particularly the classical specialists."

Lisinski confirm that they are very keen to promote what Kiseljic refers to as "the total package concept". There are 12 rest rooms, four bars and a restaurant, together with a selection of well-appointed accommodation suites. Along with the obvious studio facilities, Lisinski is not only able to offer a huge choice of instruments for hire, but can arrange flights, transport and accommodation for large orchestras as well. □

Vatroslav Lisinski Palace, Lisinski Recording Studios, 41000 Zagreb, Trnjanska bb, Yugoslavia. Tel: (041) 534 227.



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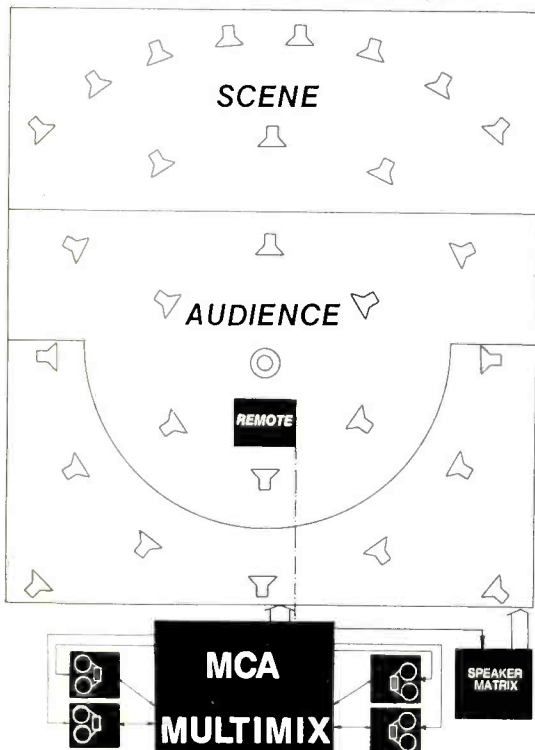
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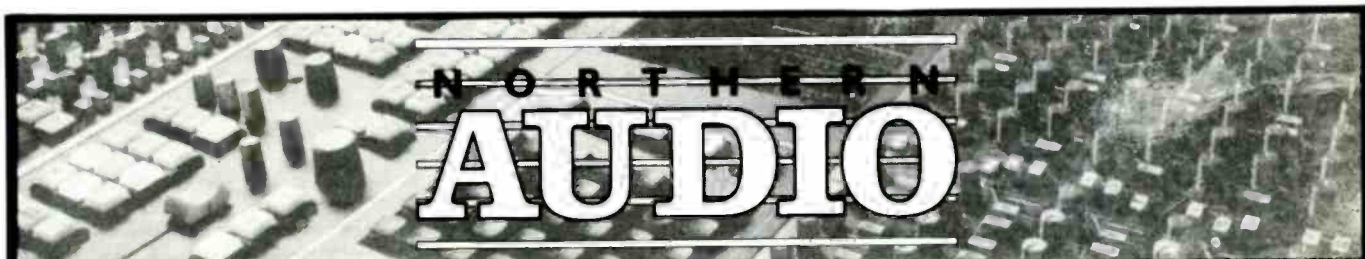
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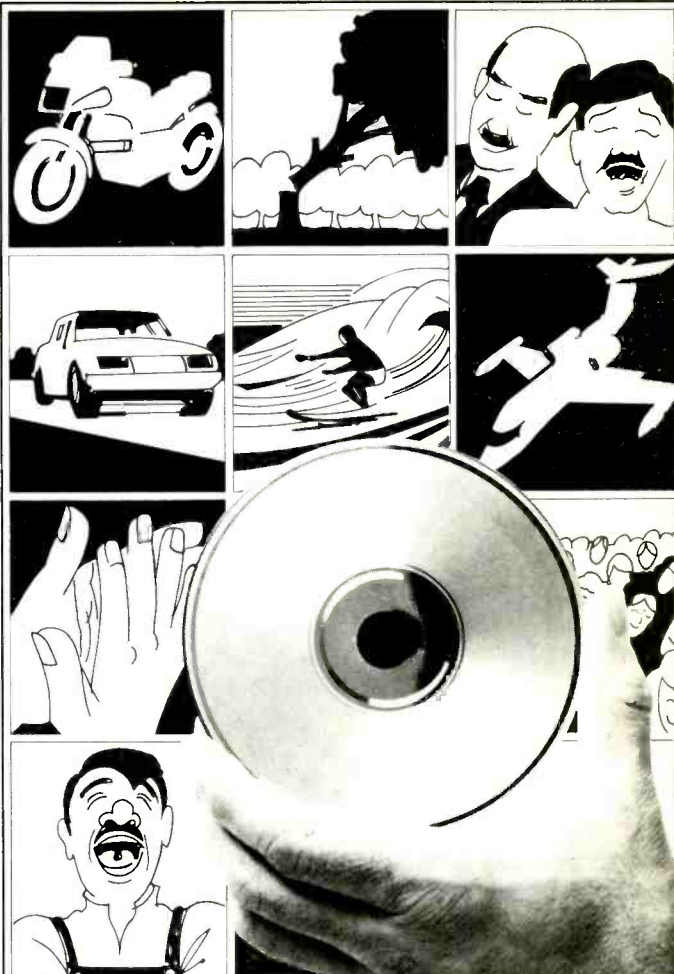
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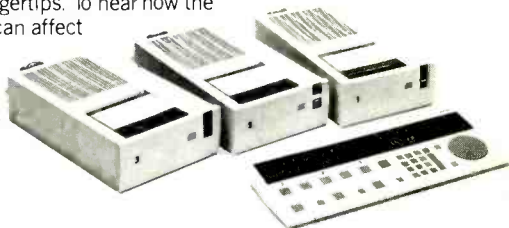
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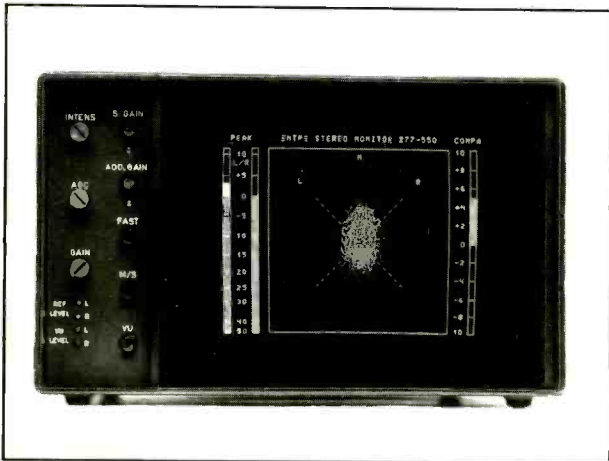


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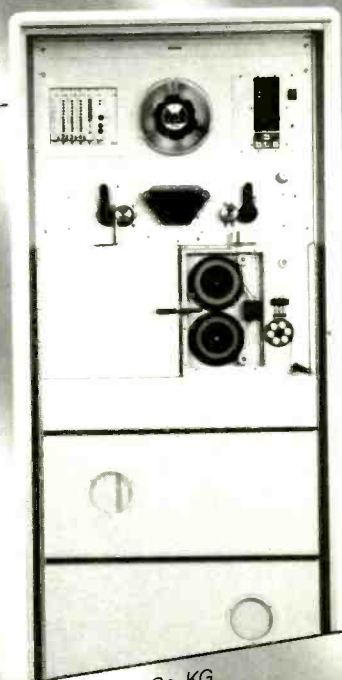


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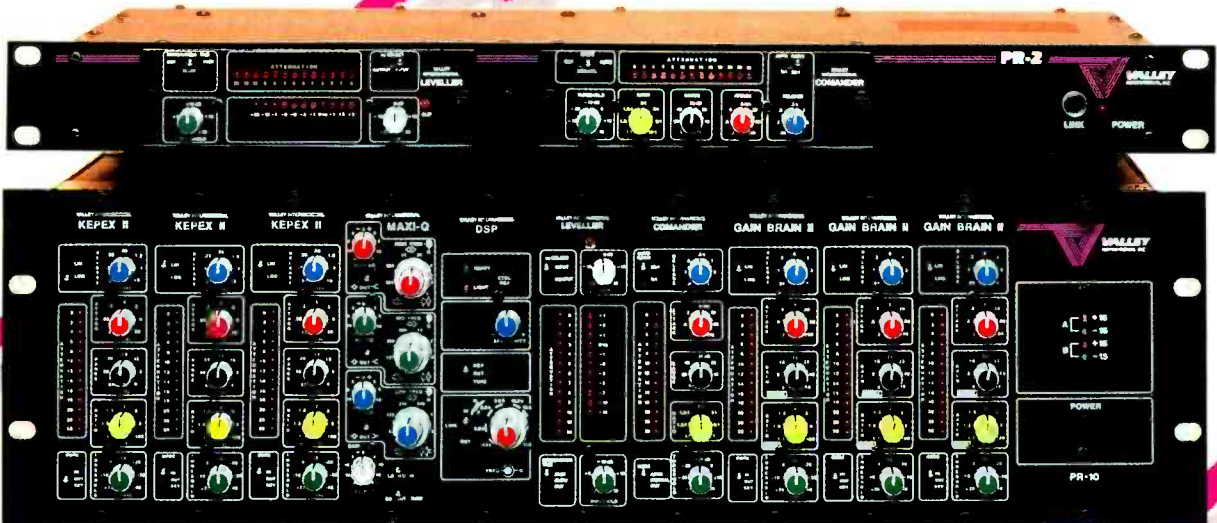
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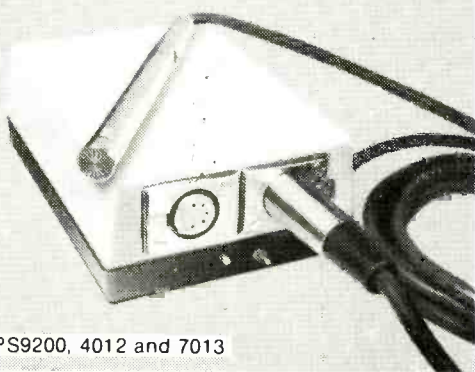
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BARRY FOX'S BUSINESS

Although it was entirely predictable that the UK Government should ditch the idea of a tax or levy on blank tape, because a once clear issue had been irreparably muddled by the IFPI's clumsy campaign for Copycode and anticopy legislation, the baby has gone out with the bath water. Musicians and composers have lost out because there is nothing in the new Copyright Bill about commercial rental.

Whereas LP records and tapes soon wear out if hired out, laser-read audio compact discs last far, far longer. So will CD Video discs, if the format ever takes off sufficiently to interest the rental trade. Many libraries already hire out CD's for a few shillings a night. Some people just listen before buying; some listen and decide not to buy; others copy instead of buying. Each way the library earns revenue for years from one disc, while the artist gets nothing.

Almost everyone agrees that something must be done about this by amending the Bill before it becomes law. Unfortunately there is no agreement over what to do. A complete ban on rental is obviously overkill; a royalty scheme, with libraries filling out forms and sending in returns per rental, would be impossible to police.

Well here's a simple, pragmatic solution. It builds on the system already quietly run by the film and video industry. I've already put it to some of the more open-minded people in the music industry.

Many thousands of shops in the UK rent out pre-recorded tapes of 'lead titles'—recent feature films—at around £1 to £2 a night. The film companies sell lead title tapes to the video libraries at a premium price—around £50—which takes account of the fact that the tape will be hired until it wears out.

A minor amendment to the new Copyright Bill would let record companies sticker some audio discs from each pressing run with a non-forgable label, eg a holographic R. The record company would then charge a premium from these 'R' discs, the premium being tied to the durability of the carrier, eg x% over base price for an LP or tape, 2x% for a laser disc that will last longer, 3x% for some as yet uninvented format that lasts even longer.

The public would buy unstickered product at base price. But it would become a criminal offence for a library to hire out anything that did not carry an 'R' label. The Copyright Bill already makes it a criminal offence to use someone else's trade mark without permission.

To protect libraries against record companies who put lunch and manicure before business, it would be a defence against prosecution for a library to prove that the record company had not made 'R' label product readily and promptly

available.

With the 'R' scheme there would be no extra paperwork for libraries, no bureaucracy for collecting or distributing money and no room for account-swindling—because the extra money earned from selling rental discs would automatically go direct to the record company. From there it would go to artists and copyright owners in exactly the same way that it does from the sale of ordinary records. Crooked libraries who hired out unstickered product could easily be caught out by trap orders and spot checks by vigilant record companies.

The blank tape and electronics hardware companies would lose nothing. It is unlikely that any fair-minded member of the public would object to paying the little extra on rental that the scheme would cost them. Magazines currently earning money from rental adverts would have a clearer conscience. For minimal extra work, the record companies and copyright agencies would gain financially.

As already drafted, the Copyright Bill does not legalise copying so it leaves room for further technical developments and legislation on anti-copying. The 'R' scheme would leave audio and video software companies free to tinker with their recordings as they saw fit, using any anti-copy systems they chose.

This is essential because anti-copy technology is already in a state of flux. The *Macrovision* system currently hinders domestic copying of some, but not all, pre-recorded video tapes. (Try copying a recent Warner Home Video title like *Heartbreak Ridge* from one VHS machine to another...) *Macrovision* can probably be made to work with video discs, too. But some of the latest VHS machines defeat *Macrovision* anyway. If the IFPI gets its way over Copycode legislation, some CD music discs will in future not copy on some tape recorders. Future recording formats, like solid state chips, could be made copy-proof.

