

May 1986

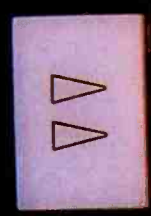
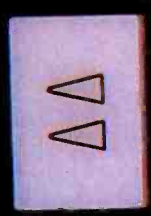
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STUDIO SOUND

AND BROADCAST ENGINEERING



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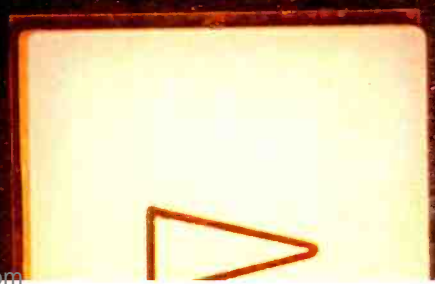
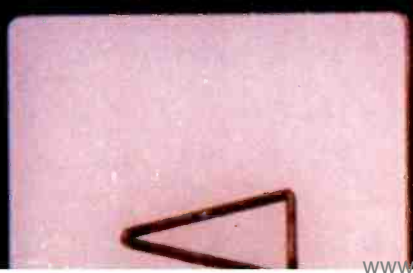


CUE

SEARCH
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SEARCH
CUE

TAPE MACHINES & TAPE





“IT’S BRILLIANT.”

Advision have just completed an impressive refurbishment of Studio Three, to complement their two SSL rooms.

In the process, they've created the largest control room in London.

Their choice of mixing console? The Soundcraft TS24.

Owner Doug Hopkins says:

“We bought the TS24 because it sounds so incredibly clean, uncoloured and neutral – which is essential when you're recording digitally.

“Technically it's right up there with the very best desks: and it'll command the same rate as the other rooms.

“The in-line concept is beautifully clear – so much so that everyone feels at home on the desk very quickly.

In fact, we've decided to buy another

one immediately for a studio project in Madrid”.

Senior engineer Dave Jacobs is equally enthusiastic.

“We've recently recorded The Little Shop Of Horrors soundtrack onto digital with the TS24. It was a dream to use – if I had my own studio I'd definitely buy one”.

Producer Steve Hague, who was in recording tracks for the Pet Shop Boys' new album, said between sessions that he felt the sound of the desk was “really outstanding”.

But the last word goes to Dave Jacobs, who summed up the TS24.

“It's brilliant”.

Soundcraft TS24



Soundcraft Electronics Ltd., Unit 2, Borehamwood Ind. Park, Kowley Lane, Borehamwood, Herts. WD6 5PZ, England. Tel: 01-207 5050. Tlx: 21998 SCR AFTG Fax: 01-207 0191
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STUDIO SOUND

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EDITORIAL

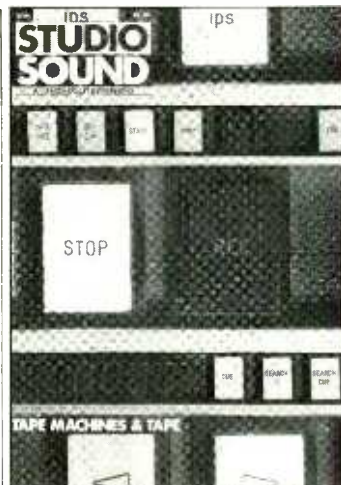
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May 1986
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Number 5
ISSN 0133-5944

Digital Mastering Rentals.

HHB are pleased to announce that they've re-equipped their digital rental service with the new Sony PCM 1630 processor and the purpose-built DMR 2000 recorders.

The PCM 1630 is the successor to the PCM 1610 and maintains the CD format compatibility which has made Sony the undisputed digital masters.

The PCM 1630 employs a superior 'oversampling' technique, resulting in even greater sonic accuracy, and the metering has been improved now giving essential 'over' and 'peak-hold' indication.

The DMR 2000 is the first U-matic recorder specifically designed for digital audio. Among other advantages of this machine are an integral fast-reading time-code generator/reader, which allows assembly of a continuous stripe, and self-cleaning heads.



Another new service – often free of charge – is the use of Sony's tape analyser DTA 2000. This employs the status port of the PCM 1630 to provide a print-out of errors vs. time, thereby removing one of

the uncertainties of the older systems.

These new machines, with the DAE 1100, form the heart of the digital mastering service that has made HHB leaders in the field.

Economic access to all this is afforded by a variety of interfaces that allow two-way digital communication between



the 1630 and the lower-cost PCM F1 and 701ES, thus significantly reducing post-production costs.

Not only do we supply and install mastering and editing systems where you want them, but we also provide full editing and copy facilities in-house, with skilled operators if required. Of course, this is backed up by HHB's trusted support service, with experienced Sony-trained engineers on 24 hour call-out.

By the way, it is not just our rental service that has expanded – we are now authorised Sony Broadcast dealers, handling their full range of digital and analogue products, as well as the lower cost processors.

And don't forget that we can also supply full studio installations, multitracks, consoles, video systems, signal processors, amplifiers, monitors..... in fact anything you need

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FROM



EDITORIAL

EDITORIAL

This month's comment from Keith Spencer-Allen

Just a smile

A featured topic of this issue is tape and tape machines. The hottest topic in the professional area at present is, of course, the movement from analogue to digital technology. Aside from the technical advantages of this change of technology, there is a whole host of other aspects that need to be considered. We have covered some of the practical knock-on effects that digital recording media can cause in associated areas such as the increased dynamic range and the lower noise floor, and the influence this is having in areas such as speaker design, microphone technique and studio design. Equally, though perhaps not with equivalent weight, we have given an airing to the views of those who do not see the introduction of digital audio in any form as a beneficial step, and to those not so extreme views that consider the development stage presented to us by equipment manufacturers at the present time to be relatively primitive.

In my position as editor I try to reflect the interests and feelings of the industry that I encounter—that is balancing the relative strengths of the above opinions within the magazine and all other shades between and beyond. Personally, I am sold on the compact disc as a domestic replay medium although I am willing to believe that it can continue to improve. I fail to understand those that prefer vinyl to CD on the grounds of the relative performance of the mediums.

I am not perhaps the average consumer. I probably have quite different criteria for judging the quality of specific recordings from the average record buyer. I may be in a privileged position in that my ears, as with most recording engineers, always aspire to hear something better and to look for improvement. My personality and training are to this end.

If, however, we look at what I will refer to as the 'average consumer' of pre-recorded music, we see a person with quite a different pattern of priorities. And this is for those who *are* purchasers of pre-recorded media. Any recording that sells in large numbers has to appeal to consumers *outside* the regular record, tape and CD purchasers and these people have a consumer motivation even more different from mine than regular buyers. This is easily shown by just standing for 10 minutes in a high street electrical retailer or non-specialist audio store on a Saturday morning and noting the factors that influence the majority of customers—not really sound quality at all even if you could assess that within such an environment. This is not meant as an insult to these customers but audio quality does not motivate them as strongly as it probably does you or me. Final choices of replay equipment are probably made on flashing lights or front panel colour or maybe against other variables and financial demands such as a foreign holiday,

etc. They make a decision based on a different hierarchy of importance.

I would now like to throw an idea against this background. Am I right or am I wrong? I have only brought this topic up as I have not seen it considered anywhere else. Could it be that development within the audio field has so outstripped the demands of the end consumer that we are in danger of becoming the first hi-tech industry to burn out through reaching consumer quality saturation?

The background to this suggestion is that the average consumer appears to be quite happy with vinyl and cassette audio quality—if this were not the case how could TV sound and AM radio still be acceptable? CD will sell to those who can appreciate beyond this average quality level and also have the required disposable income. With CD there are also benefits from lack of surface noise, durability, etc, and these may be selling points to those who are still not convinced by audio quality. For myself the jump from vinyl and cassette to CD is quite audible but there are thousands to whom this is not so. But the compact disc will generally have some aspect, be it size or durability, other than audio to recommend itself to the listener.

If we could then look forward to a future where compact disc has become the major carrier medium for audio—perhaps 10 years hence—what could possibly motivate consumers to any improvement beyond CD. I would suggest that perhaps this will be the farthest any audio standard can be taken and still achieve any mass consumer reaction. The only advance after CD would be into solid state media although the only advantage of this would be convenience and this does not appear to be a dramatic force for consumer change.

So if CD is already one step beyond average consumer quality requirements where does this leave a future in which we are gearing towards perpetual improvement? I don't know.

How will this affect recording studios and their long term updating programme. I really don't know.

Will audio development within the confines we currently accept, burn itself out through lack of consumer interest in further improvement. (That is outside a dedicated hi-fi market which is too small to motivate the larger manufacturers.)

Will we see audio development diversify into surround sound type systems (I really don't think so for audio without video) or into psychacoustic areas linked with holograms and the like (a long, long way off and even then we are probably building the wrong type of recording facilities anyway).

Or perhaps the future will just not happen like this. Sleep well.

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, \$40 US surface mail, \$75 US airmail. £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. New subscription enquiries should be sent to the Croydon address on page 3. All other enquiries should

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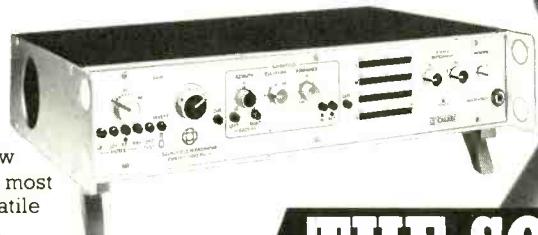
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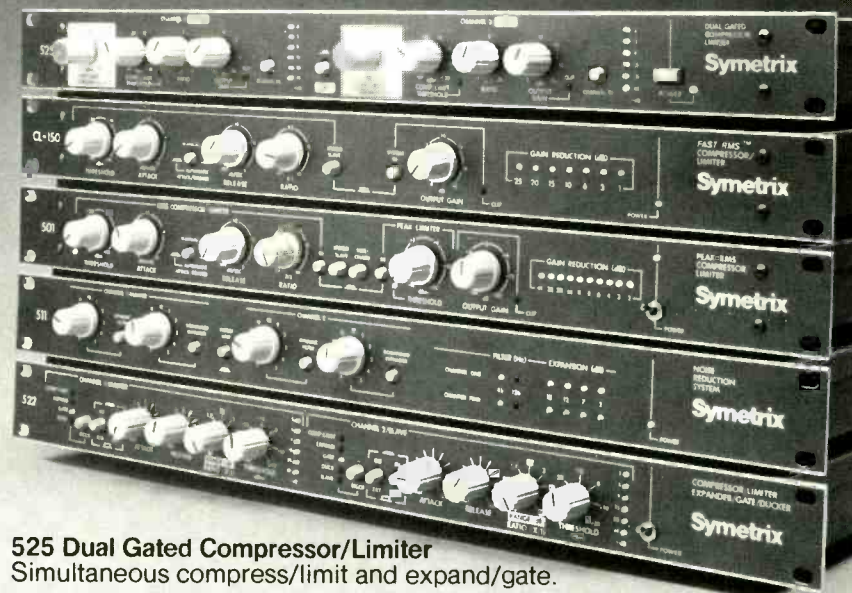
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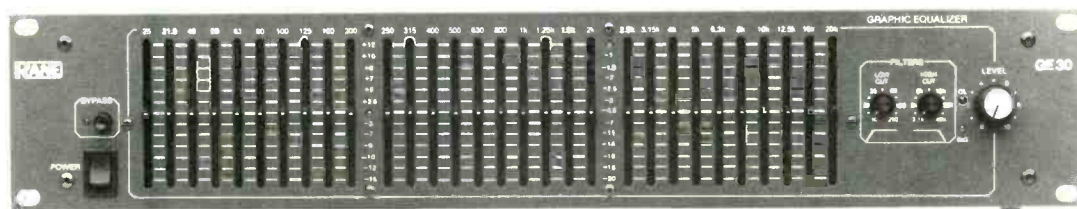
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It's the first graphic equalizer ever to let you switch from a +12/-15dB boost-cut mode to a 0/-20dB cut-only mode by simply pushing a button on the back. The first with 60mm sliders, for maximized resolution in a 3.5" format. And the first with a

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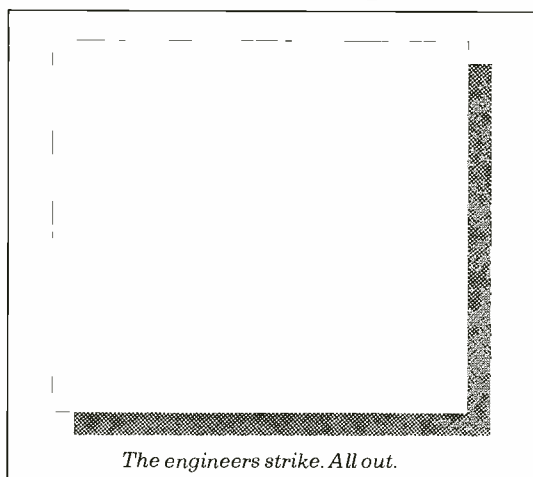
The Beatles record, the engineers strike and other revolutions.

WHEN YOU'VE HAD first hand recording experience like Trident Audio, it's not surprising that the Mixing Consoles you design reflect the kind of creative flair that went into recording the Beatles, David Bowie and James Taylor.

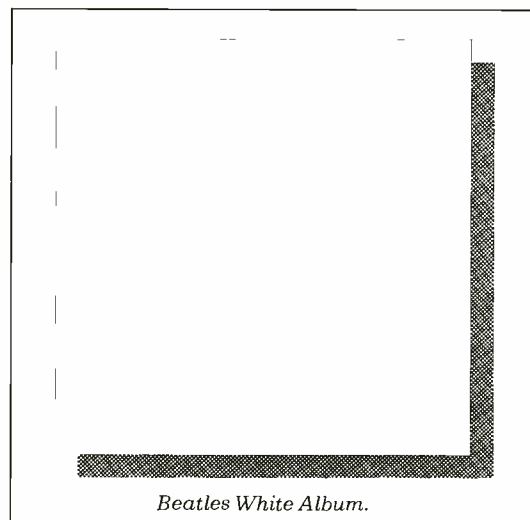
Innovations like the first console ever to feature EQ on Monitor, 4-band Graphic EQ and 10 Auxillary Sends on each channel made Trident's "A" Series a landmark in console design, when it was introduced in 1972.

Most major studios in the UK boasted 'a Trident' in the early seventies and the word was spreading abroad, especially the States.

In quick succession new designs and further breakthroughs added to Trident Audio's reputation and success.



The engineers strike. All out.



Beatles White Album.

The "B" Series, the 65, 75, 80B, the TSM and TIL put Trident's sound quality and reliability within the reach of studios of almost any size and budget.

Along with ingenious, yet utterly practical further innovations like Group Assignment, allowing 16-track recording from an 8-track desk; the use of the redundant monitor section as extra line inputs while mixing; and auto muting on all separate channels.

To this day, these earlier Trident consoles are much sought after as second-hand items and much treasured by the people who own them.

One of the original "A" Series desks, for example, was badly damaged in a studio flood just recently. But, rather than replace it, the studio asked us to restore it.

We even heard of one place where the engineers were threatening to go on strike when the management proposed ditching their Tridents in favour of something new-fangled.

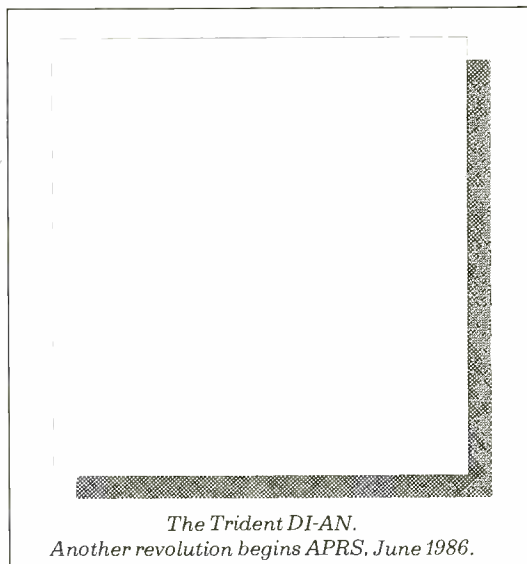
In the past few years, however, for a company accustomed to being in the forefront of studio advances, Trident have been surprisingly quiet.

Quiet, but by no means inactive.

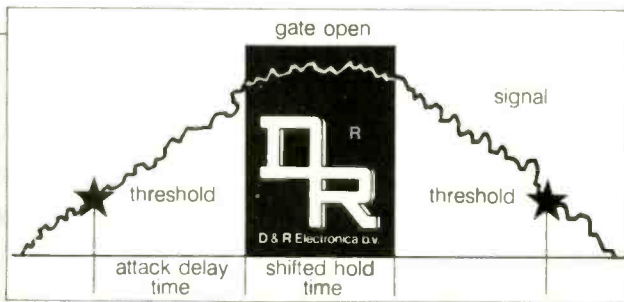
For, while others have been pushing back the frontiers of traditional console design, Trident have once again been pioneering new territory.

The result of that exploration is the Trident DI-AN, a system that will quite literally change the shape of consoles to come.

It will be shown for the first time at the APRS show in June. And, even if you can't get along to see it, we guarantee you'll be hearing about it.



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DS:4-8



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The DS:4 is a system. Software updates and new programs will ensure continuous development and progression and will, like the DS:3, demonstrate Greengate's commitment to a policy of non-obsolence. We do not believe in the concepts of 'Last year's model'.

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me the best
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heard"

Harold Zimmer

Hans Zimmer has an affinity for both instruments and technology. His vast repertoire includes a Synclavier, a Fairlight and even an original Moog.

With partner Stanley Myers, Hans has produced some of the most original and compelling screen scores of recent years. Deer Hunter, Eureka, Widows and the Russian Soldier amongst numerous others.

Small wonder then that when the time came to look for a new twenty-four track console, Hans was more than just a little particular.

After almost twelve months of listening to major consoles and manufacturers, Hans discovered the DDA AMR24 in the pages of the Turnkey Mix. He called us to find out more and Jon Ridell took him to Fountain Television Studios where the first AMR24 is in constant daily use.

"The integrity of the electronics impressed me a great deal. DDA have a number of consoles placed in digital classic music environments where purity of sound is paramount. I wanted a console that would carry signals without adding colouration."

As you'll have gathered by now, a mere demonstration was hardly enough for Hans Zimmer. A factory visit was arranged and Hans talked with the DDA team.

Customisations were confirmed, we moved on his old Cadac, arranged finance, and the new console was installed at Lillie Yard Studios a month or so later.

About the AMR 24

Hans' requirements reflect the new awareness of noise, crosstalk and signal distortion.

The immediate future of recording makes nonsense of analog specifications.

As the clarity and transparency of sound become the goal, consoles have to offer improved sonic integrity as well as more advanced operational features. Major console design has certainly moved forward in terms of facilities, though the overall



performance rarely strives to improve on what the analog medium can achieve. Indeed, the signal path often suffers from ever increasing circuit complexity.

The DDA AMR24 design is somewhat different. Whilst offering all the facilities expected from a major studio console, painstaking attention has been applied to optimise each stage in the signal path.

About us

DDA from Turnkey is our response to these new demands on performance.

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NEW PRODUCT PROFILE



QUAD 522

T.D.K. CASSETTES

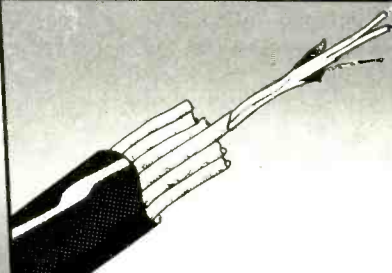


SHURE MICS.



AKG 460

NEUMAN
TLM 170

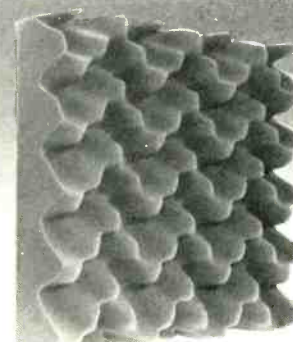


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‘Memory’ – a live sound mixing console – is the first product to incorporate the ‘SARP’ concept.

The reaction of sound engineers at the CTEAP in Paris and AES in Montrose, to that part of the ‘SARP’ concept released publicly, was unanimous in applauding “the most advanced user-friendly computer controlled sound processing system’ yet introduced.

If you would like more information on the Memory – or indeed the rest of the SAJE range of mixing consoles – contact the address below or visit us at the APRS in London in June.

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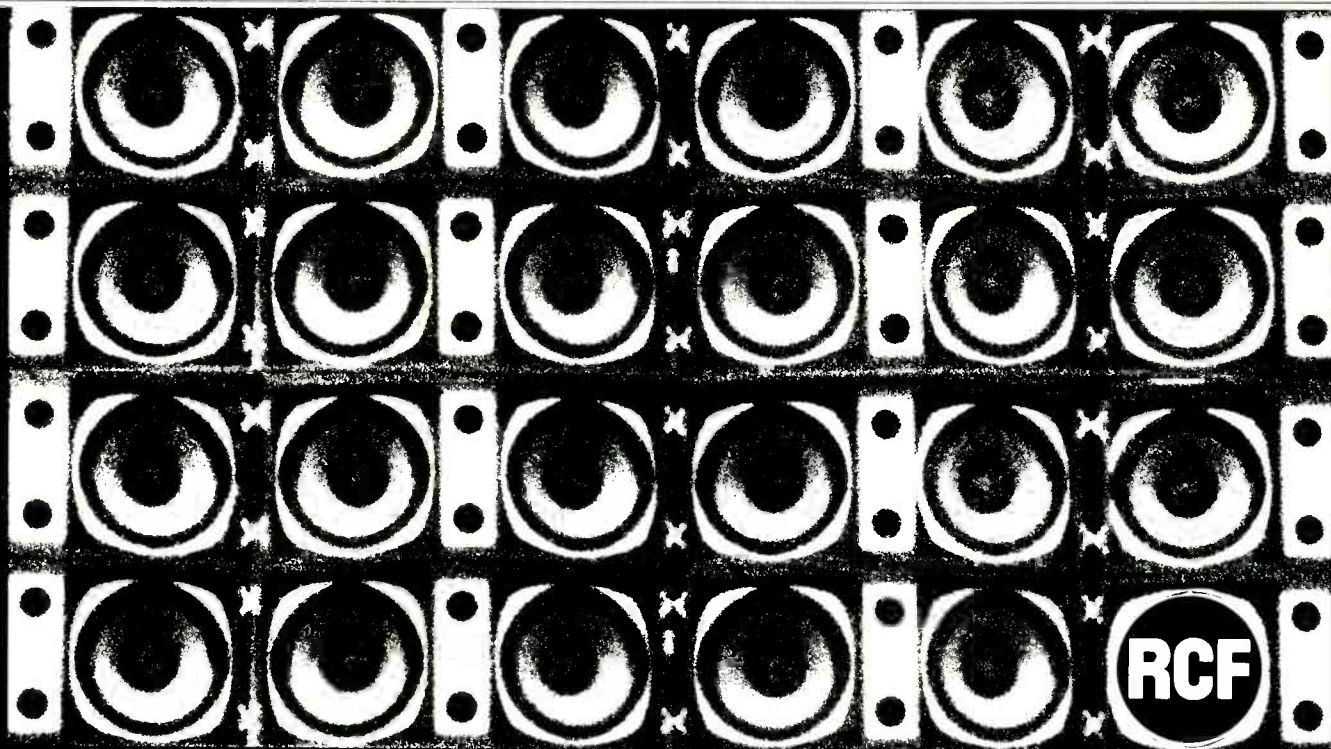


The Queen's Award for Export Achievement to Edendeck Ltd. In July 1985 Edendeck Ltd. became AMS Industries plc.

For full details on the DMX15-80S contact us today.

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Burnley, Lancs. BB11 5ES. England.
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The new all-valve E.A.R. Pultec Type EQ's and E.A.R. all-valve Fairchild Type Comp/Lim. are available ex stock.

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TRAD

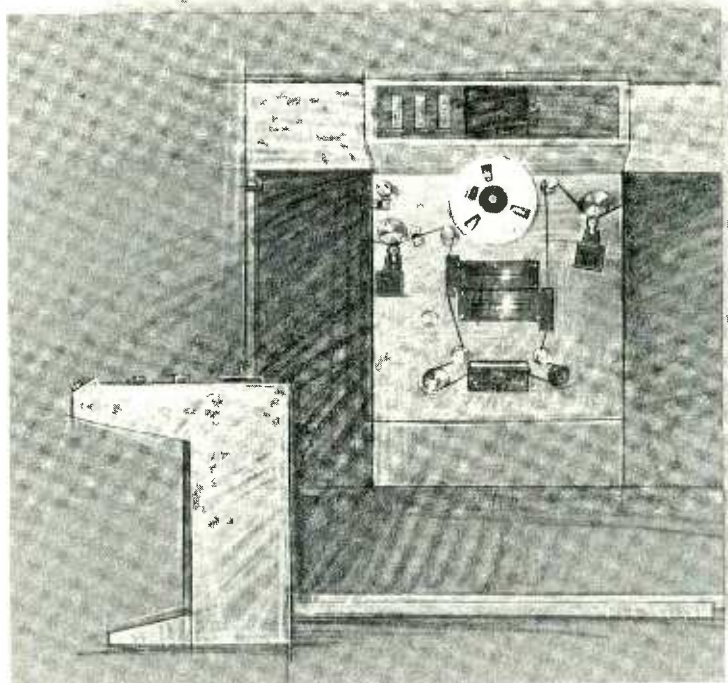
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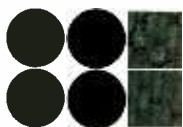
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Leading Edge Sampling Technology?

The laboratory standard sampling equipment illustrated on the right will not give you 21 seconds of 20 KHz sampling on each stereo channel, full editing and triggering, plus delay, pitch transposition, sound shrinking and reverberation; all in stereo.

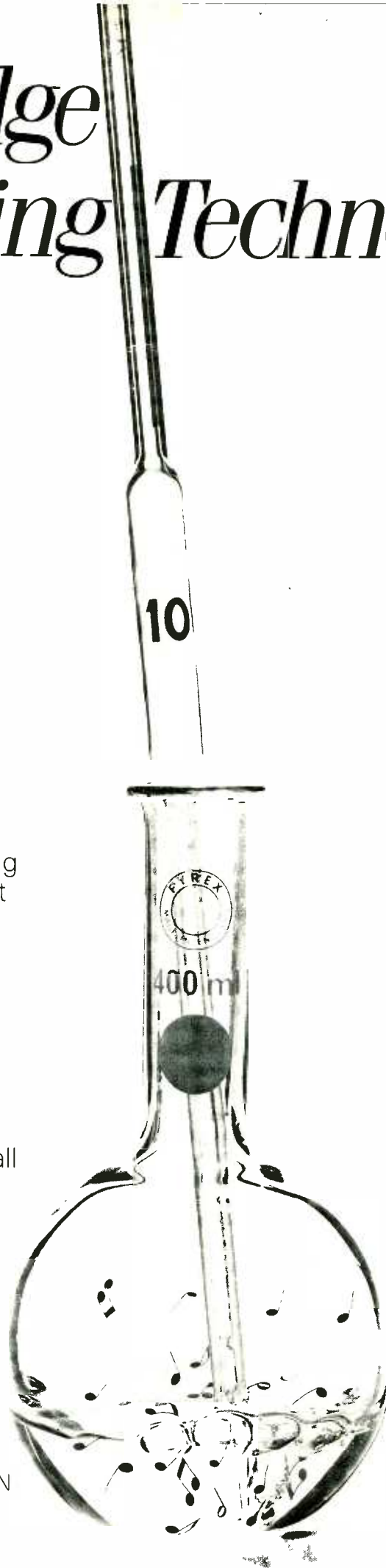
The Publison IM 90 Infernal Machine (*not illustrated*) will do all these things and more.

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Publison 18 Avenue de la Republique, 92170 Bagnoleet. France



Who wants a stereo digital reverb with Midi for under £400?



The MIDIVERB from Alesis

At £395 including VAT, you may not believe it, but the MIDIVERB is a top-class device. *So good*, it will impress even the most difficult A&R man. *So quiet*, it will put the average mixing console to shame. *So powerful*, that you will wonder why people even *consider* anything else!

The flexibility is remarkable – 63 programmes in full stereo, everything from plates to massive halls, decay time from 0.2 secs to 20 secs, and nine gated and four reverse room programmes, *so clear*, they will astound you.

Easily interfaced with most mixing desks, instruments and home recording studios, the MIDIVERB can be used stereo in/stereo out or mono in/stereo out. The reverb programmes in the MIDIVERB can be changed rapidly either manually on the unit, or from another MIDI device through any of 16 selectable MIDI channels.

Specifications

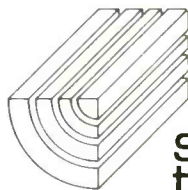
Frequency response	20Hz to 10kHz
Dynamic range	80dB Typical
Programmes	63, Preset
Inputs	Stereo & Mono, Phono Jack, 50 Ohms
Outputs	Stereo, Phono Jack, 600 Ohms
Controls	Increment Prog/Midi Decrement Prog/Midi Midi channel select By-pass Mix (on rear)
Midi Connections	Midi In, Midi Through

New Digital Reverb Design

All this has been made possible by a new design approach, borrowed from the most recent trends in computer hardware: RISC Architecture (Reduced Instruction Set Computer). RISC designs provide the programmer with a very small set of possible instructions that execute very quickly as opposed to more complex machines that offer more apparent power but operate slowly. RISC machines are simpler and less expensive and even though at first glance seem to have limited power, they often out-perform their bulkier counterparts.

The MIDIVERB uses an extremely specialised instruction set that runs at 3 million instructions per second, much faster than most systems on the market today.

Contact Sound Technology for your nearest dealer, or send £1 for a demonstration cassette.



sound
technology

Sound Technology Limited,
6, Letchworth Business Centre,
Avenue One, Letchworth,
Hertfordshire SG6 2HR.

Telephone: 0462 675675
Telex: 826967

ALESIS

NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

Neve V series console

Neve Electronics has launched a new range of analogue recording consoles. Designated the V series, the new design incorporates the latest technology coupled with the proven mechanics pioneered in the Neve 51 series. The V series is a full 48-bus multitrack console available with 36, 48 or 60 channels.

New mic inputs have been developed and all inputs and outputs (other than the new mic inputs) are transformerless. Other features include individual channel dynamics (limiter/compressor/gate) with external keying, a unique solo system and up to eight mono (or four stereo) cue or reverb sends. A

separate, easy to use but comprehensive cue system is provided which according to Neve will greatly facilitate overdubbing or post-sync recording.

The V series is built in 12-channel sections for ease of installation and re-assembly and extra 12-channel sections can be added at a later date if required.

Neve Electronics International Ltd, Cambridge House, Melbourn, Royston, Herts SG8 6AU, UK. Tel: 0763 60776. Telex: 81381.

USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, CT 06801. Tel: (203) 744-6230. Telex: 969638.



Crown GLM microphones

Crown has introduced two new miniature electret condenser microphones. Known as the GLM (Great Little Microphone) series, the GLM 100 is an omnidirectional version and the GLM 200 hypercardioid.

Designed for both stage and studio use the GLM can be taped or clipped to horns, acoustic guitars, flutes, etc, allowing the musician greater freedom of movement. They can also be attached to drum rims, suspended over an orchestra or hidden on stage or film sets for unobtrusive pick-up of sound.

Both microphones, according to the manufacturer, have a frequency response to 20 kHz with the GLM 200 going down

to 60 Hz and the GLM 100 extending to 20 Hz. Transient response is claimed to be excellent with minimal off-axis colouration and overload level of 150 dB (SPL peak).

Included in the standard GLM package is an all-purpose mounting clip, tie bar, belt clip and windscreen. Other optional mounting accessories for various instruments are also available.

Crown International Inc, 1718 West Mishawaka Road, Elkhart, IN 46517, USA. Tel: (219) 294-5571. Telex: 810-295 2160.

UK: HHB Hire & Sales, Unit F, New Crescent Works, Nicoll Road, London NW10 9AX. Tel: 01-961 3295. Telex: 923393.



Otari digital tape machines

Otari has released plans for several new PD format digital tape machines designated the DTR-900 and due later this year.

Expected in the summer are 1 in 32-track and 1 in 24/32 (24-track expandable to 32); 1/2 in, 16-track machine is planned later in the year; and by the end of 1986 a 2-track 1/4 in version should be available. Also planned is an upgradable 16-track version of the 24-track machine.

On show for the very first time at the Montreux AES were 16- and 32-track prototype machines. These featured standard 16-bit linear encoding with switchable 48/44.1 kHz sampling rates. Tape speed for both machines is 30 in/s (2-tracks will be

7 1/2/15 in/s). Reed-Solomon type coding is used for error correction. Both machines feature parallel and serial control parts (RS-232C and RS-422) allowing easy interface to SMPTE editors, the SMPTE/EBU control bus, the CB-120 autolocator or other synchronisers.

Other features of the DTR-900 series include $\pm 10\%$ varispeed control, on board EC-100 series chase synchroniser, easier video interfacing and ultra-smooth ferrite heads for long life and gentle tape contact.

UK: Otari Electric (UK) Ltd, 22 Church Street, Slough, SL1 1PT. Tel: 0753 822381.

USA: Otari Corp, 2 Davis Drive, Belmont, CA 94002. Tel: (415) 592-8311.

Mitsubishi X-86 digital 2-track

Mitsubishi has announced preliminary details of the new 1/4 in PD format 2-track digital mastering machine. Eight data tracks provide the main stereo signal with additional tracks for timecode and a spare data track suitable for recording sub-code information for subsequent transfer to CD. Conventional analogue is recorded for cueing and editing.

Sampling is switchable between 48 and 44.1 kHz and the X-86 has RS232 and RS422 connections and will run with 9.6 kHz external sync or via any standard

synchroniser. The X-86 also includes built-in locate and varispeed ($\pm 5\%$) functions. 14 in reel capacity and currently records at 15 in/s although for storage and archive purposes a 7 1/2 in/s version is planned. Full digital port compatibility with the X-80 is provided.

UK: Mitsubishi Pro-Audio Group, Unit 1, Fairway Drive, Greenford, Middlesex UB6 8RW. Tel: 01-578 0957.
USA: Mitsubishi Pro-Audio group, 225 parkside Drive, San Fernando, CA 91340. Tel: (818) 898-2341.



This much power in this much amp.



The Amcron tradition of peerless performance was established with the introduction of the legendary DC300 series in 1967. Now, in 1985, on the back of modern technology and two decades of experience, Amcron bring you the Micro-Tech 1000 amplifier.

