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EDITORIAL

EDITORIAL

This month's comment from Keith Spencer-Allen

Just looking is not enough

This issue either breaks new ground or marks the entry into an area of unmitigated foolishness. In many ways I am not completely certain with which I align my total conviction, although to do nothing would make for a far easier life.

We have never ever reviewed a loudspeaker in the entire 25 odd years of this magazine. There were very good reasons for this which, for the time, were right. Circumstances change, however, as do the expectations of our readership (or a sizeable proportion) and so about 18 months ago we accepted that at some time in the future we would start a review programme that would include loudspeakers. We have now reached the first phase of introduction of such reviews.

Although it may be a very wide generalisation, up until 10 years ago there was very little to choose from in the way of monitors for the multitrack recording studio. If we exclude the field of classical and broadcast monitoring where the requirements have always been rather different, the monitoring choice for most UK studios was made from a field of two. Similar situations were prevalent in most of the recording centres of the world although the choice of monitors was perhaps from three manufacturers with only one being in common with the UK.

The last decade has seen the emergence of several monitor manufacturers who have had considerable impact internationally. There are also a whole host of smaller manufacturers, many regional at present, who have products that are designed as monitors and can offer many different approaches in design. We must add to this the number of studios who also have developed their own systems either from the ground up or due to dissatisfaction with certain units of their own installed system. From this you can see that the situation we currently find ourselves in is not as it was 10 years ago.

As a parallel to these changes, the spread of recording studios throughout the UK and USA, and indeed throughout the world has been such that there are now a significant proportion based outside the accepted recording centres of the world. Access to new equipment for these studios is often not so easy. Even if there should happen to be a pro-audio show within financially feasible commuting distance, the chances are that it will be a 'silent show' with no possibility of loudspeaker demonstrations or at best you may have the opportunity to audition a system such that the worth of the demo will vary proportionately with the similarity between your control room and a standard hotel bedroom. The only exception to this that I have personally witnessed was the UREI demonstration at a recent European AES Convention where they had taken a great deal of time to measure out and treat a fairly large room so

that the monitors had at least a fighting chance. The exception, however, proves the rule.

With a rapidly increasing number of manufacturers designing units for the studio monitoring environment; the increasing importance that monitoring must be given with a CD end product; the lack of suitable circumstances to audition monitors and the lack of any comparable specifications, it has become a necessity to consider such reviews.

For the reviews to be of any value, it has been obviously very necessary to consult a wide cross-section of monitor speaker manufacturers, designers and users. It had been hoped to complete this project and formulate a set of review procedures that would be meaningful and worthwhile measuring. The response from almost all manufacturers consulted so far has been very positive and most are very keen to see such a project successfully undertaken. This stage is unfortunately still not complete and there are many areas yet to be finalised and several manufacturers to be consulted. It may be that the finally accepted reviews procedure will have little similarity to methods used for other equipment—indeed this is almost certain to be the case.

In this issue we have started in a small way to show that we mean business. It is our intention that these reviews are to be of value to you, the reader, although we still may modify our procedure in the light of comments. Speaker reviews have always been a contentious subject, particularly in the consumer press. However if you start with the philosophy that the purpose of equipment evaluation is to inform the reader rather than become over-involved in self defeating blind alleys, then the attitude that we have to take is far more clear.

APRS column

Another first for this issue is the introduction of a regular monthly column contributed by the Association of Professional Recording Studios. The APRS is a UK based association for recording studios, pro audio manufacturers and several other associated areas. European and regular readers of *Studio Sound* will be familiar with the activities of the APRS although they may only know them through the annual exhibition of equipment that they host every June in London. It is a pleasure to welcome the APRS column and to hope that they find it beneficial as a way of furthering contact with their membership and informing non-member readership of their attitudes and activities.

**STUDIO
SOUND**
AND BROADCAST ENGINEERING

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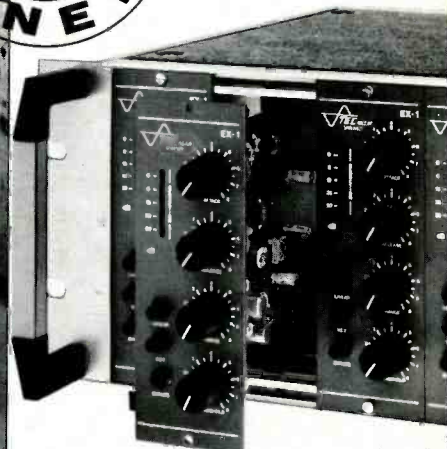
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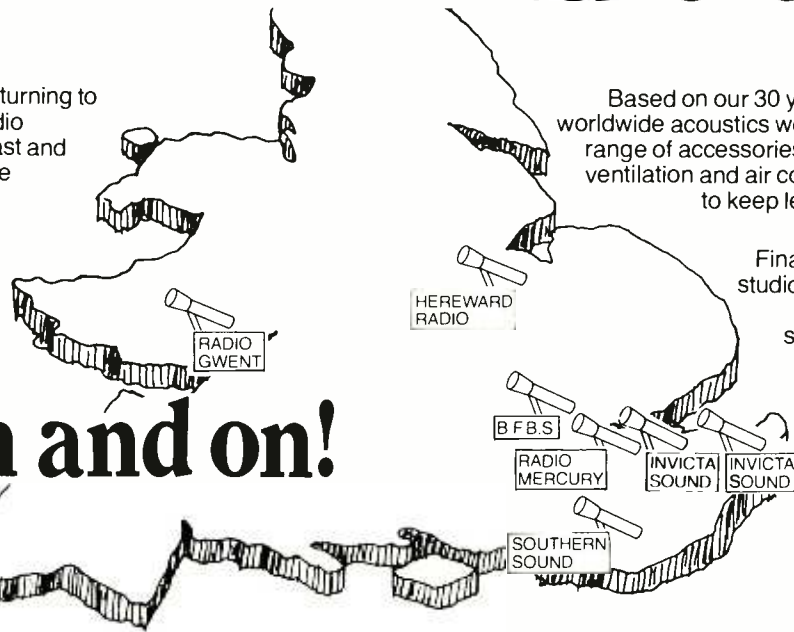
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Good News for everybody between eight and sixteen

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Facing the reality of a highly competitive market, Soundcraft's most budget 200 Series, is equally suited to stereo, four or eight track recording. And in particular, it's a firm favourite with AV producers. Stepping up, the 400 Series expands on the basic features.



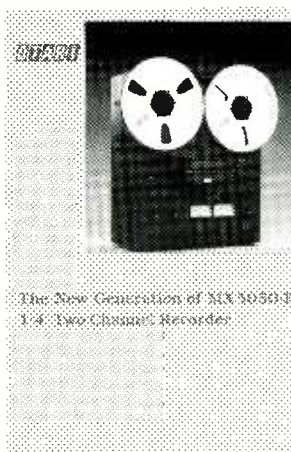
Various module options are readily available to customise the console to exact requirements. And finally the highly acclaimed 1600 Series, which cater for up to twenty four track.

In combination with Soundcraft recorders, we offer Producer packages. Matched

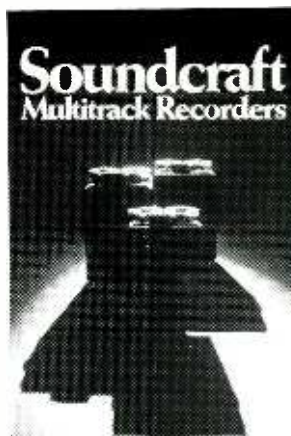
systems that can be delivered and installed rapidly.

There's choice for mastering from two track up to twenty four from both Otari and Soundcraft.

Both companies have recently upgraded the basic transport for their recorders, and it's worthwhile comparing both specs and prices closely.



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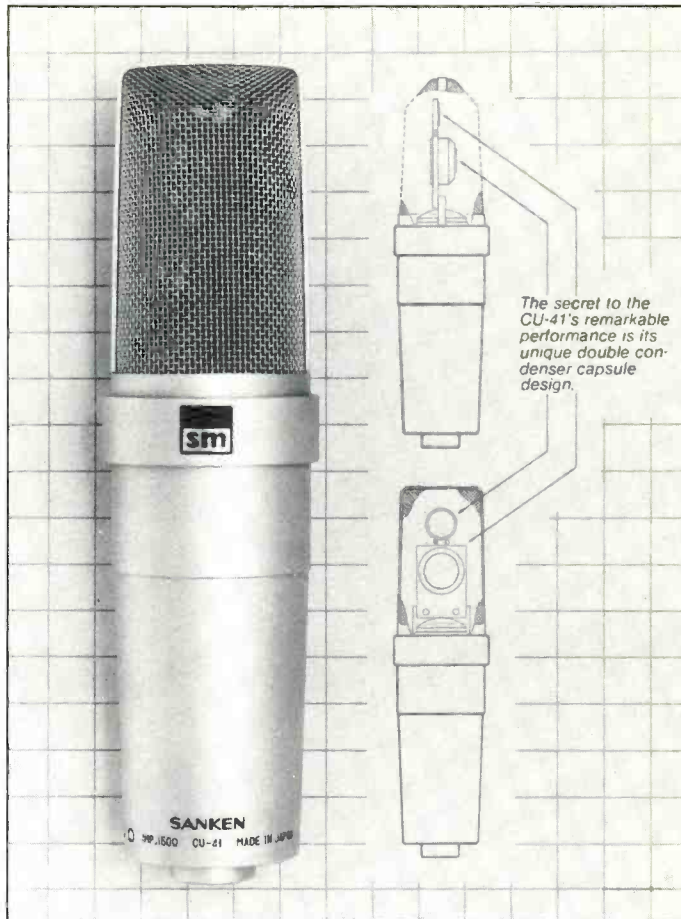
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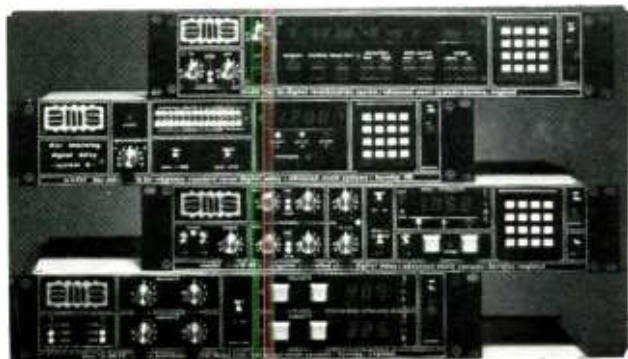


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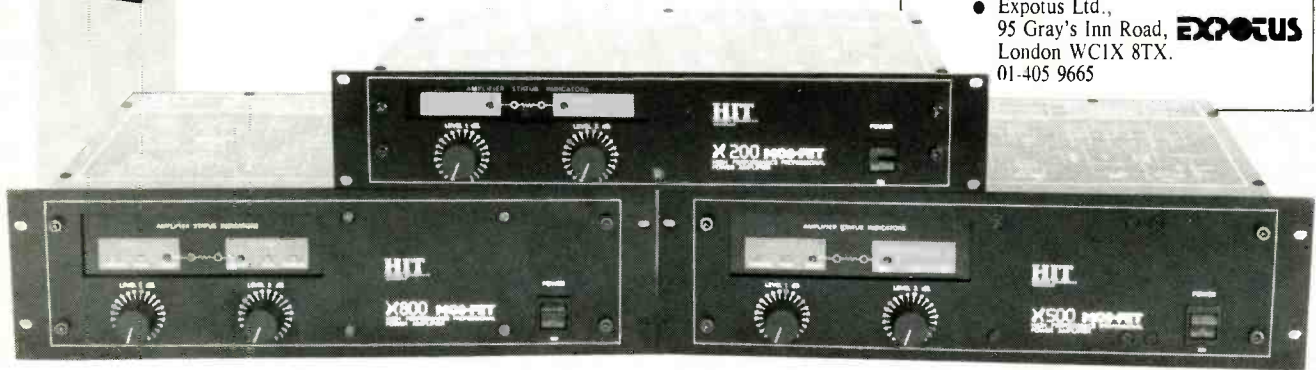
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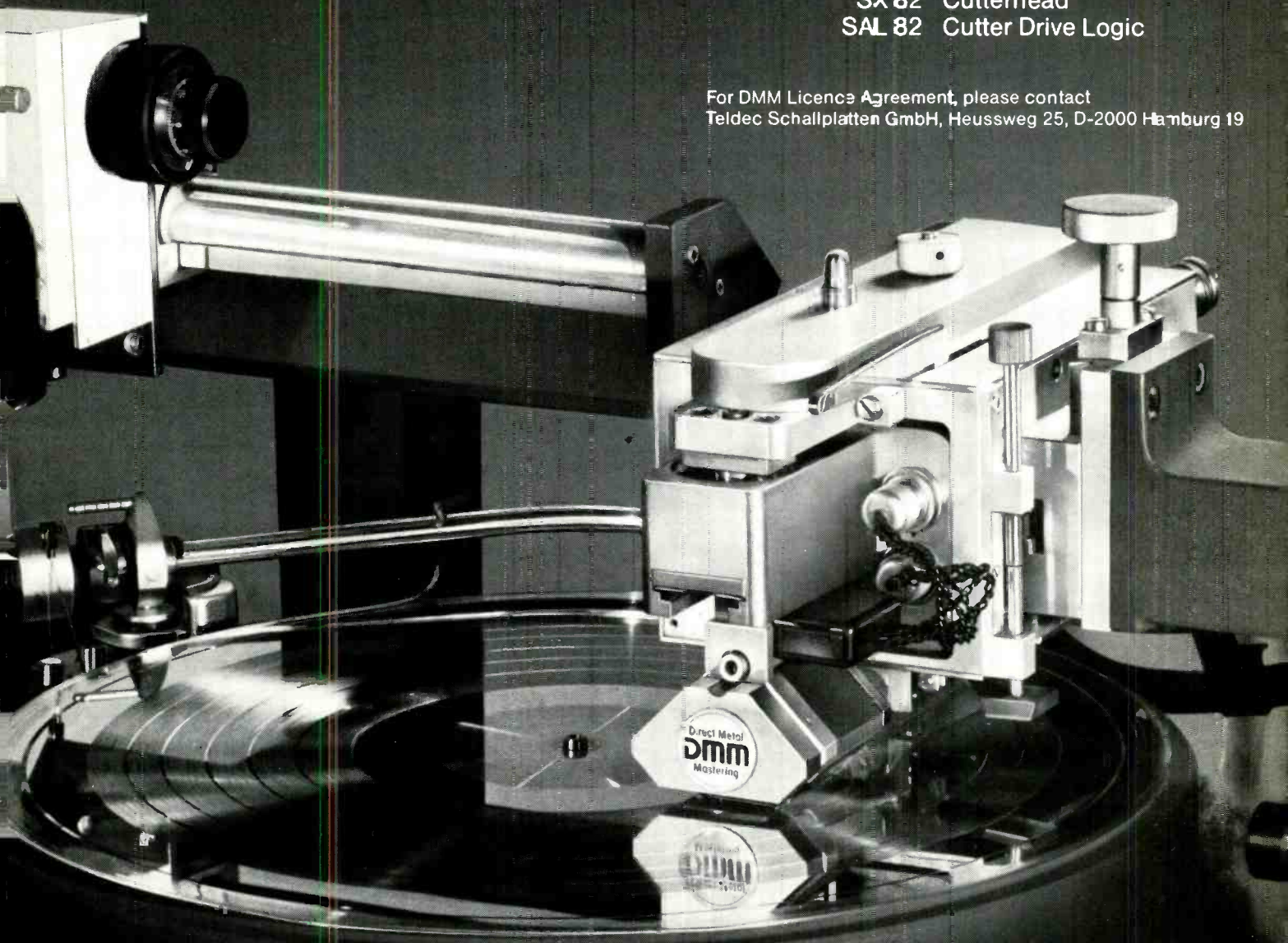
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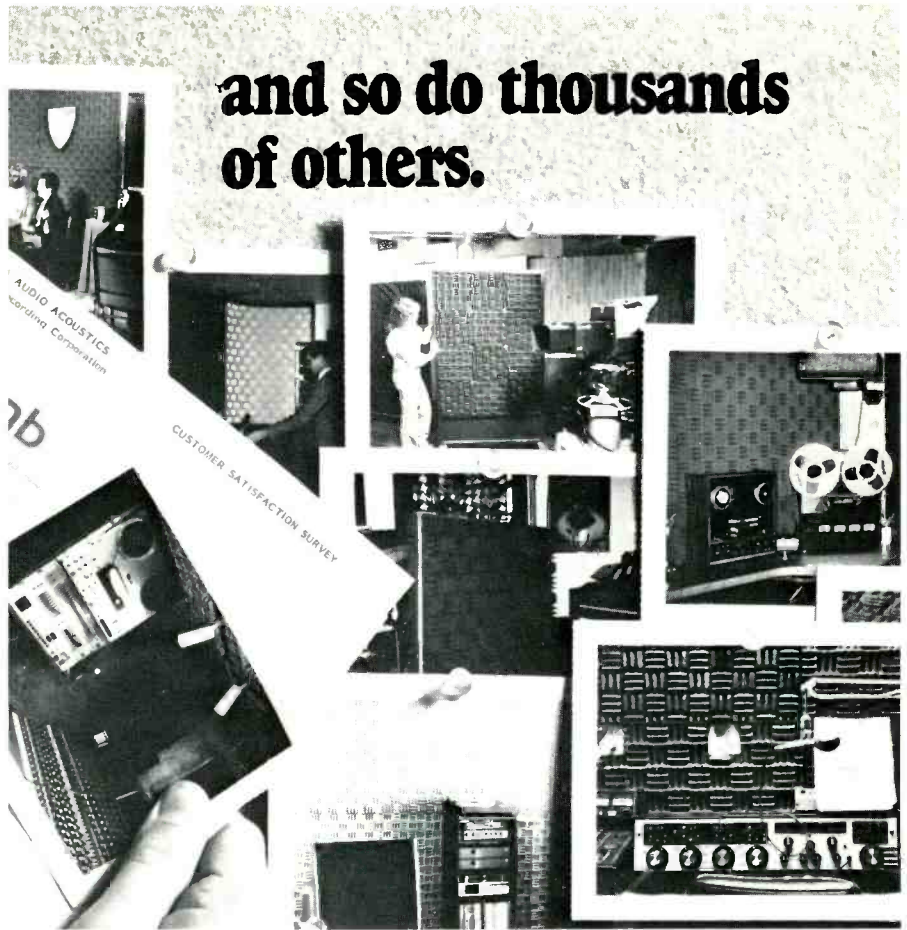
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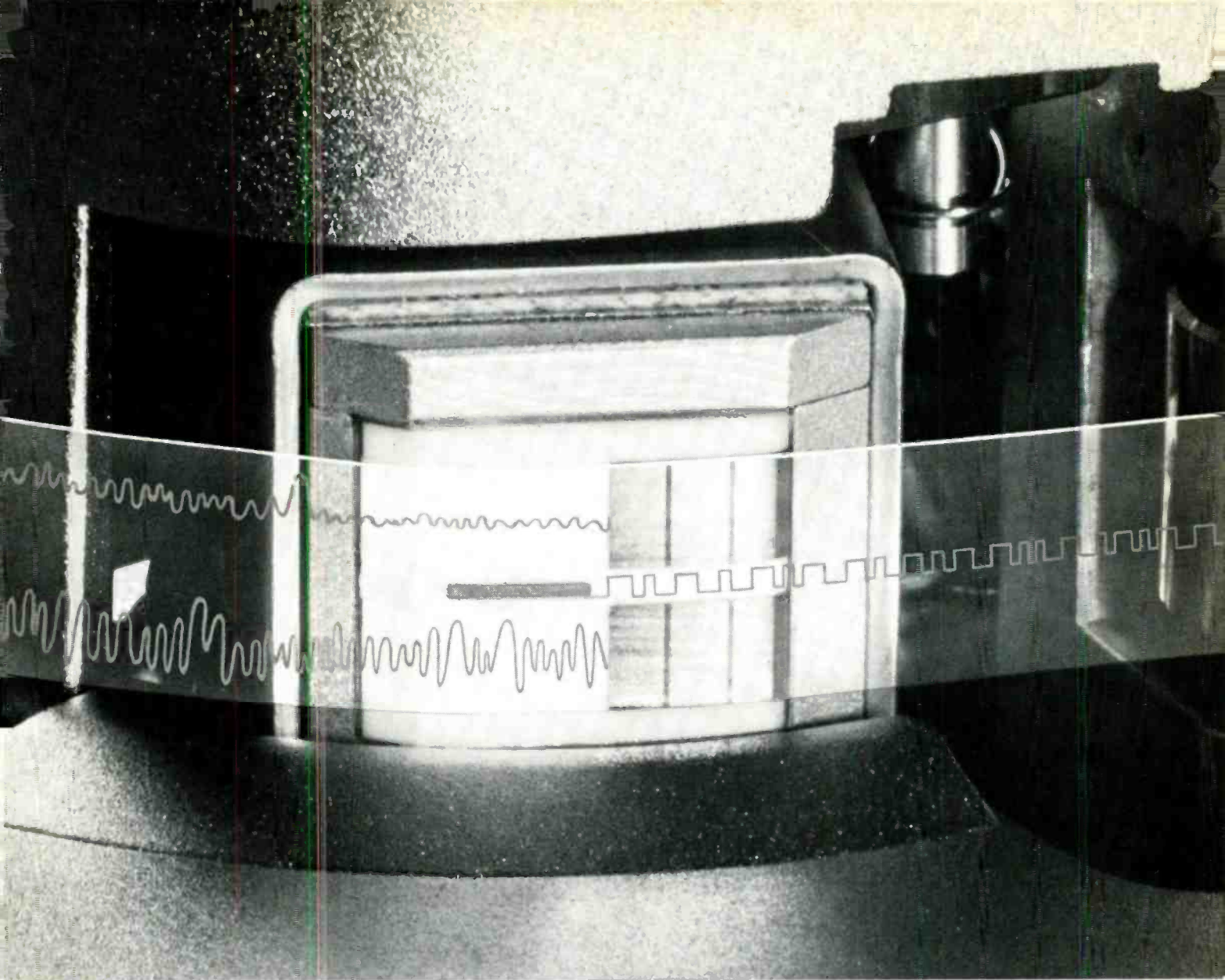
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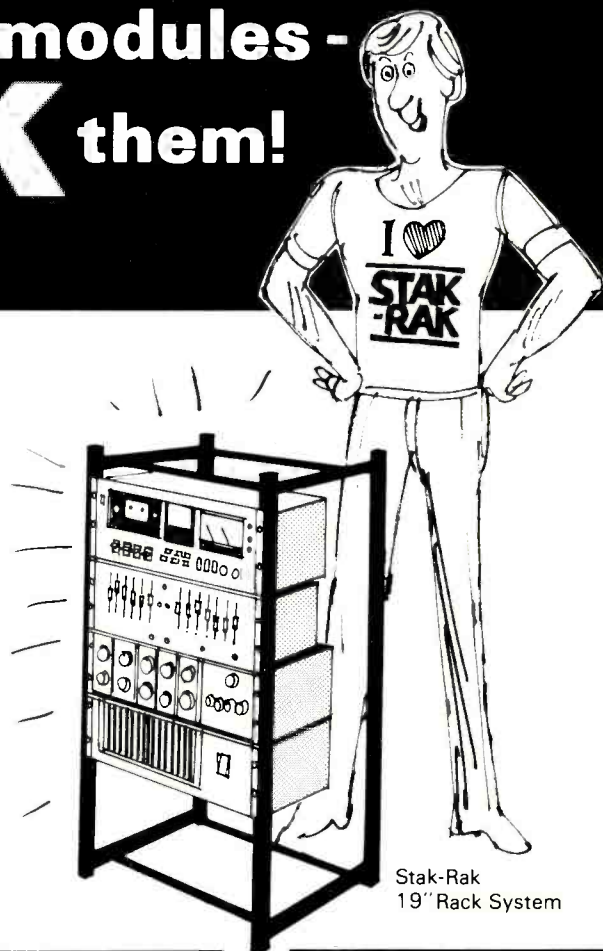
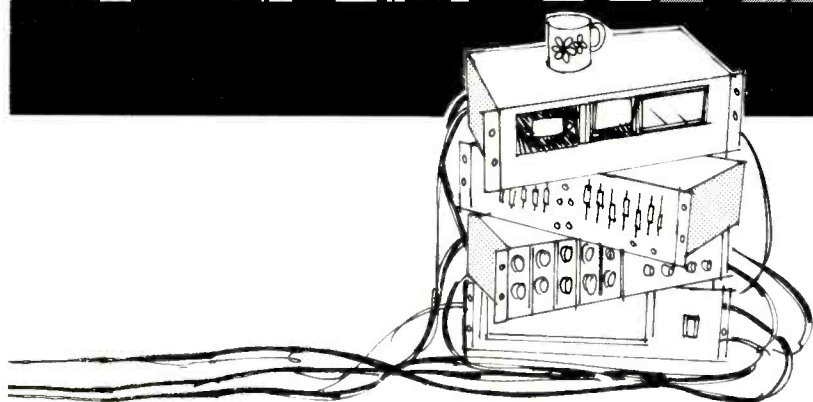
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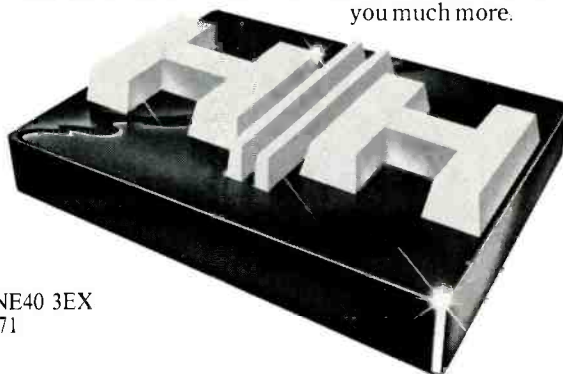
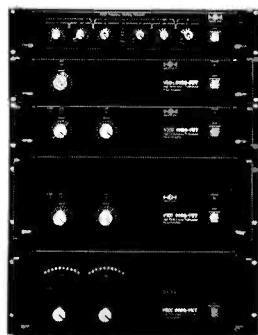
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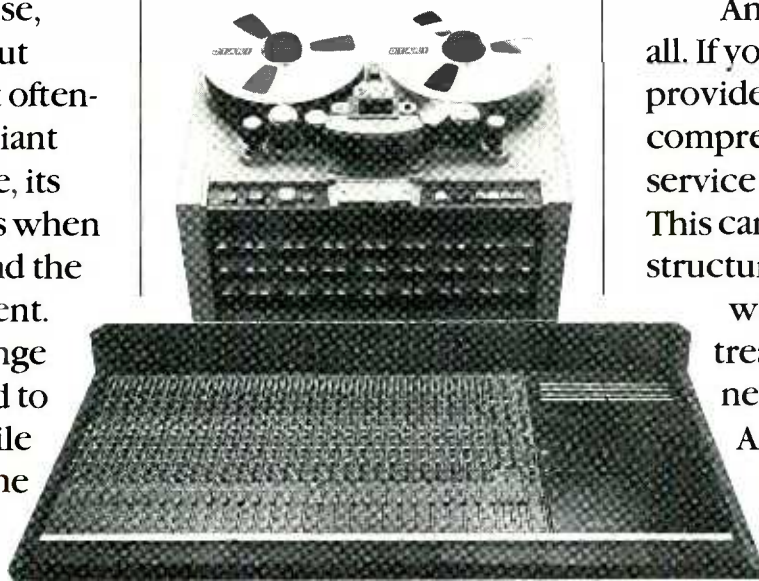
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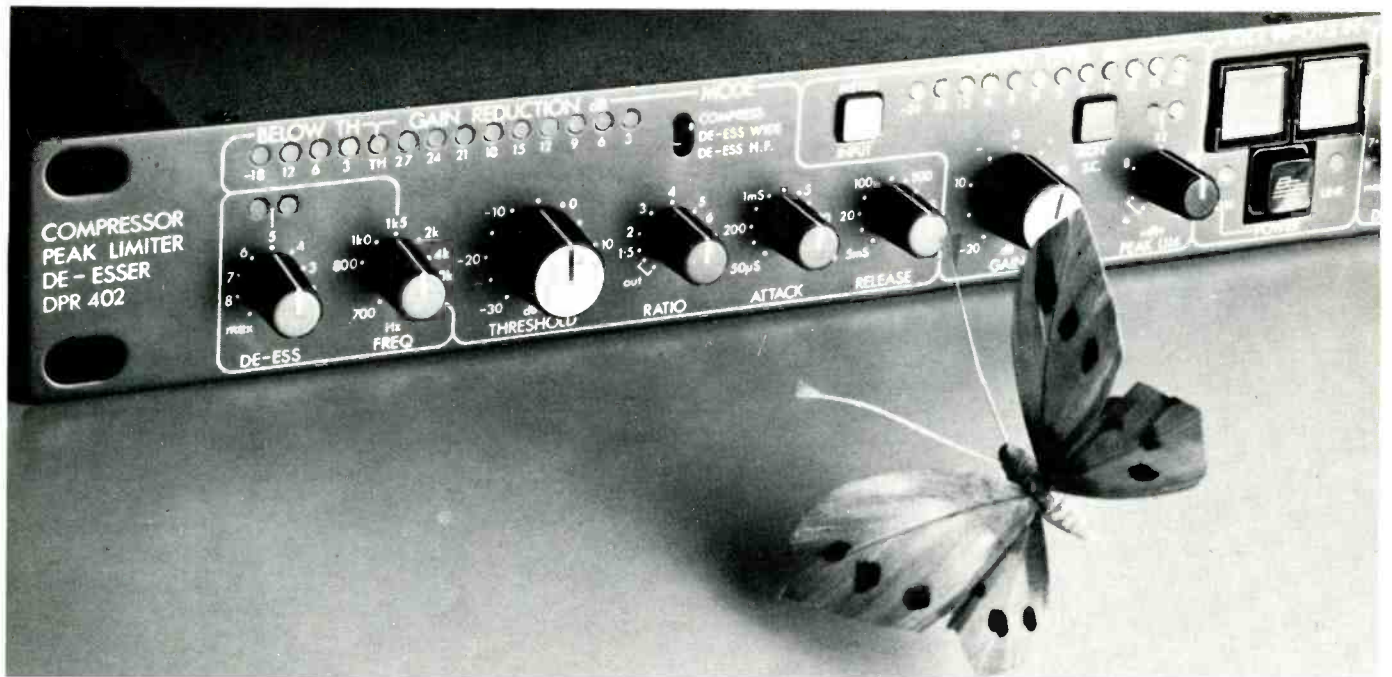
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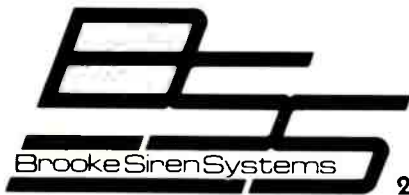
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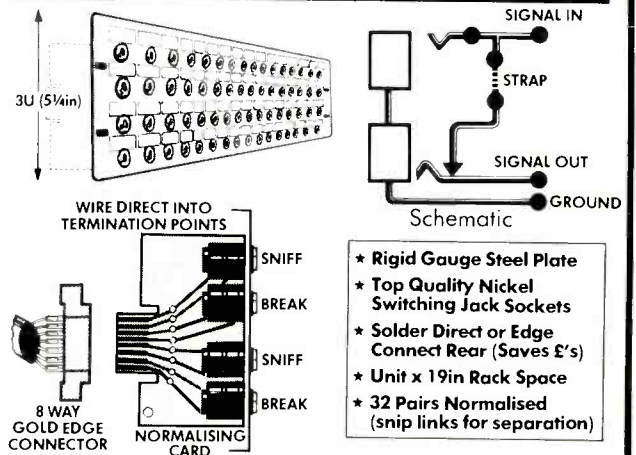


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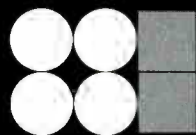
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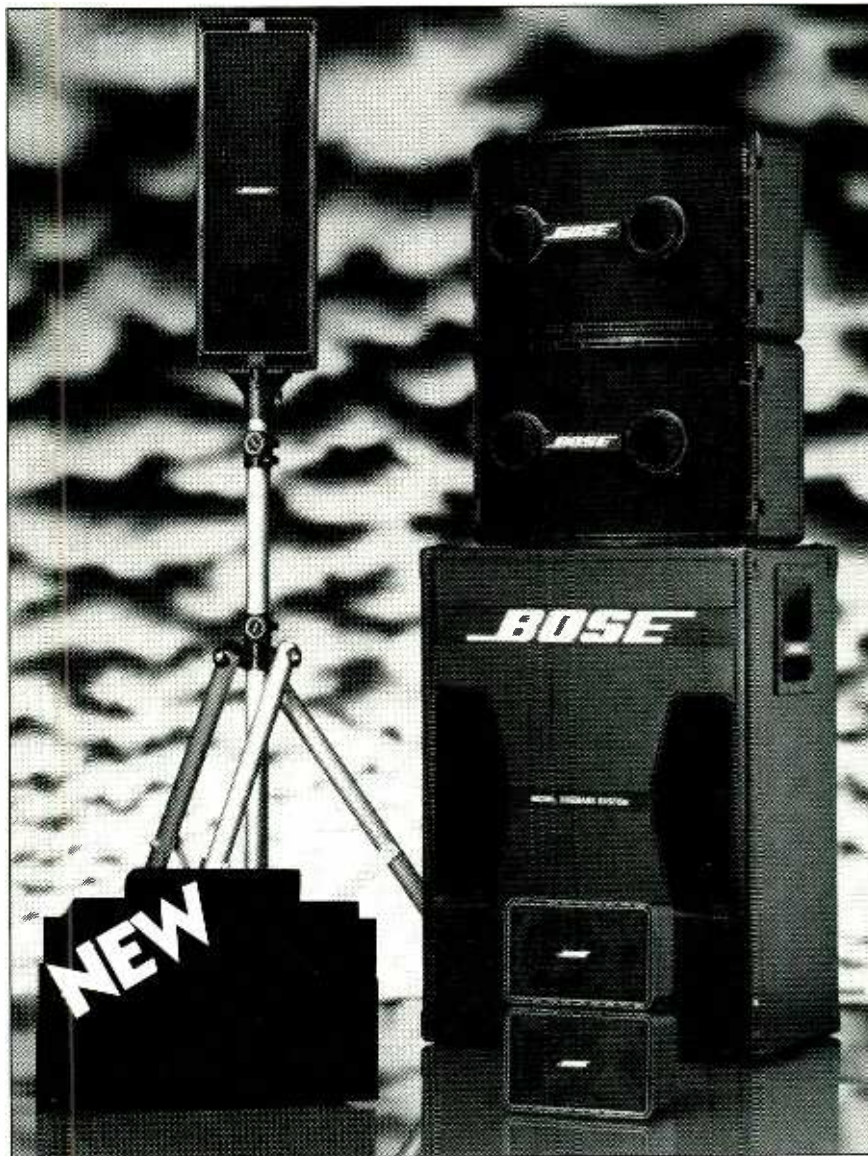
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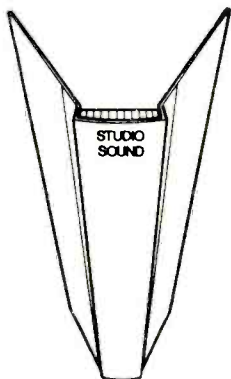
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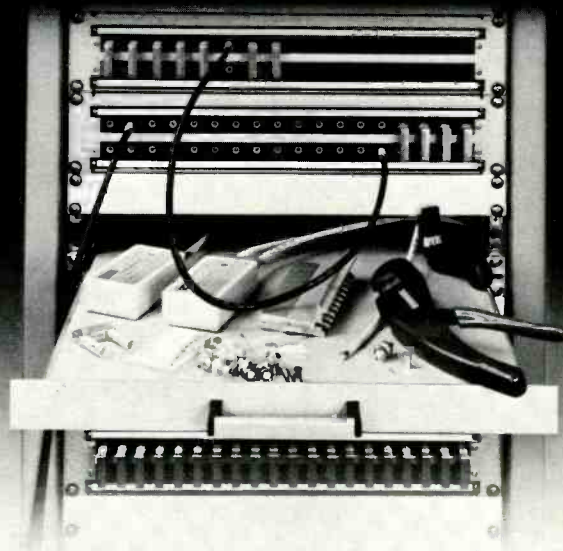
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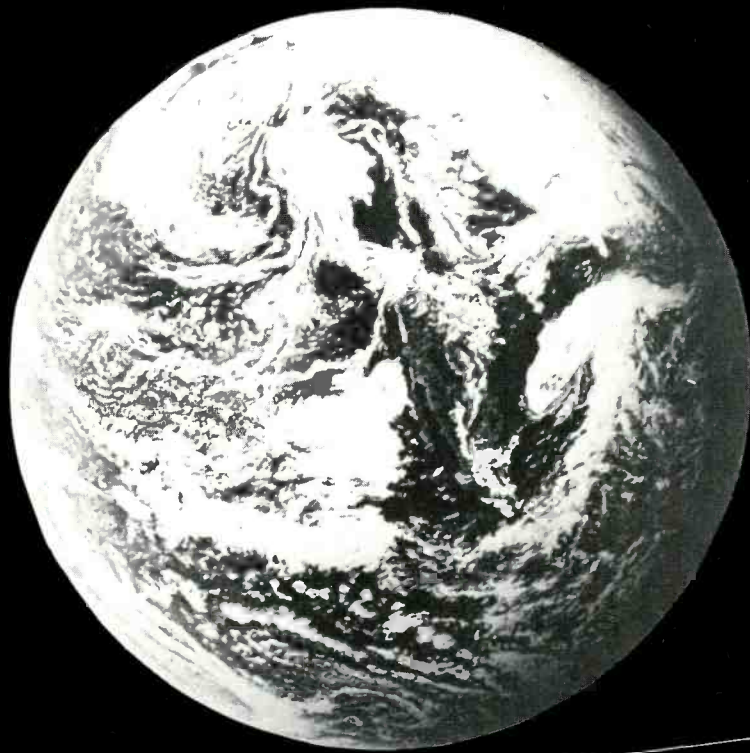


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THE BLACK & WHITE C

The concept of playing acoustic or 'sampled' sounds on a keyboard, first introduced by Fairlight with the CMI in 1979, has now become a requirement of today's synthesiser users.