The 'R' scheme sidesteps all this. It leaves the public with the right to rent but with pot luck on whether the rented material can be copied or not.

Sometimes people say things which say it all; a few words that sum up years of debate. John Eargle said it all on compact disc and digital audio: "If you have heard even one recording that sounds right, then that proves the system is inherently good—and poor results have other causes."

Rex Baldock said it all recently on Copycode: "It's lucky the system was just bad enough for some people to hear its defects immediately. If it had been a bit better we might not have found out until it was too late."

And here's a thought for those who wonder why

Sony paid \$2 billion for the CBS audio and video software vaults. Compare the market value of even five-year-old electronic hardware designs with the market value of five- 50- or even 500-year-old software. Skim through the racks in your local record or video shop and see the amount of old material that sells well. Then check the sales prices of last year's hi-fi. That's why the Japanese electronics industry wants to buy into Western software.

Launch of the *SoundStation II* prompts a reminder on what is happening in optical storage. It also, incidentally, makes me wonder whether people who design equipment ever actually use it.

Few will disagree that the Digital Audio Research *SoundStation II* is a beautifully styled piece of kit. Clearly it builds on the disk storage and computer editing technology developed by New England Digital and AMS, and adds to the growing number of manufacturers offering the chance to use optical WORM (Write Once Read Many) disks instead of, or as well as, magnetic Winchester hard disks. The time is ripe for this. Compusonics/Ferrograph have already shown a more basic WORM recorder; both AMS and Fairlight are starting to use WORMs. Lexicon have been talking about it and the NED Synclavier system has a WORM option for audio storage currently available and in use.

So far optical WORM disks have been expensive, largely because the computer industry has played its usual crazy game and gone off in all directions, creating a chaos of different standards for data processing disks. It is not just that different firms use different sizes (14 in, 12 in, 8 in, 5¼ in and 3½ in), they use different data coding standards so that even two disks of the same size may not interchange.

Dutch Philips has a joint venture on optical disk with American company Control Data in Colorado Springs, called *Laser Magnetic Storage*. I visited and was impressed by the engineers but deeply unimpressed by the muddling middle management who seemed to be embroiled in silly Dutch-Yank politics. LMS hoped to set a standard for 5¼ in optical disks but failed when the Japanese took advantage of the Colorado feud and ganged up on the rest of the world. And the new Philips/Sony standard for CD WORM (using a standard size 5 in CD) is completely different and incompatible.

At first sight it seems an attractive idea to have a single optical drive that can handle either 5 in CD WORM discs (with a 'c') or 5¼ in WORM disks (with a 'k') as in the *SoundStation* and Compusonics/Ferrograph optical recorder. But so far it's completely out of the question and likely to remain so.

All the WORM disks used by the data processing industry work on the Constant Angular Velocity (CAV) principle. They spin at constant speed, like a gramophone record or magnetic computer disk. So the surface area can be neatly divided into pie-shaped sectors, which are labelled. This is what lets the control computer access data, whether text or sound, very rapidly. *SoundStation* and Compusonics/Ferrograph optical WORMs are CAV.

CD WORM works, like an ordinary CD or CD ROM, on the Constant Linear Velocity (CLV) principle. The disc speed continually varies, to keep tracking speed virtually constant within the range 1.2 to 1.4 m/s. So the disc stores data as one long stream along the spiral track. In other

words it's like a tape streamer. Although the data can be labelled, the disc surface area cannot be divided up into labelled sectors. So access is by finding the right turns of the spiral and then homing in on the wanted data packets.

The *SoundStation* has a very attractive touch screen for operator control. Apart from the often forgotten problem of how mucky these screens get from sticky hands, individual touch areas are very small and close together. You need small, oriental fingers to be sure of switching the right option rather than the one alongside it on the screen. During one demonstration the DAR operator twice hit the wrong touch area.

What scared me was that one of the menus, towards the bottom left of the screen, gives a choice between edit, record and playback for each of the four tracks. What happens if you touch record, which is next door to playback?

"A lot of people have pointed that out," says DAR. "When the machine goes on sale in March there will be an interlock system, so that you have to press a button on the console as well as touch the screen to enable recording."

That makes sense. But how can anyone who works in the real world design even a prototype touch screen that puts one-touch record-enable so close to playback-enable on a super sensitive touch screen?

Meanwhile, expect rapid development in the field of magnetic disk storage. Fujitsu now sells an 8 in Winchester disk drive with 1000 Mbyte (1 Gbyte) capacity, with data transfer rate of 3 Mbyte/s. In theory, with each mono channel running at around 100 kbytes/s, that's fast enough for nearly 32 channels of audio in realtime, although in practice, it's rather less. A new 5¼ in drive from Fujitsu has a capacity of 389 Mbytes and transfer rate of 2.5 Mbytes/s.

Around 10% of Winchester capacity is lost when the disk is formatted (data blocks labelled for easy access) but that still leaves a whole lot of Mbytes. And as a useful rule of thumb, each Mbyte of disk capacity stores around 10 s of 16 bit mono.

The latest 3½ in floppy disks can store 2 Mbytes, but data transfer rate is only 500 kbits/s or 60 kbytes. This is too slow for realtime audio. Also, formatting, reduces the 2 Mbyte capacity to 1.4 Mbytes, which is a big pile of paper text but not much use for audio.

Why must classical music concerts be so stuffy? The musicians perform, the audience applauds, the musicians stand up and the conductor goes through a ritual of hand shaking and standing up and sitting down. Then they all go home.

At the end of last year, Kodak sponsored a concert of Christmas music at the Royal Festival Hall given by the Royal Philharmonic Orchestra and a gaggle of choirs with Philip Ledger conducting. The evening ended with four specially arranged carols, with harmonies reminiscent of Stan Kenton's famous re-working of *God save the Queen*.

The audience was encouraged to join in. "Sing loud," said Ledger, bending the first rule of stuffy classical music and deigning to talk to the audience, "because the harmonies are a bit strange and we need a strong melody."

The audience joined in and loved it. To tumultuous applause Ledger went through the hand shaking ritual and then flourished his arms. Ah good, he's going to break rule number two and play an encore, we thought. But no. Up got the orchestra and disappeared.

Afterwards at a private reception the RPO's

figurehead gave a speech saying how difficult it was to fill concert halls and how impossible it was to survive without sponsors.

"Where is it written," I asked him later, "that there shall be no encore at the end of classical concerts?"

"Nowhere. We would play encores if the audience wanted them. But they don't."

Oh really?

It's at times like this that I see why Britain's orchestras need all the subsidies they can get.

Technicians at TVam have been on strike over how many people it takes to work a portable video camera—their union says five, the management says three. The management is laughing by showing old '60s *Batman* and *Happy Days* tapes. They are cheap and the word is

ratings are up. People prefer re-runs to a lot of the usual TVam garbage.

Over Christmas, Channel 4 showed an hour-long jazz programme bought in from the USA. Nice, but nothing too special. At the end the credits ran for 2 minutes 45 seconds. A total of 125 names rolled up: 12 musicians and the rest production crew. All the usual credits were there plus a whole lot of new ones: switcher, CMX associate, associate talent co-ordinator, assistant technical co-ordinator, limousine co-ordinator, apprentice executive and spiritual guidance.

Perhaps some of them should try applying for jobs in Camden Town.

And soon after, on the very same day that workaholic Michael Grade joined Channel 4 and put the fear of God into his staff, a well-lunched BBC executive returning to his office after a long holiday break was overheard to say:

"No...no problem...I'll just see what's to be done and delegate." □

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MARTIN POLON'S PERSPECTIVE

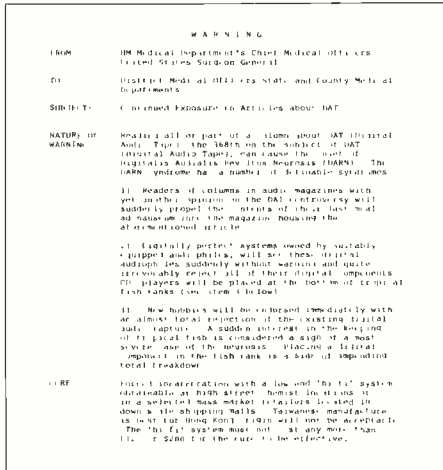
If there is anyone in audio who does not know the latest chapter of the continuing saga of DAT vs the Copycode filter, we shall recap for you. When we last finished viewing Chapter 68 of this continuing saga of the search for truth, justice and the American way, the US Congress had turned the matter over to the technical judgement of the United States National Bureau of Standards (NBS). The Bureau's 3,100 employees and \$220 million budget is a clear indication of the importance of the work being done at the Gaithersburg, Maryland facility and at Fort Collins, Colorado facility and at other venues as well. The Bureau is the official creator and maintainer of standards for the United States Government and its work has directly contributed to at least three Nobel prizes. Nonetheless and despite its well-earned reputation for excellence, the Bureau has had to rely on outside consultants to support the questions validating (or invalidating) the concepts of Copycode scanning and filtering.

The questions being asked are:

- Does the digital Copycode scanner system achieve its stated goal of preventing digital audio tape machines from recording when protected pre-recorded material is involved?
- Does the system of protection encompassing the filtered 'notch' diminish the quality of the pre-recorded material being so protected?
- Can the Copycode system be bypassed and if so, how easily?

The outcome of this research will be used to guide the US Congress in making a final determination on the fate of DAT in the United States and, so hope the record companies by extension, the rest of the world. However, the pot continues to boil just beneath the surface. Both sides have grudgingly decided that the Bureau will be impartial and is asking the right questions. How well the Bureau can carry out its task with a battery of outside consultants remains to be seen. Many industry experts feel its not a case of whether the Bureau or its experts are capable of delivering an appropriate degustation as to the relative merits of each side of the Copycode issue. Any negative feeling has more to do with the relative shortness of the time frame for this kind of significant study to be done properly. But it seems clear that the Bureau felt threatened in its role as the Congressional scientific think tank and made a measured response to the Congressional demand for timely results as given.

The climate in Congress has changed considerably since the original effort was mounted by the RIAA to stop DAT in the Fall of 1986. The situation is best summed up by a long time Washington observer: "In 1988, Congress is unlikely to 'slap a Jap in the yap', no matter what the issue. The outcome of the NBS study can only help Congress avoid a politically touchy situation one way or the other. If the NBS says Copycode is innocent of all charges, a deal can be cooked up to substitute a blank tape and machine



import royalty for the notch. If the NBS finds Copycode guilty as charged, then everybody says 'Oh well, we tried'. The nearly \$200 billion in direct and indirect investments made by Japan in the US economy provides a certain degree of leverage in this and a lot of other situations. This is 1988 and it is an election year and less than 15 days in the first month of the year, Wall Street took another pratfall* of 150 points. No, I don't think we will see any untoward action on DAT."

The real threat to the audio and music industries is not the outcome of the NBS study. The threat to be dealt with is the perception of both the record industry and the audio industry that the squabbling over DAT and Copycode has left with the music consumer. While one could argue the point that the so-called 'acoustical hypochondriac' has made worrying about the presence of the Copycode filter a virtual new category of fetish right up there with collecting ladies corsets, the real impact of 18 months of sniping has been far wider. The music industry has precious little time left before the whole issue of Copycode and filtering becomes a major topic for the consumer press, newspaper consumer reporters and television consumer reporters. Once the public perceives the whole issue as a reality, there is virtually nothing that will change that perception except for the passage of time.

The time frame for the successful adoption of DAT technology is not as brief a time on this orb of ours as the record companies have suggested. DAT recorders will not be selling for 'considerably under the five hundred dollar price point' for some time to come. It seems clear that we will be in the 1990s before DAT recorders even approach the under-\$500 mark. The decline of the dollar against the Yen has created a very unlikely scenario for the traditional 'knee-of-the-curve' price deceleration we have all come to expect of new consumer electronic products. The presence of significant VAT duties on Japanese products reduces the advantage that the EEC member countries have achieved vis-a-vis their currencies and the dollar. All of that coupled with the existence of a large base of relatively satisfied cassette recorder users will limit demand, and demand will limit price reduction. The DAT

recorder does not fill the classic description of a 'breakthrough' product. It does not perform a new and unique function. Of course, DAT play-only machines are another issue and could drive price reduction in both the record and play-only modes. The demand potential for play-only machines in cars and for portable usage could exceed 50 million units worldwide if pricing is made attractive by the DAT hardware makers. A curious unknown will be the newly recognised potential for hardware makers such as Sony and Philips to use their hardware clout to price DAT players competitively so as to encourage sales of a newly emergent DAT software catalogue.

It's also time to accept the fact that DAT recorder sales have been positively grim in Japan and Western Europe where consumers have had some real exposure to the product. Reports from Canada are mixed. The problem may be one of expectations. The DAT players we are seeing for the consumer market are still early generation units with all of the assorted design ramifications that befall a leadership product. The first CD players were accepted as a marvel of new technology despite some flaws. That level of tolerance of digital innovation is apparently not being extended by prospective buyers to DAT.

The reality of digital audio as it effects the consumer is also an issue here. Relatively few consumers have purchased sound systems appropriate to the dynamics of the compact disc relative to the large number of CD players sold worldwide. The resulting inability to truly 'hear' the impact of digital technology tends to be self-limiting. The qualitative improvement of the DAT over cassette recording is not going to justify the large price differential for most consumers in the audio mass market. This too will slow adoption of the DAT format.