The Micro-Tech 1000 is the amp we've all been waiting for - lightweight, compact, and with more than enough punch to suit the increased power requirements of the digital age. These are the facts:

- 400 watts RMS per channel into 4 ohms.
- 500 watts RMS per channel into 2 ohms.
- 1000 watts RMS into 4 ohms - bridged mono.
- Safe operation at high power to 1 ohm.

- Reversible forced-air cooling.
- Amcron performance in 3½" rack space.

We believe that these facts, coupled with Amcron's reputation speak for themselves. But if you wish to know more about the Micro-Tech 1000 and how it can solve your headroom problems, call HHB Hire & Sales at: Unit F, New Crescent Works, Nicoll Rd, London NW10 9AX. Tel: 01-961 3295. Telex: 923393.



NEW PRODUCTS

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Equipment, modifications, options, software

Soundcraft Saturn

Soundcraft chose the Montreux AES to launch the *Saturn*, a completely new multitrack tape machine which makes extensive use of digital control technology. Advance information available at the time of writing states that the machine is available in 16- and 24-track formats with the heart of the machine being the *Total Remote* unit. It employs many of the features found in the series 20-channel electronics alignment by pushbuttons and the storage of numerous alignment configurations which may be selected from the remote control.

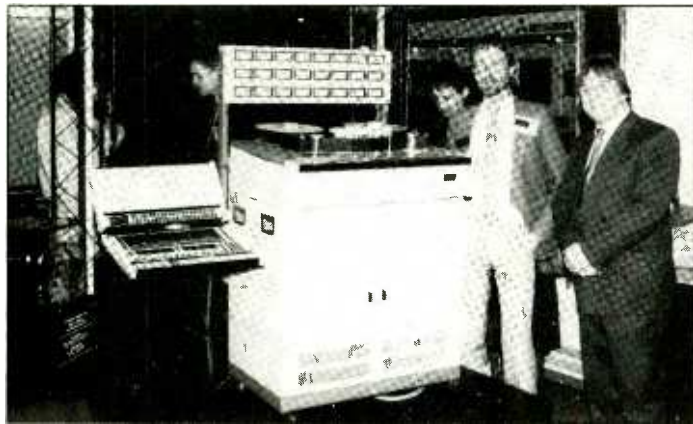
The remote holds an optional full set of VU meters enabling alignment without reference to machine.

Additionally within the autolocator section, there are four programmable function

keys that may be used to store complex transport functions as well as monitor switching. Remote facilities include full transport controls, multi-function 10-memory autolocate, 32-key sequence programmable function keys with edit facility, full control over signal electronics, three tape speeds, three EQ settings, one octave varispeed range, four tape type alignment memories, LCD display information and alignment oscillator.

Soundcraft Electronics Ltd,
Unit 2, Borehamwood
Industrial Park, Rowley
Lane, Borehamwood, Herts
WD6 5PZ, UK. Tel: 01-207
5050. Telex: 21198.

USA: Soundcraft Electronics
USA, 1517 20th Street, Santa
Monica, CA 90404. Tel: (213)
453-4591. Telex: 664923.



One of the most talked about topics at the Montreux AES Convention was the demonstration of Dolby *Spectral Recording (SR)* and the impact it will have on all users of analogue tape machines. *SR* is a signal processing system that is used in an encode/decode format around a tape machine and can be used with any professional analogue recorder running at any standard speed. Dolby describe *SR* as exploiting the spectral diversity of audio signals to enable an improvement in the information carrying capacity of analogue recording. A powerful new coding algorithm is employed that is sensitive to variations in signal spectrum as well as level changes. Additionally *SR* has a linear

Dolby Spectral Recording

transfer characteristic with very high recorded levels having reduced spurious high order harmonics and intermodulation components due to tape saturation, leading to better sounding transients and better overload characteristics. The generated increased headroom will allow greater freedom for the recording engineer.

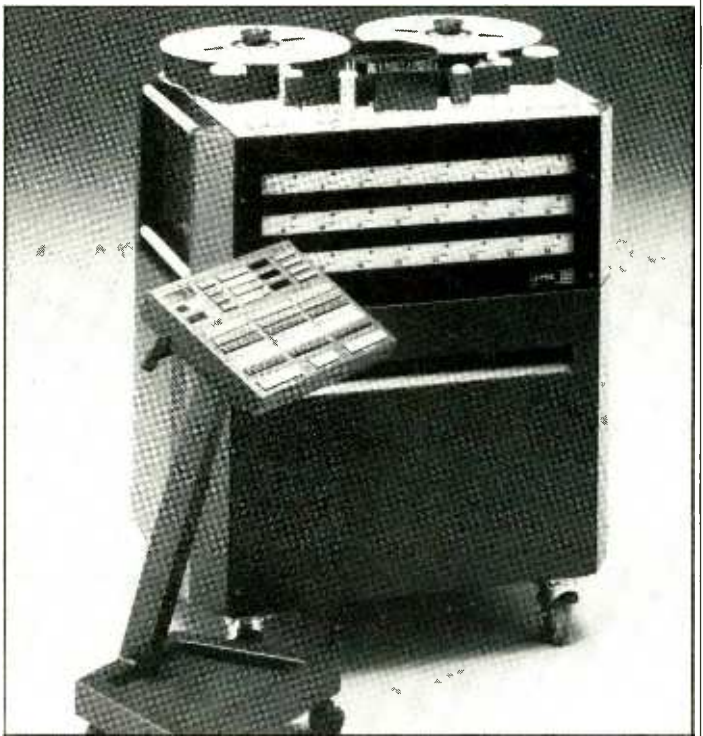
In more practical terms Dolby claims that *SR* will deliver an extremely large dynamic range, reduce modulation below audibility, maintain signal purity at all levels with no hard clipping and a non-critical reaction to typical tape machine level and frequency response variations—

Lyrec multitrack

The Lyrec *TR533* is a further development of the established *TR532* multitrack machine. The most significant physical change is the ability to handle 14 in reels in addition to there being a choice of two metering options with the standard model having the meter housing built into the mainframe although the penthouse version will also be available. The major areas of improvement are the use of

servo-controlled solenoids, phase compensated record amplifiers as standard and self-aligning servo-guide rollers.

Lyrec Manufacturing A/S,
Box 199, Hollandsvej 12,
DK-2800 Lyngby, Denmark.
Tel: 02-876322. Telex: 37568.
UK: Scenic Sounds
Equipment, Unit 2, Comtech,
William Road, London NW1
3EN. Tel: 01-387 1262. Telex:
27939.



a capability of producing recordings equal or superior to 16-bit PCM.

The demonstration that Dolby prepared for Montreux was a selection of special recorded items of all types including those types of signal that usually give noise reduction/signal processing systems particular trouble. Based on the replay demonstration of these recordings from a standard Studer *A820* running at 15 in/s and monitored through a pair of JBL monitors within a typical hotel conference room environment, the results were very impressive with no audible side effects and a technical audio ability that

one normally associates with digital audio. The true test will of course be when channels are available for evaluation towards the end of May.

The cost of the system is currently estimated at £500 UK/\$750 US per channel and it will be available in Cat 22 replacement form (Cat 280) and slightly later, the cards for the *SP/XP* series (Cat 431). These will retrofit standard Dolby racks although the *M* series will need a slight modification to fit the 280 modules.

Dolby Laboratories, 346
Clapham Road, London
SW9 9AP, UK. Tel: 01-720
1111. Telex: 919109.
Dolby Laboratories, 731
Sansome Street, San
Francisco, CA 94111, USA.
Tel: (415) 392-0300.

Low-cost digital audio comes of age.

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

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

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

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

SONY FROM **HHB**

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THE SONY PCMF1 AND PCM701ES DIGITAL AUDIO PROCESSORS.

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DCS DAP-1 digital audio processor

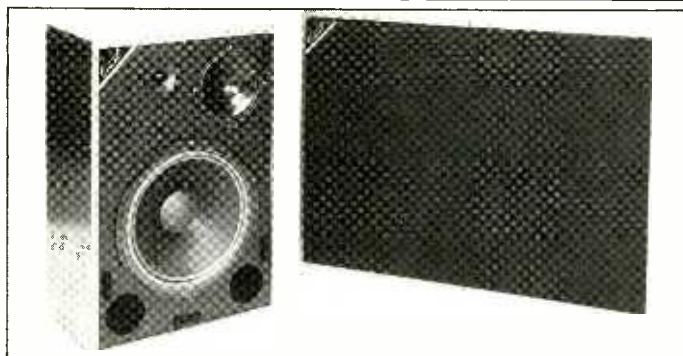
The DCS *DAP-1* is part of a sophisticated, computer-based, effects system using both hardware and software options. Preliminary details indicate the availability of three hardware configurations: the standard *DAP-1* with front panel controls and simultaneous processing of four independent channels, a *Remote Control* version for use in fixed installations with front panel controls contained within the remote control unit and an add-on *Slave* unit providing four additional input/output channels and additional memory and processing sections. The *DAP-1* can control 15 *Slave* units with 64

audio channels being processed simultaneously.

Preliminary software packages include an *Effects Editor* and *Assembler* for creating and developing new effects in conjunction with an Apple *Macintosh* or IBM *PC* (and compatible) computer.

The *DAP-1* has a 20 kHz bandwidth, easy to use LCD display and features 'effects chaining', ie serial running of individual effects. Presets include plate reverb, noise gating, loop editing, chorus and various digital filters.

DCS Audio Products Inc,
335 East 21st Street, Suite 2D, New York, NY 10010, USA. Tel: (212) 982-3654.



Court studio monitors

SJ Court & Associates has introduced two new high power soft dome monitors. Designed for small control rooms, mobiles and broadcasting studios, the *SN300* is a 3-way monitor using a 15 in bass unit with a high compliant roll surround in a reflex ducted port enclosure. The cabinet is high density fibreboard. Mid range is provided by a 6 in plastic cone ultra linear driver in a separate sub enclosure, high frequencies are handled by a 1 in soft dome unit in a double chamber acoustic transformer. This according to the manufacturer provides the ultimate in directivity by acting as a dispersion system rather than a horn.

A 500 Hz/3500 Hz ultra linear high power crossover with minimal insertion loss is used. Frequency response for the *SN300* is claimed to be 35 Hz to 20 kHz, efficiency

96 dB 1W/m, amplifier requirements 50 to 300 W (8 Ω).

The *SN600* is identical to the *SN300* but uses two high power bass units increasing the low frequency power handling to 400 W. A biamp access panel at the rear of the speaker allows the connection of a second amplifier via a 250 to 500 Hz electronic crossover. Frequency response of the *SN600* is down to 30 Hz and efficiency up to 99 dB 1 W/m.

Also available is an extension unit for the *SN300* bringing it up to the *SN600* specs. The *SN300 Monitoring Extension* enables a studio to update at any time and to locate the bass extension unit wherever is convenient.

S J Court & Associates, 3 Primrose Hill Studios, Oppidans Road, London NW3 3AG, UK. Tel: 01-586 5139/5130.



Alesis Midiverb

The new Alesis *Midiverb* has already created a great amount of interest. Essentially it is a digital reverb packaged in an innovative and unconventional way. The unit is roughly 6 in square and about 1 in in depth and is supplied with a remote power supply. There are no user adjustable controls for the programs: each of the 63 individual stereo effects are simply called up via their individual numbers on a Up/Down touch pad.

All the programs are listed on the top of the unit and the range includes 50 individual combinations of small, medium and large rooms with 'dark', 'warm' or 'bright' characteristics. These provide delays between 200 ms and 20 s. In addition there are a further nine gated effects (100 to 600 ms) and four reverse effects (300 to 600 ms).

Sixteen MIDI channels are available. These are switchable manually or via an external MIDI device. Visual indication that the unit is in the bypass position is provided by two bars on the numerical display. The only other indicators are two LEDs showing -12 and 0 input level.

The *Midiverb* uses a RISC (Reduced Instruction Set Computer) chip to enable fast processing (3 million instructions/second) and simpler internal construction which enables the unit to be very competitively priced.

Alesis, PO Box 3908, Los Angeles, CA 90078, USA. Tel: (213) 467-8000.

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



Numark CD9000 CD player

Numark Electronics has introduced the *CD9000*, a variable speed compact disc player with obvious pro applications. In addition to variable pitch (x10%) the *CD9000* features slide-in CD carriers to ease disc handling. The unit is housed in a standard EIA 19 in rack-mountable chassis and a remote control unit is also

provided.

Other features include track display, memory, playback, forward and reverse search modes and a start/stop control. A special indicator alerts the user when a selection has 30 s playing time remaining.

Numark Electronics Corp, 503 Maritan Center, PO Box 493, Edison, NJ 08818, USA. Tel: (201) 225-3222.

In brief

Fane Acoustics: has introduced an optional white protective steel grille for their loudspeakers in addition to the existing black and silver options. Grille sizes range from 5 to 18 in diameter. Edge trims can now be ordered in luminescent blue, red, green, yellow or white in addition to the original black finish. They are available in separate individual packs and are quickly and easily self-fitted. Grilles with coloured edge trims as an original fitment are available to OEM users and large quantity trade buyers only. Fane Acoustics Ltd, 286 Bradford Road, Batley, West Yorkshire WF17 5PW, UK. Tel: 0924 476431 . . . **West Hyde:** has announced the introduction of a large range of 19 in enclosures. The *Internorm* range is moulded in a new material to provide a strong, lightweight case. Cases are available in half, three-quarter or full width versions in heights from 3U upwards. West Hyde Developments Ltd, 9-10 Park St Industrial Estate, Aylesbury, Bucks HP20 1ET. Tel: 0296 20441 . . .

Wireworks: *You Configure It Out For Yourself* is the title of a new audio systems design kit created to provide an informative overview of the Wireworks *Mix-and-Match* components. Included in the kit are a system specification worksheet and a peel off system components sheet. Wireworks Corporation, 380 Hillside Avenue, Hillside, NJ 07205, USA. Tel: (201) 686-7400 . . . **Omniphonics Research:** has recently released two new power amplifiers—the 1U high *OR-240* (40 WRMS/channel) and the 2U high *OR-2100* (100 WRMS/channel). Omniphonics Research Ltd, White Cross, Lancaster LA1 4XH, UK. Tel: 0524 67323 . . . **John Hornby Skewes:** has announced the UK introduction of the *Teczon 4C4* multitrack cassette recorder featuring Dolby C and simultaneous 4-track recording. JHS, Salem House, Garforth, Leeds LS25 1PX, UK. Tel: 0532 865381 . . . **Meyer Sound Laboratories** and its Japanese distributor **Acoustic Technical Laboratory** have announced a high quality stage monitor console which is

available in limited quantities only. Configured 24/8 with four additional aux, including one stereo mix . . . **FM Acoustics:** has introduced the *FM 236/4* linear-phase electronic crossover. All the original *FM 236* features are included with the addition of limiters for each band (either at the time of ordering or as a subsequent update) and peak and signal present LEDs. Special circuits avoiding VCAs and ICs in the limiter signal path have been used . . . **Timeline:** has updated the *Lynx* synchroniser with a new *Lynx/VSI* video systems interface which allows control of audio machines from standard video editing systems. Also new is the *Dataline*, an automated studio management package for IBM compatible systems equipped with Winchester drives. Features include *GL/AR/AP*; scheduling; flexible client rates; tape library database; invoicing; inventory and flexible management reports . . . **By The Numbers:** has developed a new 4-channel 16-bit portable digital recording system known as *Colossus*. The system uses a standard U-matic VCR for programme storage and editing. The bandwidth is claimed to be well in excess of 20 kHz and no data reduction or compression of any kind is used. Dynamic range is greater than 90 dB and the sampling frequency is 50 kHz. Frequency response is 4 Hz-20 kHz (+0, -0.4 dB) . . . **ILES Enterprises:** has announced the UK availability of the hand made Speiden stereo ribbon microphone. For further details contact, The Casals Room, Copseview, Wrotham Road, Meopham Green, Kent DA13 0QB, UK. Tel: 0622 59867 or 0474 813851 . . . **Martin Audio:** has launched three new loudspeaker systems. The *VRS-800* is a fully horn loaded bi- or tri-amp system using 'delay line' porting techniques for enhanced LF punch. The *BSX* is a compact sub-bass system for use with all Martin products in the near to medium throw range and the *CX-3* is a 600 W dual driver version of the *CX-2*. The added 12 in bass driver provides a 6 dB increase in low frequency output. ▶

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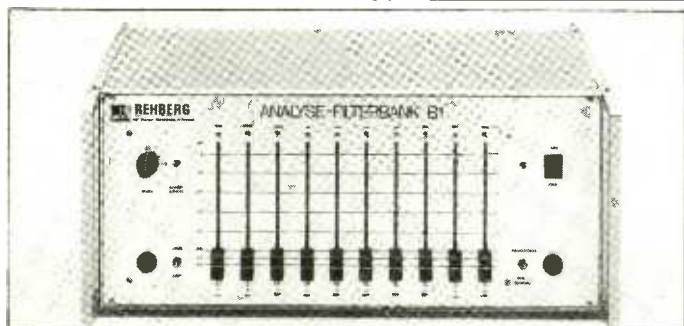
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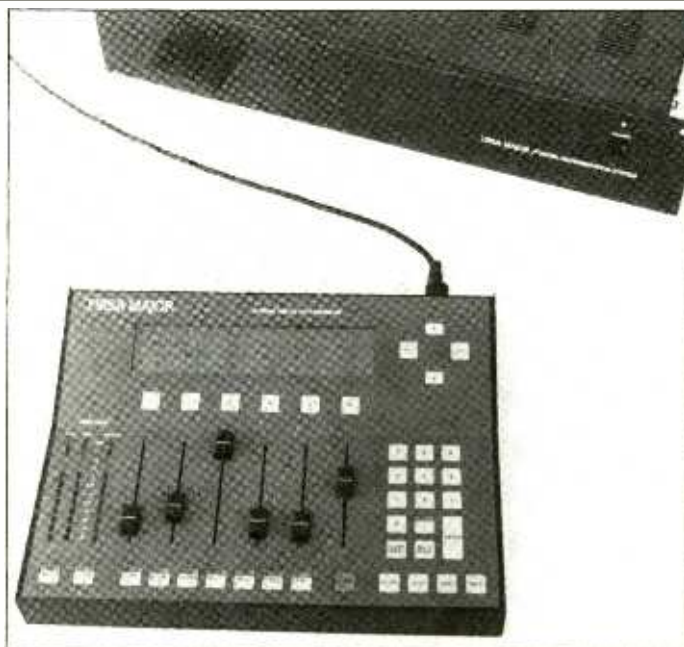
EMS Filterbank B1

The EMS *Filterbank B1* is a wide range 10-filter graphic equaliser with long throw faders and selective massive attenuation for use in removing hum, unwanted tones and hiss. The unit has also been designed to allow simulation of hearing damage curves. According to the manufacturer the filters have extremely steep roll off slopes. The low and high pass filters are claimed to be better than 40 dB/octave and the eight bandpass filters better than 50 dB/octave. Complete muting

and absence of noise when faders are in the closed position is a feature of the *B1*.

The 4U high unit has centre frequencies at 250, 500, 1k, 2k, 3k, 4k, 6k and 8k with the low pass filter set at 125 Hz and the high pass at 12.4 kHz. Input sensitivity is claimed to be -15 to +25 dBm with a maximum output voltage of +10 dBm.

**Elektronik Musik Studio,
Finkenstrasse 4, 7257
Ditzingen 3, Heimerdingen
bei Stuttgart, West Germany.
Tel: 07152-53273.**



Ursa Major Aurora effects reverb

Ursa Major has announced the *ADR-68K Aurora* digital reverb and effects unit. Based on the new 68000 computer chip the manufacturer claims the unit is sophisticated enough to implement all algorithms currently in use or anticipated. The unit uses 16 bit A/D converters and 32 bit internal processing. Reverb, sampling, special effects and EQ are all possible.

The programme dependent bandwidth is switchable between 15 and 20 kHz. The 2 in/4 out design features full MIDI implementation including register recall and parameter control. Sounds up to 8 s can be triggered independently or simultaneously via MIDI or trigger inputs. The *ADR-68K* can also run two different programs at the same time with, for example, bass and snare drum going into the unit and returning with reverb from two different rooms.

A full function remote is provided with 'soft labelled' display slide controls, rapid access to standard and user-stored presets and a help facility. Removable RAM cartridge effectively doubles the parameter memory and provides the user with a portable storage medium for unique sound effects that can be put in your pocket and taken away with you.

The *Aurora* is completely software-based and the manufacturer intends to generate new programs and sounds on an ongoing basis. A special *Aurora* magazine will be sent to all users at no charge sharing ideas and applications.

**Ursa Major Inc, Box 28, New
Town Branch, Boston, MA
02258, USA. Tel: (617)
924-7697.**

**UK: Industrial Tape
Applications, 1 Felgate Mews,
Studland Street, London W6
9JT. Tel: 01-748 9009.**



Turbosound phase checker

Turbosound has introduced a new phaser checker system. The *TPC-1151* is a two-piece pocket size system designed for use in the alignment of multiple loudspeaker arrays. The system includes the *PG-11* pulse generator and the *PD-51* pulse checker and can also be used for a variety of other audio functions including electronic polarity testing, cable continuity, line location in multi-conductor snake systems and signal flow verification through other components in the audio signal path.

The *PG-11* is a full range pulse generator and can be

connected directly into a power amplifier, electronic crossover or console via a customised extended male *XLR* connector. The *PD-51* pulse detector includes a condenser mic for measuring acoustic phase and a female *XLR* connector for electronic polarity testing. In phase and out of phase conditions are indicated by green and red LEDs.

**Turbosound Sales Ltd,
202-208 New North Road,
London N1 7BL, UK. Tel:
01-226 0099.**

**USA: Turbosound Inc, 611
Broadway #841, New York, NY
10012. Tel: (212) 460-9940.**

Distech Sound-Sorber panels

Discrete Technology has a range of acoustic moulded foam sound absorber panels which according to the manufacturer provide a total noise reduction factor of .90, will break up standing waves when corner mounted and when used in rear wall applications will act as a

diffuser. Absorption is specified between 125 Hz and 4 kHz and claimed to go down to 100 Hz. *Sound-Sorber* panels are available in nine colours. **Discrete Technology, 2911
Oceanside Road, Oceanside,
NY 11572, USA. Tel: (516)
764-1121.** □

By-pass Spaghetti Junction



The **MG1212 Recorder/Mixer** – the complete recording system from Akai – offers unparalleled flexibility for all your recording needs. So compact, it's as much at home in your front room, when you're putting songs together or trying out an arrangement, as it in the studio, when you're working on masters.

Whatever your application, the Akai MG1212 Recorder/Mixer's got the edge over the competition. If you were limited by 8-track before, now look at this: the MG1212 has 12 audio tracks plus a special sync track – ideal for synchronising your MIDI sequencer to tape for overdubs with a small instrument set-up. If you hated the hassle of wiring between machine and mixer – finding enough leads that worked every time you wanted to put down an idea – the MG1212 has the answer to that too: it's a combined mixer and recorder, and both sections of the MG1212 have the flexibility, versatility and professional quality

you expect from a company like Akai. At a price you can afford.

The mixer section features XLR inputs, insert points, LED bargraph metering, and a full 3-band sweep EQ. A centralised routing matrix deals simply and quickly with the task of getting the right sounds to the right tracks.

Akai's unique 1/2" cassette system is at the heart of a recorder section that's crammed with the features you need: an autolocator with pinpoint accuracy; dbx noise reduction; and much more. It's as simple to use as a home video recorder.

And talking of video, the MG1212 has all the facilities you need for synchronising a video recorder with SMPTE time code.

What you won't find is a load of gimmicks that slow you down. The Akai MG1212 is designed to get top-quality results. Quickly. Easily. The way you want.

AKAI
professional

MUSIC PAGE

MUSIC PAGE

Mark Jenkins with a report from the Frankfurt Music Fair

Several trends in instrument design have become clear at this year's Frankfurt Fair.

- MIDI interfacing for keyboards, computers, digital effects units, sequencers, guitars and less conventional instruments such as harmonicas and accordions.
- Rack-mounting modular options for synthesisers, pianos and sampling units, coupled with voiceless mother keyboards with increasing MIDI control capabilities.
- Rapid adoption of new micro-computers for MIDI control applications.
- Simpler and cheaper digital effects units largely based on software rather than hardware.

Quark LRM-2

LRM-2 is a 19 in rack-mounting 1 U high unit allowing MIDI signals to be transmitted over standard balanced lines for at least 200 m. Conventional MIDI cables are likely to become unreliable over 15 m range, which would make them unsuitable for stage or even large studio applications. It can send and receive two independent sets of MIDI information using screened twisted pair cables with XLR connectors, the unit converting MIDI to the RS432 computer communication standard. Two sets of In, Out and Thru sockets on the back and front panel give a choice of long-term or quick access use; 240 or 120 V mains can be used, and a DI version, studio MIDI ring-main version and modular MIDI patchfield will become available at a later date.

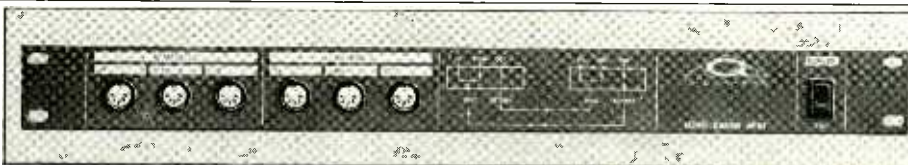
Quark Ltd, 16-24 Brewery Rd, London N7 9NH. Tel: 01-609 8282.

MIDI software

Sound Designer 2000 from Digidesign runs on the Apple *MacIntosh* and displays the waveform of samples for the Sequential *Prophet 2000*. Three sounds can be displayed at once, re-arranged and spliced together with a smoothing function to avoid glitches, edited with a cursor to remove unwanted clicks, looped, digitally EQ'd, or combined with synthesised waveforms. We understand that the package is also capable of transferring samples files between the Sequential *Prophet 2000*, the Ensoniq *Mirage* and the E-Mu *Emulator II*.

MidiTrack III from Hybrid Arts runs on the new Atari *130XE* micro using a *MIDIMate* interface. The package is a 16-channel polyphonic composition system with 10,500 note capacity, overdub, copy and paste, looping and chaining, variable MIDI channels, delay, combination and de-combination of tracks, mute and solo and full synchronisation to tape or MIDI with Song Pointer information.

Steinberg Software has introduced *V2.3 AX* of their *Pro 16* composer package for the Commodore *64*. The new revision includes an improved filter for unwanted



Quark LRM-2 long range MIDI signal transmitter

MIDI information, MIDI Thru, improved delay functions for compensation or ADI/repeat effects, Song Pointer functions and MIDI status transmission.

Also new for Frankfurt from Steinberg were the Atari *520ST* 24-channel composer; the Apple *II* version of the *Pro 16* package; an Ensoniq *Mirage* editor for the Commodore *64/128*; and hardware in the form of a 4/8 MIDI matrix and EPROM version of the *Pro 16*, with the optional *TNS* note editor/score writer. **Digidesign, 920 Commercial Street, Palo Alto, CA 94303, USA. Tel: (415) 494-8811.**

Hybrid Arts Inc, 11920 West Olympic Boulevard, Los Angeles, CA 90064, USA. Tel: (213) 826-4288.

Steinberg Research, TSI GmbH, Neustr 12, 5481 Waldorf, West Germany.

Steinberg UK: OSC, Flat 5, Gladstone Court, Gladstone Road, Headington, Oxford OX3 3LN. Tel: 08675 5277.

Sampling

Two sampled electronic pianos are now on the market, or will be in the near future:

The Ensoniq piano has 12 sounds (grand, bright and detuned pianos; electric and chorused electric pianos; marimba and chorused marimba; upright and electric basses; vibes, percussive keyboard and mallet keyboard), 76 weighted keys, stereo outputs, MIDI, transpose and sustain/sostenuto pedals.

The Korg *SG-1* Sampling Grand has a 76-key wooden weighted keyboard and four on-board sounds: Acoustic Piano I and II; Electric Piano I and II. Further sounds can be loaded via a ROM card, and various pre-programmed cards will be made available.

Three-band EQ, digital chorus with stereo output, transpose and velocity are active on the piano; the *SG-1* also has pitchbend, modulation and pressure sensitivity for transmission to other MIDI units only.

The *DS: 4-8 Sampler/Sequencer* from Greengate has been previewed and now features a full 16-bit design with CD-quality sampling up to 12 s (24 s with 2 Mbit memory expansion), eight voices, SMPTE and MIDI. It's available as an expansion for the existing Apple *II*-based *DS:3* sampler and has jack or optional XLR individual voice outputs, headphone socket, MIDI interface, SMPTE real- and step-time sequence recording, 12,000 note capacity, keyboard splitting, digital delay software and harmonic synthesis.

Production versions will be 19 in rack-mountable and Greengate hope to

announce an optional MIDI control keyboard in mid-1986.

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

UK: Ensoniq UK, 35 Piccadilly, London W1.

Europe: Ensoniq 65 Ave De Stalingrad, 1000 Brussels, Belgium. Tel: 2 512 7712.

Korg USA, 89 Frost St, Westbury, NY 11590. Tel: (516) 333-9100.

Korg UK: Rose-Morris, 32-34 Gordon House Road, London NW5 1NE. Tel: 01-267 5151.

Greengate Productions, Unit 4, Happy Valley Industrial Park, King's Langley, Herts. Tel: 09277 69322.

Master keyboards

Bit has launched the MMK MIDI *MasterKeyboard*, which features a 4-channel polyphonic sequencer, velocity and pressure sensitivity, upper, mid and lower split zones and programmable MIDI transmission channels.

Siel's *DK700* Master Synthesiser has a basic analogue polyphonic synthesiser onboard but also has various mother keyboard functions. Oberheim's *Xk* mother keyboard is unusually compact and has give MIDI control 'zones', attack and release velocity and pressure sensitivity and three performance controls. Yamaha has launched the *KX76*, a 76-key version of the *KX88* and featuring its wooden weighted keyboard. The *KX76* is not to be released in the UK.

Roland has released the *MKB200* Mother Keyboard; this model is more compact than the previous *MKB1000* and *MKB300* models, having a plastic rather than wooden keyboard but introducing pressure sensitivity.

Italian company Fatar have an 88-key MIDI controller, but it's uncertain whether this is available for export; Akai's 6-octave *MX73* Master Keyboard will be available in the UK and USA shortly.

Bit, Crumar SpA, 60022 Castelfidardo (Ancona), Contrada Montecamillone 26, Italy. Tel: 71 781033.

UK: Chase, 58 Oldham Street, Manchester M4 1LE. Tel: 061 236 6794.

Siel UK: Siel (UK) Ltd, Ahed Depot, Reigate Road, Hoodwood, Horley, Surrey RH6 0AY. Tel: 01-934 76153.

Roland UK: Roland (UK) Ltd, Great West Trading Estate, 983 Great West Road, Brentford, Middlesex TW8 9DN, UK. Tel: 01-568 4578.

Roland USA: Roland Corp US, 7200 Downsview Crescent, Los Angeles, CA 90040-3647. Tel: (213) 685-5141 □

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Our customers made quite varied demands of us in 1985. Between them, they're a pretty representative cross-section of the industry. Whatever the nature of their business, IFA met their needs—smoothly and effectively.

Fountain Television, in New Malden, Surrey, is a new TV production and post-production facility. We were chosen as the main contractor for their extensive sound facilities. We supplied Otari MTR90 and MTR12 recorders as well as all the outboard and ancillary equipment. We also installed everything and did the fairly mammoth wiring job!



Fountain Television

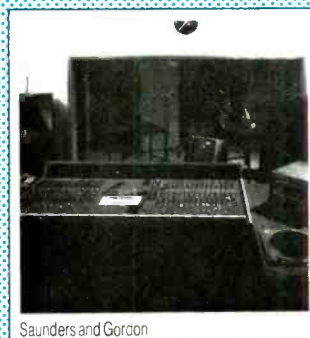


Swan Yard

Swan Yard is one of London's newest and most prestigious music studios. They chose us to supply their two Otari MTR90 24-tracks and their two MTR12 mastering machines.

Saunders and Gordon is a highly successful new company in Central London providing the ultimate in

sound production facilities for radio and TV commercials. We supplied all the equipment in the two studios: custom Amek Angela consoles, Otari MTR90 multitracks, six MTR12 2-tracks, and everything else besides.



Saunders and Gordon



Billy Curries studio

Billy Currie of Ultravox also chose the popular MTR90/Angela combination for his private studio. Besides supplying much of the outboard equipment, we did the entire installation which included several special provisions for computer and MIDI control of instruments.

13 YEARS AUDIO INDUSTRY EXPERIENCE

If it involves sound recording, IFA can help. We are one of the longest-established suppliers in the country, and besides being main U.K. agents for Amek and Otari, we can supply equipment from virtually every major manufacturer.

If you're planning a new project or a major upgrade it makes sense to talk to IFA.

