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MIXING CONSOLES

This is the mixing console that will cause a revolution in 24 track studios.

The world's first Dual Mode mixing console.

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When you record with the TS12, its in-line monitoring means you create a control room mix on the main faders.

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Standard features are impressive, to say the least. Six auxiliary sends, seven stereo line inputs or effects returns, a 'musician friendly' headphone mix, an extensive 19" metal frame patchbay – and the option to create a massive total of 102 inputs.

Quite a line-up.

Attention to detail is equally stringent with modular PCBs, no dual concentrics and a clear, logical layout that belies the sophistication inside.

But the most remarkable feature of the new TS12 is without doubt the price.

We suggest you call us today to find out just how remarkable.

## ALL THE FEATURES YOU'D EXPECT IN A £30,000 CONSOLE, EXCEPT ONE. THE PRICE.



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A LINK HOUSE  
PUBLICATION

Publisher and consultant to  
APRS for Studio Sound's  
Producer's Guide to APRS  
Members 1984/85

May 1987                      Number 5  
Volume 29                      ISSN 0144-5944

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Several days before writing this column I found myself having to explain several aspects of the audio process in very simple terms to some relative laymen. This was not so much the techniques of the recording studio but more how analogue recording worked; how digital recording worked; how the two systems differed; some questions on the compact disc, and some basic areas of electronics and electroacoustics. Most had little difficulty in grasping how the more traditional aspects of our equipment worked—the function of the loudspeaker creating sound pressure waves which we interpret as sound was easily assimilated. So was the analogue electronics aspects of mixing consoles and amplifiers. However, analogue sound recording—the interface between electronics and magnetism—was several degrees more difficult to explain. They understood but there was an element of surprise that something with such a simple basic concept should be able to produce the quality of sound we are used to.

When I had to explain digital audio and the concepts of quantisation, bits and sampling rates, there was an immediate barrier of disbelief. There appeared to be no way they could comprehend that the process of digitisation and conversion back to analogue was capable of even working let alone making music of any quality. These were not people to whom technology was foreign, it was just that they had never considered how this area of it functioned. So although they understood the physical process, that this worked in practice was rather more difficult for them to grasp. There was a technology credibility gap and the only reason they believed it worked was because they could see it in front of their eyes.

Audio is not the only technology that carries this distance between the understanding of the factual aspects and the belief that it really does work. I have similar feelings about genetic engineering and certain aspects of nuclear particles—I can usually grasp the principles of the process when explained to me, but the fact that it really does work on these basic principles is often hard to digest.

New technologies will always have this effect on people until they become fully accepted. When electricity first began to be installed in houses, I understand that one of the concerns was that it could leak from the wiring and prove harmful. The credibility gap here was that although it was easily accepted that electricity flowed best within metal cables, experience in the domestic environment had been limited to (natural) gas and water where it was very easy to see that the pipes contained them. But the concept of a 'solid pipe' containing electricity was not so clear and therefore it was not so obvious why the air surrounding the electric wire should not conduct this invisible 'substance' as well. By living with the technology (or with the electric cables), even those who do not understand why it should work can adjust to the fact that it does. So as a little exercise let us look forward to future possible pro-audio credibility gaps and guess at what might happen. Just imagine if...

... after 30 years of intensive further development on transducers, speaker systems and control room acoustics,

# EDITORIAL

someone somewhere develops a way of bypassing the ears for 'hearing'. Immediately speakers and special acoustics become redundant or rather irrelevant.

Would you believe it? **Yes/No**

... after 15 years, mixing consoles are compact desk top type controllers of a digital audio signal path that includes audio synthesis, editing, storage systems with full software control.

Would you believe it? **Yes/No**

... after 10 years of debate, meetings and proposed standards, there are internationally accepted interfaces, buses and protocols for all pro-audio and video equipment; but by this time the whole aspect is rather worthless as all this equipment has already become part of a single processor system handling all aspects of the processing.

Would you believe it? **Yes/No**

... in 20 years it will be possible that the consumer music (disc/chip, etc) format will also include some software that is an analysis of the musical patterns and style behind the recorded music. This will then be read by the replay machine allowing it to create further music similar to that already recorded using sound samples from the recording. It will be very controversial.

Would you believe it? **Yes/No**

... in 25 years time we had outgrown all the digital recording systems that are known today and were into the third generation systems, but the manufacturers were still divided into two separate camps who refuse to talk to each other.

Would you believe it? **Yes/No**

Keith Spencer-Allen

**STUDIO SOUND**  
AND BROADCAST ENGINEERING

STUDIO SOUND is published on the second Friday of the preceding month. The magazine is available on a rigidly controlled requested

basis only to qualified personnel (see back page for terms) or for an annual cost of **£18.00 UK, £24.50** overseas surface mail or **£46.50** overseas airmail to non-qualifying readers or where more than two copies are required in a studio or small organisation.

**Circulation enquiries.**

**New readers:** Link House Publications plc, Link House, Dingwall Avenue, Croydon CR9 2TA, UK. Tel: 01-686 2599.

**Free subscriptions:** Controlled

Circulation Dept, Studio Sound, Link House Magazines Ltd, Central House, 27 Park Street, Croydon CR0 1YD, UK. Tel: 01-760 0054.

**Paid subscriptions:** Subscription Dept, Studio Sound, Link House Magazines Ltd, 120-126 Lavender Avenue, Mitcham, Surrey CR4 3HP, UK.

**US mailing agents:** Postmaster please send address corrections to Studio Sound, c/o Expeditors of the Printed Word Ltd, 515 Madison

Avenue, New York, NY 10022. Total average net circulation of 14,240 per issue during 1985 UK: 6,335. Overseas: 7,905. (ABC audited).

Studio Sound and Broadcast Engineering incorporates Sound International and Beat Instrumental. Printed in England.

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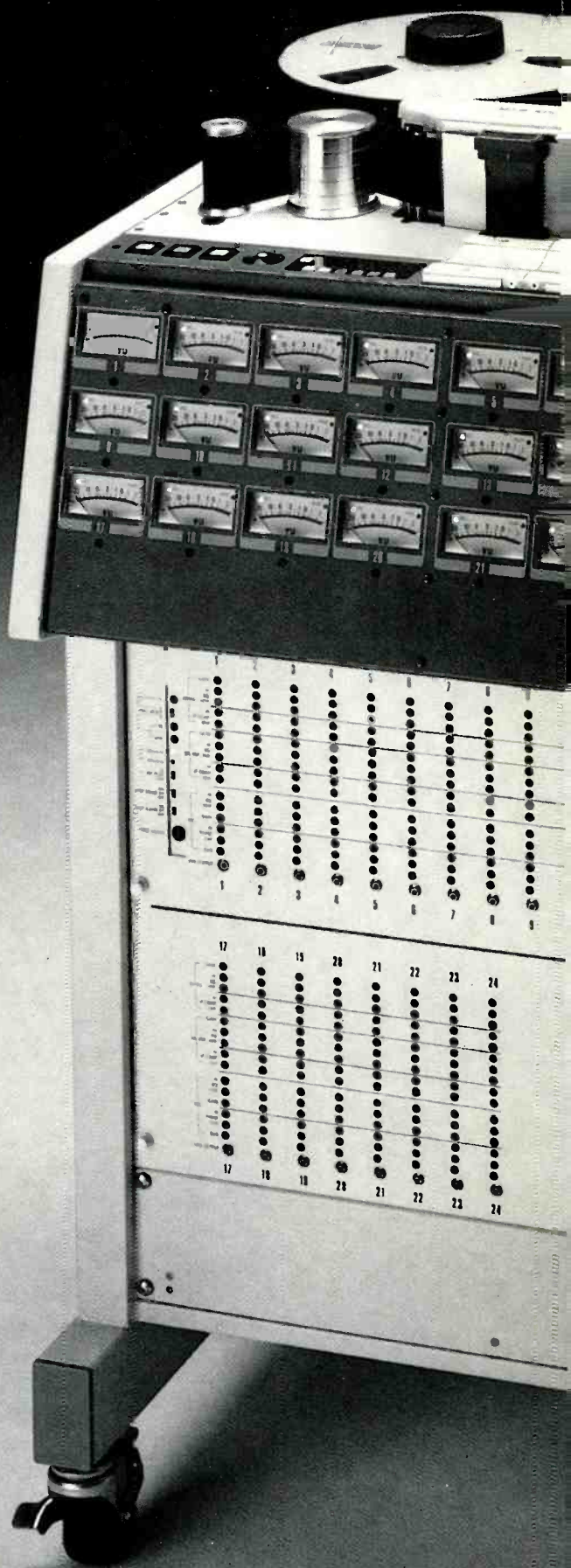
Sound quality is remarkable; with the Dolby rack it's outstanding. Outmoded or secondhand machines are no longer the only options.

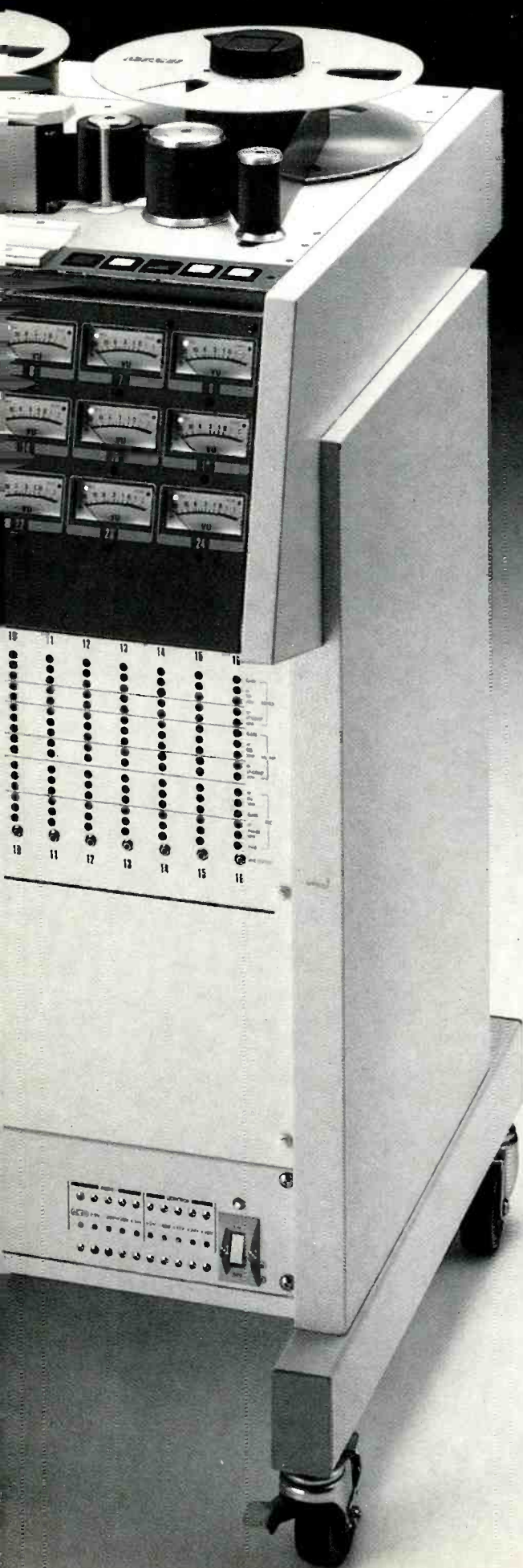
The **MTR-90** needs no introduction; its tape handling is flawless and with our new, custom Dolby SR<sup>®</sup> overbridge its status as the world's most successful multitrack is assured.

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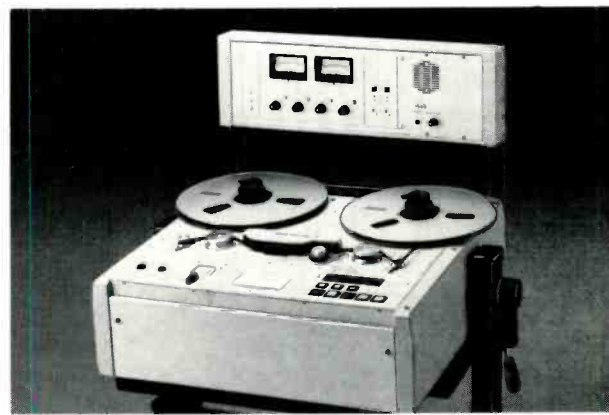




◀ **MX-80** New multitrack in 2" 16/24/32 track versions. Features closed-loop constant tension transport with 30/15/7.5 ips speeds, each with gapless punch in/out. Integral facilities include Dolby HX-Pro\*, synchroniser interface, switchable EQ curves and 4-cue autolocator. Full remote provided; Dolby SR\* overbridge, timecode-based autolocator and chase synchroniser optional.



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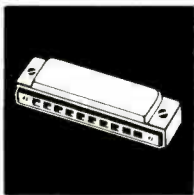
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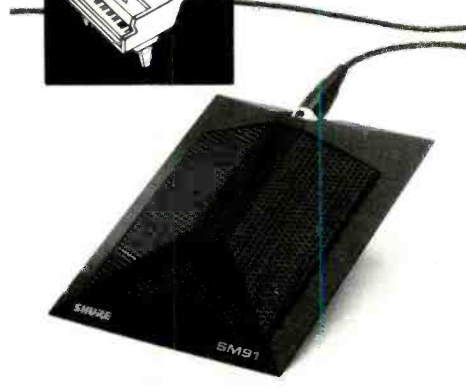
## SHURE SM94 GENERAL INSTRUMENTS

The SM94 is an excellent instrumentalist's microphone with performance that compares favourably to many more expensive studio units. Flat frequency response with no troublesome "spikes" or "icicles", very uniform cardioid pattern does not "collapse" at high frequencies for highly controlled off-axis performance, internal battery takes over if Simplex power fails, low handling noise.



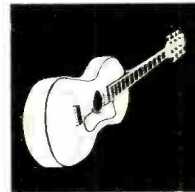
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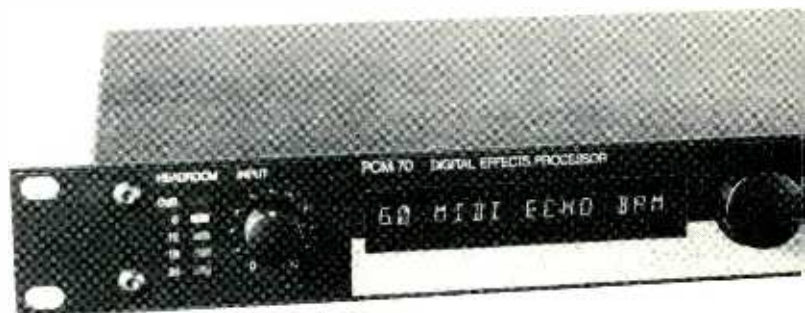
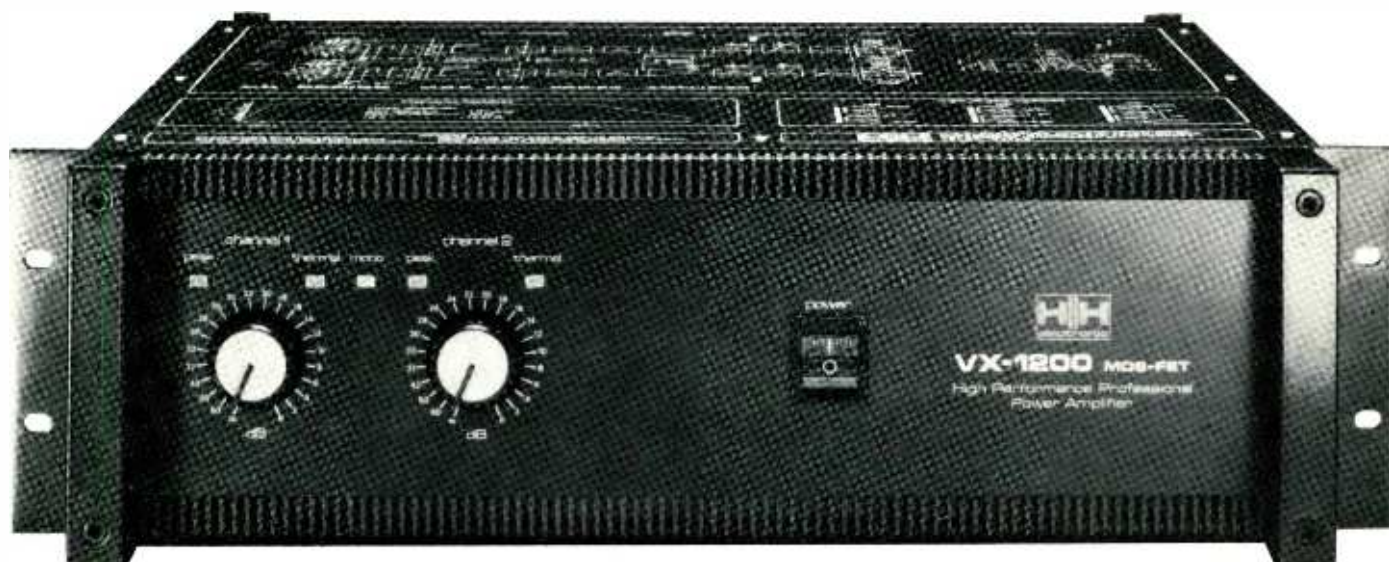
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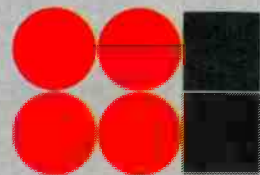
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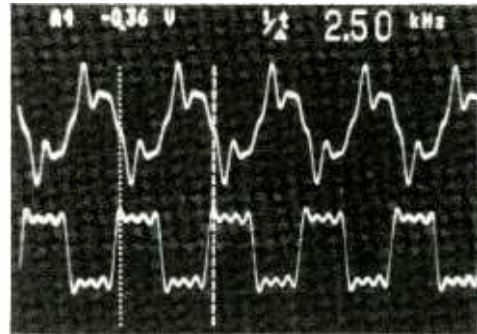
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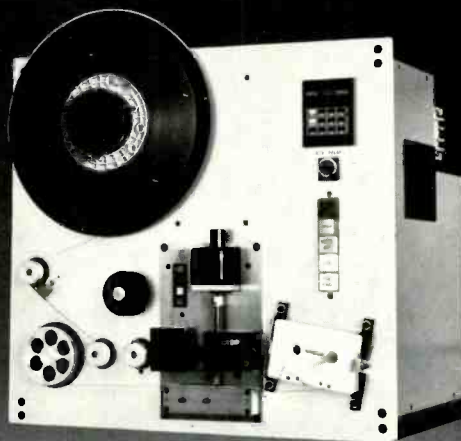
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Time musicians and producers spend just hanging around while they do it.

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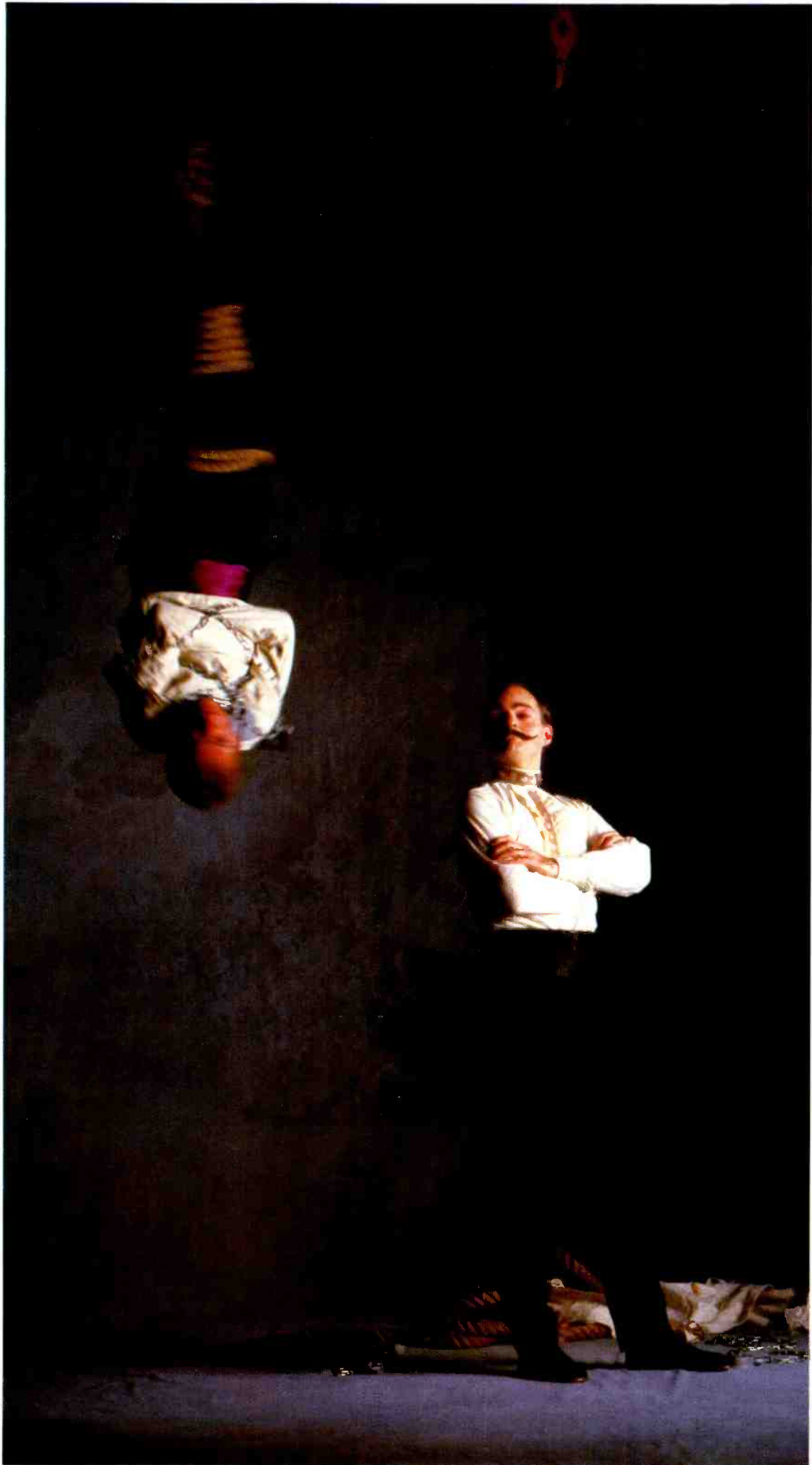


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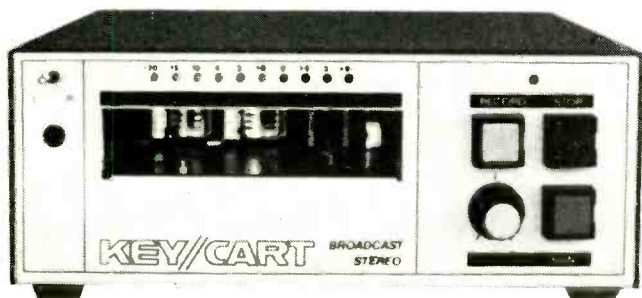
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The TC 2290 is the first sampler/delay in the world to give you 100% accurate sampling up to 32 seconds. Make an A/B comparison with any analog or digital master tape or compact disc, and you will notice there is no difference.

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ducking, chorus and delay simultaneously, automatic panning 100 presets and MIDI feature making it possible to control the TC 2290 from a computer.

**Big studios will like the extras, small studios will love the price**

\*) "There is no better sampling" is a quote from Bob Schwall - Right Track Studio in N.Y.C.

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We think the Soundtracs CM4400 with the CMS2 SMPTE Automation and Soundcraft SCM762 24 track machine represents unbeatable value.

The Soundtracs CM4400 with CMS2 gives you automated routing, channel and group muting, pre-programming of effects, sends and returns, programmable record drop in via events recorder, control of eight external devices and 30 different mixing combinations all under SMPTE timecode control.

The Soundcraft SCM762 Mk III recorder comes complete with remote control, varispeed, zero locate

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Package consists of:

*Soundtracs CM4400 – 32 input mixing console.*

*Soundtracs CMS2 – automation system.*

*Soundcraft SCM762 Mk III 24 track recorder.*

*Commodore PC and disk drive.*

*Video monitor.*

*Set of interconnecting cables.*

*Please ring for a full demonstration.*

---

**Don Larking**  
audio sales

# APRS fights back

The UK Association of Professional Recording Studios have gained significant concessions from the British government after the announcement of the new tax regulations on foreign entertainers, due for introduction in the 1987 tax year. In their original form, the rules were so all-embracing that in a hard-hitting press conference on 25 February, APRS president, George Martin, saw the new legislation as being "curtains for many studios and desperate consequences for a successful manufacturing industry and a valuable export trade."

The APRS then followed with a well-argued 28-page submission to the Inland Revenue, and a meeting with Financial Secretary to the Treasury, Norman Lamont, to whom the APRS explained the grave consequences of such a legislation. On 13 March, the Treasury Secretary announced the government's change

of heart, which meant the exclusion of "payments which arise from the sale of records" (especially royalties). This major climbdown by the government effectively answered the APRS objections.

APRS chairman, Ken Townsend, summed up after the government's decision: "We are, of course, relieved and very happy that the Treasury has seen the force of our arguments and that a serious threat to the recording industry has been averted. The association will continue to be alive to dangers from whatever source, and prompt to protect the interests of members in every sector."

## NEWS

### In brief

● Electrosonic Ltd of London have announced the opening of a new office in Hong Kong. The new company forms part of the worldwide Electrosonic group, and is headed by Brian Smith and Ian Fueggle. Electrosonic Ltd, 2803 Admiralty Centre, Tower 1, 18 Harcourt Road, Hong Kong. Tel: 5-290356.

● CP Cases of Middlesex are now offering *Rak-Kit*, a new system for supporting 19 in rack-mounted units. Easy to assemble and offering up to 31 unit mounts, the kit can be used in a variety of combinations. The matte-black steel side frames can be mounted on floors, walls and benches. Complete with all mounting accessories *Rak-Kit* retails for £39.95 (inc VAT). More information is available from CP Cases, tel: 01-568 1881.

● The San Francisco Conservatory of Music have installed a professional recording studio in their Hellman Hall. The equipment was a gift from the ELW Foundation, which awards grants to exemplary educational, health and medical, public affairs and cultural projects. The installation itself, a gift from AIC Pro Audio, was by Dennis Rice Studio Services.

● Syco have announced a marketing drive geared towards assisting universities and colleges to gain access to their equipment. In-depth research has resulted in designs for specific packages to assist in areas such as non-capital budget lending, lend hiring, leasing, PA payments, cost splitting and grant and charity funding.

● Lee International plc of west London have entered into an agreement for the sale of the whole issued share capital of CTS Studios Ltd to Lansdowne Recording Studios Ltd, both from London. The move creates a combination of studio facilities specialising in music recording for film and TV, as well as record and advertising work.

● Trident have been invited by the APRS to hold a seminar on the *Di-Ar* console, which will be demonstrated in conjunction with the Otari *DTR 900* digital 32-track. It's hoped that this will give many people a chance to see the console who were unable to at last year's APRS exhibition. It will be held at the Royal National Hotel, Bedford Way, Russell Square, London WC1.

## TAC grows in China

In late '85, Total Audio Concepts received an order from the Chinese national broadcasting organisation for 70 slightly modified *Scorpion* consoles—the PBC, or Production Broadcast Console. Since then, TAC have consolidated their position in China by supplying a wide range of *Scorpion* and *Matchless* products, and now, according to director John Penn, sell at least one console a month there. It may appear that entry into the Chinese market is only a recent

phenomenon but, as Penn points out, TAC began their enquiries as early as 1982, and exhibited their products in Beijing the following year. TAC's quiescence on the subject to date was based on obvious competitive reasons, and their recent explanations were intended to 'set the record straight'.

Besides the 70 *Scorpions* being the largest single order TAC has received, Penn also believes that it is the largest order China has ever placed with a console manufacturer.

## Peavey rental plan

Peavey Electronics (UK) have announced the start of a new programme whereby authorised main dealers can offer hire facilities in their localities of fully integrated Peavey systems. Mixer amplifiers, speaker systems, microphones and stands can be hired by the hour, day

or for long term periods, with options to buy in most cases and a fully backed service structure. Details are available from: Peavey Electronics (UK) Ltd, Hatton House, Hunters Road, Weldon Industrial Estate, Corby, Northants NN17 1JE. Tel: 0536 205520.

## People

● Lenco Inc of Jackson Missouri have announced the promotion of David Aufdenberg to the position of national technical services manager. Among his responsibilities will be supervising the technical customer service with the company's TV/radio broadcast dealers and with their graphics products dealers.

● Fuji audio/visual division have appointed Megumi Morishigi European technical manager for their full range of magnetic tape products. Morishigi will be responsible for technical advice and new product development of Fuji's professional audio, video and floppy disk products.

● AVC Systems Inc of Minneapolis, Minnesota, have announced the appointment of Eric Pilhofer as systems consultant, who'll be specialising in assistance with all aspects of studio design.

● Gary L Hudson has been appointed to be the first marketing and sales manager with Meyer Laboratories of Berkeley, California. Hudson comes

from Threshold Corporation where he was worldwide marketing and sales manager for pro and consumer electronic products.

● Audio Image Corporation, new dealers for Otari in Northern California, have appointed John Francombe and Dave Van Hoy to their sales team.

● Guitar supremo Adrian Belew has joined Royal Recorders studio in Lake Geneva, Wisconsin, as artist/producer in residence. Belew's guitar can be found on works by Frank Zappa, Talking Heads, David Bowie, King Crimson, Paul Simon and Laurie Anderson.

● Australian-based Jands pty have appointed Peter Twartz product manager for Soundcraft equipment. Twartz's last three years were spent with previous distributor Rank/Klarion in a similar capacity.

● Soundcraft have announced the appointment of Jane Lovell as new marketing co-ordinator, taking over from Claire Finch. ▷

# Westar+ COMPUMIX P.C.

## The New Westar+

Need bells and whistles? The new Westar+ High Performance Music Recording Console is the only console available today with the combination of a field expandable frame design, plug-in equalizer options (4 types), 3 levels of automation option, 8 auxiliary sends, 4 different fader options (Manual, VCA, TBA and IDF), and technical and sonic performance second to none.

## Studio Requirement

With cost effective digital processing consoles scheduled to be available by 1990, the profit oriented studio today needs a reliable high performance analog console to match the sonic qualities of the new digital recorders like the Mitsubishi X-850. The Westar+ is such a console system, at a price the studio can pay back by the time digital consoles become reality.

## Studio Economics

Investing over \$400,000 in a digitally controlled analog console does not make sense economically, nor can such a console match the processing and automation power of the future digital consoles. The cost effective choice today is the Westar+.

## Westar Studios

Westar consoles are already proven in service at leading studios around the world, in the U.S., Canada, Japan, Scandinavia, Austria, W. Germany, Colombia and England. For studios not intimidated by "the fashion console of the month," the Westar+ is the intelligent choice.

## Powerful Automation

Compumix PC is a powerful extension of the popular tape based automation system, providing storage on floppy diskettes of an unlimited number of mixes and off line editing of mix data. The Compumix PC comes complete with IBM XT compatible PC (with Dual floppy and 20 MB Hard Disk), Mitsubishi 13" color graphics monitor, custom and standard keyboard, and all cables and software.

Compumix PC is probably the most cost effective high performance automation system available today, and a perfect fit for Westar+.



**"The Best Console Buy Around."**



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# Software update

# NEWS

## Contracts

●After Trevor Horne's purchase of a series 80B console, Roland Orzibal of Tears for Fears bought a similar one after hearing it in action. Both were sold through Stirling ITA.