What is so fascinating about the concerted effort the world's record companies and IFPI and RIAA have mounted against DAT is the enormous amount of free publicity that the campaign has engendered for the whole concept of digital audio tape recording. It is as though the well documented and hard learned lessons of the pitched battle waged against VCR by the Hollywood movie industry and specifically by Universal Pictures and Walt Disney Productions over 10 years ago has been already forgotten in the related campfires of the record industries. The Japanese consumer electronic companies on the other hand have learned their lesson well from that previous encounter. The VCR garnered what some analysts listed as close to 'a billion dollars worth of free publicity'. It is clear that the concept of DAT has benefited from the current controversy and that the public's awareness of the technology is significantly higher than if the topic had been ignored.

There would appear to be some value in sitting all of the DAT combatants down (some of them straddling both sides of the line) and finding a solution at the bargaining table. Some of the more likely alternatives would bring peace back to the consolidated audio industry and we could soon find hardware and software companies working together again to regain both the lost market share from the discretionary dollar and

*Pratfall—This is an American expression that does not easily translate across the Atlantic. It describes a sudden and great drop as one would experience should one's legs be violently removed whilst one's body were in an upright position.

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PERSPECTIVE

the public's sense of trust and value. An acceptable outcome might use one or more of the potential solutions discussed below.

Solution number one is some kind of royalty system involving software (blank DAT media) or the hardware (DAT machines) or both. The willingness of the DAT hardware camp to accept some kind of royalty is as much an acknowledgement of the legitimacy of the position that the record companies find themselves in with copying as it is a recognition of some price having to be paid for the relinquishment of the Copycode conundrum. The amount of the royalty would be a matter of discussion between the various parties but it seems likely that a fee of \$2 to \$50 per DAT recorder is not far off the range. Tape fees ranging from less than \$1 to \$5 will also be a topic of discussion.

Solution number two is a technological scheme such as the Philips concept of using a digital flag to limit a DAT recorder to making only one copy of any given compact disc. There is a renewed interest amongst the DAT signatories in sitting down with the record companies to find an acceptable solution. Whether that solution uses the Philips technology or another alternative technology, there is strong attraction to any solution that will protect the record companies' right to control profligate copying of their property without directly infringing the recorded music on a disc.

Solution number three is to accept the reality of the status quo, the issue being the inevitability of the successful introduction of DAT players concomitantly with DAT software and not necessarily with DAT recorders. One point has emerged during the last few months. The EEC Parliament is now unlikely to 'lock step in unison' with the US Congress whatever the outcome of the National Bureau of Standards' report. Observers have begun to concede that the real issue may well have as much to do with profits from CDs being threatened by DAT software sales as anything else including copying. Sony now owns the largest storehouse of recorded software available in the Western World and may well be dominant in terms of the ability to get DAT players to market. One point is clear: Sony did not purchase CBS records and assume some \$2 billion in debt to a range of Japanese and other banks for the privilege of owning a catalogue and sitting on its corporate hands. Philips is right behind in terms of the amount of software extant and the potential for DAT player hardware dominance. JVC is another switch-hitter: able to bat in either the software or hardware venue.

Amidst all of this is the consensus of opinion that the CD has failed as a portable music device and that DAT would be the ideal tool for the provision of digital music in a portable environment. A portable CD player is a lot like a light Russian meal: it sounds like a good idea in theory but it becomes oh so heavy in practice. There is strong pressure to place automotive and personal DAT players in the hands of the consumers by the middle of 1988. Ford has

announced the availability of an automotive DAT unit for its top of the line Lincoln Continental by summer 1988. Other auto makers are following in Ford's footsteps. Casio has announced a 1½ lb portable player for the digital 'walkperson' marketplace. So it would appear that the die is indeed cast.

As to the efficacy of forcing legislative controls on DAT machines, the sheer impossibility of enforcing such limits does not bode well for any kind of solution that depends on criminal strictures. A law enforcement official of note commented anonymously on the issue. "I've said it before and I'll say it again. You do not have the horses in the stable to control something like this, which is the smuggling equivalent of the victimless crime. There are DAT machines being sold legally in Canada right now and in Mexico in the future. The same kind of smuggling that goes on right now with alcoholic beverages and cigarettes would encompass DAT machines as well. There are trackless miles on the Canadian borders that are patrolled by one man. The Coast Guard is starving to death without adequate funding. Lots of luck in keeping DAT machines out of the country with a legislative solution."

Solution number four is to accept the fact that we all sleep in the same bed and we have been eating far too many crackers in that bed for the last 18 months with this DAT/Copycode controversy. The public has begun to treat consumer audio hardware and recorded software as though they were mature products having only a minimal hold on discretionary spending. Whether that is related to the associated bad press from the controversy or is just a reflection of a reduced positive output from the music industry is unclear. The owner of several large records stores in the States sees the current dilemma clearly: "The industry needs to reassemble the old allegiances and work together to sell products. CD player sales are lagging badly and CD software sales are a shadow of what they could be. I feel this DAT thing constantly. Consumers come into my stores and ask if the records have been Copycoded. It's the CDs they are most afraid of since they spend the most on them. They also come in wanting to buy DAT cassettes to use in their cars since they have heard that these would be digital and would make their car systems sound better. On the other hand, I have had people bring CDs back to the store and tell me that the 'filter' has been used. I exchange the disc and rewrap it and resell it. I know that nothing is wrong with the disc but I also recognise the power of the media in communicating all of the arguments surrounding DAT to the public. If we don't put this all to bed quickly, you ain't seen nothing yet."

The record store owner continues: "In 1988, the public is expected to indulge in jars of parsley pesto, Italian-made shotguns, hand-held computer schedulers, Cuban meals, having babies and computerised exercise bicycles. All of this plus staying home and watching rented videotapes is IN. What is OUT for 1988, so the experts say is Cajun food, very short skirts and the compact disc.

It would seem to be time to recreate an industry-wide consensus designed to sell our most important product of music in any format that the public is willing to embrace and consume."

Ultimately, this whole comedy of manners will stop because the inelasticity of

technological development cannot encompass this kind of proprietary commercial dissent on a regular basis. The next product after DAT to threaten the domain of the record companies with computer-perfect recording options will be the recording optical disk. This could happen any time during the next two to four years but in this case the protagonist and the antagonist will not be as neatly matched as the record companies and consumer electronic companies were for the DAT-go-round. In a fight over the recording optical disk, all \$4 billion of gross industrial product (GIP) of the record business will be played against the \$400+ billion of GIP of the world's computer industry. That means the record business amounts to just about 1% of the gross industrial product of the world computer industry. It seems unlikely that the coterie of electronic giants will tolerate any attempt to tamper with their future products and by definition their corporate bottom lines.

IBM alone accounts for nearly half the total when you count in the foreign holdings of the computer giant and it makes in excess of 60% of all profit in the world computers category. Back in the beginning of the 1980s, the US Justice Department was attempting to impose anti-trust litigation on the giants ATT and IBM. The government's effort was successful in the case of ATT but far less so with IBM, who escaped virtually unscathed. The lawyers at the Justice Department liked to play baseball during this timeframe; so the story goes. One weekend the group working on the ATT case sported T-shirts stating the ATT slogan at the time, 'Reach Out—Reach Out and Touch Someone'. The next week the group attempting to deal with IBM appeared in T-shirts stating what they saw as the IBM credo: 'Reach Out—Reach Out and Crush Someone'. Whether the story is true or merely apocryphal, the point remains the same. The next battle over the potential risk of a new technology will not easily be won by the recording community when pitted against such omnipotent rivals but the calamity we have endured in the States should never happen again. We must accept the inevitability of accelerated development of new technologies as the price we pay for life in these times. What we have to do is make all this work for us and not against us.

The real end to this story is to count up all the time, money and energy that has been spent on this internecine warfare within the various elements of the worldwide audio and music industry. If that energy had been put to work in educating the public as to the advantages of digital hardware and software of all kinds, then the current shortfall of demand for compact discs could have been replaced with a surge of demand for digital recordings of all kinds. Concomitantly, the connected slowdown in demand for consumer audio hardware and the levelling off of recording sessions for new releases could all be replaced with a boom of demand for audio systems and audio services of all kinds at all levels. The world audio and music industry has within its power, the ability to turn the current adversity into a time of plenty. So be it. □

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USING THE G

The new G series computer is the first major hardware update from SSL for several years. Patrick Stapely looks at the abilities of the new system

In their continuing policy to disregard alphabetical order, Solid State Logic have ignored F and introduced G as their new studio system. The G series contains major changes to both console and computer, but so far as this article is concerned I will be dealing only with the computer. I will also assume that the reader is reasonably familiar with E series.

If there was one word to sum up my impression of the new computer it would be 'speed' and this applies equally to the hardware as it does software. There are new, faster processors, a vastly increased on-board random access memory (some 16 times greater than E series), and the introduction of the Benoulli data cartridge which takes over the job of the floppy reel disk, but with

80 times more storage space. Also, there is an improved keyboard with standard size computer keys giving users with typing skills greater flexibility. New status control and the ability to update individual faders in rollback makes the job of mixing a much faster and simpler task. E series owners will be pleased to note that G series computer conversion kits are becoming available, as is a remote version of the full size G series keyboard for use with E or G series.

Disks

Due to the increased size of RAM, there is now no need to use the program disk for temporary storage such as the current mix 'scratch pad'. The program itself is still loaded via a floppy and consequently the system retains two floppy drives in addition to the two data cartridge drives. The data disk (Benoulli) is enclosed in a hard, rectangular plastic cartridge measuring slightly less than a box of ¼ inch tape and costing slightly less than a reel of 2 inch tape. Each data cartridge contains 20 Mbyte of storage and before it can be used the engineer must decide how much of that storage he wishes to use. As I have mentioned each cartridge holds the equivalent of 80 floppies worth of information, and the computer organises the disk into a number of different named sectors or 'reels', the sizes of which are decided by the user. For instance, if I am mixing a 3 minute single I might utilise two reel disks-worth of space from the cartridge, but if I were mixing a complex 12 inch I would use considerably more. There should now be no problem with running out of space and having to copy disks or perform endless slow deletions, although once a master has been mixed it makes good sense to dump it onto floppy and store it along with the tape.

G series will accept and convert all E series disks but it is not possible to convert G series mix information to E series.

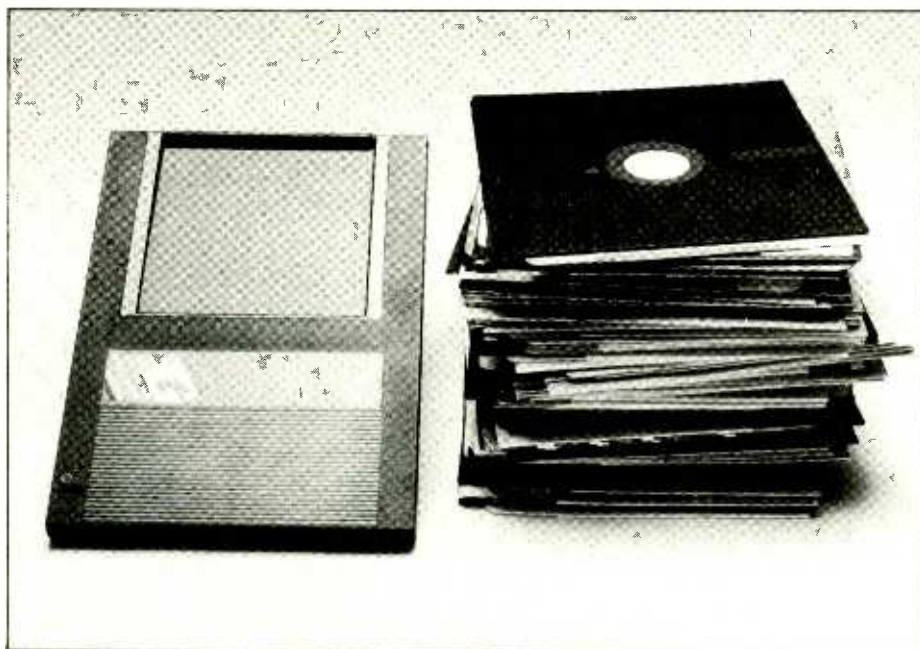
Mixing and Status

One of the most important changes to the mixing system is the introduction of the selective rollback facility. It now becomes possible to continuously rollback over a section and update it fader by fader so building up a set of complex moves without having to keep any mixes. When the tape is wound back and put into play, the computer switches into Mix Review and all faders assume Replay Status (this is a new name for Disconnect, ie faders read previous moves but have no effect on the mix or the monitor).

By pressing the fader status buttons individual channels can be selected to a number of new statuses dependent on which status options have been employed. There is a new master status display called the Mix Options Box which appears constantly during mixing in a column at the top centre half of the screen. It lists five abbreviated status modes which can be toggled on/off from the keyboard. These are: UA—Update Absolute; RC—Revise Cuts; AT—Autotakeover; PV—Preview; IP—Immediate Pickup.

This new display replaces the old status menu and statuses are now switched on or off by hitting their first letter key or the number pertaining to their order in the display, so Autotakeover would be toggled with either A or 3. The Fader Status Master key is now released to perform a number of other functions which I will discuss later.