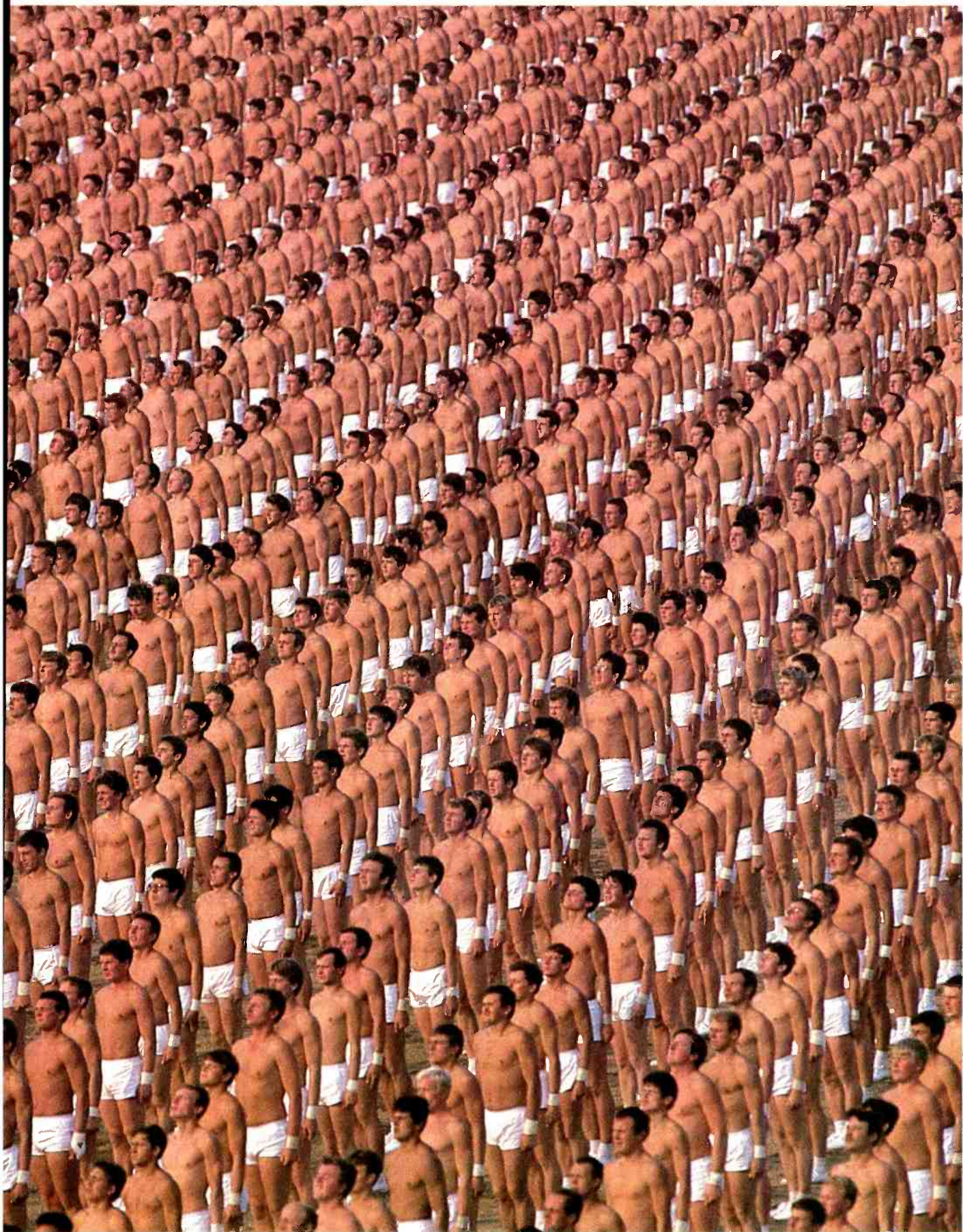
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DIARY DIARY

People, events, services

Address changes

● Limey Sound (UK) Ltd has announced a new business partnership with Nite Lites and Sounds of Newcastle upon Tyne and are now located at United 7A, West Chirton Industrial Estate, Westmoreland Road, North Shields NE29 7TY, UK. Tel: 0632 580134. Limey Sound in the US is now based at 2805 Lera Jones Drive, Antioch, TN 37013. Tel: (615) 367-0312.
● All departments of Peavey Electronics (UK) Ltd are now located at Hatton House,

Hunters Road, Weldon North Industrial Estate, Corby, Northants NN17 1JE, UK. Tel: 0536 69029.

● Due to legal complications San Francisco Sound Recorders have changed their name to City Sound Recording.

The previous address and telephone number remain unchanged.

● Tom Hidley is now located at Route de Gliion 24, Residence Panorama 6-B, CH-1820, Montreux, Switzerland. Tel: 41 21 63 77 61. Telex: 453321.

AES digital seminar

The AES British Section will be holding a digital audio seminar in London on May 13. The afternoon session will present papers on digital

followed by an evening session of introductory papers. Full details: AES Secretariat, Lent Rise Road, Burnham, Slough SL1 7NY. Tel: 06286 63725.

Agencies

● Stirling Audio Systems has been appointed to market and sell the Tom Hidley studio design concept in the UK.
● Regentport Ltd has appointed Musimex as sales agents for Canary mixers and power amplifiers in the UK,

Europe and Scandinavia.

● North London hire and sales company, HHB has become the first UK pro-audio dealer to be appointed by Sony Broadcast. HHB already supply Sony UK Ltd consumer products.

Glossary

ADT: A refreshing and relaxing brew made from a common Jamaican 'erb.

Cans: Part of the talkback system, between which a piece of string is stretched.

Capstan: A man's cigarette. (Note: this only applies to the tape op's fingers on discovering double tracking (qv) or zero level (qv).)

Cardioid: A mic that doesn't work back to front.

Clipping: The first form of discipline applied to errant tape ops.

Double tracking: Recording on top of another track because the tape op forgot to note the earlier track on the cue sheet.

Foldback: What you do to the tape op's fingers on discovering double tracking (qv) or zero level (qv).

Motion sensing: A primitive method of detecting if a musician or producer is still

alive; a more sophisticated method is to place a mirror under his nostrils.

Multicore: An exotic herbal cocktail in cigarette form.

Punch in/out: See clipping.

Reduction: What the producer asks for when you finish mixing his album 2 hours before the end of his six week booking.

Talkback: The most common cause of clipping (qv).

Tape op: (1) Teaboy, messenger and general dogsbody. (2) Assistant engineer who can be blamed for all the engineer's mistakes.

Wet sound: The most dreaded sound in the business, that of beer or coffee spilling into the mixer. Usually followed by a brief silence and an explosion of sound.

Zero level: What you discover on trying to play back that perfect take.

Literature

● The UK Health and Safety Executive has issued a free booklet entitled *Working with VDUs*. The 10-page pamphlet, in a question and answer

format, looks at general health and safety aspects of working with computer screens. Copies can be obtained from any area HSE office.

It was recently announced that a National Discography recordings information service has been set up, jointly financed and administered by the Mechanical Copyright Protection Society (MCPS) and the British Library National Sound Archive (NSA).

The discography will be run by National Discography Ltd—a subsidiary of MCPS. So far the project has been well received within the record industry and it is hoped that the discography will be able to rely heavily on record companies for donations of copies of all their recorded material including 7, 10 and 12 in singles, picture discs, EPs, LPs, cassettes, CDs and music videos. These will supplement the National Sound Archive's already vast collection of discs and tape.

The information will be compiled on the computer systems which MCPS already operate but full details have not been finally decided upon. There are differences in the way and type of information which the NSA and MCPS each catalogue for themselves and

National Discography inception

the extent to which all the details will be included is still a matter for discussion. It is likely, however, that it will include not only details of the music but also performers, writers, titles, producers, arrangers, lyricists, music publishers and distributors.

MCPS runs its production computer systems on a DEC VAX11/780 8 Mbyte memory, with a similar machine used for development and backup. The two machines are linked via Dec-net and share an on-line disk capacity of 3.3 Gbytes. There are 75 terminals on-line which run under the VMS version 4.2 operating system. Most of the data is under the control of ADABAS database management system software.

The organisers appeared to be unsure as to how long it is going to take to have the discography up and running. They estimate that in approximately three years time all recordings which are

commercially available will be catalogued in the discography but, they said, it may be more accurate and up to date quicker than you think. They simply intend to get on with it and complete the project as quickly as possible. Starting with all new releases they will gradually list all currently available recordings and then start into the back catalogue archive material. It is their intention to list all commercial releases in this country in addition to those imports which are brought in in large quantities.

Initially it will be restricted to the UK but, since there is no other discography like it in existence it may well take on a more international flavour.

Although it is likely that most sources of recorded material, ie record companies, will supply the discography with whatever goods and information they require, it would be a simpler job for ND

if there were a legal requirement to do so. There is currently such a legal requirement to deposit any books which are published and although the library does advocate such measures for ND it is early days. Once they are more established and know exactly how to proceed they will take steps to try and have such a scheme introduced.

Benny Green, who introduced the press announcement, was very excited at the prospect of being able to locate recordings of such gems as *You Stole My Wife You Horse Thief* and *If He Can Fight Like He Makes Love, God Help The Germans!*

Probable users of the National Discography are chart compilers, record retailers, radio and television producers, advertising and PR agencies, film and video producers, record libraries, music colleges, musicians, composers, actors, journalists, critics, clubs and societies.

Further information is available from Malcolm Tibber at National Discography Ltd, tel: 01 677 5141.

Janet Angus

People

- Hellerman Electric, the Plymouth based cable marking and protection specialists has announced the promotion of Terry Brigstock to UK sales manager.
- Adrian Bailey has been appointed the new sales and marketing director of DEC Ltd, which is perhaps more commonly known as the Mitsubishi Pro-Audio Group. Other Mitsubishi appointments include Karl Walters, formerly of Neve, who will be responsible for installation, acceptance testing and servicing. Karl Chapman has been appointed sales engineer

and will be responsible for the sales of pro-audio products in the UK and Europe and Simon Bradbury, previously with Rank Film Laboratories and Jacobs Studios also joins the Technical Services team.

- Altec Lansing has appointed Allen McAlister as district sales manager for southern California, southern Nevada, New Mexico, Hawaii, and western Texas.
- Sony Professional Audio Division, New Jersey has promoted Michael J Feniello to manager of marketing administration.

Correction

Audix has supplied the BBC with 10 *MXT1200* desks for the 1986 Commonwealth Games

and not one as stated in Contracts, in March issue's Diary section.

Contracts

- Audio Link of Milan, Turbosound's Italian distributor, has recently won a contract to supply the 50,000 seat Udine Stadium in north eastern Italy with 18 *TMS-4* enclosures. Other recent installations include the Circus Building, Denmark; The Metropole, Vienna.

- Paul Samuelson of Sam Therapy Studios, London has recently taken delivery of a Fairlight *CM1* series III.

- Soho Studios, London has recently purchased a 42-channel fully automated MCI series 542 console (capable of 88 inputs on remix) and fitted tri-amped Quedsted monitors. Further expansion is due shortly with additional audio visual and film soundtracking facilities.

- An 'automation ready' 32-channel Soundcraft *TS24* interfaced with an Otari *MTR90* has been supplied to Palladium Recording Studio by Stirling Audio Systems. The studio, based in Edinburgh, was originally equipped with a Soundcraft *1624* console.

- Gnome Studio in Detroit has completed a major update. New equipment includes a Soundcraft *TS24* console, Otari *MTR90* with *EC-101* SMPTE synchroniser card and UREI 809 monitors. New MIDI equipment includes the Prophet *T8* and the Roland *GR-700* guitar synth.

- London's CTS Studios has

opened a new electronic music recording, mixing and overdubbing facility. The new Studio Four has been designed by Eastlake Audio and includes an isolation room and a large control room with an extensive range of permanently installed synthesisers. Among these are a Fairlight *CM1* with MIDI/SMPTE, Linn *9000*, Prophet *T8*, Wave 2.3, Oberheim and Yamaha.

- Stirling Audio Systems has supplied *MTR-90* 24-track machines to Advision (their third), Music Lab Hire and producer Gary Stevenson.

- Soundcraft Electronics has recently supplied to Island Music a 16-track Soundcraft producer's package and Skcratch Music producer Nigel Wright a Soundcraft *1600* and 24-track for a second home facility.

- New River Studios in Fort Lauderdale has recently added to its processing equipment a Lexicon *224X* digital reverb with 8.2 software, Drawmer *DS201* noise gates, API *550A* equalisers and an original RCA *BA-6A* tube limiter.

- Andre Perry Video has completed a \$3m production centre joined with its recording facility Le Studio Morin Heights, which includes a 45x30 ft command centre a 2- and 3-D computer graphics department and a 37x30 ft shooting stage.



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STUDIO FILE

STUDIO FILE

Some studios thrive because they are in the heart of the film and music business. Others because they are next door to an advertising agency. Sentinal Records? Because it is almost completely surrounded by the sea.

Picture the scene: it's Christmas, a ferocious force 10 gale has whipped Mounts Bay into a bowl of steaming froth and white water. Gigantic waves encouraged by 90 mph gusts of wind angrily lash the coastline. There is a power cut. Fishermen and other locals are in the pub, drink in one hand and hot pasty in another, sit out the storm in the candlelit bar thankful to be on dry land. In celebration of life the fishermen sing carols and hymns. This is the stuff of Sentinal Records.

Started by Job and Irene Morris in 1971, their first premises were at the back of a hi-fi shop next door to the first pub that any fisherman is likely to see after landing a catch at Newlyn Fish Market, Penzance. And surrounded by the hustle and bustle of the busy fishing village Job began to make recordings of the sounds around him. A fish market auction, or the choirs whose voices echo out from Wesleyan chapels and around the cobbled, twisting streets where once smugglers' packhorses carried contraband brandy and French lace.

All these sounds were collated on to a first album, *The Sounds of Cornwall*, which found immediate popularity with not only the locals but also tourists seeking a reminder of their Cornish experience. Nine albums later Sentinal Records, or 'The sound of Cornwall', had outgrown its humble beginnings. Their catalogue now contained local folk singers and choirs and

Sentinal, Cornwall



Main recording area

brass bands and was being distributed throughout the shops of Cornwall and also via mail to expatriates in Australia and Canada and forces personnel. Foreign tourists were also taking records home.

Education cutbacks had closed a local village school situated in a dominating position overlooking the Mounts Bay area and with far ranging views to the English Channel and the Atlantic ocean. The building consisted primarily of two long and high halls side by side which, being very reverberant, were ideal for the recording of choral and brass works. The building presented Job with the perfect opportunity to design and install a studio, tailor-made to his requirements. One hall was retained as the recording studio and the other divided into two storeys for a main office above and post

production, cassette duplicating, record and cassette storage, and reception areas, below.

The recording 'hall' needed very little acoustic treatment, other than double glazing; the wooden floor, hard plaster walls and high vaulted roof offering the 'ideal' acoustic. Dry, vocal, drum and piano booths were installed to allow soloists total separation from the main choir or to double as a smaller recording studio area for musical groups not requiring a 'live' acoustic.

As the studio has to cater for large numbers of vocalists or players are any one time, often in a 'formal' layout as an orchestra would be, favoured microphone supports have been mounts suspended from the roof beams. Thus the floor area is always clear, not only of stands but also cables, etc. Microphones used are

STC 4038, AKG and Neumann hanging just above the heads of the vocalists. Figure-of-eight mics capture both voices and reverb from the room and loft space above.

A piano and church organ are available for accompaniment, the latter to facilitate the many hymn-singing Wesleyan choirs that record there.

Above the separation booths is a gallery to accommodate more performers if necessary or simply double as an area where those waiting to record may sit and relax. Consequently, the tendency for the control room to become overcrowded is avoided.

Like the studio the control room is tailor-made to the more or less specific requirements of the Sentinal catalogue. Because the majority of recordings are made in only a few takes, a large multitrack facility is unnecessary and this philosophy is applied right down the line in the selection of control room equipment.

Monitoring is through Tannoy *Gold*s in Lockwood cabinets and Otari 8-track 1 in and ¼ in mastering machines sit side by side next to a customised 24/8 mixing console. Signal processing and effects equipment, such as is needed, include the usual comp/exp/lms, etc. and digital delay units. The latter mainly for folk groups and artists, or local rock groups making demos either out of their own pockets or after winning free recording time in a local rock group competition.

Now, with other 80 albums in their catalogue the reputation of Sentinal Records studio attracts many choirs from other areas to record there. □

David Hastilow
Sentinal Records, Paul,
Penzance, Cornwall, UK.
Tel: 0736 731246.

Although as Solid Bond, this London facility is a relative newcomer to the studio market, its history under another name goes back many years. The studio actually opened in 1959 under the Philips flag and has had a varied history under the auspices of the Philips/Phonogram/PolyGram companies ever since. Until 1983 that is, when Paul Weller, then of the Jam, now of Style Council jumped in feet

Solid Bond Recording Studios, London

first after rumours that PolyGram would be putting it on the market. It was one of the first of that record company's studio facilities to go and, sadly the others slowly followed suit.

One of the many PolyGram legacies was the typically custom-built PolyGram console which, although of excellent

quality, in this day and age has proved a little unwieldy with the result that the studio recently installed an SSL console, at the same time giving the control room a new lease of life with a slight acoustic and visual adjustment. Not many studios can say that an SSL is actually smaller than their

previous desk!

The studio location is in very spacious basement premises near the historic Marble Arch. (It is in fact at 'The Garden' level with only a few of the offices having the appearance of a basement. The studio itself is at ground level with, as they rightly say, the garden outside.) As engineer Jeremy Wakefield pointed out, it is a great place to have a studio simply because it is so central, let alone the fact that there is ▶



Control room Solid Bond

a garden, daylight in the control room and lots of shops and other facilities nearby.

The studio is managed by Paul's father John Weller who operates all the other Style Council related companies from the same premises. Brian Robson is the chief engineer and is also a legacy from PolyGram days, having started out in the Chappell's studio and moving to PolyGram when that facility was closed in 1979/80. Jeremy has been working at the studio for 1½ years now, and the technical team is backed up by freelance maintenance engineer Ian Wilkinson. It was pointed out, however, in no uncertain terms, that it is really caretaker Arthur Ball who rules the roost—cross him if you dare. I didn't.

The main reason for changing console and giving the control room a facelift was really to attract outside work. For a long time Paul had had almost exclusive use of the facility but now it was time for it to pay its way. A more contemporary console was required and, work wise as well as facilities wise, SSL 4000E with *Total Recall* was considered the answer.

The rooms which Paul purchased were original Eastlakes—the control room dating back to 1979 and the studio to 1977. The only major change to the acoustics of the control room was effected by installing a wooden floor surface under the console (which for some reason has got an extra leg: "Nobody knows why it's there or where it came from—the guy from SSL said he had never seen one like that before!"); other changes were purely cosmetic.

Apart, that is, from the little matter of the secret room. When the refurbishment was carried out a hollow room was discovered behind the multitrack machine recess which had been bass resonating. Well it won't be doing that again in a hurry; it is now full of Rockwool held in by wooden battens.

The desk did change the acoustics slightly because, being smaller and a different shape than its predecessor, it is less reflective. The room is approximately 20×18 ft with the console facing the control room window through to the studio. The equipment is recessed in typical Eastlake style with staggered brickwork dispersing the sound on the rear part of each side wall. The back wall is trapped, as is the ceiling over the console and the area underneath the monitors mounted either side of the control room window. The timber used on the floor is an attractive oak and there is a token amount of cork shielding the sound from the main door. The overall effect of the refurbishment is to make the room feel brighter, following the current trend of thinking in control room acoustics and environment. The atmosphere is assisted by a series of coloured and white recessed spotlights mounted in the ceiling. The wood cladding on the walls is light coloured elm since Eastlake generally make a point of co-ordinating and matching their timbers.

The tape machines are Studer A80s: one 24-track and three 2-tracks. Outboard equipment is racked in a custom-built console at right angles to the desk. The extensive effects list includes ▶



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STUDIO FILE

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MXR Pitch Shift Doubler, two Eventide Instant Flangers, two Eventide 1745M digital delay/Harmonizers, AMS RMX16 digital reverb, 15-80S digital delay line/pitch shifter with keyboard interface and Tape Phase Simulator, Yamaha R1000 digital reverb, Roland Chorus Echo, Audio+Design Panscan, Korg SDD 3000 delay line, Drawmer noise gates, Orban de-esser, Klark-Teknik DM360 stereo 27-band graphic equaliser, four PolyGram limiter/compressor/de-essers a stereo limiter/compressor and eight noise gates, four EMT plates (augmented with a natural echo chamber) and Dolby/dbx 24-track and stereo noise reduction. For digital there is a Sony F1.

The main monitors are JBL 4350s and there are also Tannoy Little Red in both the control room and studio, and Visonik David in the control room. The power amps are M900 MOSFETs with JBL crossover and Klark-Teknik DN27 equaliser. The Tannoys are powered by Harrison X1800s and foldback by Quads.

The Solid Bond microphone complement is suitably varied and includes from Neumann 87 and 84, AKG 414, 224, C12, C24, D12, D20 and D25, Shure SM69, STC 4038 ribbon microphones, Electro-Voice RE20 and RE10 and the Tandy PZM. "They're great those Tandy's. They work really well and they are very cheap compared to some of the other PZMs on the market," quoth Brian, seconded by Jeremy.

Access to the recording area is via a small (minute?) passageway which is apparently excellent for recording double basses which Paul Weller uses quite often on the fair few jazz-type tracks which he does. This is also where the window to the outside world is positioned strategically so that it is viewed through the glass control room door.

The studio itself is very large—roughly 35×20 ft. At the far end is the live area with its marble floor and mirrored back wall and the ceiling sloping up to approximately 14 ft. The main area is carpeted with one live and one absorbent wall. The liveness is created with Hidley

Solid Bond, continued



Above drum kit set up in the 'live end', below the more absorbent wall of the main studio area



rock and the dead by Hidley trapping covered over with floor to ceiling curtains. (The carpet is new giving a slightly different audio and visual effect.) The room is lit with recessed spotlights which give a bright atmosphere.

Being an Eastlake room there is a small drum booth to the left by the control room window which, Jeremy explained, doubles as a vocal booth for shy vocalists. Plans are afoot to make it also work as a separate isolation booth by the installation of overhead flaps which will come down and fill in the top half of the walls completely. Next to this, under the window there is a bass trap. The grand piano is a Yamaha, and demonstration proved it to be a very nice bright instrument.

At the point of entry to the studio, if you were to choose the right hand door you would find yourself in a more than adequately furnished copy facility with an abundance of tape machines of all descriptions. Admittedly it was in a bit of a turmoil at the time of the interview due to the fact that it had had to yield up part of its space to the building of a room for the SSL computer and air conditioning. Especially attractive about this room is

the fact that there are large windows on to the corner garden making it a very pleasant place to work.

The new wall is covered in cork tiles. Otherwise, the arrangement of the room was still being deliberated so there is not much point in going into enormous detail here. The console is an "ancient Neve—I think it's the oldest in the world, but the EQ is absolutely perfect for cassette copies. It is 8/2 with four echo sends tie-lined two to the echo plates and two to PolyGram compressors. There were two lots of monitors, although probably one will disappear in the long term: Tannoy Little Red and a pair of KEF LS/5.

The various tape machines are Revox B790, an old valve Philips Pro 50 2-track, Studer A80 2-track and 8-tracks, a 4-track ATR100 Ampex and, for real-time copying, 11 Sony FX1010 cassette machines. Outboard includes Drawmer dual compressor and Dolby noise reduction. There was a massive Philips/PhonoGram patchbay which, because nothing was normalised on it, was in the process of being replaced. This facility is used by many of the nearby record companies and smaller studios including PRT.

Within the warren of offices

there are rooms dedicated to tape library, echo plates and maintenance workshop as well as the 'canteen' as they called it ('lounge' as the brochure calls it!) with its own Espresso coffee machine and plenty of things to lounge around on. Amusement-wise there is video, video games and TV.

If you put your coat on, go for a hike to the rear of this massive building, descend a flight of broken steps and (if you've got the key) you can discover the echo chamber. Covered in white tiles this room has had all the parallel surfaces eliminated to avoid flutter and is of a very fair size. There is a Leslie cabinet permanently wired in alongside a real antique humidifier to keep it moist. This chamber is tie-lined all over the building, as are most of the rooms. Brian: "We used to record in the Gents until they put a false ceiling in and spoilt it."

There is a story about the echo chamber: a house engineer (now well known producer who shall remain nameless) for some reason known only to himself decided to do without the key. He somehow calculated where the chamber was in relation to the rest of the building and hurtled himself through the ceiling. Decidedly odd behaviour even in this business. Evidence exists that the incident is not a figment of imagination although this method of access clearly was not popular because the hole has been filled in!

Well if that tale doesn't grab you, maybe the one about the ghost will. Many people claim to have seen it, not just the staff. It appears to be a clumsy sort of soul because it goes round dropping things and making people jump and interfering with work. Strange how many London studios seem to be haunted—maybe they are all frustrated artists.

Despite all this the atmosphere seemed to be very calm, with none of the intensity you so often find especially in the big studios. □

Janet Angus

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MIXING CONSOLE TECHNOLOGY

THE AMEK VIEW



Amek APC console with GML computer as shown at the Montreux AES Convention

Over the last year we have been looking at the development of mixing consoles and the way that future designs will be far more than just another permutation on channel strip layout. In this article Nick Franks and Graham Langley of Amek Systems & Controls present their personal philosophy and introduce the new APC console

The rapid changes in technology which have taken place since the advent of multitrack recording in the late '60s and the great increase in the market for audio production work of all types, have brought about continual developments in methods of sound creation and manipulation. The introduction of digital techniques has, above all, been the motor for a re-adjustment in recording methods since, for the first time in musical history, the quality and texture of sound have been divorced from the limitations of both instrumental skill and acoustic possibility. A large proportion of all recordings, whether intended for records or soundtracks, now contain sounds which exist only as a result of electronic processing, and which cannot be found or created in the natural environment using non-electronic means.

Traditionally, sound

recording was based on a combination of excellence of microphone placement techniques used to capture musical performance, and faithful registration on tape of the signals received. This situation has changed radically, and nowadays many recordings are principally assembled from a wide range of exactly repeatable signals produced from a variety of 'non-performing' programmable machinery such as synthesisers, sampling devices, and digital sound effects units.

In addition, through the development of video technology and with overall increases in production and programming, there has been considerable growth in both the post-production and television sound sectors. This has generated a demand for sound mixing consoles which can be operated in synchronisation with timecode.

These new situations have created a need for a fresh

approach to mixing console design. The following general points have to be considered within future console development:

- Multitrack recording: The traditional technique was a 2-stage process of recording signals on to multitrack tape and then remixing to stereo, adding sound effects processing during mixdown. Effectively, the final result was obtained only towards the end of the recording process. Consoles incorporated elaborate monitoring facilities which constituted a 'mixer within the mixer', allowing submixes to be created to guide the engineer and the musicians as the tracks were filled. Once the tape was full, the monitor mix was largely forgotten and the 'real' mixing began. Developments in computer techniques allowed a degree of mixing to precede and assist the actual mixdown process.

Two rival types of console monitoring systems have been favoured; the 'in-line'

('American') system and the 'split' ('British') system. The principles of 'in-line' and 'split' monitoring were laid out at the beginning of the 1970s and there have been no fundamental changes since—at least as far as console manufacturers are concerned.

A different situation has prevailed in the studio, where four main tendencies have become apparent: the use of a larger number of tracks—48 and heading for 64; the use of synthesisers and drum machines with multiple outputs; the use of very large quantities of external signal processing equipment; and the abandonment of the monitoring system provided with the console as being unsuitable for what might be called 'virtual mixing' recording techniques.

The essence of 'virtual mixing' is that the producer and engineer attempt to work from the onset with the sounds and sound sources that will be used in the final mix. As the recording process continues the layers of effects increase and must be exactly repeated with each pass of the tape. Overdubs are made not within the context of raw microphone signals replayed from tape but as part of the overall conceptualisation of the piece of music, and must be accompanied therefore by the finished product at whatever stage it has reached. The engineer, producer and musicians all need to hear identical signals.

The end result is that there is no longer any significant division between the 'monitor' mix and the 'stereo' mix. The target has always been the stereo mix and the present-day approach to it is to 'mix as you go'; to create the end product from the commencement of recording.

The practice of 'virtual mixing', therefore, combined with the increased requirement for inputs, has suggested a new approach to console design in which a separate monitoring section of whichever format is excluded from the mixer. Instead, a large number of identical inputs should be provided, each dedicated to a particular signal, be it tape output, effects device, or source. These signals are then mixed to a common stereo bus, with multiple outputs available

from stereo (stereo bus and stereo monitor) according to the needs of the moment. Since the full range of input facilities—equalisation, inserts, auxiliary sends, automation, etc. are now used on most signals, these multiple inputs effectively need to be standard input channels except for a monitor mix section.

This approach makes the console basically simpler since the confusing division between monitoring and mixing is large removed. A further result is that the increased number of inputs is compensated for by a reduction in complexity of the console making the engineer's task proportionately simpler at the point when he has to focus his attention on a greater number of signals.

● Reduction in console size for increased ergonomics: adding more inputs to a console makes it wider. This in turn leads to ergonomic and operational problems, since the console becomes excessively long and unwieldy; it becomes 'user hostile' in a very real physical sense.

As it is, module length (front to back) has tended to become uncomfortably long, since in addition to the monitor mix section, extensive routing and dynamics facilities have been added to the channel strip. The shortening of the module by removal of the monitor mix and routing sections increases operator comfort and helps reduce console depth; shrinking the module width (to 30 mm, 1.18 in, in the APC1000 console) whilst retaining all normal facilities, allows a drastic reduction in console width.

● The console occupies less space: not only does the console become much more manoeuvrable—user friendly in the very physical sense noted above—it also occupies less space in the control room. The initial importance of this is that although very large consoles are undoubtedly impressive to look at, they are recognised as being the primary disturber of the acoustic environment in the control room. Thus a better acoustic performance becomes feasible with a smaller console.

In video and teleproduction applications, space is often at a premium and audio facilities generally come a poor second to video. In many cases a new audio desk must be fitted into existing space originally designated for much less sophisticated sound equipment. Thus whilst complex consoles are now often required, not much room is allocated for them. Space is similarly at a

premium in mobile recording and video production (EFP) trucks, where many inputs are often needed, especially as video shoots and live coverage increases in size and scope. Hence, the reduction in console size again is ideally suited to broadcast and video production requirements. Similar comments apply to recording studios in which existing consoles need to be replaced by much 'larger' ones (in terms of inputs) in order to keep up with the number of inputs required by contemporary technology, preferably without engaging in the expenses of tearing the control room apart.

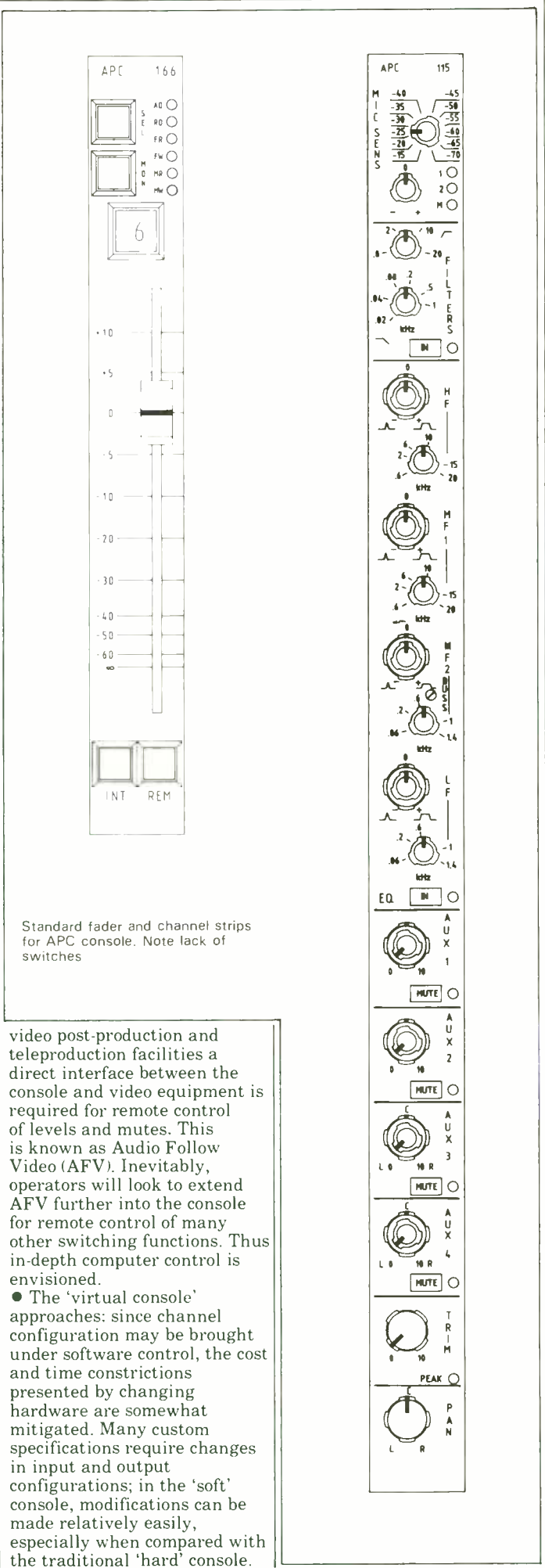
● Instant repeatability is required: the introduction of computer-assisted mixing has given the engineer critical control over both levels and mutes and the use of timecode-based synchronisation has allowed the memorised events to be repeated in sequence with multiples of audio and video recorders locked together. Mixing is often interrupted by time constraints on studio availability and thus a need to include memorisation of control settings in the computer system became apparent to allow engineers and producers to return to the point where they had left off at the previous close of work.

The development of recall systems for console potentiometer and individual channel configuration has made a step towards repeatability but only through relatively slow manual re-loading of the memorised positions using elaborate graphics-based prompts.

A longer term aim is the ability to completely reset an entire console from memory within a very short time span (typically less than one SMPTE time frame) but at this intermediate point a combination of reset and recall facilities is practical and cost-effective. Switch settings can be stored and reset easily and simplified recall information entry procedures can be devised. Thus archives of console settings can be stored and to some extent, dynamic reset can be accomplished during mixing; or alternative console set-up configurations can be addressed by different engineers merely by paging to a different memory number allowing immediate selection of a preferred routing and switching set-up.

A further advantage is that electromechanical components, a major long-term source of console downtime through wear and tear, can in some part be eliminated.

● Audio Follows Video: in



Standard fader and channel strips for APC console. Note lack of switches

video post-production and teleproduction facilities a direct interface between the console and video equipment is required for remote control of levels and mutes. This is known as Audio Follow Video (AFV). Inevitably, operators will look to extend AFV further into the console for remote control of many other switching functions. Thus in-depth computer control is envisioned.

● The 'virtual console' approaches: since channel configuration may be brought under software control, the cost and time constrictions presented by changing hardware are somewhat mitigated. Many custom specifications require changes in input and output configurations; in the 'soft' console, modifications can be made relatively easily, especially when compared with the traditional 'hard' console.