Syco, the specialists in 'sampling' keyboards, have selected the 'state of the art' instruments, instruments which meet the varying demands of our clientele.

The choice of the best sampling keyboards, The Fairlight CMI, the Emulator II and the Kurzweil 250. The Black and White Collection.

Fairlight CMI is much more than a musical instrument. It is an integrated music production system, expandable to cope with the ever-changing needs of today's musician. Consistently upgraded since its introduction in 1979, the CMI has become legendary for its compositional software. Now the largest selling computer musical instrument in the UK, the options arriving in the next six months will increase its already fantastic potential tenfold.

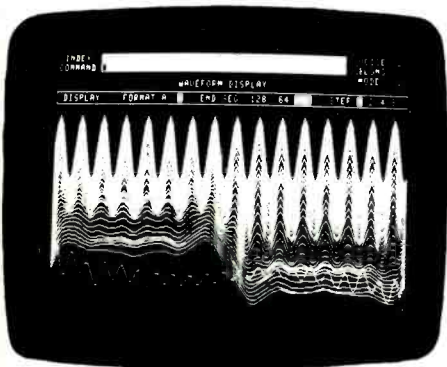
EII, successor to the popular Emulator, brings the power of high quality sampling within the reach of most professional musicians. Featuring a five octave dynamic keyboard with a variety of possible keyboard modes, the inclusion of filters, VCAs, envelope generators and independent LFOs allows you to extensively modify any sampled sound. An eight track sequencer with MIDI and SMPTE interfaces enables complex compositions to be recorded. These features, together with a dramatically increased sampling memory make the EII a powerful creative tool.

Kurzweil 250 features an 88 note piano-type keyboard. Utilising technology from the fields of artificial intelligence and pattern recognition it achieves extraordinary realism of sound with unprecedented expressive capabilities. It's supplied with thirty preset sounds, (expandable to 60), can accommodate up to 40 keyboards set-ups, and features a twelve track sequencer. Ideally suited to live performance and studio work, the Kurzweil 250 is the only viable alternative to an acoustic grand piano.

All of these instruments are available for you to see and hear at our demonstration suite in W2. So next time your looking for something very special, try the best sampling keyboards.

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COLLECTION FROM SYCO



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DIARY

DIARY

Changes at Peavey

The Peavey Electronics Corporation of Meridian, USA have negotiated the purchase of their UK distributing company, Peavey Electronics (UK) Ltd. Ken Achard, managing director of the UK operation will continue in this role handling consumer service, advertising, sales promotion, artist liaison and educational programmes.

Peavey Electronics (UK) will continue to operate from Unit 8, New Road, Ridgewood Industrial Park, Uckfield, East Sussex TN22 5SX. Tel: 0825-5566.

AES publishes 'Digital Audio'

The AES has put together a collection of 25 papers presented at the AES premier conference on Digital Technology in New York 1982. The volume is divided into eight categories and covers everything to do with digital audio, from basics to areas such as rate conversion, recording formats and error correction. *Digital Audio* is priced at \$40 to AES members and \$75 to non-members and is available from Audio Engineering Society Inc, 60 East 42nd Street, New York, NY 10165, USA.

Tandberg Professional

Norwegian specialist electronics company Tandberg have announced the creation of Tandberg Professional Products Division aimed to respond to specific customer needs and to develop and produce its own professional products to fulfil known requirements in the professional audio market.

Tandberg Professional is headed by Vidar Lerstad with engineers Roger Jensen and Kurth Tviberg responsible for management and sales.

Studio Sound Directory

The 1984/85 edition of the Pro-Audio Directory is now available. Designed as a comprehensive guide to industry services and products the directory has become an important international reference book providing up-to-the-minute information on everything to do with audio from cleaners to compressors. The cover price is £6/\$9 and is available from Link House Professional Publications Group. If you would like to order a copy, just fill in the order form in this issue of *Studio Sound* and send it off, together with your cheque/postal order/International money order/credit card number.

Cabinet designs from Fane

Having brought out their *Colossus 2AE 400 W 24* in fundamental bass driver Fane Acoustics, have recently made available cabinet design drawings for three different styles of enclosure. A free copy can be obtained by sending a stamped addressed envelope to Fane Acoustics Ltd, 286 Bradford Road, Batley WF17 5PW, UK.

Studer price cuts

Sales of Studer's *A800* multitrack machine have now reached a level where they have recouped initial development and tooling costs. A similar situation was reached about four years ago with the *A80* multitrack and following this precedent Studer have made a significant reduction in the *A800* price. This means that in the UK an *A800* machine will cost just over £30,000 plus VAT.

Addresses

- Crystal Clear Records Inc have moved to larger facilities and are now located at PO Box 838, Orinda, CA 94563, USA. Tel: (415) 254-7600.

In brief

New York-based pro-audio dealer Audiotechniques recently passed the \$25 million mark in sales of Sony products. In recognition of this, Sony presented the company with a sales achievement award. . . The recently completed David Bowie album was mastered using the JVC *BP900* digital mastering system. The album was recorded at Le Studio (Morin Heights) and engineered by Hugh Padgham. . . US acoustics consultancy firm, Bolt, Beranek & Newman has been chosen as a recipient of a 1984 Institute Honor from the American Institute of Architects. . . The latest recipient of the BASF Chrome Award is producer Steve Levine for his work on Culture Club's *Colour by Numbers* album. . . Ampex Great Britain Ltd has just celebrated 25 years of trading in the UK. The Reading-based operation was the first Ampex venture outside of the USA. The anniversary was marked with a donation to a local charity family centre. . . US radio station KWMU, the public radio affiliate at the University of Missouri, St Louis, has just completed the first Ambisonics broadcasts in the US. Audience reaction was claimed to be favourable with particular comment about accurate imaging, front back orientation and natural ambient sound. . .

Contracts

- Elliott Brothers have recently supplied Harrison Information Technology (HIT) amplifiers (*HIT X150* and *X800*) to the Royal Shakespeare Company, London Weekend Television, British Broadcast Service, the National Theatre Complete Video and Thames Television.
- ITA's recent Otari installations have included *MTR90* 24-track machines in Pete Bellotte's private studio, Park Lane Studios in Scotland and Trackside Studios in Southend-on-Sea; two *Mark III-8* ½ in 8-track recorders plus Applied Microsystems synchroniser system for the Thompson Twins; and an

MTR12 ½ in stereo mastering machine in Marquee Studios, London. They have also supplied complete Amek/Otari packages consisting of Amek *Angela* consoles, *MTR90* 24-track machines and outboard equipment to Square One in Lancashire and Bob Heatlie's private studio in Edinburgh.

- Sound Attenuators Ltd of Colchester recently completed an unusually tall acoustic door order. Installed in the Teliesin Centre for Arts at University College, Swansea the doors (each over 6m high) are tall enough to allow major pieces of scenery to be manoeuvred on and off stage.

- Alangrove Associates have started design and construction at the Nomis Complex, London, on two large multi-purpose studios. These studios will be an integral part of Nomis' expansion into further areas of audio/video.

Alangrove have also been appointed UK and Scandinavian representatives, for Tom Hidley design.

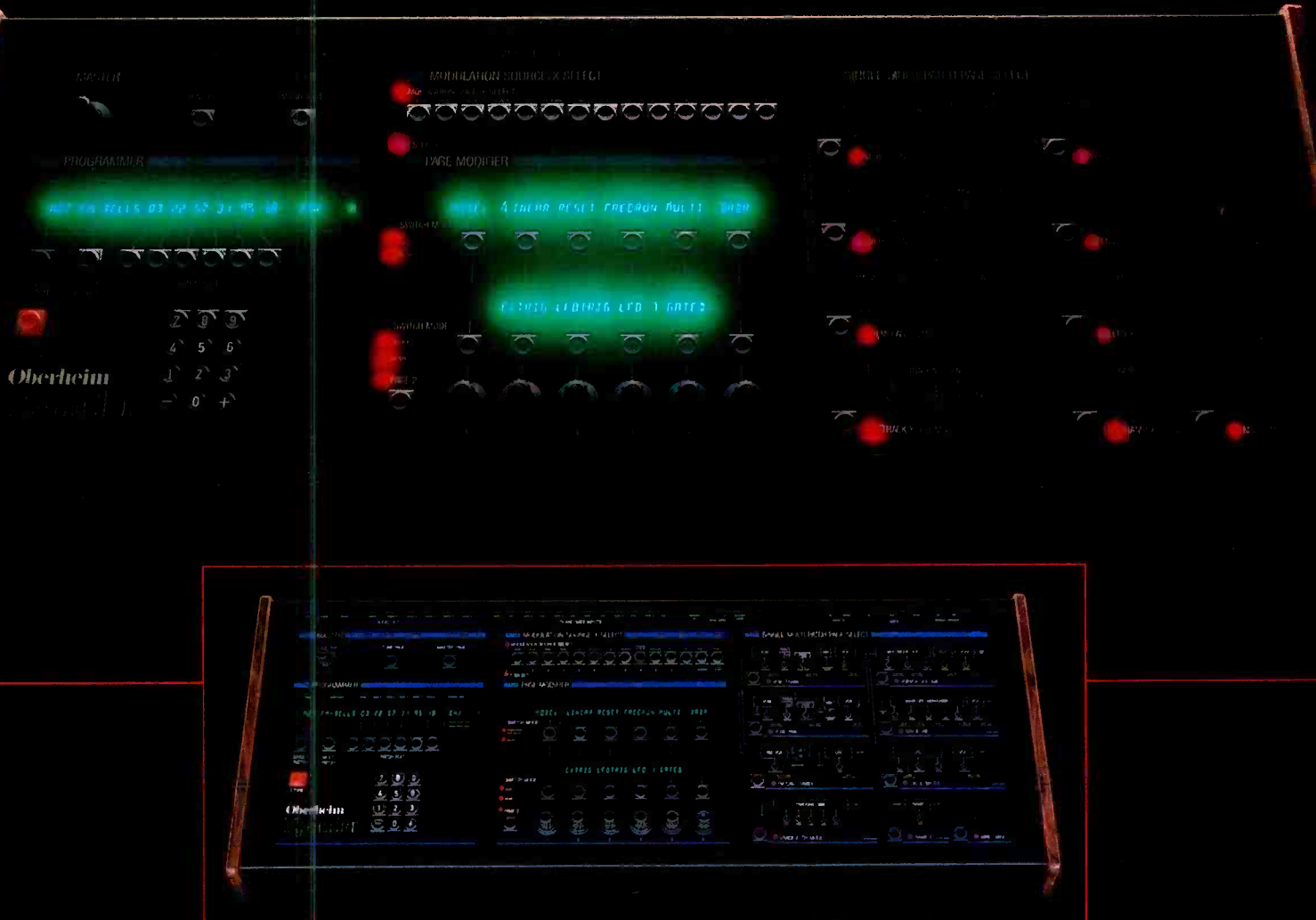
- Custom Mastering Inc, one of Nashville's newest cutting rooms has installed a Sony *PCM-1610* digital audio system, supplementing their existing digital facilities which include the Sony *DAE-1100* digital audio editor and the *BVU-800* U-matic VTRs.

Agencies

- Solid State Micro Technology of California, manufacturers of ICs aimed at the audio, analogue signal processing, music synthesis, mixing console and electronic music system market have appointed Coole Marketing Services Ltd as their exclusive stocking agent in the UK. CMS Ltd, 26 Pamber Heath Road, Pamber Heath, Basingstoke, Hants RG26 6TG. Tel: 0734-700453.

- Simmon Sound & Vision have been appointed by Audio Limited to act as national distributors for their radio mic range. Simmon Sound & Vision, 28a Manor Row, Bradford, W. Yorks, UK.

A FANTASY REALIZED



Imagine six of the most amazing synthesizer voices you've ever heard with 2 Oscillators, 15 VCAs, 5 LFOs, 5 Envelope Generators, 4 Ramp Generators, 3 Tracking Generators, Lag Processor, 15 Mode Filter, and FM on **every single voice**.

Imagine being able to control each of these voices easily and independently. A Matrix Modulation™ system that lets you connect 27 sources to any of 47 destinations **per voice**, with an interactive block diagram and 120 display characters to make it easy to use.

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1 Wallace Way, Hitchin,
Herts SG4 0SE
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Telex: 826967

DIARY DIARY

People

● Millbank Electronics have announced two new appointments: Roy Acland has joined the company as technical director, with responsibility for engineering design and product development and Michael Witham becomes commercial manager in charge of all the commercial marketing and sales activities of the company.

Contracts

● Marquee Electronics have recently supplied JBL 4435 monitors which incorporate bi-radial horns, to EMI Abbey Road and Air London Studios.
● Harrison Systems has recently delivered two new HM-5 front-of-the-house consoles designed for sound reinforcement. This is the first part of a six console order with

each unit having 32 inputs, eight stereo submasters, eight VCA subgroups, 16 effect sends and returns, two stereo programme outputs, four stereo group sends and eight mute matrix groups.

● Theatre Technology in New York recently created 16 sound systems for a show at the New York Coliseum; Frederick Atkins Inc commissioned the design and installation of eight interconnected audio systems for the meeting and conference areas of its headquarters; and a sound and monitor system was designed for the Burl Ives Show, Carnegie Hall.

● Klarion Enterprises in Australia have recently supplied several of the country's major PA rigs with HH MOSFET power amps for their touring rigs including Revolver Audio, Sydney; Concert Sound, Adelaide; Audex, Perth; Tes Audio,

Canberra and Good Oil Sound from Hobart.

In addition to the HH power amps Revolver Audio, Concert Sound and Audex have recently purchased quantities of Martin M300 mid range boxes for use in their PA systems.

● The US Digital Entertainment Corp has installed a Mitsubishi X-80A 2-track digital recorder in Studio B at Muscle Shoals Sound Studios.

● Discrete Research Ltd have been commissioned to supply consultancy, design and building services for the comprehensive rebuilding of Chipping Norton Studios, Oxfordshire. The control room is to be gutted, trebled in size and certified as a LEDE room. The studio is to be substantially extended with the addition of a new isolated live area to complement the existing facility.

New division for TOA

TOA Electronics Ltd have set up a pro sound equipment division, coinciding with the introduction of a new range of products. The new range supplements the company's existing professional live and studio products which include powered amplifiers and mixers, mixing consoles, speakers and microphones.

Literature received

From Cirkit, the wholly owned subsidiary of Bulgin, the Ambit Industrial components catalogue 1984. Cirkit Holdings plc, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: 0992 444111.

Audio Design CALREC

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☎ (0734) 861088 Telex: 848722 ADR UK

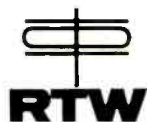
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24 or 32 Tracks?

Why buy 24-Track, analog or digital? The Mitsubishi X-800 32-Track Recorder gives you full use of 32 digital audio channels in addition to extra channels for SMPTE, analog audio and future data channels (i.e., storage of computer mixing data). Utilizing one inch tape with one hour of record time and the most powerful error correction system available, the X-800 offers World Class Studios the most desirable sound, uncompromised reliability and the long term compatibility required to satisfy the top artists and producers. The Mitsubishi X-800 32-Track Recorder is not for everyone. It's only for those studios wishing to be at the leading edge of recording technology. The World Class Studios.

World Class Studio Master Standard

The Mitsubishi X-80 2-Track Format is fast becoming the World Class standard for

mastering. And for good reasons: In New York, Los Angeles, Nashville, San Francisco, and Miami, more X-80 masters are being produced than perhaps on any other digital system. The X-80 is regarded as the best sounding digital audio recorder in the business. One reason is the wider frequency band available compared to the video cassette based systems, yielding a natural and more desirable sound.

Compact Disc from X-80

The X-80 is now the most convenient format for Compact Disc studio masters. Easy and inexpensive to edit, sequence, and make digital copies from, the X-80 masters are now being processed by PolyGram in Germany and Denon in Japan for Compact Disc mastering. We believe that you'll hear the difference the Mitsubishi X-80 Digital Mastering System makes. We invite you to call or write for complete details.

32
64



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MITSUBISHI
DIGITAL AUDIO SYSTEMS

DIARY DIARY

Carver in UK

Kelsey Acoustics are now handling the UK professional representation on certain Carver products. These are: the *M400A* cube (200 W/8 Ω) and the *P1.5* professional power amp which gives 450 W/8 Ω; standing 2 U high this amp weighs in at a mere 21 lb.

Kelsey Acoustics may be contacted at 28 Powis Terrace, London W11 1JH. Tel: 01-727 1046.

People

● HH Electronics Ltd have announced the appointment of Robin Doughty as sales manager. He was previously sales manager with Harman Audio UK Ltd with responsibilities for Teac/Tascam and JBL.

● Solid State Logic Ltd have announced the appointment of Duncan Crundwell as technical liaison at their Stonesfield, UK headquarters. He was previously technical manager of Turnkey.

● BASF UK Ltd have created the post of external affairs manager and the first appointment to this position as from October 1st will be Henry Pattinson, the present director of the Audio Video division.

● Frank Hughes, formerly of Harman Audio UK has joined Otari UK where he has assumed sales and marketing responsibilities.

New literature

● Precision Instrument Laboratories Ltd (PIL) have just released the 1984 edition of their Test & Measurement

catalogue. It is intended as a quick reference guide to the instruments stocked, repaired and calibrated by PIL and contains over 100 pages of outline specifications for over 500 products manufactured by 50 companies worldwide. PIL, Instrument House, 212 Ilderton Road, London SE15 1NT, UK. Tel: 01-639 0155. Telex: 8811854.

Point to Point prototypes

A new prototype development service has been set up in London under the name of 'Point to Point'. Services offered include PCB artworks, PCB prototype and studio wiring with skills offered in both digital and analogue areas. More

information is available from Point to Point, 33 Miranda Road, London N19 3RA. Tel: 01-281 1939.

Agencies

● Theatre Projects have appointed Clair Brothers Audio Enterprises Inc as exclusive distributors of Court Acoustics graphic equalisers in the USA. Heint Electronics Inc, Ontario, will continue as exclusive Court Acoustics distributor in Canada.

● H W International have taken over sole UK distributorship of the Sunn range of PA and Stage Sound systems. These include mixer/amps, audio mixers, power amps, speakers and instrument amps. H W International, Sunn Division, 3-5 Eden Grove, London N7 8EQ. Tel: 01-607 2717.

NATURAL
SOUND MONITORING



ACTIVE GENELEC
FOR PROFESSIONALS

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SWEDEN
Intersonic AB
Stockholm
08-744 58 50

NORWAY
Benum A/S
Oslo
02-44 22 55

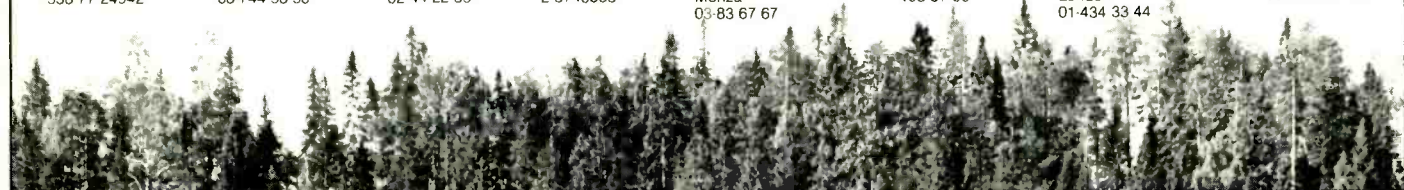
BELGIUM
Genelec
Brussels
2 3740683

ITALY
Audio Equipment
S.R.L.
Monza
03-83 67 67

SPAIN
Fading SA
Madrid
408 67 00

ENGLAND
Future Film
Developments Ltd
London
01-434 33 44

GERMANY
f.f.d.GmbH
München
089 278 04 04



IMPORTANT ANNOUNCEMENT

Sony PCMF1/SLF1



Sony PCM701ES/SLC9



To clear any confusion or misunderstanding about the above Sony Digital recording products, please be advised:

- 1** The Sony PCMF1 is still in production in Japan, and is available from HHB. The Sony SLF1 video recorder has indeed ceased production, but HHB has managed to secure limited numbers of these desirable machines.
- 2** It should also be borne in mind that an alternative system exists for applications where portability is not essential. This system comprises the Sony PCM701ES processor, identical in function and compatibility to the PCMF1, and SLC9 video recorder.
- 3** HHB are pleased to announce ex-stock availability of CLUE (Computer Logging Unit and Editor) which provides editing facilities for PCMF1 or PCM701ES/Betamax recording, as well as intelligent autolocation and logging.

Call now for more information about this exciting new product.



The No 1 name in Digital Audio.

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

DIARY DIARY

Name change

Audiotech Acoustics in Toronto will now be known as Group One Acoustics Inc. The company will continue to undertake projects involving studio design and alteration and they can still be reached

at 4 Budgell Terrace, Toronto, Ontario, Canada M6S 1B4. Tel (416) 769-9641.

Agencies

• Music Lab recently acquired sole UK distribution on four

new product lines: QSC power amps, Rane signal processors and amps, Garfield Electronics (including the Dr Click) and Scheck Audio multichannel analyser/AC-DC multichannel meter. Music Lab Sales, 72-74 Eversholt Street, London NW1 1BY. Tel: 01-388 5392.

People

• Allen & Heath Brenell have appointed Chuck Augustowski vice-president of AHB operations within the United States. He was previously sales manager. □

APRS

column

It is hard to recognise in the lively, successful, constantly expanding UK recording industry of 1984 the worried, contracting, under employed studiobiz of 1981/82. This is clearly a good year for British studios—following a year in which a remarkable turn-round of fortune was achieved—and there's every indication that 1985 will be even better (particularly if hints that the Government may alter the tax laws which force some of the UK's biggest earning recording artists to work abroad, prove to be true).

Therefore it's a happily appropriate time for the APRS regular column in this best-read of professional recording magazines to make its debut.

The APRS has been working for and on behalf of studios (and the engineers therein) and pro audio manufacturers for many years—in fact one of the many issues it has taken up in order to push the studio business's point of view is the way tax laws exile many big stars and force them to record abroad instead of working in their home studios.

For a hardworking and successful trade organisation the APRS has somehow managed to achieve fame—even within the pro audio industry—at a level second only to the cavalcade of character actors in TV and film whose faces are vaguely recognisable, but whom no-one can name.

Yet this is the organisation which works constantly to maintain and raise standards in member studios; to attract recording work, from home and abroad, to those member

studios; to offer useful legal and contract advice; to monitor technical developments; to collect technical and operational data and interpret it for the day-to-day use of the membership; to offer training for engineers and business help for managers/owners in an industry which has never properly developed large scale training and specialist business management schemes; to provide the now internationally recognised APRS showcase for professional equipment every year; and to forge and maintain very advantageous friendly links with other organisations in the record and recording industries—to the benefit of members—such as the MU, AES, SPARS and the BPI.

Through this *Studio Sound* column the APRS hopes from now on to put across its own news and views to members and potential members.

There is news of the second APRS digital seminar. This will take place at the BAFTA Theatre, Piccadilly, London, on October 29th. It will be a one-day event this year aimed at bringing in any who are professionally interested in digitised sound, all day—but divided in content so that the more technically minded will get most from the morning sessions whilst those whose interest is predominantly commercial will be best catered for in the afternoon. Details of the seminar agenda will be fully covered in this magazine, and in *Music Week*, which (like *Studio Sound*) is helping to sponsor the event by publicising it to the relevant record and recording industry readers.

After the recession-hit years—when studios pared staffing levels and budgets to the minimum, and there was little energy left over after worrying about the future to engage in activities like engineers refresher courses—

the 1984 APRS Engineers' Course at Surrey University is now fully sold out to UK engineers and to the usual (still growing) overseas contingent, including an ever higher proportion of broadcast engineers and latterly video engineers as well. This course has proved invaluable to what could almost be called generations of studio engineers, both in terms of new entrants into the profession graduating from tape op to balance or maintenance engineer and in terms of the equipment generations in the rapidly developing audio technology. This year the course will offer much more practical work, through hands-on workshops for small groups, than ever before, in addition to the week's lecture sessions. Workshop subjects will include digital editing, test equipment use, analogue mastering, mic characteristics, and practical mixdown. The course is still probably the cheapest and best residential engineers' course anywhere in the world.

The APRS has also now started to produce its own newsletter for members offering news, features, direct information and comment on main and side issues in the industry. Issue No 2 has just appeared, and the newsletter looks like being a very popular means of communication between the small APRS executive committee and a growing membership.

That membership embraces professional studios and pro audio manufacturers and agents, plus various educational establishments. As a result of a big vote of confidence from record producers the membership will almost certainly soon be extended to include producers. The APRS executive is still sifting through the 70-plus completed questionnaires from producers who attended the APRS '84 exhibition—every

one of whom said he or she was keen to see a producers' membership of the Association set up. A framework for such membership and a statement of what the APRS intends to do for producers can be expected to be announced after the summer holiday period.

As for this year's exhibition—it was the biggest and most successful of all.

Manufacturers and distributors of pro audio equipment drew huge crowds of visitors and won many orders from home and overseas, at a show which was, as always, an impressive feat of organisation for which APRS secretary Edward Masek again should take much credit.

But as APRS chairman Mike Beville put it in the first *APRS News*, "No professional association's Executive can work effectively in isolation from the members."

Expressing the feelings of all the APRS committee members he added: "I would like to see more communication and involvement between the members and the Association . . . please contact us if you have any ideas that might benefit the membership as a whole. Better still, if you are able to give some time to APRS work (perhaps assisting with some special project or acting in some capacity in your area by setting up informal meetings with other studio managers or engineers for example) please lift the phone. We can make things happen to the degree that we communicate."

Finally, a piece of late news. Sir Georg Solti has recently announced his retirement from the office of president of the APRS after many years of service to the Association due to pressure of his work. We are, however, very pleased to announce that George Martin has accepted our offer to become the new president of the APRS. □

FOR TRIDENT STUDIOS, IT'S THE OTARI EDGE.

Trident Recording Studios number among those London studios which can be accurately called "World Class". Their latest endeavour, Studio Three, features facilities for audio post-production as well as music recording.

The Trident choice for multitrack recorders: two MTR-90 Series II twentyfour channel machines.

Trident selected the MTR-90 recorders for many of the same reasons you would: superb sound quality, easy interface with video editing systems and synchronisers, an advanced microprocessor-based tape transport, and a reputation for reliable performance.

While gently handling your Masters in the most reliable

manner, the MTR-90 will deliver the fastest transport operational modes of any 2" professional audio recorder made. The compact MTR-90 even fits easily into the smallest machine or sound control room. An equally compact Remote Session Controller comes standard and an optional full-function autolocator may be easily fitted.

Whether your work is in music, radio, multi-media, film or television audio production, there are many advantages to owning an Otari.

We invite you to critically evaluate the recorders that will put you where you **need** to be: at Technology's leading-edge.

To receive full technical information and a demonstration, please contact one of our authorised professional dealers or ring us at 0753-822381. Otari Electric (U.K.) Ltd., 22 Church Street, Slough, Berks., SL1 1PT, U.K. Telex: 849453 OTARI G.

Authorised Dealers:

ITA, 1 Felgate Mews, Studland Street, London W6 9JT 01 748 9009

TURNKEY, Brent View Road, London NW9 7EL 01 202 4366

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Technology You Can Trust

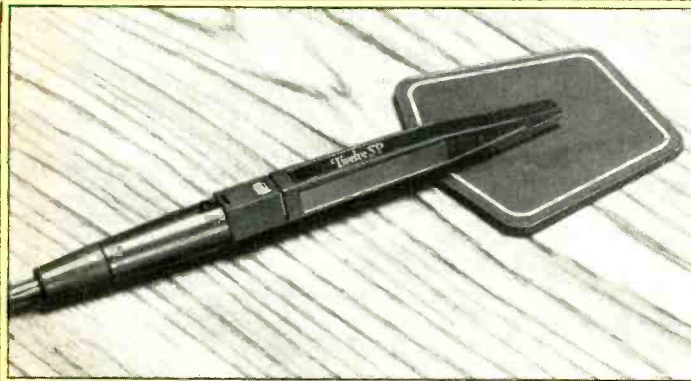


Application:

The MTR-90 Multi-channel Master Recorder for Music Production

NEW PRODUCTS NEW PRODUCTS

Equipment, modifications, options, software



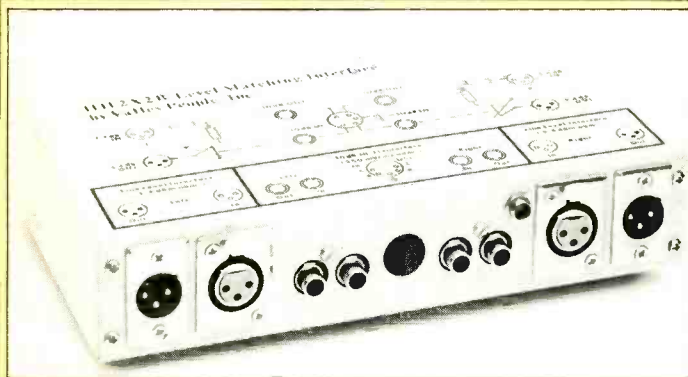
Crown 12 SP Microphone

Crown's new sound Pressure Zone Microphone, the 12 SP, is intended for use in sound reinforcement, broadcasting and electronic news gathering applications. Phantom powered from 18 to 48 V, it features a transformer balanced, low impedance output from an integral 3-pin connector. A wide, smooth response is claimed, with high frequency emphasis for brilliance. Low noise and high overload (150 dB SPL quoted), high

sensitivity and 'reach' are additional features. A windscreen is provided for outdoor or close-up use.