As before, at the start of a New Mix, all the faders will switch to Absolute and without any of the status options selected, the sequence of status



A 20 Mbyte G series data cartridge stores the equivalent of 80 floppy disks

USING THE G

remains the same as *E* series except the old Disconnect and Isolate have, as you can see, been renamed Replay and Manual and although nothing new is happening the terminology makes it easier to understand.

Whilst still in a New Mix, I may wish to Rollback into Mix Review and correct or build up a series of moves. To aid me in this I can toggle on the Preview function by hitting P or 4; now when I Rollback the fader status button will switch from Replay to Preview Absolute to Absolute. The Preview function is used in the same way as before to audition moves or find levels before committing them to the computer, but a new feature—using the FSM (Fader Status Master) key—is the ability to toggle between Preview levels and current mix levels, this of course is a monitor feature with nothing new being written to the computer until Absolute Status is entered either by hitting individual status buttons or if a number of faders are being used in the Join key.

Taking things a step further I can utilise Immediate Pickup by pressing 1 or 5. Immediate pickup only operates during Mix Review where it automatically switches status as soon as movement is detected from the fader cut button. So, if I still have Preview selected, as soon as I move a fader or switch a cut button, the status of that channel will change from Replay to Preview Absolute. If Preview had been deselected then the status would have changed to Absolute.

Update Mixes follow the same status rules as before being centred around Trim. They are now all Join mixes allowing sections to be updated and inserted automatically into the rest of the mix. The Status Options are used in the same way as described for New Mixes, so if I want to drop a fader into Absolute during the mix I turn on Update Absolute in the Options Box and the fader

status button will switch from Trim to Absolute to Replay to Absolute. (Note that once in Absolute the fader cycle will not return to Trim until UA is toggled off.)

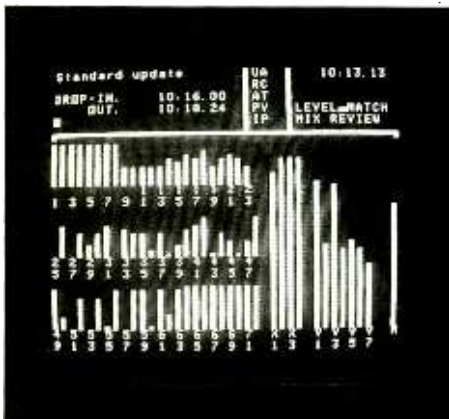
Autotakeover is switched on in the same way as the other status options and if added to Preview, Update Absolute and Immediate Pickup, the following will occur in an Update Mix being reviewed. Firstly, the fader changes to Preview Absolute from Replay as I move it. I can then find a level possibly comparing it to the original using the FSM key. At the point I want to write new data I press the status button and go into Absolute. Just before I want to return to the original level I hit the Status button again putting the fader into Autotakeover, which allows level matching and the channel to return to Replay.

By typing S in Mix Ready or SAFE and Execute with the Mix Running, I can select faders into the Safe Status which is manual. This allows full experimentation whilst disconnected from the computer.

Written cuts can be updated by switching on Revise Cuts; this then allows Read Cuts or Write Cuts to be chosen either by pressing individual status buttons or, with a preset group of faders, by hitting the FSM key which will switch the preset fader group as with other status switching required. If UA and RC are selected together the status will become Play Cuts only and the selected faders will be in Absolute their cuts being locked in replay.

There is now the facility to switch a group or all the channels from one status to another during a mix by using the FSM key. Either at the start or during the mix the Preset key is hit followed by the status buttons on the desired channels or the FSM key if the whole desk is to be switched. The Preset key is hit again and the required status arrangement selected in the Mix Options Box. With the mix running the FSM key is hit at the crucial point, thus changing status on the chosen channels. The FSM key can be used to cycle the group through status sequences, but if Preview has been chosen the FSM key will only operate as a Preview on/off toggle and the join key must be used to switch into Absolute or Trim.

The Master Fader is now as status versatile as a channel fader and controlled by the FSM key in the same way as the channel fader is controlled by its status button. To assign the ubiquitous FSM key to the Master Fader, either the M key is hit whilst the computer is in Mix Ready or MF Execute whilst the mix is running. The FSM key now acts on the Master Fader exactly as a channel fader status button. There is also a means of Level Matching the Master Fader. The Level Match function is enabled as before by pressing the Mix key. The Level Match prompt will appear on the screen and if the Master Fader





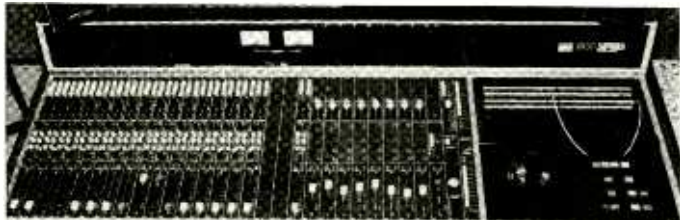
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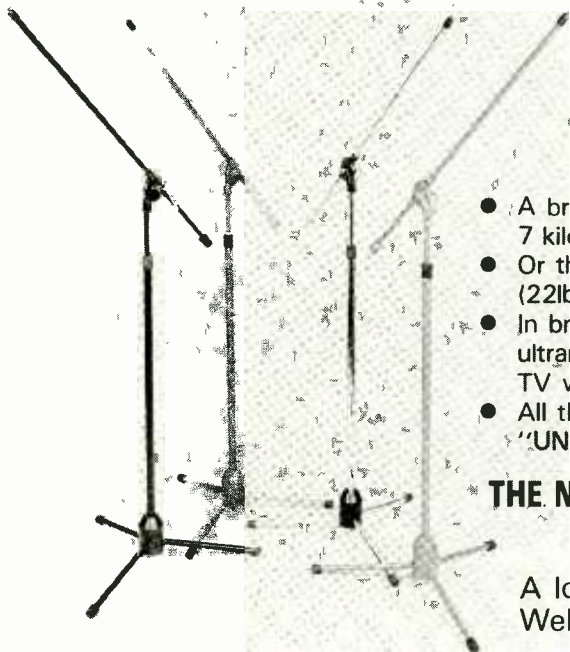
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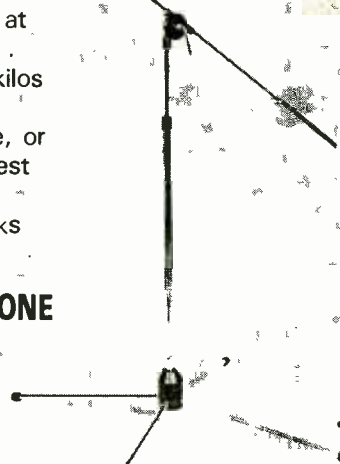
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requires adjustment a small bar will appear between the words Level and Match. The bar will be in either a high or low position depending on which direction the fader has to move and once the fader is matched the bar display clears.

Fader status can be retained in two different ways. Normally the status selections made whilst in Mix Ready will be kept until a mix is stored, then the fader status will default to the standard Set-up. The first method of retaining Status is the same as E series, by using the Copy Key, but this may only be selected after making status selections at the start of a mix. This will enable statuses to be kept and reset at the beginning of each subsequent mix until the mix on/off key is used. The second method is new to G series and utilises a volatile status store. Anywhere in the mix a preset can be made of fader statuses by pressing From and Execute. This preset can then be reset to the desk at anytime by pressing To and Execute. Also the Set-up Menu can be changed to incorporate various Status Options as standard. So, for example, I could decide to have Immediate Pickup and Autotakeover at the beginning of each mix. The computer will default to this selection at the start of every mix, without having to set this up each time.

As you can imagine in a complicated mix situation with all kinds of different statuses present at the same time, it could become quite difficult to remember which set of flashing LEDs referred to which status. To make life easier SSL have introduced the Help function. By typing H at the start of the mix or Help and Execute during the mix, individual faders can be interrogated by means of their status buttons resulting in their status being displayed on the screen.

Another useful function is implemented by the Asterisk key. Pressing the Asterisk key cycles screen information on the name of the mix being updated; the remaining mix memory space; the FSM mode; the Master Fader Status; and the type of mix as determined by the Mix Options Box.

Joining mixes

It is now possible to run two mixes in parallel and switch between them on-line by using the command, 'Set-up Mix (name) Execute' and by operating the Mix on/off key. However, there is a slight delay in switching using this method and although it is fine for reference A/B, it is not precise enough to edit mixes. To perform an instant join, the 'At (time) Join' command is used. On-line joins can be performed using as many mixes and edits as required and also with selective channel join. Off-line joins are carried out in the same manner as E series, ie Join (mix name) To (mix name) At (time), and will now also cater for selective channels for sections of the mixes.

Time shifted joins can be performed on- or off-line. The On-line command to set the offset is 'Set-up Mix (name), From (time), To (time), Execute' where the From time is the start of the offset in the named mix, and the To time is the point in the current mix to which it is offset. The Mix on/off key or 'At (time) Join' command are used as before. The off-line command for time shifted joins is 'Join (mix name), From (time) to (time), To (mix name), From (time) Execute'.

Copy and swap

Other new features to G Series are the Track Copy and Track Swap functions. Track Copy allows mix data to be copied from one channel to

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another. It will also allow channels and groups that do not exist on the present console (due to the fact that the original mix was made on a bigger desk) to be repositioned. The swap function does what one would imagine and exchanges data from one channel to another, which is useful when re-arranging the desk. It can be used in conjunction with Total Recall Channel Swap.

Lists and displays

The Bargraph display can now be toggled between previously called up list information by using the Large/Small key, and with the use of the cursor keys, lists and their associated pages can be cycled through. The handy thing here is that it makes it possible to refer to a list midway through typing a command without losing it.

Cue lists have an optional re-arrangement whereby the timecode shifts to the left of the screen next to the Cue name making them easier to read off. Cues can be time shifted in a block, so if I am working on identical program but with different timecode I can move my existing Cues back into sync.

Keyboard

The new keyboard fits into the central area of the

console taking up twice the space of its predecessor. There is also the option of a remote keyboard which due to its size, weight and connection make it extremely portable. As I mentioned earlier, the keys are now standard computer type, but a rubber bucket arrangement has been fitted underneath each key to give the feel of a contact switch. The keyboard consists of full QWERTY keys, a numeric keypad, the command keys and 10 function keys. The function keys allow strings of commands (10 key presses for each key) to be executed by the press of one button. Although there are 10 function keys, the shift key on the QWERTY keyboard doubles them up to 20. So, for example, function key 1 shifts to 11. All function key information is held in non-volatile memory allowing it to be recalled at a later date. With the exception of the function key facility the *E* series keyboard is fully compatible to *G* series. I would suggest that if an *E* series console was being upgraded to *G* series that a useful addition would be a remote keyboard.

Whilst on the subject of the keyboard, it is no longer necessary to type in timecode using punctuation. The computer will now recognise rows of continuous numbers—so 54321 becomes 5:43.21 there being no need to get all the colons and full stops in the right places. Also, for those of you who fall prey to the foul mouth of the computer you will be pleased to learn that insults now occur more rarely, but beware, when they do the screen clears down and fills with bigger, nastier letters.

Events and synchroniser

There is a new Events List with the cursor allowing selective firing of events. The user has three options: firstly to fire the event at the cursor only; secondly to fire events at and below the cursor; thirdly to fire all events. Events can now be fired and dropped in whilst in the Events List.

More synchroniser facilities are available via the keyboard and command syntax is now very similar for Adams-Smith and *Q.Lock* systems. With the new system subframe offset, information of $\frac{1}{100}$ of a frame can be entered via the keyboard. Machines will now locate to a point independently rather than following the master, thus speeding things up, and machines can be individually taken off-line and autolocated without affecting the others. By pressing Stop and Play at the same time, the master will wait for all slaves to park before going into play and by pressing Fast Forward and Rewind together followed by Fast Forward or Rewind again, the master (providing it can cater for it) will go into Frame Jog, where it will creep forwards or backwards at a presettable rate. There is the Slow Lock mode which will ignore breaks in timecode caused by drop outs or edits. If required all five machines will drop into record where before only one would, and finally subframe information of $\frac{1}{100}$ frame can be entered via the keyboard.