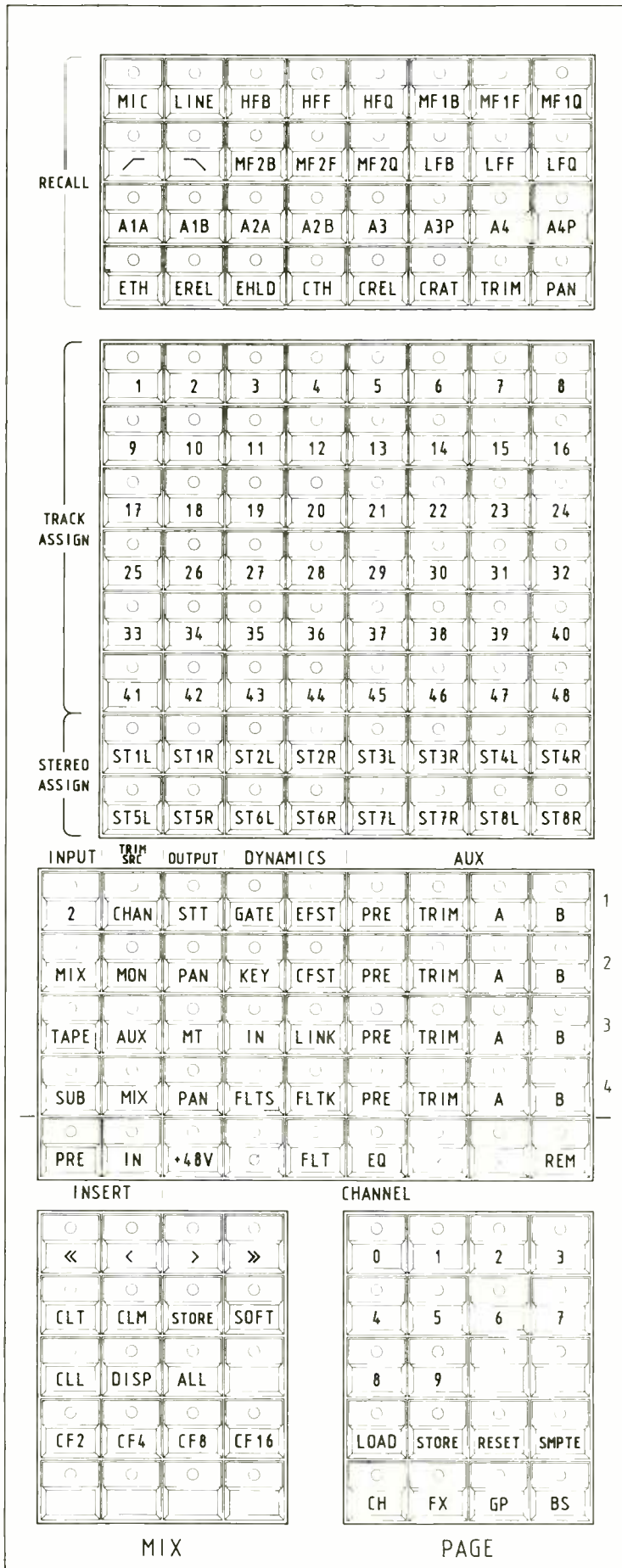
MIXING CONSOLE TECHNOLOGY

The Large Architecture Console

The *Large Architecture Console (LAC)* is the generic term Amek have chosen for our new approach to console design. The two principal characteristics are the possibility of having a very large number of inputs, and the abandoning of the monitor mix section. The *APC1000* (Assignable Production Console) is neither an in-line nor a split monitor console, these being the two traditional console types as noted above. Instead, the *APC1000-LAC* embodies many of the features outlined in the preamble, namely:

- the central assignment of channel switching functions using a keyboard, with simple master display functions allowing rapid identification of routing selections;
- a reduction in module width to 30.125 mm;
- a consequent reduction in console size, allowing more inputs in less overall space (16 inputs per 19 in) and potentially better control room performance;
- in-depth computer control, allowing automation to be brought deeper into the console—particularly into areas such as auxiliary send muting—and the use of advanced mixing systems such as the GML (George Massenburg Laboratories) moving fader system;
- Dynamic Reset* giving immediate reloading of archived console configuration;
- Synchronous Reset* allowing some console configuration to be reloaded at preselected timecode prompts;
- instant repeatability of console configuration by paging through memory;
- increased reliability through the removal of many electromechanical elements;
- a semi-‘virtual’ or (semi-soft) console which allows easier re-configuration to user requirements during manufacture;
- simplification of the console signal flow path by elimination of the monitor mix circuits;
- placement of all signals in identical input modules giving greater overall control;
- simplified recall techniques to speed data re-loading procedures for memorised rotary controls;
- AFV ports for remote control of levels and mutes from video equipment;
- increased amounts of output

APC central assignment panel showing separate keyboards for individual module configuration, re-call and memory management



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Some people are fighting a rearguard action to save analog recording systems. They talk about cost and convenience. About the sonic characteristics of analog. Its trouble free use. They even say that it's a good idea to record on analog and mix down on digital. They'll say anything, in fact, to avoid the inevitable conclusion that digital is the way the industry is going. The ostrich and his reaction to danger is far sighted by comparison.

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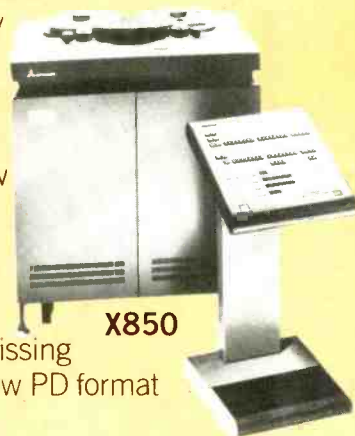
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X86



X850

MIXING CONSOLE TECHNOLOGY

buses (up to 64) facilitating assignment to multitrack recorders and stereo machines; —use of the buses as extra auxiliary send outputs when using multiple effects devices; —simplification of servicing routines through diagnostic programmes.

Introducing Amek APC1000

The *APC1000* uses novel techniques to simplify what have become increasingly complex operational requirements and to satisfy extremely varied demands. The flexible chassis system allows many different input configurations to be created easily; the central keyboard control for assigning module switching functions allows multiples of console routing and switching setups to be recalled either as snapshots or as dynamic routing adjustments in real-time synchronised to timecode; and a 'Recall' of rotary knob positions using novel and simplified setting up procedures is provided. The console is fitted with AFV ports as standard; and two levels of fader automation are available as part of the sophisticated systems control technology.

The console may have up to 128 computer-controlled modules.

With the extensive features now required on broadcast and video production consoles, conventional consoles are becoming increasingly unwieldy and confusing owing to the sheer density of controls. Many switch functions are virtually unused from day to day, or are 'presets' which when set up are not touched during operation. Furthermore, as has been noted, switches are electro-mechanical devices and inevitably suffer from wear and tear, which decreases reliability.

The assignable system allows a narrower module width to be used—and for compactness of size to be retained.

Many problems of size, ergonomics and general difficulty of operation, together with those of supplying consoles in various configurations, are overcome by using an assignable system.

The central assignment section is comprised of separate keyboards for Recall, or individual module configuration and for memory management.

Almost all the switch

functions are removed from the individual modules and reloaded to a master assignment panel. Several other functions also retain individual local switches for preview or effects use. The removal of the switches also makes the rotary controls clearer.

Switch functions controlled from the keyboard include: —channel input selection, with +48 V, phase, etc; —equalisation in/out, including pass filters selectable separately; —auxiliary output bus selection, with pre/post and in/out; —up to 48 routing buses and eight stereo buses; —characteristics of the (optional) dynamics section.

To access the keyboard from an input module, an INT (Interrogate) button on the module is pressed. The configuration keyboard will then illuminate, showing which functions have already been selected. If these selections are to be changed, the appropriate switches on the keyboard are pressed and the new set-up is stored in RAM.

When the engineer has configured all the input channels and track selection, the set-up positions may be stored as a Page in the memory for long-term Reset usage. Thus if the console is used by different engineers and in several applications, the various set up configurations may be stored as pages in the RAM and reset as each new engineer begins work.

A quick visual check of the configuration and selection of switches, buses, etc, can be made using the keyboard and is displayed by a large LED located in the meter hood behind each input module strip. Should the engineer want to check, for example, which channels are selected EQ In, he simply puts the keyboard to Display mode and presses the EQ button. The LED behind all those channels selected EQ In will then illuminate. This simple procedure can be followed for all keyboard-assigned functions.

Banks of assignment LEDs are not fitted to individual input channels, since research has shown that this display method does not enhance operational convenience.

Recall of input channel rotary control positions is enabled using the Recall keyboard together with the segment displays located behind each module. Each

display compares the actual and memorised position. Recall is displayed by function and not by channel. For example, Recall the high pass filter and the segment displays immediately show all high pass filter settings for the console.

A flexible chassis system has been designed which will accommodate various configurations of console and also include jackfields. The width of individual channel modules is 30.125 mm, which means that a large number of inputs will fit into a much smaller area than at present, eliminating the need for a separate effects returns panel. For example, 48 channels will fit into a width of 1830 mm (6 ft). The addition of a jackfield and wooden trim panels (if required) will of course lengthen the console but offboard jackfields for mounting in a separate rack are a standard option.

Dynamics modules which are the same width as the channels may be located in the meter hood.

All channels have a separate horizontal fader section at the front. Various different types of fader units are available, including, as standard, a VCA-fader with digital grouping which may be interfaced to the Audio Kinetics *Mastermix* computer and a motor-driven fader which is linked to the GML computer.

A central 300 mm (11.8 in) chassis section has a minimum of six module positions occupied by the central assignment section. Master monitor output and auxiliary send modules also located in this section.

The 48 buses may be configured for 48-track recording, as 48 mono subgroups, as 24 stereo subgroups, etc as required; the console may, of course, be set up with less than the full amount of buses and in principle could even be supplied as a 6/1, or 12/2. The general configuration of the *APC1000* console is (n) inputs with routing up to 48 buses and eight independent stereo buses from each input. The maximum amount of computer controlled modules which may be used in any one console is 128. Within this framework almost any variant is possible.

When used as a large multitrack console, the *APC1000* should be configured with a number of input modules suitably greater than the number of tracks being used to provide adequate amounts of channels for

sources and effects. For example, 88 inputs could be a suitable number for a large production studio with 48-track facilities, using 48 for tape returns and 40 for effects and sources. A multi-function Trim pot is incorporated into each input module allowing for a secondary signal path to be set up for dual-channel operation or as an additional auxiliary send with output to the multitrack routing.

The GML Moving Fader System

The GML computer is a VME-bus system using two Motorola 68000 off-the-shelf processors with the Idris (UNIX-compatible) software control system. The keyboard is a standard QWERTY keyboard with an alphanumeric plasma display mounted into the meterhood. A hard disk is fitted as standard with a minimum 500k RAM for on-line operations, giving the system exceptional expansion capabilities. Mix information can be stored to floppy disk for archiving. This combination of general-purpose hardware and software provides a complete super micro-computer including areas of functionality beyond console automation.

The moving fader system is entirely non-VCA and thus allows a smooth and transparent performance comparable with existing conductive plastic faders. The extreme speed and accuracy of the system avoid the timing degradation inherent in existing systems, the GML system can read both NECAM and SSL fader and muting information.

The extremely powerful capabilities of the GML computer facilitate automated mixing processes through sophisticated on- and off-line editing and merging routines.

The GML computer is used in an extended interface with the *APC1000* console allowing control of auxiliary send mutes, EQ, in/out, and filters in/out in real SMPTE time.

This brief article serves as an introduction to a new approach to console technology, developed in the light of actual changes in recording techniques. We feel that the *APC1000* meets the demands of contemporary production requirements. □

The terms *Large Architecture Console*, *Dynamic Reset* and *Synchronous Reset* are claimed as jointly-owned trademarks of Amek Systems and Controls Ltd and AML Ltd (Amek Massenburg Laboratories Ltd).

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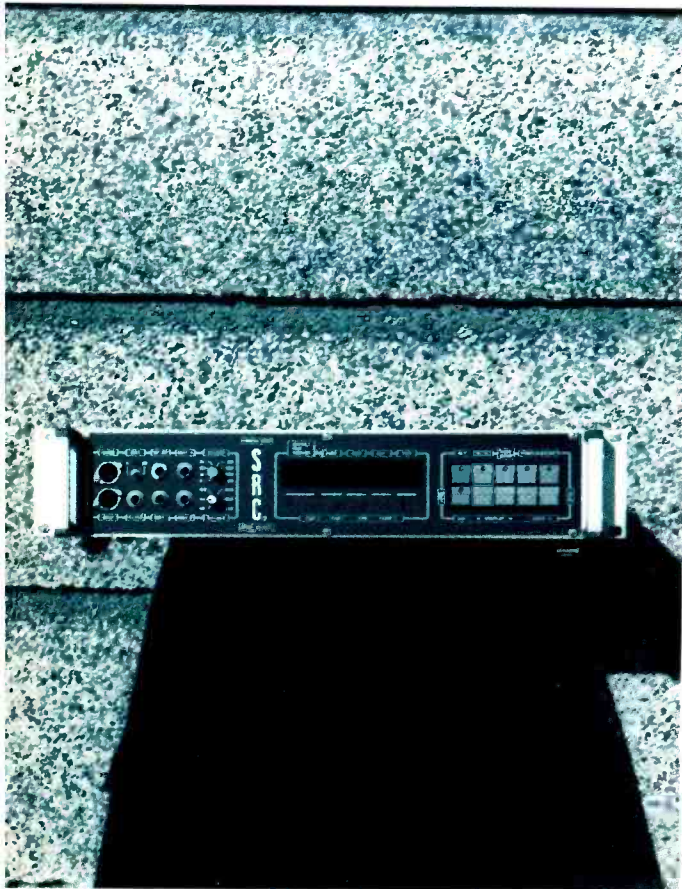
International literature requests are normally sent by surface, For air mail, send \$5 US to cover costs.

At Syco, we're never satisfied. Even after discovering Fairlight we needed to find other musical instruments that would capture a professional musician's imagination.

We found three machines that were exceptional. From California, Linn's Sequencer and E-mu's Emulator SP12. From Berlin, Friend Chip's SRC2.

Of the many sequencers available today, few are as musical as the Linn Sequencer. Indeed many destroy ideas rather than capture them. The Linn Sequencer is designed to allow you to compose, record and edit while devoting your undivided attention to your music, to enhance rather than interfere with the creative process. The 32 track MIDI recorder is operated via familiar tape machine-type controls and offers optional SMPTE synchronisation, 3.5" disc and remote control. Other features such as real-time erase, real-time transpose and auto repeat have been included for maximum creativity.

The SP-12 is not the first drum system from E-mu, but certainly represents a considerable leap forward from the last, bringing the power of 12 bit user sampling to the world of the programmable rhythm machine. SMPTE synchronisation is provided and an optional disc may be attached for the storage of rhythm patterns and sounds. Programmable tuning, decay and





mix level, touch-sensitive buttons and a unique multiparameter mode are included amongst many other new features.

The SRC 2 from Friend Chip is the smaller brother to that industry standard the SRC (SMPTE Reading Clock). Intended for a smaller budget and a less complex application the SRC2 offers many of the features that have made the SRC so essential in the electronic music environment. Two independently selectable click outputs, MIDI and Roland clock outputs, programmable cues, tempo changes and start/stop outputs make the SRC2 invaluable in any situation where instruments from different manufacturers are to be synchronised together, and where it is necessary to drop in with rhythm machines and sequencers rather than running the track from the top.

Three excellent new inventions from three established and respected manufacturers. Of course, if you have need of a drum machine, a sequencer and a synchroniser, they will work together.

Syco

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TELEX 22278 SYCO G. FAX 01-262 6081

GUIDE TO ANALOGUE TAPE MACHINES

ABE (West Germany)

ABE Becker GmbH & Co, Rob Bosch Str 18, D-7750 Konstanz. Tel: 07531 65632.

MTR Series: ¼ in mono, stereo and 2-track.

ACCURATE SOUND (USA)

Accurate Sound Corp, 114 5th Avenue, Redwood City, CA 94063. Tel: (415) 365-2843. Telex: 348327.

AS 2600: 16-, 24-track on 2 in, 16-track on 1 in, ¼ and ½ in formats available.

ACES (UK)

Aces (UK) Ltd, Featherbed Lane, Shrewsbury, Shropshire, SY1 4NJ. Tel: 0743 66671/2. Telex: 35188.

USA: Professional Audio Services, 619 South Glenwood Place, Burbank, CA 91506. Tel: (818) 843-6420.

MT16 series: 16-track on 2 in.

MT24 series: 24-track on 2 in.

ASC (West Germany)

Audio System Componenten GmbH & Co, Seibelstrasse 4, D-8752 Hosbach. Tel: 0 60 21 53021. Telex: 04188571.

UK: Uher Sales & Service Ltd, Unit Q1, Cherrycourt Way, Leighton Buzzard, Bedfordshire LU7 8UH. Tel: 0525 383277. Telex: 826717.

AS 6000 series: ¼ in 2-track, optional ¼-track headback.

AUDIO SYSTEMS COMPONENTS (UK)

Audio Systems Components Ltd, 4a King Street, Mortimer, Reading RG7 3RS. Tel: 0734 333100.

Revox PR99: customised broadcast version.

CEI (Australia)

Consolidated Electronic Group, PO Box 21, Anderson Road, Thornbury, Victoria 3071. Tel: 44 07 91. Telex: 32463.

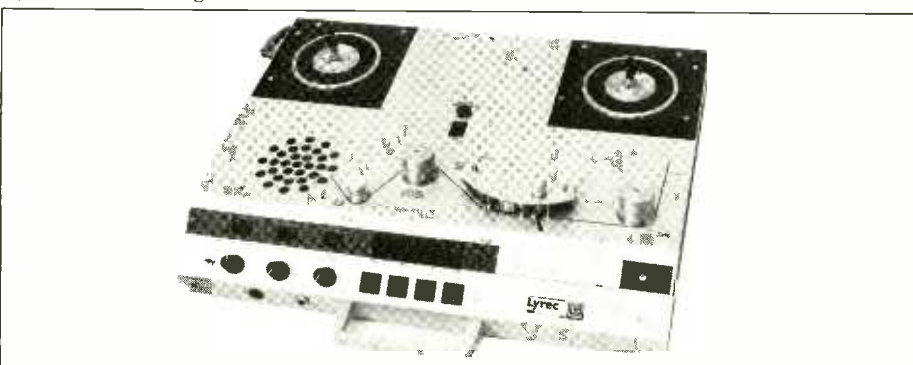
Cuemaster 77 Mk VC: full and 2-track on ¼ in, 4-track also available.

Cuemaster 77 Mk V1: 10 ½ in reel version of VC model.

ELECTRO SOUND (USA)

Electro Sound, 160 San Gabriel Drive, PO Box 60639, Sunnyvale, CA 94088. Tel: (408) 245-6600. Telex: 346324.

Lyrec FRED editing machine



Tape recorder: full stereo and 2-track on ¼ in, 4- and 8-track on 1 in.

ENERTEC/SCHLUMBERGER (France)

Enertec SA, Dept Audio Professional, 1 Rue Nieuport (BP 54), 78141 Velizy Villacoublay, Cedex. Tel: 946.96.50. Telex: 697430.

UK: PRECO, 21 Summerstown, London SW17 0BQ. Tel: 01-946 8774. Telex: 8954667.

F462: full, stereo and 2-track on ¼ in. F500: mono, mono/stereo compatible (0.75 and 2mm) 2-track, sync play, *Neopilot*, *Synchrotone* and *Nagrasync* available.

FERROGRAPH (UK)

Audio Video Marketing Ltd, Unit 20/21 Royal Industrial Estate, Jarrow, Tyne & Wear NE32 3HR. Tel: 091-489 3092/6233. Telex: 537227.

Series 77: ¼ in mono, stereo and ½-track versions.

FOSTEX (Japan)

Fostex Corp, 512 Miyazawacho, Akishima, Tokyo. Tel: 0425-45-6111. Telex: 2842-203.

USA: Fostex Corporation of America, 15431 Blackburn Ave, Norwalk, CA 90650. Tel: (213) 921-1112. Telex: 674918.

UK: Atlantex, Brent View Road, London NW9 7EL. Tel: 01-202 4155. Telex: 25769.

A80: 8-track, ¼ in.

A20: ¼ in, stereo with centre timecode.

B16: ½ in, 16-track.

E22: ½ in, 2-track.

E2: ¼ in, 2-track.

LEVERS-RICH (UK)

UK: PRECO, 21 Summerstown, London SW17 0BQ. Tel: 01-946 8774. Telex: 8954667.

Proline 2000TC: ¼ in mono or stereo.

Proline 1000/SC: ¼ in mono or stereo.

LYREC (Denmark)

Lyrec Manufacturing A/S, Hollandsvej 12, DK-2800, Lyngby. Tel: 02-87 63 22. Telex: 37568.

USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, CT 06801. Tel: (203) 744-6230. Telex: 969638.

UK: Scenic Sounds Equipment Marketing, Unit 2, 8-14 William Road, London NW1 3EN. Tel: 01-387 1262. Telex: 27939.

TR533: 16-, 24-track on 2 in.

TR55: ¼ or ½ in versions, 2- or 4-tracks.

FRED: mono/stereo ¼ in edit machine.

MECHLABOR (Hungary)

Electroimpex, PO Box 296, H-1392 Budapest. Tel: 321330. Telex: 225771.

STM-600 Series: mono, stereo, 2-track.

NAGRA (Switzerland)

Kudelski SA, CH-1033 Cheseaux-sur-Lausanne. Tel: 021 91.21.21. Telex: 459302.

USA: Nagra Magnetic Recorders Inc, 19 W 44th Street, New York, NY 10036. Tel: (212) 840-0999. Telex: 960 252.

UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St. Peter, Bucks SL9 9UG. Tel: 0753 888447. Telex: 849469.

1V-S: 2-track with *Nagrasync* on ¼ in.

1V-TC: 1V-S with timecode.

4.2: 1-track with *Neopilot* on ¼ in.

E: 1-track on ¼ in.

SN: 1-track, with or without pilot tone, on 0.15 in.

SNS: ½-track.

T-1: 4-channel on ¼ in.

T-Audio: 2- or 4-track on ¼ in.

NTA-2TA: *T-Audio* with timecode.

T-RVR: 1- or 2-track with timecode on ¼ in.

IS: full track with optional *Neopilot*.

OTARI (Japan)

Otari Electric Co Ltd, 4-29-18 Minami Ogikubo, Sugiyama-ku, Tokyo 167. Tel: 03 333-9631. Telex: J26604.

USA: Otari Corp, 2 Davis Drive, Belmont, CA 94002. Tel: (415) 592-8311. Telex: 910 376-4890.

UK: Otari Electric (UK) Ltd, 22 Church Street, Slough, Berks SL1 1PT. Tel: 0753 822381. Telex: 849453.

MX 5050 series: 2-, 4-track on ¼ in, 4-8-track on ½ in.

MTR-10: 2-track on ¼ in.

MTR-20: ¼ in stereo, full-track, 2-track and timecode versions, ½ in 2- and 4-track.

MTR-90-11: 8-track on 1 in, 16-, 24-track, on 2 in.

MTR-12 Series 11: ¼ or ½ in.

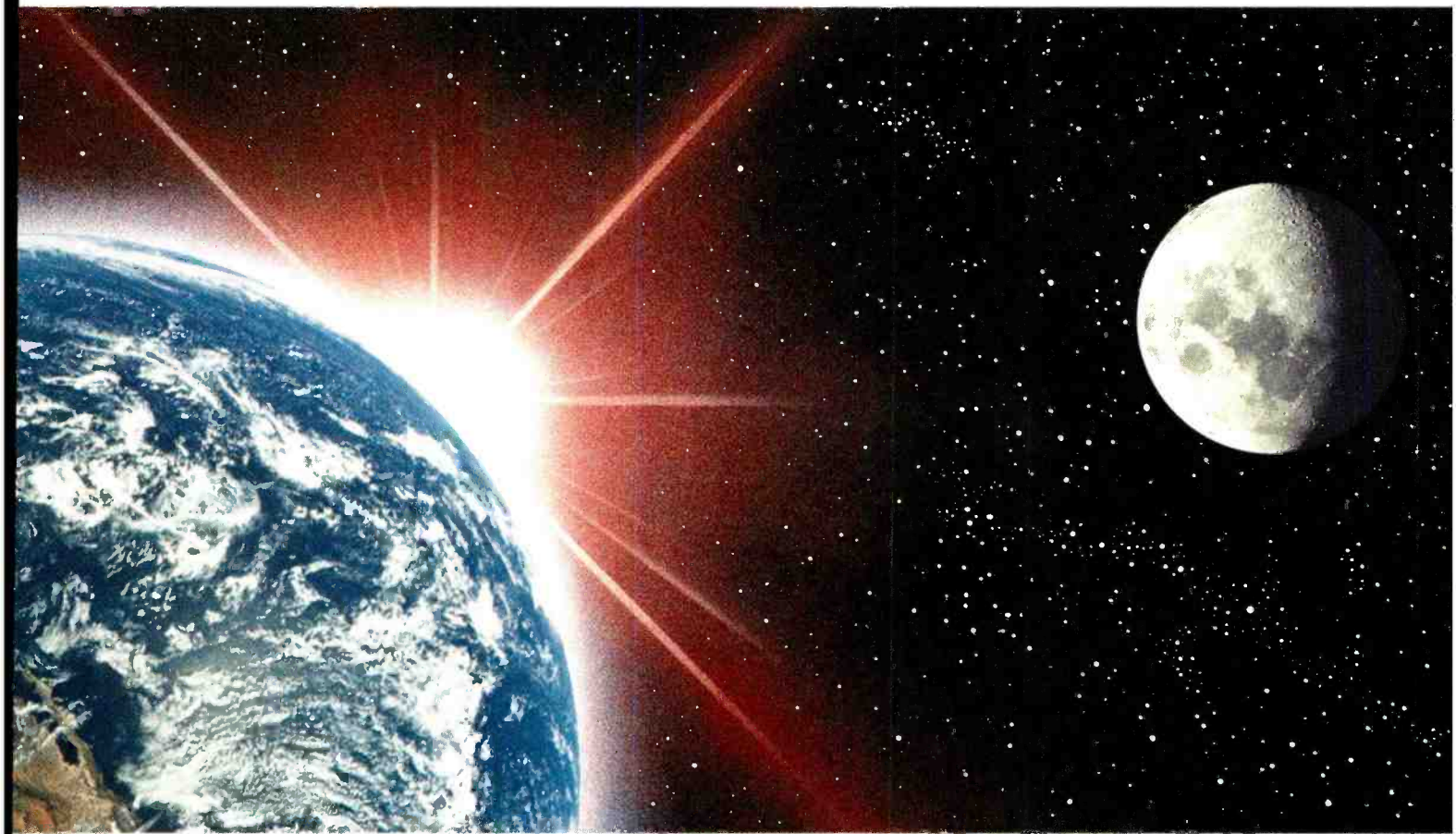
BTR 5: ¼ in broadcast recorder.

MX-70: 8-, 16-track on 1 in.

SONY (Japan)

Sony Corporation, Communication Products, International Marketing Dept, PO Box 10, Tokyo AP, Tokyo 149. Tel: 03 448-2111. Telex: J22262.

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



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GUIDE TO ANALOGUE TAPE MACHINES

UK: Sony Broadcast Ltd, City Wall, Basing View, Basingstoke, Hants, RG21 2LA. Tel: 0256 55011. Telex: 858424.

APR 5000 Series: mono, 2-track and 2-track with timecode versions on ¼ in.
APR-2003: portable ¼ in 2-track recorder with timecode.
JH-110C Series: 4-track ½ in, 4-, 8-track, 1 in versions.
JH-24: 8-, 16-, and 24-track, 1 or 2 in.

SOUNDCRAFT (UK)

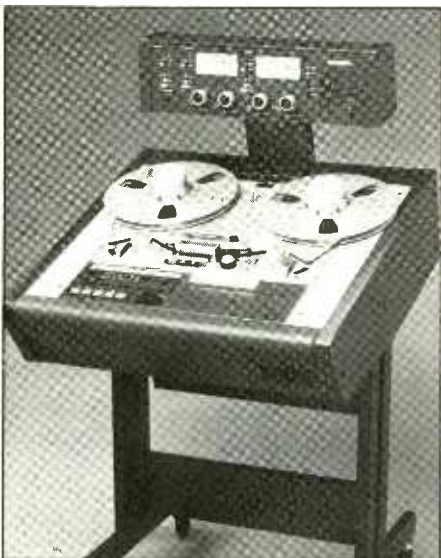
Soundcraft Magnetics, Ltd, Unit 2, Borehamwood Industrial Park, Rowley Lane, Borehamwood, Herts WD6 5PZ. Tel: 01-207 5050. Telex: 21198.
USA: Soundcraft USA, 1517 20th Street, Santa Monica CA 90404. Tel: (213) 453-4591. Telex: 664923.

SCM 381 Series: 8-, 16-track on 1 in.
SCM 760: 16-, 24-track 2 in.
Series 20: ¼ in and ½ in, 2-track.
Saturn: 16-, 24-track, 2 in.

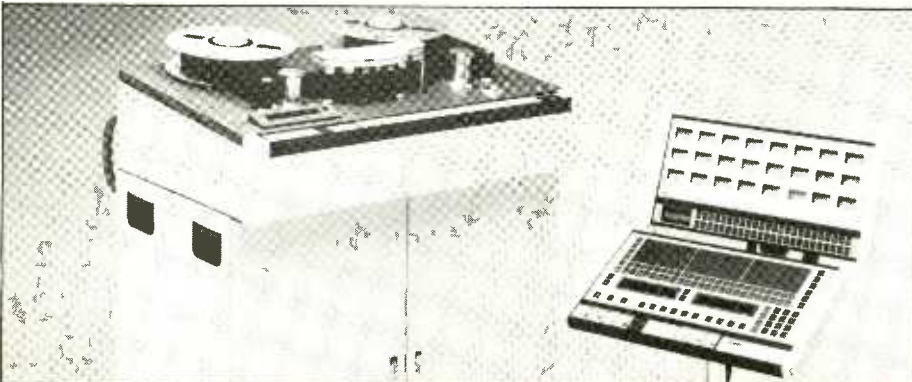
STEPHENS (USA)

Stephens Electronics Inc, 3513 Pacific Avenue, Burbank CA 91505. Tel: (213) 842-5116.
Series 821B: 16-, 24-, 32- or 40-track on 2 in, 2-track ½ in.
821B-104A-24: portable 24-track, 2 in.

Studer A812



Saturn the new analogue multitrack tape machine from Soundcraft



STELLAVOX (Switzerland)

Stellavox, Jardillets 18, CH-2068 Hauterive. Tel: 038 33.42.33. Telex: 952 783.
USA: ADB Alnaco, 6630 Tailor Road, Box 108, Blacklick, Columbus, OH.
UK: Future Film Developments, 114 Wardour Street, London W1A 3DG. Tel: 01-434 3344.
TD 9: ¼ and ½ in mono, stereo, 4-track including various timecode options.
TD 88: ¼ and ½ in stereo.
S series: ¼ and ½ in, mono, stereo, 4-track including various timecode options.

STUDER/REVOX (Switzerland)

Studer International AG, Althardstrasse 150, CH-8105 Regensdorf. Tel: 01 840.29.60. Telex: 58489.
USA: Studer Revox America Inc, 1425 Elm Hill Pike, Nashville, TN 37210. Tel: (615) 254-5651. Telex: 68-23006.
UK: FWO Bauch, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091. Telex: 27502.

A80/VU Mk 1V: 2-, 4-track ½ in, 2-, 4- and 8-track 1 in, 16- and 24-track 2 in.
A800 Mk 111: 8-track 1 in, 16-, 24-track 2 in and timecode options.
A810: full track, stereo and 2-track, ¼ in timecode available.
A820: ¼ and ½ in stereo with or without timecode.
B67 Mk 11: ¼ in full track, stereo and 2-track.
PR99 Mk 11: ¼ in full track, stereo and 2-track wide range of options.
A807: ¼ in, wide range of formats.
A812: ¼ in, wide range of formats including 2-track with centre timecode.

STUDIO (UK)

Studio Magnetics Ltd, Featherbed Lane, Shrewsbury, Shropshire SY1 4NJ. Tel: 0743 66671/2. Telex: 35188.

SML 1216: 16-track on ½ in.

TANDBERG (Norway)

Tandberg A/S, Fetveien 1, PO Box 53, N-2007 Kjeller. Tel: 02-71 68 20. Telex: 71886.
USA: Tandberg of America Inc, Labriola Court, Armonk, NY 10504. Tel: (914) 273-9150. Telex: 137357.
UK: Tandberg Ltd, Unit 1, Revie Road Industrial Estate, Elland Road, Leeds,

West Yorkshire LS11 8JG. Tel: 0532 774844.

TD20ASE: ½ in, ½ and ¼ track.

TEAC/TASCAM (Japan)

Teac Corporation, 15-30 Shimorenjaku, 4-chome, Mitaka, Tokyo. Tel: 0422 45-7741.
USA: Teac Corporation of America, 7733 Telegraph Road, Montebello, CA 90640. Tel: (213) 726-0303.
UK: Harman (Audio) UK Ltd, Mill Street, Slough, Berkshire SL2 5DD. Tel: 0753 76911. Telex: 849069.

ATR 60 Series: ¼ in 2-track optional timecode, 2-, 4- and 8-track ½ in.
MS-16: 16-track 1 in.
Series 20: ¼ in 2- and 4-track.
Series 30: ¼ in 2- and 4-track, ½ in 8-track.
Series 40: ¼ in 2- and 4-track, ½ in 8-track.
Series 50: ¼ in 2-track, ½ in 8-track.

TELEFUNKEN (West Germany)

AEG Aktiengesellschaft, Informationstechnik, Studio-Magnetbandgeräte, Bücklestrasse 1-5, D-7750 Konstanz. Tel: (7531) 86-2370. Telex: 733233.
USA: AEG Corporation, PO Box 3800, Somerville, NJ 08876. Tel: (201) 722-9800.
UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St. Peter, Bucks SL9 9UG. Tel: 0753 888447. Telex: 849469.

M-15: 8-track 1 in, 16-, 24- and 32-track 2 in.
M-20: ¼ and ½ in, timecode optional.
M-21: ¼ in mono, stereo and 2-track.

TELEX (USA)

Telex Communications Inc, 9600 Aldrich Ave South, Minneapolis, MN55420. Tel: (612) 884-4051. Telex: 29-7053.
Europe: Le Bonaparte, Office 711, Centre Affaires, Paris-Nord 93153, Le Blanc-Mesnil, France. Tel: 865 5045. Telex: 230-793.

3000 Series: ¼- or ½-track mono, 2- and 4-track ¼ in.

1400 Series: mono or stereo ¼- or ½-track ¼ in.

TRIDENT (UK)

Trident Audio Developments Ltd, Trident House, Rodd Industrial Estate, Govett Ave, Shepperton, Middlesex. Tel: 0932 224665. Telex: 8813982.
USA: Trident USA, 308 North Stanley Ave, Los Angeles, CA 90036. Tel: (213) 933-7555. Telex: 255-510 6000019.

New 2in, 24-track under development.

UHER (West Germany)

Uher Werke Munchen GmbH, Nordkanalstrasse 46, D-2000, Hamburg 1. Tel: 040 232 111. Telex: 02163961.
USA: Minehoff Electronics Inc, 946 Downing Road, Valley Stream, NY 11580.
UK: Uher Sales & Service Ltd, Unit Q1, Cherrycourt Way, Leighton Buzzard, Bedfordshire LU7 8UH. Tel: 0525 383277. Telex: 826717.