Crown International Inc,
1718 West Mishawaka Road,
Elkhart, IN 46517, USA. Tel:
(219) 294-571. Telex: 810-295
2160.

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



Valley People level matching interface

Succeeding their HH 2x2 interface, Valley people's new HH 2x2B balanced level matching interface offers a number of refinements over its predecessor. The HH 2x2B is a stereo unit capable of boosting the typical -10 dB levels typical of domestic-type equipment up to the professional levels of +4 or +8 dB.

In addition, an attenuator provides 14 dB of cut for the output to those lower level devices. Low RF and hum levels are assured by balanced configurations at the +4/+8

dB outputs, this being done with active circuitry rather than with transformers to avoid 'distortion, ringing and magnetic flux pickup'. The HH 2x2B comes with its own power supply. A 19 in rack adaptor is available to mount one or two of the units.

**Valley People Inc, PO Box
40306, 2820 Erica Place,
Nashville, TN 37204, USA.
Tel: (615) 383-4737**

**UK: Scenic Sounds Equipment
Ltd, Unit 2 Comtech, William
Road, London NW1.
Tel: 01-387 1262.**

Ursa Major 8X32 Mk II

A MkII version of Ursa Major's 8X32 digital reverberator, is now available, offering increased flexibility without losing any of the existing features. These changes have been accompanied by a substantial reduction in the US price. The new unit has four user-modifiable reverb programs: Cask, a short, coloured program with a maximum delay time of 2 s; Percussion Plate, an uncoloured program with an explosive build-up and maximum decay of 5 s; Chamber, a bright program especially suited for vocal tracks; and Reverse Reverb, a 'backwards reverb' program

with a maximum delay of 20 s. These programs are in addition to the 8X32 s Plate I, Plate II, Hall, and space. As before, the user has full control over all reverb parameters, including delay and level of first reflections, time and level of initial reverberation, etc. All selected parameters are displayed via LEDs on the unit's front panel.

**Ursa Major Inc, Eox 18,
Belmont, MA 02178, USA.
Tel: (617) 489-0303.**

**UK: Feldon Audio Ltd, 126
Great Portland Street, London
W1N 5PH. Tel: 01-580 4814.
Telex: 28668.**

Electro-Harmonix digital sampler

The Super Replay 4 s Digital Sampler from Electro-Harmonix digitises and stores between 1.4 and 4.4 s worth of sound and then instantly replays it under keyboard or Roland guitar control. The sound can also be triggered by any output from an electronic drum machine or by drum pad sensors. Any source can be employed, from mic, guitar, bass, keyboard, tape deck, effects box, etc, and a built-in click track helps with the

timings. Additionally, kits such as the *LinnDrum*, *Drumulator* or Oberheim *DMX* can be used via the 'Super Replay' function. 12-bit sampling is used and the total memory is 393,216 bits, or 32,768 12-bit words. The unit comes with an external trigger drum pad and mounting hardware.

**Electro-Harmonix, 27 West
23rd Street, New York, NY
10010, USA. Tel: (212)
741-1770.**



Only the creativity and expertise of the people using Neve mixing consoles limits their sound quality

It's true. Neve mixing consoles — whether analogue or digital — are of such a high standard and quality that it is only the people who use them that limit their capability and sound quality.

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Digital and Analogue mixing consoles for recording studios, television and radio broadcasting and the film industry. For full details of sound mixing consoles and systems phone the Neve technical information service on Royston (0763) 60776.

Neve Electronics International Ltd Melbourn, Royston, Herts SG8 6AU

NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

AHB's CMC Mixer

The *CMC* is a new 24-input, 16-bus, ultra-compact mixing console from AHB. Features include a new 3-band sweep equaliser, six auxiliary sends and 'genuine' solo-in-place on both input channels and tape monitors. The total format capability is 24/16/2, with 40 line inputs available for re-mixing.

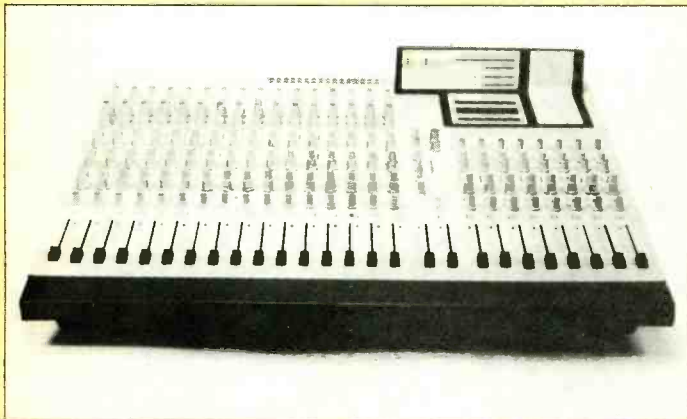
All routing from the 24 inputs to the 16 multitrack outputs is handled by a microprocessor, and complete routing status can be stored as a patch. The memory can retain up to 16 patches, as well as mute status and monitors, with battery back-up. A computer interface port

allows control of the complete systems by microcomputer, a facility which would permit still greater flexibility—increased patch storage, channel routing displays, etc.

Intended for use in situations where space is restricted, the *CMC* has front-accessible connectors and two headphone outputs are provided.

Allen & Heath Brenell, 69 Ship Street, Brighton BN1 1AE. Tel: 0273 24928. Telex: 878235.

USA: Allen & Heath Brenell USA Inc, Five Connair Road, Orange, CT 06477. Tel: (203) 795-3594. Telex: 643307.



Hafler power amplifiers

The David Hafler Company has announced two new power amplifiers, the *P220* and *P505*, both of which have been 'customised' for the professional market from existing (and highly regarded) domestic designs. Both use fully complementary push-pull circuitry and employ MOSFET output devices both for performance considerations and for their inherently self-protecting behaviour.

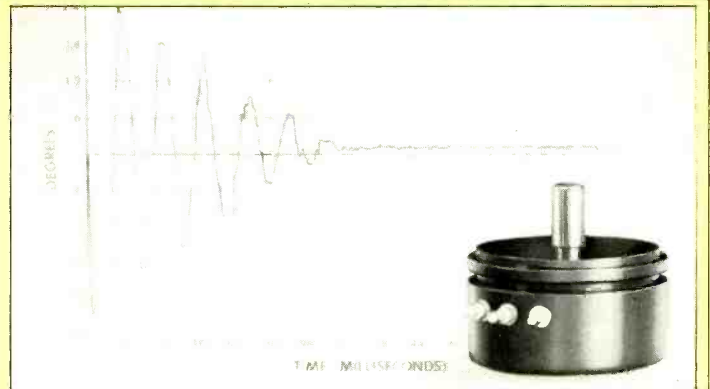
Summarising the specs, the *P220* is rated at 175 W channel into 4 Ω for less than 0.04% THD across the audio bandwidth with both channels driven. In bridged mono mode over 350 W into 8 Ω is available. The circuit includes an AC line current in-rush limiter, DC offset protection and a turn-on delay to eliminate switching transients (a corresponding front panel

indicator showing status in this respect). Thirty-one-step input gain controls and signal present and clipping indicators are fitted. *XLR* and $\frac{1}{4}$ in inputs, binding post outputs, circuit and chassis grounds, mono/stereo-balanced/unbalanced switches are provided, together with thermal cutouts in case the automatic 3-speed fan cooling fails to cope.

The *P505* offers 400 W into 4 Ω or over 800 W bridged into 8 Ω ; $\frac{1}{4}$ in inputs only, with binding post outputs, and the gain controls are rear mounted presets.

David Hafler Company, 5910 Crescent Boulevard, Pennsauken, NJ 01809. Tel: (609) 662-6355.

UK: HW International, 3-5 Eden Grove, London N7 8EQ. Tel: 01-607 2717.



Variohm potentiometer

HQ-5M is a new range of conductive plastic potentiometers with aluminium housing offered in servo sizes 9, 11, 13 and 20. All units incorporate sealed ball bearings for long mechanical life and stainless steel shafts for strength, and corrosion resistance. Continuous correction over the whole function length gives

high linearity (down to 0.075% independent).

Quoted life expectancy is 250 million cycles and the dither life (measured over 1°) is in excess of 500 million cycles.

Variohm Components, The Cattle Market, Watling Street, Towcester, Northants NN12 7HN. Tel: 0372-51004. Telex: 311754.

Syntovox vocoder

The *SPX 216* is a new vocoder design from Synton Electronics. Fourteen-channel audio analysis enables many types of sound sources to cross-modulate or synthesise other sound sources. It has a built in VCO with doubling circuit for 'robot' voices. *SPX 216* has an electronic matrix system formant shifting up or down over an interval of around a major third.

Speech input filtering gives intelligible close miking for live performance and a bypass/cleanfeed circuit provides various ways of adding original sound sources

to the effect outputs.

Other features are: built in noise generator; LED level indication on speech and carrier inputs; stereo outputs and multiconnector for external patching.

Synton Electronics BV, Box 83, 3620 AB Breukelen, Holland. Tel: (03462) 3499. Telex: 40541.

UK: Feldon Audio, 126 Great Portland Street, London W1N 5PH. Tel: 01-580 4314. Telex: 28668.

USA: Synton USA, 269 Locust, Northampton, MA 01060. Tel: (413) 586-3777.

In brief

Lexicon now have language chips for use with the *224X/LARC* for French and German with Spanish and Italian to follow soon... Sonosax have announced that the *SX-S* portable console is now available. This new unit was delayed following upgrading of certain technical specifications and the complete modification of the cabinet which they felt

was not strong enough. The *SX-B* has been out of stock for some months although a new version with a lower price should be introduced shortly. The *SX-A* is now available on special order only. Lastly Sonosax have announced a new mixer to take its place between the *SX-S* and *SX-A*, to be available in three sizes up to 24-channel and this will be launched later in the year. □

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EXHIBITION PREVIEW

AES 76TH CONVENTION NEW YORK

A

● **Accurate Sound:** range of high speed tape duplication equipment and tape machines. ● **Acoustilog:** range of acoustic test equipment including reverb timer, the *Impulser* option, time delay spectrometry equipment and details of their acoustic consultancy services. ● **Adams-Smith:** featured product will be the *2600* modular synchronising system which will be shown with new remote panels. ● **ADC Magnetic Controls:** very wide range of audio connectors, terminal blocks and patchfields. ● **Advanced Music Systems:** full range of signal processing equipment. Featured will be new Keyboard Interface, *Time Flex* time squeezer and *MX15* profanity delay. ● **Agfa-Gavaert:** full range of audio and video tapes including *PEM 297D* digital ¼ in tape and the new *PEM 469* professional studio tape intended to meet multitrack requirements. ● **AKG Acoustics:** wide range of microphones, headphones, reverb systems and accessories. Featured items will be the new generation of 'ultra-linear' capsules *CK61-ULS* and *CK62-ULS* designed for the *C460* preamplifier. Other new items will include the *C568* short shotgun mic and the *D451* intercom mic. ● **Allen & Heath, Brenell:** will show the *Syncon B* multitrack console system and the flexible *System 8*. Featured new items will be the *CMC* range of consoles with microprocessor controlled routing; the *SR Series* of sound reinforcement mixers; and for AHB, a very new departure—the *Inpulse* digital drum computer that combines keypad programming and drum pads for memory input. ● **Alpha Audio:** *Sonex* acoustic foam shown in a variety of colours. ● **Altec Lansing:** wide range of equipment including monitor speakers, small mixers and power amplifiers featuring the *3000 series* speakers and the *8000 series* cabinets. ● **Amber Electro Design:** range of audio measuring equipment. ● **Amek:** models from the range of Amek and TAC consoles including the *M2500* console, the *Angela* console now available with add-on automation and the TAC *Matchless* multipurpose console with 24 buses and an in-line monitor section. ● **Ampex:** wide range of audio and video professional tapes and audio and video cassette formats. ● **ANT:** selection of products from their range of noise reduction, radio links, multiplex systems

The 76th AES Convention will be held at the New York Hilton Hotel, Avenue of the Americas, New York from the 8th to 11th October. The convention will comprise the presentation of a wide range of technical papers and an associated exhibition. We have here compiled our usual preview of the exhibition using the lists of exhibitors and information available to us at the time of writing.

etc. Featured items will be the telcom *c4* noise reduction system in the form of specialised models *231*, *232* and *122*. ● **Aphex Systems:** full range of Aphex products with featured items being the *Compellor* compressor/limiter/levellor and the *Aphex Type B Aural Exciter*. ● **Applied Microsystems:** complete range of tape control and timing products including the *Spin Time* add-on tape timer; the *CM50* autolocator and the *I-CON 24* which is a *CM50* stretched to include 24 record select keys which are multiplexed to the multitrack. The *CM50* and the *I-CON 24* may be upgraded to provide a simple synchroniser package. ● **Audico:** full range of cassette production equipment and accessories including tape loaders, timer/rewinder/exerciser and rewinders. ● **Audioarts Engineering:** wide range of mixing consoles for broadcast and recording applications under the *Wheatstone* name, and a wide range of signal processing devices. ● **Audio & Design Calrec:** full range of products including Ambisonic Mastering Package. ● **Audio Developments:** range of compact mixers featuring three new items: the *AD062 Multimixer* with some interesting variations; the *AD145 Pico* mixer in 8-input version; and the *AD160* semi modular ENG mixer. ● **Audio Kinetics:** *MasterMix* console automation; *Q.Lock* synchroniser system with *Option 64* user-definable control routines and *Q.Soft* software for sound effects assembly (*Q.Soft-SFX*), automatic dialogue replacement (*Q.Soft-ADR*) and automatic audio editing. *Timelink* is a new aid which solves timecode difficulties, containing a timecode reshaper to clean up waveforms, and a 'gearbox' for timecode standards conversions. ● **Audio Technica:** full range of studio and stage mics, both dynamic and electret types together with ranges of phono cartridges, headphones

and accessories. ● **Audiotechniques:** details of the company's sales, rentals and service operations.

B

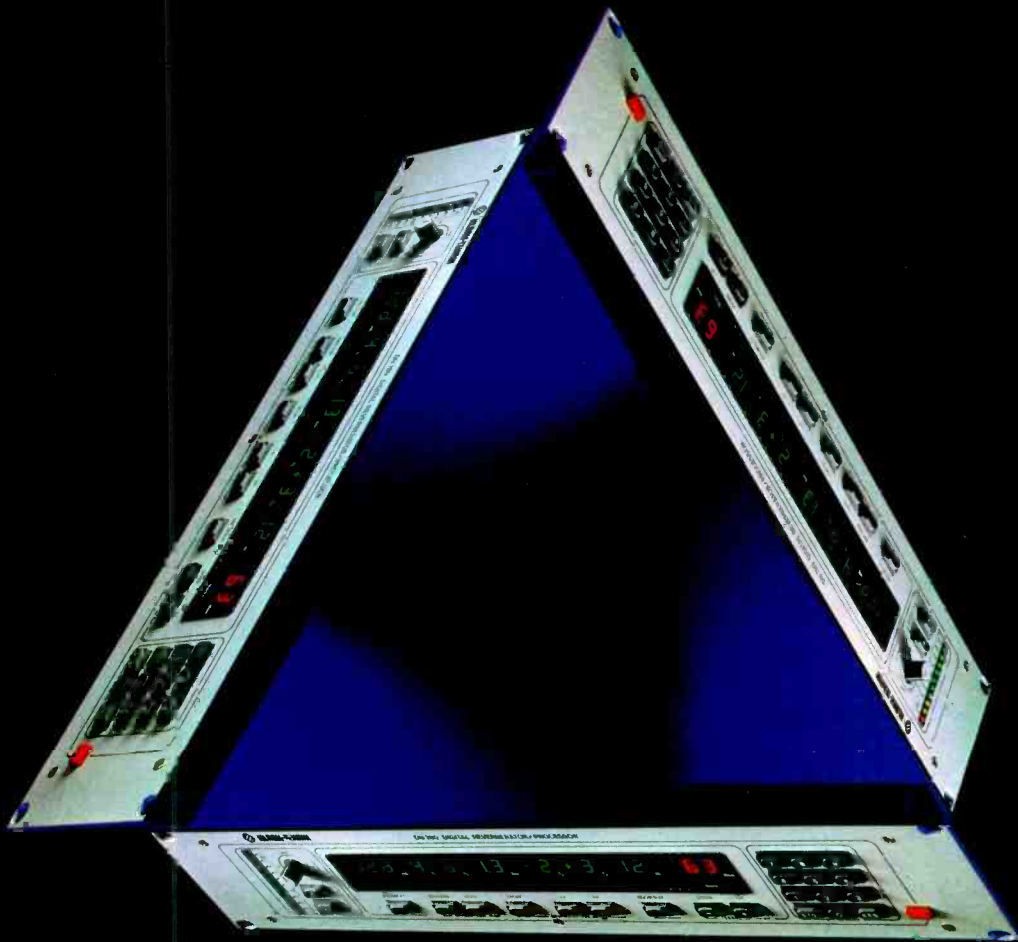
● **BASF:** full range of professional recording tape of all widths, cassette products, computer floppy disks and video recording products. Featured will be the new *Studio Master* range of tapes including the *910* studio tape, the *920* chrome duplication tape and the *930* digital sound recording tape. ● **Beyer Dynamic:** full range of microphones, headphones, radio mics and accessories. New products will include the new versions of the *DT 108* and *DT 109* headsets with options for built-in amplifiers, volume controls for the headphones section and a push-to-cough switch. Also new will be the *MC 734* condenser mic suitable for handheld applications, and the *MC 736* short shotgun and *MC 737* long shotgun mics. ● **BGW:** full range of power amplifiers and accessory products. A featured item will be the new *8000* power amplifier. ● **Biamp Systems:** full range of small mixing consoles and signal processors. ● **Bose:** full range of Bose products including speaker systems, active equalisers, power amplifiers and accessories. ● **Brooke Siren Systems:** full range of electronic crossovers and the range of accessory DI boxes, phase checker, lead/fuse tester etc. The featured item will, however, be the *DPR 402* Dynamic Processing Range which comprises a compressor/limiter/De-esser and peak limiter for two channels in a single U rack unit. This unit will also be on demonstration in the joint demo room with Klark Teknik. ● **Bruel & Kjaer:** comprehensive range of audio test equipment and the recently introduced range of recording microphones. New items will include the 1 in condenser mic *Type 4179* and preamplifier *Type 2660* designed for very low sound pressure level measurements. ● **Bryston:** range of power amplifiers.

C

● **Calzone Case Company:** range of flight cases for amplifier racks, mixers, effects units and anything else that needs casing. ● **Canare Cable:** very wide range of cable from mic to multiway with cable drums, stage boxes and a wide range of accessories.

A small universe

325
164



Create space The DN780 – Reverberator/Processor

Klark-Teknik's ongoing investment in research leaps into the age of variable space with the new DN780 reverberation simulator. Its *Very Large Scale Integration* technology and a superfast *Digital Signal Processor* (DSP) allow the world's first practical application of specifically developed algorithms, creating "added density"™ reverberation; reflections with much smaller intervals between them.

The result is simply – greater realism.

From natural concert hall reverberation through remarkable small room and plate sounds to an impressive "infinite space" effects programme, the DN780 will uncannily place you in the musical environment of your choice.



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Manufactured by Klark-Teknik Research Limited
Coppice Trading Estate, Kidderminster DY11 7JJ,
England. Telephone: (0562) 741515 Telex: 339821

Klark-Teknik Electronics Inc.
262a Eastern Parkway, Farmingdale,
NY 11735, USA. Telephone: (516) 249-3660

Distributed in the UK by Autograph Sales Limited
2 Spring Place, London NW5 3BA.
Telephone: 01-267 6677

EXHIBITION PREVIEW

● **CBS/Fender Musical Instruments:** wide range of sound reinforcement equipment including mixers, power amplifiers, speaker systems and microphones. ● **Cerwin-Vega:** range of live sound speaker systems and monitor speaker systems. ● **Cetec Gauss:** range of studio monitors, individual drive units and tape duplication systems. ● **Cetec Vega:** range of wireless mics and wireless intercom systems. ● **Coherent Communications:** range of power supplies and a compact portable location mixer. ● **Collins Automatic Tape Joiners:** full range of automatic splicing equipment including the *CAT* for ¼ in audio tape; the *Tabbie* range of ¼ in splicing tape dispensers; a ½ in video tape splicer and an early model of the cassette tape equivalent of the *CAT* system. ● **Community Light & Sound:** range of sound reinforcement systems. ● **Connectronics Corp:** wide range of cable and connectors for audio applications. ● **Countryman Associates:** range of miniature microphones for a wide number of audio applications. ● **Cover Publications:** range of musician orientated magazines. ● **Crest Audio:** range of power amplifiers. ● **Crown International:** the full range of power amplifiers, and PZM microphones. Featured items will be recent additions to the PZM range including the *SP12*, the *Delta Omega 2000* power amplifier and the *TEF* measurement system.

D

● **The David Hafler Co:** range of power amplifiers and preamps. Featured will be the new *P220* and *P505* amplifiers. ● **dbx:** full range of dbx products including noise reduction systems, rack mount signal processing systems and the *700 series* digital processing system. ● **DeltaLab Research:** the *Effectron* range of digital delay lines/processors. ● **Direct Design Sound:** range of speaker systems for sound reinforcement applications including the *DVB-1* portable vented bass enclosure and the *DRF-1* flush mounting radial horn. ● **Digital Entertainment Corp:** featured will be the Mitsubishi *X-800* 32 track and *X-80* 2 track digital recorders. There will also be new versions of the *X-80* for vinyl disc and CD mastering as well as a range of new options for the *X-80* including a VCO synchroniser interface, autolocator, varispeed and special purpose data track addition. ● **DOD:** wide range of graphic equalisers, delay lines, parametric equalisers and other rack mount sound processors. ● **Dolby Labs:** will show their full range of noise reduction systems including the single channel and multitrack type *A* units; systems for tape duplication and noise reduction cards for use with video recorders.

E

● **Electro Sound:** full range of high speed tape duplication systems including

units incorporating Dolby *HX*.

● **Electro-Voice:** will feature a new 4-channel mic/line mixer *ELX-1* designed for field and studio use. Features include light weight, auto switching between internal and external power supply, phantom power and a single U rack mount format. Also on show will be an integrated power amp/monitor speaker system *Sentry 100 EL*. Also on display will be the *DL series* of LF speakers for all applications and the full range of mics. ● **Emilar:** wide range of loudspeaker drive units. ● **Eventide:** range of sound processing equipment including the *SP2016* digital reverb/effects processor, *Timesqueeze* time compression/expansion systems, *H949* Harmonizer etc and the *Specsystem* software package for spectrum analysis with personal computer systems.

F

● **Fane:** wide range of loudspeaker drive units for all applications. ● **Fairlight Instruments:** the *CMI* digital synthesiser system with the most recent software and hardware additions. ● **FM Acoustics:** full range of power amplifiers and preamplifiers. Featured items will be the new *FM 1000* mono high power amplifier and the *FM 236* linear phase electronic crossover. ● **Fostex Corp:** full range of Fostex products including the *A2*, *A4*, *A8* tape machines; the *250* and *X15* multitrack cassette systems; the ½ in *B16* 16-track machine; the full range of signal processing units, microphones, speaker systems and the new mini reference monitor.

G

● **Gold Line:** range of low cost acoustic measurement systems including spectrum analysers and noise level meters. ● **Gotham Audio Corporation:** very wide range of products from a variety of manufacturers including Telefunken, Neumann, EMT, in addition to the Gotham/EMT developed *Systex* digital recording editing system based on hard computer disk.

H

● **Harmonia Mundi:** details of the company's digital recording/editing systems and services. ● **Harrison Systems:** a selection from their range of recording and live sound consoles. ● **Heino Ilsemann:** automatic cassette loading and labelling systems. ● **HH Electronic:** full range of MOSFET power amplifiers and a selection from their other ranges of products including speaker systems. ● **Hill Audio:** items from the range of Hill products including the *DX2000* very high power amplifier, mixing consoles for sound reinforcement, monitoring and multitrack use; compact rack mount mixer, and Hill designed speaker systems. ● **HM Electronics:** range of radio mics and receivers including road cases and accessories.

I

● **ICM:** range of audio cassette materials including C-O cases, labels etc. ● **Infonics:** tape duplication systems. ● **Inovonics Inc:** range of audio processing, recording and instrumentation products including audio analyser, average/peak limiter, octave-band compressor and the *MAP II* broadcast audio processor.

J

● **JBL/UREI:** full range of JBL speaker components and monitor systems. Also the full range of UREI monitor speakers, equalisers, compressor/limiters and power amplifiers etc. ● **JRF/Magnetic Sciences:** magnetic head sales and service. ● **JVC:** digitally related equipment, equipment for PA use and signal processing systems.

K

● **King Instrument Corp:** will feature the model *793* fully automatic audio cassette loader with automatic pancake/hub changeover and tape threading, alternator/feeder and display for machine monitoring. ● **Klark Teknik:** featured item will be the new *DN 780* digital reverb system which will also be on demo. Other Klark Teknik products will include the *300 series* of graphic equalisers. ● **Kurzweil:** the Kurzweil digital synthesiser system.

L

● **Lexicon:** the full range of Lexicon products and latest software updates on the *200* and *224X* digital reverb systems and the other digital signal processing products.

M

● **Martin Audio Video Corp:** selection of the wide range of products they supply. ● **Meyer Sound Labs:** selection of products including the *833* studio monitor and sound reinforcement speaker systems. ● **Midas:** ranges of consoles and theatre and sound reinforcement use. ● **Milab/Creative Trade:** the complete range of Milab microphones. Featured will be the new variable pattern mic/line mic *VIP 50*. ● **Mogami/Marshall Electronics:** the full range of Marshall signal processing devices and also Mogami cable products. ● **Monster Cable:** wide range of cable products.

N

● **Nady Systems:** *Nady Cordless* and *Nasty Cordless* radio transmission systems and various transmitter/receiver units. ● **Nagra:** range of portable tape machines in a variety of configurations including the *T-Audio* twin capstan multi-format recorder. ● **Neotek:** range of mixing consoles for multitrack

MOLINARE CHOSE AMEK...



PHOTO: Litrick Patchfield

Complete M2500 client list:

- Buckskin Studios, L.A.
- Broadcast Assistors, L.A.
- Studio 19, Frankfurt
- Radius Studio, Milan
- Audio Affects, L.A.
- Tonstudio Stroher, Innsbruck
- Axent Recorders, Sydney
- Universal Recorders, Johannesburg
- Discos de Centro America, Guatemala City
- Central Recorders, Sydney
- Cream Studio, Frankfurt
- Castle Sound Studios, Edinburgh
- Post Sound, L.A.
- Genesis, Guildford
- Studio Ramses, Paris
- Music Works, London
- N'Koussu Productions, Gabon
- Clan Strumenti Musicale, Milan
- The Garden Studios, London
- EFX Studios, Burbank, L.A.
- Gooseberry Studio, London
- Omega Productions, Dallas, Texas
- Roxon Records, Stuttgart
- Revolution Studios, Manchester
- Melodija, Moscow, (2 consoles)
- Molinare, London
- Studio d'Aguesseau, Paris
- Forum Studio, Rome
- Tienjin Radio, P.R. China
- Xian Film Plant, P.R. China
- Feedback Studios, Aarhus, Denmark
- West End Studios, Munich
- Studio 150, Amsterdam
- Pepperoncino Studio, Milan
- Blackwing Studios, London
- Vince Clarke's Splendid Studios, London
- Livingston Studios, London
- Paramount Pictures, Hollywood
- Titania Studio, Rome (2 consoles)
- Wanshoushi Concert Hall, Beijing, P.R. China
- Studio Davout, Paris
- Sri Siam Production Co., Bangkok
- Guangxi Radio, P.R. China
- Fonglin Productions, Singapore
- P T Remacko Productions, Djakarta
- Tonstudio Heinz, Vienna
- TVAsahi, Tokyo
- Sunrise Studio, Tokyo
- Son Soleil Studio, Montreal
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- China Leasing Co., Shanghai
- Pollicino Studio, Rome
- Peter Music, Milan
- EDI Video, Milan

The extensive range includes:

Custom consoles for film and video post-production and edit suites; M3000, M2500 and ANGELA multitrack recording and video production consoles; M1000 broadcasting and general purpose system; BC01 portable broadcast mixer. From Total Audio Concepts: MATCHLESS multi track/multipurpose console; 1682 system; 168/FB Foldback system; TAC 1042.

In the U.S.A.:

Amek Consoles Inc
10815 Burbank Blvd
North Hollywood, CA 91601
tel: (818) 508 9788
telex: 662526

Head Office and Factory:

Amek Systems & Controls Ltd
Islington Mill, James Street
Salford M3 5HW, England
tel: (061) 834 6747
telex: 668127

EXHIBITION PREVIEW

applications. ● **Neutrik**: wide range of connectors and sockets including the new *X series* of *XLR*-type units. Also featured will be the *Audiograph* modular measuring system. ● **Neve**: range of broadcast and recording consoles. Details on *DSP* system. ● **New England Digital**: *Synclavier II* digital synthesiser with recent options and software additions.

O

● **Orban Associates**: range of signal processors including the *424A* and the *422A* compressor limiters in addition to broadcast compression systems and de-essers. ● **Otari**: very wide range of products including the *MTR 90* multitrack range, the *MTR 10* and *12* range of 2/4 track machines; the *MX* ranges of 2,4,8 track machines and the *DP-80* high speed cassette duplication system.

P

● **Pan Communications**: the Sanken range of microphones with particular emphasis on the *CU-41* double capsule cardioid mic. ● **Peavey**: a wide range of equipment for sound reinforcement use including power amplifiers, mixers, speaker systems, monitors, microphones, signal processors and speaker drive units. ● **Penny & Giles**: will feature their newly introduced *4000 series* fader which has a 104 mm stroke, is available in a choice of tapers including *VCA* control law. ● **Pro Sound News**: industry paper. ● **Publison**: range of signal processing equipment including the *Infernal Machine 90* with its wide range of possible functions and a potential maximum delay time of five minutes. ● **Pulsar Labs**: range of power amps and matrix mixing consoles.

Q

● **Quad Eight/Westrex**: range of Quad Eight modular mixing consoles, automation systems, digital reverbs and range of Westrex products. ● **Quantec**: will be featuring its new product, the *QRS/L* which is a reduced version of the standard Quantec Room Simulator. The *L* version will offer the same quality and programs such as Freez, Enhance and Reverb Mode. It will, however, be finished in a different colour and will have only one input and two outputs. The *V24 (RS232)* interface is now available for both units. Both models are available as flat panel versions with infra-red remote control option. ● **QSC Audio**: range of power amplifiers.

R

● **Red Acoustics (USA)**: professional monitor loudspeaker systems. ● **Renkus-Heinz**: range of loudspeaker drivers, horns and passive crossover networks. ● **Roland**: the Roland rack system

including power amplifiers, signal processors, preamplifiers, digital delay lines, in addition to a selection of recently introduced synthesiser/computer instruments.

S

● **Saki Magnetics**: range of hot pressed glass bonded ferrite tape heads. ● **Samson Music Products**: range of phase reflex hi-band hand held wireless microphone systems, *Wy* frequency booster and range of accessories. ● **Schoeps**: the full range of Schoeps microphones and accessories. ● **SCV Audio**: wide range of signal processing products including noise gates, compressors and crossover units. ● **Selco/Sifam**: wide range of panel meters and accessories. ● **Sennheiser**: the full range of dynamic and condenser mics, radio mic systems, headphones and a wide range of accessories. ● **Shure**: the range of dynamic and condenser mics, phono cartridges, sound reinforcement products and accessories, including the new *SM87* supercardioid condenser mic designed to give tailored frequency response and maximum gain before feedback on vocals. ● **Sierra Hidley Acoustics**: displays of new phase-coherent studio designs recently completed and discussions on the use of their variable acoustics system. ● **Solid State Logic**: the *SL 4000E* and *6000E* range of consoles. Showing for the first time in US—the Synchroniser Controller, the Programmable Equaliser and the Stereo Mix Matrix. They will also unveil a major new product line for broadcasters. ● **Sony**: the full range of Sony products from mics to multitrack digital systems. ● **Soundcraft**: full range of products including new *TS24* console, *Series 20* stereo mastering machine, power amplifiers, etc. ● **Soundtracs**: broad range of mixing consoles. Two new ranges will be launched—the *M Series* for PA and 8-track recording available up to 32 inputs; and a family of in-line consoles for 16 or 24 track use. ● **Sound Technology**: range of test equipment including distortion measurement equipment and microprocessor controlled automatic tape recorder test set. ● **Sound Workshop**: several ranges of multitrack consoles and the *Diskmix* automation system. ● **Stanton Magnetics**: wide range of phono cartridges. ● **Stephens Electronics**: range of professional recorders/reproducers. ● **Studer**: full range of tape machines, consoles and ancillary equipment including the *A810* range of mastering machines, the *900 Series* broadcast consoles, the *TLS 4000* synchroniser etc. ● **Symetrix**: wide range of rack mount units including headphone amplifiers, compressor limiters, signal processors, etc.

T

● **Tandberg**: full range of professional

products including *TD 50 ¼* in reel-to-reel, two channel tape recorders.