●Kajem Studios in Gladwyne, Pennsylvania, have announced the acquisition of the following equipment: Lexicon 480L reverb and special effects processor; Yamaha concert grand piano; *Dyno-My* tri-stereo chorus; Ensoniq *ESQ-1* synthesiser; Aphex *Compellor*; and a Roland *Dimension D* effects processor.

●Audio Systems Components have supplied Silk Sound studios in Berwick Street, London, with six Technics *SL-P1200* compact disc players for their radio and television sound production facilities.

●Windmill Lane studios in Dublin, Ireland, began 1987 by opening their new Studio Three—a computer studio, fitted with: Fairlight series III, PPG with *Waveterm*, Oberheim *Expander* and *Matrix 6*. In addition, Windmill's Studio Two took delivery of a Soundcraft *TS24* console and a Studer *A800* 24-track as part of a complete refurbishment.

●Masterfonics Studio in Nashville, Tennessee, are the first studio in the US to purchase the Otari *DTR-900* PD format digital multitrack recorder. Its installation is part of a new mix room which also features an SSL console.

●Smooth Rock Studios in Calgary, Alberta, have ordered a Mitsubishi

*X-86 ¼* in digital audio tape machine. Recently installed are: *Q.Lock 4.10* synchronisation with *Eclipse* editor and *Q.Link*; Otari *MTR-12 ¼* in analogue recorder; two Dolby *280 SR* cards; two Valley People *430 Dyna-Mites*; and Digital Creations' *Diskmix V2.4* timecode-based automation storage/editing system.

●London-based HHB Hire & Sales have sold to Hilton Sound a pair of Sony *PCM-3324* digital multitracks.

●Solid State Logic have announced the following recent installations. Eurosonic in Madrid received a second *SLA048E* series, SSL Studio Computer and *Total Recall* for their Studio 2. Fantasy Studios in Berkeley, California, received a 56-channel *SLA056E* series with Studio Computer with *Total Recall*. Artisound in Amsterdam received a 36-channel *SLA048E* series and computer with *Total Recall*. Magnet Studios in Tokyo now have a 36-channel *SLA048E* series. NOS in the Netherlands received a 48-channel (40 mono, 8 stereo) *SLA048E* series. Studio 2 at the Bridge in London received a 32-channel *SL6032E* series with Studio Computer. Good Sound Studios in Taiwan brought in a 32-channel *SLA040E* series with Studio Computer. And HTV Bristol's Studio B2 received a 32-channel (30 mono, 2 stereo) *SL5448* Audio Production System and an *Instant Reset* Computer.

●Timeline Inc have introduced a software writers' guide for the new Lynx *VSI* video editor interface module. This will enable engineers to access the module through the RS422 bus using the Ampex *VPR3* protocol. The Lynx *VSI* can be used to connect an audio tape machine directly to a video editing system. One module is required for each transport. No modification to the editor is involved.

●First Order Effects have introduced further effects EPROMs for the Eventide *SP2016*. In addition to a variety of 'split' programs (enabling the unit to execute simultaneously two completely independent mono or stereo effects) special effects include Stereo Shimmer, Random Ambience, Psycho-Panner, Dynamic Reverb and Sub-Bass Synth. Also new on ROM is Studio Toolkit which includes pink and white noise source, sweepable sine wave oscillator, SMPTE code filter/reshaper, phase meter and mono to stereo synthesiser.

●Harrison have developed new software for the microprocessor-based video switcher interface. The new software (*V1.20*) provides compatibility with the Editing Suite Audio Mixer Serial II Protocol as adopted by Ampex, CMX, Graham-Patten Systems, Grass Valley and

others. The new EPROM is available free of charge to all purchasers of Harrison *VSI* equipped systems.

●Number One Systems Ltd have introduced Analyser software for the IBM PC and compatibles. Analyser offers circuit design, checking and analysis facilities and is available in two fully menu-driven versions according to circuit size and ability to produce tabulated or graphic results.

●Beam Team Software have introduced *Transform* for the Atari ST. The software package is a series of software modules controlled by precision graphics. Features include a 80,000 note real time recorder, sequencer, MIDI *Event* editor, sound generation and SMPTE *Song Pointer*.

●Wendel Labs have introduced a low cost version of the Wendel *I* drum computer. Wendel *jr* automatically replaces pre-recorded, live or synthesised percussion sounds with high quality acoustic ones. Sounds are stored on ROM chips in Wendell Carts. Currently 50 Wendell Carts are available and a special custom service is also available.

●The Syntech 48-track PC has now been updated. The new package—The 48-track PC II—provides 48 tracks, 16 MIDI channels, unlimited cue marks and sync to SMPTE in four formats.

## US audioscope distribution

At the time of the publication of the Audioscope 3211 multichannel level monitor review in the April issue, we were not aware of the US distribution arrangements.

Audioscope products are now distributed through Apogee Electronics Corp, 1517 20th Street, Santa Monica, CA 90404. Tel: (213) 828 1930.

## Address changes

●Electrospace Developments Ltd have moved to Cornwall. Their full address is: St Francis Road, St Columb Road, Cornwall TR9 6QG. Tel: 0726 861111. Telex: 45707

ELECS P G.  
●The APRS, now in their 37th year, have moved their secretariat to 163a High Street, Rickmansworth, Herts WD3 1AE, UK. Tel: 0923 772907.

## Forthcoming events

June 27 to 30 NAMM International Music & Sound Expo, McCormick Place, Chicago, USA.

August 28 to 6 September International Audio and Video Fair Berlin, Berlin Exhibition Grounds, West Germany.

September 2 to 4 MediaCom '87 and MediaForum Berlin '87, in

conjunction with the International Audio and Video Fair Berlin.

September 23 to 27 International Broadcasting Convention—IBC 88—Brighton, Sussex, UK.

September 24 12th Sound Broadcast Equipment Show (SBES), Albany Hotel, Birmingham, UK.

## Agencies

●Soundcraft have announced the appointment of Jands as their sole Australian distributor for mixing consoles and multitrack recorders. This replaces a previous agreement with Rank/Klarion.

●Crest Audio of New Jersey have appointed RPM Marketing to cover Eastern Texas, Oklahoma, Arkansas and Louisiana as their new

representatives. Taub Sales of Maryland will cover Maryland, Delaware, Virginia, Eastern Pennsylvania and Southern New Jersey.

●Otari Corporation have announced the appointment of Audio Images as the full-line dealer for Otari products in Northern California.

# Neve V Series – when only the best is good enough.



PHOTO: PRT STUDIOS LONDON

“The V Series/Neve combination is extremely good.”

GRAHAM DIXON (Freelance Engineer)

“We were delighted by the exceptionally clean response of the console and the ease of operation of the Neve system during mixing.”

GEOFF CALVER & CHRIS CAMERON  
(Producer/Engineer & Producer/Arranger)

“...without doubt the finest console I have worked on.”

BOB MALLET (Resident Engineer PRT Studios)

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# NEWS

## In brief

● Hill Audio have now supplied their *Multimix 16/4/2* mixing console with the *PSI* power supply, and have introduced direct outputs on each channel, EQ defeat, +4/-10 dB subgroup output switching and PFL metering. Hill have also replaced their *DX500* amplifier with the *DX1500*, which has greater output into 2 Ω loads, improved cooling using DC controlled variable speed fans, external earth lift switch and more versatile connections.

● Soundtracs have introduced an optional effects return module for the

PC MIDI series. Two blank modules are fitted into the console, each providing four returns with MIDI programmable mutes and solo facilities. Two returns have EQ and can be returned via a level and pan control to the LR masters and the other two have sends to Aux 1 and 2 or 3 and 4 in addition to pan and level control.

● Levell Electronics have introduced their *TM3B AC* portable microvoltmeter, which features a wide frequency range (1 Hz to 3 MHz) with variable bandwidth, high

sensitivity (-100 dB to +50 dB) and low noise. Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SD, UK. Tel: 01-449 5028.

● Crest Audio have introduced the 2U high model *FA800* power amplifier, rated at 240 W/channel into 8 Ω, and 400 W/channel into 4 Ω. Crest Audio, 150 Florence Avenue, Hawthorne, New Jersey 07506, USA. Tel: (201) 423-1300.

● Australian-based Jands have released their own MOSFET *M600* power amp. It's rated at 300 W RMS/channel minimum into 4 Ω loads

with both channels or 700 W RMS bridged.

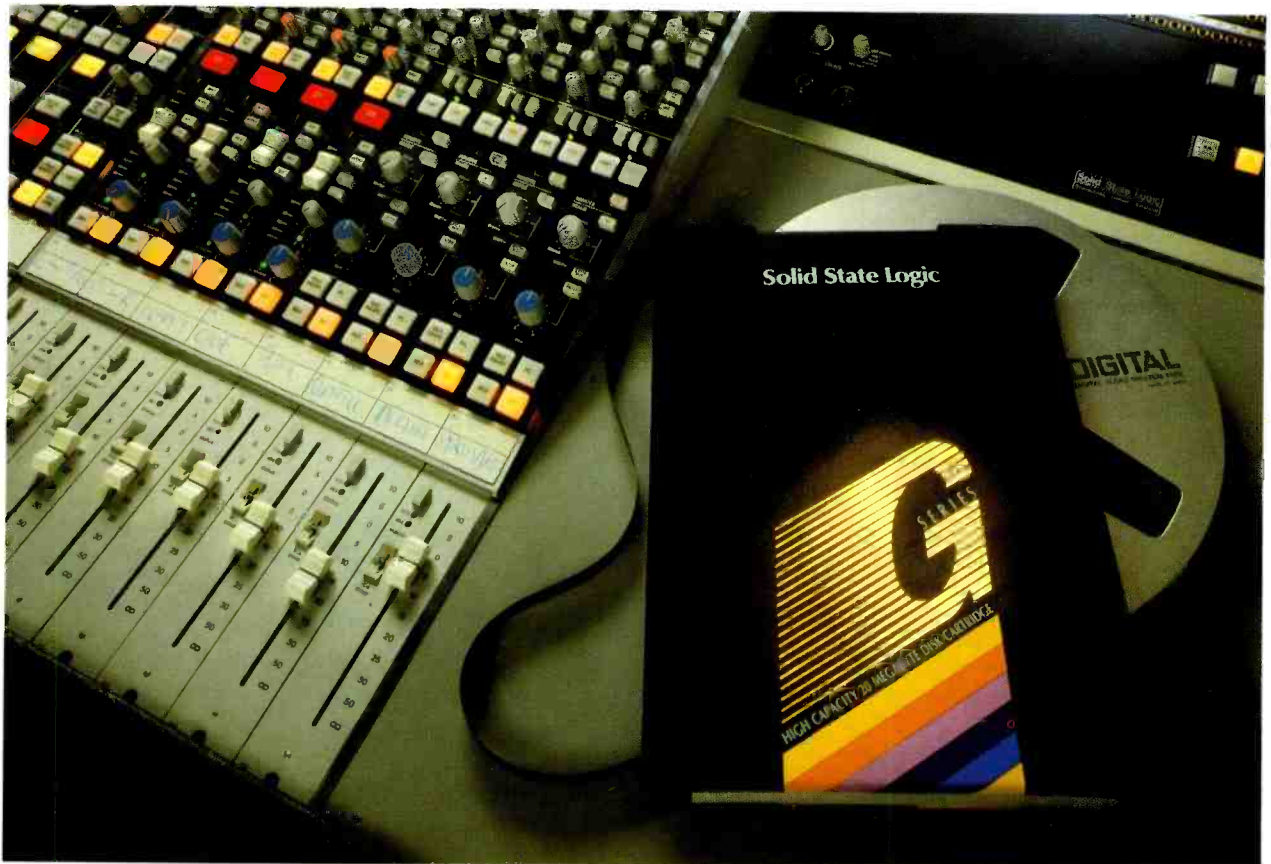
● R&D Speech Technology have adapted their Micro-Voice voice-recognition system for BBC Microcomputers. Micro-Voice Basic is a self-contained hardware and software package that plugs into the computer's expansion port. Recognition time is less than 0.5 s, and all words and phrases are stored in ROM units, which are easily incorporated into users' programs. R&D Speech Technology, Waterside House, Ponsharden, Penryn, Cornwall TR10 8AR, UK.

## Audio+Design Soundstreamer

The Audio+Design *Soundstreamer* is a hardware/software package that allows an Atari *ST* computer to store digital audio from a Sony *PCM-501/601/701* via a suitable interface. *Soundstreamer* was developed by York University's Electronic Music Studio as part of the Composer's Desktop Project (CDP).

The new package consists of a 256 kbyte FIFO (First In, First Out) buffer memory and a control system which links the Atari's ROM port to

the Sony. The current software allows the transfer of either full stereo 44.1 kHz, stereo 22.05 kHz or mono 44.1 kHz 16 bit to or from a special soundfile section on the Atari or other hard disk. Various other related utilities are also included. **Audio+Design Ltd, Unit 3, Horseshoe Park, Pangbourne RG8 7JW, UK. Tel: 07357 4545.**  
**USA: Audio & Design Calrec Inc, PO Box 786, Bremerton WA 98310. Tel: (206) 275-5009.**



## G · SERIES STUDIO COMPUTER





## Digital Creations updates

Digital Creations Corporation have released details on two new products. The *DACC* (Dual Audio Control Card) allows professional quality audio level control and switching to be added to the *STD* bus. The unit has two independent channels, each with input mode selector, VCA, dynamic mute and balanced input/output amplifiers. All switching and routing is electronic and onboard D/A conversion and glue logic tie the controls to the *STD* bus. Applications include automatic and/or remote control of audio mixing, distribution

and testing for both professional and comms systems.

The *VIC* (Video Interface Computer) is designed to allow any audio console to be controlled by a growing number of video editors. Interface is via an RS232 or RS422 port with three basic *VIC* packages: one for VCA equipped consoles, one for non-VCA consoles and one for *ARMS* equipped or *ARMS* ready consoles. **Digital Creations Corporation, 400 South Oyster Bay Road, Suite 304, Hicksville NY 11801, USA. Tel: (516) 822-0881.**

## Soundtracs FME series mixer

The Soundtracs *FME* series mixer is a fully modular design constructed around either a 22 or 30 module mainframe. Module types include mono input with or without remote switching; stereo input including RIAA and line plus remote start; monitor input with eight monitor sends; group output with upper and lower monitor sections; monitor output and master module. Modules can be fitted in various configurations according to requirements.

The display system includes 12

LED bargraphs, Solo warning and power supply rail indicators. Most inputs and outputs are electronically balanced (transformer option on mic inputs and most outputs). Tape sends/returns are internally selectable +4 dBm or -10 dBV. Specific applications include broadcast and video post production. **Soundtracs plc, 91 Ewell Road, Surbiton, Surrey KT6 6AH, UK. Tel: 01-399 6821.**

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

## La Rue EC-1000 controller

The Canadian built *EC-1000* is an expandable rack mountable SMPTE timecode event controller which reads and decodes any of the four standard timecodes (24, 25, 30 frames and 29.97 drop frame) and allows the user to program up to 256 timecode locations. Features include optional remote control and expansion unit (increasing number of control

elements); 38-pin I/O connector, Drop Frame, Enable/Disable, Control Status and Code Error indicators. Control elements on the unit are 1A/120VAC dry contact relays. **La Rue Professional Systems, 683 Mountview Place, Newmarket, Ontario L3Y 3P8, Canada. Tel: 416 895 3191.**

## ... IN THE FAST LANE

**O**n the road to success, decisions have to be taken — fast. Demanding tasks must be performed — precisely.

Today's music business demands high performance and instant reaction from producers, engineers and the systems they use. Nothing less than excellence will do, whether you are in familiar surroundings — or in a studio you have never seen before.



off-line. Individual faders can be instantly updated in rollback. A staggering 20 megabytes of audio mixing information — equivalent to 80 floppy disks — can be stored on just one *SSL G Series* disk, taking up less space and weighing less than a reel of quarter inch. And all this data can be loaded, processed, edited and copied faster than ever before.

Life in the fast lane will be sweeter than you think.

The new *SSL G Series Studio Computer* takes audio mixing systems into the fast lane. High-speed processors and vast memory provide the ideal vehicle for a new generation of *SSL* software — firmly based on systems which have already set the standard. Large and complex mixes are handled effortlessly, on and

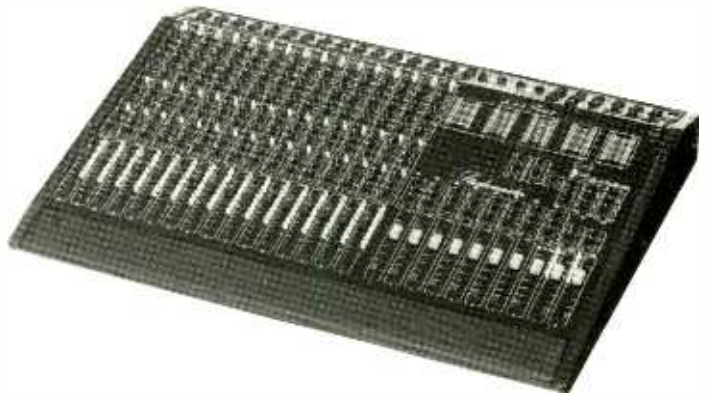
## Solid State Logic

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# NEWS



## Toa D3 mixer

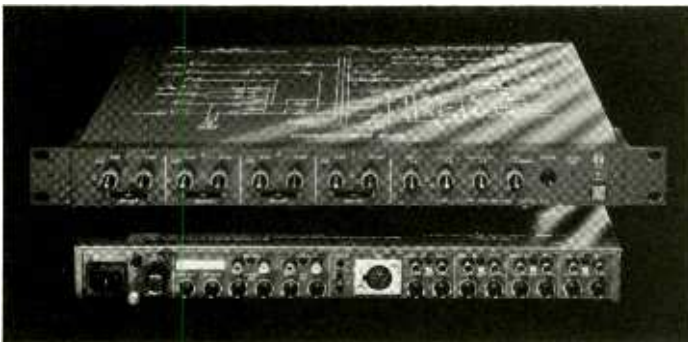
Toa have introduced a new 19 in rack mountable, 1 U high mixer based on the same design philosophy as the 4-channel *D4* MIDI mixer launched last year.

The *D3* includes four stereo inputs (eight mono), one balanced mic input (XLR) and stereo and mono output. Each of the four stereo inputs has complementary direct outputs. Four input LEDs and a Stereo Clip LED indicate signal levels 3 dB below

clipping. Other facilities include shelving EQ ( $\pm 15$  dB, 20 Hz and 20 kHz), tape input level control and headphone jack with level and balance controls.

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

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



## tc electronic TC 2290 effects processor

The *TC 2290* dynamic digital delay and effects processor is an 18 bit device with a sampling memory of 1023 ms (expandable to 32 s). The unit has 100 programmable presets and can send or receive on one or more of 16 MIDI channels. The *TC2290* also uses MIDI exclusive codes enabling the unit to be directly controlled by computer software.

Special features of the *TC 2290* include dynamic delay; variable pan (direct signal, echo or both); modulation of all delay settings and a 'learn' button which keeps delayed signals 'in time'. Also provided are ducking delay, gated delay, flanging, chorus, double tracking, tremolo and

simultaneous chorus/delay.

Other special features include pre-recording, a technique that provides an additional 28 ms of recording preceding each sample store in order to avoid clipping the start of a sample. On the audio side, tc electronics have included a soft roll-off from 20 Hz to 30 kHz to reduce what the designers claim is the unnatural high frequency response of digital sound processing.

**tc electronic, Grimhøjvej 3, DK-8220 Brabrand, Denmark. Tel: 06-26 28 00.**

**UK: State of the Art Distribution, High Lane Village, Nr Stockport SK6 8AA. Tel: 06632 2442.**

## Studiomaster series III, IV and V consoles

Studiomaster have recently introduced the series *V* console. This follows on from the earlier release of the series *III* and *IV*. The series *III* is a modular mixer designed for maximum flexibility. It uses an expandable chassis and 11 different modules are available. A 16/4/2 version is available 'off the shelf' and this can be expanded to 40/8/2 if required. Modules available include: mono PA or recording inputs; stereo PA or recording; master L/R outputs; aux master sends; group output; monitor and talkback; four tape returns and a blank.

Facilities include 3-band EQ on all inputs, six aux with two returns (routable on recording versions), Alps 100 mm faders, output level, switchable RIAA, individual phantom power selection by means of on board links, wide range gain on stereo inputs and external power supply.

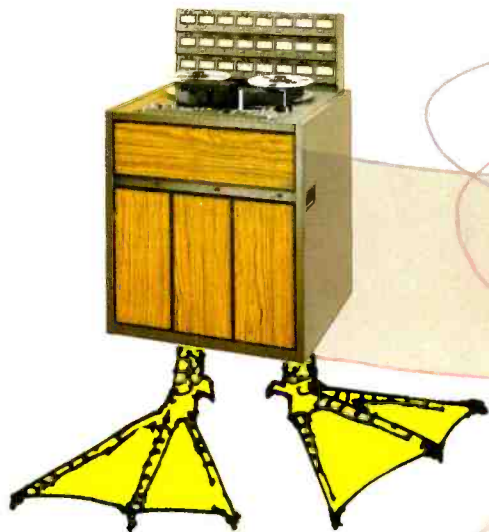
The Studiomaster series *IV* is available in two versions — 12/2 for PA applications and 16/4/2 for recording. The 12/2 has 10 mono and two stereo (with switchable RIAA) inputs. Extra inputs (up to a

maximum of 32) can be added. The recording version can be fitted with an extra four groups (to create eight group buses) and eight more inputs. Standard features are similar to the series *III* and include 3-band EQ; four auxiliaries with two routable returns, switchable output levels and phantom powering with onboard links.

The latest model is the new series *V* which has been improved over earlier models by incorporating the technology used in the series *II*, *III* and *IV*. New features include five auxiliary buses, all of which are accessible on the inputs; 100 mm faders; aux returns routable to the cue/foldback system as well as to group and mix buses and 3-band semi-parametric EQ switchable to L/R or aux returns. The series *V* remains expandable to 32 inputs, retains the angled connector panel and 16/4/2 and 16/8/2 frame sizes. **Studiomaster, Studiomaster House, Chaul End Lane, Luton, Beds LU4 8EZ, UK. Tel: 0582 570242.**

**USA: Studiomaster, PO Box 2344, Fort Worth, TX 76113.**

# UGLY?



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# NEWS



## Howe Audio 2300 phase chaser

The Howe Audio model 2300 phase chaser has been designed to detect and correct phase and signal anomalies in stereo programmes. Three principle problems are addressed: time delay errors, out of phase condition and channel dropout. Delay errors are corrected by monitoring the relative phase errors

between channels above 2 kHz. The amount of correction is displayed on the front panel LED bargraph.

A low frequency phase correlator is used to detect 180° phase differences between left and right channels. When an out of phase condition is indicated the unit automatically inverts the right channel (within

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Internal calibration (up to 3 s) is used to set the drop out correction circuit. Loss of a channel is corrected by using the active channel to replace the output on the missing one. Return to stereo is claimed to be virtually instantaneous when the

original signal is restored.

The 2300 also features a bypass switch and a Clip indicator which shows positive and negative waveform clipping.

Howe Audio Productions Inc, 2300 Central Ave, Suite E, Boulder, CO 80301, USA. Tel: (303) 444-4693.

## Applied Microsystems CM250 II

Applied Microsystems have completely redesigned the software architecture for the CM250 adding a wide range of new features. The control unit now provides simultaneous Master/Slave/Offset SMPTE displays; internal status of the system and whether the transport controls are assigned to the master, slave or both.

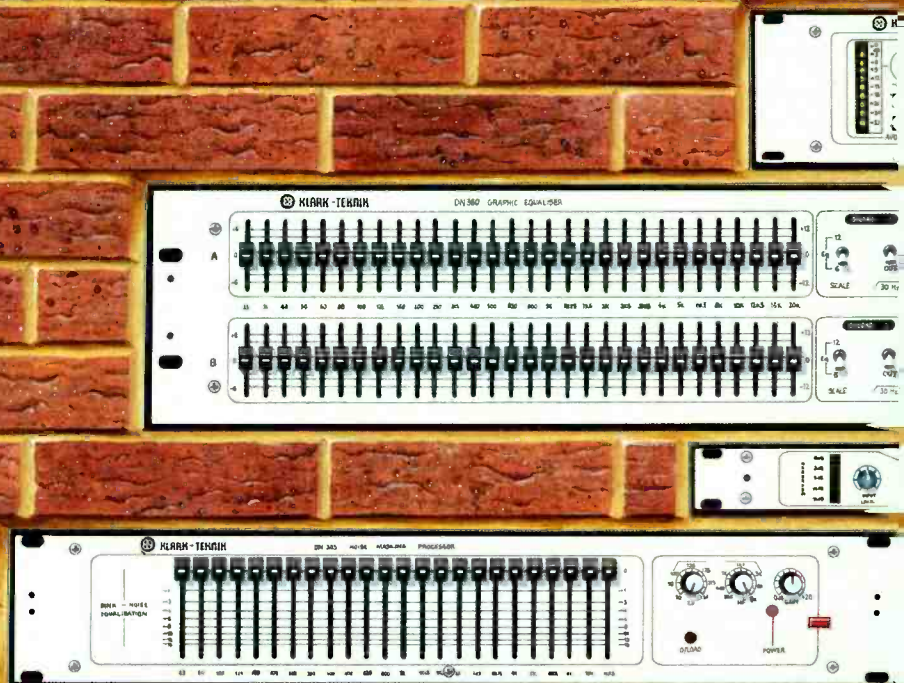
Cue storage has been increased to 30 (double this with two separate storage files) enabling the unit to be used in more complex applications such as live theatre, AV presentations and video/audio synchronising. With the new software and the Options package it is possible to reconfigure the CM250 II to work as a chase synchroniser. Cues can be entered either

automatically on the fly or via the keyboard and then frame trimmed. The Offset operates in a similar way.

The 80-character LCD display provides full text menus and prompts making it possible to operate without a handbook. There are built in interfaces for 12 different VTRs (1 in to VHS) and 18 different audio tape machines. The machine interfaces are changed with the software so only dedicated cabling is needed. No price increase has been announced for the Mk II version and existing CM250 customers have already been sent the latest software.

Applied Microsystems Ltd, Town Mill, Bagshot Road, Chobham, Woking, Surrey GU24 8BZ. Tel: 09905 6267.

# Sound architect



## SSL digital developments

**A**t the 81st AES Convention Solid Logic presented three technical papers that described a new set of tools and methods for use in the design of digital audio consoles. The development represents a radical advance over previous methods employed to design large scale digital audio systems. It substantially alters the equation by which the relative costs and technical merits of various console designs must be evaluated.

The new development is the result of more than 30,000 hours of research, development and programming and, as the AES papers revealed, should have a major impact towards reducing costs and obsolescence—two key issues affecting marketplace acceptance of earlier generation digital consoles. They also confirmed the existence within SSL of proprietary and fully operational 24 bit linear digital audio processors of enormous speed—a development foreshadowing significant improvements in digital console sonic performance, creative flexibility and self-diagnostics.

In his paper *Digital Audio Processing on a Grand Scale*, SSL's digital project leader Peter Eastty explained that the company has taken an almost entirely hardware-independent approach to the design process. "Software-controlled audio processing provides a level of flexibility and a capacity for change that simply cannot be achieved by consoles whose capabilities are primarily determined by hardware considerations. In fixed architecture digital consoles and the analogue predecessors which they mimic, both the type and quantity of operations which can be performed are limited by hardware decisions taken at early stages of the design process. This is equally true of digitally controlled analogue consoles.

"By contrast, software-defined digital consoles can allow their designers, and subsequently their operators, to freely allocate processing power to perform myriad combinations of tasks. Console configuration is no longer constrained by the imposition of diverse hardware sub-assemblies dedicated to specific functions".

According to Eastty, this software-based approach will allow

SSL's digital systems to incorporate upgrades to cheaper and faster processing technologies as they become available, with no need to redesign the system architecture or render existing units obsolete. To initially realise practical large scale digital studio systems, Eastty identified the need for easily programmed processors capable of executing more than 1000 million ( $10^9$ ) instructions per second.

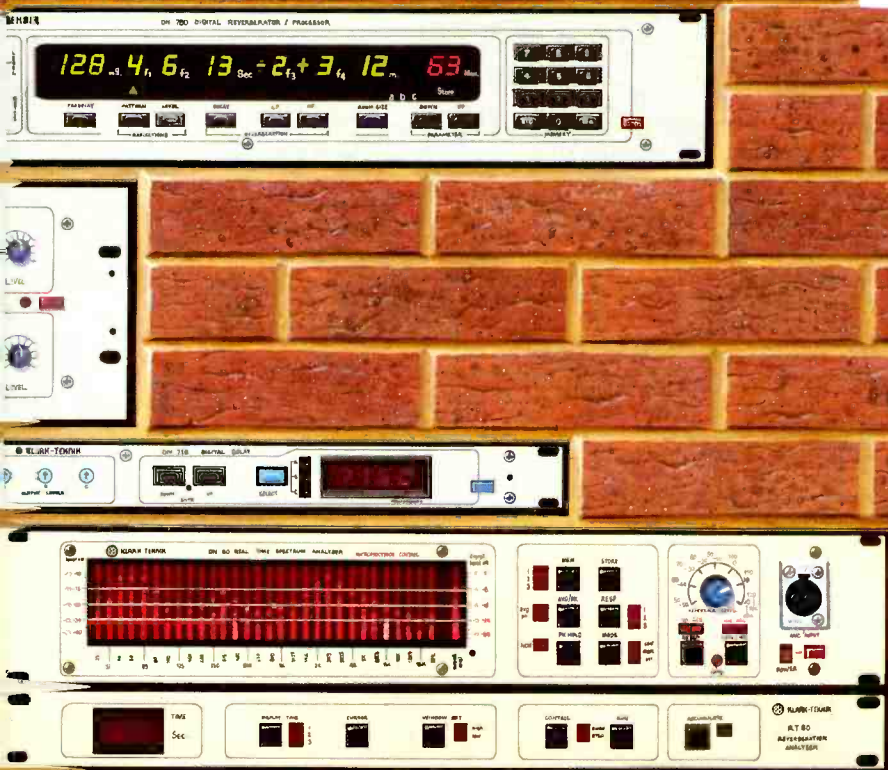
When SSL first presented this figure last year, it was pointed out that it rivalled the capacity of the most advanced super-computers. However, Eastty surprised the audience by showing them an SSL digital processor card that he said has been successfully executing compiled code since its first instruction more than year ago. The 400x500 mm board contains just under 300 ICs and consumes about 200 W. It has a 25 ns cycle time for arithmetic computation and a 12.5 ns memory cycle time. All arithmetic and data storage is done to 24 bit precision, leading to a memory bandwidth of 240 Mbyte/s for program and 360 Mbyte/s for data accesses. Each of the SSL digital processor boards executes 40 million instructions per second, and includes access to four 25 ns interconnection buses. This yields a maximum of over 3000 time slots for interboard connections, providing more than sufficient capacity to drive large scale console systems.

Addressing the issue of maintaining such systems, Eastty stated that six chips per board, the clock drivers and the register mode select are all that must be working before fully computerised diagnostics and tests may be done. He added that SSL has built in extensive real time monitoring and error logging capabilities.

Reinforcing his point about hardware-independence, Eastty described the present boards as a research tool that would not necessarily be used in actual products: "The development system that SSL has invented frees us from ties to specific processing hardware," he said. "The designs we are generating today can be directly applied to future processors that do not yet exist. We have cracked the problem of built-in obsolescence."