4000 Series: portable ¼ in, ½- and ¼-track and *Dia Pilot* option.

1200 Report Synch 10: full track plus pilot track, ¼ in.

SG 562: ¼ in, ¼- and ½-track stereo. □

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MXP-2000

FRAMES



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GUIDE TO AUDIO TAPE

This listing only includes tapes suitable for professional analogue or digital mastering purposes. Audio tapes for cassette duplication, audio cartridges and hi-fi applications are excluded

Manufacturers and agents	Type	Tape widths to (10½ in reels)				Larger reels		Additional information
		¼ in	½ in	1 in	2 in	12½ in	14 in	
AGFA-GEVAERT (West Germany) Agfa-Gevaert AG, Kaiser-Wilhelm-Allee, D-5090, Leverkusen-Bayerwerk. UK: Agfa-Gevaert Ltd, 27 Great West Road, Brentford, Middlesex TW8 9AX. Tel: 01-560 2131. Telex: 28154. USA: Agfa-Gevaert Inc, 275 North Street, Teterboro, NJ 07608. Tel: (201) 288-4100. Telex: 0134410.	PEM 468	•	•	•	•	½ in	2 in	2,500 ft length Long play version of PEM 468 Long play on 5 or 7 in reels for portable recorders Digital tape
	PEM 469	•	•	•	•			
	PEM 428						2 in	
	PER 368	•						
	PEM 297D	•						
AMPEX (USA) Ampex Corp, 401 Broadway, Redwood City, CA 94063. Tel: (415) 367-3809. Telex: 348464. UK: Ampex Corp Magnetic Tape, International Division, Acre Road, Reading RG2 0QR. Tel: 0734 875200. Tel: 847611.	406	•	•	•	•	¼, ½, 1 & 2 in	¼, ½, 1 & 2 in	Long play equivalent of 406 'Grand Master' Long play (for Fostex) Digital tape
	407	•	•	•	•			
	456	•	•	•	•	¼, ½ in	¼, ½, 1 & 2 in	
	457	•						
	467	•	•	•		½, 1 in	½, 1 in	
BASF (West Germany) BASF AG, Gottlieb-Daimler-Strasse 10, D-6800, Mannheim 1. UK: BASF UK Ltd, BASF House, 151 Wembley Park Drive, Wembley, Middx HA9 8JG. Tel: 01-908 3188. Telex: 269451. USA: BASF Systems Inc, Crosby Drive, Bedford, MA 01730. Tel: (617) 271-4000. Telex: 951856.	911	•	•	•	•	¼, ½ in	2 in	'Studio Master' 'Digital Master' for DASH format, 4,800 ft on 10½ in Larger reels to be available soon
	930	•	•	•				
MAXELL (Japan) UK: Maxell UK Ltd, 3a High Street, Rickmansworth, Herts WD3 1HR. Tel: 0923 777171. Telex: 893667. USA: Maxell Corp of America, 60 Oxford Drive, Moonachie, NJ 07074. Tel: (201) 440-8020.	UD 50-120B	•						2,500 ft length Long play version of UD 50 2,500 ft length Long play version of XLI 50
	UD 35-180	•						
	XLI 50-120B	•						
	XLI 35-180B	•						
SONY (Japan) UK: Sony Broadcast Ltd, Pro-Audio Dept, City Wall House, Basing View, Basingstoke, Hants RG21 2LA. Tel: 0256 55011. Telex: 858424. USA: Sony Corp of America, Sony Broadcast Prods, 677 River Oak, Parkways, San Jose, CA 95134, USA. Tel: (408) 946-9090.	D-½-1460		•					4,800 ft (digital for DASH) 9,600 ft (format PCM-3324) ¼ in digital for PCM-3102 and PCM-3302
	D-½-2920						½ in	
	D-¼-1460	•						
	D-¼-4730						¼ in	
D-¼-2190						¼ in		
TDK (Japan) UK: TDK UK Ltd, Pembroke House, Wellesley Road, Croydon CR0 9XW. Tel: 01-680 0023. Telex: 946727. USA: TDK Electronics Corp, 12 Harbour Park Drive, Port Washington, NY 11050. Tel: (516) 625-0100.	SA35-180M	•						Suffix M for metal reel Suffix B for back treated Long play version of LX 50, suffixes as above Only available back treated Long play version of GX 50
	LX 50-120BM	•						
	LX 35-180M	•						
	LX 35-180BM	•						
	GX 50-120BM	•						
	GX 35-180BM	•						
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IN PERSPECTIVE

IN PERSPECTIVE

Comment from Martin Polon, our US columnist

The rush towards providing the world's television consumers with yet another bells and whistles audio/video plaything has compelled the world's broadcasters and consumer electronic equipment makers to undertake three separate and non-compatible systems of stereo broadcasting and stereo home television receiving in four different countries: Japan with its FM-FM system since 1978, West Germany with Sweden using a non-symmetrical difference signal since 1980, and the United States (with the United Kingdom not far behind with its own non-compatible digital audio system). All the systems are analogue except for the stereo TV direction indicated for Great Britain by the BBC (who is currently negotiating for this digital TV audio standard with the Home Office and the IBA).

The Zenith-dbx MTS (Multichannel Television Sound) system adopted for the US has the largest potential for growth and programme production impact on the market place based on the roughly 80 million TV homes that could purchase the new service in some fashion. Since the United States produces a large percentage of the television programming used worldwide and American television is composed of nearly 1200 independently run TV stations and 6200 cable TV systems, the impact of the American stereo TV 'experiment' will be felt by viewers on six continents. Unfortunately, the lack of stereo TV standards seems to be a curse, spreading inside the US as well, and threatens to diminish the potential impact of stereo TV on all phases of the audio business. One recent study indicated that stereo TV if fully accepted by the public could virtually double the sales of professional audio equipment to the television broadcast and programme production market places and equally double audio related employment. It seems likely that there would be the same effect for the sales of consumer audio equipment and television receivers, VCRs, etc. The stakes are high but it seems that many of the players in the stereo TV gamble are playing at separate tables.

At the virtual onset of stereo television programming, stereo is being added only by those producers willing to take the gamble that it will pay off in syndication or by networks willing to underwrite the cost. NBC is broadcasting in excess of 20 hours in stereo per week; ABC only occasional specials and specific episodes; CBS is not committed to stereo broadcasting regularly until 1988. It is contemplated within the industry that the stereo will, in some cases, be post produced from monaural original recording. That brings up the practice of 'panpotting' stereo from the original source material. The complexity of recording stereo audio on location or in the film/video studio is a real and costly problem to programme producers. Many favour adding the stereo in the often

Stereo television— a progress report?

elaborate audio post production process already engendered for such shows as *Hill Street Blues* and the stereo TV pioneer *Miami Vice*. Broadcast industry experts still feel that the chicken and egg limitation of poor home TV audio prevents them from delivering the dynamic range or frequency response they would like to. These experts point to the small percentages of total TV set production equipped for quality audio in the home (while the TV manufacturers point to poor TV programme audio quality).

The transfer and transmission of theatrical movies encoded with the spectacular and successful Dolby surround medium has often taken place as though these were any other kind of television or film programming: with a double system film becoming 1 in video tape. The stereo signal still exists if desired but there are many opinions in contemplation of the survival of its surround information. Some movie studio types and network staff have actually proposed 're-working' of such signals. The justification for such a 'necessary simplification' of the stereo information, is the necessity of the inevitable transfer process of film to 1 in video tape (actually the medium of choice for display of theatrical movies on US TV or via cable). In addition to confusion of when and how to matrix the stereo signal, the question of noise reduction pops up. Some networks will use Dolby on tape machines, some have indicated interest on programme line usage and others are still planning to do nothing. All acknowledge that the dbx encoding scheme approved as part of MTS will be applied as part of the transmitting process. Many local broadcast plants and nearly all cable operations in the United States are struggling just to provide quality 2-channel audio capacity in-house; what with monaural wiring and older VTRs not configured properly for stereo audio. Concerns about keeping phase integrity during most transfer or transmission activities in the US are far down the list for industry managers trying to provide two discrete channels safe for the transfer of audio information. Although there is positive motion from programme makers towards utilisation of the third channel available with the MTS system for surround audio, most observers fear that the broadcast industry will see it as another cash cow for second or minority language follow-on to the programming being aired or isolated for stock market quotations.

The impact of domestic decisions involving stereo TV in the US could have worldwide consequences since it is unlikely that Hollywood would do one thing domestically and not attempt to

apply it as a standard; at least in terms of cost basing. Obviously, the customer will get what he pays for from the Hollywood studios but pay he will for special configurations. The situation does illustrate the dilemma of having a number of different standards for stereo TV programme material. It is possible to foresee a situation where for a small percentage of the European market, ie UK and West Germany, there would be at least two standards. With other European uses and with a diversity of domestic applications in the United States, a programme provider could be faced with a multiplicity of scanning rates and stereo audio requirements that could be a mind boggling excess in the order of 10 to 15 combinations.

For the broadcaster worldwide there seems to be several problems difficult to surmount. Firstly, the cost and the time to convert the television plant is no small factor. Most local TV plants are not compatible for stereo with monaural distribution and worse still monaural programme switching. Audio follow video switchers pose major financial burdens if they have to be re-equipped for stereo routing or require major modification or even replacement to accommodate stereo TV in the broadcast plant. It also seems likely that the forthcoming advent of the digital broadcast quality VTR will bring multichannel digital audio but at a high price. Most current C-format 1 in helical VTRs can accommodate a second channel with Dolby or dbx encoding at an affordable cost. Originating in stereo is a different issue completely. The entire accoustical layout of one or more studios has to be dealt with; the given is that most television studios possess acoustics and space more suitable for the assembly of cruise missiles than television programmes. Similarly, audio control boards often fall into the same category of 'set and forget' electronics as other fixtures in news origination operations. Most remote audio equipment has never had either the fidelity or the flexibility for stereo. The production equipment changes have required the expenditure on average of \$37,500 to \$75,000 for television stations already broadcasting in stereo.

It is also a given that transmitter sites will undergo exciter and antenna changes, require the purchase of a stereo signal processor/limiter and often need modifications to the STL (studio to transmitter link—usually microwave). These changes have cost already-stereo-equipped TV stations between \$30,000 and \$60,000. It has not been unusual for stations to spend in excess of \$100,000 to re-equip and some engineers opted that might not be all since many conversions have not included major production capabilities. Nevertheless, better than two-thirds of US television broadcasters expect to be equipped for TV stereo by the end of 1987.

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I N P E R S P E C T I V E

I N P E R S P E C T I V E

potentially (and actually) the weakest link in providing acceptable signal quality for stereo television. Many stereo limiters/compressors/processors/companions on the market have included some kind of synthesis capability. In various highly competitive TV markets many stations have to 'be up' in stereo to justify their advertising rates now—before adequate supplies of stereo programmes are available. The answer for most US broadcasters has been to use synthesisers. More than 70% of all stations surveyed in a recent poll conducted by *Broadcasting Magazine* in the US stated that they would use synthesis to fill programme time with stereo signals. The units themselves vary wildly in the quality of the 'churned' stereo they produce but some are rather good. Unfortunately, most units are not automatic. They sit in the circuit until someone switches the synthesis out. With automated transmitter sites now a reality, the potential for turning out 'audio mish-mash' is high.

One old chief engineer told this story about a competitor. "I turned him on and the stereo sounded like cross-modulated quad overlaid on voice quality telephone lines. I hooked up the scope and the audio signal looked like the last message sent by Mister Spock from space before he turned into a tree. So I had lunch there the next day and discovered my colleague had entrusted the process to one of his 'trusted' juniors. It seems the fellow had a synthesiser on the limiter feeding the microwave studio-to-transmitter link, another synthesising processor at the transmitter and the network was experimenting with a synthesiser on its feed to the station. If a consumer was using one of the new audio/video receivers capable of synthesis, there could have been four synthesisers on to that signal!"

Cable television also presents a major stumbling block to public acceptance of stereo television. In America the stereo TV issue has caused US cable systems operators to band together and force the whole issue of legal 'Must Carry' back to the courts and out of the hands of the US Federal Communications Commission (FCC). Many of the current audio transmission practices in use for cable television in the US do have the potential to be incompatible with phase and signal accuracy if not causing outright signal distortion of several kinds with improper operation. For one example, the impending scrambling of Pay-TV cable signals sent via satellite feeders could pose a substantial problem to signal integrity. Many of the multiple channel cable systems that crowded out the cable bandwagon in the late 1970s and early '80s have such limited bandwidth that even the basic MTS stereo signal of on-air TV broadcasters cannot be accommodated properly. But most cable operators would prefer to handle stereo TV as they already handle stereo cable programming such as

movies and Music Television via the cable supplied FM band. This would also enable them to charge extra for such services. However, the creation of enough new slots in the already crowded FM spectrum seems unlikely.

For the most part public experiences with these cable modulated FM stereo transmissions have ranged from fair to terrible. The effect of FM re-transmission on MTS modulated and demodulated stereo television signals is not likely to improve signal quality to say the least. Some cable operators even intend to multiplex the stereo audio from MTS broadcasts on upper limits of their systems where they have unused cable channels. They would supply special converters providing a demodulated stereo audio output at a premium price. The reaction of the consumer to a newly purchased stereo television device incompatible with a cable system sending mangled stereo television out on the FM band or elsewhere is not likely to improve the public's impression of the electronics industry or of stereo television either.

Even with the approval and acceptance of the MTS stereo television system; most TV manufacturers still feel that the consuming public does not want quality sound with the set due to cost and/or lack of interest, as evidenced by the large number of models in each set makers' 1985 line without stereo TV features. A recent Electronic Industry Association study indicated that 30% of the set buying population was interested in TV stereo although other studies have placed the figure higher. Manufacturers cite problems of set placement, the effect of speaker magnets on the picture tube, etc. That leaves the old reliable RCA pin jacks delivering a demodulated line level signal for home audio system usage as the most likely alternative. Many of the current TV receivers are using off-the-shelf parts for these line level stereo TV audio circuits. Some manufacturers are innovating with state-of-the-art chips but many TV makers are looking at stereo TV as a 'more of the same' feature. TV sets for 1986 promise to be a more complete integration of audio and video and will encompass more of the manufacturer's lines. Meanwhile, VCRs are being sold with complete stereo TV tuning and demodulation facilities. Many AM-FM stereo receivers sold over the last several years have also added stereo TV tuners; accounting for nearly 2.5% of all audio sales to US homes according to industry figures. These receiver and companion stereo TV VCR sales are difficult to analyse because the purchase of a unit may have been in spite of—rather than because of—the peripheral stereo features.

One wag has called stereo TV the 'World Audio Industry Fair Employment Act'. That stereo TV could revolutionise audio with vision in production of programming (software) and bring new technologies to the forefront in consumer

and professional audio (hardware) has been established both in print, via surveys and at such professional meetings as AES conventions and the twice annual Consumer Electronics Shows. The commitment to the stereo TV market place has been dramatic; especially from such vital contributors as the Ministry of International Trade and Industry (MITI) in Japan, who has kept the Japanese out of the home computer market in the US while obviously condoning Japanese participation with stereo television. One still has to ask if it were really necessary to move ahead so quickly. In the United States, critics of the EIA (Electronic Industries Association) and the FCC abound in terms of the selection of what many see as a system difficult to implement and so technically complicated that it cannot stand up to the vagaries of less-than-perfect broadcast conditions. Other critics in Europe wonder why the Germans could not wait for a European standard. But all these complaints ignore the fact that television is rapidly becoming a digital medium at all levels and the audio systems in use will, of necessity, have to mutate.

The current prognosis for stereo television seems to best illustrate that old saying, 'United we stand, divided we sell used cars'. Several actions need to take place; both for the domestic scene in the US and on a worldwide scale. First, there needs to be international agreement on the placement and matrixing of stereo TV audio signals. These agreed standards should operate regardless of whether stereo audio is involved in TV programme production, transmission, transfer or distribution. The standards should also cover theatrical film distributed via professional videotape, music videos and other programming comprising the stock of stereo television software. It appears that adherence to and agreement with the cinematic standard of three discrete front channels may be one viable solution; especially in terms of dialogue location.

Secondly, US experts and technical representatives from the American broadcast organisations and television networks should attend specific international meetings on stereo TV standardisation. One European EBU member commented, "It has become a standing joke that EBU actions become CCIR (and therefore international) actions without significant North American involvement."

Ultimately, the world's consumers will decide if stereo television works in the home. These early experiences with TV stereo can be the basis for current and future standards and professionalism or the direction that stereo TV might stumble towards. That will be the measure of whether stereo television hardware is a real service or just another bell and whistle. And that will set the direction for the quality of programming in the new medium to come. □

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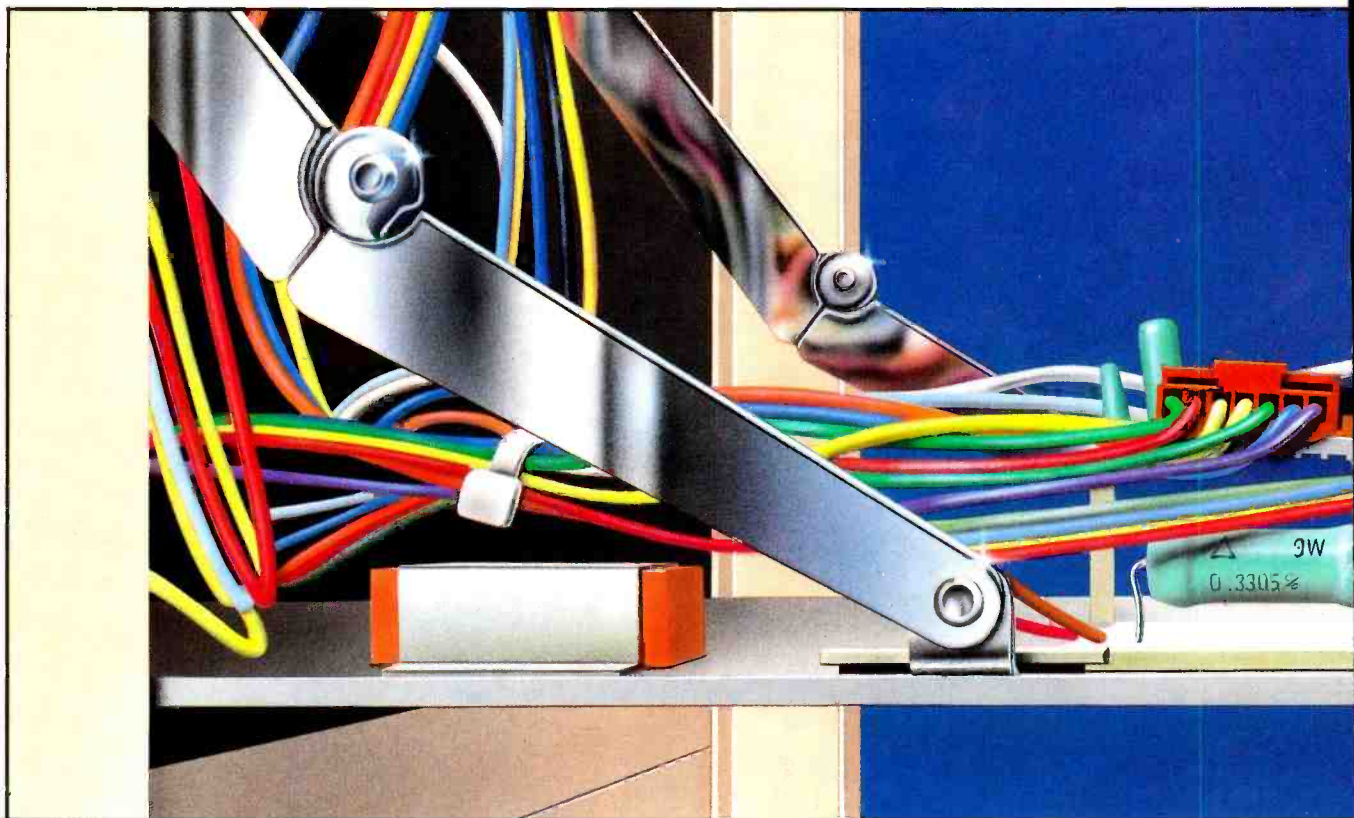
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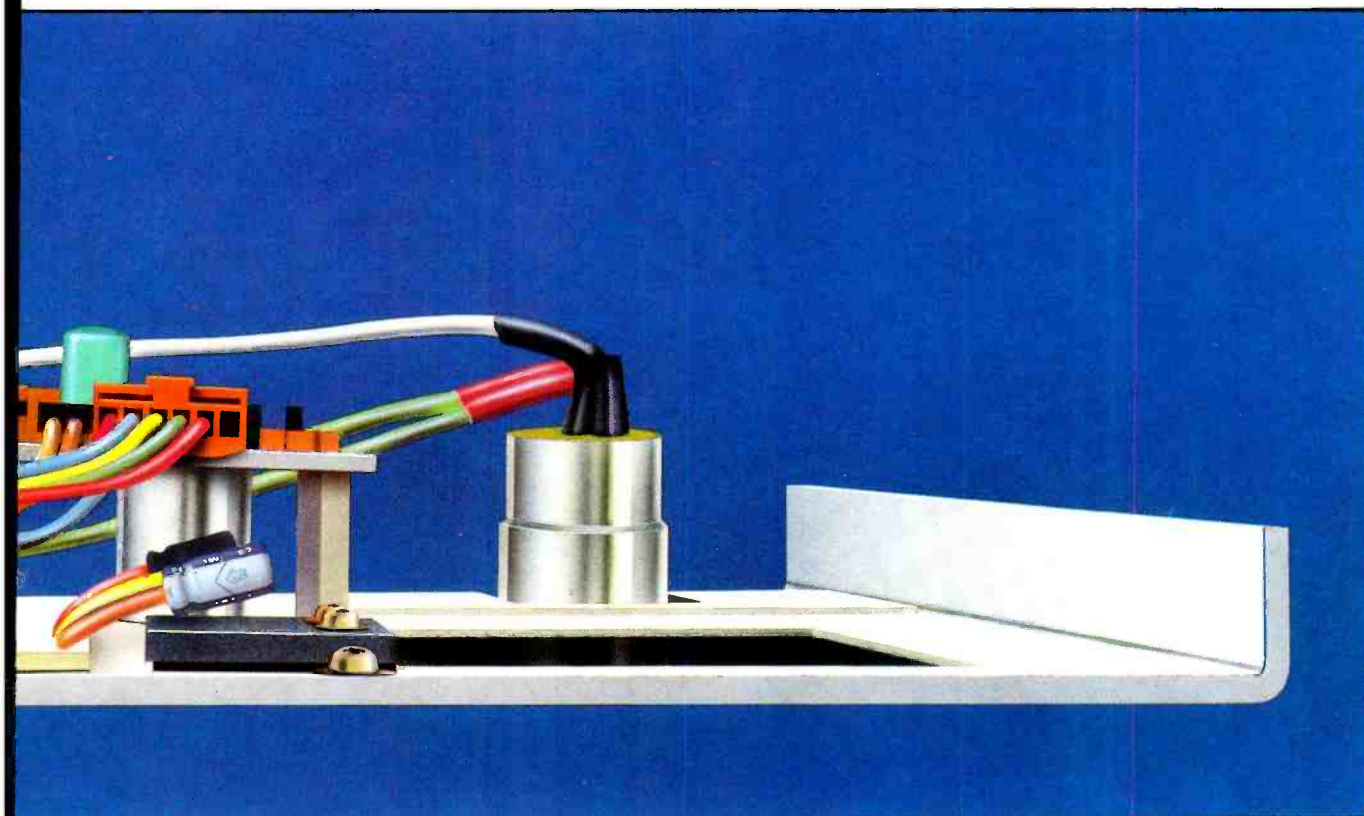
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This panel protects the mother board at the heart of the Otari MTR 12. And it's hinged to allow easier access.

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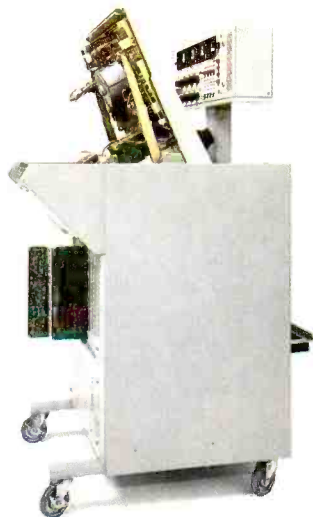
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MUSIC FOR FILM

At one time the big film studios ran their own 'music scoring stages' but with changes in the industry many of these have been sold off or closed. Also there has been a trend towards rock music film scores and bands prefer to work in rock music studios. As a result more and more recording studios are becoming involved in the preparation of music for film soundtracks. Add to this a growing number of cinemas equipped for stereo sound and an ever increasing number of film productions opting for stereo soundtracks, and we have an interesting situation. We also have a slight complication.

Now, stereo sound is left channel—right channel—no problem. In the cinema it is not quite like that. The width of the auditorium means that much of the audience would not get a clear 'phantom centre' from 2-channel stereo. Since the earliest days (*Fantasia* in 1940) cinema stereo has used at least three main channels—left/centre/right (L-C-R)—with the speakers concealed behind the usual perforated screen. These would often be supplemented by extra channels feeding off-screen speakers to surround the audience with sound.

The typical system now uses four channels: L-C-R plus a 'surround' channel which is fed to a number of small speakers around the rear half of the auditorium to carry occasional off-screen voices and effects for ambience. Film dubbing mixers will do their best to make a 2-channel mix sound good on the 4-channel system but it is obviously easier for the music recording studio to create a proper 4-channel balance from a multitrack master. There is also the consideration that many stereo films are now made with the Dolby Stereo system which has matrix encoded 4-channel sound (L-C-R and 'surround') on a 2-channel optical soundtrack.

If your heart sinks at the idea of your beautiful recordings being squashed on to film soundtrack you've

More and more studios are looking to diversify in their recording work and music for film is one such area. In this article Ron Pender of Dolby Laboratories outlines the basic principles of music recording for Dolby Stereo film sound. Tim Leigh Smith provides the film sound background

probably been watching too many old movies on TV. In the worse cases these may be 16 mm copies running at about 19 cm/s (7½ in/s) with the soundtrack heavily compressed to overcome the noise of ricketty old projectors when they are shown in village halls out in the sticks. Modern 35 mm optical soundtrack still has limitations but it can be very much better than some early examples might suggest.

The vinyl disc also has its limitations but these are second nature to recording engineers and are rarely thought of as limitations—it's just the way things are. Fortunately working on Dolby Stereo optical soundtrack need not mean having to learn a whole new set of parameters. Dolby Labs offer a matrix simulator which is inserted on the studio monitoring so engineers can hear exactly what effect the matrix system has on their balance.

35 mm film originally had some 25 mm (1 in) available for the picture width, and an aspect ratio of 4:3 which meant each frame was 19 mm (¾ in) high. The nominal silent running speed of 16 frames/s was rather neatly 12 in/s in imperial terms (about 30.5 cm/s) but it suffered from flicker and many silent films were shot for projection at higher speeds. The introduction of sound meant that projection speed had to be standardised.

In the first few years some studios used sound on disc. The film and disc, driven by the same motor, had to be set up on sync start marks like sepomag tracks. Problems arose

when the film got damaged—any frames removed had to be replaced by exactly the same number of blank frames to maintain sync.

Optical sound was much easier for the cinemas and the new standard speed of 24 frames/s gave it a chance of reasonable quality. The track had to occupy one edge of the picture width so the photographers gave up about 10%—2.5 mm (0.1 in). The height of the picture was also reduced to maintain the aspect ratio. Old silent films shown using the sound standards give the impression that all the captions are slightly off-centre and that everything moved rather faster in the first quarter of this century.

Early optical soundtracks had to contend with imperfections in the recording system, film stock, film printing process and repro system which contributed varying amounts of distortion and noise. Random noise caused initially by film grain, and subsequently by dirt and damage, was a major reason for the Academy curve—a late 1930s attempt at noise reduction using the simple expedient of hefty top cut.

The American Academy of Motion Picture Arts and Sciences in 1938 defined the typical performance expected of optical repro systems at that time—flat to about 6 kHz then rolling off quite rapidly—and suggested that after equalisation the sound reaching the audience should be flat to about 2 kHz then

roll off to be 6 dB down at 6 kHz and about 25 dB down at 10 kHz. This got rid of the noise but it is not much use for stereo and is less than one might hope from film running at about 45.7 cm/s (18 in/s).

In the 1950s the cinema began making determined efforts to out-spectacle television with wide-screen colour pictures and stereophonic sound. Most spectacular but fairly impractical, were Cinerama (from 1952) and Cinemiracle (once in 1958) which required a curved screen with pictures from three projectors, and up to eight audio channels from sepomag film. 1953 saw the first 35 mm CinemaScope prints with 4-channel sound (L-C-R-surround) carried on four 1.25 mm (0.05 in) magnetic stripes alongside the sprocket holes at the edges of the film. This was followed in 1955 by 70 mm prints with six 1.25 mm magnetic tracks for left/inner-left/centre/inner-right/right/surround.

Only plush picture houses in the cities were equipped to handle 70 mm prints although some local houses could run 35 mm with magnetic tracks. Most shows continued to use standard 35 mm with mono optical soundtrack. There was a major cost advantage. Magnetic tracks require additional time and expense for striping, recording and checking. Optical track can be printed along with the picture in a single high speed process.

The Academy curve has remained the standard for mono optical track for almost 50 years although there are thoughts of changing it to take account of improvements over the years. Dubbing theatres used the curve in their monitoring so that they knew what they were up against and could boost the HF accordingly but that brought the risk of distortion. This was where Dolby came into the picture. After some experience in the early 1970s with Dolby A noise reduction on mono optical tracks and multichannel magnetic tracks 2-track Dolby Stereo optical system was developed with Eastman Kodak and RCA.

Tim Leigh Smith

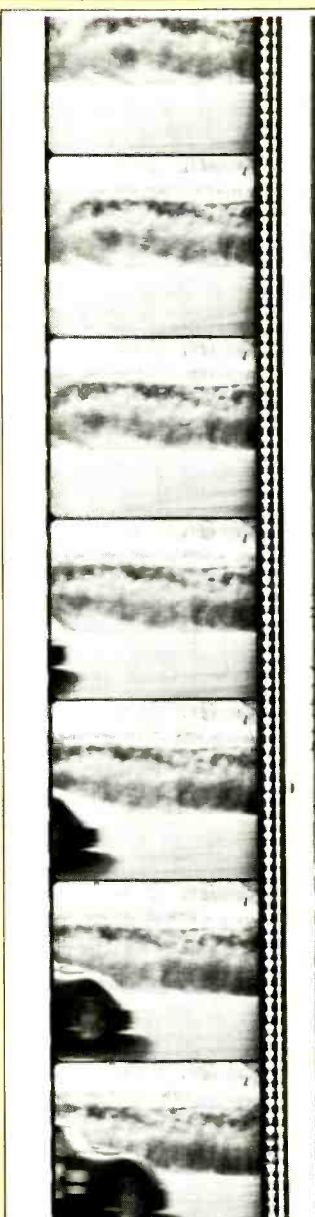
So a client has rung up and wants to use your studio to record the music for a feature film, you haven't recorded film music before but it's not much different to recording music for videos only the sound quality from film isn't very good is it?

Well, film sound is different from video and depending on where and when you last went to see a film you may already know that there has been a vast improvement in film sound over the last 15 years. The improvement is so large because the sound had been bad and there had been little improvement since its introduction nearly 60 years ago. To give some idea of the magnitude of the change, just think how new technology has improved recording quality for records in the last 15 years, film sound has made even greater improvements.

After the pioneering work done in the late '20s to go from silent movies to talkies, the Hollywood film studios settled down to making all their films with sound, eventually it occurred to them that when a film was played in various cinemas or studios it would sound very different. (As it happens this point of view is often expressed these days as engineers take their recordings from one studio to another.) However, the film studios took a pretty radical approach to the problem—they decided to standardise. This

was done by measuring the limitations at each step of the chain, eg microphones, optical recorders, projectors, loudspeakers, etc, and then as far as possible make everybody's systems match. As you can imagine this tends to reduce everything to the lowest common denominator this became known as the academy characteristic. The resultant frequency response is reasonably flat to 2 kHz then starts to rolloff to 5 kHz where it approximates the white cliffs of Dover, being some 20 dB down at 9 kHz. The situation hadn't changed much in the intervening period up to the '70s, improvements in any part of the chain were simply offset by adding a filter to maintain the status quo.

Dolby Laboratories became aware of the problem, and started to investigate. The first thing they found was that most of the various links in the chain were in fact capable of high quality. After all, microphones and amplifiers had improved considerably and the improvement in film stock and optical recorders meant a flat frequency response well in excess of 10 kHz was now easily obtainable, and only small changes were needed to projectors to match that response on replay. The remaining limitations were the loudspeakers and, of course, that filter. The latter could be



Dolby Stereo optical film soundtrack, showing different modulation of the left and right tracks

removed and the loudspeakers could be equalised or changed for more modern designs.

The one advantage of the existing system with its steep HF rolloff was the reduction in print noise particularly scratches and dirt picked up on a used print. Dolby had a ready-made answer to noise with their A type noise reduction system. Experiments were conducted with excellent results; the multi-band low level operation of A type noise reduction effectively removed the noise without any side effects. A linear compander would have been unable to cope with this due to the impulse character of most of the noise. A special unit, the 364 was developed for cinema use. This had noise reduction decoding for prints encoded with A type NR. It also had provision for playing conventional prints. An additional unit, the E2 was also developed. This was an equaliser for use with the cinema loudspeakers to improve their frequency response. A substantial number of cinemas were equipped this way and a number of films were released in this format.

So after 40 years high quality film sound was at last possible. Although successful, by this time the public had a high awareness of stereo through the use of hi-fi at home so Dolby Laboratories having proved the basic soundness (sic) of optical sound, started a research programme in conjunction with Eastman and RCA to develop a stereo optical system. It should be noted at this point that stereo had been available in cinemas for over 15 years through the use of

The Dolby Stereo Matrix Encoder 4-2

Channel	Console output	Lt	Rt
L	+4 dBm	+4 dBm	
R	+4 dBm		+4 dBm
C	+4 dBm	+1 dBm (in phase)	+1 dBm (in phase)
S	+4 dBm	+1 dBm (+90° phase)	+1 dBm (-90° phase)

Along with the equipment, studios are entitled to the services of Dolby Sound Consultants. These include Chris David, Film Projects Manager, and Tony Spath, Studio Projects Manager, who are based in London and are former studio engineers.

Chris David: "Possibly the greatest problem with regard to music recording is the width—it tends to pull in to the centre. There are lots of things you can do in the music studio to make it wider and that's why we provide the simulation. Because you're listening through the matrix you can mix everything wider."

Tony Spath: "It means you have to put up a centre speaker, and a couple of hi-fi speakers for the surround, to monitor through the matrix—

hearing exactly the way that the matrix will steer everything on a playback in a cinema."

CD: "You need a centre channel speaker of the same quality and the same equalisation as the left and right. That ISO curve which rolls off above 2 kHz is designed for cinemas. In a music studio you're reading much more direct sound and much less reflected sound so you equalise to a much flatter curve. So we're not asking people to roll off all their HF, but the centre speaker should be to the same curve as the left and right."