● **Tannoy**: full range of professional monitors for studio and broadcast applications. ● **Teac**: full range of Teac products including the *58* and *52* series of multitrack and stereo tape machines, the range of signal processor units, the *M50* console, etc. ● **Tektronix**: range of test equipment including the *SG5010* and *AA5001* programmable instruments for carrying out a variety of measurements. ● **3M**: full range of the company's magnetic tape products including magnetic tape and cassettes. ● **Toa**: complete line of professional sound systems from microphones to speaker systems, largely intended for the live sound market. ● **Trident**: featured console will be the t.i.l. which is Trident's in-line type console; the series *80B* with new 3-band monitor EQ; and a completely new console designed for 4, 8 and 16-track recording. ● **Turbosound**: range of live sound systems. ● **TTL USA Inc**: *515B* high speed automatic cassette loader for blank or recorded tape.

U

● **Ursa Major**: will be demonstrating the *Space Station*; the new *StarGate 323* digital reverb and the *Mark II* version of the *8X32* which features four new programs—Cask, Percussion plate, Chamber and Reverse Reverb and a lower price than the original version.

V

● **Valley People**: full product range including new level interface unit.

W

● **Whirlwind**: wide range of cables and connectors assembled into patch cables, stage boxes, multiway systems, etc. ● **Wireworks**: full range of professional cables and connectors.

X

● **Xedit Corp**: complete range of *Editall* splicing blocks alongside the range of audio test equipment.

Y

● **Yamaha**: full range of Yamaha professional sound products including digital reverb, digital delay, mixer and power amps.

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MONITORING

Monitoring is very much a matter of personal opinion. Although the monitor is intended to be a device for conveying the 'truth' about the monitored signal to the engineer/producer, the 'truth' can be presented in many shades—and so it should. There is at present a very wide choice of suitable speakers for monitoring purposes encompassing a number of quite different approaches, eg dual-concentric systems maintain popularity, existing quite happily in the market with various HF horn loaded systems in a selection of improbable looking shapes and with a number of units offering various types of dome HF systems.

If we are looking for a trend in monitors, then it must be diversity in manufacture and design. There is no common direction for system designers at present, the striving for phase coherence and alignment of the drive units for minimum time differential having now been absorbed into the basic design for many manufacturers and now no longer a matter of hot debate.

The increasing familiarity with the 'revealing clarity' aspects of digital recording at the professional and consumer ends of the chain has led many studios to look at their monitoring from a different way. Yes volume and power handling are essential for multitrack work but there is also a real need for fidelity particularly during the mixdown process. As Andy Munro said in a recent *Studio Sound* article "there is a certain physical element to rock music and you have to be sure that that certain element is in the recording—the only way being a large monitoring system". However the problem did appear to be that high level monitoring and the basic requirements for musical fidelity extended frequency response and transient response were not compatible. There are, however, a number of manufacturers who now say that this is not the case and that monitors they are developing will in fact prove this belief to be a fallacy.

Further adjustments in professional monitoring philosophy may have to be made to meet the demands being made of the mixing process. It is now fairly well known that the consumer with a CD player and a reasonable pair of hi-fi type speakers, stands a very good chance

An in-brief look at new monitor systems available for professional use by David Blair

of hearing a number of sides of the recording in his living room that may not have been audible to the recording engineer. This is obviously (or should be) a matter of some concern to studios whose recorded output may end up in such a format. There is, however, a very strong belief that the monitor is a tool and is designed to fulfil a monitoring function and not be a 'good listen'. This I feel to be essential during the recording aspect of multitrack work. I need to work with a monitor that will give me a physical response to the music at a volume that is proportional, to a degree, to that being recorded.

Musicians who have been laying backing tracks will need to hear playbacks at a level that is approaching or proportional to their playing level or they will not be able to respond fully to it and make a real feel judgement. I don't carry this to extremes however—I value my current hearing capabilities too highly to have them prematurely aged. So firstly we have the 'monitor as a tool' concept where the argument is that the experience of the engineer will allow him to interpret the sound and response of the monitors so that ideally he would produce the same sounding finished product no matter what monitor the music was mixed on. We all know that this is not actually the case although of course other aspects such as the room are never equal. Now it may be that the sound character difference obtained from mixing on different monitors (of the 'tool' type) is of no real consequence—either artistically or commercially, but if such monitors don't reveal certain aspects of the sound that the engineer cannot make allowances for, then their value as a mixdown tool must be highly questionable.

There have been a number of monitor systems introduced in the last couple of years that actually provide the answer to the 'hearing everything' dilemma. I can

think of two monitors that were able to reveal aspects of the monitored sound that threw a quite different light on the mixing process. They enabled you to hear very small changes in the EQ on certain channels, very small changes in level on single channels, to respond to dynamic changes within the mix far more noticeably and most strangely, even when the measured output level of the monitors was very high, they did not sound over loud. Either because of this or due to another property, it was still possible to hear small delicate sound details even at very high level—the sound did not blend and this was still true at low levels with it being quite possible to hear the individual composition of the track very easily up to about half a dozen instruments. This may sound marvellous and just what you need—however, there was a drawback—very few people find such speakers pleasant to listen to. They are far too revealing and although many engineers that I have spoken to found the prospect of a system such as this very exciting as a tool, from a purely commercial aspect clients do not like them. They are far from flattering and as such, a producer new to that studio would be completely at sea with no reference points and a somewhat unpleasant sound in the control room. If he could learn to live with this and had faith in the system abilities, the end result should be far better but that point is still some way off I fear.

The third area of monitors would appear to be those coming from the hi-fi manufacturers. Many classical engineers have used some systems from such manufacturers for many years although for all the reasons covered so far they have been somewhat unsuitable for rock and other high level monitoring—could they take their full output from a bass drum whose fader has been accidentally left wide open, and live to tell the tale? There are now, however, a number of such systems that are worthwhile looking at. As yet I have not had the chance to fully evaluate what these designs are like under operational conditions although this approach may well have something to recommend it.

There does appear to be only one way out of this dilemma. Studio design will have to make allowance for more than one monitoring system within the studio

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MONITORING

environment. For example maybe a pair of 'muscle-monitors' for track laying, a pair of lower powered speakers with more pretensions at fidelity and the obligatory mini reference monitors. Both of the main systems should be designed into the room so that there was no inconvenience in switching between systems and this would appear to meet all necessary requirements. This would mean that the search for the near mythical high power, high fidelity accurate monitoring tool would be less of a necessity although perhaps still a worthy and attractive goal.

To complete this brief article, I should add a round-up of some of the new products and areas of activity of some speaker manufacturers. Auratone suffer perhaps from being too good at one thing. They recently introduced a completely new range of monitors including such models as *QC66*. Certainly in my mind Auratone are very much associated with the *5C* and as such I feel that the new range is perhaps not getting the exposure that they might deserve. Unfortunately I have not had the opportunity to evaluate these new models although they would appear to be ideal in many respects for near field monitoring which is a current area of interest for me at present.

Studio Sound carried an article by Ilpo Martikainen on the debate between active and passive loudspeaker design (April 1983). His company, Genelec, have produced a number of good sounding although compact systems that have sold well in Scandinavian countries but they never had a big powerful system. At the Eindhoven AES a prototype of the *1025* system was shown and this is now in production and provides a high power alternative to the smaller systems. This is again an active system and is designed for structural inclusion in the studio control room.

As part of his revised approach to studio design Tom Hidley has modified the monitor system that he recommends for inclusion in his studio projects. There are two versions available and these offer response down to 20 Hz and 30 Hz in the form of a 2-way system. They also incorporate a new design of wooden horn that apparently doesn't have the cellular effect that was present with earlier designs.

TAD have been demonstrating two new systems at recent exhibitions. Featured in both systems is a newish HF unit. Based on simply listening to units at recent exhibitions, they do sound very smooth in the HF end although other judgements are impossible in the demonstrating environment.

The JBL *4400* series have continued to make inroads into the studio market. When they were first launched into the UK about two years ago the reaction was rather negative. In recent months we have seen the installation of systems in Air London and Abbey Road, so someone or something must have changed. I do feel that the sound of the bi-radial horn is far preferable to that of

the standard diffuser.

At the June APRS exhibition, DJM Studios were showing a range of monitors that they had developed for their own use due to a dissatisfaction with other systems that were available to them. There was considerable interest in their work and they have managed to sell one system already although this was, I gather, not their reason for the original development work. The HF and MF range units are soft dome types with the bass drivers varying with requirements.

As I mentioned earlier, the hi-fi manufacturers have started taking studio monitoring seriously and in the last year there have been models from quite a number. KEF introduced the *KMI* which is an active system with its own amplification system and a relatively high price tag. Power handling though would not appear to be any problem based on reports of demonstrations that KEF have made.

Some B&W speaker systems have been used for classical monitoring for many years although they remained fairly low powered systems. The newly launched *808* improves on this aspect although I feel that perhaps they will still be classically orientated due to the direction of the marketing. Radford have also added a professional system to their range, the *S90* although information other than the fact that it is a large 3-way system is not available.

Tannoy have added a number of new models to their range with applications in the lower powered small systems although the large monitors remain as before.

In the UK the monitoring field is largely divided up between Tannoy, JBL, UREI and Eastlake. A number of other manufacturers are, however, making an impression in some areas though. These include Electro-Voice with the Sentry *100A* and *500*; Altec with the *FS 800*; Meyer with the *833*; and Yamaha with the *NS100* which is finding quite wide use.

There are two companies that should be watched quite closely in the near future for interesting developments—Rogers and Eastmill. Rogers have shown the *Studio 2* which is a large monitor with the choice of its own amplification system. With developments into PA monitoring also, Rogers appear to be moving into a new area and although I have yet to hear the *Studio 2* (New Products September 1984) properly, their background in the manufacture of BBC licensed designs such as the *LS5/3* and *LS5/8* give them an excellent pedigree.

The other company is Eastmill. Earlier designs used dome drive units and their philosophy was well covered in Neil Grant's article (*Studio Sound* July 1982). They are currently in the latter stages of development of a new model that could be particularly interesting if you feel as I do that maybe an alternative to horn loading may be a better long term solution to many aspects of studio monitoring. □

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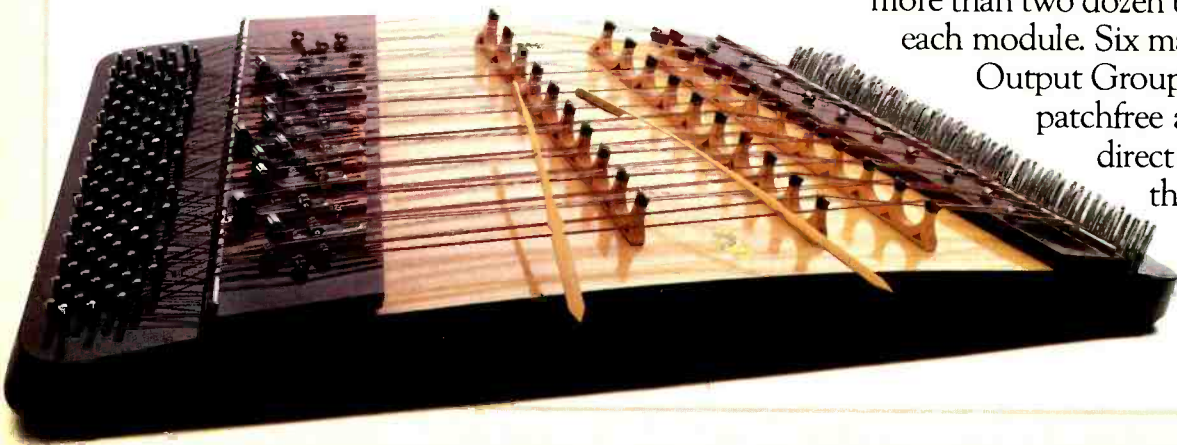
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THE MEANING OF MIDI

THOUGHTS ON NAMM

Years ago, there was a *Peanuts* comic strip that opened with Lucy bragging about her new 'hi-fi' jump rope. In the last panel, Charlie Brown wondered 'How can a jump rope be hi-fi?' A couple of years later, Lucy had a 'stereo' jump rope. There was no 'digital' jump rope in the '70s, but had *Peanuts* author Charles Schulz been at the convention of the National Association of Music Merchants (NAMM) this past June in Chicago, there is no doubt he would have been inspired to write about a 'MIDI' jump rope.

"Is it MIDI?" was The Question that rang for four days through the rafters of Chicago's McCormick Place. Every face that poked into a keyboard display at the NAMM Show asked it. Of course, much of the time The Question was irrelevant—a program from Yamaha that allows an Apple Computer to take over the functions of those silly little buttons on the DX7 (known as *DX PRO*) doesn't need a MIDI interface any more than your chief mixer needs a hearing aid—but that didn't stop The Question.

And in many cases, The Question was a good question. MIDI does indeed seem to be taking over the music industry. There were new MIDI keyboards from CBS/Rhodes, Roland, Yamaha, Seiko, Akai, and E-Mu Systems (among many others), a couple of MIDI guitars, and an attachment for reading MIDI data from electric, electro-acoustic (eg Yamaha and Kawai), and even acoustic upright and grand pianos. (This gizmo, from Forte Music of San Jose, California, unfortunately does not work in reverse—you can't yet program your Commodore 64 to perform Beethoven's 'Emperor' Concerto on your Bosendorfer.)

Owners of older synthesizers, those venerable *Minimoogs* and *ARP 2600s*, who are loathe to junk their favourite axes and invest in these newfangled digital thingies, asked The Question. For

The MIDI interface has caught the imagination of the synthesiser makers.

Paul D Lehrman reports from the Chicago NAMM show

them, the answer was a series of MIDI 'kludge boxes' from J L Cooper Electronics that can do all sorts of neat tricks converting control voltages and analogue triggers into MIDI data and vice versa.

But besides "Does it do it?" there was another Question, one that few seemed to have an answer to: namely, "What does it do?"

Using a computer to manipulate musical data and spit it back out to machines that make sounds is a fine idea. It is certainly the first step in creating a kind of universal musical instrument: anything that can go into the computer, whether it's generated by a music keyboard, an ASCII keyboard, a Koala pad, or any of a number of analogue or digital devices, can potentially be used to make music. But today, a full year after the format was unleashed on an unsuspecting public, software for MIDI still lags way behind the hardware.

Sequencing, of course, is an obvious application for computer control. For studio musicians, the idea of working out and recording tracks at home before going into the studio with its expensive clock is rather appealing. (So is the idea, promoted heavily a year ago but mysteriously absent these days, of *telephoning* synth tracks into a session. Although it shouldn't be difficult to do,

apparently no one has yet figured out how to get communications software to transmit MIDI files.) Studios, in turn, can set up separate, small, lower-priced 'MIDI rooms', in which much of the programming, editing, and mixing can take place off-line—leaving the multitrack tape deck and console free for other clients. Since (with the ideal MIDI system) pre-recorded synth tracks can be played back without anyone actually playing the instruments, when the tracks are being laid to tape the synths can be left in the MIDI room, and their signals merely piped into the main control room.

The first computer sequencers—4-track programs from Passport Designs and Sequential Circuits with piano-keyboard entry, minimal editing capabilities, static preset and volume values, and no provision for recording key velocity, pitch bend, modulation wheels, etc—were a good start, but their buyers started complaining about their limitations almost immediately. Although expectations were high that Passport Designs, at least, would have 8- and 16-track updates in short order, nothing seems to be forthcoming. (They will, however, make a ton of money on their 'MIDI album' which will allow the home organist to literally re-create Michael Jackson's *Thriller* in his living room, but how many studios and professional players can use that?)

Fortunately, two companies were showing at NAMM really useful 16-track sequencers with tape recorder-like editing and mixing functions. Cherry Lane Music, who have heretofore limited their activities to music publishing, are developing an impressive such package called *Connections*, that will come in at between \$250 and \$300 retail, including Roland's new *MPU-401* "intelligent interface" card for the Apple. Syntauri, whose *Metatrak* system has been threatened with total eclipse by the MIDI movement, managed to pull a

ELECTRONIC INSTRUMENTS AND THE STUDIO

rabbit out of a hat with their new *Proxima* system.

Besides being a good sequencer, *Proxima*, which is being developed for Syntauri by an outside company known as Mimetics, lets the user hear as many tracks as he wants through a pair of Mountain Computer sound-generating hardware conveniently located inside his computer. Therefore, an arranger doesn't need to own 16 MIDI synths to hear 16 tracks. When he's done, he just takes the disk into the studio and hooks up to a dozen or three *DX1s* and wails. (Let me interject here that this writer is working with a slight personal bias, as I was at the Syntauri booth demonstrating the system to the masses during much of the show.) This little number will sell for about \$1000.

Yamaha announced their *Personal Composer* for the IBM PC, which they claim will do 32-track sequencing (although it's hard to envisage how the 16-channel MIDI protocol will handle that many tracks), as well as music printing, for about \$1250. Unfortunately, no prototypes were to be seen, and the various pieces of literature the company was handing out gave different figures on how many tracks the system could handle—one piece claimed it could deal with 64!

Conspicuously absent were MIDI interfaces for the Apple *Macintosh*, although this writer has personal knowledge of at least a few small companies in various parts of the US working on such devices.

But sequencing is only part of the promise of MIDI. The home-entertainment market is probably quite viable, as is the educational sector (Passport Designs is also offering some elementary music theory packages). For the professional, however, there are far more interesting possibilities. Since MIDI is controlled by a clock, there should be a way to interface it with other time-based systems, like SMPTE. Roland has taken the first step in that direction, with the *SBX-80*, an inexpensive 'tempo controller' that can read, write, and translate both MIDI pulses and SMPTE timecode. In addition, it will generate 24-pulse timing information for driving drum machines. A company called Ensonig was showing a \$140 drum synthesiser called *DrumKey* that resides inside of an Apple. The sound quality is not the greatest, but the software is very useful and clever, and it has clock outputs—at least one company was talking about allowing the *DrumKey's* clock to control its MIDI software.

Music, however, like language, is ideas; MIDI, by reducing musical information to easy-for-a-computer-to-manipulate data, should give us the capability to treat music like language, and play with it as we would literary ideas in a word processor. So far, the technology is turning off more potential users than it is helping—for the majority of musicians, manipulating musical events by laboriously entering them in one at a time from a piano or typewriter keyboard is completely antithetical to

the creative process.

There were rumours at NAMM of various small companies developing systems that would allow input of musical data from alternative sources, like graphics systems, various kinds of touch pads, and woodwind-like instruments, and if they come to market, those will be a step in the right direction. But there is a more pressing need for programs that will allow real-world composition commands. Imagine, if you will, the following set of instructions:

"Play back that lead line at half speed. Change the C in bar 4 to a D. Sustain the F in bar 8 for another beat. Now repeat the last 16 bars, make the bass line swing, give the countermelody to preset 18 on synthesiser 12, kill the strings, and double-time the drums. When that's done, tack on this four-bar coda. Now print me out a chart for the second rhythm guitar player, and tell me

how much my studio time is going to cost."

Even given the limitations of the MIDI format (which as any serious computer composer will tell you are legion), there is no reason why this kind of software cannot be written. In fact, it already is, but not with these applications in mind. On one end of the scale, programs like Electronic Arts *Music Construction Set* and Syntauri's *Musicland* allow graphics-style 'cut-and-paste' editing of musical events. On the other, the Lucasfilm *Audio Signal Processor* and the *Interactive Music Processor* out of Hazelcom in Toronto, will allow those with many thousands of bucks to do really sophisticated manipulation. But if *WordStar* could be adapted for the lowly Apple II, surely there's room in that there 6502 for a composition language that will really advance the state of the art. All it needs is the right creative minds, and the right kind of backing. □



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BUSINESS BUSINESS



Barry Fox investigates the facts behind the industry news

Video film for digital audio

Indiana Jones already has his temple of doom. Kodak and Polaroid must surely soon have theirs. These are the only two companies pressing ahead hard with 8 mm video, the new format almost certainly destined to fail in competition with portable VHS. But let them do it. All the time and energy put into promoting 8 mm video could have some wonderful spin off benefits for the domestic and professional audio industry. Think about it.

The might of Matsushita and Toshiba is behind the development of recording equipment capable of handling the new 8 mm tape, with helical scan at the hitherto unprecedented low writing speed of under 4 m/s. A completely new loading technique has been devised for a new small diameter head drum. TDK is desperately trying to provide Kodak with bulk supplies of metal powder or metal evaporated tape for the 8 mm launch in America this Autumn. Otari has built cassette loaders for 8 mm tape. Ampex, 3M and BASF have taken licences from Matsushita to produce metal evaporated tape. All this energy is initially going into the tape and hardware technology which Polaroid and Kodak hope to sell to the public as a basis for a point and shoot camcorder video system.

The VHS companies have already built a camcorder that uses a miniature VHS cassette, compatible with existing VHS equipment. This VHS Video Movie camcorder is smaller, lighter and probably cheaper than the Polaroid and Kodak 8 mm units. My bet, and I'm willing to be hung on it in years to come, is that 8 mm video will fail and the technology will be adapted to create a completely new format for digital audio. The 8 mm cassette, with the tape run at half speed, could offer three hours of uninterrupted digital recording, or for that matter FM recording, using helical scan. A non-standard wrap, for instance 90° only round the drum, would keep the recorder size small. It makes eminently good sense to use a new format tape and cassette for a completely new recording standard. Imagine the confusion if existing cassettes were used for a new standard.

It really is ridiculous that although existing helical scan video cassette formats can give four, even eight, hours of recording time in video or PCM, existing audio cassettes can give at best a reliable 45 min. So heartfelt thanks to Kodak and Polaroid for unwittingly investing in what could turn out to be the most significant advance for audio since the LP and CD. Remember, if you will, that we only have CD because of the technology spun off from *Laservision* videodisc.

Cinema sound

During the recent Consumer Electronics Show in Chicago, JBL was hoisting dealers off to a special screening of Steven Spielberg and Lucasfilm's *Indiana Jones and the Temple of Doom*. The intended point of the exercise was to see the film in a cinema kitted out with a THX sound system. The interesting point for me was that the cinema wasn't in down town Chicago, but an hour's coach ride out to the Yorktown shopping centre in Lombard, Illinois. This proves how cinemas are now serious about winning back customers with high quality wide screen pictures and surround sound. It's the one ground on which video can never compete.

When *Indiana Jones* opened in America, nearly 300 cinemas were screening it from 70 mm prints. At \$10,000 a print that's quite a commitment. Representatives from Lucasfilm visited each 70 mm cinema to check projection equipment, and align where necessary. This is the TAP or Theatre Alignment Program, you may have read about. Where the projection equipment couldn't be properly aligned, Lucasfilm pulled back the 70 mm print and replaced it with a 35 mm one instead. That way people who take time off from their home video and pay for a 70 mm-cinema seat won't be disappointed and go happily back to home video.

Lucasfilm launched the idea of THX around a year ago, offering a package at a cost of about \$15,000 per cinema. Only cinemas already equipped for Dolby sound have the privilege of paying the extra for THX. An extra wall is built behind the screen and five banks of speakers mounted flush into the wall. These banks (not surprisingly when you bear in mind JBL's coach trip for dealers out to Yorktown) all use JBL drivers with Holman X-overs. Each stack is a 2-way split, with two 2225, 15 in woofers for the bass end and a 2445 compression driver and 2360 horn for the mid and top. The 2360 has a directional pattern which is independent of frequency. This means uniform coverage throughout the whole cinema. So people in corner seats don't go home wondering what their friends in the centre were raving about.

Just 10 years ago the idea of a cinema investing money in equipment to make the soundtrack sound better would have seemed ludicrous. But that of course was before the home video boom knocked the bottom out of cinema ticket sales. There's also another, hidden factor. The idea of technical change in the cinema was resisted by directors, producers and engineers who had been working in the film business since before the war. Now many of those old timers have retired and it is people like Lucas and Holman who pay the piper and can call the tune.

Better pictures for better sound?

Expect the next threat to cinema status quo in the field of picture quality, with audio spin-off. 3-D of course remains a permanent gimmick and wide screen is here to stay. But all movie films run at 24 frames/s, with artificial flicker introduced to create the equivalent of 48 images/s. At that rate the eye sees something resembling fluid motion. But it's not truly fluid because there are still only 24 images. Also when the projector arc is bright and the picture content light, as in a wide expanse of desert sky on a small screen, you will often notice the flicker. Subconsciously it's there all the time. Douglas Trumbull, best known for his work on *2001* and *Silent Running*, is now trying to sell a new system which runs 70 mm film at 60 frames/s. This matches the US TV standard, and makes flicker completely invisible and motion more fluid.

Already there are some experimental cinemas in America showing experimental films in the new format, called Showscan. Lucas is sniffing around. There's surely audio benefit to be had from Showscan. A 70 mm film running at 60 frames/s is travelling very fast through the projector. At that rate the soundtrack might well be able to cope with digital audio!

Sales jargon

Every June 100,000 dealers in the business of selling consumer electronics make a pilgrimage to hot, sweaty Chicago for the four day CE Show. There are around 1,500 exhibits, spread through the main exhibition halls and hotels across town. That leaves around a minute for each exhibit if you do without eating and drinking and use a flying broomstick for transport. Like the Berlin Radio Show, and the Japanese electronics shows, it's traditionally the place where major electronic companies show off their new developments.

The only pity is that so many firms over there seem happy to employ loudmouths who know nothing about the technology of what they are selling. One theory, which I back with more enthusiasm after each visit to CES, is that Japanese companies deliberately hire hot shot buffoons to sell for their American operations because sales buffoons won't understand enough about the technology to give any trade secrets away to the prying press. This year my prizes go to TDK and Sony, whose US sales people's lack of technical understanding and dedication to sales bullshit go far beyond the call of press-buffing duty. □

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RECORDING TRADITIONAL IRISH MUSIC

As a music tradition that has evolved over hundreds of years, Irish traditional music presents its own particular problems in recording. Felicity Stephen discussed the music and techniques with Brian Masterson of Windmill Lane Studios, Dublin.

Brian Masterson: "A long time ago, in the early 8-track days, I had a Ceilidh band come up from the west of Ireland to record an album. They were used to playing in little country pubs and cottages all their lives and their 'manager' was anxious about this sudden transportation to a relatively strange and 'high tec' environment. 'Look,' he said, 'we'll have to sneak the guys in to the back door. I don't want them to see the control room, the mixing desk or the tape machines—they will just totally flip!' So we dashed around and hastily erected a set of impromptu curtains between the control room and the studio. We brought the band in—through the back door—and they never saw any controls until after they had been in there for quite a few hours and had settled down to playing the music."

"It is always very important to fit the studio to the musician rather than try to make the musicians fit the studio; but especially important when you're recording traditional music. Engineers can sometimes forget that and make unfair demands on musicians just to suit themselves. They may get a technically superb recording at the end but that indefinable something which makes music is missing. I think that engineers who have had some involvement in the musical scene are at an advantage over the guy who's a technical wizard because whilst an understanding of the technicalities involved is important, an understanding of the musicality involved is much *more* important. You have to have a sympathetic rapport with the

all it's music you're recording, not sinewaves.

"I've come full circle, from early days in a band to building synthesisers and now recording traditional Irish music. The traditional music crept up on me gradually over the last five years and I began to realise how wonderful the music is. Since then I've tended to specialise in that area—though not to the exclusion of anything. I like all sorts of music and until recently played bass in a jazz/rock/funk band!"

"Irish traditional music is definitely designed for very close contact—eye contact and foot contact! The musicians tend to sit around in tight bunches when they're playing. If you bring them into the studio and try to spread them out, 'you sit over in that corner and we'll put you in this box and you in that box...', it just won't work. You can't have unhappy musicians in the studio and expect it will all just happen, and that applies to any sort of music. So I would usually set up the musicians close together and if they are a band who perform together regularly like the Chieftains, I would certainly not attempt to switch them around because they would not feel right."

"There can be a problem with the foot contact. When the musicians are playing dance tunes—the jigs and reels—it's the most natural thing in the world to tap your feet. It can be quite funny when you're faced with a group of five people—some who are tapping on the 'on beat', some on the 'off beat' and some who are tapping to an entirely different rhythm; they're playing in time, it's just a little thing that suits them! Depending on the surface they're playing on (usually wood) and how near they are to the mic, you can sometimes get a signal-to-tap ratio or a signal-to-foot ratio that are not great figures! You can't say 'Stop tapping!' and it's no good putting their foot on a pillow because they need to hear something coming from it. So the only thing to do there is: "Off with the shoes!" They're totally unaware of the problem until you do a take and say, 'It's great—but the foot's very loud.' They look down at it as if it's not theirs; as if it had a life of its own."

"Recording traditional music is akin to recording classical rather than rock music—trying to preserve the original sounds and textures of the instruments. Maybe slightly unlike classical you try to improve them if you can. It's not as if you're creating the sounds in the studio; the sounds are there and you're just trying to make the best of them. If you

get somebody with a fiddle that they paid £60 for it's not going to sound like a Stradivarius—it's not meant to. But maybe you could make it sound a little nicer; so it's not ever a question of 'don't touch that equaliser'."

"It's also a matter of using the room to the greatest extent possible. I would always use at least a stereo pair, somewhere suitable, as well as individual microphones. I've found *PZMs* to be very useful with their 'clean' top end—they just seem to suit the music, a lot of which is 'stringy' with the bouzoukis and acoustic guitars."

There is one particularly fascinating instrument which has an important place in Irish traditional music: the Uilleann (elbow) pipes. In the early 18th century it became the favoured instrument for most kinds of Irish music, overtaking the popularity of the harp. It is an extremely sophisticated form of bagpipes comprising a bag, bellows, chanter, three drones and regulators. Unlike the Scottish bagpipes they are a chamber instrument—you'd have real problems playing them whilst hiking over the mountains. It is wise to sit down before you start piping—as Brian explains!

"The Uilleann pipes are very difficult to learn. As well as keeping the right pressure on the bag and controlling the air flow (which is supplied by bellows secured to the player's arm), you've got the chanter which plays all the melody, the drones: bass, baritone and tenor, and the regulators which are chordal blocks to provide harmonic accompaniment. The regulators are fixed but you select whichever ones you want. Watch a piper play and there are fingers flying up and down, elbow pumping—and they've got to lift the chanter off a knee pad to get a particular high note."

"I think it must be the most contrary instrument that ever was invented; there are all sorts of problems with the pipes. They tend to lose their tuning very easily and the reeds can cause problems. They use a split reed and pipers will either make their own or be at the mercy of whatever reeds they can obtain. The standard of musicianship with the really good players is quite phenomenal—you really do need an incredible amount of patience to play them. And a fair amount of patience to record them!"

"Strangely enough, these days the pipes are treated a little bit like a drum kit when they're being recorded, in that you would tend to mic the different



Brian Masterson in Windmill Lane Studio II with Odhrán O'Caseaide

sections (the chanter, regulators, drones) rather than just putting up a pair. I might use *KM84s* as the main mic for the chanter and *D12s* for the drones, but this depends on whose set of pipes we're recording—some being very strident and others having a rounder sound. A piper is always so close to the instrument and if he hears a playback of pipes that have been recorded with any sort of a semi-distant pair, he's not feeling and hearing the sound that he's used to feeling and hearing in the traditional setting. But when pipes are fairly close miked you get a thick, close sound from them—or maybe a slightly larger than life sound, with more emphasis on the drones than would naturally be there. It depends on the piece of music and what you're looking to do."

A couple of years ago Brian recorded a work at Windmill Lane called *The Brendan Suite*—a concerto for pipes and orchestra. It was written by a modern Irish composer, Shaun Davey, who was

inspired by Tim Severin's book *The Brendan Voyage*. This book contains the story of St Brendan setting out in a leather skinned boat from Ireland, to find the New World. It also tells of the author's own successful adventure when he embarked on the same ocean pilgrimage, building a boat to the same specifications, and proved that it was possible. Shaun Davey decided to write a work which would musically illustrate the voyage. He looked for a meeting point between old and contemporary music and chose the pipes to represent the boat which, in the book, takes on a personality.

The Uilleann pipes guide us through ferocious storms, swirling mists, monster icebergs and encounters with strange sea creatures. Liam O'Flynn, who was a founder member of Planxty, is the piper, and Brian pointed out that for a musician steeped in the traditional music, Liam's skill in playing with an orchestra was a major accomplishment. With the exception of a handful of overdubs, the Uilleann pipes and 48-piece orchestra were recorded simultaneously

over a period of two days.

"One of the very interesting things about the pipes is they have no dynamics. The pressure on the bag is terribly important and the player knows instinctively that if he puts the air in a little too hard it will jump an octave; a little too soft and it will just die! So, it was very interesting with the *Brendan Suite* where the score was full of dynamics and the pipes incapable of expressing them. As well as being recorded, the work has been performed 'live' several times. On these occasions it was a case of whatever you did with the orchestra, you definitely needed to mic up the pipes and the sound engineer had to know the work backwards—and almost express the pipes' dynamics for it. When you're working with a small group of traditional instruments it doesn't need the dynamics too much to cut through. But when you're trying to work the pipes against an orchestra—it's a different story altogether.

"Editing pipe recording is incredibly difficult. Uilleann pipes have a set drone but unlike other bagpipes you don't always use it. Very often pipers will play whole tunes through without drones, or only turn it on when going into the second part of a tune. If there's no drone, there's no problem with the editing; but once the drone is playing I've found it to be an almost impossible task. You can hear the slightest discontinuity in the drone as a fault in the recording—so it's a very delicate operation. Digital editing will be the saviour of pipe recordings!"

There are various other instruments used a lot in Irish traditional music—the Irish harp being one. It is much smaller than the concert harp and normally has gut strings, though Derek Bell of the Chieftains occasionally plays a metal stringed harp which has a completely different (rather 'bright') sound; it's a relatively simple instrument to record.