The development system referred to by Eastty was detailed by Solid State Logic's William Kentish and David Bell in their paper *An Automated Approach to Digital Console Software Design*. In a radical departure from traditional console design

# cture.



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# NEWS

techniques, SSL have developed a method by which individual consoles are defined solely by two large pieces of software and a control surface layout.

To make this approach practical, two fundamental problems required solution. The first was to shorten the time required to generate and prove massive designs that are realised entirely in software. The second was to provide the means necessary "to enable the right people to design digital consoles". The scientists and engineers who are proficient in super-computer technology are seldom fluent in the strategic intricacies of audio console design. The analogue console designers who most thoroughly understand the technical and creative requirements of the end user are seldom proficient in supercomputer construction and programming. This situation is aggravated by the fact that each group generally communicates differently; console designers working primarily with schematic drawings and computer designers with lists of code.

Kentish and Bell described a set of development tools which SSL's digital team has created to resolve these problems. Working at a CAD (computer-aided design) system terminal, an experienced console design engineer can specify a system by drawing a largely traditional schematic on the screen. These schematics are built from a library of familiar pictorial representations, each of which might, for example, represent an equaliser or a delay unit.

These pictorial units are separately developed and may themselves be built from several lower level models, such as an individual filter description. They can represent processing at any level in the desk, whether in the control domain or the sound processor domain or both. Drawing from a complete library of these symbols, the console designer can place the required functional blocks in the desired order by simply connecting them with wires drawn on the screen.

The bottom level models correspond to different things in each of the two domains—audio models corresponding at the lowest level to individual instructions performed by the sound processor, and control models corresponding to functions or small programs written in a high level language (C) which are later linked together to form the complete control program. Numbered inputs and outputs on these models are used by the system to generate a netlist containing all of the input and output 'pins' and their connections along with further descriptions in editable look-up tables assigned to the models.

This netlist is then automatically divided into two files, one

containing connectivity information for the control computer domain, the other containing this information for the sound processor domain. SSL's Control Program Generator accepts the first list, and performs extensive checks to detect any inconsistencies or disallowed configurations in the schematic. It then automatically produces the actual code required by the control computers. Maintaining hardware independence, the control software becomes machine specific only after compilation of the completed C program, which is done with reference to an easily modified external control surface file.

The second list is passed to SSL's Microcode Generator, which as described in Chris McCulloch's paper, *Automatic Generation of Microcode for a Digital Audio Processor*. McCulloch has devised a system which processes this list in four passes and produces as its output loadable microcode to run on the desired sound processor.

The format of these microcode instructions is defined in an external file describing a specific processor. This file can be changed to accommodate new processors as they become available; the system can then automatically recompile the netlist for those processors. Changes to the underlying hardware can thus be implemented without any need to revise the actual console design. Moreover, the system also makes it possible to compile efficient microcode for several processor boards of different designs and to link these into a single console system—an enormously cumbersome, time-consuming and error prone task if attempted manually.

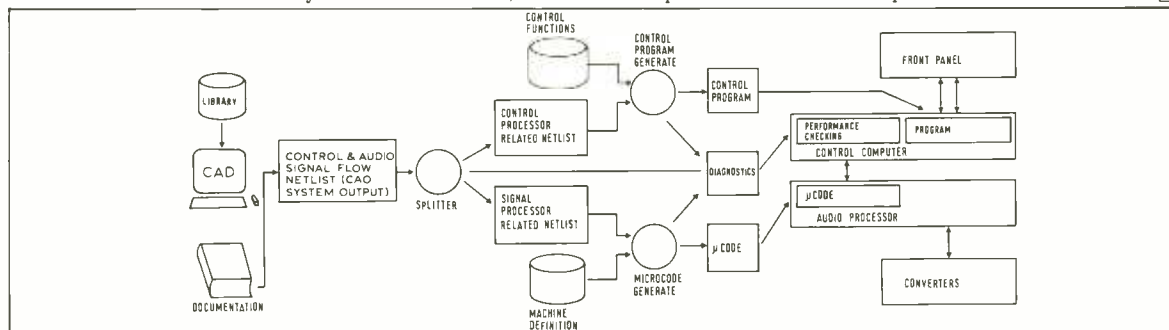
In summary, the development system which Solid State Logic have completed provides a totally new method of console design, allowing experienced analogue systems engineers to work freely and rapidly in an all-digital domain. Design concepts are expressed and specified in largely traditional form as schematic diagrams, from which all of the necessary control computer and sound processor code is automatically generated and tested. This significantly shortens all aspects of the design cycle, reducing the company's long-term development costs and increasing its ability to experiment and innovate with the system's creative aspects. It was also pointed out that the totally hardware-independent nature of the system has allowed the company to proceed in parallel with other aspects of the project such as control/display, conversion, and storage/editing developments.

Solid State Logic's chairman and managing director Colin Sanders commented: "We've been very careful to not announce anything about our digital project that was not an accomplished fact, leading some people to speculate that our work was progressing more slowly than is the case. The successful completion of this most essential phase in our plans marks SSL's entrance into a vastly accelerated final state of practical digital product development.

"It is difficult to overestimate the impact that SSL's new capabilities will have on digital system design," Sanders said. "The economies that we are now seeing make it possible for me to confidently state that present day digital console prices are totally out of line with what can be realistically achieved. The large scale SSL Digital Studio Systems that we anticipate offering in 1989 or 1990 should cost the same as the assignable analogue consoles that will become available next year."

Sanders went on to say: "By scaling down from our large-system capabilities rather than pushing less capable technology to its limits, we have discovered that we can achieve similar economy over a much broader range of digital product than we had initially realised. Consequently, SSL will be introducing its first 24 bit digital systems well before the end of the decade."

He declined any discussion of specific features as "premature" but a product announcement is promised "sometime in 1987". □



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SS 5-87

# A FUTURE FOR ANALOGUE CONSOLES

*In the area of mixing console design, attention is turning to the digital console. Douglas Self of Soundcraft Electronics compares the state of digital and analogue design and covers areas of improvement left in the latter*

**W**ith compact discs advancing rapidly on LPs as the primary music source, the unstoppable advance of the digital multitrack, and the general ability of digital products to plummet in price, it at first seems as though the days of the analogue mixing console are distinctly

numbered. However, there are quite a few reasons why setting a date for the funeral may be premature.

There is of course a huge price differential to be made up—the only digital multitrack desk on the market at the time of writing costs over £¼ million. Bringing this within reach of even the average 16-track user is going to require a major



*The Soundcraft TS24 in Advision's Studio 1 control room*

research effort into high speed VLSI—the 'channel on a chip' is an economic necessity. The development history of chip sets for CD players shows what can be done in this respect but the investment required in time and money is awesome and it is significant that all the companies active in the development of such products are of multi-national size.

Analogue morale has also received a considerable shot in the arm from the successful introduction of Dolby *Spectral Recording*, which looks certain to give analogue multitracks a considerable extra lease of life.

For the immediate future, some aspects of analogue are a fixture. For the foreseeable future a console is going to need analogue microphone and line inputs. Analogue outputs are perhaps more dispensable, with the possibility of direct digital links from console to digital multitracks but foldback and monitor outputs will remain analogue as long as ears do. It is likely to be a very long time before every outboard processor is totally digital and the all-digital 'patchbay' becomes a reality. (It is perhaps more likely that 'outboard processors' will in the future evolve into software packages to be run on existing digital console hardware, with a standard software interface.) The introduction of digital outboard equipment depends crucially on the widespread acceptance of a digital interconnection standard that will meet all conceivable quality and control capability requirements for the foreseeable future. Digital consoles will also still be interfaced to decidedly analogue operators through knobs and linear faders, and these A-to-D conversions alone make it difficult for digital to undercut analogue on price alone.

It is certainly a serious mistake to assume that the analogue mixing desk has reached the end of its possible development. It is mature technology—in the sense that the average analogue console works reliably and very well. A few parameters, such as the minimum equivalent input noise for a 200  $\Omega$  microphone, are impossible to improve upon, but then this applies to digital desks as well.

Nonetheless there are still great possibilities for improvements in analogue signal paths, to keep pace with the demands of a digitally-aware market. In fact, a good analogue desk is in some respect still ahead. A linear 16 bit A/D interface gives a maximum dynamic range of 96 dB. The standard IC op-amps give a maximum signal level of about +20 dBu, implying that the noise level in an analogue circuit need only be -76 dB to stand comparison. In almost all parts of the console audio path it is easy to better this; for example, the careful use of standard ICs allows the design of a parametric equaliser with a noise level below -105 dBu when set flat, exceeding the dynamic range of even 20 bit digital. The two main exceptions are the mic amp, which, as mentioned above, is unfortunately constrained by the laws of thermodynamics, and the mixing bus system.

The mixing system noise can be considerably improved over that generated by the unthinking wedging of 5534s into every socket, and Soundcraft have for some time been using sophisticated summing amps that combine the low noise of carefully selected discrete transistors with the low distortion capabilities of fast slew rate op-amps. Careful application of this technique can reduce mixing bus noise by as much as 17 dB, compared with the standard configurations. The good results obtainable are seen in the TS24, TS12, and the Series 500, 600 and 8000 consoles. For example, the TS12 summing amplifiers yield, under the usual measurement conditions, an



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# A FUTURE FOR ANALOGUE CONSOLES

equivalent input noise of  $<-125$  dBV.

As with mic amp technology, the ultimate limits are set by Johnson noise generated in the parallel combination of all the mix resistors connected to a given bus. The situation is however rather more open-ended, as the value of the mix resistors used can be chosen at the design stage, which is rather better than being given a  $200\ \Omega$  source impedance and being told to get on with it. In general, the lower the value the better, as not only is noise reduced but also the susceptibility of the bus to capacitive crosstalk. Practical considerations obtrude when preceding stages start to object to driving a routing matrix made up of low-value resistors. The amount of signal current injected into the ground wiring also needs to be watched with a wary eye. In Soundcraft consoles, the value of mix resistors used varies depending on their particular function; usually group buses use  $22\ \text{k}\Omega$ , to allow the routing matrix to present a reasonable load, auxiliaries  $12\ \text{k}\Omega$ , and the all-important mix bus  $4\ \text{k}\Omega$ .

As the demands for higher performance continue there are other, more esoteric techniques, that can be deployed for still lower noise, such as balanced mixing (dealt with in detail below), hierarchical or devolved mixing, and various less obvious techniques involving current sources and negative-impedance converters. The extra cost involved in these techniques is not negligible but is still relatively modest compared with a long bank of top quality faders.

Whenever an audio path is being designed, there are apparently inescapable compromises to be made between noise and headroom.

Consider for a moment the design of an electronically balanced line input stage, whose task is to perform balanced to single-ended conversion, and at the same time allow a range of input levels to be reduced (or increased) to a fixed nominal internal level. In the case of Soundcraft consoles this is either  $-2$  or  $-6$  dBu. Such a stage can be given a relatively low fixed gain, to prevent input overload, followed by a variable attenuator and an amplifier with sufficient fixed gain to bring any credible input level up to scratch. This has the snag that the latter fixed gain amplifier provides a constant (though hopefully fairly low) noise level that does not reduce when the input gain is reduced. The obvious alternative is to give the electronically balanced input stage a higher gain so less make-up gain is required after the variable attenuator, however, this means that the input overloads easily.

The elegant way of avoiding this uncomfortable compromise is to use active gain control techniques; in other words the input stage itself is

designed with a variable gain, so that the inherent circuit noise also reduces as the gain is reduced, while the headroom remains maximal at all settings. The circuitry required to give variable gain with a constant good common mode rejection ratio, and a pleasant control law, is not entirely obvious but it is well worth implementing, especially if an input is being designed to cope gracefully with both  $+4$  and  $-10$  input levels. This technology is currently to be found on modules such as the *TS24* stereo sub-group, and the series *200B* stereo input.

Similar considerations of noise and headroom apply when several inputs are routed to one group. While the total input level is controllable, it is a thundering nuisance to have to pull down half a dozen channel faders, while keeping the relationship between them constant, to rescue an overburdened group summing amplifier. However, if the summing amp is given a fixed low gain, the

fader post amp gain must be high enough to make this up and, therefore, not as quiet as it might be. The best solution, as implemented on the *TS24* in-line console, is to make the gain of the summing amp itself variable. The *TS24* group summer has a gain range of  $+6$  to  $-20$  dB, which gives ample scope for accommodating over-enthusiastic inputs without juggling an armful of carefully aligned channel faders.

One of the characteristics of digital is very low distortion at high level—most CD players can achieve 0.003% at maximum output. It is in the nature of the linear encoding used in the medium, however, that THD steadily increases as level falls, typically reaching 0.5% at  $-60$  dB. It can, however, be worse than this in a less than perfect implementation. In contrast, any non-linearity in a well conducted analogue desk will fall rapidly with level, disappearing into the noise never to be seen again. (Assuming of course that the circuitry is not so lost to all sense of decency as to generate crossover distortion.)

This is not to suggest that digital sound is subtly inferior, but it is a fact that not everyone is happy contemplating the aesthetic implications of quantisation.

There is no reason why a good analogue desk should not have lower distortion than a 16 bit digital path over an average distribution of signal levels; for many years the only remaining difficulty in achieving double-zero distortion throughout was the 'industry standard' two-transistors-and-an-op-amp electronically balanced mic amp, which is not as linear as it might be at all times.

The Soundcraft solution to this is a new highly symmetrical configuration of electronically balanced front end that produces no detectable distortion at any gain up to  $+80$  dB. In its usual ▶

*The Soundcraft TS12 dual mode console*



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# TASCAM

A 32-Track version of the ATR-80 will be available soon. ©1986 TEAC Corporation, Tokyo.

# A FUTURE FOR ANALOGUE CONSOLES

form it incorporates a DC servo system that provides precise control of DC conditions while allowing a very wide gain range. The company believe this is quite a step forward in mixer technology; at present it is only to be found on the *TS12*, *TS24*, and *8000* series.

The end result is that setting up a path from mic input (with +70 dB of gain) to tape send output gives a reading on a distortion analyser of 0.01%, almost all of this being due to Johnson noise at the mic input.

One indisputable advantage of digital mixing is that crosstalk is theoretically non-existent. (In practice, of course, this depends crucially on the detailed design of the input and output converter systems.) In analogue, however, achieving truly excellent crosstalk figures is a major test of design skill. To keep pace with demand for ever-better performance in this department, we have adopted several proprietary techniques.

The Soundcraft routing matrix system reduces crosstalk in the routing switches to at least 20 dB below the conventional methods, and a sophisticated ground-cancelling mixing system is being introduced with the *TS12* to improve matters further by rendering innocuous signal voltage drops along ground conductors. This effectively samples the unwanted signal voltages on the ground of each channel module, and subtracts a weighted average of them from the combined signal at the summing amp. With this approach the auxiliary send off-ratio of the *TS12* is better than -85 dB at all audio frequencies, and the general crosstalk behaviour of the console is markedly improved.

One obvious approach to crosstalk reduction is fully balanced mixing buses which, when properly implemented, can not only cut capacitive crosstalk by 30 dB or more (as well as automatically giving the ground-cancelling effect mentioned above), but also give a useful 3 dB improvement in mixing noise. This is one of the rare occasions when it is possible to actually gain all of the improvement that is theoretically possible! However a full implementation of balanced mixing more than doubles the overall cost of the summing system, and careful assessment of the economics is required.

There are many detailed improvements that can be made in analogue mixer design, and we have made it our business to make them. One example is the Soundcraft virtual earth PFL detect system, which to the best of our knowledge is an industry first. It makes absolutely certain that no trace of a click can find its way on to the summing buses when a PFL condition is called for, as this is

signalled in the form of a current rather than a voltage change whose edges might capacitatively couple to any nearby mixing bus. Others include the Soundcraft push-pull FET silent muting system—a sophisticated grounding system that makes earth loops a good deal less troublesome—and a multipoint positive and negative peak detector that monitors three or more points in the signal path simultaneously and warns of almost any possible clipping condition with PPM-like attack and decay characteristics. And there's more in the pipeline.

One area where the digital console has an unarguable advantage over conventional analogue consoles is that of control recall. The implementation of a scene-setting or patch storage system, using floppy or hard disks, is probably the easiest part of the daunting task of designing a digital console; it almost comes for free, as the various routing and control parameters have to be stored in digital form anyway. It is, therefore, normal practice to make every switch and parameter, and even radical rearrangements of the audio path, completely storable.

In comparison, analogue desks are typically much less 'storable'. Systems to store and recall major control settings have existed for some time but they often involve some very tedious manual knob-twiddling to line up things with a computer-generated indicator.

It is of course possible to build an 'all-moving-control' console, with equaliser knobs and so on motorised along the lines of moving fader automation. This might in some senses be ergonomically the ideal solution but the cost, bulk and power consumption are truly intimidating. A halfway house along this road to financial meltdown is the use of continuously rotating control knobs with digital shaft encoders, and associated LEDs to indicate the effective knob setting. The cost of implementing this in full on, say, a 56-channel console would still be fearsome.

The alternative approach is that of the assignable console, where the control surface consists of only one set of channel controls, plus the master controls such as aux master gain and so on. The channel controls can be quickly assigned to change the settings of any channel of the many that are actually available. These channels are usually only represented by controls that require rapid access, such as the fader, and channel cut and solo buttons. A third button, typically emblazoned Assign, directs the control surface to that channel.

It is of course inherent in this technology that most control pots no longer have any physical existence, and parameter control is all-electronic,

since the information for each channel is in digital form and, therefore already adapted for storage, recall, and rapid movements between totally different console setups at the push of a button.

This approach is significantly more economical than a fully digital desk (although the design challenges are still very real) and digital control of analogue provides a very viable middle path, giving the flexible control with a much lower price and potentially no less performance than that of a first rate conventional analogue desk.

When thinking of the control philosophy of a mixing console, the department needing the most speed and sensitivity is that of the faders—immense effort goes to the deceptively simple goal of providing the smoothest possible feel. The capabilities of a digital console do not inherently include full fader automation; storage and recall of a rapid flow of data with precision timing is a very different task from handling setup 'snapshots', where nobody really cares if it takes one or two seconds to perform the disk operations.

It is significant that despite the general fall in the price of computer hardware, fader automation remains far from universal. It is frequently said that it places an extra and unwanted layer of technology between man and music, and that a good VCA subgrouping system is more usable when push comes to the inevitable shove.

The remarkable success of the MIDI standard, however, makes it likely that economical and easily learned automation systems based on this technology will appear, though there are inherent limitations in data rate that would seem to render unlikely the graceful handling of an armful of 14 bit encoded faders. Dragging down a dozen of them is all too likely to bring the icy fingers of 'MIDI choke' around your neck.

It is likely, therefore, that MIDI systems will, for the time being, confine themselves to real time control of the muting of channels, aux sends, and effects returns. The *TS12* is already prepared for this, having silent FET muting in all of the above positions, as well as control of EQ in/out. However, at the time of writing, speculation is rife as to the enhancement of the MIDI spec in the near future (MIDI 2?) to include faster data rates, possibly using the two pins currently spare in the MIDI connector; this would have the great advantage of maintaining complete compatibility with existing equipment running at 31 kbaud. The advantages of having a universal standard such as MIDI are so great that any modifications must be done with great care. There are, however, distinct limits to the rate at which serial data can be sent down cheap and robust cables, and we are watching carefully to see what emerges in this area.

The purpose of this article is comparison rather than confrontation, and nothing here should be taken as a declaration that Soundcraft will never manufacture a digital desk. They have their own advantages, particularly in the possibilities for integrated effects processing. It is an intriguing thought that the signal handling performance of a digital desk can be improved almost without limit simply by using ever wider data buses (assuming of course that your processing power can keep up). Unfortunately, though, the signals must always pass through the bottleneck of A/D conversion, and progress in converter technology is currently somewhat measured.

For the moment, the cost and complexity of digital mixing desks do seem to make them unattractive but it would be a brave man who tried to predict exactly how long this will remain the case. □



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# SAJE MEMORY

*French console manufacturer SAJE has developed an approach to digital control of audio that they refer to as the SARP Principle. Terry Nelson looks at its application within the SAJE Memory console*

Consoles have increasingly become more complicated with more and more controls that must be manipulated. The other drawback has been that control room floor space has been steadily eaten up.

The last year or so has seen the appearance of consoles that have centralised functions—either fully or partly—in an attempt to make mixing more manageable by reducing console size and/or the number of knobs and switches.

Research into this type of console has not been limited to England and the USA, however, and French manufacturers SAJE have been quietly engaged in the development of the *Memory*. The first showing to the world was at the CTEAP in Paris, December '85, and since then the *Memory* has been



gathering interest in spite of a notable lack of fanfares or informed general press coverage.

SAJE are situated in the Parisian suburb of Argenteuil and here managing director, Patrick Aufour, was able to explain the principal reasons behind the initiation of the project.

"In 1980 SAJE brought out what we believe was the first production live sound console in Europe with eight auxiliary sends, the *Auxy*, which enabled it to be used for front-of-house or stage monitoring without modification. As the '80s progressed we started seeing consoles with 16 sends becoming standard and if the rate continued, we would soon be up to 24! (Can you imagine what trying to run a console with 24 auxiliaries would be like?)

"We felt that there were two ways out of the situation—either reach for a drill and install more knobs than the competition or re-think the whole concept of the console and come back to a saner level.

"A point that people seemed to be forgetting as consoles got larger was that the time taken to reset it was also getting longer and longer, thus cutting down efficiency and making them unwieldy to use.

"You could almost say that it was back to the old dictum, 'there has to be a better way'—and this is when we came up with the SARP concept."

SARP stands for the SAJE team which developed the system that was to become the *Memory*—Charles Edouard Six, Patrick Aufour, Daniel Rainotti, Claude Prevost although, "We would have liked to put the initials in alphabetical order but that gave us APRS!"

In a world where we are used to seeing innovations directed initially more towards the recording studio, the *Memory* stands apart by being a live sound console.

"In my opinion," Patrick went on, "live sound is where you have to work the fastest. This is not to say that studio operation is not pressurised but there you go when you are ready. Live sound—and this can be PA, broadcast, mobile recording, etc—is happening there and then and you have to go with it. By starting with a live sound console we felt it would be easier to apply its functions to a studio console rather than the other way around."

## Basic requirements

"From the start, one of the major stipulations that went out to our R&D people was that at no time could an engineer who was working the console start wishing he was back with a conventional desk. There was to be no wait time between the calling up of different functions and the fact that the console would be computer-controlled could not excuse any restrictions on operation.

"The 'password' at the early stages of development was a worst case situation: it is 8 pm, the concert is at 9 pm, the truck has just arrived (late for any one of a thousand reasons) and there has been no rehearsal with the band."

At first glance one could be justified in wondering what benefits a computer-controlled console could bring in a case like this (apart from instant dismay) but, after hands-on experience at the *Memory*, the answer is—quite a lot!

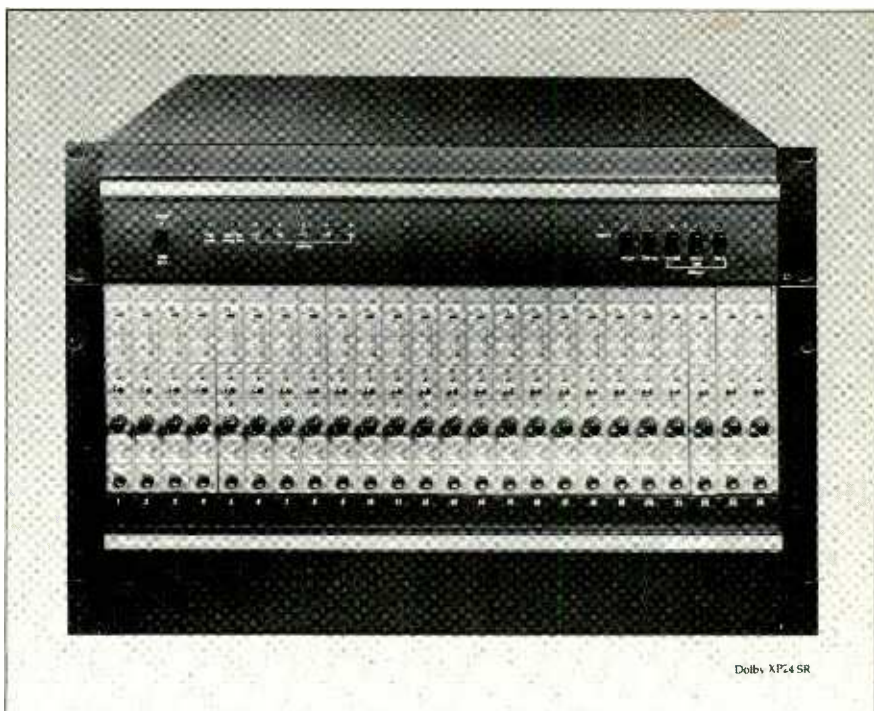
The main improvement is the speed with which the console can be configured and from power-up you can have a rough mix on both the main faders and auxiliaries plus basic EQ settings within minutes whereas with a normal console you would probably still be resetting functions from the previous gig (and if the desk had been conscientiously set to zero the last time, still twiddling knobs and pushing switches).

SARP's principle is based on the realtime functions of rack mounted audio electronics as displayed on a video monitor: "The graphics are really there to reassure the engineer and to provide him with a connection to what he was working with previously." Put more simply, the graphics display gives a visual indication of the status of one or several inputs or outputs with animated 'knobs' and 'switches'. Colour changes are used for push switches for clear indication of their status.

A little thought shows that the number of actual commands on a console can be reduced to three types: On, Off, Variable, with on/off usually being switch functions and variable being

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## Input channels

The SARP system enables the motorised faders for each channel to be assigned to four functions: input gain trim, channel fader, auxiliary send 1 to  $n$  and pan. A keypad selects the channel faders to the chosen parameter whereupon they set themselves in position according to the values held in the memory, thus providing immediate visual indication of that parameter's current status. This permits very rapid alterations to auxiliary mixes, for example, the different mixes (1 to  $n$ ) being called up one by one and modified in a matter of seconds. The faders incorporate a touch control facility which recognises human touch and allows for instant updates, the new position being put into memory as the last recorded value.

The motorised fader, familiarly known by SAJE as the *Super-Fader*, has two operating modes which can be seen in Fig 3, these being position set and update.

# SAJE MEMORY

potentiometer and fader commands.

The various parameters of the console are controlled as follows: a 360° rotary potentiometer is used essentially for EQ settings and preserves the normal left/right feel of a normal knob. While a bank of motorised linear faders is used for level control. On/off switch functions are carried out via two keypads, one for the programming of individual channels and one for overall channel programming.

The basic makeup of a SARP console is: two video monitors, a control desk and a remotely-controlled audio rack. The video monitors consist of one high definition graphic display of console functions and one normal monitor for systems management display. The control desk is comprised of the various keypads for the computer's commands, a set of motorised faders, metering and the computer system.

An important feature of the SARP system is that the audio electronics can be analogue or digital without any change in the control desk—or console—itsself, thus avoiding obsolescence in the future.

The development of the SARP system entailed a close analysis back to first principles of console operation and this was found to consist of two principal phases; setup (or preparation) and operation.

Setup, which usually takes place before a signal is run through the console, includes such functions as routing, selection of auxiliary sends to be pre or post fader, channel selection of signal sources, mic or line input selection, phantom powering, pans, etc.

Operation can be sub-divided into two parts: rehearsal and performance. Operation of a console may be generalised as being on two levels: immediate control, such as gain and level changes or selection of a key function, and fine tuning, such as EQ changes, panning, etc.

The hardware flexibility of the SARP system is such that the console outputs may be configured as auxiliaries, subgroups and masters. During research SAJE noted that the signal post EQ section is the sum of attenuation values when it reaches the output stage (this leaves aside headroom considerations in the input and output stages, though these factors are also reckoned with). It is easy with a computing system such as this to calculate a control value which will be this sum and apply it to the post EQ signal before it goes to the output summing amplifier and thus obtain the output level required.

Fig 1 shows that it is a very simple system with minimal signal path and this is one place where the *Memory* differs from other automated consoles. As designer Daniel Rainotti explained, "Most manufacturers think 'hardware' and put in VCAs for each stage, which is unnecessary. Only one final control value is needed to set overall gain through the channel path, meaning more efficiency and a cleaner signal."

In the same way that the hardware has to be flexible, so must the software controlling the console and the front panel graphics.

Once the initial console configuration is decided (groups, auxiliaries, etc), two software functions are created: (1) the graphic representation of the console front panel is drawn; (2) the necessary calculations for the various types of output are put into place as shown in Fig 2, ie the control programmes are 'run'.

FIG 1  
SYSTEM FLOW

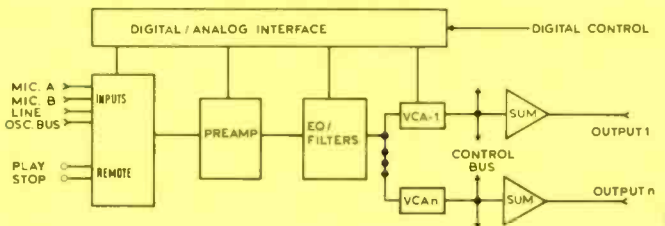
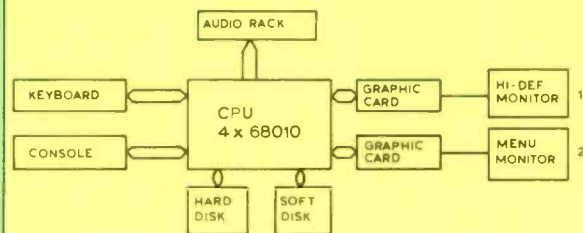
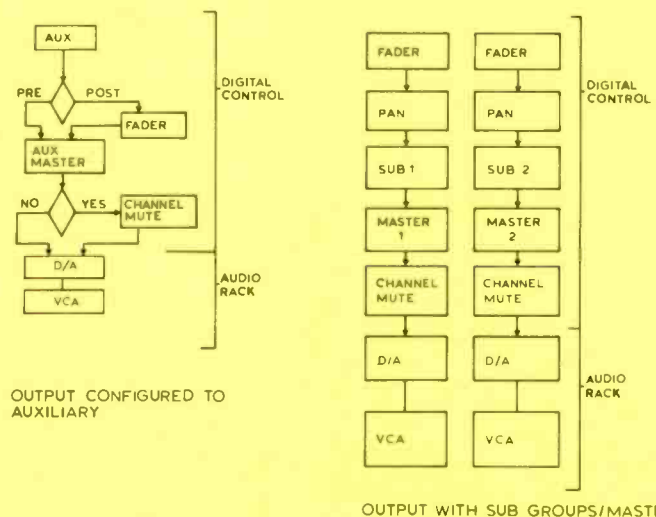


FIG 2  
OUTPUT EXAMPLES







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# SAJE MEMORY

**Position set:** The track of the fader is connected to the reference voltage bus of the console. The wiper of the fader goes to one of the comparator inputs with the Set—or memory value—voltage going to the other input. The moment the comparator senses a difference between the Set value and the reference bus, this difference is applied as a voltage to a motor which moves the fader wiper to the position where the Set and reference values are in equilibrium (and which is the value in the memory). Thus calling up different parameters causes the faders to position themselves according to the values in the memory.

**Update:** The moment the fader button is touched this is detected and activates a switch that cuts the comparator output to the motor and routes the fader tension to the memory. This enables the wiper to ride free of the motor and a new value put

in the memory.

A numeric keyboard for the input channels enables a particular input to be called up and its functions—or status—to be put into memory. The moment a channel is selected, the strip is 'drawn' on the video monitor showing current status and is ready for any changes that may be required.