TS: "When we go into music studios we don't generally equalise their speakers. We have a look but we accept that studio engineers know what their speakers sound like, and

it's normally right in good studios. If they have speakers built into the walls it's generally difficult to get a centre speaker of the same calibre, so what people are doing is bringing in three free standing speakers.

CD: "I think anyone who wants to do a Dolby Stereo film now without monitoring on four channels is not being serious about it, because they are not able to monitor what they're doing. It beats me how casual some people can be about film mixing when they're so particular about their record mixing. If people do it right it can sound really good. It's just two things: getting the monitoring right and understanding the optical medium."

"There's no point in putting a lot of 16 k on a cymbal when

not much 16 k comes back off optical—what it does do is it mucks everything else up because it doesn't allow you the room for everything else. On the other hand there are people who think optical isn't capable of handling anything beyond 6 k. But it is flat to 12 k, and there's still some there at 16 k. I can't hear any more than that, and neither can the rest of them, so it is flat over pretty much all of the audible spectrum."

TS: "One of the wonderful things about cinema is that engineers can get their rocks off with the bottom end. You can put all this bass on that you can't get on to record because it brings the level down. You can start using the 30 Hz which you can hear in cinemas—you can *feel* it in cinemas and it's exciting." □

35 mm and 70 mm magnetically-striped prints, although these were very expensive and tended to vary in quality. The attractiveness of a stereo optical print is that it is a lot more consistent in quality and doesn't cost any more than a mono print.

As the soundtrack dimensions on prints are governed by international standards, a stereo track had to fit in the same area as a mono track. This had the advantage that stereo prints would be usable in mono cinemas. It was recognised that three channels would be needed for the screen, this is because most of the important action in the picture is kept to the centre of the screen and the various sounds particularly dialogue should match that action. If only two channels are used centre panned sounds are fine for people sitting in the middle of the cinema but for those sitting near the edges the image would shift and this would spoil the illusion. A third loudspeaker in the centre fed with a mix from the left and right channels helps but still doesn't stop some image shift unless played at such a high level that the stereo ends up almost mono, so a separate centre channel is needed. It was also decided to have a fourth channel for the auditorium. This surround channel was to help give greater depth and involvement with the action on the screen. After investigating various ways of getting four channels in a standard soundtrack area the method decided upon was four channels matrix encoded to two tracks on the film. No doubt many people who remember the poor results that accompanied some of the quadrophony matrix systems of the late '60s and early '70s may be concerned to see the use of such a system. However, the requirements for cinema use are very different from the idea of a loudspeaker at each corner of the living room.

The matrix has two axes: left-right and centre-surround. It is optimised for maximum separation along these axes particularly the centre-surround axis. The enhanced separation is achieved by using logic steering and a delay line in the decoder. The delay line is in the surround output and makes use of the Haas effect where the ear will respond to the first sound arriving for its directional information, this is very

MUSIC FOR FILM

If you have a sequence with loud effects and music—a battle or that sort of thing—the percussive stuff will tend to come through but the sustained stuff just becomes part of the general roar and clatter. If you keep them separate it enables the film mixer to adjust the balance and get the music to come through, while allowing the effects their place.”

Jeff Wayne's musical version of *War of the Worlds* used this sort of idea as only the strings were dipped during Richard Burton's narration; the driving beat continued unabated. A similar technique can be used to allow music at higher levels under dialogue.

Chris David: “If the ambience is separate you can

important for dialogue which must appear to come from the screen. As with all matrix systems separation is not quite as good as a discrete system which brings us back to our main theme, recording music for film.

This is the one area where the slight reduction in separation is noticeable, particularly where a stereo record mix is used in a film and it is expected it will sound like the record. It won't! A lot of records are mixed to give a coherent soundfield on fairly widely spaced loudspeakers in a near field situation which gives a good image spread but not necessarily a very wide stereo which sounds marvellous in the control room or in most homes. However when played in the cinema through the matrix and where the angle between the loudspeakers is relatively narrow for most of the audience, that marvellous mix suddenly doesn't sound so good and is little more than wide mono, this is because the optimisation of left-right and centre-surround separation results in a slightly lower separation between left-centre and right-centre. So what is the answer? Well the obvious thing is to make a separate mix for film but short of mixing down in a totally strange film dubbing studio how will you know if your mix is OK? Of course until fairly recently most film music was recorded and mixed in a few specialist studios where engineers got used to mixing for Dolby Stereo films and

keep the reverberation down instead of bringing the music level down. With reverberation you tend to get a build up of sustained-type material that just becomes a wash—you don't really hear it amongst everything else but it muddies things. Also cinemas are considerably more reverberant than music studios, so if you put a lot of reverberation on your music mix it's going to sound even more reverberant in the cinema. That's not to say you shouldn't use reverberation but a good adage would be: 'If in doubt—don't put it on.' In those instances when it's fighting with dialogue and effects, if it's a drier track they'll be able to have the music at a higher level.” □

could reasonably predict the sort of results they would get but as more recordings were made in non-specialist studios Dolby Laboratories decided to make a matrix simulator.

The *DSA-2-4* studio monitor unit comprises a matrix encoder and decoder and is intended to be put into the studio monitor chain. It is available to studios who are recording and mixing music for films which are to be released in Dolby Stereo. The studio will also need three front loudspeakers and a couple of smaller loudspeakers for surround. The arrangements for the front loudspeakers will vary from one studio to another, the important thing is that the loudspeakers match. For studios with free standing loudspeakers this can be achieved quite easily by bringing in a third loudspeaker of the same type as the existing ones for the centre. In studios with built in loudspeakers it will be much more difficult to arrange a matching centre loudspeaker and in this instance it would be wiser to bring in three loudspeakers of a reasonable size and quality.

Unfortunately for this sort of work, however good they may be, nearfield hi-fi loudspeakers are not suitable. It is important to have a good bass response as cinema loudspeakers have a fairly solid extended bottom end and you should have some idea of what bass you are putting on.

Why three front loudspeakers when you are mixing stereo? This is because the matrix decoder will regard a signal panned centre as though it were a separate

centre channel and decode it to the centre loudspeaker and not to the left and right loudspeakers. Similarly depending on the relative phase and level of the various elements of the mix some music will come out of surround. This may have been unintentional but as with any matrix system some crosstalk is unavoidable and in practice it is usually found that when played in a cinema you're not aware of the music on surround unless the surround channel is suddenly turned off and then the music sounds very flat and lifeless.

Whilst still on the subject of loudspeakers, monitor levels should be considered as this will have a marked effect on the mix. Various investigations by Dolby Laboratories into film sound revealed that average dialogue levels in cinemas gave a sound pressure level (SPL) of 85 dBC (C-weighted) therefore when setting the different parameters for Dolby Stereo the monitor level for each of the four channels was fixed at 85 dBC, which corresponds to 50% on optical. If the monitor level is raised, dialogue is still mixed at the same level but the effects and music will be raised in level to suit the peak operating level, consequently resulting in a wider dynamic range and dialogue intelligibility problems. Of course, these are problems that largely affect the bubbling theatre, nevertheless it does have a bearing upon the music mix. It is not simply a case of saying, 'if I mix at a bit higher level it will not change much when played at 85 dBC' for much of the film the music will be played at a much lower level as underscore to dialogue and effects and the apparent balance of the mix will change quite dramatically.

Until now we have referred to a conventional stereo music mix. This is the least preferred format for mixing music for film.

Depending on the musical content the final mix should be at least a 3-track mix and in some cases 4- or 6-track. For instance most underscore music will be fine mixed to 3-track but if it's a musical with solo singer, choir, etc, it would be better to mix the orchestra on three-tracks and the singers on another three. It may seem that this gives the dubbing mixers more chance to 'ruin' your mix but remember that unlike records, yours is not the last link in the mixing chain and while

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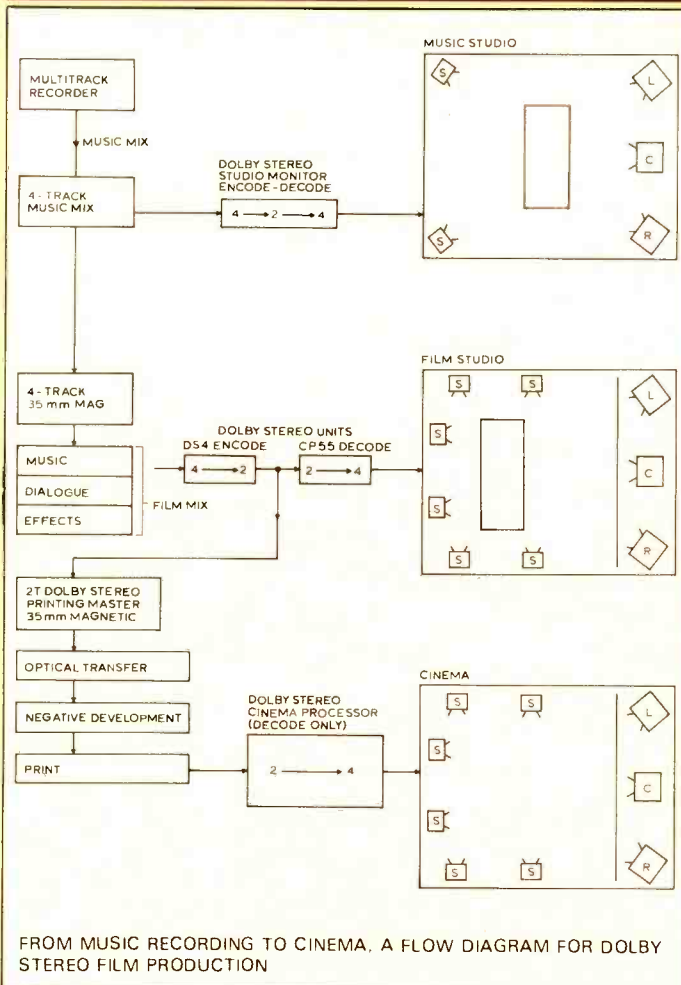
the dubbing mixer is only too happy to mix with all the tracks level, he is mixing other effects and dialogue for example, and the ability to make small changes to the music balance to avoid a singer becoming obscured by some effects can be very worthwhile. An alternative format would be to keep the percussive sounds separated from the sustained sounds such as strings because when the music is mixed with dialogue the percussive sounds can be left at a higher level than the sustained sounds without obscuring the dialogue.

Dolby Laboratories have several sound consultants who work with the film production companies to help them with all aspects of the sound side of film-making. It is always a good idea to have a music production meeting with the director, composer, music editor, dubbing mixer, music mixer and Dolby consultant to discuss the various requirements and to decide on the format for the music recording. One of the factors to take account of is that quite often the music from a film will also be released on record. With most recordings made 24-track this allows sufficient flexibility for both the film and record mixes.

At what stage should the *DS4-2-4* be used? Although it could be used just for the mixdown it is preferable to use it throughout the recording sessions for two reasons, first having spent some time listening to the mix building up while recording, putting the *DS4-2-4* in can be quite a surprise and a little unnerving. Secondly when using the *DS4-2-4* throughout it is possible to make small changes when recording such as controlling the ambience by changing mic position particularly for things like drums where several mics will be used, or by changing the programmes on stereo synthesisers, as any stereo source will be affected by the matrix to some degree. With the *DS4-2-4* in use from the outset these changes are automatic and will make the final mixdown easier.

With most films it will be necessary to have picture available in the studio either projected or from video tape, with the latter you will need monitor televisions in the studio and the control room. Whilst music such as front and end title music can normally be recorded without picture, a lot of the music in between is scored to fit very tightly to the action often to

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one sprocket hole ie $\frac{1}{96}$ s. The music editor will produce a click track for each piece of music to help the conductor keep time with the picture, this means the conductor and some if not all of the musicians will require headphones.

Unlike pop videos, film music is recorded to match the picture. The one exception is for musicals where the songs are recorded so that the film can be shot to a music playback on the set.

If you don't have a film recorder to mixdown on, the best solution will be to mix on to an 8-track tape machine as this means you can mix up to six-tracks and have timecode as well. This tape will then go to one of the film mixing studios for transfer to 35mm sprocketed tape which will then be cut to match the film by the music editor.

It is quite normal to use the signal processors that most studios have such as limiters, compressors, delays and reverb units but remember the matrix is phase sensitive and delays and reverbs are likely to result in some signal appearing on surround, although having the

DS4-2-4 in the monitor means you will be able to judge the effects of these devices. With reverb it is usually better to use a little less than you would for a record as cinemas have a much longer reverberation time than control rooms and of course this adds to the reverb in the mix. It is difficult to judge how much reverb to use but err on the dry side, after all if it is found to be too dry when in the dubbing theatre there is no problem in adding a little extra, on the other hand it is rather more difficult to remove if there is too much.

Dolby consultants are sometimes asked whether different mic techniques or studio layouts should be used for stereo films. Due to the large differences between studios and between the music requirements of different films any advice can only be very general. In the first place studio layouts which give good results for records will probably work fine for film although it will be helpful for the mixdown to try and keep reasonable separation between

the instruments. If recordings are made with many overdubs or using instruments and synthesisers which are direct injected, then separation will of course be excellent and will allow more flexibility on the mixdown.

The most common point raised about mic technique is, 'should stereo pairs be used?' This is particularly relevant to orchestral sessions. Like most things it is governed by the sort of score the composer has written. Certainly, stereo pairs can be used at times and as coincident pairs are phase coherent the amount of signal going to surround will be less than spaced omnis. Also it can be controlled by the choice of polar characteristic, cardioids, giving less surround than figure-of-eights. On the other hand the latter will give a wider stereo when their angle is opened up to 110° to 120° instead of the conventional 90° although this might leave a hole in the middle on the record mix and a centre fill will be needed. The alternative technique using M(sum) and S(difference) stereo pairs has produced some excellent results as the width can be controlled by varying the relative gain of the M and S channels, also by changing the M(sum) mic from omni to cardioid the amount of surround signal can be varied.

In general very few problems are likely to arise and those that do will become immediately apparent when mixing with the *DS4-2-4* in the monitor. A recent problem occurred when a composer wrote the music for two separate bands, one to play on the left and the other on the right, unfortunately one band started before the other and when the second band started the image of the first band shifted towards the centre somewhat because the logic steering in the decoder had been hard to one side and was then opened up by the second signal. There didn't seem to be an easy solution until it was found out from the sound editor that the bands would be playing in the middle of a huge battle with lots of effects, these would keep the matrix wide open and solve the problem. Fortunately such problems are few and far between but this emphasises the need to use the *DS4-2-4*, and if you have any worries or problems ask the Dolby consultant who is there to help you and the production company got the best possible results. When it's all finished take an evening off, go to your local Dolby-equipped cinema and enjoy the film. □



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BUSINESS BUSINESS



Barry Fox investigates the facts behind the industry news

Surround with mono

If you are passing through Milton Keynes new town this winter, try to stop off to visit the new cinema complex.

With seating capacity of 2,000 The Point is 10 cinemas under one roof, all with fully automated projection and all with Dolby Stereo.

There are three projection rooms, two of which serve four cinemas at the same time. All the Cinemeccanica projectors use CNR platters or 'cake stands'. Up to 8,000 m of film is wound on a single platter, looking rather like a pancake of tape. The film pulls out from the centre of the platter, runs through the projector and then winds on to the centre of an identical platter. At the end of the performance the projectionist swaps platters and re-laces by pulling film from the centre of the second platter. If the queues outside the cinema show that one film is especially popular, the projectionist can run the single print through two, three or all four of the projectors. The film runs round the projection room like a snake.

Each cinema has a Dolby CP55, four Cinemeccanica C200 power amplifiers, three JBL 4760A speakers behind the screen and eight JBL 4401 surround speakers. Each cinema also has sub woofers fed from the Cat 241 card in the Dolby CP55, and a 300 W amplifier made by Smart Systems of Atlanta, Georgia.

The news is that each cinema also has a gadget called a Smart 1130B stereo surround synthesiser. The idea of this is to trick up mono prints into stereo with surround. Here's how it works.

The Smart has a comb filter which splits the mono signal into 20 narrow frequency bands, with one half of the comb routed to the left and the other to the right. It also generates a hard centre channel which leads the side channels by 11 ms and must be set 6 dB louder than the sides. At the same time the Smart detects special effects from the mono track and routes them to surround speakers. How on earth does it do this?

The Smart data sheets suggest that it works like a noise gate. It is, and I quote, "... only on during special dramatic effects in the film... a logic system 'votes' between dialog and effects on the soundtrack... a voltage controlled amplifier circuit quickly fades the surround in and out rather than chopping it on and off". The surround channel also has time delay to mask bleed through from the front.

The set-up manual explains how the "surround detect sensitivity" pot must be pre-adjusted so that special effects on the track trigger the surround system but dialogue doesn't. What Smart calls a "truth table" explains how the surround will turn on and off.

For voice only, surround is off; for soft music, it's off; for effects, it's on; for soft

effect and voice, it's off; for loud effects and voice, it's on; for loud music, it's on. Personally I have always thought that mono should be left as mono, rather than tricked up to become pseudo stereo. The idea of tricking it even further to become pseudo surround and stereo, sounds pretty worrying. But it's unfair to pre-judge. That's why I suggest that anyone passing through Milton Keynes might like to stop off and get an earful of The Point, especially if one of the 10 cinemas is showing a mono print.

Simulcast sound

Don't blame Channel 4 or Capital Radio for the rather odd-sounding simulcast which was transmitted in the London area on New Year's Day. Capital broadcast the stereo soundtrack of *Blue Suede Shoes*, a rock show shot at Limehouse and featuring Carl Perkins, George Harrison, Eric Clapton and Ringo Starr. But it sounded more like mono. On this occasion it was a case of never mind the width, feel the quality.

Channel 4 ran a 1 in C-format video tape of pictures and stereo sound. A mono mix was broadcast as a Channel 4 soundtrack and the stereo feed sent via the BT Tower to Capital for re-transmission on VHF FM. The commercial breaks came from Thames Studios, next door to Capital. As Thames normally uses an automated system of 2 in video tape cartridges with mono track, the two minute stereo commercial for *A Chorus Line* was sourced from 1 in video tape at Thames.

Everyone agrees that 'Suede Shoes' was ideal material for a simulcast; it sounds like a radio programme without pictures. Everyone agrees that people in the London area who tuned into VHF FM heard higher quality sound through their hi-fi system than those who had to listen through a grotty TV set. Channel 4 and Capital want to repeat the experiment. But privately their engineers make no bones about the fact that they were very disappointed with the 'Suede Shoes' sound. The music was like spread mono; the applause was even narrower. Anyone who tried running the signal through a surround sound decoder got zilch from the rear channels.

The reason was beyond the control of Channel 4 and Capital. Dave Edmunds mixed the sound from a Limehouse multitrack and took a deliberate, policy decision not to go for wide stereo. He wanted a sound in keeping with the era of the original music. There was talk of a re-mix for the simulcast but it was vetoed. So what went out was as near as makes no difference mono.

Under the circumstances it was probably a good thing that Channel 4 failed miserably to advertise the simulcast in advance. Let's hope that next time Channel 4 and Capital get

together they will be able to find something with a bit of width.

Stereo reincarnations

When researching the story on Brad Kay's stereo recreation (using separate old disc masters for the left and right channels) I phoned EMI in London. In fact I phoned several people inside EMI. It got pretty wearing, explaining the whole story from beginning to end on each occasion. I found no-one inside EMI who had heard of the Brad Kay experiments or who had ever thought about the possibility of using separate master discs to recreate stereo.

The reaction from EMI people ranged from sceptical to open-minded. Some EMI engineers were very helpful but no-one seemed convinced that Kay's theories were sound. 'Very plausible' was the nearest I got. That's understandable. When I started researching the story I thought it was a hoax or an innocent mistake.

My talks with EMI were back at the beginning of October. Just before Christmas an interesting piece of news filtered through the grapevine from Abbey Road. After hearing my copy of Kay's taped examples EMI engineers had pulled out matched takes of old recordings from the archives and were blending them together into stereo. It now looks as if EMI will issue some matched pair stereo, probably early Elgar, but not describe it as such. EMI will then see what the critics have to say about the recordings. If reaction is good, there will be more recreations and more reissues. I asked EMI for official comment. There was none. I shall watch with interest to see how the EMI publicity people handle this. Will they give due credit to Brad Kay for the original discovery, or will they dress it up as an EMI innovation?

There is already a whole lot of politickin' going on inside EMI. Some people still think it's all a mistake. They worry about EMI getting egg on face. Some worry about other companies getting in first. 'Tip of the iceberg' is one phrase being bandied around. First researches show that the contract deals on some disc record pairs may be split between EMI and RCA Victor in the US and even between different EMI companies. The EMI empire has been through a string of splits and mergers since the old HMV days. Burrowing through the '20s paperwork is going to take as much time as matching disc pairs and syncing them up.

Meanwhile Michael Gerzon of Ambisonics *et al* is, as usual, one step ahead of everyone else. Is there any chance that three discs were made on some sessions, he wonders. If so they could be the basis of UHJ from the '20s.

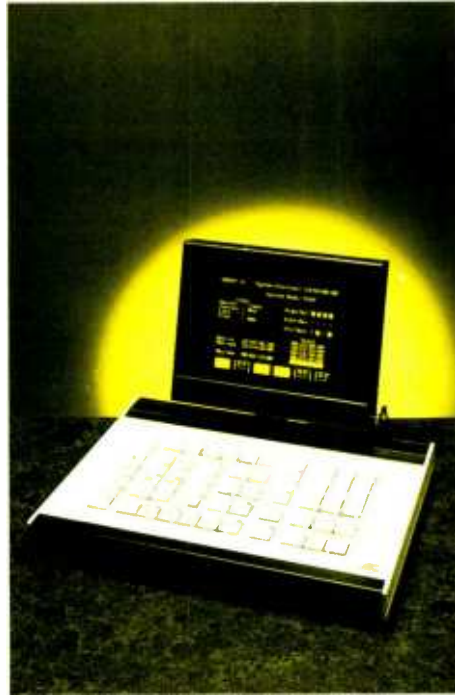
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REVIEW REVIEW

A user report by Keith Spencer-Allen

BROOKE SIREN SYSTEMS DPR 402

The Brooke Siren Systems DPR402 is a multiple function dynamics processor which the manufacturer describes as a compressor, de-esser and peak limiter. In practical terms the DPR402 is far more versatile than that. In fact its versatility is such that a user review with its necessarily restricted length cannot fully get to grips with this unit. This review, therefore, is more a guide to its full possibilities rather than being an exhaustively definitive study of all the operational permutations.

The DPR402 is housed in a 1 U, 19 in rack-mount case. It contains two independent channels of dynamics processing that may also be interlinked as we will discover later. The design incorporates a type of user hierarchy of operation in that there is a basic 'plug it up-turn it on-and forget' mode; a full front panel control user level; and finally the full level of operation involving breaking into the dual side chain and rear panel cross patching that should meet most sophisticated user requirements.

The DPR402 functions in a slightly different way from standard compressors. The main signal path is simple and consists of an input de-balancer, subsonic and ultrasonic filters, a subtractor stage, gain control and an output line driver. Compression occurs when the threshold setting is exceeded and the subtract side chain generates a 'suitably scaled version of the input signal' and subtracts it from the main signal at the subtractor stage. If the phase of the subtract side chain signal is reversed, the scaled signal is added to the main signal rather than subtract thus creating expansion rather than compression. The control side chain

contains all the front panel settings to provide the correct scaling to the voltage controlled attenuator. Both of these side chains can be accessed. The wide range of effects possible will be covered later.

Front panel layout

The controls for the two channels are laid out as completely independent sets of controls on either side of the three large centrally located buttons. The lower of these three buttons is the power on/off with its associated LED. Above this are the bypass switches for each channel. These large, self-illuminating red buttons indicate that the channel controls are operational. A particularly clever aspect is that although in the bypass mode the input signal is connected through to the output, it is also still passing through the front panel controls. So with the effect of these controls being out of circuit it is still possible to set levels (with input and output meters reading) and adjust controls, hit the bypass switch and come in circuit already set up with levels correct which is useful for broadcasting and live sound use.

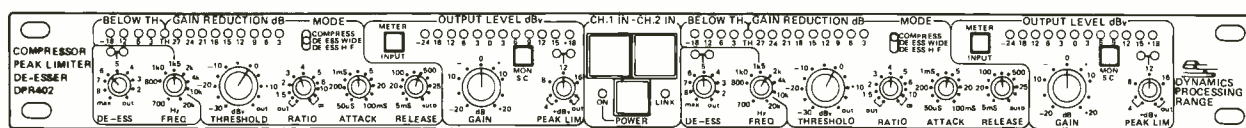
To the right of the power switch is the stereo link LED indicating that the detector outputs of both channels have been coupled together by a switch on the rear panel for stereo operation.

Rather than work physically through the front panel it will be easier to follow if we now look at groups of functions, the principal section being that of compression. Gain reduction in compression is made by a voltage controlled attenuator with a 30 dB range. The threshold control is adjustable from -30 dBV to +20 dBV although the very fullest clockwise position of this knob is marked OUT meaning that with the

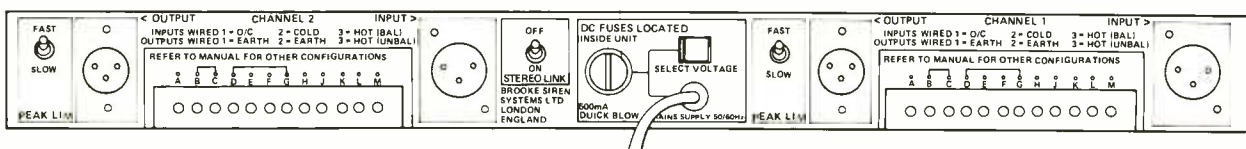
threshold at this setting only signals clipping the input stages would exceed the threshold. Above the threshold control is a chain of 14 LEDs marked Below TH and Gain Reduction dB. The five Below TH LEDs indicate signals below threshold with the top LED being halfway illuminated all the time as a useful threshold indicator. Once the input signal exceeds the threshold, the amount of gain reduction is displayed on the other half of the LED chain. Should input signals use more than 30 dB gain reduction then the intensity of the display will increase which should draw the operator's attention to the problem.

To the right of the threshold control are the ratio, attack and release controls. The compression ratio is adjustable between 1:1 and 1:∞. It is also possible to obtain over ∞ settings (expansion) by rear panel adjustments that will be covered later. Attack time has a range of 50 μs to 100 ms in 11 switched steps. Although continuous adjustment always seems preferable, 11 switched steps did not prove any great hindrance in operation. Release time is adjustable from 5 ms to 5 s in 10 switched steps. At the extreme clockwise rotation there is a position marked Auto which is a mode that sets both the release and attack time automatically, related to the programme signal. This control is the heart of the simplest level of DPR402 operation; with the unit in that mode, all the operator effectively has to do is set up the input and output levels roughly and then forget about the unit.

The gain control is on the output stage for adjusting output gain over a range of ±20 dB. The LED ladder above this control is the output level meter. The meter also incorporates a similar feature to the gain reduction meter where, when the output level exceeds +20 dB, the

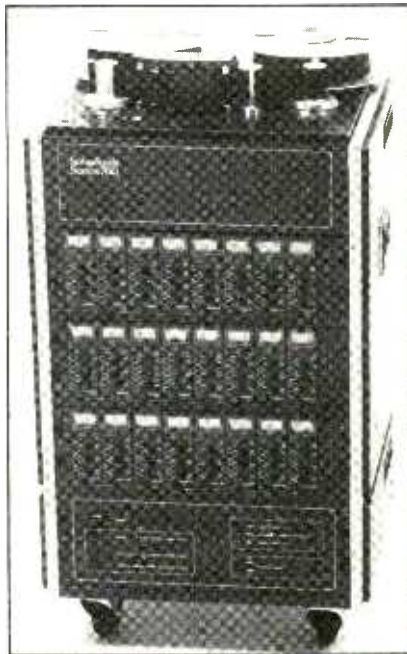


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REVIEW REVIEW

LED display gains in brightness to catch the operator's eye. At the left hand end of the meter is a small square momentary action switch that allows the output level meter to display the input level to that channel. This is invaluable in setting up operational levels particularly when the mixing console output metering is not visible from the equipment racks to allow sight of the input level to the unit.

By the gain control is another switch labelled Mon SC. This is the side chain monitor which allows the monitoring of external inputs to the side chain. Remaining in this section is the peak limiter control, a separate stage of gain reduction intended to catch fast transients 'missed' by the compressor although designed to work with the compressor section. The ratio is internally set at 20:1 with a threshold range of +4 dBV to +20 dBV. Attack and release times are internally set but a switch on the rear panel allows a choice between preset fast or slow settings. The limiter also has a pair of LEDs—the green to show the onset of limiting and red to show limiting in excess of 10 dB.

If we now return physically to the compression section, there is a 3-position switch labelled Mode just by the gain reduction meter. The positions of this switch are Compress, De-Ess Wide and De-Ess HF. For normal compression use this switch will be in the Compress position; the other two positions select the de-essing functions.

The DPR402 has two de-ess modes. With De-Ess Wide, compression triggered by high frequency energy will be applied across the full programme frequency spectrum. In De-Ess HF, compression is

used only on the frequencies that exceeded the selected HF threshold. With De-Ess Wide mode selected, the Freq control is still active. The normal threshold control sets the amount of gain reduction. Freq is a variable high pass filter that should be adjusted until the frequency of the filter is about the same as that of the lowest frequency of the sibilance energy. With this broadband type de-essing, the main compressor section can be used as a normal compressor together with the de-ess functions on the same channel. In the other mode, De-Ess HF, the De-Ess control is inoperative; Freq controls an internal high pass filter inserted into the subtract side chain, and the control side chain filter simultaneously over a de-essing range of 700 Hz to 20 kHz. The effect of the Freq control can be monitored on the side chain monitor mode. The de-ess compression characteristics are controlled by the main compressor controls making that channel now just a versatile de-essing system.

This completes the front panel controls except that there is, of course, another set of these controls repeated for the other channel. The panel is painted a dark grey and the legends a cream/white colour. Layout is straightforward and easy to understand although I have to admit that when first confronted with the unit, it is not so easy to see how controls relate to each other. In operation, however, you find that the controls fall easily to hand and the logic of the layout then becomes obvious.

Rear panel

All programme inputs and outputs to the

unit are 3-pin XLR-type sockets. The input is actively balanced with an unbalanced output. On both sockets, the 'hot' pin is pin 3 which appears to be the standard that Brooke Siren Systems have found to be required of them. The pin connections are, however, clearly marked on the rear panel and as long as this is noticed during installation the appropriate steps may be taken. The power cord enters in the middle of the unit with associated voltage selector and fuse holder. In addition there is the already mentioned stereo link switch and separate switches for peak limiter fast/slow characteristics settings for each channel.

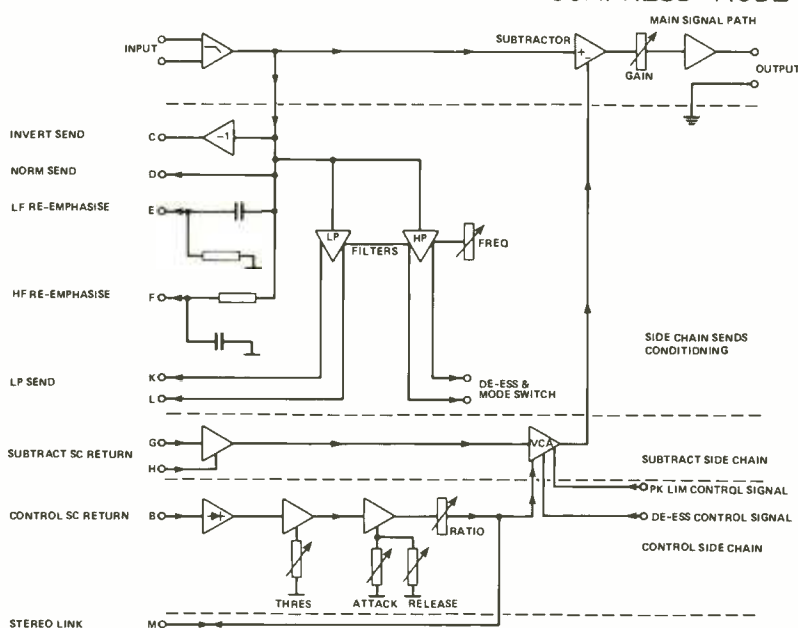
Not so far covered on the rear panel is a barrier strip that allows connection to the higher level of operation functions such as the subtract and control side chains, inputs and outputs. There is a separate barrier strip for each channel with each having 12 connections. These are ground; insert return control side chain; insert send reversed phase; insert send normal phase; insert send LF re-emphasised; insert send HF re-emphasised; insert return subtract side chain; insert return subtract side chain gain link; another ground connection; insert send subtract low pass filter; insert send control low pass filter; and stereo link. As you can see, a real experimenter's paradise and the reason why this review will be less than exhaustive. Some of these terminals have connections across them as standard as obviously the subtract and control side chains need to be closed by links or via external equipment for the unit to function. Should you wish access to these functions it would seem sensible to bring them to a patch bay positioned beneath the unit itself.

The manual supplied with the DPR402 does not contain any proper circuit information or component values for servicing but the rest of the manual is very clearly laid out and takes the user through the unit from basics in such a way designed to match the multi-level experience of users—it is also quite easy just to check some particular feature. All operations are explained in terms of front and rear panel diagrams. Due to the complexity of the unit and the possible number of front and rear panel settings and connections, I would have liked to have seen the inclusion of one large set of front and rear panel drawings to photocopy and allow storage of particular important settings of effects, etc.

Rear panel effects

Several pages of the manual are given to some of the effects possible using the rear panel connections and what front effects to then expect from the front panel controls. Some of the areas I experimented with was narrow band

SIMPLIFIED BLOCK DIAGRAM FOR COMPRESS MODE



REVIEW REVIEW

compression and expansion, ie compression or expansion at HF or LF only. With drums and percussive instruments this effects area can be interesting particularly in salvaging dodgy recordings from the multitrack.

Amongst the possible effects listed we have HF re-emphasised compression (compression higher at low frequencies); a more extreme version of the same; LF re-emphasised compression, ie greater compression at HF; wide band LF control compression which modulated the entire frequency band by the frequencies under the setting of the Freq control; Narrow band LF compression as previous but only compressing on those frequencies below the Freq setting; Wide band expansion; LF expansion only; expansion with bands under the Freq control; external gain control of wide or narrow band operation, and amplitude controlled mixing. In this latter case it is possible to create effects such as adding an external signal to the main output of the unit whenever the threshold is exceeded by the programme signal. For instance good examples here might be adding reverb to a snare drum track or perhaps on a vocal track only on the louder sections.