The wooden flute is also often encountered. It is blown like a classical flute but the sound that people are aiming for is one that a classical flautist would probably not be terribly happy with. They produce a much 'breathier' sound from the wooden flute, which cuts through all the other instruments. And there's the penny whistle...

"That's a difficult instrument to record—unless you get far enough away from it. There are huge 'peaks' from note to note on the whistle; the peak-to-mean ratio is quite incredible sometimes. And there's such a difference between the high and low octaves—I mean, the high octave's about four times louder. This is

IRISH MUSIC

definitely a case where the compressor comes in very handy.

"Tuning of the instruments can be a strange thing too because you have all these variables like the flute and the pipes that can sometimes drift in and out of tune with themselves, depending on the temperature. And they will not always go the same way. If it gets hot the flute might drop and the pipes will go up. It's often best to do a 'take'—capturing the feel of the music—and then, when overdubbing, revert to a bit of the old 'varispeed' to match things up.

"The bodhran (the drum played by the Celtic musicians) tends to be quite 'boomy' and loud, and can cause 'spill' problems—so sometimes it is just slightly screened off, still keeping the player as near to the band as possible. It depends on how it's played and who's playing it; there are lots of different styles. Some people play with a stick, and some with their knuckles and fingers. Each gives a totally different sound. They can 'damp' the bodhran by pressing their hand against the skin at the back, where they're holding it and some can play scales. They will play in modes for the different tunes, changing the overall pitch of the bodhran to suit.

"There are various ideas about what should go on a bodhran—what will produce the best sound and which skin is best able to withstand differences in humidity and temperature. (Goat skin is the most common.) The bodhran is immensely affected by its environment; when it's warm and dry, the skin frequently gets too tight and will sound 'high and honky'—so it has to be damped down with water to reduce this. When you're in the studio, you can start off getting a pretty good sound but if you have a few false starts, by the time you get to a take the bodhran is actually 'rising'—so it tends to be a problem in that respect."

The talk of humidity reminded Brian of his trip to China last summer, with the Chieftains. They were invited by the Chinese government to perform six concerts and Brian went, together with an 8-track, flight-cased recording system, to record the whole event.

"We ended up in Shanghai for the final concerts and it was 98% humidity on our first evening there. Derek was tuning his harp (which had gut strings) and 2 min later on stage—finding it was out of tune. And Kevin was having problems with his collection of bodhrans... it was very funny! We asked the Chinese for some sort of a heater or fan to put on stage—so that he could

keep them relatively dried out to be able to play them at all. We don't know what happened (between the request, the interpreter and the message being passed on)... perhaps they couldn't find anything else? This great big machine for keeping food hot was ceremoniously wheeled out on stage and I'll always remember Kevin sitting beside this stainless steel monstrosity—his bodhrans stuck in where the chop suey should be!"

During their stay in China, the Chieftains performed with a traditional Chinese orchestra—the musicians playing two stringed erhus, the Chinese equivalent of fiddles and violas, which all have a particularly haunting sound. They thought there would be some confusion with notation when performing together, but to everyone's surprise and relief the Chinese and Irish musicians used the same way of notating (the tonic sol-fa) and 'away', says Brian, 'they went!'

"We visited the Peking opera one night during our stay and the traditional music we heard there was the kind that is alien to Irish ears! The concert ran for three hours... the nice thing is, they make allowances for foreigners and have about six intervals. They understand that you want to take a break! But there is the other Chinese traditional music, the beautifully descriptive kind with titles like *Lotus Flower Opening in the Sun* and this certainly seems to have a crossover point with Irish traditional music. Not the reels and jigs and hornpipes, but the slow airs, where it's pure emotion that's happening. One of the most thrilling sounds I've ever heard was the Chieftains' first rehearsal with the Chinese orchestra—when they all played an Irish piece together."

An important breakthrough happened in Irish music when a musician by the name of Sean O'Riada decided to introduce a classical influence to the traditional music, by adding harmony and accompaniment to the melodies. Up until then, the melody was a sacred thing which you didn't alter or add to in any way.

A later development came with *The Bothy Band* era. The Bothy Band (named from the 18th century Irish Gaelic 'both', or the later Scottish—'bothy' meaning hut or cottage... and we think that's where the potato pickers stayed when they journeyed to Scotland... sorry! back to the story)—they only ever played traditional instruments; but they had an original approach to the way they used electronics and the recording studio,

producing interesting new sounds.

"Founding member Donal Lunny's genius was in making a successful marriage of Irish traditional music and modern production values. The Bothies would play together to get the basic feel of the music. Then, once that was down, Donal would go off and do all sorts of things to enhance its 'modern-ness'; He would think nothing of double-tracking fiddle, or pipes—and working out very complex arrangements: Bothy Band albums usually took quite a long time to record. But he never lost the rhythm, feeling and whole essence of the music. That, to me, was the great era of the present resurgence of traditional music.

"The Bothy Band had about three different line-ups; it existed as various combinations of musicians playing pipes, fiddle, flute, bouzouki and keyboards—and the power that they could produce! When they all suddenly hit a change of tune together it was incredible. I've seldom heard a rock band produce as much—no matter what amplification they're using. It was just the actual power of the music. Donal was also a member of Planxty who were a much more melodically based band with Christy Moore providing vocals.

"In *Moving Hearts* you've got an interesting situation, where there's a move away from the traditional music. Along with other musicians, there's Donal (the same one) whose basic roots are in Irish traditional music; Davey Spillane, who's a wonderful Uilleann pipe player; and there's Keith Donald, a jazz sax player.

"People are becoming more aware these days that you tend to get a situation where the same tunes keep cropping up. So, some musicians are going off to different areas of the country and discovering the old melodies and songs. And some are writing their own, but writing them with the guiding rules and rhythms of the original music. It's lovely to hear a band like Stockton's Wing, all highly accomplished traditional players, who are pursuing this path."

Brian feels, very strongly, that it's a good idea to get out and record people 'live', believing that studio engineers can get really cut off from reality. No matter what happens in a studio, when musicians are playing together in front of an audience there is a special reaction generated between them—the mood of the audience helping to influence the mood of the music. "You're relating them to what can happen live and there's an imprint in your mind as to how the music should be in the end." □

Working Musician's Choice

News Flash: Musician
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Peter Banks (formerly of After the Fire) has just landed a new recording contract! How? By preparing his demonstration tapes at home using Yamaha* and Roland* synthesisers, the Fostex* B16 and naturally the Soundtracs 16-8-16.

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INSIGHTS INSIGHTS

Recording industry observations by Richard Elen

Something is happening to the UK record industry which bodes very well for the future, and shows a return to a feeling of security (or, at least, less insecurity) in Britain. No, I don't mean the fact that British music is now a world leader once again, although that is perhaps a (very welcome) part of it. It is Britain's attitude to other people's music that has changed.

As I have no doubt mentioned before, I feel that the British music industry took a major dive in the mid-'70s, from which it has only recently recovered. The problem lasted from late 1976 until some time in 1981. During that period, it seems to me that British music lost its way: we began to specialise in producing self-indulgent, poorly-crafted material that few other people were interested in listening to. In early 1976, Britain had almost as great a hold on the *Billboard* 'Hot 100' as it does today, but a couple of years later the situation was quite different. One view is that our music had become over-produced, over-formularised, and too concerned with some kind of superstar syndrome, in which artists had to spend months at a time in the studio, at great expense, to produce something worthwhile; that this material was impossible to do live without numerous backing tapes; and that artists had generally lost touch with their audiences. The reaction was to go more for 'street-credibility' in which the music could be as well played by a member of the live audience as by the band. A bit of a silly attitude if you ask me, but it has been suggested.

A related suggestion was that mid-'70s rock had reached the end of the road and needed a fundamental change, just as had happened 25 years before, when rock'n'roll began to take over from the big bands. While I agree about rock'n'roll versus big band music, I can't agree that the same parameters affected rock in Britain. Had this been the case, surely it would have happened everywhere, not just in Britain alone? In fact, I rather think that it was a pity that rock'n'roll and the big-bands couldn't co-exist: living next door to the gentleman who was Maynard Ferguson's producer and one of his arrangers, I have heard some truly wonderful music in that idiom, and I am quite certain that modern big-band music deserves a great deal more attention than it currently gets.

One of the results of the '70s change of direction was that a whole new load of small studios opened up: no bad thing in its own way. Some of those studios have gone on to greater things, but many have disappeared into the void. Some great musicians came out of that period too but I'm rather of the opinion that greatness will come through regardless, whatever else is going on. The real disaster was that we lost a great number

Musical internationalism

of 'second division' bands. I was working with one at the time, and I remember it all too clearly. So, too, do I remember all the people—producers, engineers and musicians—who either went to the USA, went into advertising or library music, or left the business entirely. I remember a whole new generation of creative people coming up 'through the ranks' with far too few in the way of experienced rock people around them, and leaving them to work everything out from first principles. Whether they are better for it today, I know not. Who can tell?

Something else happened, too: we stopped listening to music from other parts of the world. European music had sadly never been particularly popular in the UK, and while the likes of Abba will no doubt punch through any barriers that exist, we missed out (and, to a large extent, still do today) on a lot of excellence coming from the continent next door. West Indian music was well-entrenched in this country at the time, and had been since the '60s: during the late '70s, British bands appeared and developed the form in a peculiarly British way which was, and is, very successful. But in the field of rock music, we stopped listening to what had previously been an important influence on British rock, namely North American music.

Why this happened I cannot imagine. In my more cynical moments I am tempted to conclude that our own material was so bad that letting American music into the country would have given the game away. Yes, there are several criticisms that can be levelled against American rock of that period: too much emphasis on technique, and not enough on feel (on both sides of the glass); over-formularisation; and so on. I don't agree with that argument a great deal but I can see why it could be raised.

The real reason may be something else, namely the awful state of radio in the UK at the time: an overriding blandness which was so crushing as to rule out anything not within a certain narrow band of music. I have discussed the effect of lack of airplay outlets for music of all kinds enough times so there's no need to repeat myself: the fact is that today, it's different. All of a sudden, in the last six months, things have changed dramatically for the better. There's still some way to go, but the signs are good. British music is very strong and getting stronger, and now we are hearing that other countries (I am mainly referring here to North America, but it's more widespread than that) are, and always

have been, capable of producing good material that people here will listen to, enjoy, and go out and buy.

I think this change has been brought about by two primary influences: Radio Caroline and Laser 558. Both stations are based on ships moored in the North Sea, doing the same job as the old off-shore stations of the '60s which gave the music industry such a boost at that time. Now the same is happening again.

It is a pity that one cannot include Britain's ever-resourceful land-based pirates in this catalogue of influences, but unfortunately, while they have had important local effects, their impact nationally has not been as significant. A contributory factor in this has been their concern, in some cases, with competing with the ILR stations, and thus risking the same kind of blandness which Government restrictions have wrought on an official local radio network which would be really good at it if left to its own devices as in the USA.

Laser 558 is the more recent of the two stations. Running 25 kW on 558 kHz from the *MV Communicator*, the station is American-financed, equipped and staffed. The format is 'hit radio', and the station guarantees over 45 minutes of music per hour. They are really good at it, and the station would certainly hold its own commercially if transplanted to the USA—something which can be said about Caroline, too, but not about any of the 'official' stations apart from, perhaps (a big perhaps) BBC Radio 1.

Caroline is, of course, Britain's longest-running off-shore station. Broadcasting on 963 kHz, it is today putting out what we might call a 'mellow rock' format by American standards, employing the standard US radio technique of playing 'sets' of three or four tracks without breaks for announcements or commercials.

What is important about these stations is that they are playing music from Britain, Europe, and the other side of the Atlantic. Laser claims an audience of 9 million, and from the number of people I know who listen to it, this may be an understatement.

The station is strong enough to be heard in most parts of Britain and Western Europe: indeed, Radio Telefis Eirann have been complaining about it because they say it interferes with them (I don't quite know how, as they are on different frequencies and I can hear both clearly at night at home, 30-odd miles west of London). I'm not aware of Caroline's listening figures, but they must be little less, although the station does not put as good a signal into Britain for some reason.

All in all, I suspect that these two stations have done more to internationalise the British music scene than anyone else. It's a good thing, and long may they continue: the UK record

INSIGHTS INSIGHTS

industry needs their influence.

All the above isn't to say that these stations are the only influence. The record companies have contributed too, as there would be little chance of, say, Cyndi Lauper's latest single getting into the charts if it wasn't actually available, however much off-shore airplay it might be receiving. Luckily, the record companies have been very good at releasing foreign material for some years. I might criticise them for not promoting said material too much, but things appear to be changing there too.

The record companies also deserve credit for the international flavour of their Compact Disc releases (did you *really* think you could read an article by me which *didn't* mention CD?). The fact that CD manufacture is still largely centralised geographically, with some record companies making all their CD's for world distribution in Japan, and others in Hanover, has meant that it is relatively easy to drop a few CDs on Britain as the discs make their way across the world. Having slagged off Warners not so long ago for not releasing several of their US-available CDs (all made in Hanover) in the UK, I am now pleased to note that in a massive burst they released virtually their entire CD catalogue here the other month. There can now be no more than one or two Warner group CDs which are out in the US and not here. Congratulations to Warners, I hope this practice will continue. CBS have also done a respectable job of getting the same records out here as elsewhere. There are still some anomalies in CD distribution, especially with EMI, but Britain's highly efficient specialist CD dealers are doing a great job of locating wanted discs from Japan, Europe and Scandinavia.

On the subject of CD availability anomalies, I notice that MCA are about the only major record company not offering CDs for sale in the UK.

I will conclude this month's verbiage with an observation, again about Compact Discs. CDs are still quite expensive, although prices are starting to move in the right direction as sales increase. With the latest report from City analysts Key Note Publications suggesting that CD players will become an 'obligatory household item', and that 'The question remaining is one of "when", rather than "if" CD takes over from the *outdated* vinyl product' (my italics), this is obviously a trend that will continue. The present limitation on CD playing time—around 63 min—is not due to the discs at all, but the availability of long enough U-Matic tapes of digital quality to prepare the masters. But an hour is a good deal longer than you get on most vinyl music albums cut at normal level. With the current prevalence of 12 in singles, and special

mixes (which often appear on the cassette version only of an album), how about slotting some of them in on the end of the Compact Disc? To their (or his) credit, CBS have included extended versions of no less than five tracks on the CD release of Paul Young's *No Parlez*, resulting in a CD which is probably offering better value for money than the vinyl release (mind you, I didn't check that the extended versions were left off the vinyl version, so I may be wrong).

If you do it on cassette, why not do it on the CD? On the other side of the coin,

it must be said that producer Pip Williams gave me some very good reasons last year as to why one track was left off his Moody Blues *The Present* album (all versions), reasons which revolved around the fact that the dynamic range of the track would have been a bit tedious for the vinyl listener. While I agreed with him at the time, I now definitely feel that extra material on the CD both takes advantage of the extended playing time of the Compact Disc, and gives the CD-buyer (or potential CD buyer) something in the way of an incentive. □

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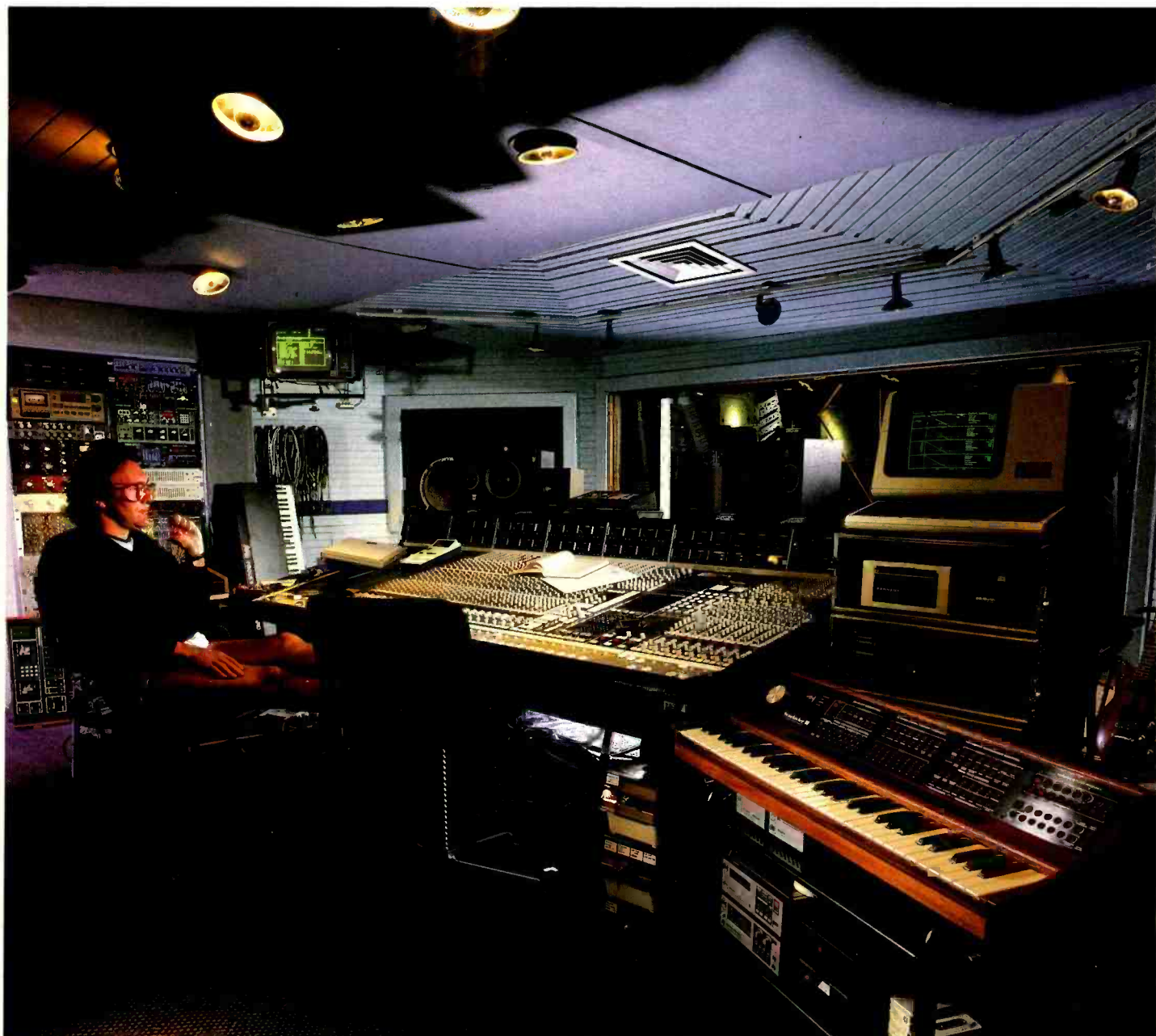
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HORN SECTION

Tony Mitchell talks to Trevor Horn.



We asked Tony Mitchell, deputy editor of one of Britain's foremost music papers, *Sounds*, to interview Trevor Horn about the Synclavier.

MITCHELL: The name of Trevor Horn is synonymous with state-of-the-art record production on both sides of the Atlantic. From his early ventures with Buggles (remember 'Video killed the Radio Star?') to his association with megastars Yes, from ABC to current chart favourites Frankie Goes To Hollywood, the story of Trevor Horn has been one of unrivalled success.

And yet, far from wrapping himself in the sort of smug confidence that often accompanies such achievement – far from being satisfied that he's found a formula that'll enable him to sit on a set of solid gold laurels for years to come, he continues to pursue a particular vision with quietly energetic determination. His vision is of a totally new kind of music, and it takes him on dangerous but exciting journeys into the unknown, where lesser mortals still fear to tread.

Needless to say, technology has played a vital role in the realisation of his ideas. But one piece of technology in particular lays claim to a very special relationship with Mr Horn. It's called the Synclavier.

"I analyse what somebody's dream is then make it come true"

On the surface, the Synclavier, bristling with banks of red LEDs, looks like a keyboard synth that's been designed by the people who put up the Blackpool illuminations. Well, it is a synthesiser, but it's also much, much more. It is, among other things, a very sophisticated sequencer and digital sampler, courtesy of the powerful computer which is its unseen brain.

Digital sampling is, of course, becoming ever more popular as a way of creating or recreating both natural and synthetic sounds, and the Synclavier is not the only device offering this facility. So the first question in my mind as I sat with Trevor Horn in his eyrie of an office, high above the frantic bustle of Sarm West Studios – headquarters of his ZTT label – was:

"Why did you choose the Synclavier rather than any other supposedly comparable system?" His answer was devastatingly direct.

HORN: "I chose the Synclavier basically because I had no choice.

There was nothing else to choose. The thing that interested me most about it was not the synthesiser side but its ability to sample sounds, and sample them to a much higher quality than any other machine available in the whole world. It was the only machine that could do what it can do.

I found myself quickly becoming dissatisfied with the kind of records that are being made using synthesisers, and really felt for a long time that the idea of taking sound and manipulating it in the way that you manipulate film or visuals was a much more exciting direction. A real sound is much more detailed than a synthesised sound and so with such a device you can make much more interesting records that have much more detail in their sound."

MITCHELL: "But why did you feel the Synclavier was so good?"

HORN: "The Synclavier, being able to sequence real sounds, gives me complete control. I can take any element and put it anywhere I want it, arrange things and control it. I can't deny that the way I produce things, I like to have total control of the sound."

MITCHELL: "You're talking about audio fidelity, I presume?"

HORN: "Yes, I am. I find it lacking a lot of the time and I love making records using a total manipulation of sound. I'm concerned about the quality of records at the moment in general. It's way down on what it used to be back in the 60's and 70's. I find audio fidelity lacking a lot of the time.

Other people make different kinds of records, you know, Mark Knopfler makes really nice records with Dire Straits and they play... that's one thing. I don't do those kind of things. It doesn't suit me – unless I have people that play like that. I do a different kind of thing. I analyse what somebody's dream is, and then I make it come true – it's a different philosophy and I need control of the sound. And the Synclavier is the only thing that can do it at the moment"

MITCHELL: "Do you regard it then as primarily a producer's tool?"

HORN: "Yes – for me it is. I mean – you could take it on stage, and I hear it stands up very well, but I'm not even talking about the synthesiser side, even though it's quite incredible. They're doing something now with the synthesiser side that's going to be amazing – you're actually going to be able to recreate real sounds using the synthesiser. I think it would be quite an incredible stage instrument for anyone who could afford it"

"It's a different philosophy which requires control of the sound and the Synclavier is the only thing that can do it at the moment"

MITCHELL: "And it certainly looks as if it's designed to appeal to the non-computer literate person – the regular musicians."

HORN: "Well I never have anything to do with that side. Even though I own one and I know what it can do, I don't always push the buttons.

I just sort of sit there and dream the thing and I have people that work it. But it's possible to get a helluva lot of expression out of the Synclavier – it's possible to do lots of things where people would never dream that there wasn't somebody playing the thing.

It's also possible with the Synclavier to actually play the real sounds. In fact, it's really light years ahead of anything around because the sound quality is so different.

And it goes really well with digital. I'm working towards trying to do a new kind of record and

with the quality of it and everything, I'm getting there gradually. I kind of make a step forward every time."

MITCHELL: "But the question that surely begs to be asked is: which really came first the chicken or the egg? Were you really simply waiting for something such as the Synclavier to do your bidding, or was it the power the device put at your disposal which led you to do things you wouldn't otherwise have thought of?"

HORN: "Well of course, this whole idea dates back to the Mellotron, using tapes of string sections and the like. But when I met Malcolm McLaren and he played me this thing where the guy was scratching the record, I mean, I love it! I thought – what a great idea! And then I thought, well, with the Synclavier we could do exactly what they're doing – taking bits of junk and making them into something else."

"Records'll still be about music, and that's really all that bothers or interests me in the end"

MITCHELL: "What about the machine's other facilities – the integral 16-track digital recorder for example?"

HORN: "It's an amazing thing for people who are doing demos or whatever but I'm not into that really. Of course, I don't need it – I'm lucky enough to have my own recording studio."

MITCHELL: "But it would be useful if you happen to have a Synclavier in your upstairs front room?"

HORN: "Yeah, but you see, I have very strong feelings about getting into that area. The way musicians are being alienated from each other because everyone's disappearing into the cupboard with their own instruments, they're not interacting with each other and forming groups and listening to really good music and developing."

MITCHELL: "So you don't see yourself using the modem and sending your Synclavier stuff off to distant parts down the phone lines?"

HORN: "No, not yet. People tell me it will all happen but when they start talking about that – when people give me the old blag about what it's going to turn into – I always get kind of glassy-eyed about it. People say we won't be having records soon, we'll just send a bunch of numbers down the phone.

Well that doesn't interest me because records'll still be the same and they'll still be about the same thing, and they'll still be about music, and that's really all that bothers or interests me in the end."

If you'd like more information on the quite remarkable Synclavier, write to Turnkey, Brent View Road, London NW9 or contact David Whittaker on 01-202 4366.

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MODULAR ACOUSTICS

The concept of modular acoustic treatment is far from new. It is a reliable, flexible and relatively inexpensive method of taming a room, and remains in widespread use today.

Data derived from spectral analysis allows the acoustician to know roughly how much absorption is needed and at which frequencies. It will also tell him approximately where in the room the treatment should be placed.

Specially designed boxes or modules, with possibly differing acoustic properties but matching cosmetic design, are then distributed about the room accordingly. The position of each module can be adjusted repeatedly until an optimum result is obtained and should any undamped resonances remain, it will normally be a simple matter to construct and apply the necessary extra modules.

Although, aesthetically, the 'boxes on the wall' technique is somewhat outmoded, the concept of distributing the necessary absorption around the room in, at least, a semi-modular form, is still generally considered prudent and effective.

Modular prefabrication

Modular designs are normally formulated specifically to match the requirements of the room being treated, making each project largely a 'one off' affair. In contrast, Modular Perfections have produced a range of 4 ft wide modules with a variety of heights which, they claim, can be combined to solve most acoustic problems. This standardisation opens the doors to mass-production, and greatly reduced manufacturing costs. In practice, the average studio will probably still require one or two special modules to suit its individual characteristics, but the vast majority of the treatment can usually be drawn from stock.

Having established the nature of the studio site, and the desires of the audio owner-to-be, designs can be drawn-up using the available modular building block dimensions. The company's catalogue contains a number of different shaped modules such as poly-cylindrical, flat, stepped etc, plus modules to cope with corners, windows, doors and ceiling. Each shape is available in at least two of three general absorption characteristics:

Miami-based studio design company Modular Perfections has developed a system of prefabricated modules which can provide a complete, state-of-the art acoustic treatment, quickly and inexpensively. Satisfied clients include The Bee Gees and The Sony Corporation of America. President, Seth Snyder, claims the cost can be about half that of a standard 'turnkey' equivalent. Is modularity the answer?
By James Francis

'live', 'semi-live' or 'dead', the characteristics of which are provided. Other possibilities include optional in-built RF shielding and a variety of cosmetic finishes.

Working from a floor plan of the building in which the studio is to be created, the modules can be put together in the factory to ensure that the system works, even before it goes anywhere near the actual site. Once complete, each section is clearly marked to allow an easy and rapid repeat performance at the studio. This assembly process is generally captured on video tape so that, although the company can offer an experienced crew for the installation, any able team of builders and technical staff should feel fairly confident in tackling it themselves.

The modules can either be battened together in a free-standing configuration or hung from a suitable existing wall. In the latter case 8 x 4 in bevelled battens are fixed to the wall and are mated with similar battens attached to the modules.

Assuming no overly peculiar personal requirements, the use of mass-production techniques, and initial off-site assembly, make this a relatively inexpensive method. President Seth Snyder estimates the average cost to be in the region of half that of a standard effective alternative.

Prices are also predictable. The fact that most of the modules will already have been made at the time of the quotation, or fabricated shortly thereafter, means that accurate prices can be given.

When installing a studio in the usual way experience has often shown studio construction estimates to be somewhat unreliable, in terms of time taken and, therefore costs. This initial construction period has to be seen as 'down-time' for the studio. If, through those infamous unforeseen circumstances, it should drag on for weeks and months past the projected completion date, serious financial repercussions can ensue: equipment waiting in storage or in dusty, incomplete control rooms; clients waiting to start projects; and staff on the pay-roll with no work to do.

In contrast, excluding any major structural work, Modular Perfection's acoustic treatment can normally be completed in just a few days. Separate metal and plastic conduits are built in to the modules allowing immediate installation of mains and signal cabling, respectively, once the treatment is in place. This arrangement helps to avoid mains interference on the audio circuits. Such expedience and predictability have to be considered as major factors when evaluating the worth of this service.

Expandability

Initial capital investment in a recording studio is very high, and a project's financial viability will often require reasonably long term stability. A considerable part of this expense is usually tied up in acoustic treatment which, under normal circumstances, is permanent. This fact often casts a shadow of doubt over the use of rented or

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MODULAR ACOUSTICS

short-term leased property.

The nature of a self-contained modular construction means that a large proportion of the treatment can simply be removed along with the rest of the studio hardware, to be re-installed in a new building. Also if a studio wants to expand or re-configure its operation the inherent portability of the system is ideal.

Whilst certain modules offer a relatively high mass in relation to their size and portability, they are no substitute for 8 in of solid reinforced concrete in terms of separation; neither will they compensate for any other major structural deficiency. Before the acoustic treatment is installed, then, the building's construction has to be seen to be basically sound.

History

The company started back in 1977. Seth Snyder's five years as a technical/balance/cutting engineer at Miami's Criteria studios saw him keen to strike out on his own. It became apparent that hardware sales and studio design would be far more viable areas to pursue, and so it was that he first conceived of modular prefabrication, and the beginnings of Modular Perfection.

Completion of the first project required a combination of theoretical understanding, practical knowledge and a good deal of trial and error to establish the correct make-up and combination of the various modules. By that time word had spread, and several other design/construction jobs were in the offing. Since then a total of nine studios have been successfully completed, and demand continues.

One of the most recent of these was designed for the Sony Corporation of America. They wanted to create a complete broadcast production environment in which to demonstrate their products at the 1983 NAB convention in Las Vegas. There was a total of 10 days in which to complete the suite, and then only a day in which to dismantle. How else could such a demand be so easily met?

After repeating the operation for the 1984 NAB, Sony finally sold the complete system to a small commercial studio. Seth expects to be designing a new Sony control room for next year's convention.

Bee Gees

Probably a better known example of an MP operation is the Bee Gees' studio, Middle Ear, in Miami.

It started in January 1979 with the band's acquisition of a large warehouse space in which to rehearse and store equipment. All they originally wanted was a quick, inexpensive treatment to provide a reasonable acoustic in which to work. But Seth suggested that they might like to borrow, on 'sale-or-return', a proper MP system. This they agreed to,



Control room at db showing non-modular-looking modularity

and by the summer the rehearsal room had turned into a full blown recording studio project.

Here are some of the problems which denied the realisation of an 'overnight' completion. For reasons of isolation, a double 8 in reinforced concrete wall was decided upon to separate studio from control room. On closer inspection, it was discovered that years of slow subsidence had created a 3 ft space beneath the apparently solid concrete floor. This difficulty was solved by the expedience of pumping about 100 tons of non-modular concrete into the unwanted void.

Far more intimidating was the discovery of a 5 kW AM radio station, only a couple of hundred feet away on the other side of the road. Those who have experienced the agony of endless days and nights attempting to eradicate RF breakthrough from the audio circuits will understand that a lesser organisation might possibly have oiled out at this point. In this case, however, this adversity gave birth to a new MP module option: that of an in-built metal screen, with a switchable grounding facility. This precaution, together with the installation of purpose-built lowpass filters across certain of the mic lines finally reaped a satisfactory result.

After the basic acoustic treatment, the flexibility of the modular design allows for adjustments and fine tuning. In the case of the Bee Gees' project, the only addition was that of acoustic 'clouds' hung below the mass of large acoustic wedges on the ceiling, to increase diffusion.

The band remain very happy with the studio which has produced many successful recordings from the likes of Barbra Streisand, Dionne Warwick, and for the movie *Stayin' Alive*.

In early 1983 Seth decided to build db Studio in Miami as a showcase for both Modular Perfections and the product lines for which his second company, Recording Studio Equipment, was agent. The most striking thing about the studio is how 'non-modular' it looks. The final finish is applied such that you really can't see the joins, and any fears

concerning the end result looking 'boxy' or temporary can be forgotten.

As with most other things, the level of sophistication is to an extent dependent on budget. The standard finish uses a large amount of natural, untreated woods for their clean, open appearance and positive acoustical properties in terms of low frequency absorption and high frequency diffusion.

In keeping with the majority of Seth's designs, db has a control room based on a hexagonal, *LEDE* design theory. It is important to point out that it isn't actually a certified *LEDE* room, although Seth is fully trained and authorised by the Davis' to work with *LEDE* designs and analysis techniques. He feels that this format quite simply offers all round better results, and whilst he will tackle a 'standard' control room design, he always advises this concept.

It's difficult to give any precise costs without knowing specific requirements, but Seth estimates the cost of a full acoustic treatment for a total floor area of 3,000² to 4,000² ft (studio and control room) to be in the region of \$150,000, plus installation.

The company is understandably reticent to divulge such information as the precise make-up of each module for fear of imitation, although the basic absorption characteristics are provided. An ever expanding list of satisfied clients confirms that the system works.

The future

Designs have been drawn up for video edit suites, using a combination of specifically designed modules and the standard stock. So far, however, they haven't had any orders placed, and no drawings were available for publication.

What is catching on is the 'do it yourself' packages for small radio production facilities, where the station technical staff can install the treatment themselves. For a group of stations using these packages, it ensures consistency between control rooms.