## Channel programming

Programming is split into two modes: control of static functions and control of dynamic functions.

The static program panel contains all the necessary facilities for operation of all switching functions in an input channel, eg pre/post aux send, etc or for overall commands to all inputs, eg auxiliary sends 1 to 4 all prefade. This takes place visually in the same manner as on a conventional console but from a centralised position.

The dynamic programming panel contains two command controls: an impulse coder addressable by a 4-directional keypad (up-down-left-right) and a motorised fader which becomes the channel fader of the particular channel called up. The latter 'doubles up' on the channel fader of the relevant channel and puts all controls into one area, ie if channel 3 is being adjusted, any changes in level made with this fader will be reflected by the channel 3 fader, similarly, when a channel is called up, the fader will go to the same position as in that channel.

The impulse coder and keypad permit access to all variable parameters such as EQ and certain level controls, as well as to those static functions that are not directly accessible from the static panel.

## Facilities

The prototype *Memory* that has been exhibited contains 24 input channels and 16 output channels, the outputs being designated as groups, auxiliaries or masters as required. However, the available configurations will be for eight to 128 input channels and eight to 64 output channels.

Each input channel contains two switchable microphone inputs, A and B, with 48 V phantom (about the only thing that has to be switched manually), a line input, phase reverse switch, a Start/Stop remote control function for external equipment insert on/off switch, routing, EQ section comprising 4-band parametric equaliser, high and low pass filters and EQ on/off switch, linear motorised fader with functions as previously described, PFL switch post EQ and insert, mute switch (both manual and programmable), LED meter which displays relevant channel level in PFL and 4-figure alpha-numeric display for use as a write strip, ie input source labelling (Score function).

The routing differs from a conventional console only in that rather than presenting a fixed number of groups and aux sends, the output buses can be configured as required. For example, one session may require eight auxiliaries, six groups and two masters; the next, four auxiliaries, eight groups and four masters; and so on. It should also be remembered that 'switches' refer to the graphic representations with the actual switching (with the exception of 48 V phantom, PFL and manual mute) being software commands.

Each output channel contains manual mute switch (also programmable), PFL, motorised linear fader, insert on/off, LED VU meter for relevant output and two 4-figure alpha-numeric displays for indication of type of output (group, aux, master) and number.

The *Memory* can be used for static (or snapshot) automation or dynamic automation (the latter requiring the appropriate system). The static storage possibilities include 8000 console setups (Write mode), recall of a memory position in less than 30 ms (Read) and a Link function, which after a general padding of the console calls up a different console status.

## Control key functions

These are grouped according to the overall functions, such as Outputs Control, Inputs Control, Individual Input Control, Output Assign, Input Assign, Stop Clock and various other duties (see Fig 4).

FIG 3  
SUPER-FADER

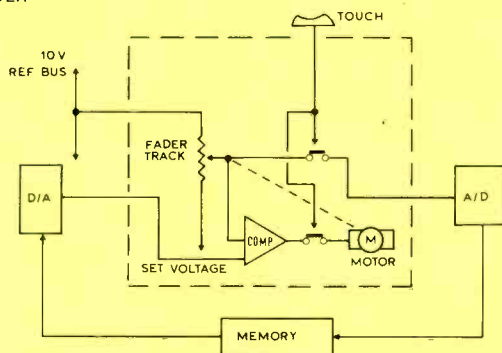
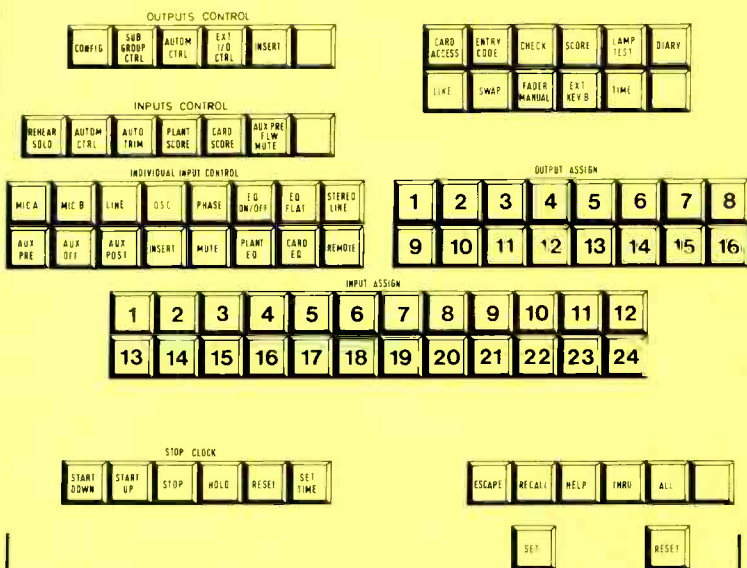
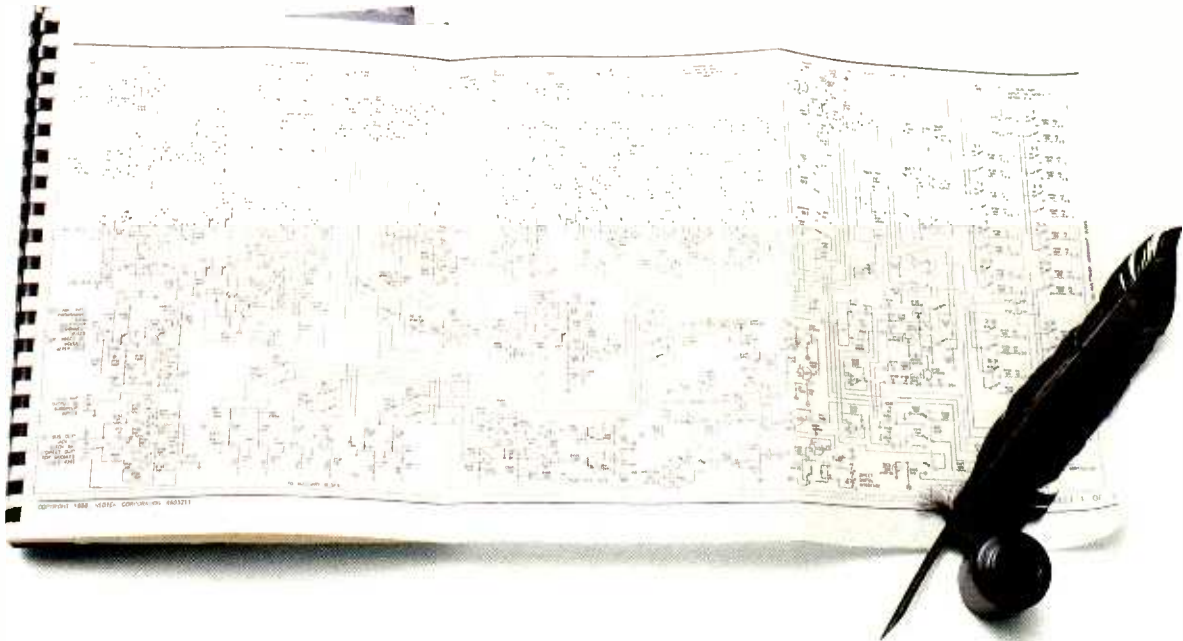


FIG 4  
ASSIGNMENT KEYBOARD



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Great composers write each note carefully on the page. Every passage leads to their vision of the whole. So it is with Neotek's artists of circuit design.

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But if they had . . .

## NEOTEK

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# SAJE MEMORY

FIG 5  
FADERS AND VIDEO CONTROLS

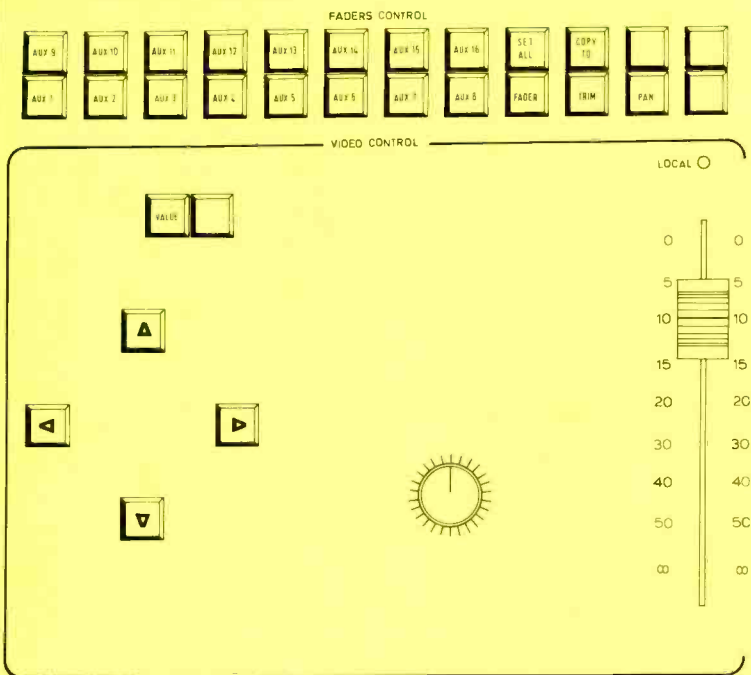
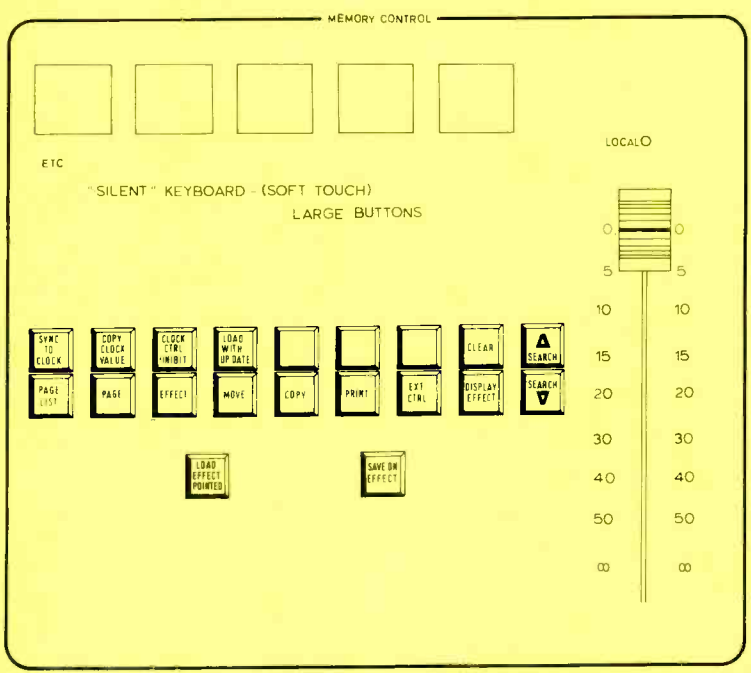


FIG 6  
MEMORY CONTROL KEYBOARD



Most of the legends are self-explanatory but some controls deserve definition.

- CONFIG prepares the initial setup of the console, ie type of console as defined by number of groups, auxs, etc.
- SUBGROUP CTRL routes the subgroups.
- AUTOM CTRL selects the automation menu for inputs and outputs in both cases.
- AUX PRE FLW MUTE enables selected prefade sends to be muted when the selected channels are muted.
- CARD ACCESS stores information on the user's personal card (more about this card later).
- SCORE enables the alpha-numeric 'write strip' to be written.
- DIARY (misprinted DAIRY and not for remote control of the *Teasmade!*) permits a message to be left in the console to be read by a subsequent user.
- LIKE enables a channel N to be set like channel Y.
- SWAP inverts settings between channels.
- EXT KEY B is for control by an external keyboard.
- TIME displays the internal clock.
- REHEARSE SOLO provides an in-place solo function during setup.
- STOP CLOCK section is for the internal clock.
- STEREO LINE creates stereo link channels.
- REMOTE is for programming start/stop events with external equipment.
- The lower right buttons are for general programming as well as for getting brainstormed engineers out of trouble!

A simple example will illustrate how easy it is to program the *Memory*, and also how timesaving. Suppose we want to route inputs 1 to 6 to output 1. All we do is—press Set; (Input Assign) 1 Thru 6; (Output Assign) 1—and it's done in less time than it would take to route channel 1 to output 1 on a normal console.

## Fader and video controls

Again much is self-explanatory (see Fig 5). The 4-directional keypad is the 'cursory' control for selecting functions on the graphic display with the large knob providing the tactile interface to commands such as changing EQ settings. The fader duplicates the channel fader of the channel called up.

The Aux (1 to n), Fader, Trim, Pan buttons select the functions for the channel faders, Value provides a numeric readout in Hz and dB for EQ settings on the VDU, Copy To sets up the same mix on selected group and auxiliary outputs, with Set All being used for an overall command.

## Memory control keyboard

This will use a 'silent' keyboard with large buttons for ease of use. The fader can be used as either a Grand Master for overall output level control or as a crossfader between 'snapshot' mixes. A control lever will also be fitted into this panel to control the up/down speed of dynamic control in the memory. Some other functions are as follows:

- PAGE calls up a page of 10 sequences from the memory (the 20 Mb memory permits approximately 8000 effects or setups to be stored)—
- SYNC TO CLOCK synchronises the console to the internal clock—
- MOVE enables relocation of a setup in a file sequence—
- DISPLAY EFFECT provides a readout of effects without modifying console status—
- LOAD WITH UPDATE permits an update to be inserted into a program (eg: an EQ change). The console provides for continuous updates without restriction of memory.

## The system

SAJE feel that the *Memory* project stands apart from other manufacturers in that they have taken a software and communication orientation as opposed to a hardware orientation. One problem that was posed early on was—how should a computer controlled console look? Though at first this might appear a silly question, close investigation shows it to be the contrary.

Patrick Aufour: "The overall system is simple! From the start ▶

# UNIVERSAL

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Why is it always such a struggle to link audio and video tape transports through most synchronizers? Because each machine speaks a different control language. Translating reel and capstan commands for one type of transport is complicated enough. Factor in a multitude of machine-specific commands and transport design philosophies, and you have a real nightmare.

### Rethinking the synchronizer

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# SAJE MEMORY

it was obvious that the console had to be the human interface, providing a link to the electronics. The past has shown time and time again that equipment which has been designed so that the user has to adapt to it—rather than the other way around—has nearly always been a failure. With mixing consoles, for example, the tactile impression is very important, which is why there is a knob for ‘turning the equaliser’ instead of touchpads. The console had to reflect established working methods in its operation and not impose a more computerised approach. I had more than one fight with our more computer-oriented R & D people over the final presentation in order to keep the engineer/console interface intact and not let it become a fancy computer keyboard.”

SAJE certainly feel that the world is heading towards software. “We’ll soon be able to buy or hire services in software form. If we look at effects I’m sure that before long we will be able to buy or hire a Lexicon disk, an AMS disk, and so on rather than having to have masses of racks of outboard gear. We’ll be able to just dial it up as required.”

Daniel Rainotti talked about the computer side of the *Memory*. “The system uses four 68010 processors with our own DOS.

Each 68010 is 512 kbyte double access, running at 12.5 MHz without ‘wait state’—this means that the system is, to all intents and purposes, instantaneous. We use two hard disks plus a soft disk for security (3 Mbyte), with the interface from hard to soft disk being via an SCSI bus running at 1.4 Mbytes.

“A question that some people might ask is: ‘Why our own DOS? The answer is ‘for various reasons!’.

“(1) The multi-tasking systems that exist are stop/go and are not applicable to console operation. (2) Most DOS are subject to a licence system. This has the disadvantage of not all the necessary information being available in order to protect the programs. Having our own DOS means that we have total control over the system. (3) Using another DOS means using something that is not guaranteed ‘bug-free’! The lack of information provided means that de-bugging is virtually impossible and a great waste of time.

“Apart from the reasons mentioned above, there is also a technical reason. A big problem when using someone else’s DOS is that when you have to change tasks, a certain time is fixed for each task. The SAJE system (which we think is unique) is variable for each task, thus providing optimum working efficiency.”

A fairly unique aspect of the *Memory* is that it uses products that are right at the forefront of technology and in some cases it has been necessary to wait for the technology to catch up to the ideas! An example of this is the direct collaboration with the R & D department of Thomson CSF and the use of their Bus VME circuits which are so new that they are not available for general use yet. “We help each other! We give them ideas and they turn them into reality.”

SAJE realise, however, that the console has to be, above all, reliable and everything has to reflect this, from the disk drives to the basic solidity of the frame. With the best will in the world, PA consoles do get knocked about.

Mixed in with the *Memory* programme is the GAP project or *Generateur Automatique de Programme* (Automatic Programme Generator). Put briefly, this means that when graphics are programmed, the function is also programmed as well as its documentation. This means, for example, that programming the

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graphics for a parametric equaliser will mean that the function is also programmed. (Assembly language is used for speed.)

The development of the *Memory* has often entailed two stages: what SAJE call 'development tools' and the actual product. "We found ourselves having to develop the means to develop the product," mused Daniel, "quite an interesting situation". But Patrick put a more practical point of view: "The problem with most development engineers is that they never realise that there has to be a final product which can be sold and thus finance all of the research! If it was left to them you would never see anything as there would always be some new idea to be pursued. There always comes a time when you have to say 'Halt! That's it—the improvements will be for the next version.' Of course, the advantage of the *Memory* is that it is all software so can be updated and/or expanded at any time without problem."

The audio rack for the console uses a 24 bit audio bus. This consists of six balanced control lines in the form of a multifunction bus. An advantage of this is that it permits modification of the bus structure.

A console using the SARP system is what SAJE prefer to call an Intelligent Peripheral Controller, or an IPC. A unique aspect of the system (even if it is evident!) is that it operates simultaneously at different levels. Daniel continued, "This system is flexible. A control processor can be a slave or a master at a given time. The cards are also interchangeable. Within the SARP system you have the IPC which also operates with the buses, which are a communication system, and the CPU, which can be considered as the systems manager."

Part of the *Memory* concept is that consoles can talk to each other via a modem. In a theatre situation, for instance, a new production of a show opening elsewhere could be sent all the console information from the original production and thus save time in getting the new production underway. Tours on tight schedules could leapfrog systems with the console setups being transferred as required. In a studio situation information could be transferred from studio to studio.

A big advantage is that consoles can communicate directly with the factory and receive updates, swap information and also

be serviced remotely. SAJE aim to have a central software 'bank' where programs can be exchanged, hired or bought. (I think I'll try a Superverb tonight for a change!)

The remaining feature of the *Memory* is the user's (or owner's) card. This permits access to the console in the form of an electronic key and prevents use of the console by unauthorised or untrained personnel. "We don't want situations where the house electrician is doing the sound," explained Patrick. "Not that this is a reflection against theatre electricians but it is very rare that they have been trained as sound engineers!" As well as being a key, each card can be programmed with favourite console configurations for ease of working, as well as any other parameters desired.

A not inconsiderable aspect of this is that it is proof that an engineer is competent to run the console (it will only be issued after a training course) and may lead towards the lessening of one of the greatest lies in rock'n'roll: "It sounded great out in the house, lads!"

However, this is not to imply that operation of the *Memory* is difficult and within Patrick's prescribed ten minutes I had the basics of the console under my fingers. "It was necessary that any experienced engineer be able to use the console in a short period of time—at least the major functions. The full realisation of the console capabilities will obviously take more time but this is true for any new console situation."

An interesting point raised during hands-on was that one really does not look at a console when working it—or in the case of the *Memory*, at the video monitor. "The monitor is there to reassure but it is really not necessary most of the time. Let's face it, an engineer should be listening more than looking!" Certainly, once I got over the impulse to look at the monitor and trusted 'to instinct' with the controls, operation suddenly became much faster and the graphics became just a point of reference to be glanced at just to make sure everything is as it should be.

The SAJE *Memory* represents a major step forward in console design—and conception—though reactions are bound to be mixed! Some will be sceptical although for others it will be just what they have been waiting for. □

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right to call ourselves the  
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*centre in the country.*



# OPTIMISED RECORDING

Peter Frigo on mic transformer care

Modern mixing consoles no longer require periodic realignment because extremely stable mechanical and electronic components are used which means that recalibration is only necessary after a defect. But this otherwise perfect image has a minor flaw. Despite their many advantages, microphone transformers (transformers with line level are not critical) have also a disadvantage: their sensitivity to microphonic noise.

Let us illustrate this by giving an example (Fig 1). Through a fault (ground contact in this case) a DC current can flow through the input transformer. This current consequently flows through the input winding and magnetises the transformer according to:

$$\frac{H=N \cdot I}{l}$$

Although high quality, magnetically 'soft' materials with small hysteresis loops are used for input transformers, a small amount of residual magnetism  $B_r$  remains (Fig 2).

The remanence  $B_r$  has two effects:

- (a) The possible control range  $\pm B_{max}$  is reduced asymmetrically by the remanence  $B_r$ . This results in even-numbered harmonic distortions; a phenomenon which occurs particularly at low frequencies and high levels.
- (b) Mechanical vibrations cause the coil wires to move in a weak magnetic field (to express it in simple terms), and thereby produce a low voltage. The transformer acts as a (poor) microphone (microphonic noise).

These two effects are not serious, however, and they can readily be detected through measurements.

## Suggested remedy

From time to time the microphone input transformer should be demagnetised. A simple way of accomplishing this is by means of an erase function similar to the one used in tape recorders. The transformer is fed by an AC voltage, the frequency response and level of which are dimensioned in such a way that the transformer is driven into saturation. Subsequently this voltage is slowly and continuously decreased and finally brought to zero. This procedure requires approximately 5 to 10 s during which the magnetic-level control follows the curve illustrated in Fig 5.

A corresponding demagnetisation circuit is illustrated in Fig 6.

## Moral of the story

Through periodic, preventive demagnetisation of microphone input transformers, it is possible to achieve optimum recording quality. □

(This article was first published in *Swiss Sound*, the monthly news publication of Studer Revox.)

**Fig 1**

GROUND FAULT

MIC

2 x 6.8kΩ

48V

$I = \frac{48V}{6.8k\Omega} = 7mA$

**Fig 2**

REMANENCE  $B_r$

NEW CURVE

HYSTERESIS LOOP

COERCIVE FORCE  $H_c$

H (OR I)

**Fig 3 (left)** Magnetically hard material, eg for speaker magnets, magnets in dynamic mics, oxide powder in tapes and permanent magnets.

**Fig 4 (above, right)** Magnetically soft  $R\mu$  material, eg for transformers, chokes, relays, electromagnets and power transformers.

**Fig 5**

**Fig 6**

$R_i \leq 50\Omega$

1000μF

$f \leq 31.5Hz$

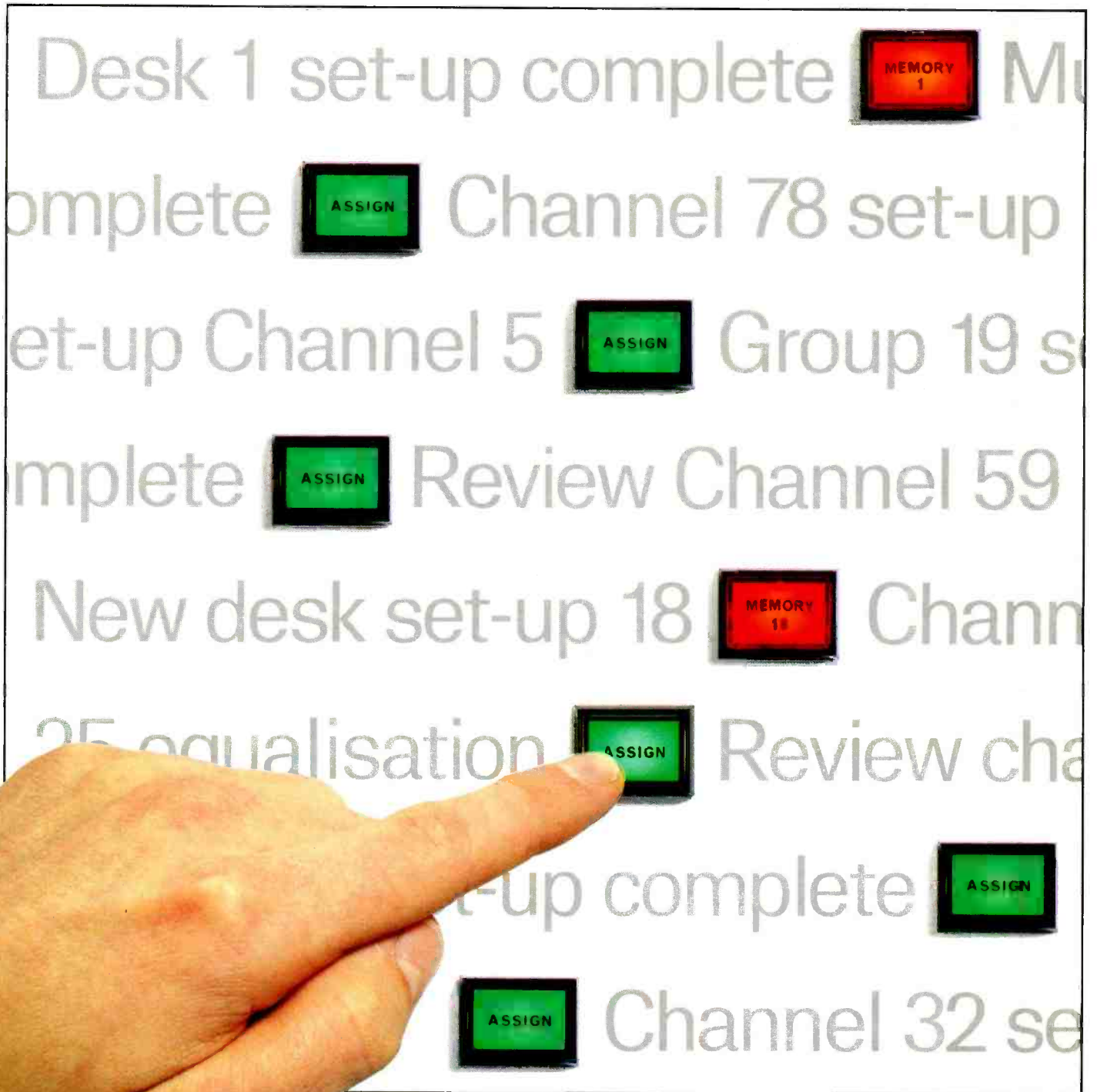
0...3V...0V GENERATOR

R 680Ω

DEMAGNETISING COUPLER

MICROPHONE TRANSFORMER

**Fig 6** Demagnetising circuit with C/R decoupling for generators with direct output.



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# TAKOMO

*Takomo is a studio that is well adjusted to its market.*  
*Janet Angus reports*

**F**inland, land of a thousand lakes and islands, is a bit of a culture shock in the Scandinavian tour. The language, which is related to Hungarian, bears no relation to the other Scandinavian languages. The people as a race tend not to speak English—at all—and it is impossible to even guess at the meaning or pronunciation of street names and places. There is a small proportion of Swedish-speaking Finland but Helsinki is not in it! Unsure now of what preconceptions there were of this land, arrival brought breathtaking scenery stretching for mile after mile of lakes and forests. Although the country is larger than Britain in terms of square miles, the population is less than five million with the result that huge areas are uninhabited, where wild moose rule the land.

Close proximity to the USSR has brought an affinity with that country and a great deal of Finnish export goes that way. Trading is encouraged by the Finnish government with arrangements to pay in Finnish marks for goods exported, since Russian currency does not change hands.

The picture, then, is of a country remote and isolated, yet technologically, and in some ways commercially, Finland is much more advanced than its Scandinavian neighbours. For example, the first Cernet telephones came out of Finland. Socialist Denmark and Norway are go-ahead enough to have independent local radio stations but they have to be non-profit making. Not so the Finns; a similar local radio network was set up but with definite intent to make money.

Profitable radio is one thing; profitable studio business quite another. The record buying public is difficult to conceive because of the tiny population figure. Because Finnish has nothing in common with other Scandinavian languages their records cannot even sell elsewhere in Scandinavia, let alone in the rest of the world. A sales figure of 50,000 is reckoned to be a tremendous hit. In 1985, *I Dingo* sold an incredible 150,000, beating all previous sales and instigating a 'Beatles' type mania amongst the nation's 12 to 14 year old girls.

The studios need to keep pace with developing technology, and therefore invest in large amounts of outboard gear. Yet there must be a limit to how much money is to be made to recoup that investment. The obvious answer would be to attract outside work but who would think of going to Finland to record their next hit? The country's profile needs a bit of PR.

Video has also contributed to the recording studios' problems, taking a share of the public's leisure money away with the result that facilities struggle to keep up to date with equipment and are unable to grow. Studio rates have been static for years with sometimes bitter competition for work. Record sales during 1983 and 1985 decreased alarmingly, meaning less money for new projects and a trend to sacrifice quality for a cheap job. Quite a number of the few 24-track facilities are putting their efforts into video as a more reliable source of income. And many studios belong to a larger parent company which can afford to support them when necessary.

One such facility is Takomo Studios in Helsinki, part of Fazer Musik Inc. Fazer operate in a variety of fields including piano manufacture (the instruments are distributed worldwide), import and export of musical instruments, Finlandia classical record label, Fazer publishing, classical concert management, Finnlevy production, import and wholesale record company, Scanvideo and Consumer Electronics, Fazer Songs pop music publishing and, of course, Takomo Studios.

The complex is situated on a Helsinki industrial estate in an area which houses several other music/audio businesses, five miles from the city centre. Takomo was one of the first 24-track recording facilities in the country (there are now six). The original 16-track studios were built to a Tom Hidley/Eastlake design in 1977, changing over to 24-track in '79/80.

Its history, however, dates back as far as 1972 when the company bought up a small record company which had a studio attached. In '76 their lease on the central Helsinki premises ran out and the present building in Takomotie was found. Then the big decision as to who should design the rooms had to be made.

Studio manager Jukka Teittinen explained the Hidley choice: "We had to decide whether to go for a Finnish or overseas design. Because acoustic design is a secret art, we thought it was best to use someone who had built a lot of studios and already had a chance to learn by their mistakes! It's all very well using a local firm who might be comparatively cheap, but in the long run when you have had to get them back in again to put things right, you would have been much better off getting somebody experienced to do it in the first place. Hidley had that experience and he did it right. We were very happy and got what we wanted. At that time it was very popular to have a very dead studio; more recently people want it more live. We would like to put in a more live room but there is no room. However, we still are the best studio in Finland so we are very pleased with it."