There is another mode that allows the summing of an external signal with the main programme as above but under the control this time of the external signal or even another external signal—this is without touching on the possibilities of linking the other channel in. It is possible to interconnect up to four channels simply by use of the barrier strips.

In use

I have to admit that it took a couple of hours to become familiar with this unit although after that I was away. You do not have to get involved in the higher rear panel function at all as there is plenty of scope on the front panel particularly in the area of de-essing. On the review model, the two channels had been set up differently, internally—one with a 'soft-knee' type compression point and the other with a 'progressive hard knee'. I understand that this is simply an internal jumper connection. The differences between the two channels were as you would imagine and if you are thinking of these units as complex processors then this might be a good way of retaining maximum possibilities.

I find that when accessing dynamics units I listen for nasty clipping and other unpleasant sounds that cannot be adjusted out or tend to occur too easily. The *DPR402* was quite free of these types of effect in the normal front panel modes.

I found the controls flexible with a sensible range that allows everyday work while still permitting the more extreme functions even without playing the rear panel.

Conclusion

The Brooke Siren Systems *DPR402* is a unit to be suggested for your perusal. It functions well and offers a very wide range of dynamics control possibilities although still being a useful simple device for those applications that do not demand user overkill. The suitable range of applications for a such a unit must include just about every audio application imaginable although live stage work was obviously very high in the designer's mind. I could certainly

imagine several of these units with the rear panel facilities brought out on to a patch bay being exceptionally useful in the processing of old analogue multitracks and mix masters for CD release as well as in the area of cleaning up old film soundtracks. This unit deserves a solid recommendation.

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REVIEW REVIEW

A user report by Patrick Stapley



LEXICON 200

The Lexicon 200 has been available for some time now. It started life as a 3-program unit and has recently been expanded to six programs. New programs are provided free of charge through authorised dealers.

The 200 is unmistakably a Lexicon product with its traditional blue exterior being reminiscent of the *Prime Time*. It fits into a standard 19 in rack although somewhat tall at 5¼ in and 15 in deep.

The basic operation is similar in concept to the 224X in that there are a number of factory preset sounds arranged in programs, with each program consisting normally of 10 variations. Any of the factory sounds can be changed by using the various parameter controls and the result can be stored on one of 10 registers in the unit's non-volatile memory.

The six stereo programs are labelled:

- 1 Halls
- 2 Plates
- 3 Chambers
- 4 Rich Plates (giving the quality of a *Gold Foil* plate)
- 5 Rich Splits (allowing one to use left and right channels as two totally separate controllable mono reverbs with a chamber characteristic)
- 6 Inverse Room (giving non-linear and

reverse echo effects).

The Inverse Room program is the only effects program on the 200 and this is an area where I feel the unit could be usefully expanded in the future. Having said that, the 200 does offer a comprehensive range of reverb with sound quality that matches the 224X at a third of the price (UK).

Operation

The 200 is divided up into three sections and labelled on the front panel as Program, Reverberation and Audio.

The Program section situated at the left of the unit consists of a numeric keypad, four function buttons and a 5-digit alpha-numeric display. This section deals with the loading of programs and their variations as well as storing and accessing the memory registers. The operation is very straightforward. To load a program one simply presses the function button PGM followed by the number of the program required. The display will read something like '3P' showing you that the Chamber program has been loaded. Whenever a program is called up in this manner it will be selected to Variation 1. To go to another variation one presses the decimal point key at the bottom of

the keypad followed by the variation number. The display will read the number of the program, a decimal point and then the number of the variation. To store a register the function button STO is pressed along with the number of the register. It is important to have both buttons held down together, otherwise nothing will happen; this is a safety feature to prevent accidental erasure of registers.

To recall a register, press the function button marked REG followed by the number. One other control worth mentioning whilst on this section is the key marked F. This is used in conjunction with Rich Split and switches between left and right mono channels allowing independent parameter changes to be made.

The next section, Reverberation, is situated in the middle of the unit and deals with the control and display of seven parameters. These are Predelay, Reverb Time, Size, PreEchoes, Diffusion, RT Contour and Roll Off.

Predelay, Reverb Time and Size are arranged vertically each with their own rotary pot and display window. The maximum predelay time is 999 ms but this is dependent upon the selected program and size, as is the minimum value; so in the case of a 'medium sized

REVIEW

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chamber' setting the minimum value is 18 ms which cannot be switched out and the maximum value is 672 ms.

The first 50 ms of any predelay setting are in 1-division steps; the next 100 ms are in 2-division steps; the next 200 ms are in 4-division steps, and thereafter in 8-division steps.

The Reverb time at its widest setting has a range of 1 to 99 s. (Minimum reverb time can be shorter at lower maximum settings.) This, like the Predelay, is dependent upon selected program and size; and for a 'medium sized chamber' it ranges from 0.4 to 47 s. There is also an infinite setting that appears in Programs 3, 4 and 5 which allows one to freeze sounds into the reverb and also to layer sound on sound to produce ethereal chords.

The size control is measured in meters and has a range of 5 to 99. Lexicon describe this scale as follows: 5 M suggests a closet, 10 M a living room, 20 M a large room, 30 M a recital hall, 40 M a large concert hall and 99 M is the equivalent to the space of the Astrodome. The range of the size scale is program dependent and, as has been seen, can effect predelay and reverb time values.

Pre-echoes are either on or off, and are controlled by a pushbutton with its associated LED. The pre-echoes are meant to simulate stage reflections and they generally add more body to the sound. Being factory set and changing between variations in the same program it can make it impossible to copy a variation by duplicating the parameters on another variation.

Diffusion controls the extent to which the reflections of the initial sound spread out in time and a single push button cycles between high, medium or low diffusion. High diffusion tends to smooth out the reverb giving it a 'blankety' texture, whereas low diffusion creates a sharper clearer sound.

The Reverb Time (RT) Contour is responsible for controlling the low (100 Hz) and high (10 kHz) frequency decay times. There are two pushbuttons marked Low and High that cycle between three values of decay for each frequency. The values are arranged as multiples of the overall reverb time. The bass end is divided thus: x1.5, x1 and x0.5 and the high end into x1, x0.5 and x0.25. So for example with a reverb time of 1 s you can lengthen the bass RT to 1½ s and decrease the high RT to 250 ms. The display has been cleverly laid out to give a graphic indication of the contour selected.

The last parameter is Roll Off, and this like Diffusion, consists of a single pushbutton that selects between high, medium or low. High selects a 48 dB/octave filter at 10 k, medium and low a 6 dB/octave filter at 7 k and 3 k respectively. The display here also plots a curve.

Whilst on the subject of parameters it is worth describing how the variations arrange themselves parametrically. Imagine the keypad as a grid of rows and columns with variation 1 in row 1, column 1 and variation 9 in row 3, column 3. There are three parameters that arrange themselves into the same pattern for each program (except program 6 which only has four variations). Each row affects the size. Row 1 (ie variations 1, 2, 3) will always be large, row 2 medium and row 3 small. The columns affect the reverb time and pre-echoes. Column 1 (variations 7, 4 and 1) has a medium Reverb Time and no pre-echoes, column 2 has a medium reverb time and medium pre-echoes and column 3 has a short reverb time and loud pre-echoes. The system seems rather complicated but as one gains familiarity with the unit everything falls into place making it quick to find a suitable variation. There is also a variation 0 which is identical to variation 1, except it has a more metallic quality and should be used if any problems occur with modulation noise.

The last section, Audio, is on the right of the front panel and deals with inputs and outputs. The stereo input level slider in conjunction with a gain switch at the back of the unit allows input levels from -18 to +24 dBm to be dealt with. The output level is set by two gain screws which in normal circumstances shouldn't have to be tampered with. The maximum output is 24 dBm. There is an output mix slider that in most studio cases will be set to wet but for a live performer it may be useful to have control over the balance between direct and reverberant sounds. Below the sliders there are two buttons, Input Mute and Reverb Stop. Input Mute cuts all direct signal to the unit leaving the reverb to hang over and Reverb Stop allows just the direct signal to be heard. One of the more useful facilities of this section is Input Mix. This does away with the need to parallel patch when using a mono input to feed the stereo reverb channels. For example by pressing in the Left Input Mix button both reverb channels receive the same

mono signal from the left input. The same applies with the right input button. With both buttons in, the stereo reverb receives a combined mono signal from both inputs. With the two buttons out normal stereo working is restored. A 12-segment stereo LED display measures the signal in the reverb channels between -20 dB and 12 dB overload. The unit's inputs and outputs are by way of balanced XLR plugs.

The 200 has been designed with the live performer very much in mind, and a set of remote inputs at the back allow the unit to be controlled by three foot pedals: the program step pedal which can also access the memory; the reverb time pedal; and the input mute pedal which allows the reverb to die away naturally whilst retaining the dry signal.

The last operative function I will mention is the self diagnostic power-up. When the unit is switched on or the reset button is pressed the unit goes through a 15 s series of diagnostic programs. If a problem is encountered an error message will appear on the display, if all is well then the unit returns to the last user setting. There are also a number of more specific tests that can be run to diagnose problems.

Summary

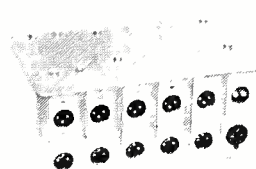
I found the sound quality of the 200 to be every bit as good as the 224X, with excellent stereo and good natural sounding programs. I was able to produce all the basic reverberant conditions quickly and easily although I missed some of the effects programs.

As far as parameters are concerned one is obviously not going to have the same control as the more expensive units but what is there, is certainly adequate for most needs. In view of the relative price and the possibility of new, free, programs in the future I think this unit is worth investigating.

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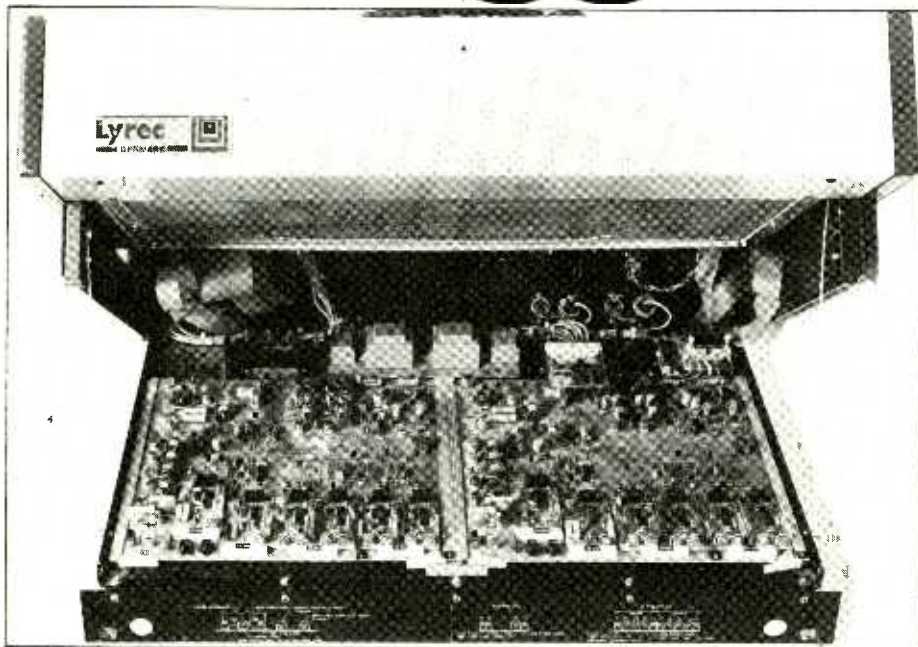
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REVIEW REVIEW

Hugh Ford reviews a stereo tape machine

LYREC TR55



The Lyrec TR55 is intended for studio use and can be used on a table top or in one of two types of stand. Both types hold the recorder in a horizontal position with the fixed stand keeping the recorder 850 mm above the floor and the elevator type allowing the height to be varied between 740 mm and 930 mm.

Construction is quite novel, giving a lightweight machine with excellent access for servicing. The tape transport is constructed from a flat 7.8 mm thick plate of special alloy, said to have been formulated for the aerospace industry.

This plate is secured to a fabricated steel frame across the middle and at the sides and front with the remainder of the chassis being formed from 15 mm square steel sections.

The full width base plate of the recorder hinges at the rear so it can be dropped down to reveal the complete audio electronics which are fitted to the hinged section. The tape transport components are on the underside of the tape transport plate.

Releasing a single recessed Allen screw at the front of the recorder allows the extruded alloy front panel to be pulled forward in the form of a full width

drawer, the base of which is covered by a mother board which supports over 20 plug-in daughter boards, all of which comprise the tape transport control.

This section has numerous LED indicators showing the status of the machine in addition to a number of adjustments, in the form of skeleton and multiturn potentiometers, covering tape speed, tape lifter speed, capstan drive, etc.

Other than identifications on the mother board, which are very good, there were no component identifications to aid servicing. However, the instruction manual includes circuits, board layouts and good servicing information.

With the tape transport control drawer inserted and the hinged base clipped into its working position a small hinged section at the bottom front of the recorder hinges down to reveal all the audio channel adjustments which are well identified.

Each complete audio channel is contained on a single plug-in printed circuit board which may be pulled out at the front of the recorder, the audio input and output transformers being within the recorder. At the front of each audio channel board four small boards plug-in to set the desired equalisation standards for two tape speeds, which may be any combination of 30, 15 and 7½ in/s.

Other than a control for setting the DC balance of the output amplifiers all controls can be accessed at the front of the audio boards with the boards in position, bias and erase current may be monitored at jack sockets with trimmer capacitors setting the bias and erase resonance, a multiturn potentiometer setting an auxiliary bias current (which is selected by a switch on the board) and a normal potentiometer setting erase current.

On the record equalisation sub-board multiturn potentiometers set bias, record level and high frequency (18 kHz) equalisation with a 270° potentiometer setting high/mid equalisation at 10 kHz.

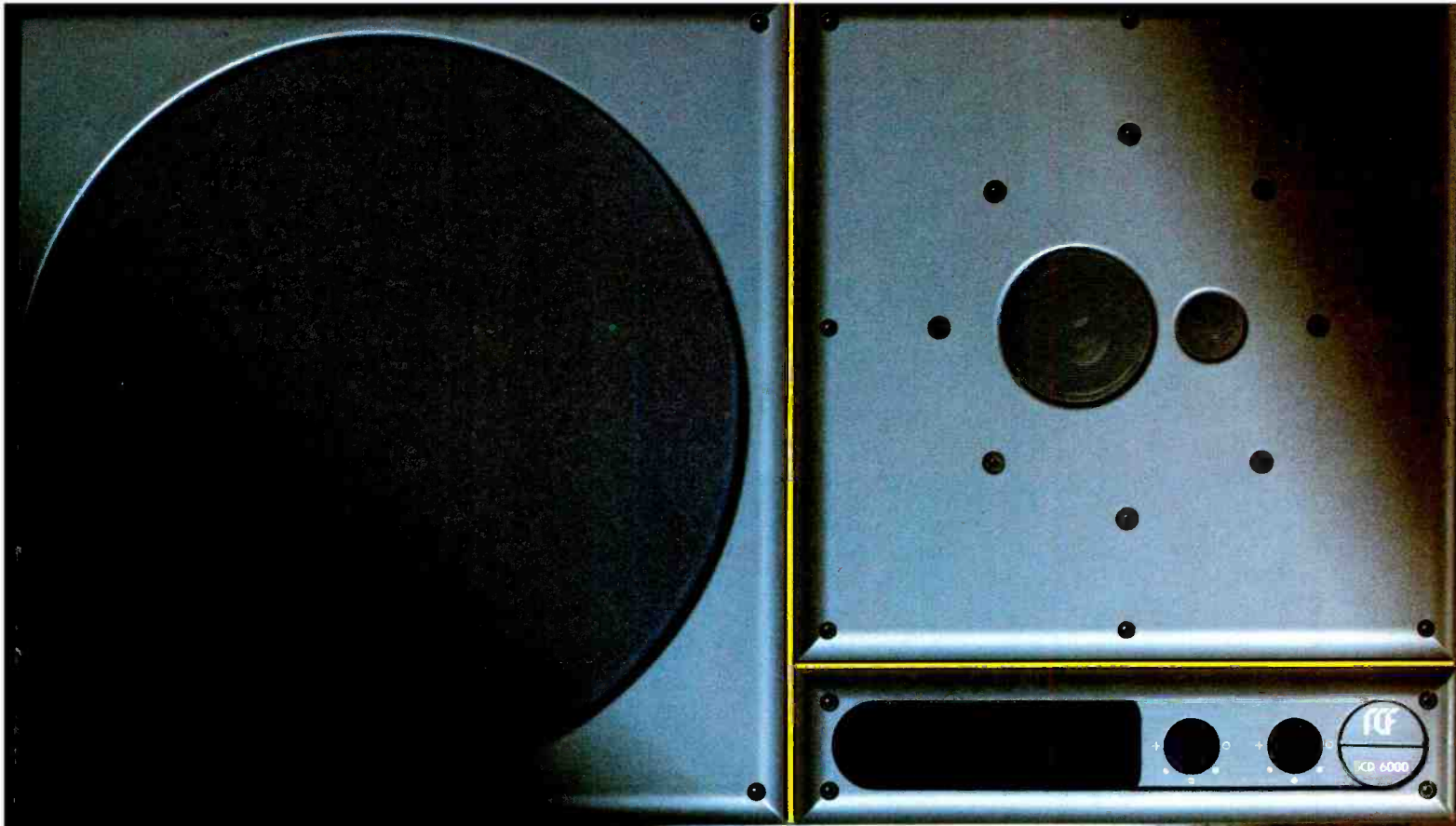
The replay equalisation sub-board which has separate controls for replay and sync replay has multiturn controls for level and high frequency (18 kHz) equalisation in addition to 270° controls

Tape speed: 762, 381 or 190.5 mm/s (any two speeds to order). Varispeed -50 to +100%.
Reels: NAB, DIN and Cine. 3 in to 14 in.
Long term speed stability: better than 0.1%.
Rewind: approximately 80 s for 1,000 m tape. Approximately 60 s for 2,400 ft tape.
Stop time: maximum 3 s from wind speed.
Tape tension: 90 p (0.9 N) in play. <175 p (1.75 N) in any other mode.
Wow & flutter: 381 mm/s RMS weighted—maximum 0.04%; 190.5 mm/s RMS weighted maximum 0.07%.
Start time with 10% in reels:
 Approx 0.5 s to reach 0.1% wow & flutter at 762 mm/s.
 Approx 0.4 s to reach 0.1% wow & flutter at 381 mm/s.
 Approx 0.3 s to reach 0.1% wow & flutter at 190.5 mm/s.
Timer accuracy: ±0.1%, electronic display

MANUFACTURER'S SPECIFICATION

indicating hours, minutes, seconds at two speeds. Negative prefix below zero.
Signal input: balanced and floating. Input impedance 10 kΩ -6 dB to +24 dBm input level (adjustable) to produce 510 nWb/m tape flux.
Signal outputs: balanced and floating. Output impedance 40 Ω maximum. 510 nWb/m tape flux causes output level 0 to +8 dBm (adjustable). Maximum unclipped output level +24 dBm into 200 Ω.
Equalisation: NAB or CCIR.
Signal to noise ratio (Rec-repro):
 381 mm/s: RMS unweighted 62 dB; RMS A-weighted 68 dB.
 190.5 mm/s: RMS unweighted 60 dB; RMS A-weighted 67 dB.
 All values refer to 510 nWb/m tape flux. RMS unweighted values measured with bandpass filter 30 Hz to 15 kHz.

Frequency response (record/replay):
 381 mm/s: 60 Hz to 18 kHz ±1 dB. 30 Hz to 19 kHz ±2 dB.
 190.5 mm/s: 60 Hz to 16 kHz ±1 dB. 30 Hz to 17 kHz ±2 dB.
Erase efficiency: >75 dB at 1 kHz.
Crosstalk: >40 dB/1 kHz.
Connectors: audio connections with XLR-type connectors.
Power requirements: 90 to 130 V, 200 to 240 V ±10%. 50/60 Hz, 280 VA.
Working conditions: ambient temperature range: +10 to +40°C. Humidity range 30 to 90%.
Weight: tape deck 39 kg, floor stand 11 kg, floor stand with castors 20 kg, elevator floor stand 20 kg.
Manufacturer: Lyrec Manufacturing A/S, Hollandsvej 12, DK-2800 Lyngby, Denmark.
UK: Scenic Sounds Equipment Marketing Ltd, Unit 2, 10 William Road, London NW1 3EN.



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REVIEW

REVIEW

for low frequency (40 Hz), mid frequency (4 to 8 kHz) and medium-high frequency (10 to 15 kHz) equalisation.

To the rear of the recorder the power supply is a self contained unit at the middle with a finned heatsink to the rear with the two reel drive power amplifiers having similar heatsinks at either side of the rear.

Power input is via an IEC connector with an adjacent, correctly identified power fuse with two terminals securing a removable ground link. The power consumption of the machine is incorrectly identified as 280 AV instead of 280 VA. Internal fuses accessed through the hinged base protect the DC lines.

Audio inputs and outputs are floating at XLR connectors with an additional 4-pin XLR plug providing an unbalanced auxiliary sync output and a 3-pin Tuchel connector permitting a remote record indication for the two channels.

Remote control is via a 25-way audio remote control plug and a 25-way tape deck remote control socket. The former has input and output signals for the levels in the two channels in addition to record indicator feeds all of which would normally feed the optional VU meter bridge which fits at the rear of the machine.

The tape deck remote connector has lines (to be switched to +24 VDC) for all the tape deck controls to be described later, feeds of all internal DC rails and a fader start connection.

A second 25-way D socket provides a slave display output for a remote tape time display. This output is a decoded output for five digits in the form of 7-segment displays.

Turning now to the tape transport itself the two 150 W DC reel motors equipped with solenoid operated band brakes are mounted off centre on to circular plates. The complete sub-assemblies are secured to the bottom of the deck plate by Allen screws through the top of the plate. The mounting is such that the assemblies can be mounted in two positions such that the unit can accept 12 in reels in one position or 14 in reels in the other—a clever idea.

The directly driven reel platters are designed such that they can accept special clip-in adaptors for Cine, AEG (European hubs) or NAB reels. The NAB adaptors are Revox types fitting on to the special Cine type adaptors which clip into the reel platters.

From the reels the tape passes to fully protected large diameter (about 60 mm) rollers fitted above holes in the deck plate. Whilst the right hand roller has no function except as a tape guide the left roller is fitted with a slotted tachometer disc, the rotation of this is detected by infra-red and is used to detect tape speed for the servo system and tape timer.

Following in the tape path at either

side are fully protected tape tension arms with an edge guide at the far side of the spring loaded arms. The position of the arms (hence tape tension) is detected by effectively an eccentric disc on the arm hubs, the position of which is sensed by an arrangement of infra-red diodes with their associated electronics having two adjustments for each board.

From the fixed guides the tape proceeds to the head area to the right of which is the directly driven capstan. The metal capstan of 7.986 mm diameter is directly driven by a DC printed motor fitted with an optical tachometer disc on the other end of its shaft.

The pinch roller is operated by a solenoid fitted with a variable transformer type position sensor, the solenoid moving a cast alloy linkage which provides positive positioning of the roller.

The headblock itself plugs into a floating 25-way D connector and is based on a 5.9 mm thick, black anodised, alloy plate. To the back of the plate two hollow stainless steel legs locate on spigots let into the deck plate providing positive lateral location with a third leg at the centre back providing further vertical location.

To the front, fixed guides at the entry and exit locate the tape in addition to providing a further vertical reference for the headblock which is secured to the deck plate by a single non-captive Allen screw.

Heads are a ferrite, twin gap erase head and metal record and replay heads by Woelke in the 2.75 mm stereo format.

These are slung below the headblock plate with identical mountings giving solid location with azimuth and tilt adjustments, there being a needle bearing flutter roller adjacent to the replay head.

When in position on the recorder, the headblock is covered with an alloy trim which incorporates a splicing block having 90, 60 and 45° cutting angles. However, an option is a pair of inbuilt scissors operated by pressing a plunger to the rear of the headblock. These operate in a rather cunning way in conjunction with the two combined tape lifters and edge guides located between the erase and record heads and between the record and replay heads. These are independently operated by solenoids equipped with variable transformer position sensors.

One feature is that touching the scissors plunger operates the right hand tape lifter before cutting the tape precisely above the replay head at 45°. Another novel feature of the tape lifters is that their normal operation depends upon tape speed, such that they lift the tape above a preset speed of 60 in/s.

The tape transport controls are recessed into the top of the extrusion that forms the front of the unit with a small monitoring loudspeaker being

located behind holes in the front of the extrusion. The level at this loudspeaker and at the headphones jack in the top of the extrusion is controlled by a lever which operates the level potentiometer, inserting the headphones mutes the loudspeaker. Whilst the headphone feed is in stereo the loudspeaker is fed with left plus right.

To the right of the controls two illuminated pushbuttons select the current tape speed only whilst in the stop mode. The very clear tape timer to the left of the controls follows the tape speed setting showing time in hours, minutes and seconds with negative readings being shown. In addition the tape timer can display tape speed in inches per second.

Associated with the tape timer are four pushbuttons one of which resets the timer to zero and another of which locates zero time, remaining illuminated during this operation. The second pair of buttons set and locate a cue point, it being possible to set the cue point at any tape speed. Pressing one of the locate buttons followed by start, locates the desired point and then puts the machine into replay without stopping.

At the centre of the controls are the conventional fast, play, record and stop buttons, all illuminated buttons indicating the current status. In addition there is an Edit button and a rotary control. A number of editing possibilities are available. The rotary control is a touch sensitive variable speed winding control. This is activated by touching it simultaneously with the Edit button after which the tape may be wound in either direction at variable speed by moving the control, however, the tape speed remains constant for any given control setting. This allows the tape to be wound for storage at any fixed high speed, the normal high speed winding being far too fast for good winding at 500 in/s.

Pressing the Edit button in the variable fast mode puts the tape in contact with the replay head. Another trick with the Edit button is to press edit in the replay mode when the tape is lifted from the record head. Record may then be entered with the tape out of contact with the record and erase heads—subsequently pressing play and record allows programme to be dropped-in as the record head tape lifter drops the tape on to the record and erase heads.

In the normal stop mode the tape may be rock-and-roll edited by handling either spool with the edit button releasing tape tension in this condition. From here, pressing start initiates the tape dump mode.

An anti-dump mode is entered by pressing and holding the Play button with the tape tension released around the pay-off spool and using manual tape tension to wind the tape on to the take-up spool—care is needed here, as any



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REVIEW REVIEW

tape tension arriving at the pay-off spool will initiate an immediate and violent action by the pay-off motor. Provided manual tape tension is used the machine can also replay tape loops and short lengths of tape.

A number of options are available using six sections of the 8-way dual in line (DIL) switch on the mother board within the drawer. The audio outputs may be muted in the stop mode and demuted only with the tape at the normal running speed, or, also demuted in the stop mode and only muted in fast wind and during acceleration to the play speed.

After editing the tape tension may be restored by pressing start, wind or edit wind, however, a DIL switch also allows the automatic tape tensioning to be restored by manually applying tension to both spools.

Spool braking is normally achieved by dynamic braking but this may be switched off to give very steady tape handling and a long stop time and also the replay head tape lifter may be activated or not activated in the edit wind mode. The further DIL switch functions select either high or low speed operation at switch on and select a steady or flashing stop light when the tape is not loaded.

The optional VU meter bridge, which was not supplied with the review machine, is easily retrofitted to the rear of the machine to which it is secured by four screws.

In addition to containing the two VU meters, above which are record indicators, the bridge has four potentiometers for uncalibrated input and output level settings for the two channels. A single switch in each channel sets both the input and output levels to calibrated or uncalibrated.

A further switch puts both meters to measure either the input level or replay level, these being identified as PRE or POST. Finally a further switch with a warning LED selects calibrated speed or varispeed, the latter being controlled by coarse and fine speed adjustment potentiometers. Simultaneously pressing the play button and the current speed select button displays the current tape speed in the tape timer display with a resolution of 1/10 in/s whilst the buttons remain depressed.

The mechanical finish of the machine is excellent and to the highest European standards with servicing of the mechanical parts being extremely simple.

Turning to the electronics, there is rather a large number of adjustments relating to the operation of the tape transport but the control method has been carefully chosen and provided that the circuits are stable this should not present any problem.

With all integrated circuits being socketed and all boards being plug connected either to other boards or by

means of ribbon cables fitted with insulation displacement connectors, servicing of the electronics is straightforward. Whilst I would have preferred to see component identifications on the printed circuit boards, good layout diagrams and clear circuits are included in the instruction manual.

In operation the machine is extremely quiet with the minimum of noise when starting and stopping—in fact the pushbuttons make more noise than the solenoids! The complete machine ran very cool with no detectable temperature rise of the deck plate or reel hubs.

At sensible tape speeds the machine wound tape well but the fast wind speed of 500 in/s is asking too much and I feel it should be halved whenever operationally possible. The tape tension was unusually well controlled, being 80 g at either reel in the play mode and peaking around 160 g at maximum acceleration in the fast modes in which it fell back to 80 g once speed stability had been reached.

Inputs and outputs

The floating, transformer coupled input were found to have an impedance of 10 k Ω constant with gain with the good common mode rejection being shown in Fig 1. As received the input level for recording 320 nWb/m on Ampex 456 tape was +0.3 dBm at 15 in/s or -0.3 dBm at 7 1/2 in/s with the record level control having 8 dBm gain in hand and being of the full range type.

The maximum input level that could be handled was in excess of +36 dBm with the overall input capabilities being entirely satisfactory.

At the floating, transformer coupled, replay outputs the level as received for replaying 320 nWb/m was -0.3 dBm for both channels at 15 in/s and at 7 1/2 in/s with the available range of the replay sensitivity controls being +17 dB to - ∞ .

The output impedance was found to be

about 18 Ω at 1 kHz with the output drive capability being in excess of +30 dBm. At the unbalanced sync outputs the available level for a recorded fluxivity of 320 nWb/m was +18 dBm from a source impedance in the order of 70 Ω . As received the sync outputs delivered +5.8 dBm for a recorded fluxivity of 320 nWb/m.

At the headphone monitor outputs one channel was faulty having low gain with the other being capable of clipping the output at 5 VRMS out from a very low impedance, the headphone gain control having a satisfactory range.

Commands delivered to the tape deck remote control connector are either returned to +24 VDC (included in the connector) or to 0 V with momentary contact being required to initiate the various commands. Those commands returned to +24 VDC such as start, stop and rewind required a contact rated at 175 mA whilst the commands returned to zero were +5 VDC levels drawing 4.3 mA when grounded.

The remaining signals of interest at this connector are the capstan sync connection and the varispeed connection. The latter needs to be fed from the centre tap of a potentiometer between ± 15 VDC.

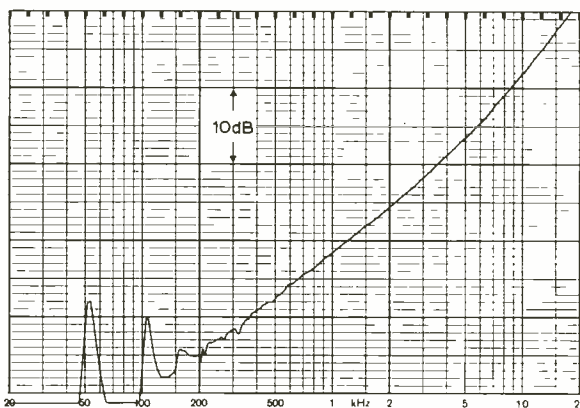
The remote record indicator output at the 3-pin Tuchel connector delivered +22.7 VDC from a source impedance of approximately 180 Ω when the machine was set to the record mode.

Frequency response

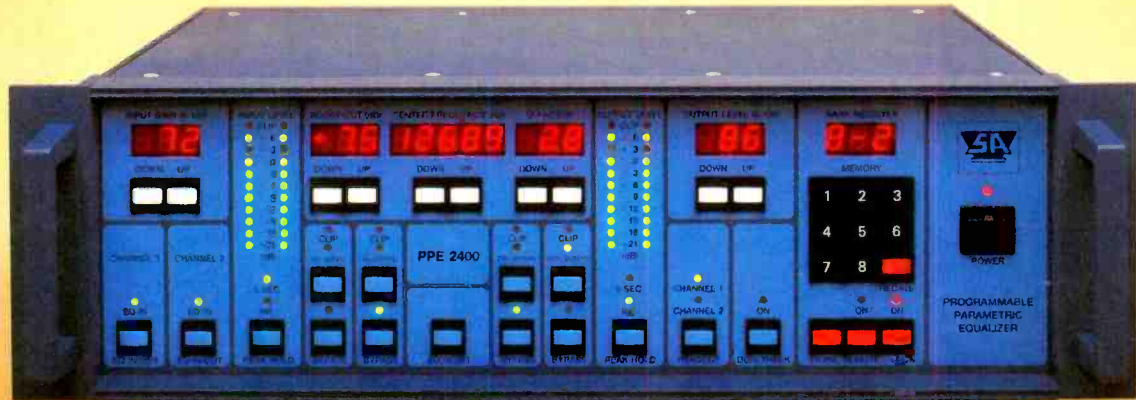
The replay frequency response was initially checked against the nominal IEC equalisation of 35 μ s at 15 in/s and 70 μ s at 7 1/2 in/s using BASF calibration tapes. Whilst the azimuth was correct both channels at both speeds showed a small lack of high frequency response. This was confirmed using Ampex calibration tapes with the results shown in Table 1.