For some people, at least, modularity would seem to be the right answer. □

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LETTERS LETTERS

Letters should be marked 'For Publication' and sent to the Editor at the Croydon address on page 3

Multichannel TV compatibility

Dear Sir, In your excellent article on Multichannel Audio Production for US TV, Paul Lehrman has inadvertently passed along some misinformation to your readers which requires correction. In discussing production standards and consumer acceptance of the new MTS System, I stated that any three channel format would not be compatible with existing home stereos.

My point was that early acceptance of the system depends on how readily stereo programming can be produced, and how easily it can be brought into the home. Obviously any system requiring a third amplifier and speaker is incompatible with existing home stereos and VCRs. With the exception of dubbing theatres for cinema release, discrete three channel is also alien to the vast majority of audio production and post-production studios.

It was in this sense that I referred to compatibility. In his report on the NAB Lectures, Mr Lehrman has confused my comments on production with issues involving transmission and reception. For the record, the American multichannel television sound transmission standard does not pose serious compatibility problems with existing mono and early stereo TV sets, as stated in Mr Lehrman's paraphrase of my remarks.

In fact, the committee which developed the transmission standards has gone to great lengths to devise a system which is completely hierarchical and downwardly compatible. It provides triphonic transmission with little or no penalty in station modulation capability and coverage area. Those with stereo sets will receive a stereo derivative of the triphonic transmission. The only change anyone with a mono set should notice is that, hopefully, the overall sound quality will be better.

In addition to discrete three channel, the system can carry a main stereo programme mix and a mono secondary audio programme (SAP). Compatibility is maintained here as well. Stereo sets will receive only the main stereo mix, and mono sets will receive a L+R version of the main stereo mix. The mono SAP will be heard only by those viewers who select this option on their specially equipped receivers.

Provision is also made to insert an identification signal into the vertical interval or the audio baseband. This signal will enable TV set manufacturers to build in switching which will automatically select the appropriate configuration according to the format of each programme.

While the transmission standards are therefore quite well sorted, there is a great deal to be worked out as far as

production standards are concerned. At NAB, I stated my personal opinion that standard stereo will prevail in transmissions intended for the home. I should point out that there are other applications such as DBS transmission to theatrical venues where triphonics may well become the norm.

The lecture series at the recent NAB was a beginning effort to help the television community deal with the production problems involved in multichannel sound. For an overview of the transmission problems, I would suggest that your readers contact at the National Association of Broadcasters Office of Science and Technology in

Washington DC, Mr Edmund Williams. Your attention is also directed to an excellent paper, A Triphonic Sound System for Television Broadcasting by Emil Torick of the CBS Technology Center, was delivered at the 124th Technical Conference of the SMPTE in November 1982. Copies may be available from SMPTE headquarters in Scarsdale, New York.

Finally, regarding my comments about the secondary audio programme, the audio mixer will not have to be bilingual as I implied at NAB. But he or she will have to have three ears.

Yours faithfully, Doug Dickey, Solid State Logic, Stonesfield, Oxford, UK.

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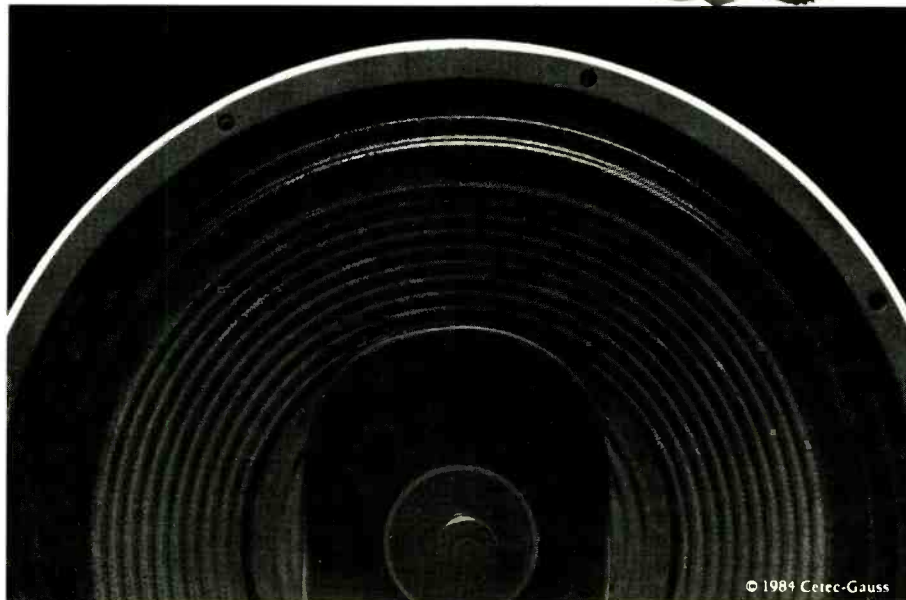
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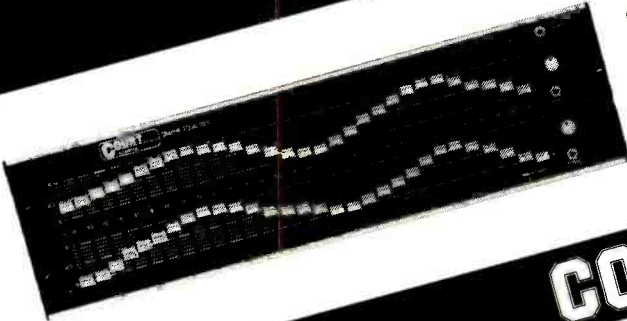
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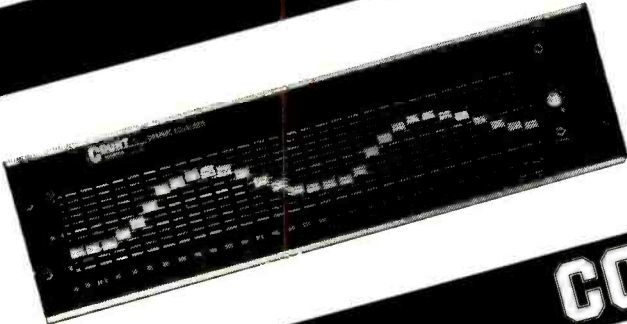
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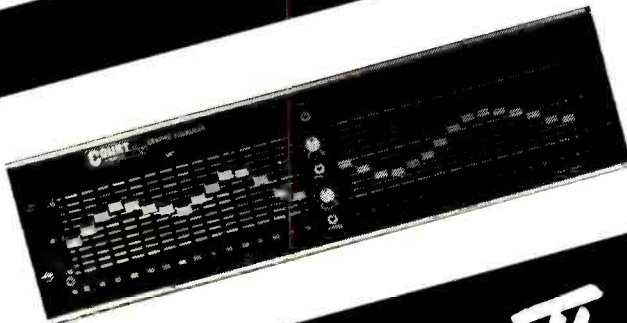
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CD MASTERING

HOW IT SHOULD HAPPEN

Compact disc is with us and here to stay whether you like it or not—at least for the foreseeable future. Even the most avid critics of CD, or the digital medium as a whole, are forced to admit that the little shiny disc has captured the imagination of a significant, and rapidly growing, section of the music buying public.

However, while CD offers almost all the advantages that its manufacturers claim, it can only be as good as the original source material, and it is to this all important subject that this article is addressed. In putting it together I have attempted to encapsulate the basics of CD mastering while at the same time including some practical tips gained from two years of producing tapes for many of the world's CD plants.

Despite extravagant claims by a small section of the record industry, digital re-recording or mastering will *not* improve a poor recording. Tape hiss, drop-outs, phase errors and other failings of the original master tape will not magically be swept away by 'digital mastering'. In fact, because CD is a more critical medium it is likely that any faults inherent in the original recording will become even more obvious. So, what can the poor recording or mastering engineer do about the problem? The answer is—a lot.

Mindful of criticisms of early CDs, many of which were derived from 15 in/s third or fourth generation copies, the CD plants have developed a near paranoia over tape hiss and what they refer to as 'disturbing effects' (clicks, musicians fidgeting in their seats, etc) so it is absolutely

With increasing numbers of CD releases it is becoming more important that all studios become familiar with the requirements for CD mastering. Bill Foster outlines the basic rules for success.

essential that detailed information is supplied regarding any defects on the tape, with a timecode reference for easy identification. Early recordings with high background noise should, wherever practicable, have their fades helped in order to avoid an abrupt transition to silence at the end of a title.

Likewise, a fast fade-in prior to the first note of a track is audibly more desirable than tight leading.

When presented with the 'master' tape for transfer, first establish its 'pedigree'. It is quite likely that it will be an equalised copy from the studio or mastering suite which cut the vinyl disc. While many of these are perfectly acceptable, they are at least second generation and therefore, unless digitally recorded, are not as good as the original studio master. Try to obtain the original in all cases and with it the cutting notes from the mastering session or the EQ'd copy for comparison. It will now be possible to match the sound of the vinyl disc without generation loss—although it should be borne in mind that sometimes a different 'sound' may be

desirable for the sharper audio quality of the Compact Disc. Wherever feasible, it is a good idea to involve the producer at this stage.

Having decided on which tape to utilise, great care should be taken in setting up to line-up tones and checking monaural compatibility, peak levels and so on. (It is incredible how many analogue to digital transfers we have received which are off azimuth—try to correct that in the digital domain!) In the early days of the Sony 1610 system recording levels varied considerably but it has now been established that the optimum peak level is between +18 and +20 on the 1610's bargraph meters. This will result in a fully modulated CD, although it must be pointed out that if pre-emphasis is selected when recording, on replay the de-emphasis employed will produce an audibly lower level CD—by how much will depend on the programme's HF content. (While I appreciate that other digital systems exist besides the 1610, to my knowledge the only format unilaterally accepted by CD plants is 1610 and therefore, unless you know the ultimate

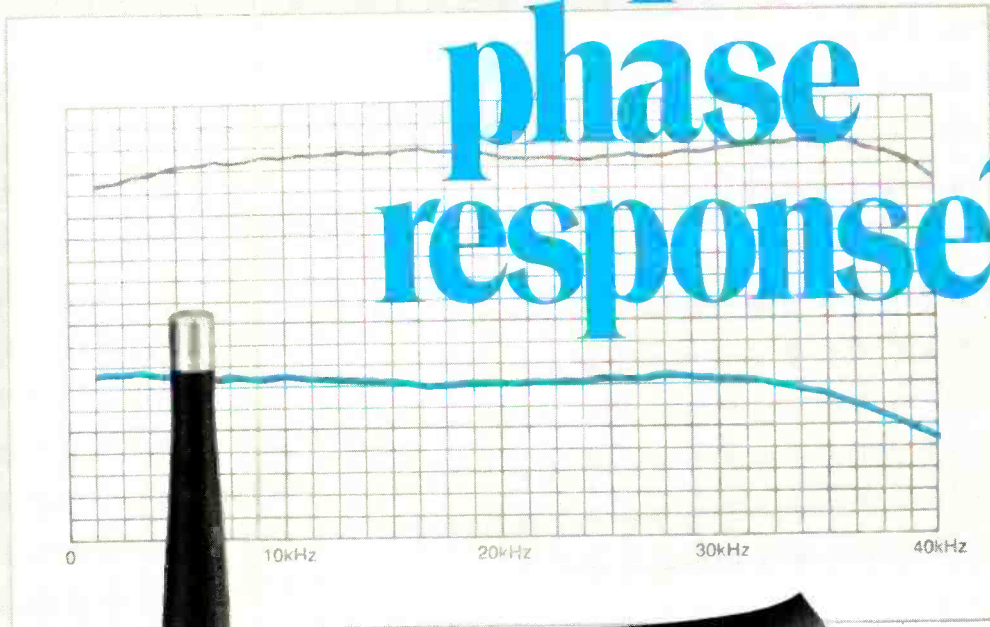
destination of your Master Tape/Tape Master, I feel it is sensible to 'play safe' and use this format.)

The subject of whether or not to use pre-emphasis is a difficult one. Pre-emphasis, which is introduced at the A/D stage, serves to reduce noise by emphasising the high frequencies while recording and de-emphasising on replay—a sort of 'digital RIAA curve'. Much reduced though it is, noise can still be a problem in a digital recording. After all, a dynamic range of about 90 dB (in a 16-bit system) is not that incredible when one considers some of the current analogue equipment able to produce signal-to-noise figures in the region of 120 dB.

As pre-emphasis is removed during D/A conversion it will be realised that, if recorded, pre-emphasis will be present on the CD disc. This does not create a great problem because the CD player will detect the pre-emph 'flag' and decode it automatically (although how accurately each player achieves this would make an interesting survey for one of the consumer hi-fi magazines). If you are compiling a tape from various digital sources, some with and some without pre-emphasis, this should be perfectly OK—unless a continuous programme is required. The switching in or out of emphasis can be likened to the switching of an EQ unit and may, therefore, be audible in audio. Even if the changeover is not detectable on the 1610, a cheaper CD player could show it up. When transferring analogue material to 1610 to intercut with existing 1610 tapes it is advisable to select the same emphasis status in order to avoid any of the problems

Bill Foster is Managing Director of Tape One Studios, London, Chairman of the APRS Technical Sub-committee and regular attendee of all recording industry 'Social Gatherings'.

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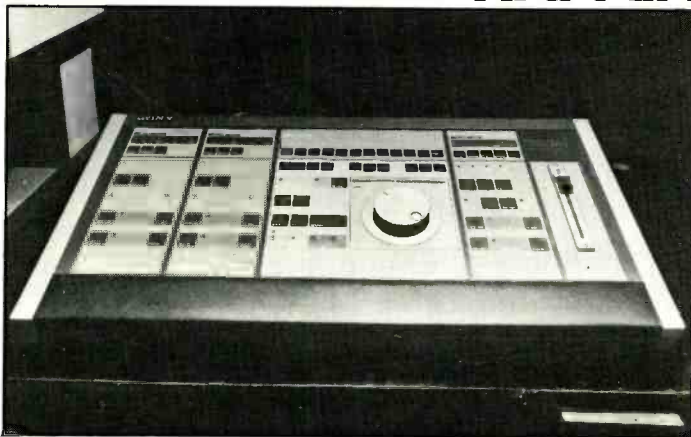
detailed above. This last point becomes essential if preparing an 'edit section' as the CD player is only able to switch emphasis at the end of a title and not during one.

Now we come to the major difference of opinion (or is it policy?) between the two designers of the system. Polygram in Germany prefer, but do not insist upon, CD master tapes without pre-emphasis as they consider the additional 'top' can produce HF distortion when close to 100% modulation. The Japanese, meanwhile, prefer—but again do not insist upon—pre-emphasis on tapes supplied to them. So, if the ultimate destination of a CD master tape is known this should be borne in mind. Remember, at present the only way to remove or add pre-emphasis, unless you are one of the lucky few with a digital desk, is to convert to analogue and then back to digital.

There are a number of distinct stages on the way to a CD, all of which are defined by agreed titles:

- Digital (Production) Master—either the digital

CD MASTERING HOW IT SHOULD HAPPEN



Sony DAE 1100 digital editor

- studio mix, EQ'd copy from the mastering suite or transfer from analogue tape;
- CD Master Tape—this contains all the titles in correct sequence with continuous timecode on audio track 2 and accompanying CD Mastering Order (covered later);
- CD Tape Master—as above but with PQ subcode added on audio track 1. This is the final stage before 'cutting'

on to the glass master. Assuming you have received or prepared a 1610 digital master from which to make a CD master tape you will now require a 1610 processor, DAE 1100 editor and two U-matic recorders suitable for digital recording. By that I mean that they must be NTSC, should have the drop-out compensator (DOC) out of circuit and, in the case of non-BVU machines, have had a modification made

to the head switching servo to shift the crossover position. (Machines so modified usually have 'DA' at the end of the model number.)

Now we come to some of the parameters required for a CD master tape. Timecode must run continuously from the beginning of the tape to at least 1 min after the end of programme. The recommended procedure is to reset the timecode generator to zero, start the record U-Matic and, before it actually goes into motion start the timecode running. This will ensure that the clock counts from 00.00.00 and also that no negative figure is used (ie 23.59.59.29) which will totally screw up the CD system. Also a requisite of the system is that a minimum of 2 min of recorded digital silence elapses after start of code before commencement of programme which, among other things, gives space to lay a condensed version of the PQ code on audio track 1. (The minimum time for each plant varies slightly but 2 min covers them all.)

When using the DAE 1100 editor it is possible to assemble titles one after another with continuous timecode—otherwise the tape

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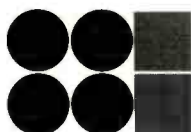
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will have to be 'striped' first and the titles insert edited afterwards. No tones should be recorded on to a CD master tape—and don't forget, there is no side one and two on a Compact Disc. It wouldn't be the first time a so-called CD master tape has reached a plant with not only a long gap between the middle tracks but tones as well. The only technical information required by the CD plant is the sampling frequency (44.1 kHz unless you want additional charges), whether pre-emphasis is being used and the digital headroom, ie a maximum peak of +18 represents 2 dB digital headroom. On the latter subject, a maximum peak of lower than +16 (4 dB headroom) is not viewed with enthusiasm.

Unless you are equipped with a PQ Subcode Processor/Editor (such as those manufactured by Philips and Sony) which is able to produce a finished CD tape master complete with all track, index and pause cues, you will now need to complete the CD mastering order which must accompany all CD master tapes. To fill one of these in correctly (an incorrect one could prove very expensive for you or your client) it is essential that a working knowledge of the CD system is gained. Both Polygram and Sony produce a very comprehensive guide to their technical requirements which runs to 30 pages or so. Even armed with this it is wise to check with them before launching into this final stage as parts of the specification are likely to change periodically as they continue to learn more about interfacing this incredibly complex technology with some of the cut price/cut corners CD players on the market. It has on occasions been necessary to modify the control information on the CD, not because of any software deficiencies, but to minimise the returns of discs caused by mis-tracking, mis-cueing hardware.

Interestingly enough, Polygram and the Japanese have tackled the hardware interface problem in different ways, due probably to the requirements of their individual markets. Most of the troublesome CD players seem to originate from the 'Far East,' units manufactured in Europe and by the Japanese are generally of a higher standard and, because of this, usually sell at a higher price.

CD MASTERING HOW IT SHOULD HAPPEN

One of the biggest failings of the cheaper units is their inability to locate precisely the start of a given title and so, to minimise the risk of a clipped start, the Japanese CD plants recommend that the timecode reference for the start of each track be at least one second before the beginning of programme material. At the end, 15 frames is suggested before the 'end cue'.

Polygram's attitude is different and, in the author's opinion, the better one. They maintain that the specification for a CD player's performance is laid down in detail by Philips and Sony and if purchasers do not check before buying whether the player meets this spec it's their problem, not the software manufacturer's. The relevant part of the specification is that a CD player should take only 14 ms to de-mute after locating the start cue. This is less than one timecode frame but, to be realistic, Polygram have chosen to locate the start cue 5 timecode frames ahead of programme, $\frac{1}{4}$ s. This is about where a competent engineer would front leader an analogue master. The same time lapse is used after the programme. There is one further potential disadvantage of the Japanese philosophy—1 s before the start increases the risk of hearing the end of the previous selection if the album were to have tracks following close together. Polygram do, however, concede that the first title can be the

most difficult for a player to cue so, just to confuse things, they recommend that the 'start cue' be 2 s before programme on the first track only: no preceding title, no problem.

Preparing cues for 'live' or continuous programme material can be a bit more tricky as quite often there are no pauses between titles and the 'end cue' of one title is the same as the 'start cue' of the next. This is fine but be careful on a crossfade, don't put the 'start cue' of the second track before the 'end cue' of the first. The system will not handle what it calls 'negative cues' so a compromise position will have to be located for both cues.

Finally, there are what is known as 'index cues' which enable the sub-division of a particular title. A player with only track location facilities will not see these cues but the new second and third generation players will allow the location of sections within the programme—provided, of course, that the producer and/or record company have provided 'index cues' in the first place.

It is in the area of PQ coding where I feel that specialist mastering houses will come into their own, advising the producer how to get the maximum effect from this new technology without losing sight of the original reason for making the CD—to get the music into record buyers' homes by way of the highest

quality audio carrier available to us today.

A few words of warning are in order should you come across a recording made on one of the earlier Sony 1600 systems. The *only* sampling frequency acceptable for CD manufacture is 44.1 kHz—with timecode of 30 (non-drop) frame type synchronised to the digital signal and recorded on audio track 2 of the U-Matic tape. The 1600 originally operated at 44.056 kHz with drop-frame timecode, although almost all of these early units were later modified to 44.1 kHz. However, while the crystal was changed to generate the new sampling frequency, on many of the modifications the digital 'flag' continued to show 44.056, thus rendering the tape unsuitable for CD production without first making a copy to 'convert' the sampling frequency. Another very important point to note about the 1600 is with regard to pre-emphasis. This earlier system was not equipped with pre-emphasis and will therefore not recognise the emphasis 'flag' when replaying an emphasised 1610 recording. As a result you end up with a lot of very non-digital hiss and, even worse, if you attempt to copy an emphasised digital tape through a 1600 system the copy will have all the HF emphasis of the original without the emphasis 'flag', leaving an emphasised copy which is impossible to de-emphasise in any conventional manner. □

In compiling this article I would like to acknowledge the invaluable help of Tape One's chief engineer, Ben Turner, who, as well as being responsible to numerous CD masters has spent many sleepless nights experimenting and developing new techniques to improve the overall quality of our CD master tapes.

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CD MASTERING HOW IT HAPPENED

This album has turned up in the pages of *Studio Sound* before, during various stages of its production as it has progressed. Here, I hope to convey a useful impression of how the CD tape master of the KPM/Nimbus album, *Surprise Surprise*, by Chin & Cang was finally prepared.

There is some degree of confusion, it seems, as to what exactly a 'CD Tape Master' (as opposed to a 'CD Master Tape') really is. To lay that particular appellatory ghost once and for all, a 'CD Tape Master' is the same as a 'CD Master Tape' except that it has the P and Q subcodes recorded in a neat little tone burst at the front of the tape. The P and Q subcodes give the player information on where the tracks are (and the indexes within the tracks, if there are any) so that it can find them successfully, plus information on how long the tracks are, and how long the pauses between tracks (if any) happen to be. This information is stored at the front (otherwise known as the middle) of the Compact Disc as the 'Volume Table of Contents' or VTOC.

The majority of CD manufacturing facilities will happily accept a non-PQ'ed tape and will do the work for you. The master U-matic tape (DASH masters will be acceptable shortly) has the P and Q subcodes encoded on audio track 1 (the track where the SMPTE timecode isn't) at the front. Nimbus would have been able to PQ the tape themselves, but the chance to watch it all happen (and play with a real Neve DSP, albeit a small one) was too much. So one Monday morning we turned up with an armful of digital tapes and sat down with Tape One's resident digital wizard, Ben Turner, to Do The Deed.

In the beginning

The starting point for the

The mastering process, as distinct from the manufacture, for Compact Disc is as important as it is in conventional analogue disc-cutting. Richard Elen recently completed his first CD at London's Tape One studios with Ben Turner, and here he reports his findings.

preparation of a CD tape master rather depends on what you've got to start with and we had a curious variety of things. *Surprise Surprise* is a compilation, for commercial release, of the major tracks from two KPM music library albums by Eddie Chin (late of the Tourists) and Matthew Cang (late of the Alex Harvey Band). The first album, *Surprise Package*, had been recorded on various things from a *PortaStudio* to 24-track Soundcraft gear, and mixed to conventional analogue for the original release. The second album, logically titled *Another Surprise*, had been recorded entirely at Nuptown Recordings, and was mixed Ambisonically (our second) to Sony *PCM-F1* with an Audio & Design *ProPak II* for time-correction. That album had been digitally transferred to 1610 at HHB in North London. We did, however, need to lift one track off the original *F1* recording for the CD, as we had decided to use a different mix. We had also Ambisonically remixed the major tracks from *Surprise Package* on to a Sony 701, so we had those on Betamax tape as well.

Our first task, then, was to transfer the required tracks from Betamax *F1/701* format to 1610 via the nearly-ubiquitous RTW box. We did this via the Neve DSP that Tape One have lurking in

their digital basement. Had we wanted to, we could have EQ'd, compressed and limited the tracks on their way through, but we were quite certain this wasn't necessary so we just used the DSP to adjust levels, and, more importantly, remove the pre-emphasis that the *F1* and related systems put on your material. This having been done, we transferred the tracks we needed off the existing 1610 tapes via the DSP, again removing the pre-emphasis.

This pre-emph business is quite interesting. Conventional European (ie Polygram) wisdom says that while pre-emphasis is a good thing on 14-bit systems, all it does on 16-bit is force you to drop the level. Conventional Japanese (ie CBS/Sony) wisdom has it that pre-emph on 16-bit is actually a good thing. For this reason, the Japanese CD plants like you to send them tapes with pre-emphasis on, and Polygram like you *not* to. Nimbus, however, would have taken either with no concern—their CD literature says that you can submit *F1* PAL tapes (preferably 16-bit), 1610 tapes, or ¼ in analogue. With digital tapes, 'Pre-emphasis may optionally be used; if it is only for some tracks then it may only change during a 'pause' period between tracks.' They like you to tell them if it is there or

not, and where.

Intent on giving Nimbus no trouble in this regard, we removed any trace of pre-emphasis. Personally, I have a slight suspicion that you get lower-level CDs if you have pre-emph on them: my Japanese CDs give a measurably lower output from the player, but unfortunately my player doesn't tell me whether pre-emph is present or not, so I'm not going to commit myself on that point.

Preparing the master tape

The next thing we had to do was to cobble these two 1610 U-Matic tapes together into one master reel which contained all the edits we wanted and the right pauses between tracks. So we started from the top and worked down, transferring the tracks across, checking the levels were suitable, and doing the odd edit. We had carefully prepared ourselves for the whole session with goodly lists of all the tracks. We also had timecode (or at least timer) points for the start of all the 'raw' takes on the reels, what edits were to be where, and what *sort* of pause (not always too accurate) we wanted between tracks. Some of them were to follow on from each other pretty fast; others had a respectable 3 s or so gap, and others butted right up to each other and sometimes had the nearest thing to a crossfade between them that the *DAE-1100* digital editor will allow (99 ms).

A word of warning about crossfades is in order here: you can't do them. Well, at least, you can't do them at this stage. The digital editor allows you to do microcosmic crossfades, so that you can do all manner of otherwise impossible edits, but it really is limited to 99 ms. More usually, you will use 10. In either case they are more like butt edits than crossfades. Do not ask the poor digital



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mastering person to do your crossfades, as you will be disappointed. Digitally speaking, you'll need a couple of 1610 or something in the recording studio to do that kind of thing.

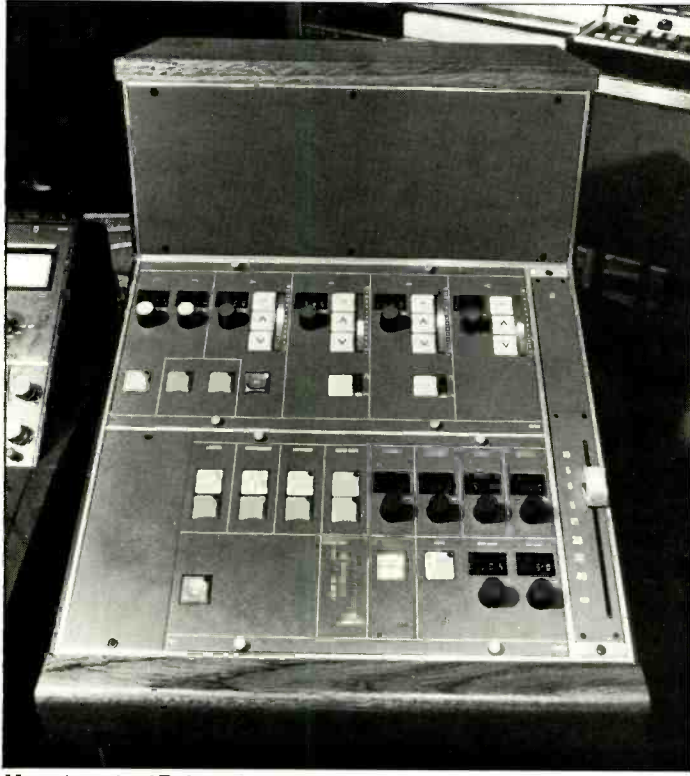
Bearing in mind that we are preparing a tape for Compact Disc, we must remember to leave a couple of minutes of recorded blank tape (with timecode) at the front of the master. The PQ editor puts the subcode data up here, starting 30 s in from the top, on audio track one. It apparently doesn't matter if the subcode data carries on into the music, but it *does* matter that you have your two blank minutes. You must also leave a blank minute of digital silence and timecode at the end of the master.

While compiling the master tape, doing the edits and getting the pauses right, you are obviously setting edit points for the start of tracks on the digital editor. Ben Turner made a point of writing these down on a sheet of paper. Why? Because when you come to do the PQ'ing you have to whizz off and find them all again, so it saves a good deal of time if you have a note of where to look.

There is another point to watch here if you are doing edits on tapes transferred to 1610 from F1 format. The F1 has a nasty habit of suffering from a DC offset, and you want to ensure that you pull the fader out at the end of each transfer to 1610 to get rid of it. Similarly, when you do your edits (and more especially when you mark your track start points) you need to ensure that you don't put a start point in the middle of a bit of DC offset. Most people have encountered analogue tape with DC on it from time to time, and you will know if that is the case when you drop in or out on it: there will usually be a loud 'bang'. Exactly similar is the case with DC offset on a digital recording: if your CD player turns its mute off and finds DC there, the poor thing will also at least click, if not bang. You need to be careful of this.

Following the compilation of the master tape, we did a safety copy of it on to F1. There is a lot of sense in this, especially if you are dealing with far away CD plants. Polygram and CBS/Sony (and no doubt the others, including Nimbus) listen very carefully to what you give them. They are obviously very concerned that they don't get any nasty clicks, bangs or other 'disturbing sounds' on your

CD MASTERING HOW IT HAPPENED



Neve 'mini' DSP digital processor.

CD. They are even more concerned that you don't put any on, in case they get the blame. So that the plant knows who's fault such a 'disturbing sound' is, you are required to tell them if there are any that are definitely your responsibility. They might be clicks and bangs that you really can't get rid of, or musical or musicians' noises which are quite all right. If you don't put them on the list, you will probably get a long-distance phone call. You might even get one anyway, as that little buzz halfway through the second track will probably twitch the ears of highly-experienced listeners at the factory. Then you can go back to the safety and see if there is really one there or not, and you can make suitable excuses, admit it was your fault, or castigate them for messing up your master.

Watching your Ps and Qs

Now we come to the exciting bit. We have a neatly-finished CD Master Tape and we want to turn it into a CD Tape Master. We have our list of track start timecode points and we want to put it all together. In comes the CD Subcode Processor/Editor. Both Philips and Sony make one of

these. Tape One have the Philips variety, known as the LHH 0425. They preferred it for their applications because it does a lot of work for you, and prints all the stuff out on to pieces of paper. The machine itself looks like a pretty ordinary computer terminal, talking via serial link to a box in the corner, as such things are wont to be. It also talks to the DAE 1100 digital editor in no uncertain terms, which we will come to later, thus avoiding all manner of operator errors.

First we enter the appropriate mode with a few keystrokes, enabling us to enter exciting and important information about the name of the album, the name(s) of the artist(s), the catalogue number, and so on. The manual for the unit is at least partially impenetrable (the device is so new, it is almost certainly preliminary) and in any case it is a little difficult to try reading a manual when you are really too excited about pushing buttons. Luckily Ben knows all the machine's little foibles, so without anything in the way of a hassle, we get to the line labelled 'TITLE'.

Filing

Here, believe it or not, we

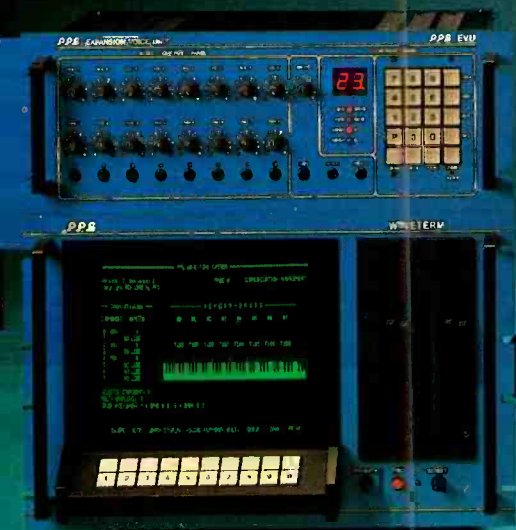
enter the album title and the artist(s): 'SURPRISE SURPRISE'/CHIN & CANG'. Next 'ORDER SOURCE', 'KPM MUSIC/NIMBUS RECORDS' then 'MASTER IDENT'. This is usually the catalogue number. What is the catalogue number? I've been so happy with myself for actually having persuaded Nimbus and KPM that this was really such a good idea, and been so busy making sure that the music actually existed in some reasonable form, I never thought to check. A quick call to Nimbus—can they change it later?

The answer is reassuring—we can stick anything we like in there and it won't be indelibly engraved on the disc for all to see. I make up a number. It's KPM's and it's Nimbus'. And it's a Compact Disc. And it's the first collaboration of this kind. 'KNCD1001(?)' I enter. If it comes out on the disc like that I will quietly scream. Oh, look at the next line, that's even worse.

What it says here is 'UPC/EAN Number', followed by a string of 13 (no less) zeroes. 'A bar code (UPC/EAN number) for the whole disc,' says the Nimbus leaflet, 'can also be recorded on the disc.' Oh, great. You can hardly make one of *them* up! Apparently not every record company is using barcodes yet. Very kindly, the line is waiting on the machine: a line of 13 zeroes. <Enter> leaves it that way.