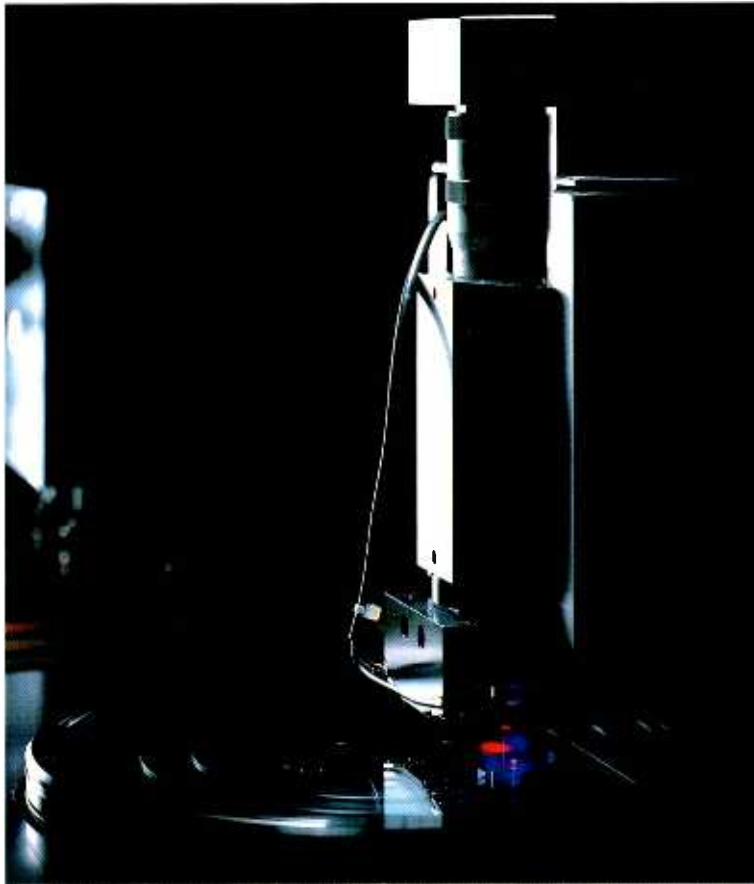
Jukka himself has grown with the studios right from 1972 when he joined the company from a job as engineer for FBC records, before which he was a drummer in a north Finnish jazz band. Ten years as studio manager has not turned him away from the control room. As often as pressure of administration allows he keeps his hand in as engineer since he believes this is the only successful way to run a studio.

## *Studio One control room*



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The **DMC-1200** Master Code Cutter  
from Sony.

Studio One is a fairly standard Eastlake design of that period with drum booth, isolation room, and live room with marble floor and mirrored walls.

"For the type of music we do it has been very satisfactory. We did try some big band stuff but it was not very good! We tried a 25-piece string section too—it wasn't very pleasant!" There's honesty for you.

The studio houses a 6 ft 1 in Steinway grand piano and there is a pair of Pioneer speakers for talkback. At the time of this *Studio Sound* visit both studios had their original API 3232 mixing consoles, both of which have since been replaced with SSLs.

"These American split consoles have been very good. The one in Studio One control room is 32/24 with a monitor section on the end, parametric EQ, routing for 16 or 2×16, stereo direct output, echo and foldback. They have been very good workhorses and we have had no problems with them."

But eight years is a long time and the need to change was brought home to them when video facilities houses started opening up with Calrec and Harrison consoles.

Takomo have not regretted their choice of Lyrec multitrack machines, which have proved to be very reliable. When upgrading they considered other available machines but decided in the end to stay with Lyrec, working with Dolby noise reduction. Their stereo machine is a Studer A80. Because there are no hire companies as such it is not possible to hire in outboard equipment and studios therefore have to stock what they require. The various studios do tend to co-operate with each other, lending equipment and instruments whenever possible. The outboard rack is naturally fairly full and includes Orban sibilance controller, four UREI compressor/limiters, Audio+Design *Express Limiter*, Lexicon *Prime Time*, *Scamp* rack with gates and compressor/limiters, Klark-Teknik spectrum analyser, UREI equaliser, Roland 3000 delay, and Drawmer dual gate. Monitoring is on Eastlake *TNI* monitors driven by Crown *DC300* amp with White EQ, nearfield monitoring on Auratones. Other equipment includes a Revox *A700*, Yamaha *K520* cassette deck, Simmons *SDS7*, Yamaha *DX7* and Roland *Jupiter 8*. Fairlight and the like would be hired in.

The room was equipped with speaker cabinets for quad monitoring since it was around the time that quad was a likely proposition but the rear cabinets, however, do not have speakers fitted.

Studio Two is an overdub/mix room with a vocal overdub room. The Eastlake brown carpet and cork and oak walls, etc, are once again in evidence with sliding glass doors through to the control room. Equipment here comprises Otari *MTR-90* 24-track, Studer *A80* and Lyrec mastering machines, with full

245E stereo synthesiser and Orban sibilance controller, Dynaflex *D-2B*, four channels of Dolby noise reduction, two UREI equalisers, Aphex *Compellor*, Orban sibilance controller, UREI *LA3A* levelling amp and two Universal Audio *565* filter sets.

The room was designed by a Finnish architect, as were all the other rooms in the building, bar the Eastlake studios. It incorporates a false ceiling with traps behind the monitors and an absorbent rear wall. Next door is the writing room with upright piano, and uses similar proportions and finishes in its design.

Studio 3 has recently undergone complete refurbishment. In order to utilise one of the API consoles formerly used in Studio 2, a video post-production and pre-programming suite is being installed to serve the growing need for video facilities and the general trend towards synthesiser-based tracks. This facility will be sharing a voiceover room with Studio 4, which is intended primarily as a writing room.

The new studio is to a house design with fairly light acoustical treatment. Monitoring is on Genelec *1022* with tape recorders/reproducers by Lyrec (24-track) and Otari (2-track with centre timecode track). Video synchronisation is on *Q.Lock Eclipse* with Sony *5850* U-matic. Initial outboard equipment comprises Yamaha *REV7*, *SPX90*, Lexicon *PCM60* and UREI *LA3* limiters.

Pre-programming is facilitated by various instruments including *RX11* drum machine, *QX1* sequencer, *TX816* rack, Master Keyboard, Roland *Super Jupiter* and Fairlight *CFI*. The control room is to be tied in to the main studios downstairs.

Video is becoming increasingly successful in Finland, encouraged by the opening up of a new commercial television channel (run by a joint national television and commercial broadcasting organisation). Jukka foresees that there will be plenty of video work around for all the studios.

The rest of the upper floor is given over to a maintenance workshop and tape library. One day of each month is set aside for maintenance in both studios and the rest of the time is spent developing new bits of equipment.

In the winter, however, the most popular place must be the relaxation area with its log fire and wooden ceiling.

The Takomo complex is run on a staff of seven: four engineers, one maintenance engineer, secretary and Jukka.

"About 98% of our work is Finnish music; we have had some productions from Sweden but very few. It is mainly pop music recording. We have quite a back catalogue and produce 'Greatest Hits' type albums. The high season for recording in Finland is August and September, one of the reasons being the annual television competition—*Melody of the Autumn*—for which you have to send in master tapes. This gives a lot of work to the studios. Also, producers come back from holiday and start work afresh. 1985 was very good for rock record sales; MOR type productions are selling quite badly and bands are beginning to sell a lot more. Rock and roll takes the lion's share. During 1985 electronic music became very popular as in the rest of western Europe but it was getting boring. Lately more drummers have been coming in."

There are two cutting rooms in Finland now. Prior to these facilities opening up Finnish record companies went to Sweden to cut.

"Finnish producers know very little about the technical side of cutting; they don't understand and it takes a long time for them to learn to trust the cutting engineer."

Compact disc is naturally slow to take off in a country which can hardly scratch together enough sales for its vinyl releases. This lack of demand coupled with the queues at the CD pressing plants makes it an unlikely proposition. Finlandia record their classical projects mostly on Sony *F1* but even then they have difficulty booking pressing time at the various plants. At the time of this visit Jukka said that he was aware of only two Finnish CDs—both rock and both analogue.

It's a mystery to those of us in countries where the music business is a relatively thriving entertainments industry such as Germany and the UK how the smaller territories like Finland manage to make ends meet. The advent of independent commercial radio may well bring a much needed source of income. Nevertheless it makes you realise that maybe we haven't all got it that tough. We haven't got the lakes and islands either; or the mooses? Moose? Meece?

**Takomo Recording Studios, Takomotie 1, SF-00380 Helsinki 38, Finland. Tel: 358 0555 303.** □

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## The high season for recording in Finland is August and September

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complement of Dolby; Eastlake and Auratone monitoring, Yamaha *REV1*, Lexicon *224* and *224X*, two EMT *140s*, two *240s*, Klark-Teknik spectrum analyser, Orban sibilance controller, MXR digital delay, Aphex *II Aural Exciter*, Roland *3000* digital delay, DeltaLab delay/effects processor, Audio+Design *F760X* complex limiter, Eventide *H949*, Lexicon *Prime Time*, *Scamp* noise gates and limiters, UREI EQ, Lexicon *102* digital delay system, Yamaha *K960* and *K520* cassette machines and *CD3* CD player, DeltaLab *DDL*, Eventide *H910* and EMT *928* record deck. Takomo use Agfa *PEM 468* tape.

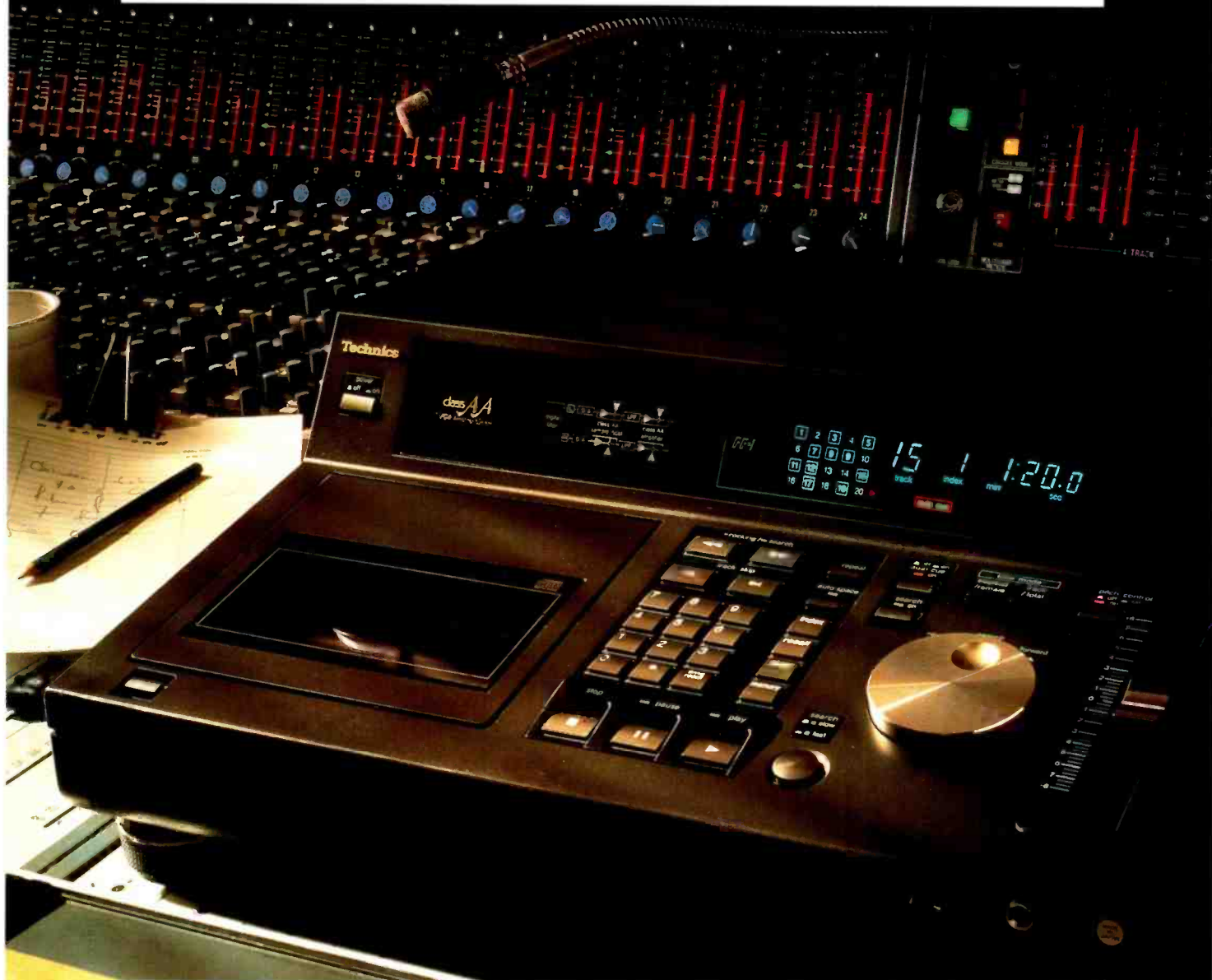
Control room acoustic finishes retain the traditional Eastlake stone, cork, wood and brown carpet.

Above these facilities there are further writing and copying rooms as well as administration offices for various Fazer companies. Studio 4 is the copy/edit room which houses a Trident *10/4 Fleximix* (2×2 out), Studer 4-track and Studer and Lyrec 2-track recorders. Some recording work is done here on 4-track, such as storybook cassettes and other speech projects. Tie lines connect into the adjacent writing room. Monitoring is Tannoy/Lockwood and other equipment is two Yamaha *TC520* and *K950* cassette machines, an Orban dual reverb *IIIB*, Orban

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as long as you



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# ...AND ALL FOR £15 AN HOUR

*Peter Orr, who has worked in recording and broadcasting studios for more than 30 years, tells the true story of a recent and disturbing experience*

**Y**es, of course I should have known better. For £15 an hour, a convenient and, apparently, ideal studio seemed too good to be true. So in the event, it proved to be. But, before I invite the accusation that I was out looking for trouble, let me emphasise that I had worked there before, and on this occasion, the horrifying details of which are shortly to be related, I had made a preliminary reconnaissance in company with an experienced and trustworthy friend, who was to be my co-producer on the sessions. As far as we could see on that visit, no major problems or potential dangers lay in the way of a successful recording. But readers of a previous account of disasters which have befallen me ('It's only on the monitor', *Studio Sound*, September 1986) will be quick to recognise that my professional life has been dogged by the direst of mishaps. Last summer's episode, to which I now turn, served but to confirm this most unfortunate trend.

To begin at the beginning. My colleague and I had booked the studio (no names, although in retrospect I could have wished for some rigorous pack-drill in certain quarters!) and we had taken care to specify our requirements with some precision. A few days later, the studio changed its name, but at the time we read nothing sinister in this alteration. A singer and a pianist were to be involved in the recording, which was very far from being a complicated one, and arrangements were made to move a piano into the studio the day before. That part of the business went quite splendidly; in accord with our request, a posse of strong men had been assembled, and the instrument was shifted with the greatest of ease. It was there and then, on the evening before the first session, that the engineer casually asked me about microphones. I had the impression that I had already indicated that I should like to use U87s. Faced with that demand, the engineer announced that he would have to hire them. It seemed to me, at such a late hour of the day, that this was cutting things a wee bit fine, but there came the serene assurance, which I innocently and optimistically accepted, that all would be well. At the same time, it turned out that we should have to lay hold of another ¼ in tape machine, as the studio possessed only one, and I always prefer to run a safety at the same time as the master. I have followed this practice ever since a tape which I was editing trailed over a lighted cigarette end, which caused a nasty curling over a few inches of the tape, and the loss of an entire word, a replacement for which was not easy to find.

But to return to more recent happenings: later in the evening of the piano-shifting, I was telephoned at home by the people from whom the equipment was to be rented: the studio had no credit standing with them, they said, and would I, on behalf of my company, be prepared to guarantee payment? I had no choice. Since only the darkness of a single night separated us from the morning's session, I gulped, and gave the necessary undertaking.

Dawn seemed to arrive rather early the next morning. The session was due to begin at 11am, and my colleague and I arrived at the studio in good time, having enjoyed a hearty breakfast of bacon and eggs together at home. At first sight, all seemed to be well: the piano had been tuned, the singer and the pianist were there and ready to make music. The owner of the studio had gone away, leaving the place in the charge of a man who appeared to be a little sleepy for the time of day. "We've been up all night rewiring the studio," he explained after an impressive yawn. I nodded sympathetically, but wondered vaguely why such extensive rewiring had proved imperative at that stage. "Two reels of tape enough for you?" he asked laconically. I started. Alarm bells began to ring, as yet faintly, in the distant recesses of my consciousness. Since I had booked 13 hours of studio time, and was aiming to end up with a recording of about two hours' duration, I replied that two reels would certainly not be sufficient, and would he kindly provide further stock immediately. For some reason, it transpired that he would have to go to a place somewhere off the M4, about 50 miles distant. When, at this juncture, I began to manifest signs of dismay, he assured me that he drove very fast indeed, and would be back with the tapes in no time at all.

The clock now stood at 10.45. There was no sign of the engineer. Before the acting boss-man departed, I enquired after this missing link. "Oh," he said in tones obviously intended to soothe me. "It's all right. I've just banged again on the ceiling, and he should be down shortly." The engineer, we discovered, slept in the flat above the studio. Why he should be still asleep at 10.45 in the morning was something of a mystery but I assumed that he, too, had been a member of the all-night rewiring party.

A few minutes before the hour appointed for the session to begin, he appeared, looking remarkably unconcerned. By this time, both my colleague and I had begun to detect what I can only term a certain lack of urgency in the proceedings. I greeted the engineer, and pointed out politely that we were almost due to start, and ought he not to busy himself in setting out microphones and in attending to those routine tasks that engineers are normally expected to discharge before the business of the day gets under way. With an enviable display of equanimity, he announced that he was unable to do any of those things, since the microphones and the Studer machine had not yet arrived. That was quite a blow, and left me winded for a few minutes. "When are they going to be here?" I managed to blurt out at last. Confidence was ebbing rapidly from me. "Should be quite soon," he replied blithely and, without more words, made off towards the kitchen and his morning cup of tea. A distinct feeling of uneasiness crept over us.

Meanwhile, in the studio, the singer and pianist were warming up. When I appeared at the control room window, our vocalist, obviously a little puzzled, questioned me: "Shouldn't there be some microphones here?" waving at a studio patently devoid of microphones. "We're sending out for them," I announced. Waves of laughter greeted that quip. "They think I'm joking!" I said between clenched teeth to my friend in the control room. He looked at me grimly. We both felt the tension mounting.

The hours passed quite uneventfully until the acting boss-man returned from out of the west with boxes of tape. "The police nearly got me," he said. "I was doing over the ton, but I managed to tuck in behind a Jaguar, and they stopped him instead." Obviously exhausted by his adventure, he retired to rest on a couch in the front office. More time elapsed, and then, to our extreme pleasure, a ring at the front door announced the arrival of the Studer, which was carefully wheeled into the control room. Things were certainly beginning to look up at last. But of microphones, there was still no sign. I was told that they were coming from another direction, and were expected to turn up on the doorstep at any moment.

Meanwhile, it was discovered that only one channel of the



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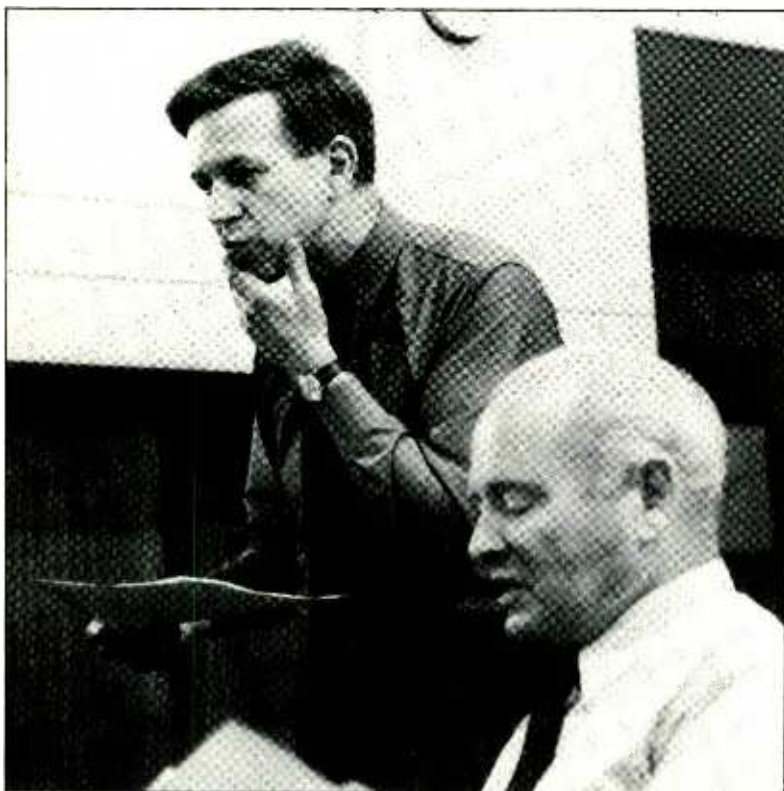
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# ...AND ALL FOR £15 AN HOUR



Peter Orr with recording director, George Rylands.

Studer was working. Help was summoned, and arrived in the shape of one of our stalwart piano-shifters. Further improvised wiring was added to the nocturnal efforts, the result of which was to reveal that the Studer was not at fault after all, but that one channel of the Dolby replay unit was not operational. Just then, several things happened almost simultaneously. My colleague leaned across and whispered to me: "I don't think this lot really know what they're doing!" Our singer, who had been hanging around doing nothing much for some hours, was by now, quite understandably, showing signs of impatience and offered to go home, never to return. It was a tempting suggestion, which appealed at that moment to all of us, but I was determined that they should see I was made of sterner stuff. "Lunch, everybody!" I announced in tones which I hope did not betray faltering resolution. In my experience, when things are going wrong, it is a good idea to turn to food and drink. Amazingly, just as we adjourned, the microphones were delivered. We ate our lunch hastily, our hearts lighter than they had been all day. At last, I thought, we were in business.

With one Dolby channel out of commission, I was offered the choice of listening to an undecoded signal from both monitor speakers, of listening to one side decoded and the other undecoded, or of monitoring, decoded, the right hand channel only. Whether wisely or not, we opted for the last of those solutions. At this point in the narrative, I feel impelled to echo Anna Russell, when she gave her improbable but perfectly accurate summary of the plot of Wagner's *Ring* cycle: "I'm not making this up, you know!" she remarked to an incredulous audience. Well, believe it or not, I am not making this up either.

Three hours behind schedule, the real business of the day began. We were actually recording. The machines were running, and we were listening anxiously to sounds coming from the single speaker. "What's that?" I asked. The engineer affected

not to hear. My friend turned to me. "I have a suspicion," he murmured ominously, "that every time the front doorbell rings, it puts a click on the tape." For an instant, I wondered whether he was pulling my leg but then I had to acknowledge that nothing was beyond the capabilities of the all-night wiring party. All too soon, it was time to pack up for the day, in which we had accomplished very little.

Whenever possible, I always try to do a quick rough-edit of the day's takes when I get home in the evening. Occasionally, it will disclose faults overlooked at the session. And so it was in this instance. I detected some sort of interference on quite a few of the numbers, which had gone unremarked in the heat of the day, but which, in the cool of the evening, refused to be ignored. On the following day, there was nothing for it but to insist on retakes of those items. The singer was far from pleased; in fact, we had words about it. And I don't believe that the pianist was utterly delighted, either.

But by this time, the Dolby units had been repaired (another all-night wiring session, I have no doubt), and we were able to enjoy the luxury of monitoring the session on both channels. Thus re-equipped, we proceeded peacefully for a while, until something struck me. We were listening to two apparently identical monitor speakers, Tannoys laid on their sides. "Why is it," I asked, "that we are getting two totally different kinds of sound out of these two speakers? They look the same to me, but they certainly don't sound the same!"

"No, they wouldn't," replied the engineer with a measure of aplomb quite remarkable in one so young. "The top end has completely gone on that speaker." He pointed to the item in question. There seemed no real point in trying to prolong a conversation on the subject, so I announced another take number and, not without misgivings and forebodings, we plunged onwards.

"What's that?" I said. My friend and I exchanged dark glances, while the engineer appeared again to feign deafness. "There's a very loud hum coming from somewhere," I said, stating what was quite obvious to all of us. The engineer turned towards me. For a moment, I had the dreadful suspicion that he was about to tell me that it was only on the monitor, but something in my expression must have warned him off that tack. He pondered for a few minutes, and then looked at the desk before offering the following explanation: "It's the gain on that mic channel." He pointed a wary finger at the fader. "It's right up at the top, which is why we're getting a hum."

"But why is the gain so high?" I demanded fiercely.

"So that we can get the proper level on tape. Is that amount of hum acceptable to you, Peter?"

"No, it isn't," I replied. "What can you do about it?" There was a silence, except of course for the hum. "Well," I said, trying to sound masterful. "Well, we'll just have to see, won't we?" Like Mr Pooter, I wish I could have thought of something better to say. The minutes ticked off slowly. The whole thing was becoming excessively tedious.

"What's that?" I demanded suddenly, and then realised that I was beginning to repeat myself. We listened carefully for a few seconds. "Can you turn the monitor up?" I asked the engineer. He promptly turned it down, which was not a great deal of help. "No, up, up!" I insisted, making vigorous hand signals in the direction of the ceiling, just in case he failed to understand the words. At an increased listening level, we were able quite easily to identify the sounds of Radio 2. "Where's that coming from?" I asked. Silly question, and it got the answer it deserved.

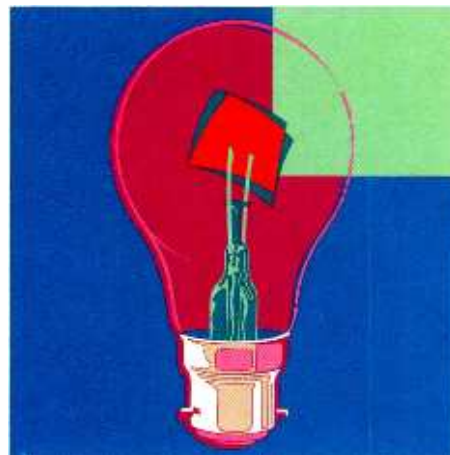
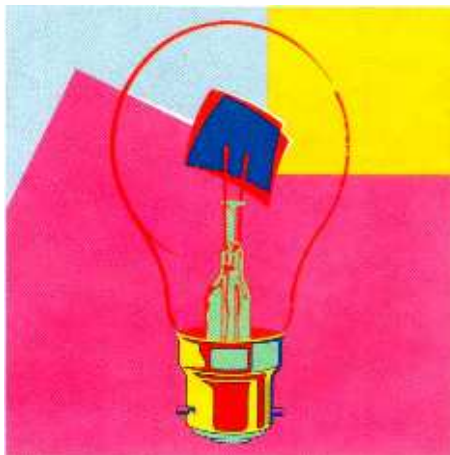
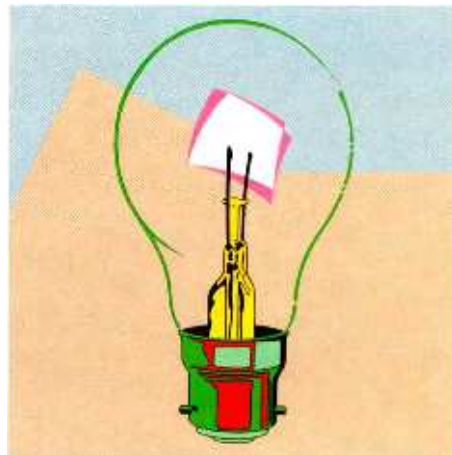
"Dunno," he said. I suspected one of the microphones, but there was nothing we could do about it, as there were no suitable replacements available on the premises, and I certainly was not going to send out for more of the same. And so, once more, after some fiddling with the equipment, we were back to retake the affected passages. And, once more, I was not popular with my musician friends. Bless 'em all!

At the end of it all, the real marvel was that, despite all the unforeseen traps which had opened beneath our feet with such frequency, we contrived to come out of the studio with material for a satisfactory master. But it was one of the most nerve-twisting encounters I can recall, and it has to be confessed that I shall not be hurrying back to that particular studio, even if they do change their name yet again. Oh, I almost forgot to mention that the air-conditioning worked a treat. Thanks a lot, boys! □

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A

WRITE  
B

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WRITE  
C

WRITE  
D



# INTERNATIONAL RECORDING HUNGARY & CZECHOSLOVAKIA

*The recording industries of East European countries Hungary and Czechoslovakia are examined by Mike Bennett*

**H**ungary (Magyar) is located in the central part of Eastern Europe bordered by Austria, Czechoslovakia, Rumania, Yugoslavia and the USSR. It is divided into 19 counties and 6 cities all having the same rights among them, Budapest, the capital city, being classed as a separate county in its own right. The population of Hungary approximated 10.5 million at the last census. The main exports are industrial and agricultural goods.

Budapest is divided in half by the River Danube (of Strauss fame) with Buda on the west bank and Pest on the east. This beautiful old city with its warm, outgoing, friendly people, quickly changes any preconceived ideas visitors may have of Eastern Europe. Hungary is one of the most modern up-to-date and go-ahead countries in Eastern Europe.

In 1981, Sony decided to hold a Digital Audio Seminar to include a demonstration recording session in Budapest. Agreement was reached with the principle film company in Hungary, MAFILM, to use their main music studio and control room to demonstrate the latest digital audio equipment, including *PCM-1610*, *DAE-1100* and *PCM-3324*.

Recordings were made using a well known group of Hungarian 'pop' musicians and full digital audio (DA) techniques were applied to recording, mixing down and editing a number of tracks to demonstrate the advantage of digital technology. In addition to the recording sessions which took place, a series of lectures on digital audio, theory and compact disc technology were given. Following this successful seminar and recording session, Hungaroton became the first company in Eastern Europe to invest in digital audio equipment.

## *Hungaroton*

For many years the Hungarians have been lovers of great classical music, a fact reflected in the titles available from Hungaroton (a record company that has been established for over 30 years), with a very comprehensive list of classical titles available both at home and abroad.

The main studios of Hungaroton are located in Budapest and consist of three main music studios with control rooms, four to five additional studios in other locations, six editing rooms and two vinyl disc cutting rooms. In addition, they have their own disc and tape cassette factory.

Hungaroton was one of the first Eastern European record companies to invest in Sony digital equipment (circa 1981). They quickly realised that digital recording, mastering and mixing down was essential if they were to maintain the high quality of their classical recordings. This, in turn, would put them in a good position to release compact discs as and when CD plants in Western Europe came on line with spare capacity. There are now 150 classical CD titles available from Hungaroton; this will reach 300 by the end of 1987. Some titles are extremely rare classical pieces, digitally recorded, at Hungaroton Studios in Budapest.

Most classical recordings made by Hungaroton are now digital. This process enables them to keep their options open when releasing new titles by being able to choose either vinyl or CD. Two of the six editing rooms are complete digital editing work stations which are operated on two daily shifts of eight hours with one additional shift over the weekend. One of the disc cutting rooms is also equipped with digital equipment, including a Sony *DDU-1510* preview delay unit which allows vinyl discs to be cut from digital master tapes. The remaining digital equipment is used for recording within the studios of Hungaroton or for concerts and sessions that take place in other areas of Hungary.

As there are now many CD titles available, Hungaroton carry out in-house quality control on CD by using a Sony *CDA/CDP-5000* analyser system. This enables the recording studio to check the standard of CDs being received from the pressing plant, the majority of CDs being manufactured by Denon, Polygram, Sanyo and Sonopress.

Hungaroton have been using any spare capacity in their





*MAFILM Studios, Hungary*

digital edit rooms to edit and pre-master digital audio tape for Western European recording studios. To date, over 40 compact disc master tapes have been produced for various countries, at least 10 of which entailed original recording in Budapest using overseas producers and musicians. Hungaroton hope to increase this service during 1987 but this will, of course, depend on the amount of work created locally. Not all the output from Hungaroton is classical; pop, folk and jazz are also available. Of particular interest and in great demand is Hungarian gypsy music, originating in this part of central Europe many years ago.

Analogue equipment from Studer, Ampex and Sony/MCI is in every day use at Hungaroton. Two MCI consoles—*JH-500-28* and *JH-542-42LM*—sit in the main control room areas. The latest type of ancillary equipment such as EMT, Lexicon and Sony digital reverberators, *Scamp*, Aphex and Klark-Teknik, is also used daily. Monitoring in the control room is primarily Tannoy *Classics* and JBL 4355 studio monitor loudspeakers. All digital equipment is Sony and includes: *PCM-1610*, *BVU-800DA*, *DAE-1100*, *DMR-2000* and *DDU-1510*.