Conclusion

I think by comparing the *G* facilities with that of the *E* series you will see SSL have made major advances in developing the system for ever-increasing requirements. It is obvious that SSL pay a great deal of attention to comments and suggestions from the people that actually use their equipment, and this is reflected in the final product. □



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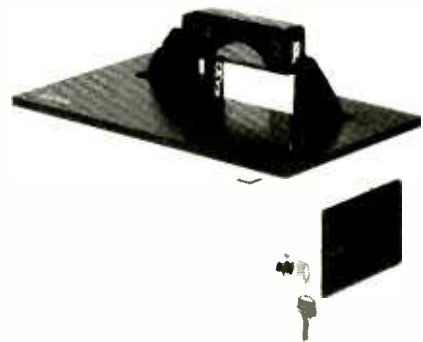


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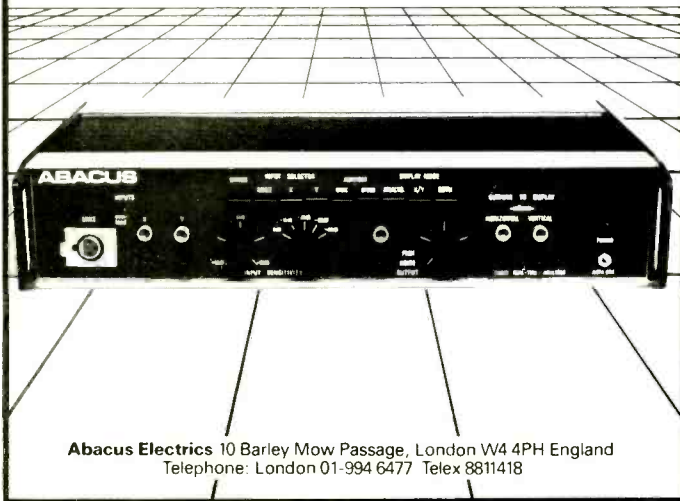
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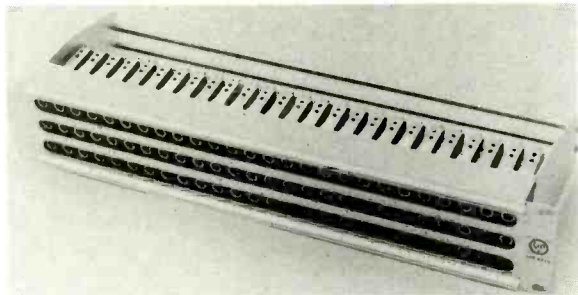
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REVIEW

Dave Foister presents a user view of the Drawmer M500 dynamics processor



It is unusual in the audio business for a company to become quite so inextricably linked with one specific product as Drawmer has with the gate. Mention the name Drawmer to most engineers and they will immediately think of the ubiquitous 201, arguably the most-used gate on the European market of the last few years, in the same way that most people associate Hoover with vacuum cleaners. With that kind of record, any new dynamics processor, particularly something as radical as the M500, has to be of interest.

It is probably no exaggeration to say that the M500 contains virtually every dynamic processing facility you can think of and then some, with as much control over the effects as you could wish. The seven basic processes comprise De-essing,

gating, expansion, compression, limiting, panning and fading, in stereo where required or as two discrete channels. The effects are not mutually exclusive; any logical combination of the seven can be chained together but since the effects are all in software exercising digital control over a single VCA element, there is no more signal degradation with six effects than with one, unlike some systems that chain together separate processors. Almost every available effect incorporates some novel feature, and gives more control over a wider range of parameters than most standalone devices, with the result that there are an enormous number of adjustable parameters on the unit. Drawmer, however, wanted to make the unit simple and instinctive in operation and it is a great credit to them that it is indeed faster, more logical and easier to learn than many much less sophisticated devices.

Part of the reason for this is the fact that no control on the M500 has more than one function. Each of the 21 main keys on the left of the panel calls up a menu on the large LCD screen; this usually consists of at least two (sometimes five) screens full of information and/or adjustment options, and four cursor keys move easily around the pages and options. Parameter adjustment is made with a large, reassuring rotary knob, giving the best combination of speed and fine control. If the operating system has a disadvantage it is the inevitable one that separate keys means more keys, which in turn means smaller keys with small legends, but unless you're particularly ham-fisted or myopic the benefits far outweigh the snags.

There are so many novel ideas on the M500 that it is simplest to take it as read that all the normal dynamic processing functions are available and that they all work extremely well with at least as much control as would be needed in the most demanding circumstances. The audio performance is exemplary; I found that however hard I made the unit work, in whatever mode, it was easier to make the signal sound ridiculous than to degrade its quality. It is unusual to hear the M500 complain at what it is being asked to do, whether in terms of noise, distortion, pumping, breathing or whatever nasties other devices may introduce.

Perhaps the most elaborate section of the M500 is the Gate. This is the effect with five screenfuls of information; these include a metering and gain reduction display (as do all the other effects) and all the usual parameters, plus several unusual ones. Control over the envelope is enhanced by the provision of a 'Peak' facility which, when the gate opens, increases the gain for a short time before reverting to unity gain. The amount, duration and decay time of this peak are all adjustable and the result is a considerable amount of extra punch, particularly on percussive sounds. Drums respond well and digital drum machine sounds acquire new life and crispness.

The normal gate envelope parameters can, however, be abandoned altogether. The M500 is able to record the envelope of any sound fed into it, store up to 16 envelopes in memory, and use any one of them to control the gate, superimposing the stored envelope on the sound being processed.

Recording the envelopes is extremely simple and obviously less critical than recording a sample; once stored, they can be applied to any signal, and triggered in any of the ways a conventional envelope would be triggered. The options here are also unusual; apart from the usual audio triggering—direct or filtered, internal or external—there are three MIDI trigger modes, opening up a whole new area of creative treatments. The gate can be triggered by MIDI notes (a separate page allows the recognised range of notes for this and other effects to be selected) or by MIDI beats from a drum machine or sequencer. In this mode the number of beats and/or frames/clocks between triggers is adjustable on the MIDI page. The final option is called MIDI Fast and is only usable between two M500s, when it will open the slave gate about three times faster than conventional MIDI notes. The gate will also send MIDI note on (any note can be selected) when it opens.

The gate section also features niceties like adjustable pre-delay (up to 20 seconds!) and a whole set of retrigger options including a retrigger mask time, a retrigger level that may be set lower than the gate threshold in order to introduce hysteresis and eliminate false

retriggering, and choices of MIDI retrigger responses. In fact it is hard to think of anything the *M500* gate will not do.

Also complex, sophisticated and making imaginative use of MIDI is the Pan section. This offers no less than eight modulating waveforms for the panning, allows pan sweeps to be triggered by the audio signal or by MIDI beats, provides an envelope for the modulator so that the pan width can increase and decrease automatically, and allows the actual pan position to be controlled in realtime by MIDI note numbers. The Fader section allows automatic fades both in and out to be triggered by MIDI start/stop commands or any assignable MIDI switch, and also allows automated fades at a pre-programmed point in a track by timing the length from the first received audio signal. It will even time and store the required length for you if you hit the appropriate key at the point you want to fade.

The De-ess section is as versatile as might be expected, providing full band or split-band de-essing or various split-band compression effects, with an exceptionally wide degree of control, including the use of the variable soft-knee compression characteristic from the Compressor section. The De-esser in fact highlights the only apparent limitation of the *M500*; there is only one filter per channel, and since de-essing by definition requires the filter it is not available for use by the gate simultaneously on the same channel, although of course the other channel is unaffected and may be configured as required.

The Expand, Compress and Limit sections are comparatively simple, although still more comprehensive than most standalone units. Interesting features include the already-mentioned variable knee curve and an auto threshold facility on the compressor.

The power this set-up places at the user's fingertips is very considerable. It may at first appear daunting but 78 factory presets demonstrate clearly and comprehensively the wide range of possibilities, and since editing and adjustment are so easy and logical a short play with the unit soon gives complete familiarity with the system. Setting up complete effects from scratch is almost as simple as editing the presets and 50 user memories allow new patches to be stored. Several presets cater for the processing needs of specific instruments, such as a snare drum gate, and all offer good starting points for experiment and fine adjustment. Every signal I passed through the unit was handled exactly as I would want it to be; the range of control is so good, and the audio performance to such a high standard, that there appears to be nothing the *M500* won't do. (*He rather likes it!—Ed*)

As things stand at the moment, this must surely be the ultimate dynamic processing tool. Too many multiple effects units offer no more than a collection of simplified processes with compromises all over the place—jacks of all trades but masters of none—and too often only capable of one job at a time. The Drawmer *M500* provides several versatile processors, simultaneous multi-tasking capabilities, good exploitation of current external control possibilities and high audio performance, together with a superb operating system which makes a unit that might have been unmanageable, a pleasure to use. It is hard to find fault with it in any respect. □

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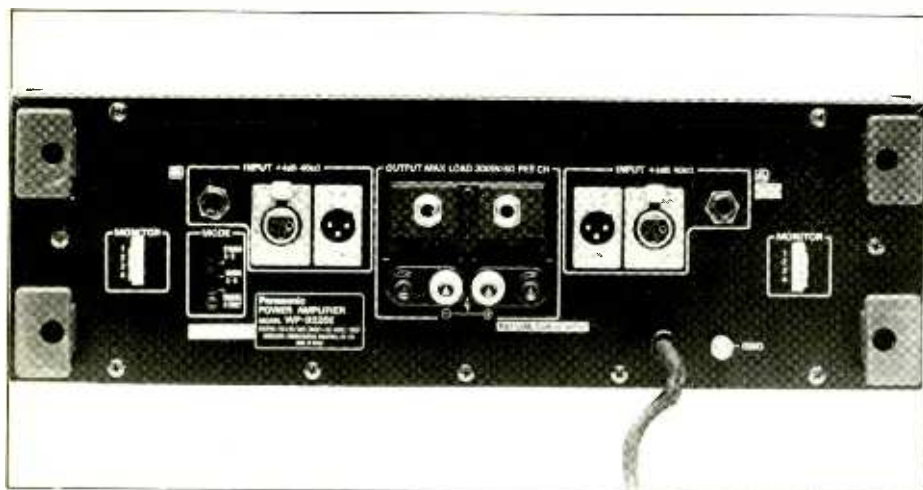
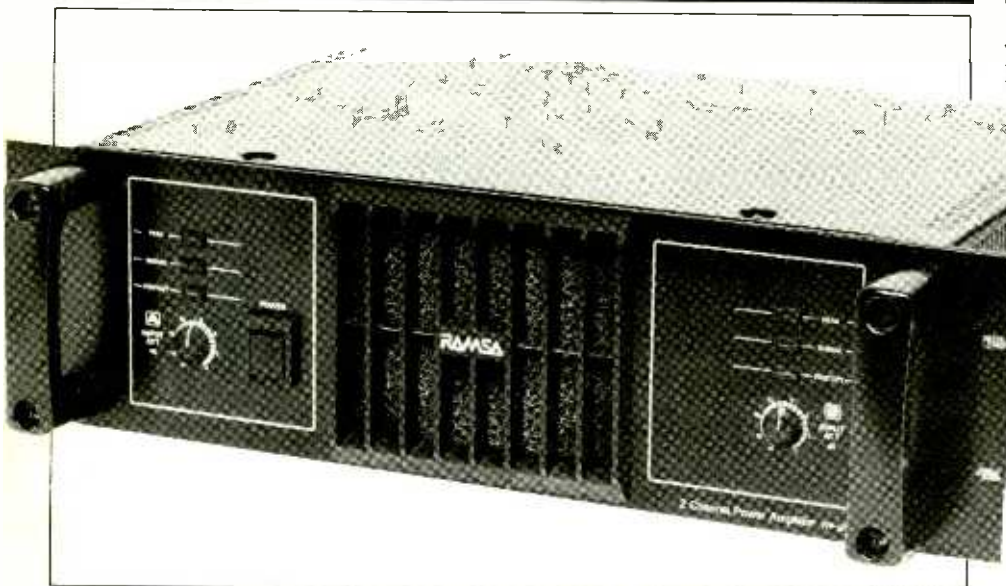


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REVIEW

Technical evaluation of the Ramsa WP-9220E power amplifier is provided by John Woodgate



There are two types of equipment that put reviewers in a quandary. One is the mediocre, over-priced product supported by megahype, where the less than discerning buyer needs protection. The other is the product that is so good that the poor reviewer is driven crazy trying to find anything of substance to criticise. Nowadays, the

latter is occasionally to be found but is still all too rare. This is one of them.

The amplifier comes in a satin-black finished 3U rackmounting case. The case is 383 mm deep and the unit weighs 18 kg. The front panel appears adequately strong but for use in a mobile rack it would be advisable to fit side-runners or rear brackets. There are substantial handles on the front and dual-purpose feet/handles on the rear.

A prominent feature of the front panel is the cooling fan grille, which gets dusty and rather spoils the appearance. The front panel also carries the power switch with LED indicator, user-preset gain controls for each channel, and separate LED indicators for each channel labelled PEAK, SIGNAL and PROTECT. The gain controls, which have click-stops, are calibrated from 0 dB to 19 dB, the last stop being 'infinity'. These gain controls operate after the electronically-balanced input stages.

On the rear panel are the XLR-3-type input connectors, with parallel output connectors for daisy-chaining. The input connections are duplicated on 3-contact ¼ in jacks: presumably of the 'international' type (American 'A' gauge). There is a separate 'GND' terminal connected to chassis. The internal circuits are connected to chassis both at input and output. This is unusual as it often spells trouble but in this case there were no ill effects at all. Contrary to popular practice, it is best to connect the common rail to chassis (and thus to mains earth) at the input. If it is connected at the power supply all the common-rail voltage drops appear on the earth input lead, where they can do the most damage. If the earthy input lead is connected to chassis, however, the common-rail voltages appear at the earthy load terminal, where they are relatively harmless.