Now we start to have more fun. A blank line, and then 'DIGITALLY RECORDED.'. Well, that's easy. I type, 'A/D/D (SPARS CODING)'. It will say that on the cover, after all. Along with 'Analogue recording, digital mix, digital mastering' or words to that effect. Such euphoria is temporarily alleviated by the next line, 'DIGITAL HEADROOM'. What is it? Ah, 2 dB. Ben kindly fills in the line 'MASTERED BY:' with 'BEN TURNER/TAPE ONE LONDON.'

We can now go through and fill in the track titles. There is much pressing of function keys. The machine automatically comes up with a blank form into which you can put the data you need for the subcodes. As well as the actual track numbers (TNO), you can have indexes, which allow sophisticated players to find little bits of music you have marked for the listener. Are we going to go through and index all the tasty guitar solos and stuff? No we are not. Just the track numbers. ▶



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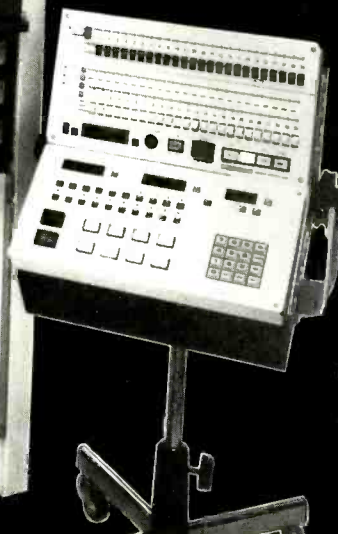
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Paradoxically, this means that each TNO actually has *two* indexes. INX 0 is, curiously, the pause *in front of* the track, INX 1 is the track itself. We don't want to put the timecode values in yet, so we press one function key and skip past the weird bits and another key to enter the title.

The 'weird bits' aren't just the timecode points. Next to the word 'PAUSE', a few columns along, are four bits of information, headed 'ROM', 'COP', 'PE', and 'ISRC'. Then there's the 'Playing Time', which is currently a black-on-white boxful of zeroes (the PQ Editor calculates them by itself, later). Finally, there's the SMPTE timecode point associated with the pause. That will be entered later. On a new line, INX 1 is about to be waiting for a title. ISRC is the International Standard Recording Code, a line of, yes, 13 zeroes, waiting to be *left alone*. But what, pray, are ROM, COP and PE?

ROM is apparently something to do with information being coded into Read Only Memories, perhaps for some kind of future interactive gaming application. 'N' for 'No', then. COP is like the 'copy inhibit' function on an *F1*: it will enable or disable the digital bitstream output on

CD MASTERING HOW IT HAPPENED



Philips LHH 0425 CD Subcode Processor/Editor.

an Advanced Player. But is it 'N=No Copying', or 'N=No Copy Inhibit'? A good question. The answer is 'N'. PE simply stands for 'Pre-Emphasis', and we know we don't have any of that any more: 'N' again.

While we are entering titles, we can put in any notes we might have on the dreaded 'disturbing sounds'. Philips have kindly avoided exciting the wrath of producers on seeing a list of 'disturbing sounds' on the sheet. Instead, they call them 'Remarks'. On the final printout, they are listed at the bottom.

We have three 'Remark' euphemisms to note. One track appears twice on the album, in two different versions. They finish what would have been sides 1 and 2 of a vinyl album, and they have a remarkable bit of piano on them which was recorded in diverse ways about which we shall not speak, but suffice to say we wrote 'slight granular distortion at end'. The other remark concerned some weird stereo processing which accentuated the 'slight distortion' of a Fairlight sound we rather liked.

We now go on to enter the timecode points. We locate the start of the first track: we do not, in this instance, have to

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enter the previous pause time, as the machine works this out for itself eventually. When the point is located, you press the 'out' edit point button on the *DAE-1100*, hold the time offset 'out' button down, and wind back five frames. This is to allow the muting circuitry of a player to open up before the track starts, so that the music begins in a sensible way.

Different factories prefer a different number of frames left for this: five frames is the Polygram recommendation; the Japanese however prefer between 1 and 1½ s. When the correct time has been located, pressing the 'time' command key on the PQ editor reads the time from the *DAE-1100* and stores it in the appropriate window on the display. Now we locate the end of the track, and mark that as the start of the pause before track 2.

Then we find the start of track 2, back off five frames, and store that too. It is not essential to back off the end of a track by five frames, for obvious reasons—we didn't.

What you do need to watch, however, is the length of the pause. If you are backing off the start of a track by five frames, and not the start of the preceding pause, what do you do if the pause between one track and the next is actually less than five frames? The answer is simple: you mark the start of the pause and the start of the next track as the same value, so effectively there is no pause at all. It's NTSC video, so there are 30 frames/s: five frames is pretty quick. We had pauses of 0 min, 0 s, 0 frames several times on the album, when the

CD MASTERING HOW IT HAPPENED

pause was less than five frames, or the tracks were actually butted up to each other. It all goes into the machine.

The marked point for the end of the last track becomes the 'start lead-out' point for the record. Of course, as there was no following track, we didn't have a note of where it was, and had to look for it!

Now we have a listing on the screen with all the timecode points we need marked, the machine is told to redisplay the information. When this is done, the PQ editor works out the playing times for each track and enters them into the display in minutes, seconds and frames. It also calculates the total playing time of the CD, including pauses. It has still, however, got a meaningless value for the start of the first 'pause'—that's the one that doesn't really exist. Going back to the main menu and redisplaying gives the PQ editor the incentive to work this out correctly and insert it into the now-finalised list.

Shoving it on to the tape

Ben tells me that the next thing to put in my notes is, "shove it on to tape". To do this, we rewind the master to the top, and select 'Store' from the main menu. The screen

clears and displays the simple line, 'writing cue code'. What it is actually doing is putting 30 s of header tone on audio track 1 of the master, and then writing all our cue data on to the tape at some unholy baud rate. It's that simple.

We now need to print the list out. Why? Well, one copy wants to go to Nimbus with the completed tape; Tape One need one to keep with the safety copy; our graphic designer needs one so that he can lift all the titles (we managed to leave one out in the list we had given him previously!), the track lengths and the local running time for the artwork; I need one for Fig 1 in this article; and of course Matthew wants one, doesn't he?

The printing out of the data provides an opportunity to check that it is all really there and it is all over bar the printing (and, of course, the manufacturing!).

We are all happy, and hopefully Nimbus will be too. It is our further hope that when the thing finally emerges from the factory in September it will all work properly. Finally, we fervently hope that we will beat Lamborghini Records' release of Steve Hackett's album, which is also Ambisonically mixed, and that it will therefore be the first commercially-released Ambisonically-mixed album as

well as the first Ambisonically-mixed Compact Disc and one of the first CDs made in England.

Summary of information required with each tape

(From the Nimbus Records guide to their CD Mastering and Manufacturing Service, available by request from Nimbus Records Ltd, Wyastone Leys, Monmouth NP5 3SR, Great Britain. Tel: (0600) 890 682)

Title, catalogue number, name of customer, etc
Lettering for centre of disc (if different from catalogue number)

Format of the tape (PCM-1610, PCM-F1, analogue)

Whether timecode or cue format present (PCM-1610 tapes only)

Barcode (if any)

Total playing time, including pauses (optional)

Starting point for timings (tapes without timecode only)
For each track:

Track number

Start time

Stop time

Times of index points (if any)

ISRC (if any)

Whether emphasised (optional)

Length of track (optional)

Title of track (optional)

The Nimbus documentation also gives full data on the size and parameters of the CD label, inlay card and booklet, plus information on how and how not to use the Compact Disc official logo. □

DIGITAL UPDATE

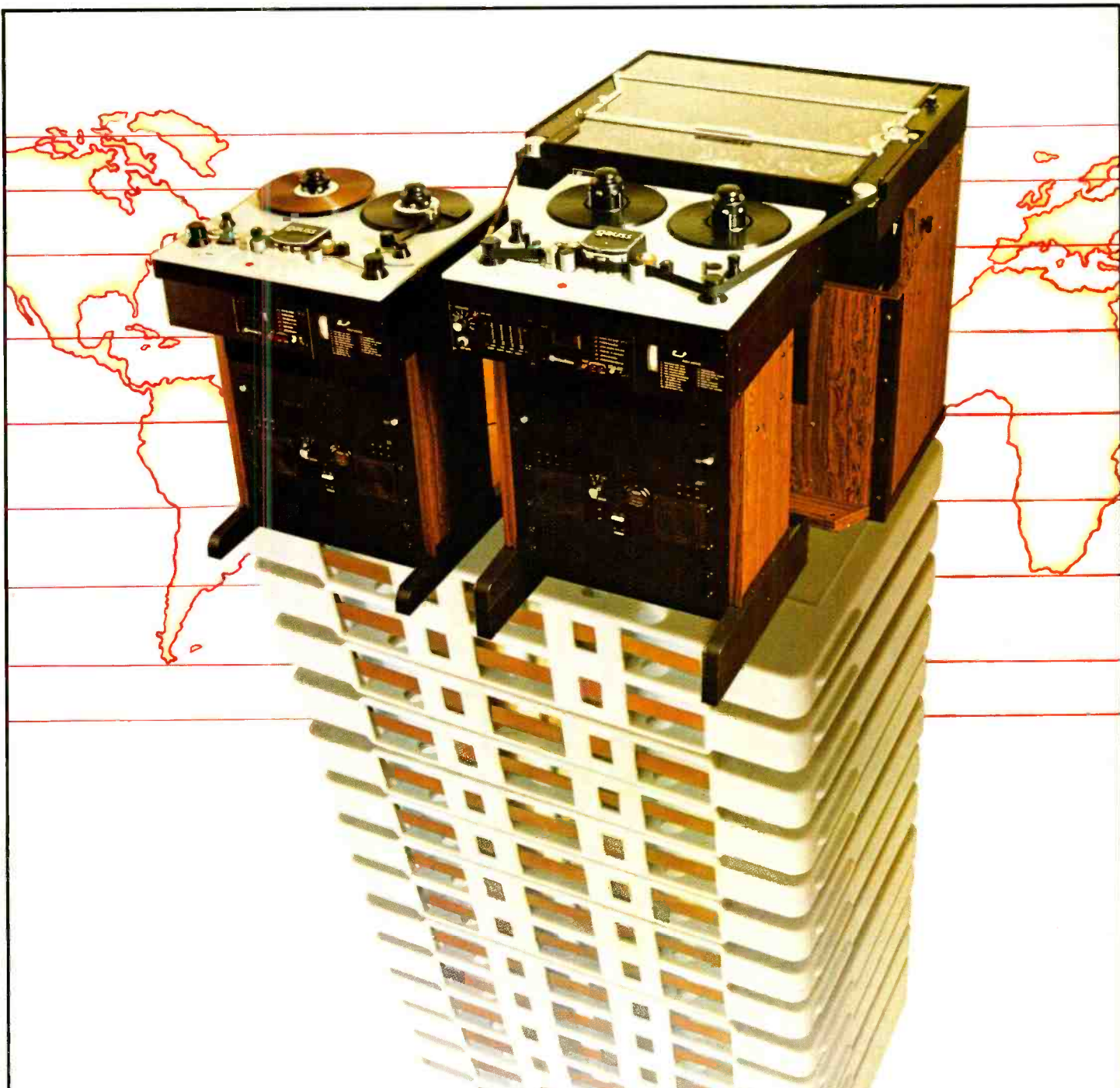
At last year's Digital Seminar, APRS issued to its members the following summary of the main points to be kept in mind if recording on Sony *PCM 1610* when subsequent transfer of the master tape may be for CD production. To promote further understanding of the system APRS have kindly given permission for it to be reproduced here.

When preparing master tapes for CD manufacture, we strongly recommend that the manufacturers instruction documents are studied in detail.

- 1 **FORMAT:** Sony *PCM 1610**.
- 2 **SAMPLING FREQUENCY:** Output sampling frequency selector (inside unit) should be switched to 44.1 kHz. Other sampling frequencies are liable to attract additional charges by the CD manufacturer.
- 3 **PRE-EMPHASIS:** Can be utilised if desired. If other material exists which is to be intercut, the same format should be adopted.
- 4 **TIME CODE:** 30 (non drop) frame SMPTE synchronised to the video signal (as generated by the *1610*) recorded on audio track 2 of the U-Matic at 0 VU (± 1 dB). Timecode should start at, or just after, 00.00.00 and should run uninterrupted to 30 s beyond the end of the recording. At least 30 s of timecode must elapse at the start of a cassette before any audio commences. If individual selections are being recorded, 10 s is required at the start of each selection. This is necessary for subsequent editing.

- 5 **LEVELS:** To optimise bit usage, recordings should peak as close to +18 on the *1610*'s bargraph scale as is practicable. Do not be guided solely by the desk meters as the characteristics of digital meters are very different from those of VU and many PPMs. The engineer will find it advantageous to keep the *PCM 1610* in sight when recording.
- 6 **VERIFICATION:** To ensure that no distortion is caused by overloading of the A/D or D/A converters, monitor 'through the system', ie from *1610* analogue output. Remember, Sony *PCM 1610*, in common with other U-Matic based digital recorders, is a 'single head' system. Where retakes would be impracticable, utilise a second U-Matic recorder. (This does not require a second *1610* processor.)
- 7 **CASSETTES:** To minimise the error rate it is recommended that only broadcast standard U-Matic video cassettes are used.
- 8 **TONES:** No tones should be recorded on master tapes destined for CD plants. Studios may find it beneficial to record tone(s) on session tapes at their operating level for subsequent analogue copies. (Unless an editor is used, all digital copies will be 1:1.)
- 9 **BOX MARKING:** U-Matic cassette labels should show, in addition to usual artist/title details, digital format, sampling frequency and whether pre-emphasis is in or out.

* Some CD plants will now accept other formats.



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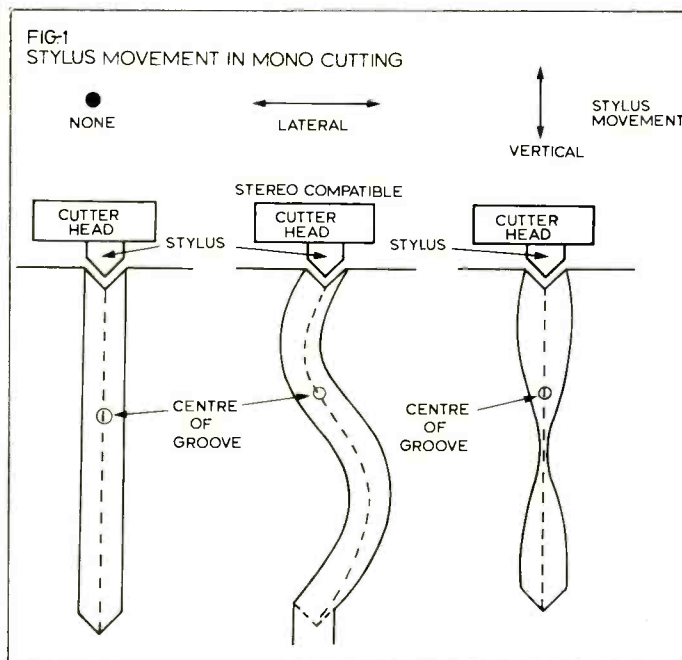
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THE CUT AND AFTER 2

There are many differing opinions as to how a disc should, or should not be cut. To begin with we will look at the way a groove is cut and the relationship between the two stereo channels. Assuming a perfect cutting lathe, correctly set up and with very little rumble or other mechanical noise that could be introduced on the record, if we then cut a groove on a blank disc, without modulation, using a cutting stylus which is in good condition, then the only noise we should hear on playback is that generated by the acetate or DMM (direct metal master) blank itself. Providing, of course, that the noise level of the playback system is well below the noise floor of the blank.

The walls of the groove have an angle of 90° to each other and should, if examined through a microscope, appear clean with a few track lines along the length of the groove wall. These are caused by minor blemishes on the cutting edge of the stylus due to the polishing process used during the final stages of stylus production. Providing these are small enough they should not affect the audio but

In the second part of Mike Jones' article on disc mastering, he covers some of the arguments and ideas put to him during the research and leaves you to draw your own conclusions.



this point is worth consideration as we improve the rest of the system: is it not possible that these polishing marks, as small as they are, could become audible?

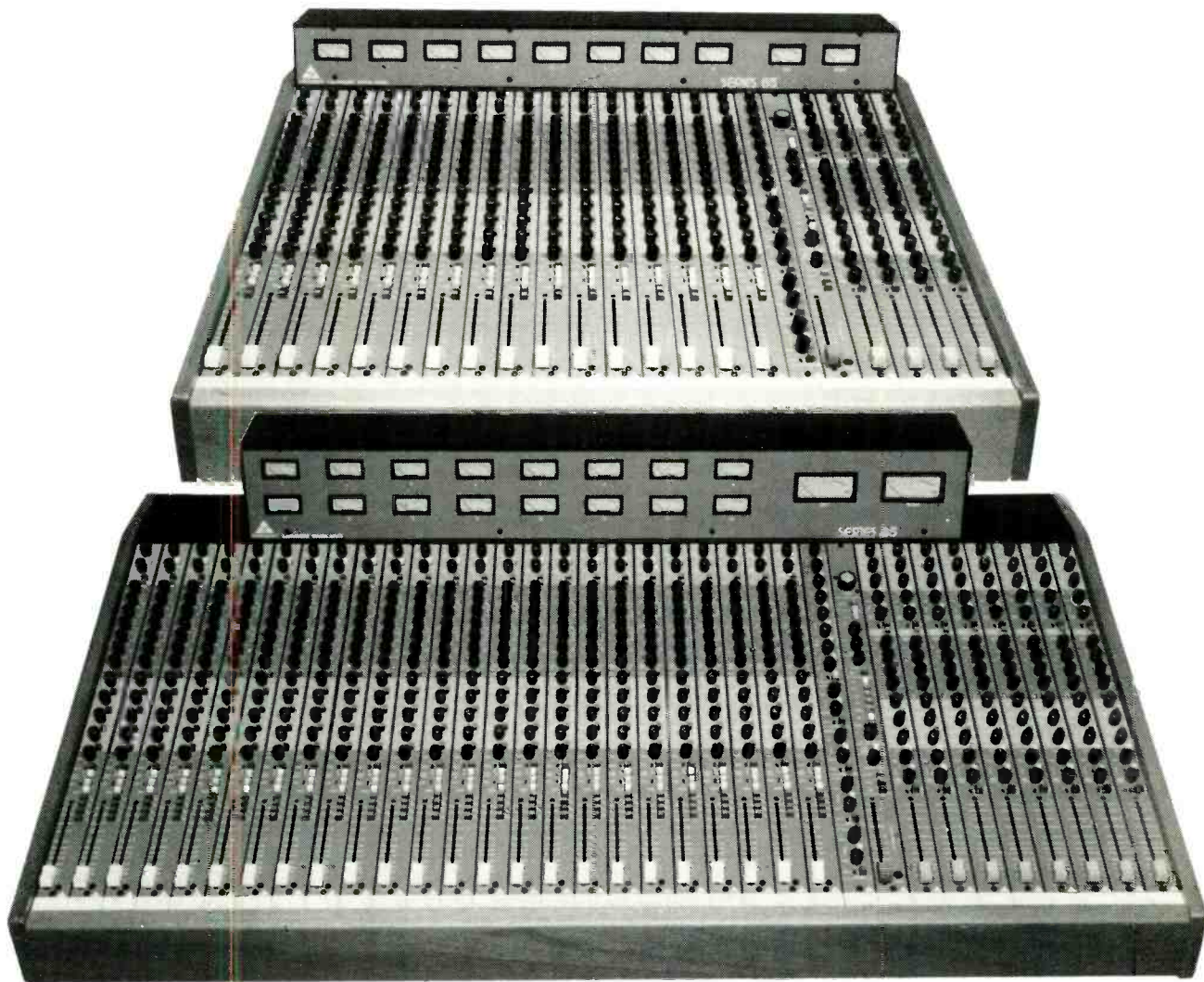
But, to return to our 'silent' groove, as there is no modulation it will not move from side to side or vary in depth. Because of this it will not generate any signals in the replay cartridge and as such, is ideal for measuring the noise of the blank at various depths, for checking rumble, etc, or to determine the optimum heater current so we can obtain the quietest cut combined with the maximum amount of dynamic range.

To store information on the record the cutting stylus is moved in one of several ways and the way in which it is modulated is crucial to the final quality of the disc. Indeed, many cutting engineers' comments, along with others involved in the industry, are related to this one particular topic allied to the quality of the signal on the original recording from which they have been asked to produce a master.

Fig 1 shows the two ways in which a mono record can be cut: laterally or vertically. For commercial records the lateral

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system has always been used and for this reason the playback cartridge is designed to work the same way with maximum output being derived from a lateral signal. When a stereo record is made, the left and right hand channels are cut at the same time, one on each wall of the groove. Because the two signals are cut at 90° to each other there is a minimum amount of crosstalk between the two channels. When the two channels are in phase with each other the resultant groove is cut laterally and is mono compatible as is shown by Fig 2b, but when the two signals are out of phase, as in Fig 2c, the cut becomes vertical. Apart from being difficult to cut, a mono cartridge would have great difficulty in resolving such a signal coherently.

'Ah, but nobody produces mono records any more,' you might say. Or you could point out that all modern cartridges are designed for stereophonic sound. True, but what about radio, what happens to the quality of the mono signal that the broadcast engineer has to produce, by combining the two stereo channels for medium wave or even some FM transmitters? In many ways he has a similar problem to that of the mono cartridge unless the cutting engineer ensures that the stereo signal he records on to the disc is mono compatible with both channels being kept in phase with each other.

The listener at home, whatever his choice, will get more enjoyment from a recording which has a solid stereo image than one in which the instruments are wandering about because of phasing problems.

While you're listening try comparing the stereo version to the mono one by combining the two channels and see what it sounds like. Is the sound firmly located in the centre or does it wander around? Does it sound as good and if not, why not? Either way it is worth remembering that many record sales are lost or won when the consumer hears the disc on a mono radio for the first time. So the quality of the mono signal is important in more ways than one.

It's worth reminding ourselves of the effect that the RIAA recording characteristic has on the signal being passed to the head. It is used to keep the amplitude of the cut

THE CUT

groove constant at all frequencies (providing of course that the level of the incoming signal remains uniform) it also has the advantages of improving the replay signal-to-noise ratio by an increasing amount at frequencies above 1 kHz. The cutter head will be driven far harder by HF signals than it will by those which are lower in frequency.

Modern recordings, especially those made on digital equipment from electronic and synthesised sources, are capable of producing large levels of high frequency information and the recording engineer should remember that while his recording equipment may be able to handle this degree of HF the analogue disc may not and this could explain why some of the pressings sound quite a bit duller than the original master due to the action of the automatic limiter built into the lathe system.

Some problems arise from the master tapes that are not directly related to the audio content although they affect it. For example tracks may have been recorded on a number of machines each with a variation in azimuth; or noise reduction could have been used on one track and not another; different recording characteristics may have been used. But the most common problem is that the tones which should be recorded at the beginning of each tape do not relate to the level of the

music on the rest of it.

Ideally all the tracks should be recorded on one machine and in the case of analogue masters using tape from a single batch, so the tape parameters are kept constant. Before the first track on each tape the following signals should be recorded:

- Dolby tone (if used) or a reference level tone. On digital tapes a 1 kHz tone recorded at 0 dB should be recorded;
- on analogue tapes about 30 s of a 15 kHz tone which can be used to adjust the replay head azimuth;
- frequency sweep or a series of spot frequencies ranging from 20 Hz to 20 kHz recorded 10 dB below reference level;
- it could also be worth recording a second and third sweep at 0 dB and 10 dB above reference level.

Written details supplied with the tape should indicate:

- Playback equalisation, ie, NAB, CCIR, etc;
- type of noise reduction used;
- playback speed and track configuration;
- playing time of each track, the length of the gap between the tracks and the total playing time;
- peak recording level on any of the tracks compared to the reference level recorded at the beginning of the tape;
- it is also useful if the points where the various peaks in level occur were indicated;
- the name of the recording engineer, the studio and a telephone number where the engineer can be contacted;

● any other information that would be useful to the cutting engineer.

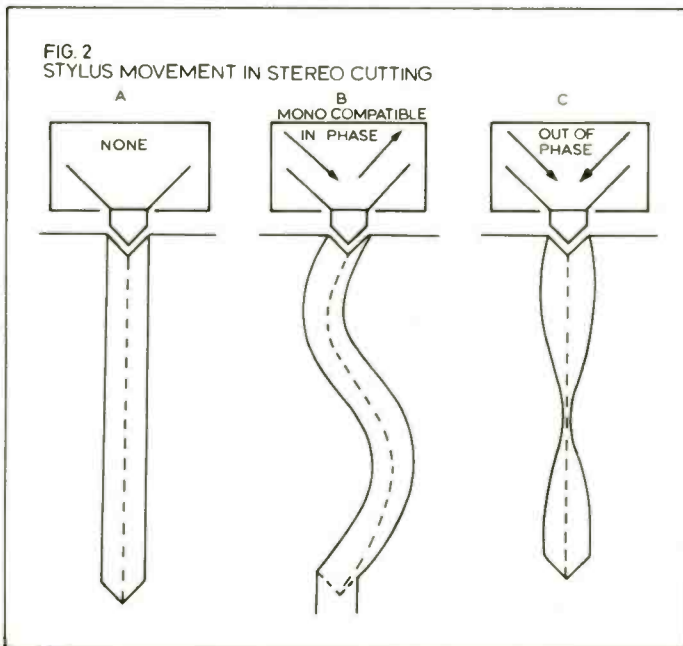
Monitoring systems and control room acoustics are carefully adjusted to create an environment which is acoustically flat and controlled in reverberation across the audio spectrum. Background noise is kept to a minimum, so it cannot mask the quieter and more subtle pieces of music, and the monitors firmly secured to a solid floor or wall so they cannot move on loud bass notes.

When a bass note is generated the speaker cone is trying to move a large volume of air and unless the cabinet is securely fixed then it will try to move in the opposite direction to the speaker cone and by doing so the note will become coloured. This may seem basic but speakers in some studios have been mounted on flimsy stands. Also not all walls and floors are as solid as they may appear and one answer to the stability problem is adjustable spikes for free standing monitors fitted to the base of the stand, which can be retracted when the speaker has to be moved.

The main problem is that the majority of studios and listening rooms sound quite different to each other. This may not matter providing the tonal balance of the recording will not be altered at the cutting stage, ie the only control that is used during the cut is the level control, with everything else being left flat. This method is fine providing the disc can be cut this way but as we have already seen, some form of treatment is often required to obtain a satisfactory master.

When this is necessary the acoustics and monitoring system of the cutting room becomes crucial. Ideally they should be identical to those found in the studio control room or at the very least they should meet the criteria outlined above. If they do not then the whole sound of the recording could be altered. For example if the monitoring system in the cutting room is bright then the resultant sound on the disc could be dull or vice versa.

The number of combinations that could arise from all these variations are limitless and in view of this it might be better for any necessary changes to be carried out in the studio control room where the original recording was made



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Lathes are fitted with a normal tone arm and cartridge which can be used to check the overall response of the cutting system and to playback any test cuts.

It should be remembered that the cutter head is a non-linear device and a motional feedback system is used to ensure that the overall response of the amplifier and cutter head is linear.

Although it is possible to check the response of the system by the monitor output which is fed from the feedback coil many cutting engineers use the tone arm and cartridge in conjunction with a standard test disc to check the overall response of the lathe.

The problem with this method is that the lathe could be set up to suit the tone arm and fitted cartridge. This would be fine for those playback systems which are using the same combination but may not favour those which are not. For example many lathes are fitted with an SME arm and Shure V15 cartridge while the highest quality playback turntables use tone arms which have tighter bearings and less low frequency resonance than the SME with moving coil

THE CUT

cartridges being used in preference to magnetic. The quality of pressings would be improved if the cutting engineer used a moving coil cartridge and a higher quality arm for calibration and playback.

Other variations are caused by the deterioration of the test discs themselves and the effect that temperature has on the cartridge. It is recommended that test discs should be replaced after being played between 10 and 20 times, depending on the tracking weight and the temperature of the cartridge should be maintained at a constant level. If it is not then the HF output will rise and the temperature increased and vice versa.

Even when the environment is stable it has been found that some cartridges will produce more output at high frequency after they have been working for an hour or so and the cantilever suspension becomes more compliant.

Possibly the most stable method of calibrating the lathe

is to use the signal from the feedback coil and the associated built in monitoring system. The tone arm and cartridge would then be used to measure noise and levels but not to calibrate the frequency response of the lathe. The frequency response should be measured on a regular basis, ideally at the beginning of every cut, near the outer edge of the disc. Occasionally it should also be checked at various diameters working towards the centre of the blank to ensure that the response is flat across the entire surface of the disc.

But whatever method of calibration is used, a great deal of care is needed if variations between masters cut on different lathes are to be kept to a minimum and remember these comments are made assuming that no equalisation apart from the RIAA curve, or any other form of special processing is used while the calibration process is taking place.

As the number of individual

components is increased in the recording chain certain aspects of quality will be reduced. The noise will increase and much of the original clarity and detail could be lost. This deterioration of the original recording is particularly noticeable on subsequent generations of tape.

The dynamic range of the disc can easily equal that of a 15 in/s master and for this potential quality to be realised the cutting engineer will need a first or second generation copy of the master on which dbx, Dolby A or *telcom* noise reduction has been used. And this is why Teldec insist on this minimum quality standard in their DMM licence—the only acceptable alternative: a digital master.

There are many ways in which it is possible to improve the quality of the black vinyl disc, but one thing stands out above all the others and that is the care and dedication required from the studio to the pressing plants. The majority do care about the product they are producing and hopefully artists, producers and record companies will support them in their endeavours to provide the consumer with a high quality product. □



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Technical Data:

Directional characteristic:
omni-directional

Frequency range: 20-20,000 Hz

Sensitivity: 6 mV/Pa \pm 0.6
mV/ μ bar (-64.5 dBV, no-load
operation at 1,000 Hz)

Electrical impedance: 200 ohms \pm
20% balanced

Max. sound pressure level (for
1,000 Hz and 500 ohms load
impedance, harmonic distortion
k = 1%): 80 Pa \pm 1.32 dB SPL

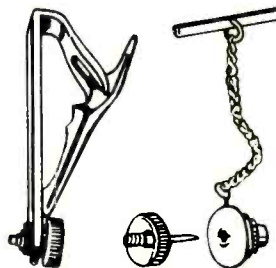
Connector type: 3-pin standard
XLR-type connector
pin 1: ground
pin 2: audio (inphase)
pin 3: audio (return)

Dimensions:
11 \varnothing 24 mm (microphone)
7/16" \varnothing x 1"
21 \varnothing x 80 mm (output-module)
13/16" \varnothing x 3-3/16"

Cable length: 1.3 m (\approx 4 ft)

Weight: 9 g (microphone only)
- 0.35 oz approx. 100 g net
(microphone + output module)
- 3.5 oz

Included accessories:
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Tie pin H 20
Universal clip H 21
Belt clip H 16



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REVIEW REVIEW

Hugh Ford reviews a collection of mini monitors

MINI REFERENCE MONITORS

This review of reference monitors is divided into a number of parts; firstly because two types are involved—those with single drive units and those with two drive units, I hardly dare call them a woofer and a high frequency unit. Secondly, experience says that in order to fully evaluate loudspeakers it is necessary to undertake measurements, some of which must be in anechoic conditions, and also to undertake subjective tests on different types of programme material.

As these loudspeakers are reviewed here in the context of secondary monitoring in control rooms, their acoustic environment and location is fairly well defined, when considered in relation to larger monitoring loudspeakers so far as studios are concerned. Thus the subjective testing was accomplished under typical studio conditions where small loudspeakers are almost universally placed on the desk either side of the operator and about 1.5 m from him.

Such conditions could apply to other applications for small loudspeakers, such as in mobile broadcast units, and whilst the larger differences between samples will be applicable more subtle differences may not repeat the order of preference.

NB: Unfortunately, the practical subjective listening tests referred to in this review have had to be held over until next month due to lack of space.

Technical measurements

Whilst a number of extremely complex measurements are nowadays possible on loudspeakers the results are frequently difficult to interpret even by those engineers versed in the measurement techniques. Thus, the measurements in this review are limited to the more conventional with which many people will be familiar.

To start with the loudspeaker/amplifier interface, the impedance of a loudspeaker commonly varies (sometimes to a very large extent) with frequency such that amplifier overload may occur due to the loudspeaker impedance falling

significantly below its nominal impedance. The modulus of the impedance of samples was therefore plotted from 20 Hz to 20 kHz in order to examine such variations.

Amplifier/loudspeaker problems may also be variations in the phase angle of the load (the phase between current and applied voltage which is in phase for a pure resistor and 90° out of phase for a pure reactance). This too was plotted from 20 Hz to 20 kHz for each sample.

The final measurement without the use of anechoic conditions was an attempt to determine the maximum levels that could be handled. Each loudspeaker was fed with a 100 ms toneburst of 100 Hz, 1 kHz and 10 kHz every second with the resulting output being detected by a ½ in Bruel & Kjaer microphone. This signal was digitally stored and examined on an oscilloscope for level and distortion at 100 Hz and 1 kHz or saturation level at

10 kHz, the maximum voltage that could be accepted by the loudspeakers being recorded for the onset of distortion visible on the oscilloscope at 100 Hz and 1 kHz and saturation output at 10 kHz.

The resulting figures were corrected for each loudspeaker's measured sensitivity and frequency response to determine the approximate maximum sound pressure level at 1 m under anechoic conditions.

Under anechoic conditions a Bruel & Kjaer 4165 high sensitivity ½ in microphone was used as a reference with the system being calibrated for level with a Bruel & Kjaer 4220 pistonphone. For all measurements the loudspeakers were placed 1 m from the microphone on the loudspeaker axis (where appropriate the tweeter axis).