Hungaroton has, therefore, firmly established itself as a record company with a vast list of classical music, a good percentage of which is now on CD. The name Hungaroton is synonymous with high quality; they are now striving to gain an even greater foothold in the worldwide record industry. Hungaroton sold 8 million vinyl LPs, 3 million compact cassettes and 300,000 compact discs during 1986.

National radio and television broadcasting is covered by Hungarian Radio (MR) and Hungarian Television (MTV) which are separate organisations.

Hungarian Radio transmits about 90 hours of programmes daily: 54 hours of inland 'national' programmes; 9 hours of inland regional programmes transmitted both in the UHF and

in the middle wave band partly in stereo; and 17 hours of 'international' programmes in foreign languages, which is also transmitted in Hungarian on short wave. Both the national and the international programmes are produced and routed to the transmitters and transmitter networks from the studio station in Budapest. For the regional programmes, Hungarian Radio operates five regional studios (Gyoeer, Pecs, Miskolc, Szolnik and Nyiregyhaza); the sixth will be put into operation in Szeged in the second half of this year, the seventh in Debrecen next year.

In the Budapest studio, the programme production facilities consist of two middle-sized studios (around 2000 m<sup>3</sup> each) and a pop studio (700 m<sup>3</sup>), the latter currently being rebuilt. In addition there are four studios for radio plays, nine small studios for lectures, talk programmes etc, studios specially equipped for newsreel-type programmes and one for the copying/editing of mixed music-speech recorded programmes. All programmes go via continuity complexes to the transmitters; six have been completed in a new building recently, consisting of an announcer studio and a technical room each. The equipment was designed specifically for continuity work.

Main features include full microprocessor control of all functions; remote control of the sources (tape recorders, disc players, etc) from the control desk and remote control of the transmission and PFL channels from each of the sources; VCA level control with fade-in, fade-out, crossfade and mix functions; level correction memory for each source; separate and independent microphone channel with automatic voiceover possibility; time and interval signal control from both the announcer and the technician; signalisation; status display and preprogramming. Functions in software can be tailored to the user's wishes and can follow the technical and operational changes in the radio station.

The system was designed and manufactured in close



# INTERNATIONAL RECORDING HUNGARY & CZECHOSLOVAKIA

co-operation with MR by the Budapest Elektroacoustical Factory (BEAG) which has supplied, together with the firm Mechanical Laboratories (ML), about 80% of the audio equipment of Hungarian Radio, the former mixing desks and monitoring speakers, the latter studio tape recorders. Both firms are producing large quantities of professional audio equipment for export.

Czechoslovakia, a land-locked country, has the following countries adjacent to its borders: Hungary, German Democratic Republic, Federal German Republic, Austria and USSR. The country is divided into two main republics. The two main regions are the Czech Socialist Republic (whose capital city is Prague) and the Republic of Slovakia (capital city Bratislava).

Record companies and broadcasters in Czechoslovakia quickly realised the potential of digital audio in the early 1980s; it has now become one of the most up-to-date and comprehensively equipped countries in Eastern Europe. All the principle record companies, and Radio Prague, are equipped with Sony DA products.

## Supraphon

The first record company to look seriously at DA technology was Prague-based Supraphon. Prior to buying Sony equipment in 1982/3, Supraphon were already experimenting with digital recording using the Denon System—which is still in use today for special session work.

Almost 100% of all classical recordings are recorded, mixed down and edited using Sony digital products. The majority of

final DA master tapes are on *PCM-1610*, thereby giving Supraphon the option of releasing vinyl or compact discs. A substantial number of titles are now available on CD, the major proportion of which are sold in Western Europe. Because large studio facilities are available, many recordings and co-productions have been recorded, mixed down, edited and released from Supraphon. Some of the associated companies are well known; for example Telarc and Nippon Columbia. The equipment is either hired from Supraphon for these recording sessions, or clients bring their own equipment and use the services of Supraphon's technicians to assist with the recording. Generally speaking, editing of DA master tapes is not carried out at Supraphon for overseas clients, but this facility is being considered for the future.

Recently, Supraphon have begun issuing Golden Discs to their artists who have achieved substantial sales of albums. The rules state that a gold disc will be awarded to an artist whose album has reached sales of 200,000 under one title, or 1 million discs of all titles released together. In 1986, five golden discs were awarded. The total production of LPs (including re-issues) released by Supraphon has now reached 10 million per year, all production being made in their own disc and tape cassette manufacturing plant.

In addition to Sony DA equipment, the studios of Supraphon are equipped with the latest type of analogue equipment. For example, they have recently taken delivery of an SSL 5000M mixing console that will be installed and commissioned later this year. This will complement the existing range of consoles manufactured by Harrison, Amek and Studer. The main analogue tape recorders are Studer A800 and A80 machines with full Dolby A facilities. Over the last two or so years, a very marked change in direction has occurred in that the management of Supraphon made a decision to move into the video business. They are now very well equipped with video cameras, a 1 in C-format video tape recorder and U-matic high band equipment. This equipment is in frequent use making videos with high quality audio programmes.

Supraphon have full editing and special effects equipment (such as a Gemini digital effects generator) for post production, dubbing and audio sweetening.

To sum up, Supraphon over many years have created a demand for its high quality classical recordings and it is interesting to note that compact discs released by Supraphon have reached 300,000 per year in a very short period of time. These compact discs are produced in Western Europe but Supraphon's own CD plant is already under construction and is due to go on line in 1989.

## Opus

The Opus Record Company and Music Publishing House is located in Bratislava in the Republic of Slovakia in the southern corner of Czechoslovakia. They have recently completed a new complex containing new studios at their headquarters in Bratislava, which is ideally located less than 60 km from Vienna, Austria. The new complex offers the latest digital and analogue equipment and, being so close to Vienna, is very attractive to Western European recording studios, artists, musicians and record producers.

Opus play an important role in Slovak musical life since it is the only recording company and, indeed, the most important music publisher in Slovakia. The company releases approximately 100 new titles each year, which are divided as follows: 40 classical, 30 pop and 30 miscellaneous (ie jazz, folk and local ethnic music). Recent releases fall under the following headings: symphonic, instrumental, chamber music and opera on the classical side; pop, rock, dance band and jazz for the middle of the road and folk, brass, humour, satire, narrations and fairy tales on the less serious side.

Opus sell approximately 2 million LPs per year and 500,000 music cassettes. The quantities of compact cassettes are roughly 300,000 local pop releases and 100,000 in the classical category. Sales are normally 2,000 to 3,000 of one particular title.

In addition to recording music Opus are established music publishers, releasing music scores and books containing contemporary Slovak, old traditional and pop music all composed locally; they also publish educational and instructional literature.

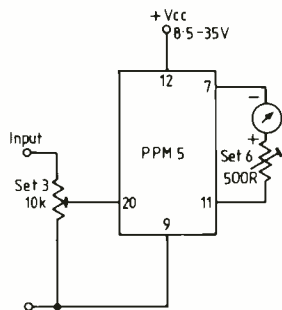
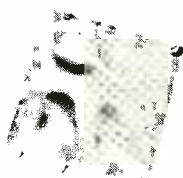
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# INTERNATIONAL RECORDING HUNGARY & CZECHOSLOVAKIA

Considerable emphasis is placed on the recording of classical music by Opus; over the years almost all major works have been recorded with many of the resulting LP's sold in western countries. The majority of symphonic music is played by the Slovak Philharmonic Orchestra whilst chamber music remains firmly in the domain of the Slovak Chamber Orchestra conducted by Bohdan Warchal. As the reputation of Opus has increased over the last few years, considerable interest is now being shown by conductors, musicians and record producers from Western Europe and the USA. All recordings made during the last two years have been made digitally and many classical recordings have been released on compact disc, the CDs being manufactured by Sonopress in West Germany and ICM in Switzerland.

In order to update their facilities, Opus recently opened this new complex containing the latest digital and analogue equipment. Opus has been a user of Sony digital products from 1983 and, since the equipment was purchased, *all* classical music has been recorded, mixed down and edited digitally. Having gained the necessary digital experience with the first set of equipment, additional mastering and editing systems were purchased and are now used for recording 'pop' music.

Hence, when the new studio complex was designed the decision was taken to purchase Sony *PCM-3324* digital multitrack machines.

The new complex has two main studios with associated control rooms. Studio One specialises in symphonic chamber, film and light music using a 32-input SSL *SLA032E* series console with full automation, a Sony *PCM-3324*, *PCM-1610* and *DAE-1100A* editor. Primary monitoring is by JBL 4435 loudspeakers with

matching amplifiers. Ancillary equipment includes Sony *DRE-2000A*, Lexicon *Super Prime Time*, Eventide *Harmoniser*, *Scamp*, Valley People *Dyna-Mite* and Klark-Teknik *DN360*. The studio will house over 85 musicians and is ideally suited to classical recordings because of its unique acoustics—the reverberation time is typically about 2 seconds.

Studio Two, on the other hand, is primarily intended for pop, light music and mix downs. The console is another SSL *SL-4048E* series, with *Total Recall*, and a second Sony *PCM-3324* with *PCM-1610* for 2-track recording. The facilities have been carefully designed to allow 48-track recording (using the two *PCM-3324*s) should the need arise. Primary monitoring and ancillary equipment are very similar to Studio One but also include an *Ursa Major 8x32* and a *Scamp Vocal Stresser*.

This studio complex was opened in early December 1986 and has been in frequent use ever since, from both locally generated business and some co-productions with Western Europe. The location of Opus in Bratislava, being so close to Vienna, will surely help to promote this truly excellent complex.

## *Radia Praha and FM Tokyo Project*

It would now be appropriate to outline a unique project which took place in November, 1985. To celebrate the 15th Anniversary of Tokyo's only commercial broadcaster, FM Tokyo, the station embarked on a series of live transmissions from various countries throughout the world. The requirement was that all concerts should be 'live', classical and feature world-renowned orchestras. Transmissions were received 'live' from three different countries: Boston's famous Symphony Hall featuring the Boston Symphony Orchestra, the Berlin Philharmonic Orchestra from Western Europe and the 'Czech Philharmonic Orchestra' from Prague. All three transmissions were resounding successes.

The concert was given in the famed Dvorak Hall in Prague by the Czechoslovak Philharmonic Orchestra; the hall was rigged in the usual way as though it was a normal outside broadcast to a Czech radio audience. A final stereo feed was fed to a Sony *PCM-1610* 2-channel processor where the signal was digitised and converted to an NTSC video signal. Normally this would then have been recorded on to a U-matic recorder, but on this occasion the video signal was routed by TV video links through Czechoslovakia on to Western Europe, finally arriving at a satellite station for onward transmission to Japan.

Using INTELSAT, this video signal was then transmitted to the earth station at Yamaguchi in Japan and from there it was relayed to KDD ITC in Otemachi, Tokyo, via a TV (video) link (see Fig 1). The incoming video was put through a video distribution unit and *TEK-1410* sync signal generator which

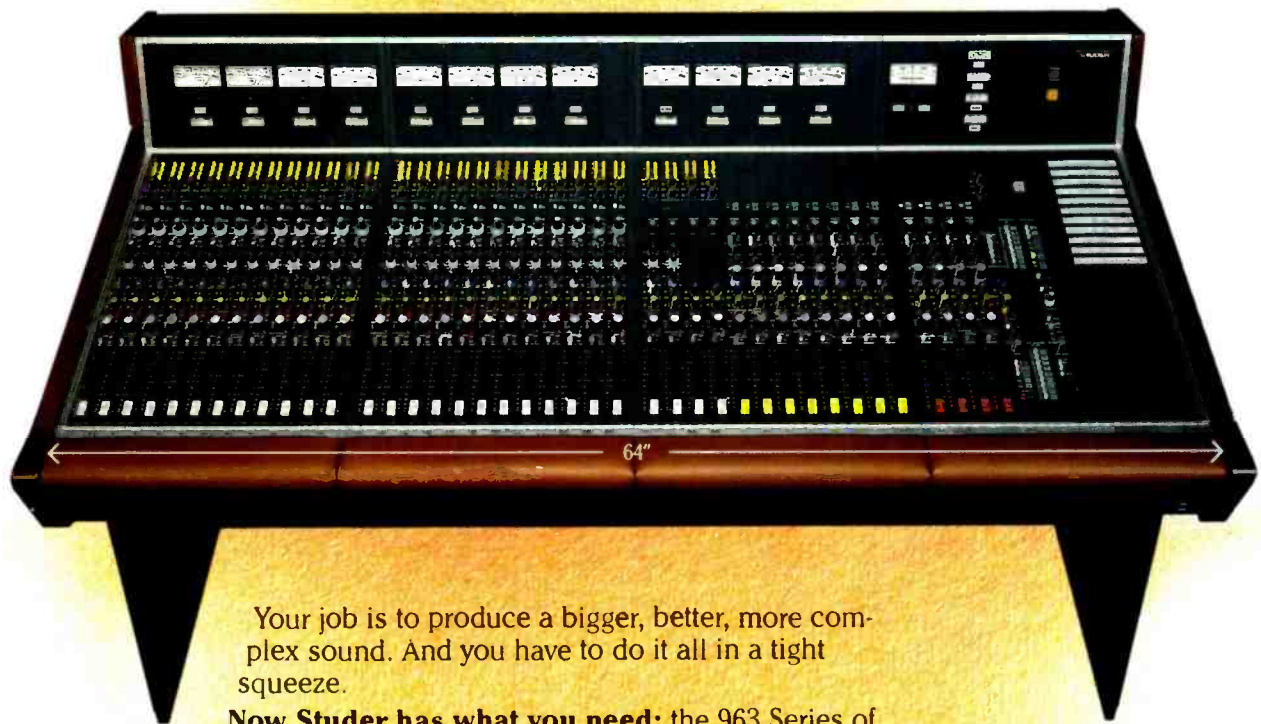
*Opus Studio control room*





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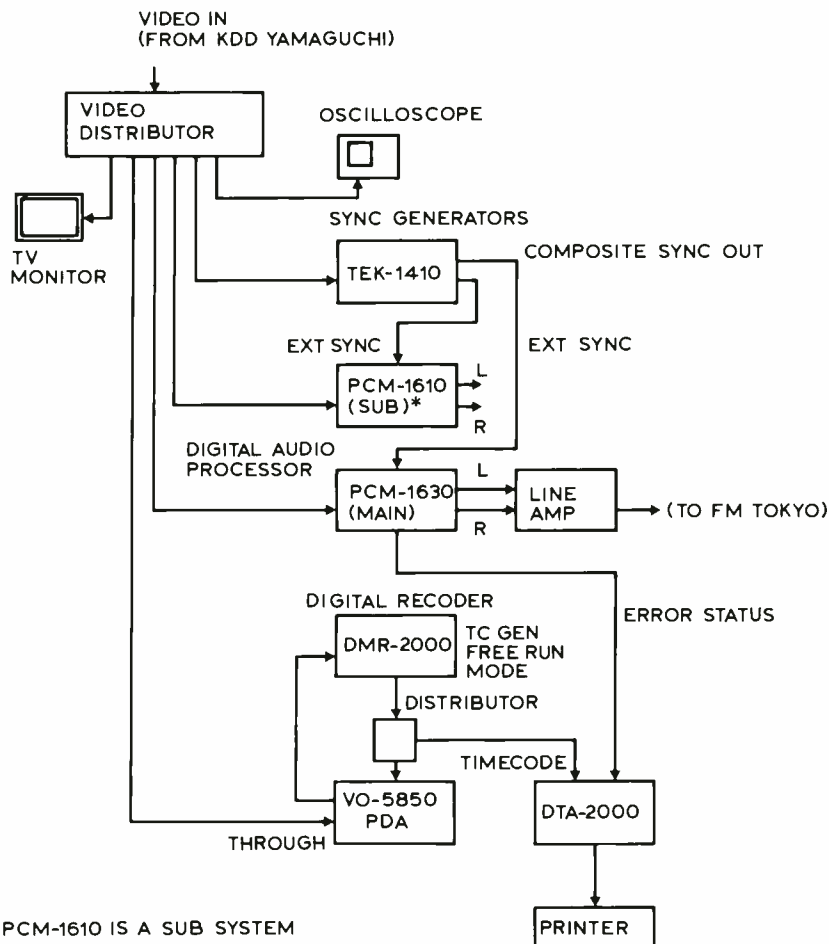
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# INTERNATIONAL RECORDING HUNGARY & CZECHOSLOVAKIA

converted it to a composite sync signal. Finally, the composite sync signal was put through a Sony *PCM-1630*, which decoded the video signal to analogue left and right stereo signals which were then relayed via a special broadcast line supplied by NTT to FM Tokyo's studio 4 km away.

The entire transmission, lasting 2½ hours, was received simultaneously in Czechoslovakia and Japan and is a tribute to the many months of planning and engineering expertise of engineers from both Radio Prague and Japan. One must remember that the distance involved, the number of countries participating (with the added problem of the various languages) and the state-of-the-art use of equipment and expertise, makes this project a remarkable achievement! It was, after all, in 'stereo', 'live' and separated by at least 9,000 miles. □

Fig 2 Reception system at KDD Otemachi



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# JAMES MALLINSON

*The role of the record producer within popular music is widely understood even though his function varies considerably. The classical record producer's role is however less clearly defined. In this article Janet Angus talks to independent classical producer James Mallinson*

**I**n terms of the record business the classical record industry is relatively small, employing a hardcore of experts in the production of recordings for a critical market. The major record companies have found it increasingly uneconomical to invest money in this area, and have reduced their facilities and resources accordingly which has enabled a select few producers and engineers to play the field.

One such producer is James Mallinson. Following a distinguished career as a staff (and latterly senior) producer at Decca of 12 years standing, he decided, as he puts it, to find out what the rest of the recording world was all about. When Decca was taken over by Polygram in 1984 Mallinson felt that what had been a rather quirky, special English company had suddenly become part of a large international conglomerate. This, combined with the fact that one of the first labels to be axed was the Headline Series of contemporary music recordings—which he himself had been in charge of—led to dissatisfaction and itchy feet.

The climate was right for testing other waters. The nature of classical recording involves large numbers of personnel which have to be assembled in the same place at the same time which may well coincide with other similarly large scale projects, all requiring staff; therefore the record companies were becoming more and more attracted to the idea of employing freelancers.

His reputation is particularly strong for opera and large scale works, although the number of operatic recordings being instigated at present is nothing like as high as he would wish. EMI use his talents on major recordings including those with Tennstedt, such as the recent Tennstedt Mahler Symphony No 8, most of their projects with conductor Riccardo Muti and the Philadelphia Orchestra, and the La Scala, Vienna Philharmonic and Berlin Philharmonic orchestras. Telarc use him for a large proportion of their European recordings.

"I am also their European representative so I have quite a lot to do with the setting up of projects which I may not necessarily produce myself, having quite a big input in the whole A&R."

CBS work includes recordings with Claudio Abbado in Chicago, and many of their soloists, including pianist Murray Perahia, cellist Yoyo Ma and pianist Cecile Licad.

"We also do the Canadian Brass quintet for CBS who play jazz and classical transcriptions. So I have a fairly catholic range of work."

Second to his love of opera is one of contemporary music and he regrets the fact that opportunities are rare. The Headline Series at Decca ran for six surprisingly successful years during which they recorded some 30 albums of works by living composers.

"Recording new music is sensational from a whole series of points of view. It teaches you proportion; working with living composers makes you realise how to approach the work of old composers, classical composers. I get very fed up sometimes when people spend a vast amount of time when recording say a Mozart symphony, worrying about whether it should be G sharp or G natural; when you realise the extent to which every modern composer I've worked with just doesn't worry about these little details, they are much more concerned about the overall sound and the impression that their work creates. I'm absolutely certain that Mozart and Beethoven were the same. This concern for textual accuracies is a modern fetish which has something to do with our own insecurities. Contemporary music is something that all the people involved in music should be forced to do to give them a different perspective, but none of the people I work with are interested in it."

Mallinson got into the business of record production by a quirk of fate and a lot of cheek. Having met Decca's head of A&R John Culshaw, whilst a music and language student at Dublin University, he kept up a hopeful though unproductive correspondence with the man.

Having been offered the job of assistant manager to the LSO he wrote to Culshaw saying he was about to accept a job, but in an ideal world he would really like to work in the record business.

"I got a telegram back from him saying 'do nothing, come and see me next Monday!'"

Culshaw had been appointed Controller of Music for BBC Television and personnel at Decca all moved up a step on the promotion ladder. This left a gap at the bottom for Mallinson to learn all about studios and record production the Decca way, which he duly did.

"I just started off as a skivvy and ended up being Decca's senior producer. There was no formal training but I learned from everybody—my fellow producers, engineers and artists particularly. You learn an incredible amount by working with artists; just how to interact with them is probably the single most important aspect of working in the record business and it applies equally to engineers. If you are an engineer and you get on the wrong side of your artists you've got problems. They don't take kindly to people who can't deal with them."

Mallinson's attitude towards the role of the producer is that it could involve virtually anything and everything. A staff producer may well spend a lot of his time working on long term plans with artists and conductors contracted to make so many recordings per year. As a freelance he may well take a project to a record company if there is something or someone he particularly wants to record, in which case he would become very involved in putting the project together, from booking halls and players, supervising both the recording and editing processes, to having input in sleeve design and sleeve notes.

"Alternatively, a record company might come to me and say we have this idea for a project which we would like you to produce and help us put together. This would involve casting the various roles in an opera and maybe it would involve choosing a location or even an orchestra. It depends entirely on what stage I come in on the project.

"If I have been invited to come in on a project by a record company, normally there is at least one major element in place and normally it is that element which makes the project interesting. For example, if they wanted to do a recital record with Placido Domingo, obviously he is the commercial item as far as the record company is concerned for that specific record. They might well say to me they want to do this record with Domingo, they think it's going to be Verdi arias but they are not sure which ones yet, they haven't got an orchestra or a conductor but why don't I go and talk to Placido and sort it out with him. It may well be a question of fulfilling the terms of their contractual commitment to him.

"There is an awful lot of basic boring planning which goes into the making of a record. Personally I think, for instance, when you're doing opera, it's a mistake to plan them around singers. The foundation of an opera recording should always be the conductor because somebody has got to be musically in charge and you can't have the tenor in charge. It has got to be the guy who is going to be in control of the thing musically, ie the conductor, so you should start with him and work everything around him.

"Another important aspect of my work is the liaison between the engineers and artists. Although my responsibilities tend to be primarily managerial and musical, I do obviously have quite a lot to say as far as technical sound is concerned.

"I have a very definite idea as to what I want to hear. The worst thing you can possibly do is ▶

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# JAMES MALLINSON

work on a recording session with no, or a very imprecise, idea as to what you want to achieve. One of the reasons multitrack tape recording was invented was so that people could put off making decisions that they should be making today to sometime next week. There is very little place for multitrack recording in the classical field. You really should go into a recording with an absolutely clear-cut conception of what it is you want to achieve, how you want to achieve it, and do it on the session.

"If you do take multitrack equipment along it is normally as a back up in case something goes wrong. For example, you're recording opera and you have a particularly good take of something which musically and technically is just what you want except that an orchestral tutti ends up being a little bit louder than you're expecting and as a result a singer who should be heard gets a bit covered. In this case, you can ease the singer out on the multitrack machine afterwards. This I think is legitimate use of multitrack but to go into a classical session with the idea of actually rebalancing all the tracks and remixing at some point after the session I think is a complete and total waste of time and will end up producing less good results.

"My role obviously does involve the creation of the sound because this is very much part and parcel of the overall performance. Musical preparation for recording sessions is absolutely crucial; I have to know the score as well as the conductor! You have to go in knowing what you want to achieve both musically and technically and at the same time be flexible enough to take what the artists or the conductor is going to offer you without trying to change his interpretation of it (assuming that the right artist has been chosen in the first place).

"To help the conductor maximise the potential of his performers you really have to know the music very well because there may be moments when things don't work out quite as everybody had hoped. Musicians do actually need help. If you are a sensitive musician, and particularly if you haven't got an audience out there by whom you can quickly tell whether something is working or not, it is a much more clinical situation. The orchestra is there, you're there and you've got a few microphones up and there's nobody else around apart from the recording crew in their box—it can be a rather naked and lonely experience.

"Owing to the knowledge that you can always do it again, the creative pressures are not as great as they would otherwise be and one of the jobs of a producer is to try to create the sort of atmosphere where creative tensions are very much around. The sessions shouldn't be too easy and they shouldn't be too relaxed; in some ways they should be rather the opposite because you have to replace the fact that the audience isn't there with something else."

Another aspect of Mallinson's role is to provide the musical interface with the recording engineer.

"Technical and musical balance are not the same thing and in an ideal world on a recording session the producer should be involved purely musically and the engineer, when it is up and running, should be involved purely technically. For instance, because I am very interested in technical balance and I have strong views about it, at the beginning of a recording session when the sound is being established I will have a lot to say about technical balance but as soon as the session's up and running I completely forget about it. I'm not interested in that anymore because it then becomes the province of the engineer. He

should be there checking on everything, listening and making adjustments and pointing out if there is anything wrong technically. I then become involved purely in the musical aspect of it. In a sense, if an engineer is too involved in the performance from a musical point of view the chances are that he will not be sufficiently involved from a technical point of view. Therefore he should need to be guided to some extent musically, otherwise he's probably getting his emphasis wrong."

In spite of this fairly clear division of roles, Mallinson chooses to involve himself in equipment choice, albeit on a democratic basis. "Recording is going through an enormous transition which people are not generally aware of. The two major developments which everybody knows about in the last two years (ie the development of digital recording techniques which replaced analogue techniques and, stemming directly from that, the advent of compact disc) have in theory produced great advances in terms of quality.

"When I say in theory I mean that I don't think either of them is an unalloyed blessing and they have both produced more problems than they've solved. There is no doubt that digital recording has conferred incredible commercial benefits on the industry because the digital recording technique came along just at the time that the industry was getting into a rather serious state of the doldrums commercially. Vinyl disc sales were beginning to drop dramatically and a new technical advance was very necessary. Now, commercially, the industry is doing far better than for a long time, really on the back of digital recording and compact disc, but it has opened up a whole series of problems in other areas of recording.

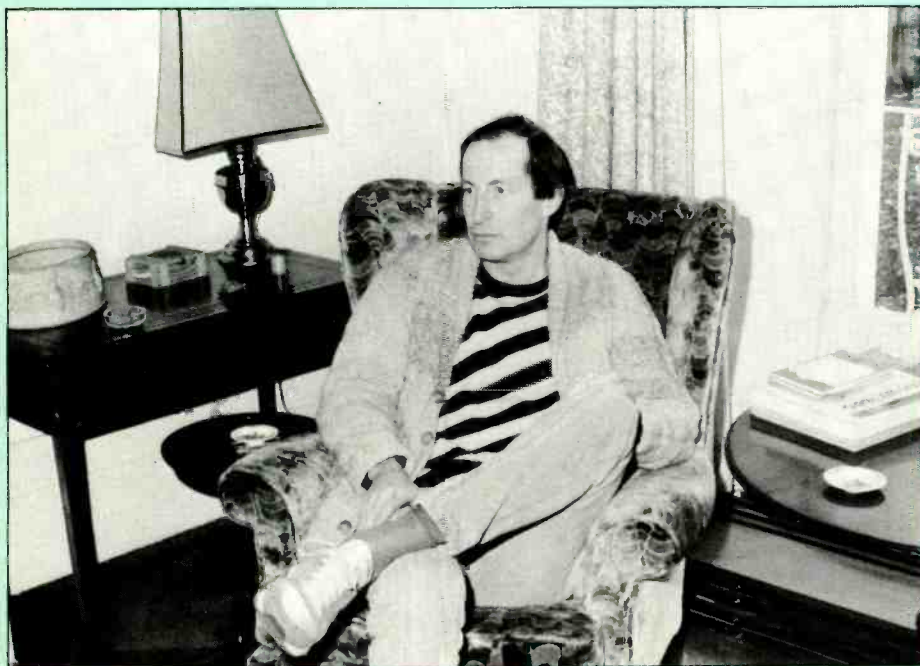
"The more I work in the new medium the more aware I become of how many deficiencies there really are. The process of getting from analogue into digital still leaves an awful lot to be desired in my view. The basic analogue design in commercial digital tape recorders is not even remotely up to scratch and the A/D and D/A converters leave a lot to be desired. I've worked with most of the machines: the Decca in-house system which I still think in many ways is the best; the Soundstream system which is now effectively dead; the JVC system and of course the various Sony ones.

"The Sony system in one form or other is the one that most people are using and I think it leaves a lot to be desired. Quite honestly, the best sounding Sony digital system is the *F1* and it costs a fraction of the price of the *1610* or *1630*. I would much rather listen to an *F1*. It's more musical. It's not perfect by any means but I don't like the *1630* at all. I have had all sorts of problems trying to achieve clarity in sound and texture."

Ironically, Mallinson feels it is not enough to turn up at a session with simply an *F1* tucked under your arm, for reasons of presentation more than anything else.

"People would say, 'Well I've got one of those at home, what are you recording us with that for?' So what I tend to do is take a *1610* and an *F1* to a session and then listen afterwards and take the one that sounds best. You can transcode *F1* to *1610* format to edit. Quite a lot of recordings made on *1610* and *F1* have ended up with the *F1* version on disc.

"I have no technical evidence but the *1610* is so much bigger than the *F1*, what is it that goes into it that justifies the fact that it is more than ten times the price? Surely what is being built in is an enormous amount of over-sophistication; ▶





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# JAMES MALLINSON

highly complicated signal paths and signal processing which is actually unnecessary. Perhaps they do it to produce better error correction but the error correction on the *F1* is absolutely amazing.

"The original JVC system sounded awful and I have only used the Mark II version once. It's much better but I don't think it is a significant improvement on the Sony. We used it on a recording of Vaughn Williams' second symphony and the *Lark Ascending* with the Royal Philharmonic Orchestra for Telarc at the Fairfield Halls with Tony Faulkner. We set up three recordings on *F1*, *1630* and JVC for evaluation. My impression at the end of the day was that the *F1* sounded best.

"I don't use digital multitrack if I can avoid it. If you know what you are looking for you should be able to decide what you want to do on the session and therefore remixing afterwards should be unnecessary. For purely technical reasons, if you have to remix, you've either got to go back into the analogue domain, remix through an analogue mixer, and then back into digital again for the final result. If you have got a digital multitrack machine the signal comes out in two forms: either digital or analogue. Now there are very few digital mixers available and so most of

operas is by breaking them up into small and ever-decreasing chunks—into just arias or ensembles or even bits of them—and then trying to schedule it in such a way that the star can fly in, do a session and fly off again. In other words there is seldom any logic in the way operas are recorded. They are done in higgledy piggledy bits and pieces which are all knitted together afterwards. I really dislike this and make strenuous efforts when I am producing operas to try and get at least a semblance of musical and dramatic order. For example, I recorded *The Marriage of Figaro* in Vienna with Muti for EMI and we literally started with the overture and finished with the finale, with one very small break when somebody was sick. In this way you retain the atmosphere and the dramatic tension. So much opera is recorded like a sort of chess board with a little here and a little bit there, all over the place and then all knitted together in the editing room. It's really a creation of the editor not of the performers, which explains why so many modern opera recordings sound very flat and rather lifeless.

"I feel very strongly that this isn't how opera should be done but the reason it is, is usually expediency: it is easier to say yes than to say no. The management of record companies aren't

*"I believe opera has to be done in real time, no multitrack, in long takes, no tracking and, as far as possible, in dramatic order"*

the remixing which is done goes through these conversions."