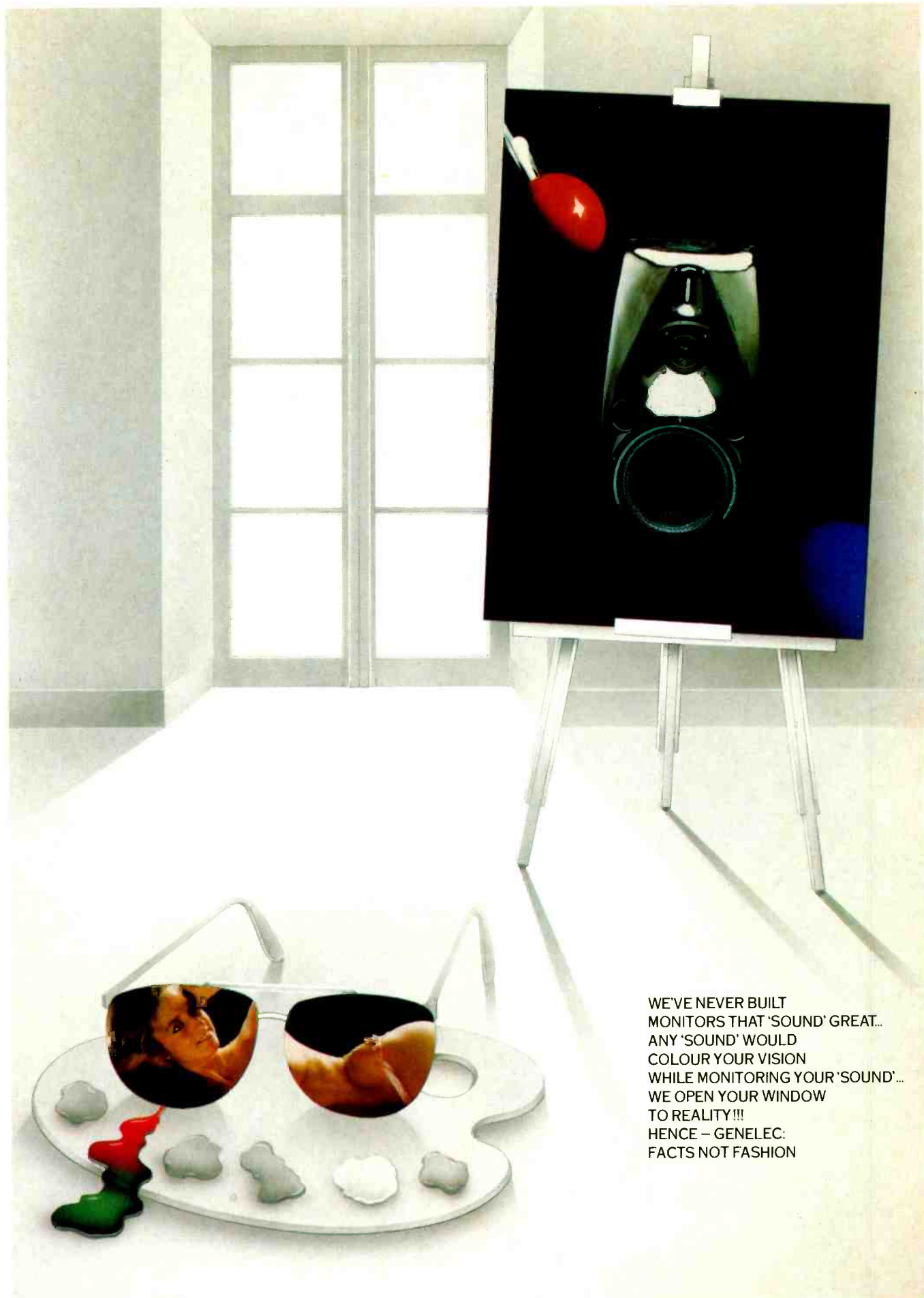
On this amplifier, the load terminals take single or dual 4 mm plugs, bare wires or pin-tags. They are rather close together (partly due to the standard ¾ in pitch of dual banana plugs) for easy connection of the substantial leads required for such a powerful amplifier. These terminals are, of course, very 'hot', and they are duly marked with the IEC standard flash mark but it is very small. The outputs are duplicated on 2-contact ¼ in jacks, specially designed to carry the high currents involved. Ordinary jacks would be operating way outside their ratings in this position. These jacks are also designated with a minuscule flash mark.

Also on the rear panel are a slide switch for selecting STEREO, MONO and BRIDGE modes, and two 4-contact Molex-type connectors for remote VU meters, including relay contacts to control their scale illumination. These are rather oddly called 'monitor' connectors, and could be mistaken for low-level audio outputs for audible monitoring.

The inside story

The top cover comes off quite easily and discloses an unusual double-limb mains transformer. This looks a bit like a squared-up toroid but may be an astatically-wound type, giving very low external field. There is liberal silicon-iron shielding. The power supply has two large 'computer-grade' capacitors, and each amplifier is built on three long, thin PCBs attached to a large, finned heatsink running from front to back at each side of the case. These heatsinks are not black, but it has been found that clear anodising on aluminium looks 'black' at infra-red wavelengths (ie it is a good absorber and emitter of heat), and that some 'black' dyes do not.

There are only two fuses visible, the 15 A time delay types in the mains circuit. It is likely that, in the event of a fault, the fuse in a 13 A mains



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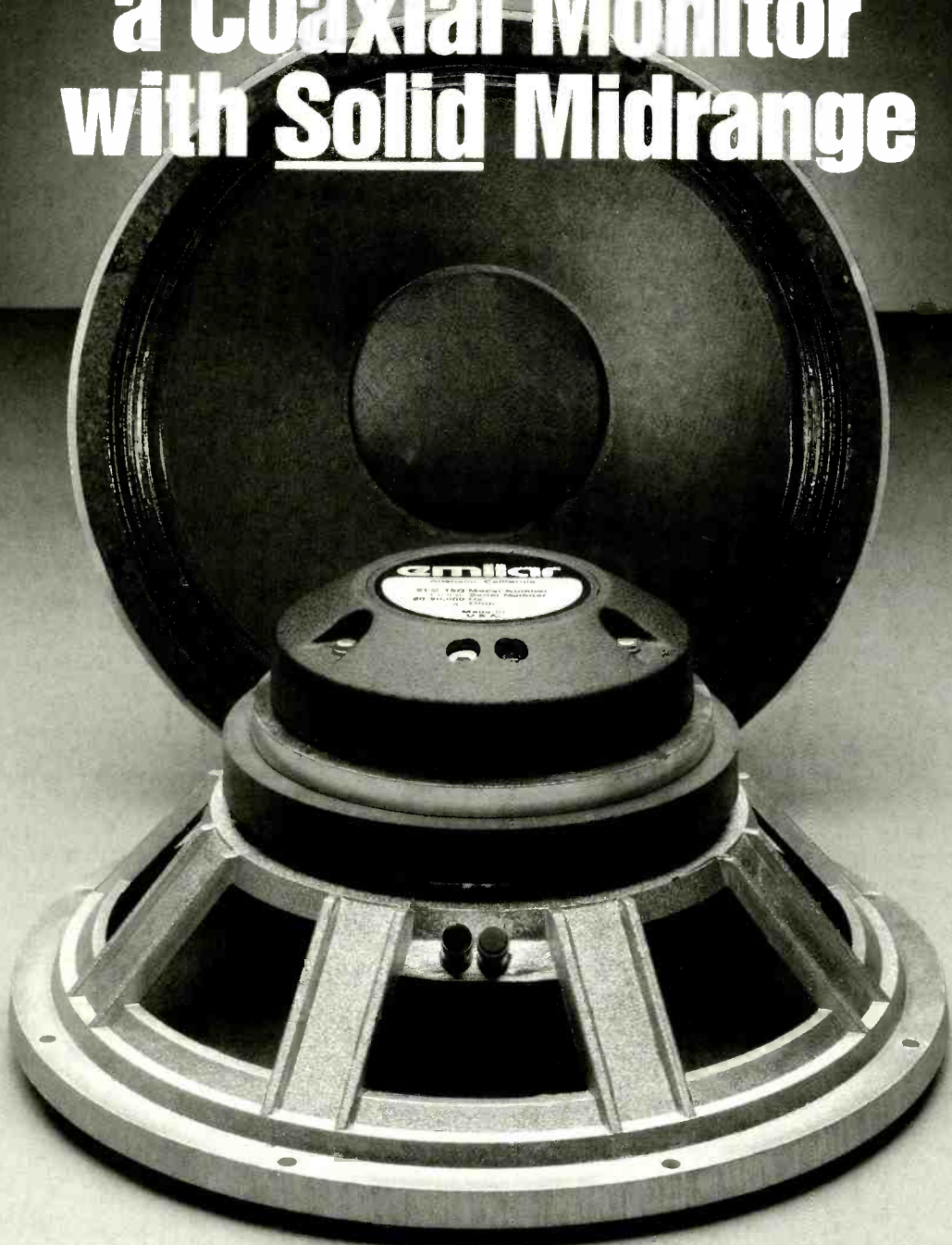
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REVIEW

plug would effectively protect these fuses from any risk of damage. The fuseholders are correctly labelled with type and value.

There are numerous small PCBs scattered around the case and it appears that, while in principle one can get at the amplifier cards for servicing by detaching the heatsink assembly from the case quite easily, in practice it is a good deal more difficult.

Rated conditions

The manufacturer's rated conditions are the vital information needed to test and use the equipment properly. Omission of any of this information can lead to damaging misuse.

This amplifier can operate on mains voltages of 110 V, 120 V, 220 V and 240 V from 50 Hz to 60 Hz, but the adjuster is hidden underneath and there should be a notice drawing attention to this. It is not even mentioned in the user instructions until page 6! There is a top-panel label that refers to 'Class 2 wiring'. This is very misleading, as it refers to US wiring codes, whereas in Europe 'Class 2' means that the equipment is 'double insulated' and does not need a safety earth connection.

The rated input voltage level is given (only on the top panel) as +4 dBu, while the rated source impedance is not stated. This is not so important but really should be given. The rated load impedances are 4 Ω and 8 Ω (doubled in bridge mode) and the rated total harmonic distortion is given as 0.1%.

There is a good deal of information in the user instructions about rackmounting but the importance of ventilation is not stressed.

The amplifier was operated from a 240 V 50 Hz stabilised mains supply, with digital monitoring

of the supply voltage. Driven just to clipping, the amplifier drew 3.9 A with 8 Ω loads and 6.35 A with 4 Ω loads. These fell to 1.6 A and 2.4 A with 10 dB less input, and to 750 mA with zero signal. (See Fig 1.)

Input and output characteristics

The rated input impedance is 40 k Ω balanced, and the measured value was nearer 50 k Ω . The output source impedance measured 60 m Ω at 40 Hz and 1 kHz, rising to 250 m Ω at 20 kHz. By comparison with the rest of the resistance in the load circuit, these values are negligible. The quoted damping factor of 100 at 1 kHz implies a source resistance of 80 m Ω , and is thus confirmed but it is a useless figure to specify.

The rated distortion-limited output power is 200 W/channel with 8 Ω loads and 300 W with 4 Ω . It was impossible to confirm these figures because at 0.1% THD the slope of the distortion versus power curve is so steep that stable readings were not obtained. It is more sensible to take a higher figure for rated THD, and quote also the THD under standard test conditions (10 dB below rated output), where the signal spends most of its time, anyway. At 0.7% distortion, the output powers were 220 W and 362 W, and at 10 dB lower there was very little distortion indeed.

The regulation (change of output voltage from no-load to full-load) is related to the output source impedance but not in a simple way. The measured values showed an equivalent source impedance even lower than the directly-measured value, and a quite negligible regulation level in the order of 0.3 dB at worst.

Limiting characteristics

Since the gain controls operate after the input stages, the overload level of those stages is important. They will, in fact, accept over 15 V (+26 dBu), which is very good.

Protection circuits include thermal cut-outs, a switch-on delay, DC offset control and 'V-I energy limiters'. The latter can cause difficulty with some types of loudspeaker and this subject is under investigation. There is a potential problem, too, with some DC offset control circuits but not necessarily with this amplifier. Some of these circuits cut off the supplies within a few milliseconds if a catastrophic fault causes the DC offset to increase greatly but do not respond to a few volts, which will nevertheless drive a significant direct current through the load. Unfortunately, while the designer can test the protection circuit by twiddling an internal preset, it is far from easy to measure its characteristics in any other way. This subject is also under investigation. This amplifier will tolerate, in fact, 1.6 A or more of direct current through the load, although the mains transformer complains a bit.

Gain and frequency response

The measured gain is 30.3 dB at the maximum setting of the gain control, which is in agreement with specification. The calibration accuracy of the gain controls is entirely adequate for practical purposes. The frequency response is 'ruler-flat' from 20 Hz to 20 kHz at -6 dBu input, and only quite negligible differences occur at rated output. The gain-limited effective frequency range ('3 dB bandwidth') is 6 Hz to 86 kHz, which is more than adequate for audio (!), and the HF response falls off smoothly to 500 kHz.

Amplitude non-linearity

The distortion of this amplifier is so low that THD measurements are masked with noise. The comprehensive factory test results included with the product (but applying to a different sample) show this clearly: the THD appears to increase inversely proportional to level at low levels. What is actually being measured is noise, and it is surprising to see such an elementary mistake in what is effectively technical sales material.