Before correcting these deviations the

FIG. 1
COMMON MODE REJECTION
ZERO LEVEL -100dB



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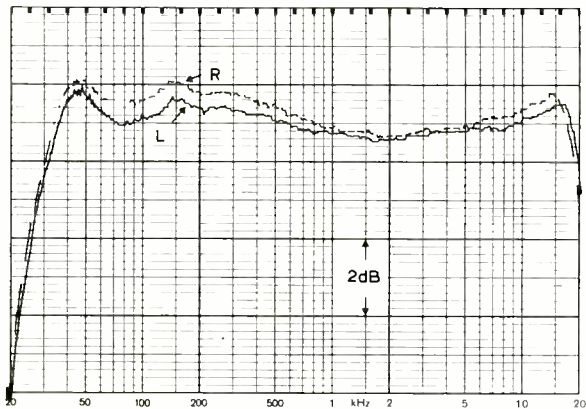
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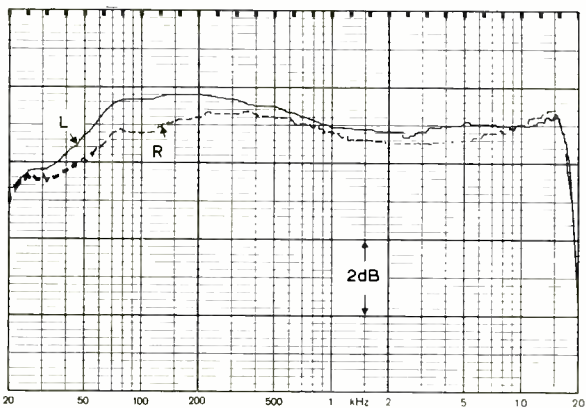
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FIG. 2
RECORD/REPLAY FREQUENCY RESPONSE
ZERO LEVEL -20dB/320nWb/m



(a) 15 IN/S



(b) 7 1/2 IN/S

TABLE 1 Replay frequency response

	Left channel	Right channel
15 in/s	+0/-1 dB	12.5 kHz
	+2/-2 dB	18.0 kHz
7 1/2 in/s	+0/-1 dB	12.5 kHz
	+0/-2 dB	18.0 kHz

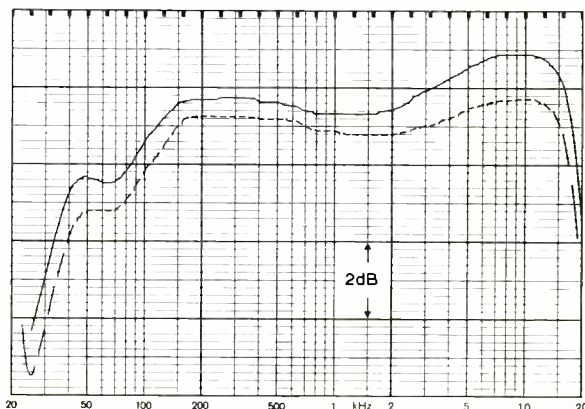
Ref: 1 kHz

TABLE 2 Record/replay frequency response

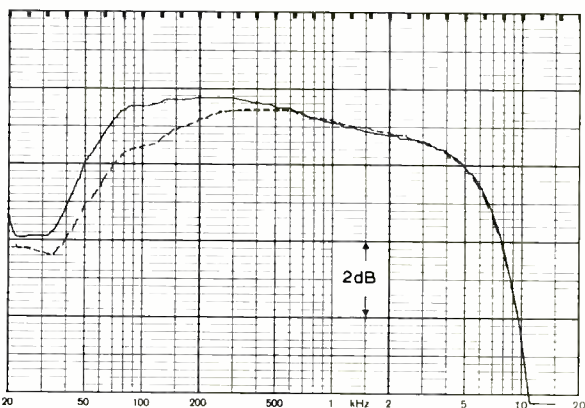
	Left channel	Right channel
15 in/s	+1/-1 dB	31 Hz to 19.0 kHz
	+1/-3 dB	26 Hz to 20.7 kHz
7 1/2 in/s	+1/-1 dB	30 Hz to 17.5 kHz
	+1/-3 dB	18 Hz to 18.8 kHz

Ref: 1 kHz

FIG. 3
RECORD/SYNC RESPONSE
ZERO LEVEL -20dB/320nWb/m

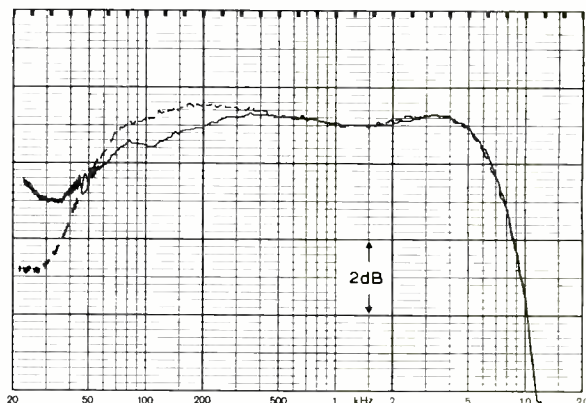


(a) 15 IN/S



(b) 7 1/2 IN/S

FIG. 4
IMPROVED SYNC RESPONSE AT 7 1/2 IN/S
ZERO LEVEL -20dB/320nWb/m



record/replay frequency response was investigated using Ampex 456 tape for which the machine had been aligned by the manufacturer. As shown in Fig 2 the overall frequency response was very flat with both channels being closely matched to within 1 dB. In addition the head profiles gave the very minimum of low frequency deviations.

Table 2 shows the record/replay

frequency response of the two channels for both tape speeds.

The record/sync response at the two tape speeds is shown in Fig 3 where again the channels are closely matched. The performance at 15 in/s is very good. However, it was felt that the 7 1/2 in/s performance could be improved by better machine alignment. Fig 4 shows how the high frequency response can be raised

giving a -3 dB point around 8 kHz.

The low frequency and three high frequency equalisers were investigated at 7 1/2 in/s. Bear in mind that equalisation is set to a particular standard by inserting sub-boards thus the available range is not intended to cover more than a single equalisation standard.

Fig 5 shows that the low frequency equaliser has cut available but no boost.

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REVIEW REVIEW

with nothing to spare when covering the 3180 μ s time constant or an infinite time constant. Also shown is the mid

frequency equaliser which has an adequate range. The performance of the mid-high

frequency equaliser is shown in **Fig 6** and the high frequency peaking equaliser in **Fig 7**, both having a useful effect. Overall the three high frequency equalisers allow a very flat frequency response to be obtained.

In practice the same circuits (with one small exception) are used for the replay and sync functions but the response of the latter is limited by the record head gap, making very high frequency equalisation rather meaningless.

Similarly the record equalisers were investigated at 7½ in/s using Ampex 456 tape over-biased by 3.5 dB at 10 kHz with the range of the equalisers being well contrived as shown in **Fig 8** for the medium-high equaliser and **Fig 9** for the high frequency equaliser.

Overall the equalisers in the record and replay amplifiers permit precise adjustment of the frequency response at medium and high frequencies. Whilst the adjustments of this number of controls is time consuming, the results are well worthwhile if a really flat frequency response is to be obtained. I would, however, like to see a little more range in the low frequency replay equalisers.

Noise and distortion

Weighted noise varied little between the replay mode and the sync mode when replaying Ampex 456 tape which had been recorded with bias but no audio signal. **Table 3** shows the averaged results for both channels in normal replay and in sync.

Unweighted measurements band limited 22.4 Hz to 22.4 kHz under the same conditions in the replay mode averaged 60.2 dB and in the sync mode 55.6 dB, all the replay figures agreeing closely with the manufacturer's claims.

Measurements of the machine with the amplifiers unmuted but with no tape running, are another story. **Table 4** shows the left/right noise for the normal replay and the sync modes. The first thing apparent from these figures is that in normal replay the quasi-peak figures show the left channel to be significantly worse than the right channel, the other figures following this pattern. This is caused by breakthrough from the digital

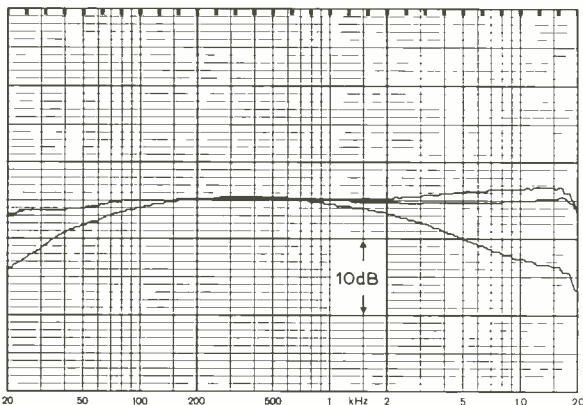
TABLE 3: Weighted noise

Measurement method	Reference level (320 nWb/m) to noise	
	15 in/s IEC	7½ in/s IEC
A-weighted RMS	65.3 dB	64.7 dB
CCIR-weighted RMS	56.8 dB	55.8 dB
CCIR-weighted quasi-peak	51.8 dB	52.9 dB
CCIR-weighted ARM ref 2 kHz	62.2 dB	63.3 dB

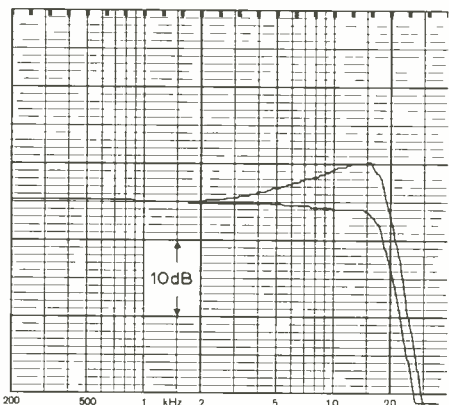
TABLE 4 Left/right noise—no tape

Measurement method	Reference level (320 nWb/m) to noise			
	15 in/s IEC		7½ in/s IEC	
	Replay	Sync	Replay	Sync
Unweighted 22 Hz to 22 kHz	62.1/63.3 dB	57.0/58.2 dB	63.7/63.7 dB	55.2/56.7 dB
A-weighted RMS	74.2/78.2 dB	69.7/72.2 dB	74.2/76.2 dB	69.7/71.0 dB
CCIR-weighted RMS	69.7/72.7 dB	67.2/69.2 dB	66.7/69.7 dB	64.2/65.7 dB
CCIR-weighted quasi-peak	62.7/68.7 dB	62.2/64.7 dB	59.2/65.2 dB	59.7/62.2 dB
CCIR-weighted ARM ref 2 kHz	76.7/79.2 dB	72.2/73.7 dB	74.2/76.2 dB	70.7/71.7 dB

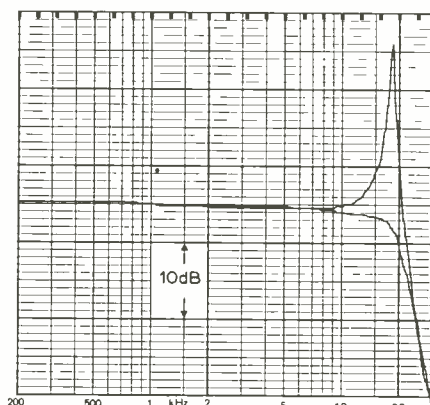
**FIG 5
LF AND MID-HF EQUALISERS
7½ IN/S REPLAY**



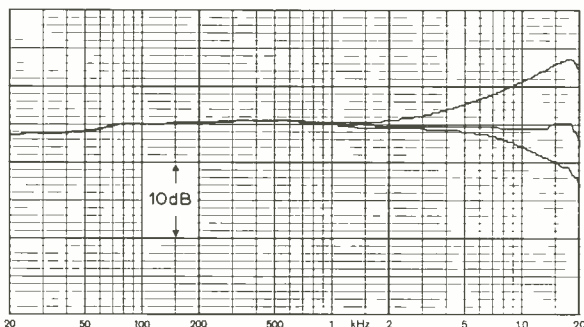
**FIG. 6
MID-HF REPLAY EQUALISER**



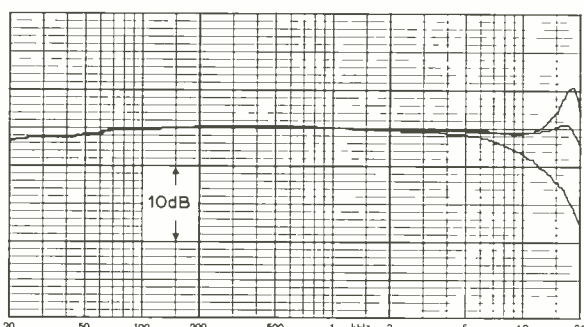
**FIG. 7
HF REPLAY EQUALISER**



**FIG. 8
MID-HF RECORD EQUALISER**



**FIG. 9
HF RECORD EQUALISER**



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REVIEW REVIEW

electronics into the left channel via the ribbon cables which are fed across the top of the audio amplifier board, the breakthrough varying with the position of the ribbon cables.

Whilst this situation is unsatisfactory, the margin between noise in the right channel with and without tape is excellent in the weighted measurements.

Whilst noise in the sync mode is deteriorated in comparison with normal replay, the performance is quite satisfactory. Power line hum within the machine was not a problem but as no hum shield is incorporated over the replay head, some care is needed to site the machine clear of magnetic fields as it is prone to hum pickup from external sources.

Harmonic distortion at 1 kHz when recording on Ampex 456 tape over-biased by 3.5 dB at 20 kHz at 15 in/s or 10 kHz at 7½ in/s was good as shown in Table 5. Clearly the 100 kHz bias frequency has low even order distortion with the maximum output level for 3% third harmonic distortion being +10.5 dB reference 320 nWb/m at both tape speeds.

The maximum record drive had a margin greater than 10 dB above this level with the replay amplifier having a similar good margin. Recording and replaying a 1 kHz square wave produced Fig 10 which is rather unusual and I suspect is related to some form of phase compensation in the machine.

Wow, flutter and speed

Wow and flutter was measured to the IEC quasi-peak standard both weighted and unweighted at the beginning, middle and end of the NAB reel of tape. Very good and consistent results were obtained as given in Table 6.

Tape speed variations from the beginning to the end of a reel were less than 0.005% with the relation between the two tape speeds being to within 0.13%—this error being subject to adjustment.

The varispeed voltage input could vary the speed over an extremely wide range with the speed variation closely approximating 10% per volt input, positive or negative for increase or decrease in tape speed.

Other matters

Recording a 10 kHz tone at 15 in/s and undertaking a narrow band spectrum analysis of the replayed tone produced Fig 11 which shows remarkably good lack of sidebands with those that do exist being at ±15 Hz and ±30 Hz from the carrier, this corresponding to the capstan diameter.

Phase jitter between the tracks was also to an excellent standard as shown in Fig 12 for a 10 kHz tone at 15 in/s where the vertical scale is 5° per division and the horizontal scale 1 s per division.

Crosstalk between tracks shown in Fig 13 for 15 in/s is approximately 10 dB better than the manufacturer's claim, being 50 dB at 1 kHz. Erasure of a 1 kHz tone at 15 in/s was better than 82 dB for both tracks—a satisfactory performance.

Summary

The Lyrec TR55 is a very well built machine with a finish matching the best standards of mechanical engineering. The novel design makes the machine unusually easy to maintain with access to all parts being really excellent.

In the electronics area the majority of adjustments have a sensible range with the mixture of multiturn and conventional potentiometers providing precise alignment. There are, however, rather a large number of adjustments both in the audio channels and in the transport control.

Overall the audio performance was very good but the manufacturer should do something about the noise in the left audio channel introduced by the ribbon cable.

The tape transport has particularly good features for editing with its variety of tape handling modes, with tape handling normally being good. However, a degree of care is needed when editing in some modes as the reel motors can be accidentally started. □

TABLE 5 Harmonic distortion

Speed	Second harmonic	Third harmonic
15 in/s	0.05/0.04%	0.42/0.44%
7½ in/s	0.035/0.045%	0.63/0.58%

TABLE 6 Wow and flutter

Tape speed	Beginning	Middle	End
Weighted			
15 in/s	0.018%	0.018%	0.018%
7½ in/s	0.016%	0.018%	0.019%
Unweighted			
15 in/s	0.055%	0.06%	0.06%
7½ in/s	0.08%	0.085%	0.09%

FIG. 11
NARROW BAND SPECTRUM ANALYSIS
1kHz TONE AT 15 IN/S

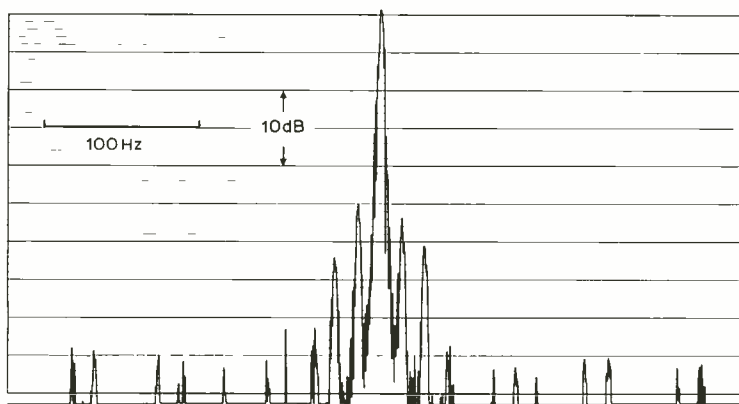


FIG 10
REPLAYING 1 kHz SQUARE WAVE

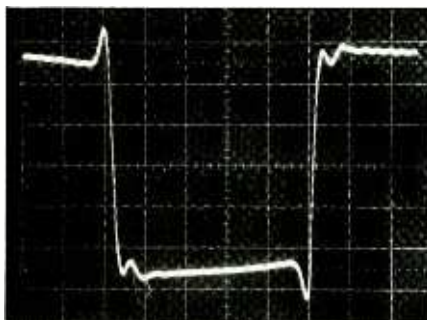
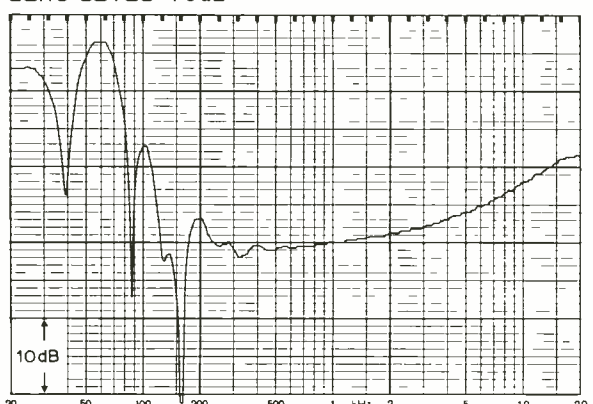


FIG 12
PHASE JITTER



FIG. 13
CROSTALK AT 15 IN/S
ZERO LEVEL -70dB





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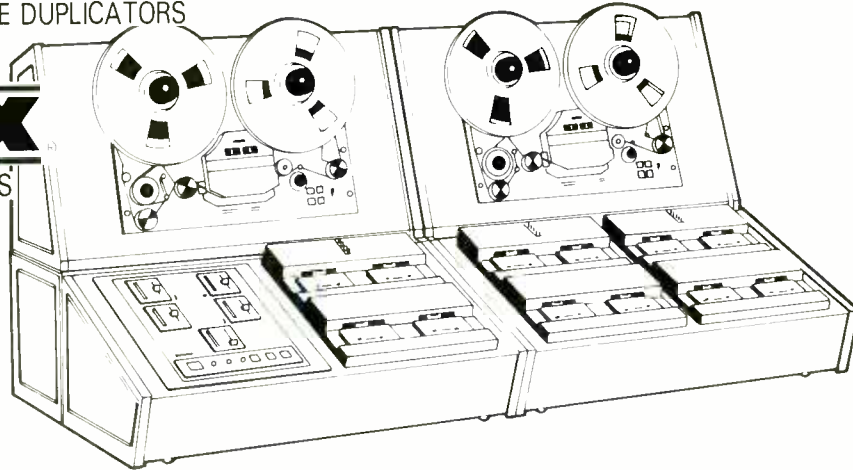
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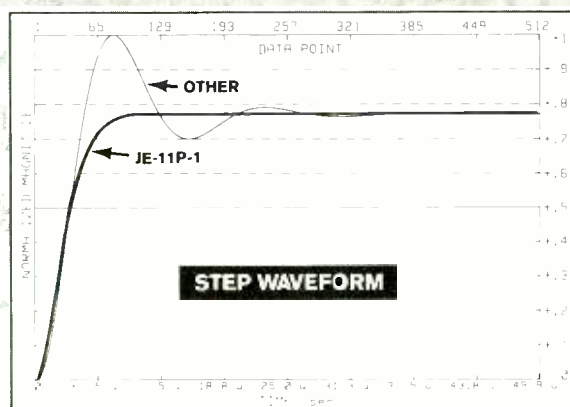
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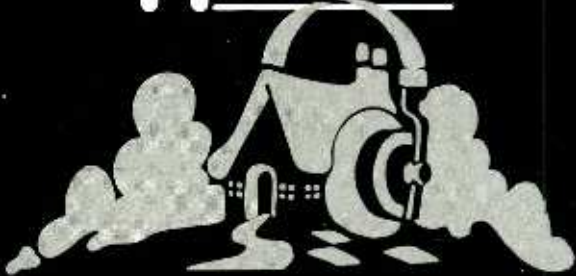
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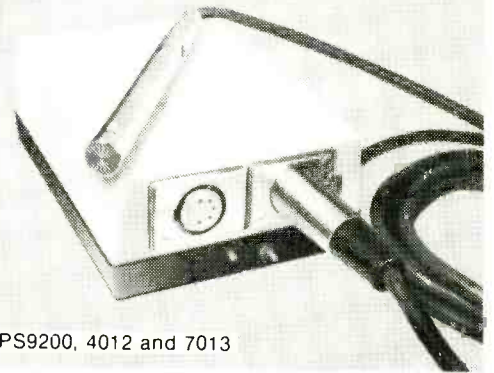
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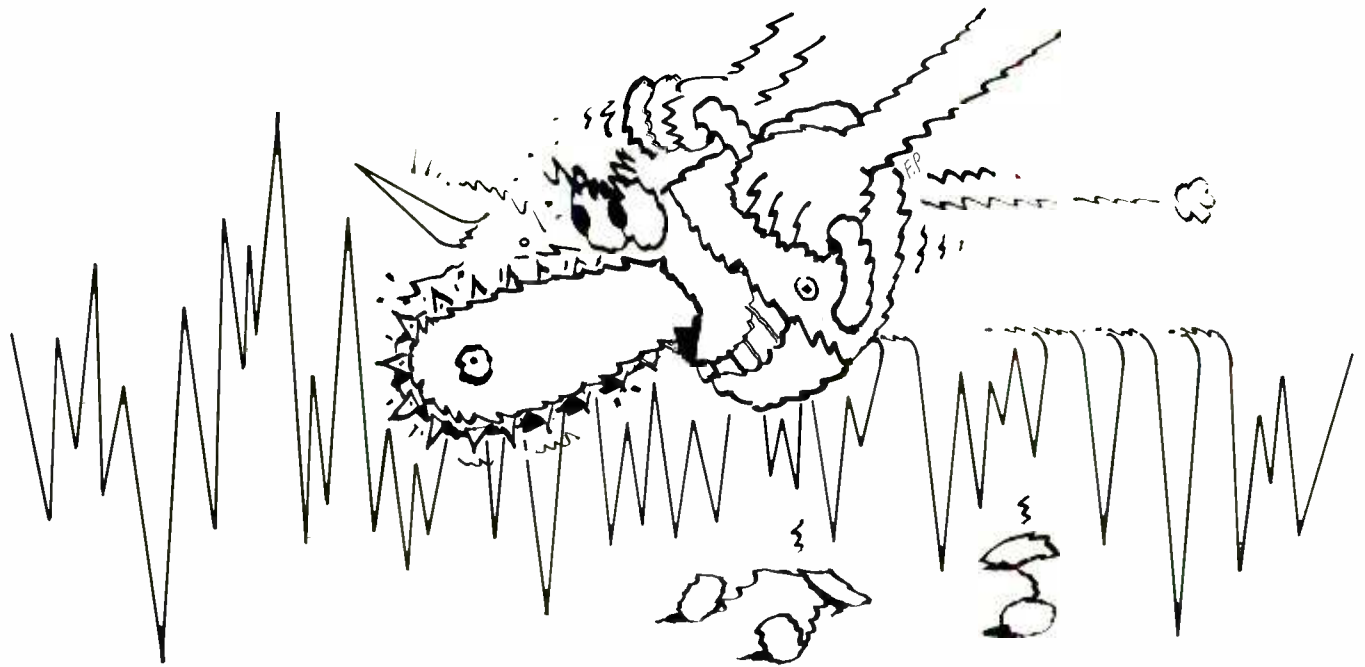
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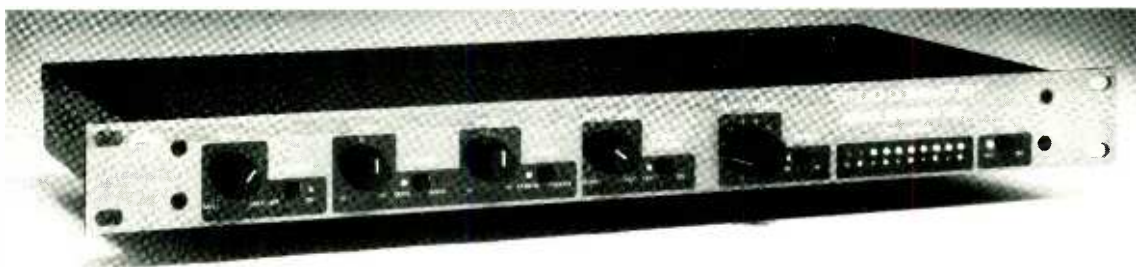
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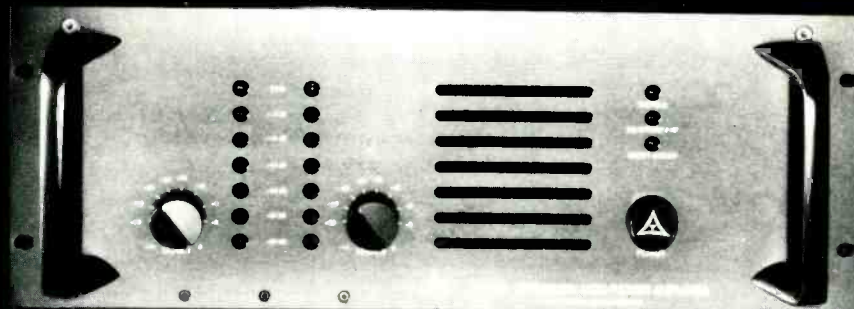
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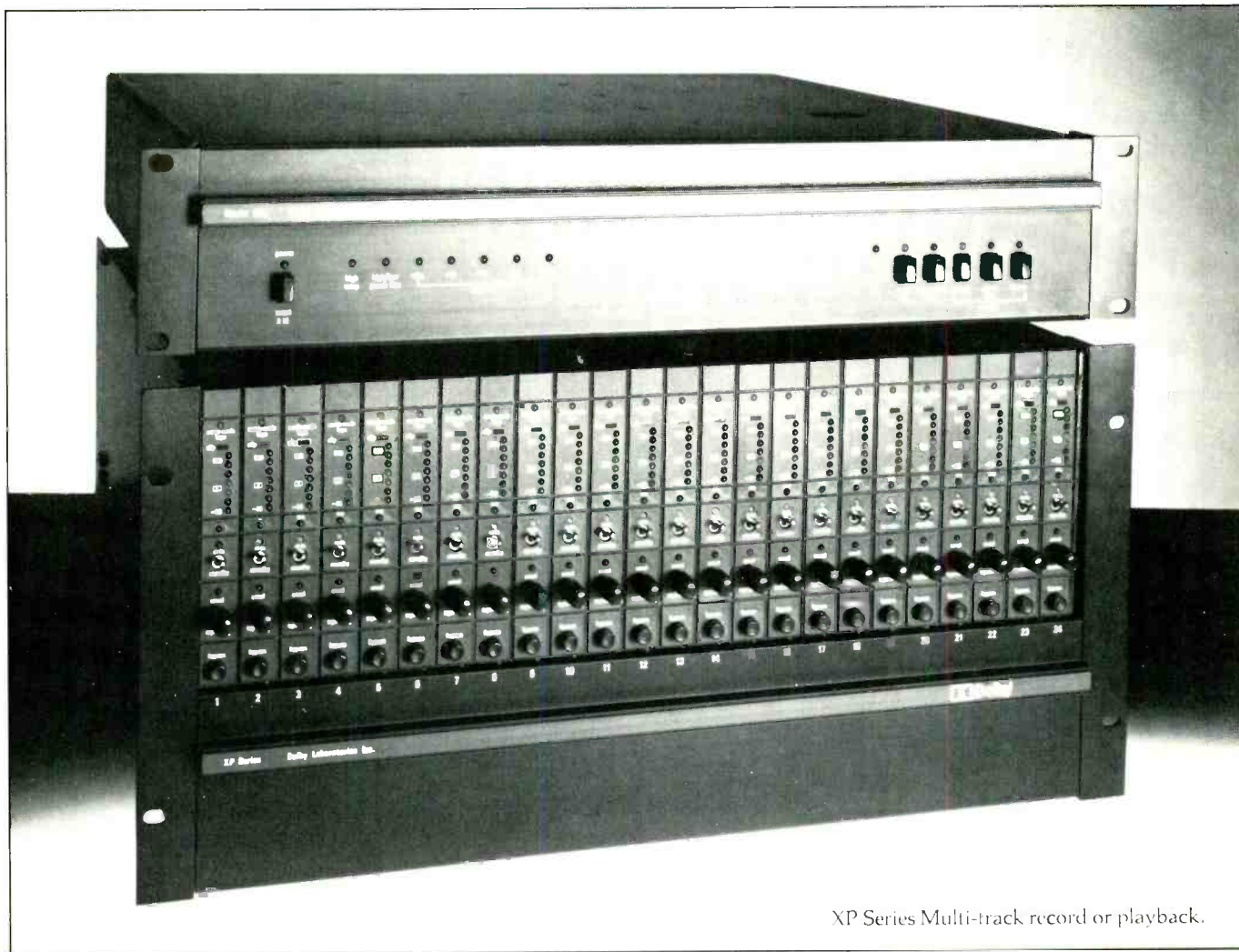
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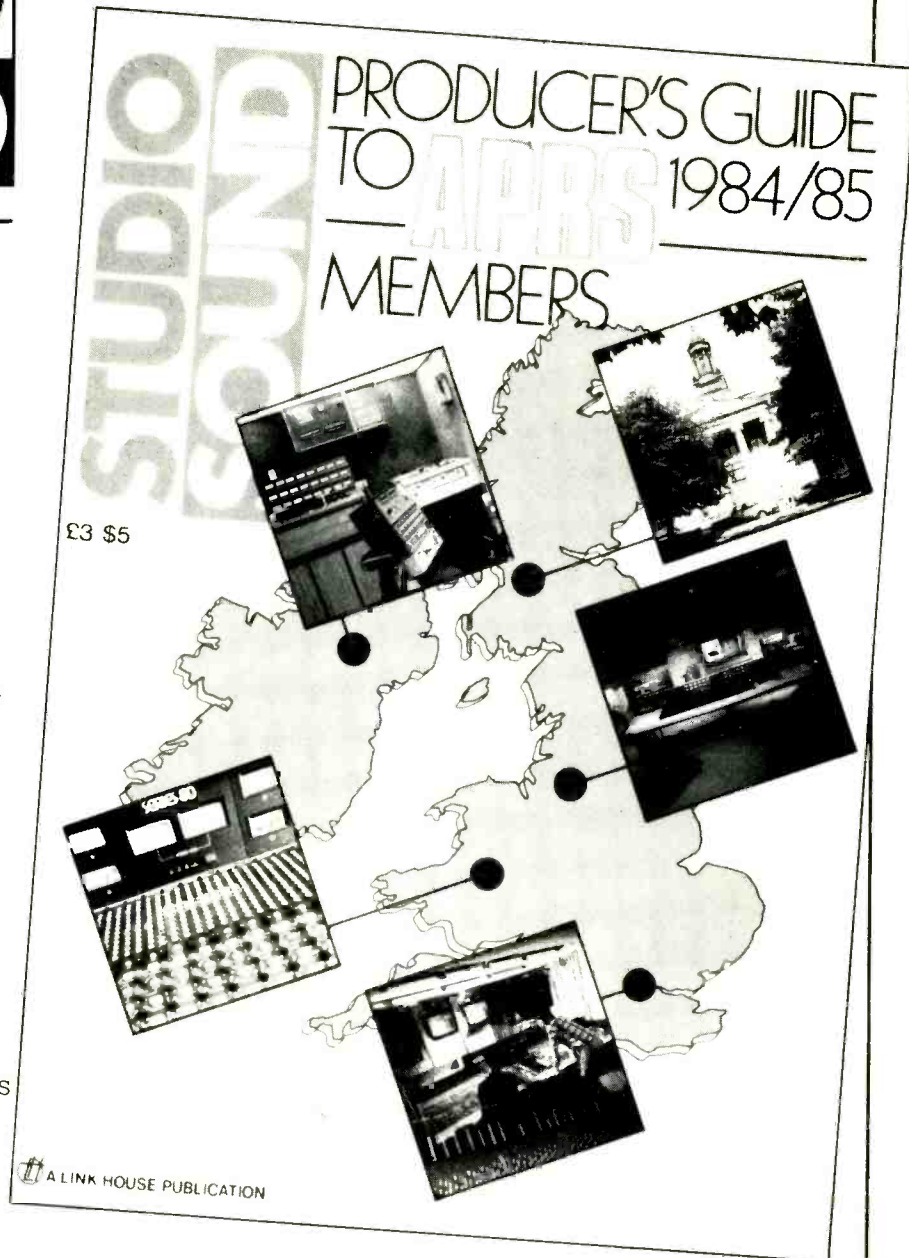
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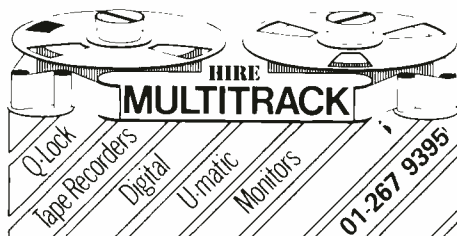
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<p>For more information please contact:</p>			
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AUDIO SERVICES

BRITAIN'S LARGEST STUDIO SUPPLY SERVICE HAS EXPANDED EVEN FURTHER!

Our London Showroom enables us to offer nationwide coverage for sales AND service. Neither of our establishments are conventional shops. We don't employ shop assistants but informed experts who keep our customers well advised and up to date on the latest professional and home studio products - appointments are not essential but recommended. As always, Audio Services are fully conversant with the latest trends in recording practices and developments. Visit either of our Showrooms to see and learn about the advantage of SMPTE based transport and midi synchronising, with products from Synchronous Technologies, Fostex and Roland. Products which save you tracks, time and money!

For some time, our studio installation boys have been absent from our ads. The reason for this is that they are very busy! But we don't want people to forget that this is a service which we are proud to offer. We offer a total service, from advising upon the right equipment, to installing and commissioning it. Do not hesitate to contact us for further information.

ONLY FROM AUDIO SERVICES

Synchronous Technologies 'SMPL' Synchronising System from: £595 to £1495. In its basic form, SMPL synchronises sequencers, drum machines etc to audio tape recorders, with 8 point autolocate programmable drop in/out and full transport control. With its lock unit, however, tape transports (audio/audio or audio/video) may be synchronised with midi units to form a flexible user friendly post production system. Anyone can use it! SMPL has been designed for operation by laymen and experts alike. Telephone now for details on the most cost effective synchronising system available.

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