In fact, as far as Mallinson is concerned, there is no mixing console available which is suitable for mixing in the digital domain.

"The only kind of project that you sometimes will have to do in a multitrack mode is where you are trying to do something very complex where all the artists weren't available at the same time and you've actually got to do a lot of re-recording. But that is a far from ideal situation anyway. If you can possibly avoid it you should."

The recording of opera produces equally strong views. A high standard of recorded opera sound was established in the '60s, starting with John Culshaw's epic recording of Wagner's *Ring* with Solti conducting. More recent opera sound often involves very close vocals, unrealistically prominent over the orchestral backing. Mallinson prefers a sound more akin to that which you would experience sitting in the audience at one of our opera houses.

"There is a big problem with opera which is being compounded particularly by modern recording and editing techniques. The normal way the major companies or people set about recording

always tough enough: they won't say 'we want you on this project but only if we can have you for a sufficient amount of time'. You can say it, I have done so to artists who are very used to getting their own way. You just have to say 'this is the way it has to be done and you've got to be available for this amount of time if you're going to participate in the project'. Artists like dealing with people who have firmly held beliefs more than they like dealing with wishy washy people who say 'of course, we'll do whatever you want. If you can't do that then we'll track it afterwards'."

Tracking is another of Mallinson's pet hates, ie the recording of the orchestral part is used for singers to overdub at a later date.

"It is the absolute antithesis of every form of music making, particularly with a singer and orchestra because it should be give and take between conductor, orchestra and singer. There can be no give and take if the conductor has laid down the orchestral track trying to imagine what the singer would do when he eventually did it and the singer has to slavishly follow what the conductor has done because you can't change it.

"For EMI we recorded *La Forza del Destino* at La Scala in Milan which is something I have

always wanted to do—record an opera in an opera house. Verdi wrote all his operas with the sound of La Scala in mind. Record companies will go to enormous lengths to find places to record operas in but they have been frightened of opera houses, which has always struck me as a bit silly. A lot of opera houses you couldn't record in but you can at La Scala. It is dry, it doesn't have a reverberant acoustic. On the other hand it is a very beautiful sound, very detailed, very clean, and we actually put the orchestra in the pit where they would normally sit, we had the singers up on the stage where they would normally be and we had the chorus behind them and it sounded fantastic, using very simple microphone technique.

"What normally happens is quite different. The problems of making operas are horrendous. First of all you've got technical problems, organisational problems, personnel problems. One of the biggest problems is that you're dealing with people's egos all the time. You're actually dealing with a tenor who says, 'I no hear the sound of my voice, my voice not loud enough, why my voice so distant, all I hear is orchestra', when actually all you can hear is his voice. You have to persuade singers that they should be in context with the orchestra and not just an enormous face in front of the microphone with an orchestra tinkling away in the background.

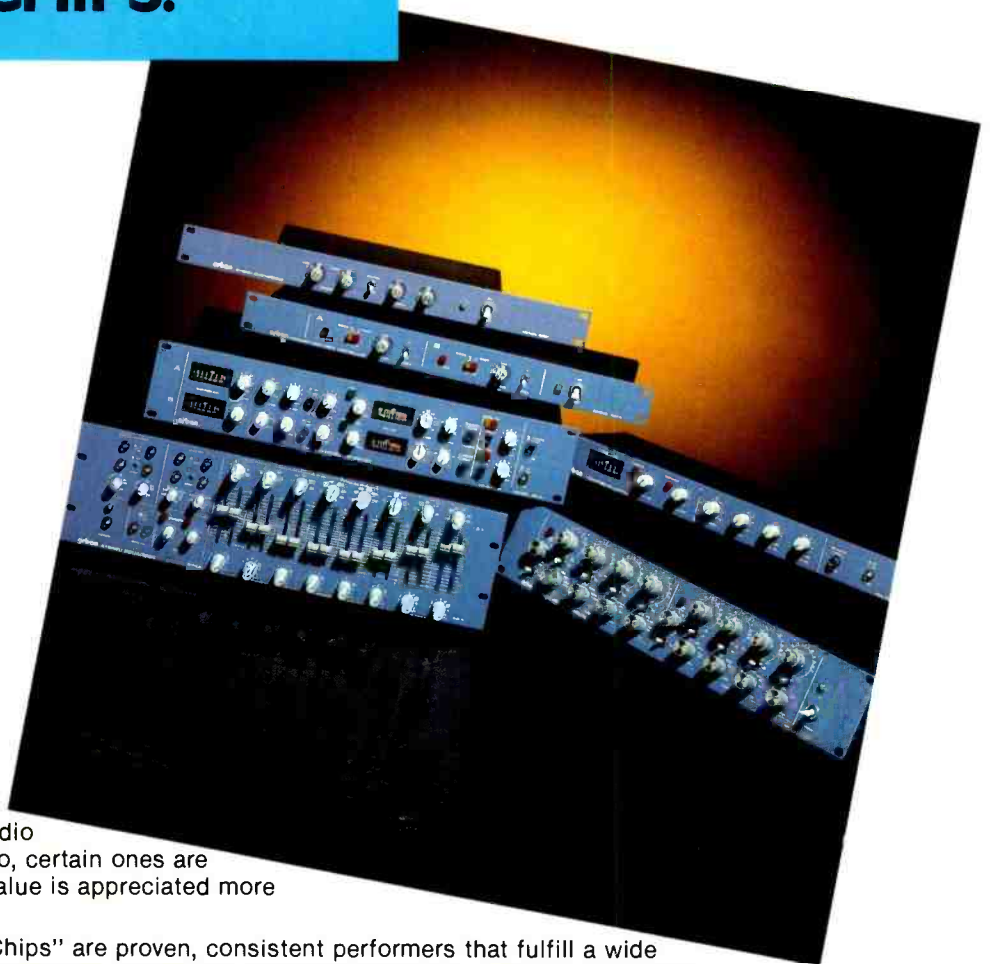
"People forget that operas were mostly written for an orchestra which is in the pit, which means down there. You can't normally see the orchestra hidden in the pit and the singers are up on stage, singing directly out into the audience. This makes a fundamental difference to the voice/orchestra balance. The way 99% of all opera recordings are made is by having the orchestra on the floor of a recording studio or hall, with the singers built up a little bit behind them and the chorus built up a little bit behind the singers. In conventional terms this is the usual way of doing it. Because there is no pit involved, the actual physical confinement of the pit is not there, which normally means that the orchestra is far too loud and you have this continuous problem of actually trying to get the singers through the texture of the too loud orchestration. You think, 'Jesus Christ, didn't the composer over-orchestrate this piece?' but of course he didn't, he wrote it to be down in the pit where there are natural factors which cause a correct balance with the stage. So if you can find an opera house with the right kind of acoustic which can give you enough time to actually record an opera, you are at least 50% of the way towards getting the balance of sound that you want.

"I believe opera has to be done in real time, no multitrack, in long takes, no tracking and, as far as possible, in dramatic order. You have to be allowed to deviate to some extent from the ideal because it is not possible to do everything according to ideal circumstances, but there are certain points beyond which you should not go and far too many people do in fact go beyond them."

Such firmly held and stated principles probably go a long way towards creating the reputation and respect accorded to James Mallinson. Is the freelance way going to be the only way for classical music? If this situation is to become the norm it opens up a host of questions about training of classical engineers and producers. Is it going to fall to the lot of courses such as the classically orientated Tonmeister degree or will the record companies find that they have to resume responsibility for something which has traditionally been theirs. □



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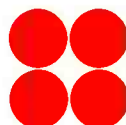
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# BARRY FOX'S BUSINESS

## DAT levy again

**A**s you read this, the record industry, represented by the IFPI for the world, the RIAA for America and the BPI for Britain, is negotiating with the British and American Governments, the Common Market eurocrats in Brussels, and the Japanese electronics industry through its trade body the EIAJ. They are negotiating a technical proposal which could well tear the recording industry apart—like previous moves on quadraphonics and digital standards. The debate is over whether future recordings should be issued with deliberately degraded frequency spectrum. The people debating the issue are the people who *sell* records. No one has yet thought to consult the people who *make* and *buy* them.

By now everyone must know that the Japanese are ready to launch digital audio tape, or DAT, and that the Western recording industry, backed up by Philips (inventor of compact disc and the conventional audio cassette), are not happy. The record industry's concern stems from the obvious ability of DAT to make perfect or near-perfect copies of commercially released vinyl LPs and compact discs. Philips and its subsidiary PolyGram have an enormous investment in CD.

The record companies have for a decade been lobbying for a levy or tax on blank tape. The campaign has been successful, or is now near to success, in many countries, including Britain. This levy would legitimise home taping.

Simultaneously the record industry wants to take advantage of the fact that because DAT is a completely new recording format, it is technically possible to make it incapable of recording some source material. It is also legally possible to make the sale of DAT dependent on the incorporation of disabling circuitry or penalise DAT with a tax if the circuitry is omitted.

Clearly it is a nonsense to make all DAT recorders incapable of recording from any discs. This would merely make DAT a more expensive equivalent of compact disc. Clearly it is even more of a nonsense to make DAT incapable of recording from any discs if the tape it uses is

taxed to compensate the record industry for losses caused by home taping.

There is a string of reasons why there is now a very real possibility that digital tape will be excluded from any levy or tax schedules.

Samsung in Korea have recently demonstrated a tiny video camcorder for point-and-shoot filming which uses 4 mm DAT cassettes instead of 8 mm Video 8 or 12.5 mm VHS or Beta cassettes. If the 4 mm camcorder idea catches on it would be wholly impractical to distinguish between DAT cassettes sold for digital audio home taping (which is likely to infringe copyright) and baby-on-the-lawn home movie making (which is no infringement).

Also the Japanese electronics companies have already offered to make domestic DAT machines incapable of dubbing direct from compact disc in the digital domain. Direct digital dubbing is easily blocked by making domestic DAT machines capable of recording only at a sampling frequency of 48 kHz, instead of the 44.1 kHz rate which is standard for CD. Already two companies, Hitachi and Sharp, have broken ranks and shown domestic machines that record at 44.1 kHz. This is clearly intended as a warning to the record industry that it cannot expect to have both a tax on tape and a technical block on digital dubbing.

Realistically, the 44.1/48 kHz issue is not of major importance. A direct analogue dub from CD to DAT would involve only marginal quality loss. The key question is whether analogue dubbing can be prevented. And for the first time in the history of audio, it can.

CBS first proposed the system now known as Copycode in 1982. It was impractical to implement then because of the vast number of conventional tape recorders already in use around the world. Now there are moves to cripple DAT with a 35% tariff into America and Europe unless all the hardware from Day One includes Copycode circuitry.

Copycode is a two-ended system. Pre-recorded material, on tape, vinyl LP or compact disc, is Copycoded by sucking out a tight (300 Hz) notch from the frequency spectrum at around 3.84 kHz. The Copycode circuitry in a DAT recorder recognises this unnatural notch and disables the record facility. Provided that the Copycode

circuitry is integrated into the same chip as some other vital function, it cannot easily be bypassed.

There seems little doubt that Copycode works insofar as a notched recording will disable a DAT recorder with sensor circuitry. Already sharp minds are thinking up ways of defeating it—for instance by slightly shifting the pitch of a recording or introducing notch-filling noise—but there is a much more important issue at stake. This is the question of what Copycoding does to pre-recorded material.

To suck out a tight notch from the frequency spectrum involves a series of sharp action filters which will inevitably introduce phase shifts. These may or may not be audible to some ears. CBS has demonstrated Copycode once to the British Government (DTI) in London at Abbey Road Studios and twice to EEC officials in Brussels. Similar demonstrations have been given in America and are scheduled for a Vancouver meeting. So far the only people who have heard Copycode in its current form are politicians, civil servants and record company executives. These professions are seldom noted for their ears. No demonstrations have been given to studio engineers, record reviewers or hi-fi journalists. The danger of this will be all too evident to anyone who has followed the antics of CBS over the years.

First there was EVR, a video system which did not record. The inevitable failure of EVR cost a lot of people, including Rank, a lot of money. Then there was SQ quadraphonics. Ask older EMI engineers about how they were railroaded by their management into using SQ and how they ended up issuing recordings which were labelled SQ but contained only a touch of ambience information in the rear channels. Then there was CX, the CBS disc noise reduction system which was hailed as compatible. It wasn't and it was killed by just those people who have not been given the chance to hear Copycode working—recording engineers, record reviewers and hi-fi journalists. Most recently there have been FMX, the CBS stereo radio noise reduction system, again hailed as 'compatible' and already looking doomed to failure because of compatibility problems. Ask the BBC, IBA and German radio engineers what they think of FMX. Meanwhile CBS is making no friends in the loudspeaker industry by claiming patent royalties on all polypropylene cones.

In Britain, the CBS head office has always looked blank when asked a technical question and shunted queries to the New York head office. The CBS office in New York has a tradition of ignoring technical questions from Limeys. The only way to get an answer has been to go through the Technology Center in Connecticut. We learn (predictably not through CBS in London or New York) that this has now been shut down.

Let's not mince words. CBS has a very poor track record on compatibility issues involving new technology which earns the company money while jeopardising audio fidelity. Copycode *may* be different. But it is an insult to the engineers, artists and producers who make recordings and an insult to the public who pay good money to buy the results, for CBS, the IFPI, RIAA, BPI, DTI, EEC Commission and anyone else on an industry free lunch, to make decisions on Copycode without first demonstrating that the system does nothing to detract from the sound of pre-recorded music and speech. Davis Stebbings of CBS claims that the system is "effectively inaudible" and that "even trained listeners have been unable to detect reliably the presence or absence of a Copycode notch". If so, why not prove it?



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equipment of the quality of the Studer A820 and Dolby SR, result in a minimal signal path that makes Marquee Studios as quiet as any studio in the world.

The only other Series Ten in the U.K. belongs to Mike Oldfield. Who is so keen to safeguard its secrets for himself, that he won't let anyone else play with it.

And Mike Oldfield isn't the only one who is keeping things close to his chest.

The computer power that lies at the heart of the Series Ten is so awesome, Harrison are required to get U.S. Government authorisation before exporting it to overseas customers.

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What we shall be doing, however, is giving information packs and private demonstrations to a restricted number of people who are genuinely interested in finding out about, and taking advantage of, the benefits Marquee Studios now offers.

If you think you should be among that select few, call Larry Bartlett on 01-437 6731 or write to him at 45 Broadwick Street, London W1V 1FS.

**marquee** studios

If the system is truly inaudible, let's hear it under the kind of ball-breaking test conditions that the BBC would cook up. If Copycoding isn't truly inaudible, then the system is a loser. Delaying the evil moment of truth will help no-one—except perhaps CBS who will cop a few short term royalties. The record industry will get its hands burned by releasing records which can't be taped, and which no-one wants to buy.

This one looks all set to end in a lot of expensive tears.

Engineers at the BBC—which will have to broadcast Copycoded recordings if the system is imposed on the public—have not yet heard it working. "We are very apprehensive" says the BBC's Engineering division "especially now that listeners' perception of high quality sound has been increased by compact disc. We would need convincing".

Because the top executives of the major record companies are so keen on the idea of Copycode, grass roots engineers dare not voice their reservations publicly. But one group of studio engineers in a London studio—who were also never consulted—decided to run their own tests. They doctored one of their own recordings with a notch which exactly matched the CBS proposal. Expert ears heard it at once. "It was most noticeable on strings and female voices on classical music; there is a subtle rounding off of the sound, with muddying of the stereo image" one told me. "I am all for stopping people copying our records, but I don't want them mucking around with the sound to do it."

The test filtering was done digitally. Analogue brickwalling, with inevitable phase shifts, could be more noticeable.

## What's in a name?

Dolby Labs are usually pretty good at communicating. But not in the case of their legal battle against pop star Thomas Dolby. Dolby are keeping quiet because they reckon they are in a no-win situation. But not talking about a no-win situation usually only makes it worse.

It has been known in the audio industry that Dolby Labs have for years been watching the professional career of synthesiser pop star Tom, or Thomas, Dolby. When he was just plain Thomas Robertson nobody had ever heard of him. When he became Thomas Dolby his career took off. Coincidence or cause and effect? Either way, Dolby Labs are now suing in California and won't talk about Mr Thomas Dolby until the case has been resolved. As legal cases in America tend to drag on for a lifetime, often through innumerable appeals, here is a bit of background.

Dolby Inc jealously guards the Dolby trademark registration and uses it to bring circuit plagiarists to heel. This is possible because when people buy a cassette recorder, they look for the Dolby label so they can play Dolby musicassettes. Recording studios put Dolby A noise reduction or SR processing on their spec and rate sheet. In the cinema and video industry 'Dolby Surround sound' has become a valuable sales label. Some Japanese hi-fi companies try to sell non-Dolby surround decoders that do the same job. But they come unstuck when they try to advertise because it is an infringement of Dolby's trademark rights to say something is 'as good as Dolby' or 'does the same job as Dolby'.

Several Japanese electronics companies have devised cassette recorder circuitry which mimics

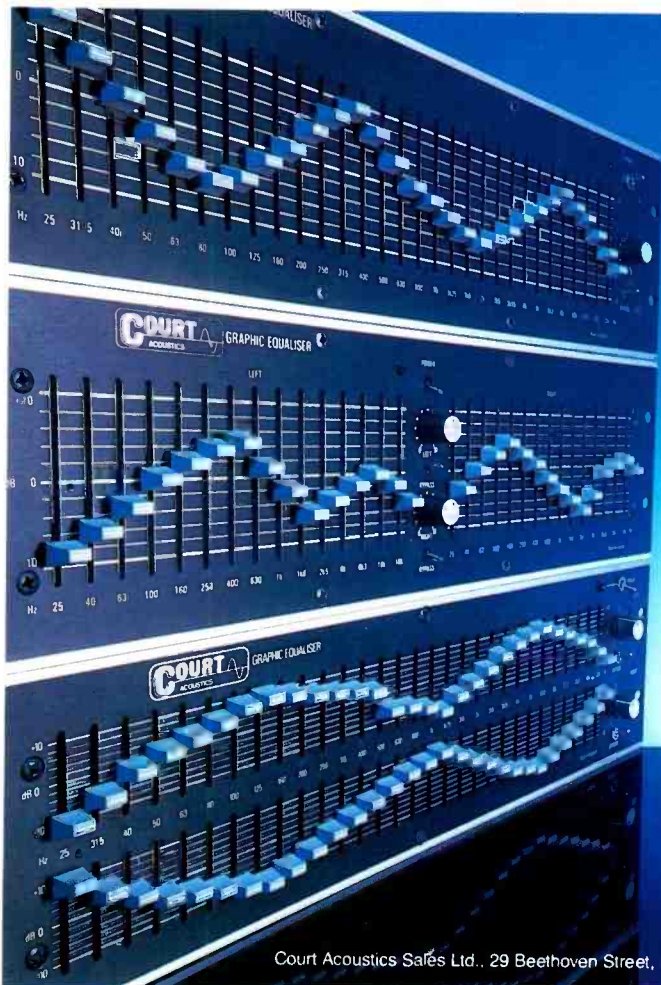
the Dolby B or C noise reduction systems without infringing the Dolby patents. JVC tried it with ANRS and Sony tried it with a never-named equivalent. But without the Dolby trademark, the products wouldn't sell and without a Dolby licence they couldn't use the Dolby trademark.

The pop star now known as Thomas Dolby was born in Egypt, the son of a Cambridge professor. Two years ago I asked his record company, EMI, why he had changed his name from Thomas Morgan Robertson to Thomas Dolby. The EMI line was that young upcoming Thomas Robertson was worried about being confused with Tom Robinson. And his real name was Thomas Morgan Dolby Robertson, he simply dropped the Morgan and the Robertson handles to become Thomas Dolby. Dolby Labs reckon his real name was Thomas Robertson and the Dolby tag has crept in somewhere along the line.

Sony once had similar trouble. When the Japanese company first started to become really successful in electronics, someone registered the same name for chocolate. Sony sued and spent four years in the courts arguing the case. Sony won. But Sony was an invented word, not a name.

The interesting part of the Dolby versus Dolby case is that anyone can change their name and then—in theory, at least—use it on whatever they make, do or sell. An Irishman named Murphy once tried selling imitation Murphy radios. He bought full sets of spare parts and put them together. But the cost of the spares was so high that he lost money on every radio he sold.

The outcome of the Dolby name case could have far reaching effects. If it goes against Dolby Labs, we can presumably expect a world tour by Bert dbx and a hit single from Archie Aphex. □



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# MARTIN POLON'S PERSPECTIVE

**I**t was one of those nights when London took its fog like a shroud and pulled it over itself. Coal fires hadn't burned in London homes for most of the century and yet...one could imagine all sorts of Victorian terrors emerging from the cloud of heavy mist. In a sub-basement just off Horse Guards Parade, the atmosphere was even gloomier than on the street if that was possible.

A man was secured to a comfortably padded steel chair by heavy straps. He was of medium build, with only his hawk-like nose lending some semblance of uniqueness to his physiognomy. His heavy suit was of obviously Eastern European cut, substituting durability for style. Several men milled around him, evidently shaken by something that had been done or was yet to be done. "It's not our responsibility," said one heavy set fellow with the red face of a policeman. "Special Branch should not even be here. It's the work...dirty work of you fellows from MI5." "I would hesitate to agree," opted a tall, thin, lanky man in an elegant smoking jacket. "Nevertheless, I opine that you are correct in fact if not in theory. But we must find out how much he knows. I suggest we use it."

Having placed the emphasis on the last word, the tall man's hand rested on the cover of what appeared to be a magazine. "Do you have the Minister's approval for this?" the fat man asked with an obvious tremor in his voice. "Of course," his cohort answered. "Do you think I would turn to this if I had another choice?" The fat man continued shaking. "Why can't we put bamboo under his fingernails or roast his toes with a gas torch? The other side does that!" The tall man wheeled and turned on his opposite number with a fury. "No, absolutely no. We are British. We must do it our way, no matter how horrible the consequences. No physical violence here. I have permission. I am going to read to him yet another of Martin Polon's articles in *Studio Sound* about the compact disc." At that, the imprisoned Eastern European began to scream...a cry so bloodcurdling that it wafted its way up to King Charles Street where late working staff had to make macabre smiles to cover their discomfort at the sound.

Now, give me a break dear reader. If audio columnists didn't write about hot industry topics,

where would we be now? I sincerely hope that my current focus on the changing face of digital recording and release technology is not quite as bad as the above fictional (I hope) tale would indicate. Or if it is happening as above, then I should at least be paid for the extra-curricular rights to my works.

It's an unfortunate reality that the question of availability of compact disc software has become virtually the most important topic of discussion today in the record and recording business. It touches on everything from the reduction in live sessions due to the CD re-issue of existing catalogues to the potential market for recordings of all kinds in the next decade. Are there or are there not enough CD pressings available to sate consumer demand in 1987, 1990 and beyond?

One record company insider views the current flap over capacity in a rather sanguine way. "This has always been a business of who do you trust or, more precisely, who's words do you trust? Some record company big-wigs are calling for a CD product saturation in mid-to-late 1987 or early in 1988. At the same time, the sense in the industry is that the LP record is dead in its tracks. A recent article in the *Wall Street Journal* proclaimed just that to the world's business community. Most record companies that I know have that feeling, but are afraid to acknowledge it verbally for fear that the record dealers will hurl vinyl platters like frisbees through their windows. The people at Motown were very gutsy to drop a broad range of their LP catalogue publicly. Of course, most labels have been quietly culling their LP repertoire for some time. And the bottom line: LP record sales will, in all probability, constitute under 20% of all recorded music sales in 1987. They could be virtually gone from the Western World by 1992."

That is especially the case if we see a rush out of black vinyl. There are no more 'givens' in the world of chemical production than there are in the audio industry. If record vinyl demands begin to falter, several reliable petro-chemical experts feel that the cost of producing the raw material could rise. Conceivably, the production of virgin record vinyl could cease altogether since it is so environmentally nasty as to render production at low volumes uneconomical. Then we would be left with only the vinyl reprocessing market. And the supply of raw material there (old records) is expected to shrink as consumers realise that their records are in many cases irreplaceable.

It has been over 60 years since the Bell Telephone Laboratories first released electrically recorded phonograph discs. It has been nearly 40 years since the 45 rpm and LP record systems were presented to the worldwide consumer marketplace. It could be argued that it is time for the retirement of a trusted friend, the LP record. Yet the LP record gave us a catalogue of releases totalling in excess of 15,000 titles in the US and Great Britain alone. Add the titles unique to each country of our world and look at roughly the 160 countries who have high technology communications and electronic entertainment capacity as members of the International Telecommunications Union. If each country had only 100 titles of music and performance of domestic interest; that would require 16,000 titles. Add that to the major works of the Western World that have been in release in some format (either CD or LP or both) and it is not hard to validate the figure of 30,000-plus titles worldwide in the world's musical vocabulary. Contrast that with the catalogue of CD releases currently available. Although the Schwann catalogue lists over 8,000 titles and the Wayne Green catalogue

lists over 7,500 works, the reality in the record stores is quite different.

In the United States, there is a strong sense amongst record retailers of shortages. A US dealer comments, "that my space has to be used profitably. Record stores can no longer locate just anywhere. The majority are part of chains, but the rules are the same for independents as well. You have to be where the action is. In a shopping mall or at a popular shopping location downtown or in key suburbs. The retailer lives and dies on his access to parking places. That kind of retail space is very expensive. I cannot afford to hold space for non-existent stock. I need to sell cassettes because they constitute over 50% of my sales volume. Records are declining but predictable. CDs make me ill. A boxed set of Springsteen that everyone should know would go gold or better disappeared off the shelves in a little more than two days. Every title is a 'cutout'. I have a competitor who has a large sign that proclaims to his customers that if they should see a title they like on CD they should buy it and not make him crazy with their complaints when they change their minds and come back and find it gone and gone forever."

A British distributor complains that, "I absolutely cannot get a product when my customers want it. And the High Street retailers have begun to jack around with the pricing. They raise the retail and then suggest the appearance of discounts. And this short supply situation has seen many distributors and retailers and even record companies carve out artificial profits. My customers come in here and get mad at me when they read a review in magazines like *Hi-Fi News*. They don't realise that the time lag for even the best of magazines is a couple of months and that particular compact disc has come and gone if you please by then, especially if it was very popular."

It might be appropriate to look at the potentials for worldwide CD supply for the next five years or so. The accompanying chart represents an educated effort from a broad variety of sources. The figures quoted here are approximate and represent educated estimates of disc capacity. Locations are according to the best information available. The range indicates the possibility of a swing in reaching the targeted production velocity on a specific time frame. It seems that the maxima will be achieved on schedule in most cases.

The 1987 total figures seem higher than those available from other sources providing capacity totals without production breakdowns. The 430 million mark indicated worldwide could indeed mean a temporary level of saturation in 1987 as some of the record companies have been saying. However, the 1990 figures seem comfortably close to estimates made by several major record producers of total capacity at the one billion (1,000 million) mark by 1990. The 1990 totals of 430 million units for North America also show close proximity to industry projections of 460 million compact disc production capacity there. All of these figures do seem to align themselves when we consider that there will be some other entrepreneurs and record producers who either increase indicated capacity here or open yet other new facilities. At least one hopes that will be the case. Many observers fear that no matter how much the supply increases, the problem with CD capacity will remain the same. The numbers look good on paper because the number of titles pressed remains low.

At the same time, almost every projection available for CD player velocity calls for 30 million units to be in homes in North America by 1990. That figure seems valid since there are

already about five million units sold and if the 1987 figures are added in with virtually no growth in sales (which is highly unlikely), the 10 million mark will be reached by the end of 1987. And nobody expects CD player sales to slow now that the £150 (\$225) price point has been reached in England and the \$150 level has become commonplace in the States. Coincidental to this, the total of all activity in the world audio marketplace is expected to push CD player usage worldwide to a total of 20 million units at the end of 1987 and 50 million players-plus in 1990.

Clearly, you can draw your own conclusions from this information. Now there are several possible flies in this particular ointment any way that we attempt to apply it. In reality, this is what is called in America the 'Peter Paul School of Management'. You rob 'Peter to pay Paul'. We all know that the record companies allocate pressing capacity by managing availability against demand. Some titles will only press to the currently accepted 20,000 piece minimum. Some esoteric releases and custom work may even press less. Others will press to 10 or 100 times that number. That flexibility of management of

demand versus capacity will continue to be the record companies, edge in dealing with the consumer response to CD. However, no matter how much juggling goes on, the presence of 50 or 60 million CD players by 1990 worldwide creates a demand that cannot be easily sated while maintaining a viable catalogue. Obviously, not everyone will want the same titles. But, with 60 million players in the marketplace, precious few have to want the same thing to place demand under significant pressure. Add the implied demand for CDs as a ROM-like (Read Only Memory) storage tool in the so called *CDI* format and the possibility of significant abandonment of the LP format—you are left with a very strong case for demand exceeding capacity.

So there, dear reader, you have hopefully the last word for a while on the compact disc production controversy. This information is supplied to allow for thoughtful comparison of various positions around our industry. This should either settle the discussions going on or make them that much more rancorous. Oh, and just remember this: a disc is just a disc, unless it is an R-DAT tape. □

Worldwide CD production (estimated)	Number of titles pressed	CD Copies per title	CD players in use (estimated)
<b>1987</b>			
430,000,000	10,000	43,000	20,000,000
430,000,000	5,000	86,000	20,000,000
430,000,000	2,500	172,000	20,000,000
430,000,000	1,000	430,000	20,000,000
430,000,000	500	860,000	20,000,000
<b>1990</b>			
1,000,000,000	10,000	100,000	50,000,000
1,000,000,000	5,000	200,000	50,000,000
1,000,000,000	2,500	400,000	50,000,000
1,000,000,000	1,000	1,000,000	50,000,000
1,000,000,000	500	2,000,000	50,000,000
<b>North American CD Production (estimated)</b>			
<b>1990</b>			
460,000,000	5,000	92,000	30,000,000
460,000,000	2,500	184,000	30,000,000
460,000,000	1,000	460,000	30,000,000
460,000,000	500	920,000	30,000,000
<b>Pressing facility</b>			
	<b>Range of Capacity 1987 (millions)</b>	<b>Range of Capacity 1990 (millions)</b>	
Capital/EMI, Jacksonville, Illinois	5-7	7-8	
CBS Records, Pittman, New Jersey	8-10	18-20	
DADC/Sony, Indianapolis, Indiana	15-25	40-50	
Discovery Systems, Dublin, Ohio	1-2	4-5	
JVC, Tuscaloosa, Alabama	9-10	10-12	
Laser Video, Huntsville, Alabama and Southern California	15-17	28-32	
Denon (Nippon Columbia), Madison, Georgia	10-12	15-18	
Memory Tech, Plano, Texas		16-18	
Philips/Du Pont Optical, Kings Mountain, NC	20-25	50-60	
Philips/Du Pont Optical, Plant No. 2	—	40-50	
Shape Optimedia, Kennebunk, Maine	15-20	35-40	
Technidisc, Detroit, Michigan	5-6	15-18	
US Digital Disc, New York	5-6	15-18	
Warner Comm, Oliphant, Pennsylvania	10-14	25-28	
<b>Totals (maximum)</b>	<b>154</b>	<b>377</b>	
Cinram, Toronto, Canada	4-5	8-10	
Interactive Data Vision, Calgary, Alberta	5-6	15-18	
Praxis, Toronto, Canada	8-10	22-25	
Sodice/MPO/SNC, Drummondville, Canada	3-4	7-8	
<b>Totals (maximum)</b>	<b>25</b>	<b>61</b>	
CBS, Sony, Shizouka, Japan	20-25	40-50	
CTA Limited, Osaka, Japan	5-6	6-7	
DAIO/Koson, Osaka, Japan	5-6	6-7	
JVC, Tokyo, Japan	25-30	30-32	
Matsushita, Osaka, Japan	2-3	3-4	
Nippon Columbia, Tokyo, Japan	10-12	15-18	
Pioneer/Warner, Tokyo, Japan	5-6	6-7	
Sanyo, Osaka, Japan	13-15	15-16	
Toshiba/EMI, Tokyo, Japan	2-3	3-4	
<b>Totals (maximum)</b>	<b>106</b>	<b>145</b>	
Sony GmbH, Austria	5-6	10-12	
ICM, Diessenhofen, Switzerland	8-9	9-10	
Nimbus, Monmouth, England	20-25	25-27	
Capital/EMI, Swindon, England	9-10	10-12	
PolyGram/PDO, Hannover, W. Germany	35-45	90-100	
Philips/Du Pont Optical (PDO), W. Germany	10-12	40-50	
Warner Comm, Alsdorf, Germany	15-17	30-35	
MPO, Villaines La Juhel, France	10-12	12-14	
<b>Totals (maximum)</b>	<b>136</b>	<b>260</b>	
Polyforma Dos Brazil, Sao Paulo, Brazil	5-6	12-14	
<b>Totals (maximum)</b>	<b>6</b>	<b>14</b>	
PRC, CD, Free Trade Zone, China	2-3	3-5	
<b>Totals (maximum)</b>	<b>3</b>	<b>5</b>	
<b>World totals (maximum)</b>	<b>430</b>	<b>862</b>	

# THE MANOR

*Dave Hastilow takes a current look at one of the UK's older country studios*

**W**ay back in the mid-seventies, when control rooms were as dry as a swagman's throat and the wood on mixing desks cost more than a Range Rover, there was the Word, and the Word was, Quadraphonics.