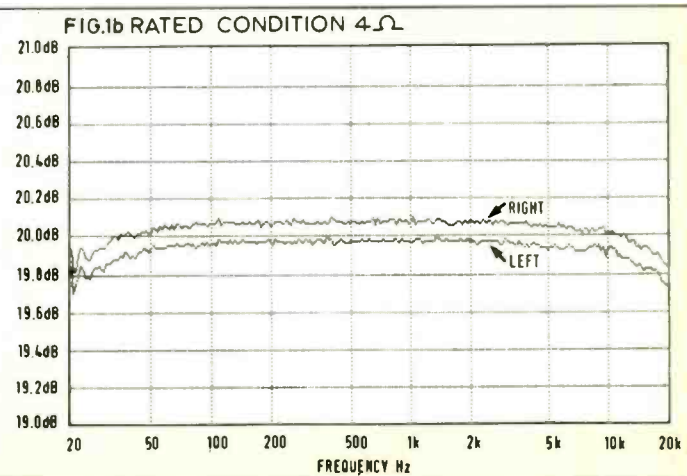
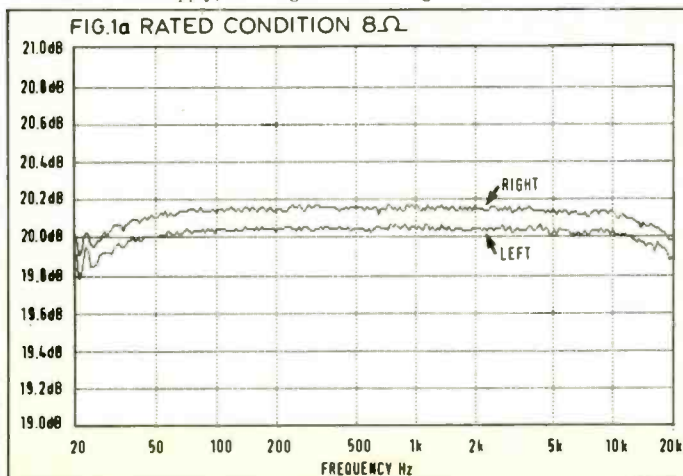


TABLE 2 Sequence tests: 8 Ω load, input level -6 dBu (ie 10 dB below rated input level, which is IEC 'standard test conditions')

Frequency response 20 Hz to 20 kHz 0 dB

30 Hz	0.00 dB	0.00 dB
40 Hz	0.00 dB	0.00 dB
50 Hz	0.00 dB	0.00 dB
63 Hz	0.00 dB	0.00 dB
100 Hz	0.00 dB	0.00 dB
125 Hz	0.00 dB	0.00 dB
250 Hz	0.00 dB	0.00 dB
500 Hz	0.00 dB	0.00 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	0.00 dB	0.00 dB
4 kHz	0.00 dB	0.00 dB
6.3 kHz	0.00 dB	0.00 dB
8 kHz	0.00 dB	0.00 dB
10 kHz	0.00 dB	0.00 dB
12.5 kHz	0.00 dB	0.00 dB
14 kHz	0.00 dB	0.00 dB
15 kHz	0.00 dB	0.00 dB
16 kHz	0.00 dB	0.00 dB
18 kHz	0.00 dB	0.00 dB
20 kHz	0.00 dB	0.00 dB

Test level out 1 kHz
+24.00 dB +24.11 dB

Crosstalk 0 dB (rel)

40 Hz	-96.2 dB	-94.4 dB
100 Hz	-97.8 dB	-93.7 dB
315 Hz	-98.4 dB	-96.6 dB
1 kHz	-93.6 dB	-92.9 dB
6.3 kHz	-79.7 dB	-80.1 dB
10 kHz	-75.4 dB	-76.3 dB

Distortion 0 dB (2 f-22 k)

40 Hz	-88.8 dB	-88.1 dB
100 Hz	-85.9 dB	-85.2 dB
315 Hz	-94.3 dB	-92.2 dB
1 kHz	-91.1 dB	-88.3 dB
6.3 kHz	-79.1 dB	-74.9 dB
10 kHz	-73.7 dB	-69.7 dB

Phase (Mean, 0 dB)

40 Hz	0°
100 Hz	0°
1 kHz	0°
6.3 kHz	-1°
10 kHz	-2°
15 kHz	0°

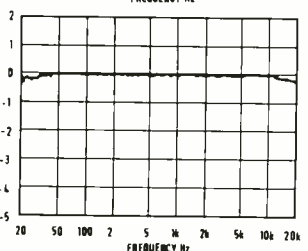
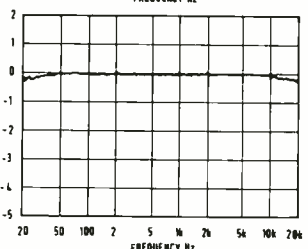
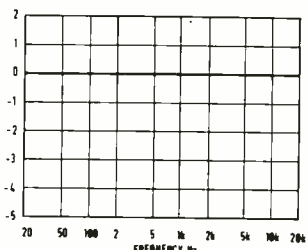
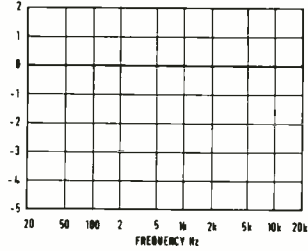
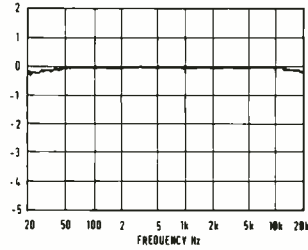
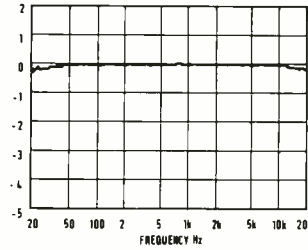
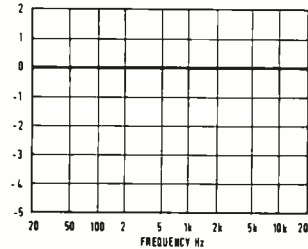
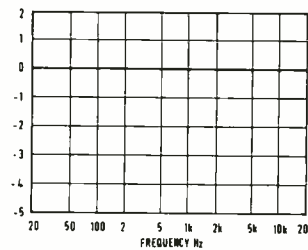


TABLE 3 Sequence tests: 8 Ω load, input level +4 dBu (IEC rated conditions)

Frequency response 20 Hz to 20 kHz 0 dB

30 Hz	-0.15 dB	-0.11 dB
40 Hz	-0.08 dB	-0.06 dB
50 Hz	-0.06 dB	-0.06 dB
63 Hz	-0.04 dB	-0.05 dB
100 Hz	-0.01 dB	-0.02 dB
125 Hz	-0.01 dB	-0.02 dB
250 Hz	-0.01 dB	-0.01 dB
500 Hz	-0.01 dB	-0.01 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	-0.01 dB	-0.01 dB
4 kHz	-0.02 dB	-0.02 dB
6.3 kHz	-0.04 dB	-0.04 dB
8 kHz	-0.02 dB	-0.02 dB
10 kHz	-0.04 dB	-0.03 dB
12.5 kHz	-0.08 dB	-0.07 dB
14 kHz	-0.09 dB	-0.08 dB
15 kHz	-0.09 dB	-0.11 dB
16 kHz	-0.14 dB	-0.11 dB
18 kHz	-0.11 dB	-0.14 dB
20 kHz	-0.17 dB	-0.18 dB

Test level out 1 kHz
+34.04 dB +34.14 dB

Noise CCIR 468-3 quasi-peak (rel)

Pk Wtd	-92.2 dB	-92.2 dB
Pk Unwtd	-97.9 dB	-97.0 dB
Mn Wtd	-92.5 dB	-92.4 dB

Crosstalk 0 dB (rel)

40 Hz	-105.8 dB	-104.0 dB
100 Hz	-112.9 dB	-105.9 dB
315 Hz	-109.1 dB	-106.4 dB
1 kHz	-104.1 dB	-102.9 dB
6.3 kHz	-89.7 dB	-90.1 dB
10 kHz	-85.4 dB	-86.4 dB

Distortion 0 dB (2 f-22 k)

40 Hz	-88.7 dB	-88.0 dB
100 Hz	-86.3 dB	-85.2 dB
315 Hz	-94.8 dB	-92.6 dB
1 kHz	-91.7 dB	-88.6 dB
6.3 kHz	-79.0 dB	-74.7 dB
10 kHz	-73.6 dB	-69.6 dB

TABLE 4 Sequence tests: 4 Ω load, input level -6 dBu (IEC 'standard test conditions')

Frequency response 20 Hz to 20 kHz 0 dB

30 Hz	0.00 dB	0.00 dB
40 Hz	0.00 dB	0.00 dB
50 Hz	0.00 dB	0.00 dB
63 Hz	0.00 dB	0.00 dB
100 Hz	0.00 dB	0.00 dB
125 Hz	0.00 dB	0.00 dB
250 Hz	0.00 dB	0.00 dB
500 Hz	0.00 dB	0.00 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	0.00 dB	0.00 dB
4 kHz	0.00 dB	0.00 dB
6.3 kHz	0.00 dB	0.00 dB
8 kHz	0.00 dB	0.00 dB
10 kHz	0.00 dB	0.00 dB
12.5 kHz	0.00 dB	0.00 dB
14 kHz	0.00 dB	0.00 dB
15 kHz	0.00 dB	0.00 dB
16 kHz	0.00 dB	0.00 dB
18 kHz	0.00 dB	0.00 dB
20 kHz	0.00 dB	0.00 dB

Test level out 1 kHz
+23.93 dB +24.03 dB

Crosstalk 0 dB (rel)

40 Hz	-91.2 dB	-89.7 dB
100 Hz	-100.9 dB	-92.0 dB
315 Hz	-96.5 dB	-95.2 dB
1 kHz	-91.7 dB	-91.6 dB
6.3 kHz	-77.5 dB	-78.6 dB
10 kHz	-73.1 dB	-74.7 dB

Distortion 0 dB (2 f-22 k)

40 Hz	-87.8 dB	-87.1 dB
100 Hz	-86.7 dB	-85.6 dB
315 Hz	-91.7 dB	-90.6 dB
1 kHz	-88.2 dB	-85.1 dB
6.3 kHz	-76.4 dB	-71.0 dB
10 kHz	-72.3 dB	-66.7 dB

Phase (Mean, 0 dB)

40 Hz	0°
100 Hz	0°
1 kHz	0°
6.3 kHz	0°
10 kHz	-1°
15 kHz	0°

TABLE 5 Sequence tests: 4 Ω load, input level +4 dBu (IEC rated conditions)

Frequency response 20-20 k 0 dB

30 Hz	-0.12 dB	-0.12 dB
40 Hz	-0.08 dB	-0.05 dB
50 Hz	-0.04 dB	-0.05 dB
63 Hz	-0.02 dB	-0.03 dB
100 Hz	-0.01 dB	0.00 dB
125 Hz	0.00 dB	+0.01 dB
250 Hz	0.00 dB	0.00 dB
500 Hz	0.00 dB	0.00 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	0.00 dB	+0.01 dB
4 kHz	-0.02 dB	-0.02 dB
6.3 kHz	-0.02 dB	-0.02 dB
8 kHz	-0.04 dB	-0.05 dB
10 kHz	-0.08 dB	-0.06 dB
12.5 kHz	-0.09 dB	-0.11 dB
14 kHz	-0.12 dB	-0.11 dB
15 kHz	-0.16 dB	-0.12 dB
16 kHz	-0.15 dB	-0.15 dB
18 kHz	-0.17 dB	-0.16 dB
20 kHz	-0.24 dB	-0.23 dB

Test level out 1 kHz
+33.91 dB +33.97 dB

Noise CCIR 468-3 quasi-peak (rel)

Pk Wtd	-92.3 dB	-92.0 dB
Pk Unwtd	-97.8 dB	-96.7 dB
Mn Wtd	-92.5 dB	-92.2 dB

Crosstalk 0 dB (rel)

40 Hz	-101.0 dB	-99.8 dB
100 Hz	-107.3 dB	-101.1 dB
315 Hz	-106.8 dB	-105.3 dB
1 kHz	-102.1 dB	-101.8 dB
6.3 kHz	-87.6 dB	-88.6 dB
10 kHz	-83.1 dB	-84.7 dB

Distortion 0 dB (2 f-22 k)

40 Hz	-87.6 dB	-87.3 dB
100 Hz	-86.5 dB	-85.6 dB
315 Hz	-92.6 dB	-91.9 dB
1 kHz	-88.5 dB	-85.1 dB
6.3 kHz	-76.3 dB	-71.0 dB
10 kHz	-72.2 dB	-66.6 dB

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REVIEW

It was found, by selective (narrow-bandwidth) measurements, that at 0 dBu input level the results with 4 Ω loads were as shown in Table 1a. At an input level of -30 dB (where transfer characteristic discontinuities would be more evident), the results were still very good as can be seen in Table 1b.

The effect of noise on distortion measurements can also be seen in Tables 2, 3, 4 and 5. The 315 Hz measurement is a narrow-band 3rd

harmonic measurement, and is clearly lower than the other figures.

The specification is rather out-of-date, stating '-100 dB IHF A-weighted'. The IHF standards are no longer current, being succeeded by EIA standards, and A-weighting for amplifier noise has little value in professional applications. The CCIR quasi-peak values are shown in the sequence results and are very good. Hum output was measured selectively at 50 Hz (-77 dBu),

100 Hz (-83 dBu) and 150 Hz (-80 dBu) with zero signal. With variable-consumption equipment, it is necessary to test also with the amplifier driven hard at high frequency (5 kHz). Under these conditions, the 50 Hz output rose to -65 dBu, which is still very good.

Balance

The input common-mode rejection ratios were close to 40 dB, which is quite good for an electronic balanced circuit.

Crosstalk

The rated value of -60 dB at 20 kHz disguises the excellent crosstalk attenuation shown in the sequence results (far greater than necessary for many purposes but who's complaining?).