And when everyone had reverted back to stereo because they'd gotten tired of playing musical chairs and spin the brandy bottle to determine who was next to sit in the seat on the X, Quadraphonics remained what it always had been: a Word. After all, the dog on the label of HMV records did only have *two* ears—but then it was only listening to *one* horn. Doublethink. In fact at that time engineers were seen to be wearing badges reading 'Back to Mono'. Perhaps they

should have read 'Bark to Mono'? For those who have forgotten, or have no idea where or what the Manor is, no need to go scurrying off into the attic to find those well thumbed, much cherished back issues of *SS*. (Mine have had a barn built around them. The builder said, "Me and the lads couldn't understand 'em, and we dardn't move 'em like, so we just laid the concrete around 'em". Fifteen years of recording history propping up a horse's trough, I ask you.) I shall endeavour to articulate all the necessary background info.

Somewhere between the birth and demise of quad—more precisely 1976—the original Manor Studio was Westlaked by Tom Hidley. It was then only the second Westlake room in Europe (Threshold being the first) and was hailed as being probably the most advanced studio in the

country.

It replaced a design which had become outdated and impractical. For instance, the control room of the original studio was built on a balcony above the floor of what had been the barn. Musicians had to ascend a flight of steep steps every time they wanted to hear a playback, but then, it had been the atmosphere of the studio to which clients flocked. To quote John Dwyer in a previous review: "they'd probably have used the studio if it had only two microphones, a passive mixer and a mono cassette machine when it opened five years ago (1971)".

In 1973 it had been the birthplace of Mike Oldfield's *Tubular Bells*; the first record on the Virgin label. (How coincidental it is to be writing this when the newspaper contains a full page share prospectus form for the flotation of Virgin Records.) Of course, the early '70s were seeing the latter days of flower-power and hippiedom, the trend was back to mother earth, and all things good and wholesome. At the Manor the atmosphere was 'a cartwheel hung precariously by ropes above the studio floor' (which nearly fell on NME's Roy Hollingworth!). Patch cords hanging from nails driven haphazardly into oak beams. Dogs and rabbits padding around the place, a fire in the grate, etc. Whatever happened to 'atmosphere'?

The new Hidley room was not a refurbishment of the existing room above the studio, but was built at the opposite end of the studio instead, and was entirely different to the former in both design and concept. Some of the original atmosphere was inevitably lost too, but the house, or mansion, in which clients stayed, remained what it had been since it was built hundreds of years ago, very grandiose and luxuriantly comfortable. The new control room was a typical irregular octagonal Westlake design with heavy trapping consisting of hung blankets covered in glass fibre in the ceiling and around the walls. At each corner, four identical monitors with Westlake horns driven by a JBL tweeter, a JBL mid range driver and Gauss bass unit.

With the demise of quad, the rear speaker enclosures were doomed to become empty resonant chambers rather than an active part of the monitoring acoustic. And possibly because the trend in music recording—the advent of disco, reggae, and heavy metal—had placed an even greater emphasis on the drum and bass sound, particularly the bass drum, it was discovered that no matter how much bottom end was wound up it just disappeared into the trapping.

Tom Hidley was consulted, and he suggested fitting the monitors with tri-amped TAD drivers. This was partially successful but it was evident that the whole room design needed altering. Tom reworked his original drawings and in 1982 set to work optimising the existing design for stereophony. This was achieved by reducing the number of hanging blankets in the traps, and then altering the size of those remaining. The rear speaker enclosures were infilled with solid materials and their front panels resurfaced with rough cut tongue and groove. To further brighten the sound, the proportions of reflective to absorptive surface area on the ceiling above the front monitors was adjusted.

The studio is not large, approximately 15×9 m and is of 'live end, dead end' design, with the live end nearest the sliding glass doors to the control room. It offers, however, considerable scope for creative microphone placement, especially since where the original control room had been there was now a carpeted gallery directly above the drum booth overlooking the Bosendorfer Grand

*Control room after refurbishment in 1986*





Piano and parquet floor of the live area. The gallery also increased the musician capacity of the studio by almost twofold. And since the studio is fully trapped in Westlake fashion, the need for separation screens is minimised, allowing musicians to work close to each other with good rejection of unwanted sound.

Imagine now, the creative scope offered by the studio since the addition, in 1980, of the 'isolated', 'live' room. For descriptive rather than other reasons nicknamed 'The Stone Room'—all surfaces are either brick or stone—it is an extension built onto the opposite end of the building from the control room and achieves a large reverberant interior volume through being open right up to the roof rafters. Large wooden panels form a false attic and reflect the sound downwards but there are plans to have these hooked up to a hoist so that they may be raised or lowered; in the upper position, for instance, there will be an increase in the reverberant dimension along the whole length of the studio roof. A flight of steps in the stone room bring one back on to the dry gallery so it doesn't take a great stretch of the imagination to realise how an almost infinite range of ambiances and unusual effects might be achieved either with microphones and live sounds or microphones and replayed sounds.

The limitations of a recording studio are often quickly realised when the first of many clients begin asking for more and more facilities. At the Manor, this was probably due to the growth of the Virgin Records organisation as a whole. Artists arriving at the door to do overdubs and mixes carrying two reels of 2 in tape usually heralded the question: "Are you 48-track?"

No, the Manor wasn't 48-track, as such, but there were a couple of *Q.Locked Studer A800* 24-tracks holding hands in the corner. An *SSL SL 4000E* board with P and T Recall with 40 input channels, 32 output groups and four quad group had replaced the Helios wraparound 32/24 installed in 1976 for the quadraphonic conversion. The SSL was installed with the stereophonic conversion in 1982. Unfortunately, SSL boards are non-extendable so 1986 saw the installation of an *SSL SL 4048E* console with 48 input channels, 32 output groups and four quad mix groups.

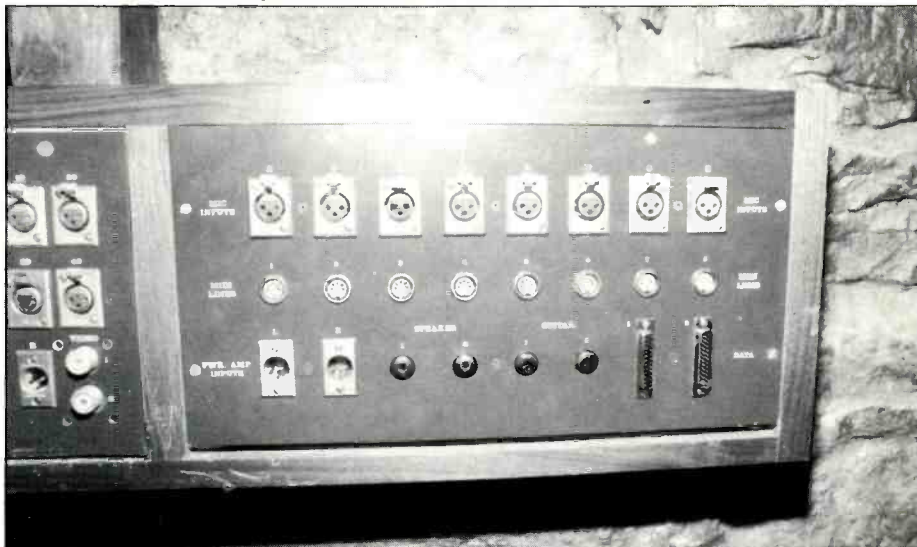
Now the Manor can say "Yes".

During the rare break in recording time, when the new SSL was housed, more improvements were effected. An 8-way MIDI system was daisy-chained throughout the studio, two feeds of speaker cable were installed, as well as two feeds of low-loss guitar cabling, which allows guitar speaker placement to be separate from the amps. Two data lines for multiway connectors rounded out the technical alterations.

Finally, the Manor are adding to their already luxurious environment (at the time of writing),

new carpets, and a multi-gym with sauna to complement their swimming pool (housed beneath

a dome in beautifully landscaped gardens). A lake with two swans was installed in 1980. □



Studio patch panel

#### Control room



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# REVIEW

## Patrick Stapley reviews Neve's Necam 96 computerised mixdown system

**N**ecam was originally introduced in 1977 as the first moving fader, computerised mixdown system. Its arrival caused quite a stir with the sceptics saying that motorised faders were R & D overkill and they simply wouldn't last, but there was also positive interest and before long, orders were coming in from a number of Neve-equipped studios. Necam's 'ghost in the machine' effect started to become a familiar sight for studio users, some of whom became immediate converts, others quite the opposite. I can remember one uninitiated producer getting such a shock when all the faders suddenly reset themselves, that he ran out of the control room ending the session!

In 1982, Necam 2 appeared with changes that mainly catered for the audio-visual world. Necam 96 was launched in 1984 but suffered from software problems, and it wasn't until mid-1985 that the system was 100% operational. It has now been installed in some 70 studios worldwide with particular interest coming from America and Japan.

Visually the most obvious change to the previous systems is the control unit and its

associated video display. The control box, measuring 415×233×46 mm high, houses a QWERTY keyboard, a numeric keypad and all the command buttons. Recently, Neve have installed the controls into a spare, central panel in their V series console, making for a compact and convenient arrangement. The standard display is via a 14 in, high-resolution, colour monitor, which provides comprehensive information of computer functions.

The faders don't look any different, still retaining their somewhat chunky appearance, but mechanically they have been improved with the addition of a new motor drive which makes them both lighter to the touch and quicker moving (top to bottom in 200 ms as opposed to the original 500 ms). The maximum number of faders the system will cope with is 96, hence the name.

The system now operates with double density floppy disks which have twice the memory capacity of previous disks. All scratch information is stored in static RAM memory, so the original scratch disk has become redundant; because of this, the system is now being produced with a single disk drive. Necam 96 is compatible with Necams 1 and 2 by way of a conversion copying program that converts the original disks into 96 format.

An Adams-Smith 2600 synchroniser is used to interface between Necam and the tape machine. It is supplied with one control module and it is left to clients whether they wish to add further modules to control more than one machine.

### Mixing

The program is loaded into the computer from the program disk. This is then replaced with a formatted data disk on which all the information relating to the mix will be stored.

To begin mixing, the Start button is pressed which replaces the old Go button. The computer notes the timecode and enters it as the mix From time, while changing its working mode from Manual to Assist. The computer is now ready to receive your moves.

The basic concept remains the same—faders write when you touch them, and read when you don't. Where things have changed is in the way the computer deals with updating. It is no longer

necessary to keep every pass to build up a completed mix. Necam retains two mixes called Previous and Update in scratch (volatile) memory; Update is the latest pass, and Previous is the mix the Update was made from. Both mixes are continually superseded as the mix is tailored, so the Update turns into the Previous as soon as the tape machine goes into play. If at any time you were unhappy with the latest pass of updates, it is possible to delete the Updates mix and return to the Previous mix once again. This way of working means that mixes are only kept as occasional safety references and as masters.

Another important change is the Rollback facility, which allows you to spin the tape back over a section and correct it, update it or just check it as many times as you like, without having to tell the computer a thing. To help you along, there is a Rollback button that takes the tape back 10 s, or a pre-specified time, and puts the machine into play. This is excellent for working on intricate parts of a mix where complicated moves can be built up gradually without the necessity to merge. In the process of doing this, it is quite likely that some faders may end up at different levels to the rest of the mix and cause a fader jump. To solve this problem, a Null indicator is provided in the main monitor display that points to the direction that the fader, presently in touch, has to move to become nulled. Once matched to the previous level, the display shows a double-headed arrow.

The Suspend mode allows either Update or Previous mixes to be played back while ignoring any new moves that are made. This is useful for trying things out without committing anything to memory, and can be selected at any point during the mix. Suspend can also be used to compare the Previous and Update mixes, resetting between the two at the press of a button.

To keep (or save) a mix on to the data disk, the Keep button is pressed at the end of the mix. The main display will respond with 'Select Mix Previous or Update'. Once the choice has been made, the computer asks you to name the mix. If you prefer numbers to names, press the Return button and the mix will be numbered and entered into the mix list along with its From and To times. When recalling a kept mix, it is important to remember that the existing Previous and Update mixes will be lost unless they have been kept. The computer prompts you with a message giving you this option, and then loads the kept mix as the Previous mix.

The two switches directly above each fader remain the same in function and appearance. The MRN switch, which is the left hand switch, is responsible for selecting one of the three modes—Manual, Relative or Normal. In Manual, the computer literally considers the fader to be in touch and, unless it is moved, will write it at a set level throughout the mix. Relative allows a fader to be trimmed up or down in proportion to the previous level, and Normal switches the fader into the standard reading and writing mode.

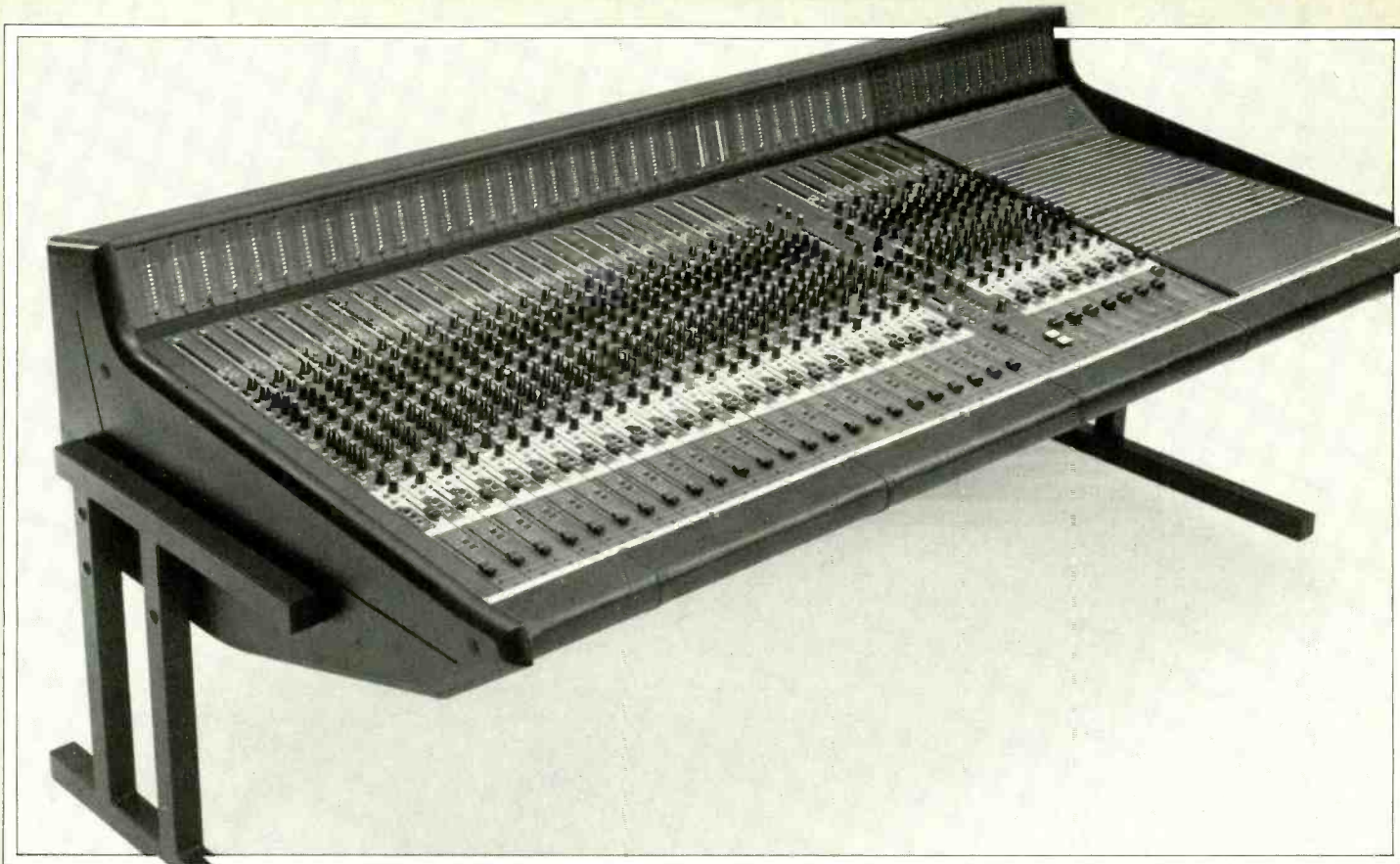
The other switch is the Mute, also a 3-position switch, which selects On, Auto and Mute. Mutes are created by using Mute to cut and On to uncut; they are then read with the switch in the Auto position. It is important to get into the habit of returning the switch to Auto after an update, otherwise you run the risk of writing over existing data.

Allied to the Mute function is the Mute list, which displays all the muting activity throughout the mix in timecoded order. If you were more interested in the mutes for one particular channel, a new list can be assembled that



Necam 96 mounted on the Neve 8128

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# REVIEW

provides individual fader On/Mute information.

It is now possible to create new mutes and trim existing ones from the control unit. This is achieved by writing new timecode values into the Mute list that can be adjusted by fractions of a frame down to increments of 10 ms. If a detailed cue sheet is available, this can be a quick and effective way of programming in accurate muting data.

## Stores

A Store is a 'snapshot' of the fader and mute positions at a chosen time. There are 99 Stores

available as opposed to only one on the earlier systems. Stores can be created at any time, with the faders moving or stationary, and are entered into the Store list in numerical order where they can be given a name.

Stores are used wherever concise set-ups need to be reset accurately and quickly. For example, if you are overdubbing on an album, which means continual rebalancing between titles, you can create a Store for each working mix and reset your balances very quickly.

Partial Stores can be made if you are only interested in certain faders, and these can be incorporated into a current setup without affecting the other faders. Another use for Stores is crossfading.

## Crossfading

Crossfading is a new addition to Necam and can be performed either manually or automatically. In either case, the faders will move from their present position to a Store position in whatever time the operator determines. In Manual, a fader is designated as the crossfade master, and by

moving it from bottom to top it controls the crossfade. With Auto, the crossfade time is pre-specified in the setup menu in seconds, and can be anything up to 99 seconds.

## Events

The Events system was introduced on Necam 2 and has undergone a number of changes since then. The standard number of Events keys is 16 in a row positioned on the mixer itself. The maximum number the computer can deal with is 128, each of which can be programmed to become either a momentary relay or an on/off relay, depending on what it is controlling. If you wanted to start a cartridge machine, for instance, you would use a momentary closure, but if you were operating a master cut system, you would opt for on/off. Built into every key is an LED that blinks for momentary action and stays on for as long as the on/off relay remains active. Because of the inherent delay in the start-up time of cartridge machines, samplers, and so on, a programmable preroll time is incorporated that advances the operation of Events keys.

There are two lists associated with the Events system. The first, The Events list, displays the events in timecoded order, giving the number of the key, what it is controlling and whether it is performing an On, Mom or Off function. This list is used, like the Mute list, to trim existing events or to make new ones. The other list is the Function list, which displays the keys in numerical order and provides information on what they control, the type of closure and any preroll values. This list is used to change the type of closure and to enter preroll data.

## Merging

Merging is the joining together of sections from kept mixes or stores. Necam gives you the option of merging all the faders and events, or making a selection by touching the required faders and keys. During a merge there is the possibility of a level mismatch occurring at an edit point; sometimes this is intentional but if not, Necam is able to smooth over the join with a crossfade that you can specify in seconds. If you typed in 10, for example, the mismatched faders would start adjusting five seconds before the join and would be matched five seconds after it. Once a merge has been completed, it is added to the mix list as a new mix.

## Labels

These are user-defined cue points created by either pressing New Label at the desired spot, or by typing in the timecode position. They appear in the Label list in timecoded order with a number and, if entered, name. It is better to name Labels since it makes identifying them later much easier. They are used to replace timecode entries, making general keyboard commands faster: Locate/Solo/Return.

Labels also appear in some of the other lists, notably Mutes and Events, where they give a useful indication as to where in the mix these functions are occurring.

## Grouping

The Grouping procedure is much the same as ▶

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before, with Necam asking you to touch the required faders to form a group. The group is then controlled by any one fader within it, causing the others to follow obediently in the balance they were set to. If you want to change this balance, you touch more than one fader in the group and adjust the levels as required. Mutes have also been incorporated into the group with one switch controlling the rest.

Groups can now be linked to each other and additional faders combined with existing groups without having to break them down and remake them.

Finally, there is no more need to switch all faders in manual to normal before a group can be made. On previous systems, this became an irritating hindrance.

## Smart

Smart keys allow a string of commands to be implemented by one button. The Rollback key, discussed earlier, is a preprogrammed smart key that condenses seven button presses into one. There are nine other smart keys, all of which are user-programmable and able to perform a vast range of functions. Each key will accept a maximum of 60 button presses or a full screen of commands—whichever comes first—and if more are required, Smart keys can be linked together.

Necam 96 gives the user the opportunity to keep Smart key commands (displayed in the Smart list) on to the program disk for future sessions rather than losing them at power down; it is not uncommon for regular Necam users to have their own personalised program disks. The Main menu is the working display for the

system and is always returned to after existing lists and other menus. Split up into different areas, the top of the display lists the name of the data disk and the studio; below this is a reference to the last mix to have been called up or kept, including details of its From and To times. Next is the Label area showing the Label the tape has just passed, and the one approaching. Following this the Events area that displays the Events in the same way as Labels. The Store area shows the last Store to have been called up and the next that will be set. Below the Store area is the message line where Necam communicates with the user. The Status area appears next, and this contains a number of different displays.

First, there is the command line where user commands are displayed. Below and to the left is the status field indicating whether the computer is in Manual, Assist or Suspend. If Necam is not in Assist, the background colour of this display changes from blue to yellow and flashes warn that the computer will not respond to any new moves. To the right of this appears a percentage of how much data disk is left. The transport status comes next, followed by the Null indicator. At the bottom right appear two timecode readouts; the first gives the current reading from tape, the other—called the timecode entry field—deals with values that may arrive from commands or calculations, eg Locate/-30.00/Return.

Necam 96 provides 10 Text pages for writing notes that are accessed by pressing the Text button. Although they are totally blank, special items like track sheets can be built-in by using the keyboard graphics. These keystrokes may then be incorporated as a Soft command, and recalled whenever needed.

Text pages and lists can be printed out with an

optional printer.

There are two other menus worth mentioning here. Set Up provides detailed information of tape machines, hardware and crossfading data; it acts as the system's co-ordinator. With the insertion of the Necam test disk, the Test menu can be called up, which provides six pages of tests relating to the tape machine, faders, events keys, memory and disks.

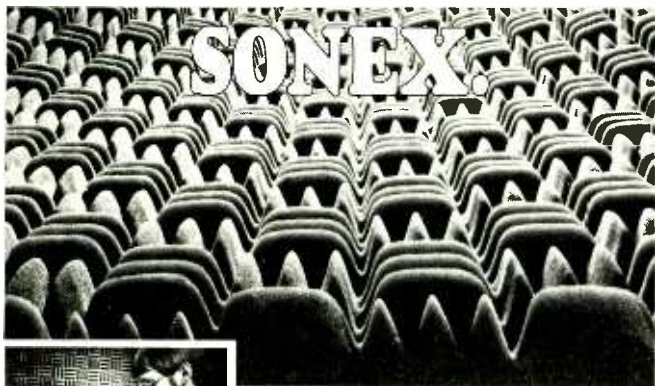
## Conclusion

I think there is a great appeal to moving faders; the very fact that they mimic your own movements makes the whole procedure much more human and far easier to relate to than a row of static VCA's with a bargraph display. Looking at a moving fader system, you can see true levels and accurate fader relationships.

Necam 96 offers a continually expanding system based on 10 years' experience in moving fader automation. This shows in the general thinking behind the system and also in the ease of its operation. The beauty of Necam 96 is that even in its simplest and most basic form, it proves a powerful mixing tool that can be understood and operated in a very short period of time. It is up to users to decide how complicated to make the system—not the other way round.

Neve have decided to relax their long term ruling that Necam may only be fitted to their own consoles; providing that another manufacturer's desk is mechanically and electronically suitable, they will be happy to install it. Along with the present revived interest in moving faders, this should create a lot of attention for Necam 96. □

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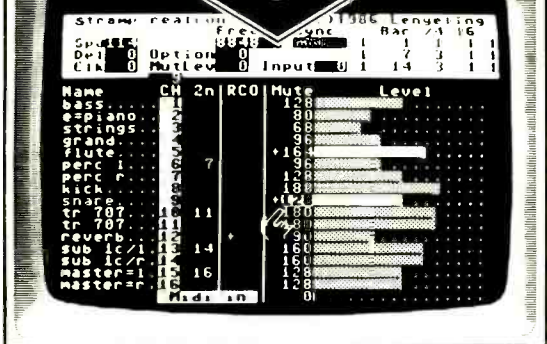
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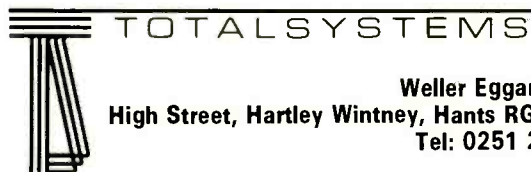


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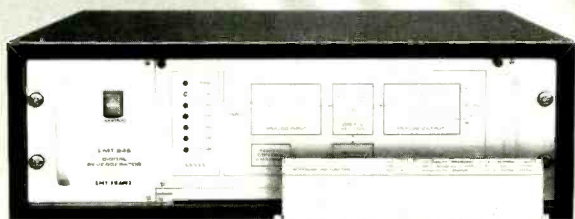
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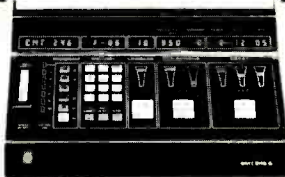


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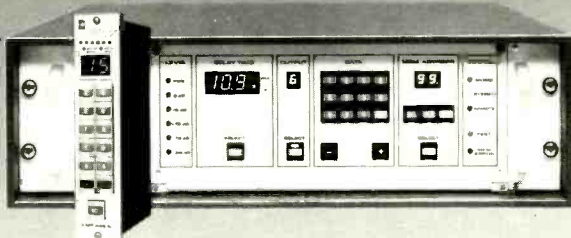


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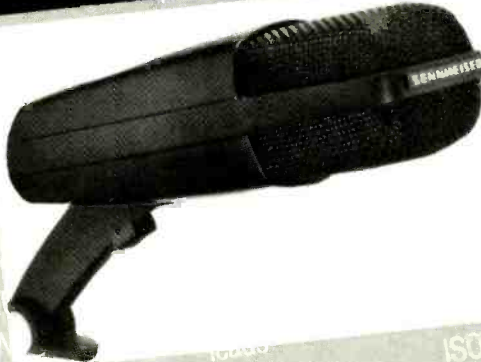
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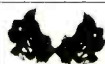
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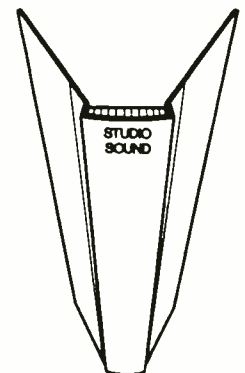
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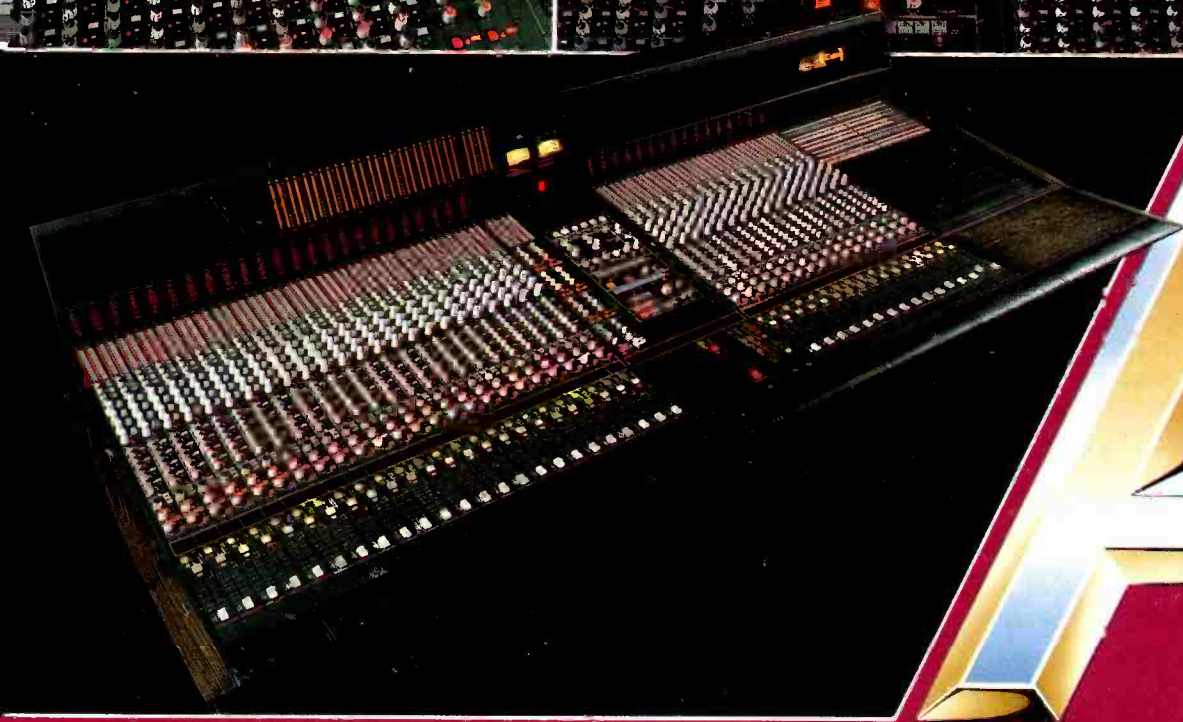
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