Conclusions

This is a very good amplifier indeed, although this is reflected in the price and the number of components incorporated. It would be silly to use it for purposes where its high performance was not matched by that of other components in the system. It would be difficult, however, to find a case where (except for very high power applications) it was in any way inadequate. It is a pity that the few points which remain to be criticised have not been corrected already. □

TABLE 1a

Frequency (Hz)	2nd (dB)	3rd (dB)
20	*	<-88
1 k	<-90	-88
15.24 k	-64	-70
20 k	-63	*

TABLE 1b

Frequency (Hz)	2nd (dB)	3rd (dB)
1 k	<-85	<-85
6.3 k	*	-81 (also 4th and 5th -85 dB)

* Not measurable

Manufacturer's specification

RATED POWER OUTPUT (Stereo mode, 20 Hz—20 kHz, both channels driven, less than 0.05% THD)	300W (×2) into 4 ohms; 200W (×2) into 8 ohms	
RATED POWER OUTPUT (Mono mode, 20 Hz—20 kHz, both channels driven, less than 0.1% THD)	300W (×2) into 4 ohms; 200W (×2) into 8 ohms	
RATED POWER OUTPUT (Bridge mode, 20 Hz—20 kHz, less than 0.1% THD)	600W into 8 ohms; 400W into 16 ohms	
MAXIMUM POWER OUTPUT (Stereo mode, 1 kHz, 1 channel driven, less than 0.05% THD)	510W into 4 ohms; 250W into 8 ohms	
POWER BANDWIDTH (Ref. rated power, 1 kHz, 4 ohm load)	-0.5 dB 10 Hz; -3 dB 85 kHz	
VOLTAGE GAIN (Stereo mode)	30 dB (8 ohm load)	
TOTAL HARMONIC DISTORTION (20 Hz—20 kHz, Stereo mode, both channels driven)	Less than 0.05% at any power from 1/4 watt to rated output into 8 ohms; typically 0.005%, full power, 1 kHz	
TOTAL HARMONIC DISTORTION (20 Hz—20 kHz, Mono mode, both channels driven)	Less than 0.1% at any power from 1/4 watt to rated output into 4 ohms	
TOTAL HARMONIC DISTORTION (20 Hz—20 kHz, Bridge Mode)	Less than 0.1% at any power from 1/4 watt to rated output into 8 ohms; typically 0.006%, full power, 1 kHz	
INTERMODULATION DISTORTION (SMPTE method, 60 Hz & 7 kHz 4:1 ratio)	Less than 0.05% at any power from 1/4 watt to rated output into 8 ohms, Stereo or Mono mode; typically 0.025% at half power	
DAMPING FACTOR	Greater than 100 at frequencies up to 1 kHz, 8 ohm load	
FREQUENCY RESPONSE (Stereo or Bridge mode)	20 Hz to 20 kHz, ±0.5 dB, at rated power into lowest rated load impedance	
INPUT IMPEDANCE	40 kohms, balanced 20 kohms, unbalanced	
SENSITIVITY (INPUT ATT 0 dB)	+4 dB (1.23V RMS), ±1 dB, for maximum rated power; sensitivity can be reduced in 1 dB steps to +23 dB (10.9V RMS) using INPUT ATT controls.	
CHANNEL SEPARATION	More than 60 dB at 20 kHz (worst case) undriven input shorted, at rated power output; typically 65 dB.	
OUTPUT NOISE (DIN, 22.4 Hz—22.4 kHz bandwidth)	Down more than 100 dB from rated output (input shorted, 8 ohm load)	
CONTROLS	POWER switch, INPUT ATTenuator (×2), MODE switch (STEREO/MONO/BRIDGE).	
MONITOR OUTPUT	Each channel has connections (post output relay) for driving a remote VU meter (+14 dB into minimum 300 ohm load; 7.5 kohm optimum load); also includes 1 amp relay closure contacts for activation of remote "amp output on" indicator lamp or VU meter lamp supply.	
CONNECTORS	INPUT	3-pin male & female XLRs & 1/4" (6.3 mm) Tip/Ring/Sleeve phone jack, all in parallel, for each channel.
	OUTPUT	5-way binding posts (std. 3/4" centers) and 1/4" Tip/Sleeve phone jack for each channel.
	MONITOR	4-pin Molex type connector for each channel.
	GROUND	Knurled, screw-down terminal post.
AC LINE VOLTAGE	110/120/220/240V, AC 50/60 Hz (Set at 240V AC)	
POWER CONSUMPTION	WIDTH	480 mm
	HEIGHT	132 mm
DIMENSIONS	HEIGHT	100.5mm (including feet); 88mm (excluding feet)
	DEPTH	144.5mm (including feet); 132mm (excluding feet)
	DEPTH	333 mm (aft of front panel); 383 mm (overall)
WEIGHT	Approx. 13 kg	Approx. 17.5 kg

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The Brüel & Kjær Cardioid Microphone

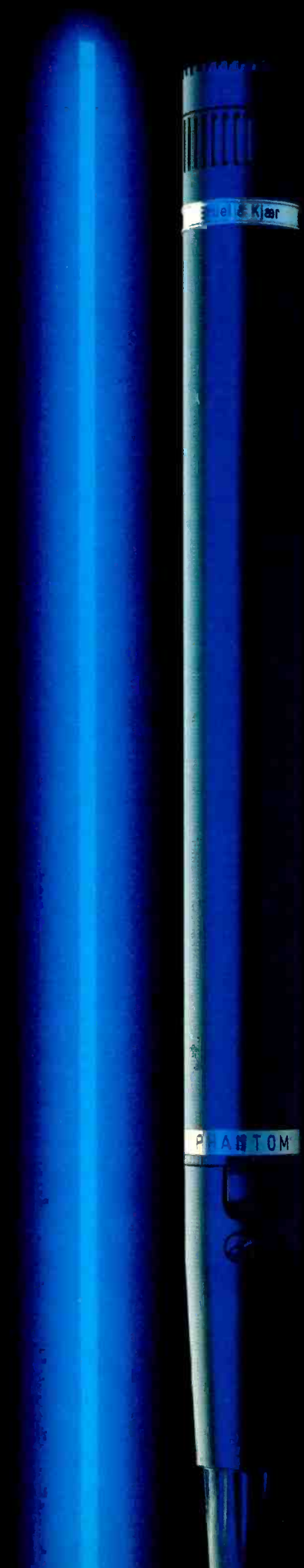
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The work Brüel & Kjær's engineers have put into the design of this microphone ensures that it will not become readily obsolete due to rapid advances in technology. The craftsmanship and materials involved in its construction are what make the difference between a good microphone and a superb microphone, and allow the 4011 to be called, justifiably, a work of art. Its technical specifications paint an impressive picture, but there's more to it than that. Put the 4011 to use and you'll find that, for once, what you read translates into what you hear.

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REVIEW

Dave Foister looks at the IDP1—a programmable dynamics processor from Studiomaster



Programmability has been comparatively late in coming to the field of dynamics processing. This may be because there are generally fewer adjustable parameters on a gate than on a delay line system for example; it's also probably true to say that compressor/expander settings are even more dependent on the nature of the signal being processed than those of other types of device. Nevertheless, most of us must have our own favourite 'starting point' settings for various processing tasks, and it makes sense to have these available for instant recall and adjustment, particularly as these devices become more sophisticated—the days of the simple four-knob compressor are largely over.

The dynamics programs in the various budget multi-effects devices are a useful bonus but limited in application, mainly because of the comparatively poor performance caused by digital-domain processing with too slow a clock rate and too few bits; acceptable for effects such as reverb where the original signal is retained but not for dynamic processing where the whole signal passes through the unit. Suddenly, however, dedicated programmable devices that do the job properly are

proliferating, and a good example is the Studiomaster Intelligent Dynamics Processor, the IDP1.

Even without the programmability, the IDP1 offers several interesting features and a well thought out operating system, which makes it a pleasure to use. The unit contains two completely independent channels that can be linked for stereo working; when not linked one can be configured as a gate while the other is working as a compressor if required, and different presets can be called up simultaneously on the two channels. Each channel can be set up either as a compressor/limiter/expander or as a gate, and the channel currently under front-panel control is displayed in the very bright, highly legible yellow display. All the indicators on the unit seem brighter than usual—it certainly draws the eye.

Parameter adjustment is performed by means of a nudge-button incremental system, but this is better designed than many such systems and is surprisingly fast to use, partly because double-function keys have been kept to a minimum. The exception is the row of six keys that select the parameter to be adjusted. These have one set of functions for the compressor mode and another for the gate mode but since these are clearly labelled

above and below the keys, and only one has a different name anyway, there is little likelihood of confusion. The unit is always in edit mode; pressing a parameter key shows the current setting on the display and makes it immediately available for modification with the nudge keys, whose rate of acceleration for once seems to be just about right.

The usual basic set of parameters is provided for compression, gating and expansion, with one useful addition—an additional simple expander, always available in the chain, for reducing any noise that may have been brought up by the effect in use. The only aspect of this expander that is adjustable is the threshold (which can be set to 'off') but fortunately its envelope parameters have been selected so as to make it reasonably unobtrusive in most circumstances, and it has built-in hysteresis, that is to say, the 'off' threshold is 4 dB lower than the 'on' threshold. This stops it flicking in and out quite so readily on low level false triggers. Its other parameters are cleverly linked to compressor ratio and release time values.

Also provided is automatic gain make-up for the compressor. This is permanently on, so again it's just as well it works. It certainly avoids the

common battle with the client/musician over compression where switching in a compressor without making up the gain apparently just makes the signal quieter, whereupon the client says, 'Don't like it, take it out.' It is slightly worrying to have this facility permanently in circuit but all I could hear it doing was keeping the subjective level constant however the compressor was adjusted.

All the familiar parameters have a good range of control, although the fastest attack time is a rather slow 30 μ s and the incremental steps by which the time constants can be adjusted may be a bit too widely spaced for some people's liking. Adjustment is made easier by the two parallel LED bar meters, of which the top one reads input level while the bottom one shows gain reduction. These are again bright and eye-catching, especially since they flash in opposite directions.

The IDP1 is of course programmable; 99 user memories are provided, and 28 factory presets show the unit off in its various modes, and provide editable starting points for customised effects. These presets certainly cover most of the common dynamic processing requirements and have obviously been carefully selected and programmed, although several are on the heavy

side and need their thresholds backing off for sensible, subtle use. Recalling these presets (and the user memories) is perhaps more laborious than it need be, involving three keystrokes on top of the actual finding of the required preset. The 'Program' key shows the currently selected preset and allows others to be selected. This is done with the nudge buttons, after which pressing Recall gives a sideways-scrolling prompt in the display saying, 'Please accept or Cancel' (very polite), which you then obey with the appropriate key. There's probably less security on the button that fires the missiles, and it all seems over the top for simply changing presets. It's one example of the unit's occasional camp touches (*or is it just user friendly? Ed*); another amusing one is the way the display says 'Hello' when you switch on. Any device which starts a session that way can't be all bad.

The range of capabilities shown by the factory presets is impressive. A list in the manual shows what each is designed to do, such as a general purpose drum gate, a compressor for bass (straight or 'punchy'), a stereo classical music compressor and so on, as well as simulations of AM and FM radio compression and a voice-operated fader using the expander in Duck mode. All have their uses and provide a quick way to get to the desired effect, although again the thresholds on some of the compression programs seem surprisingly low. On the other hand, when used on a slightly noisy guitar track the resulting raised noise floor was handled well by the extra expander, creating a clean usable sound without having to resort to additional outboard gating. All the signals I tried it with were handled with ease, including heavy compression on bass, which produced virtually none of the distortion that can sometimes arise, and general stereo compression on unaccompanied vocals, which should show up any unpleasant effects and in this case gave no problems.

Other factory presets use the extensive and imaginative MIDI facilities of the IDPI. Various modes are available, apart from straightforward program change; for instance, the compressor gain can be controlled by MIDI key velocity, the gate can be triggered from a pitch bend wheel, and the unit can be used for MIDI-triggered auto fades both up and down. All these facilities are easily accessible, and since all the required information could be simply written into a sequencer, the device opens up new automation possibilities beyond its normal roles.

Inputs and outputs are on unbalanced ¼ in jacks, with the operating level switchable on the back panel. Although there is no key input for the gate as such, the side chain for all processes runs via a 3-pole insert jack, allowing not only external keying but frequency-conscious processing as well. Unfortunately this requires yet another non-standard lead to be made up, which is a constant source of irritation in my opinion. However, switches on the front panel allow the side chain to be monitored via whatever external processing has been added.

The standard of construction, layout and general appearance of the IDPI are extremely good. Considerable thought has obviously gone into the ergonomics of the front panel, so that the instruction manual is scarcely required. Quite why it warrants the description 'Intelligent' is not entirely clear, but it does provide versatility, good clean signal processing, and simple powerful programmability in a neat, easy-to-use package. □

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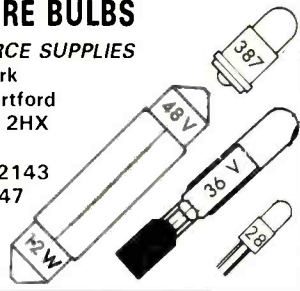
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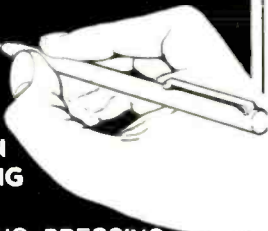
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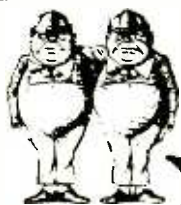
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