For the sensitivity measurements the loudspeakers were fed with a 2.83 VRMS 1 kHz sinewave (equivalent to 1 W into 8 Ω or 2 W into 4 Ω) irrespective of the

MANUFACTURER'S SPECIFICATIONS

Make Model	AKG LSM 50	Auratone 5C	Bose 101	JBL LT-1	Teac LS-X7	Toa RS-21M	Visonik David 6000
Type	1-way	1-way	1-way	2-way	2-way	1-way	2-way
Impedance	8 Ω	8 Ω	6 Ω	4 Ω	8 Ω	8 Ω	4 Ω
Music power	50 W	60 W	150 W	100 W	40 W	100 W	60 W
RMS power	—	30 W	—	—	20 W	35 W	40 W
Sensitivity ¹	87 dB	89 dB	—	87 dB	—	88 dB	81 dB ²
Response	—	±3.5 dB	—	—	—	—	—
From	130 Hz	200 Hz	—	100 Hz	80 Hz	100 Hz	45 Hz
To	18 kHz	14 kHz	—	19 kHz	20 kHz	17 kHz	25 kHz
Driver size	5 in	5 in	4.5 in	—	4 in	5 in	4 in
Tweeter size	None	None	None	—	1 in	—	1 in
Height	6.7 in	6.5 in	6.1 in	9.6 in	4.6 in	6.7 in	7.7 in
Width	6.7 in	6.5 in	8.7 in	6.3 in	7.3 in	6.7 in	5.0 in
Depth	5.6 in	5.8 in	5.9 in	5.0 in	4.4 in	5.9 in	5.2 in
Weight (pair)	8.8 lb	9.9 lb	10.2 lb	—	11.0 lb	11.7 lb	—

Notes ¹ Sound pressure level for 1 W at 1 m
² Specification not clear

Manufacturers and agents

AKG Acoustics Ltd, 191 The Vale, Acton, London W3, UK.

USA: AKG Acoustics Inc, Stamford, CT 06902.

Auratone Corporation, PO Box 698, Coronado, CA 92118, USA.

UK: Scenic Sounds Equipment Ltd, 97-99 Dean Street, London W1V 5RA.

Bose Corporation, 100 The Mountain Road, Framingham, MA 01701, USA.

UK: Bose UK Ltd, Trinity Trading Estate, Sittingbourne, Kent.

JBL Inc, 8500 Balboa Boulevard, Northridge, CA 91329, USA

UK: Harman Audio (UK) Ltd, Mill Street, Slough, Berkshire SL2 5DD.

Teac Corp, 3-7-3 Naka-Cho, Musashino, Tokyo, Japan.

UK: Harman Audio (UK) Ltd, Mill Street, Slough, Berkshire SL2 5DD.

USA: Teac Corp of America, 7733 Telegraph Road, Montebello, CA 90640.

Toa Electric Co Ltd, Kobe, Japan.

UK: Tba Electric Co Ltd, PO Box 82, Castle Street, Ongar, Essex.

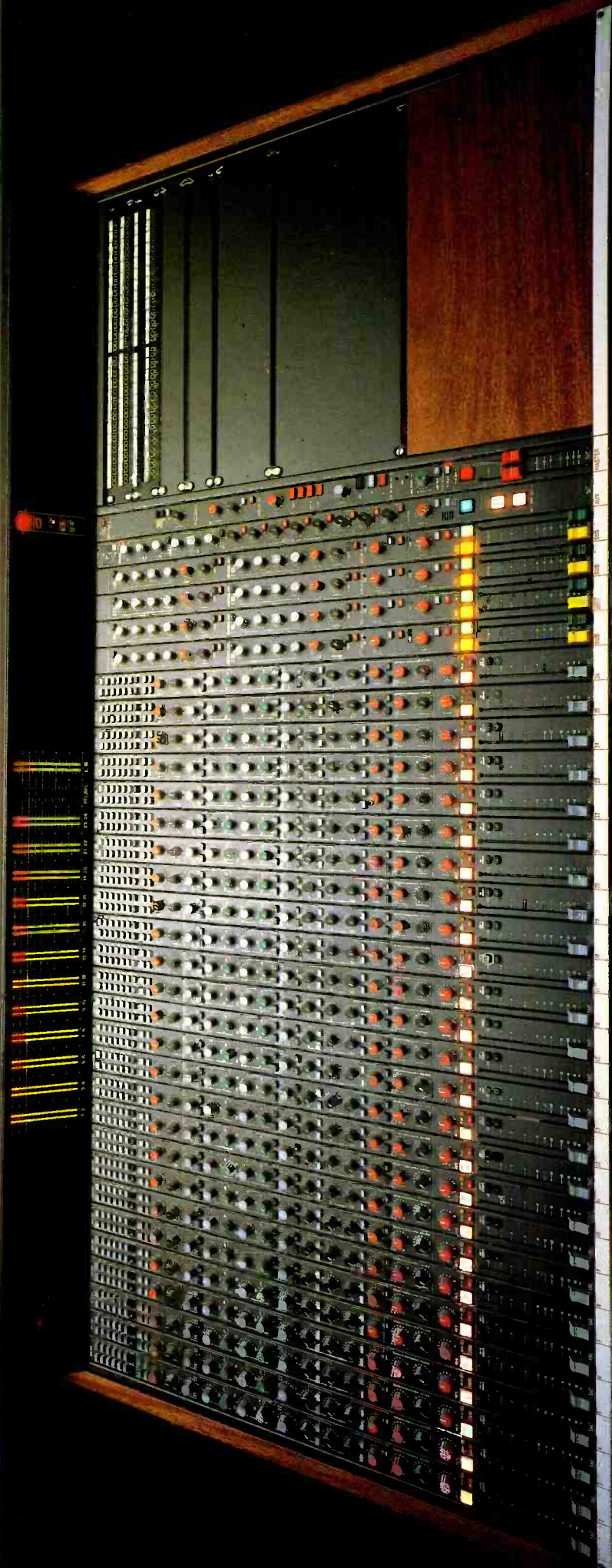
USA: Tba Electronics Inc, 1023 Grandview Drive, San Francisco, CA 94080.

Visonik—Kurt M Bruns (GmbH & Co), Nordkanalstrasse 46, 2000 Hamburg 1, West Germany.

UK: Uher Sales & Services Ltd, 30/31 Lyme Street, London NW1 0EE.

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REVIEW REVIEW

nominal impedance. The resulting sound pressure level was then measured in order to determine the sensitivity.

The frequency response was plotted from 20 Hz to 20 kHz under similar conditions with the drive to the loudspeakers being constant at 2.83 VRMS and the output from the measuring microphone being plotted on a Bruel & Kjaer 2307 level recorder with a pen speed of 100 dB/s—rather faster than used by some manufacturers of advertising literature!

The final measurement was that of the polar response which was done at 125 Hz, 1 kHz, 10 kHz and 16 kHz using selective filtering to eliminate the effect of extraneous noise. A sample of each loudspeaker was placed on a turntable and rotated through 360° in synchronism with the level recorder's paper.

In the case of twin drive unit loudspeakers and also those with an asymmetrical layout due to ports, etc, the polar response was plotted with the loudspeakers in what might be their normal position and also rotated through 90°.

Most of the review loudspeakers had either fixed grilles or expanded foam lightweight grilles which normally have little effect. However, the Visonik units had a rather complicated removable moulded plastic grille. These units were therefore measured for frequency response and polar response with and without their grilles.

AKG LSM 50

(Single drive unit)

Samples of these units were reviewed in *Broadcast Sound* January/February 1984 and some confusion was created by the supply of incorrectly manufactured units.

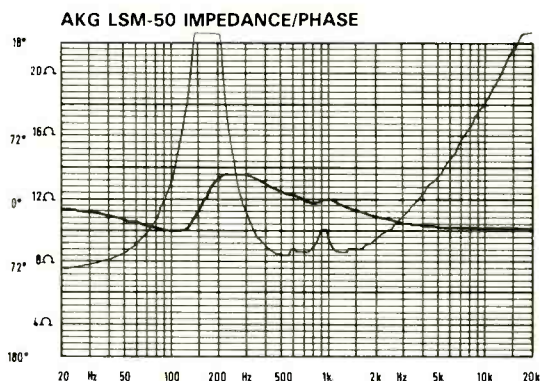
These speakers consist of what is described as a 135 mm round drive unit with an aluminium coil mounted into a fully enclosed wooden box of 170 mm square section. A cloth grille mounted over a round hole in an acoustically untreated 12 mm thickness of composition board forms the readily removable front of the unit.

To the rear the connections to the loudspeaker take the form of a fully recessed 3-pin XLR plug which uses pins 1 & 2 for the power connections, no mating socket being provided.

Optional accessories include a bracket for mounting the loudspeakers on to a microphone stand and an adjustable wall mounting bracket which can be angled in the horizontal and vertical planes.

Measurement of the load impedance and phase angle produced results that would be expected for such a unit with the minimum impedance being just under 8 Ω at low frequencies.

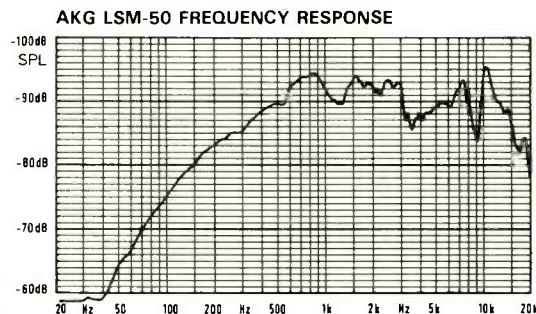
Averaging the frequency response in the 1 kHz area we rated the sensitivity at 91 dB SPL—rather higher than specified and more sensitive than similar



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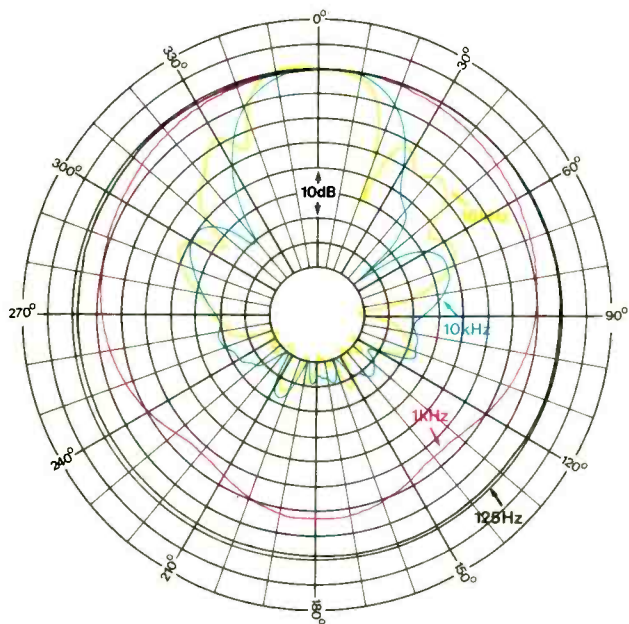
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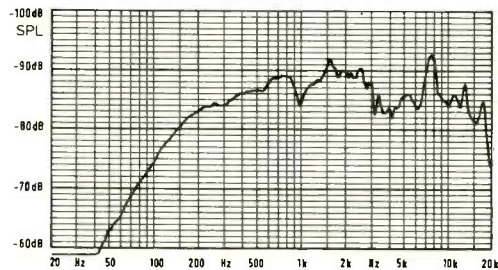
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REVIEW REVIEW

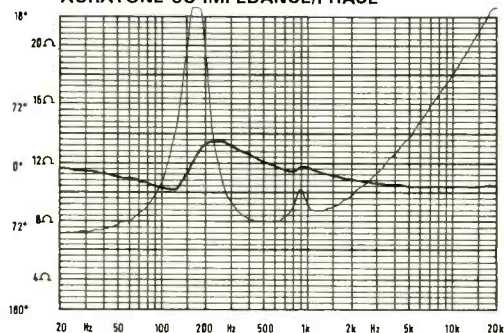
AKG LSM 50



AURATONE 5C FREQUENCY RESPONSE



AURATONE 5C IMPEDANCE/PHASE



samples of other manufacture. As compared with other single drive unit samples the power handling capacity was around the average at 100 Hz at 76 dB, below average at 1 kHz at 100 dB rising well above average to 111 dB SPL at 10 kHz.

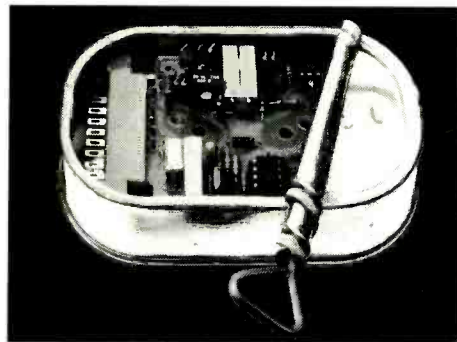
Reference to the on-axis frequency response plot shows a bass response typical of this size and type of unit with the remainder of the response up to 10 kHz being far from flat and a rapid fall off above 15 kHz.

Whilst the polar response at 100 Hz and at 1 kHz is satisfactory the performance at 10 kHz and 16 kHz demonstrates a fairly narrow front response accompanied by pronounced notches and lobes which are probably associated with the design of the front of the unit. The narrow 'acceptance' angle of this loudspeaker might produce some good arguments between the producer and the engineer if they're not sitting on each others' laps!

Auratone 5C (Single drive unit)

Sold as mixdown monitors the design of the Auratone 5C is similar to the AKG monitor containing a 5 in single drive unit in a slightly less 'live' 160 mm square section sealed wooden box. To the front, the drive unit is mounted flush with the panel, with a lightweight foam grille loosely held in place by spikes in the sides of the slightly recessed front of the wood finished cabinet.

To the rear the connections are via recessed terminals/banana sockets on the



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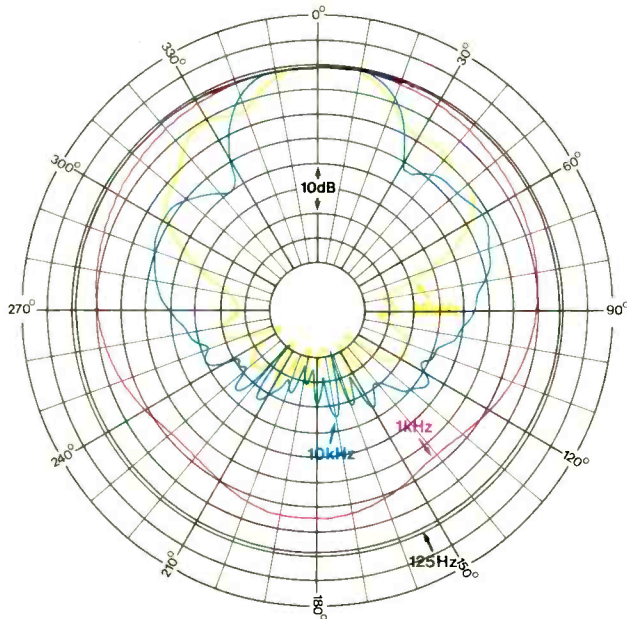
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REVIEW REVIEW

AURATONE 5C



standard $\frac{3}{4}$ in spacing. The terminals are very fiddly to use because of the way in which they are recessed—they are not however prone to damage in handling.

The minimum impedance was 7.5Ω at low frequencies and just on 8Ω at 500 Hz with the predictable phase characteristic of the impedance. The measured sensitivity at 1 kHz was on specification at 89 dB SPL with the power handling capacity being average for the type at 75/106/105 dB SPL at 100/1 k/10 kHz.

The frequency response shown in the plot has the expected lack of bass for a single drive unit of this size followed by a rather rough response between 1 kHz and 18 kHz where the response falls rapidly.

Reference to the polar diagram shows a satisfactory low frequency performance with the 'balanced' area to the front being rather restricted, however the lack of notches close to the front of high frequencies should be noted.

Bose 101 MM (Single drive unit)

The Bose 101MM series, like many other Bose loudspeakers, is of unusual design with a number of options being available. Whilst the review samples were the type with a 'passive equaliser' (in spite of being a single drive unit type) with a nominal impedance of 6Ω , an alternative type without the 'equaliser' has a nominal impedance of 2Ω intended for series connection of loudspeakers to a conventional amplifier. More recently 1Ω and 0.5Ω versions have become available.

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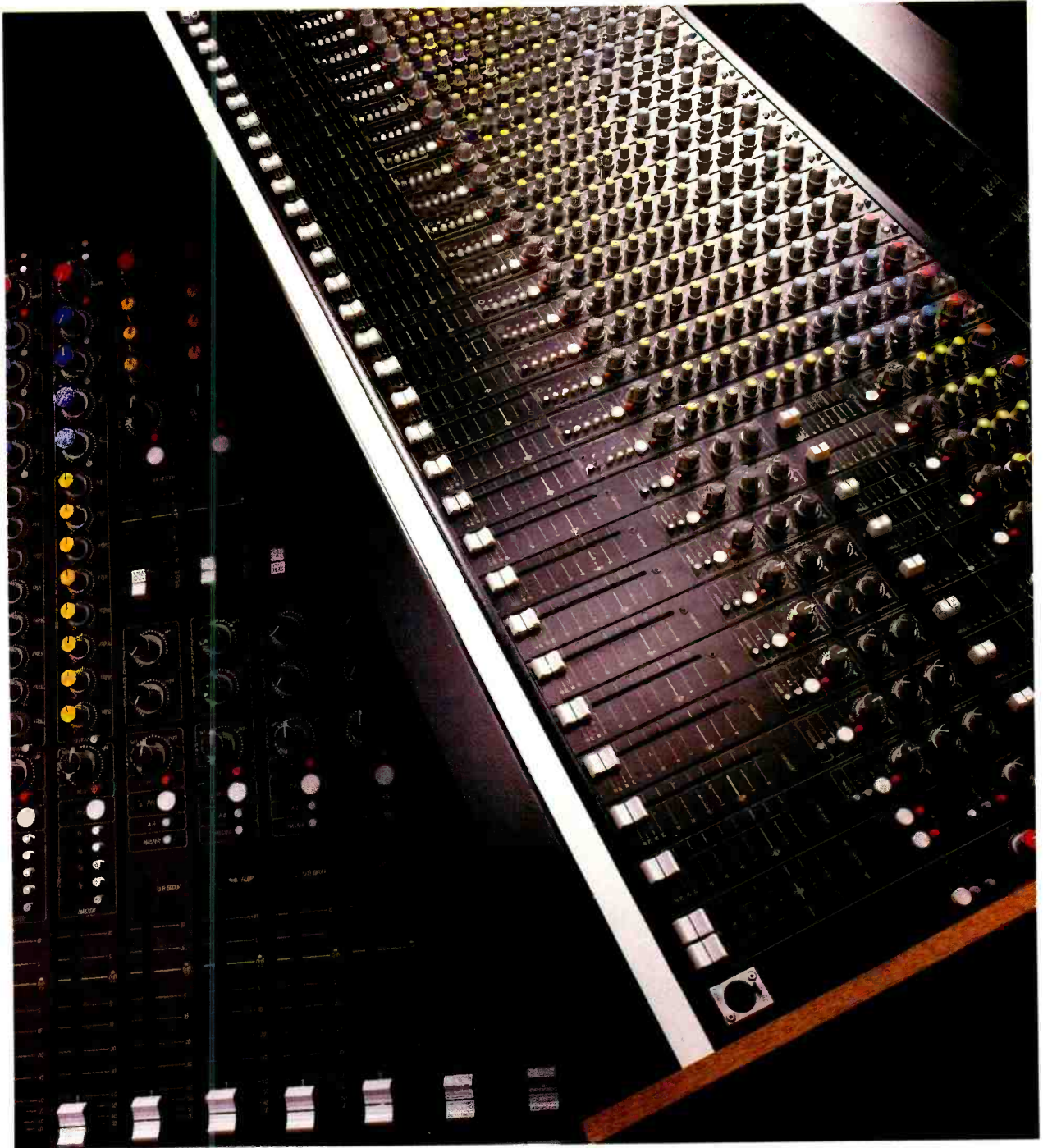
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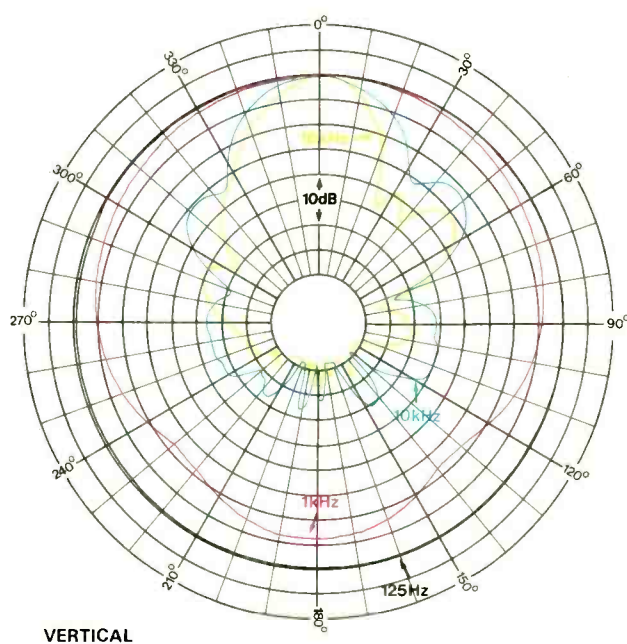
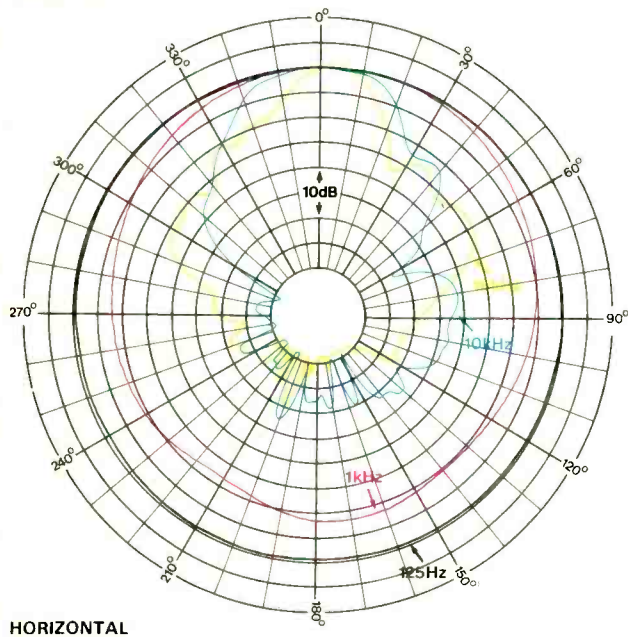
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REVIEW REVIEW

BOSE 101



embedding bracket and a universal bracket. Supplied with the review sample was a universal bracket with a screwed vice type mounting holding an L-shaped hexagonal bar with a universal locking ball joint on the other end. This has a plate to screw on to the loudspeaker which is equipped with two threaded mounting holes in its base.

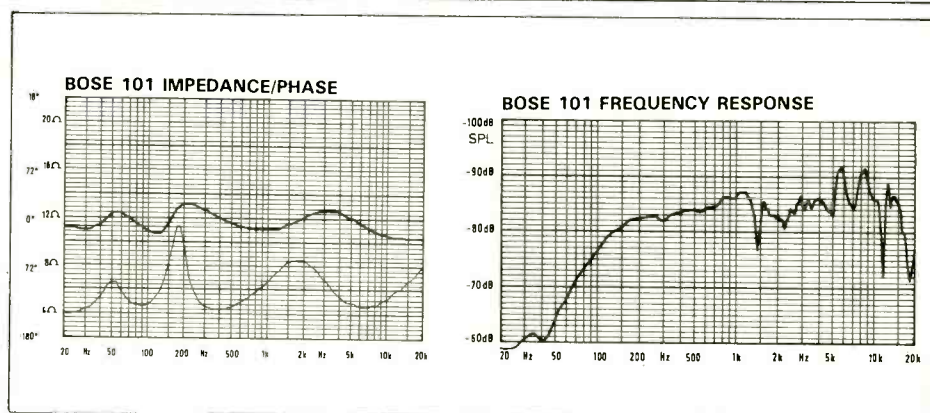
The rear and sides of the cabinet are formed from a single plastic moulding of rectangular section tapering to the rear where the inputs take the form of a ¼ in jack socket in parallel with spring type clips for bare wire or pins. The front of the cabinet is a second single-piece plastic moulding on to which the 4½ in drive unit is secured and which has an inbuilt 1 ½ in port to the right of the drive unit.

The front surface of the loudspeaker has numerous undesirable cavities six of which are for recessing the self tapping screws holding the front to the back with a wad of damping material within the cabinet. A wire mesh grille with a plastic surround push-fits into the front panel aperture, with an optional type having a coloured cloth cover.

Examination of the modulus of the impedance shows it to fall to just on or above 4 Ω at low frequencies, 400 Hz and 7 kHz with the phase having a controlled behaviour—something more typical of a twin drive unit loudspeaker.

The sensitivity at 2.83 VRMS input was 87 dB SPL with the maximum sound level output being 77 dB at 100 Hz, 104 dB at 1 kHz and 103 dB at 10 kHz—nothing special here.

Examination of the frequency response curve shows some improvement in the low frequency behaviour compared with



other single drive units, but, above 1 kHz the response demonstrates a grim performance with numerous large peaks and troughs.

Reference to the polar performance in both the horizontal (normal) and the vertical positions, which have differences,

shows a consistently poor performance particularly at 10 kHz where the front response is extremely narrow. So bad was this feature that even slight head movements close to the loudspeaker had a shattering effect upon a 10 kHz signal in the anechoic chamber.

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REVIEW REVIEW

Toa RS-21M (Single drive unit)

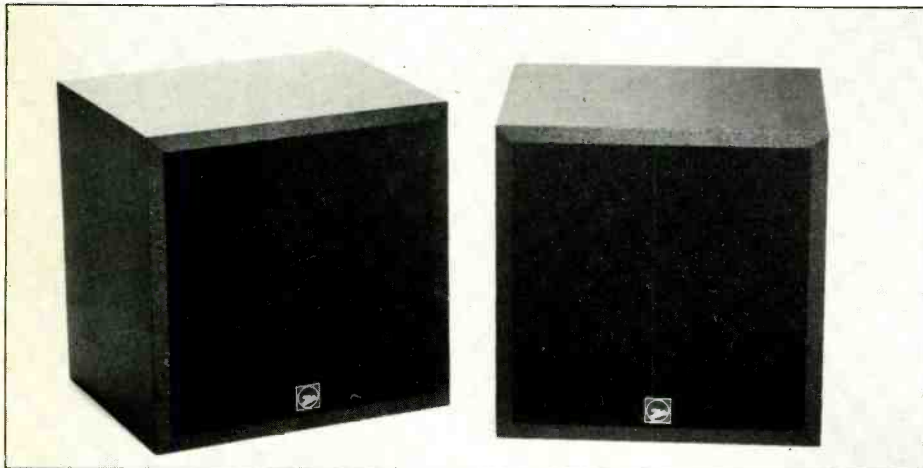
Back to convention the Toa RS-21M consists of a single 5 in driver in a square section box similar to the AKG and the Auratone but finished in black with a black cloth grille which did not appear to be removable. To the rear the electrical inputs are via recessed spring type terminals accepting bare wires or terminal pins.

The impedance was just under 8 Ω at 20 Hz remaining above 8 Ω at other frequencies with the phase angle showing little deviation, the former

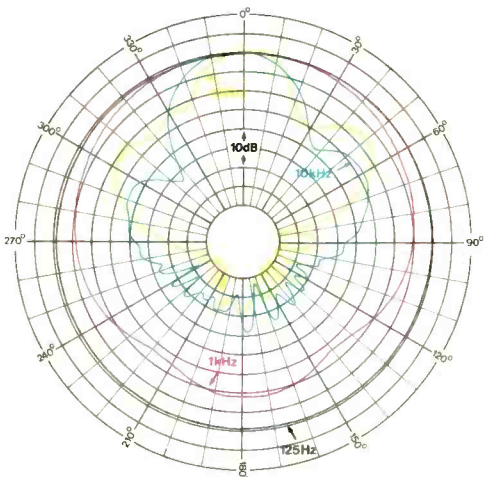
agreeing with the manufacturer's data sheet and the measured sensitivity at 88 dB agreeing well enough with the specified 87 dB.

Maximum output levels were 77 dB at 100 Hz, 104 dB at 1 kHz and 109 dB SPL at 10 kHz—all well here, with the frequency response being quite acceptable for the type of loudspeaker up to 8 kHz above which there was a nasty notch before rolling off above 15 kHz.

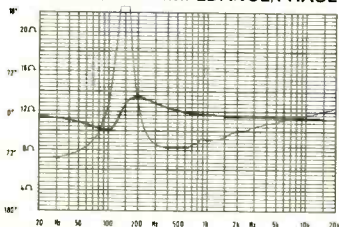
Whilst the polar pattern is on the narrow side to the front it does not suffer from any large notches or lobes and should be quite acceptable. \blacktriangleright



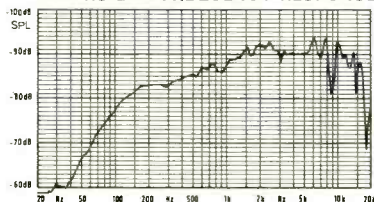
TOA RS-21M



TOA RS-21M IMPEDANCE/PHASE



TOA RS-21M FREQUENCY RESPONSE



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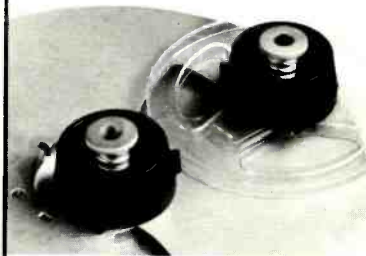
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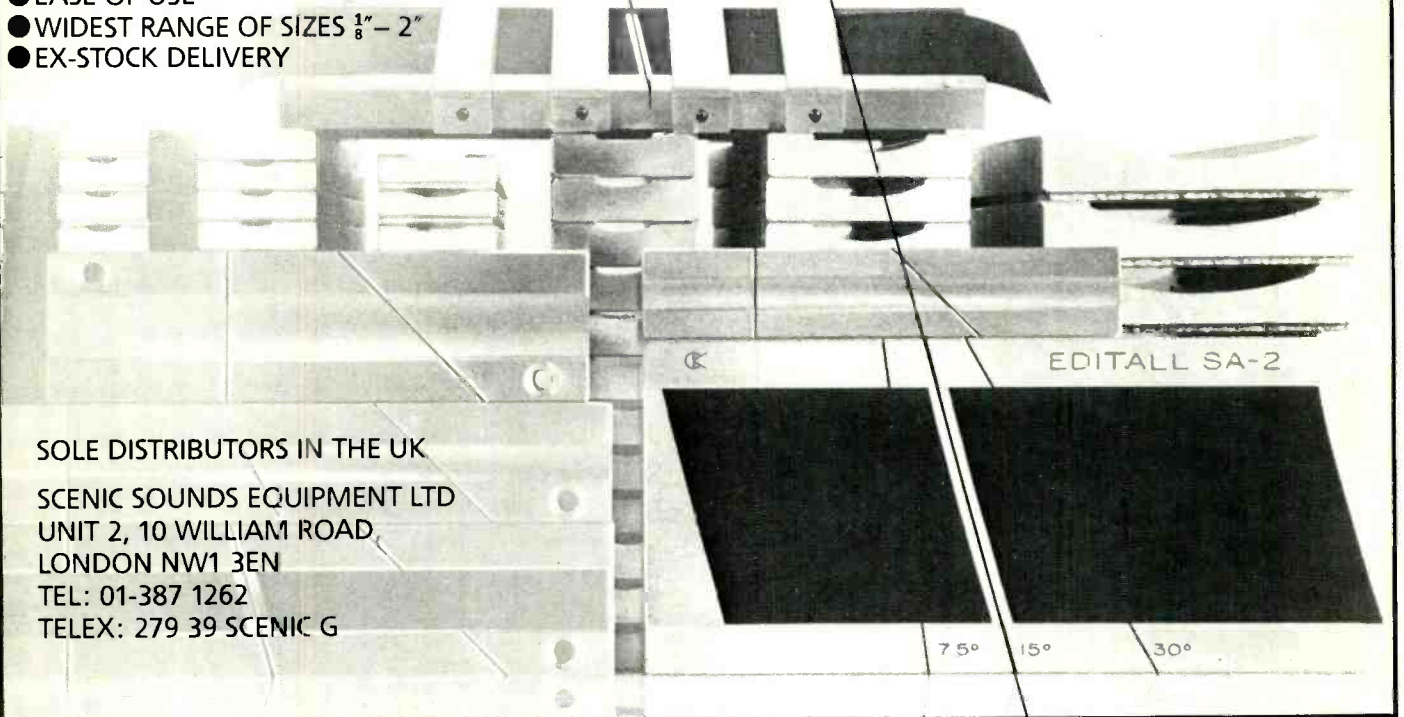
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REVIEW REVIEW



JBL LT-1

JBL LT-1 (Twin drive unit)

The JBL *LT-1* is a twin drive model with a 5 in diameter bass/mid unit to one side of the rectangular cabinet and the tweeter and a lozenge shaped port at the other end these all being covered by a metal mesh grille finished in black. The front aspect of the cabinet is a horizontal rectangular box of diecast aluminium mounted into a U-bracket which secures to the cabinet by two good sized knobs which screw into threaded holes in the cabinet.

At the rear the connections in the form of spring loaded clips for bare wires or pins are let into the casting and fully protected. It was noted that the phasing of the input was 180° out of phase with other manufacturers' conventions.

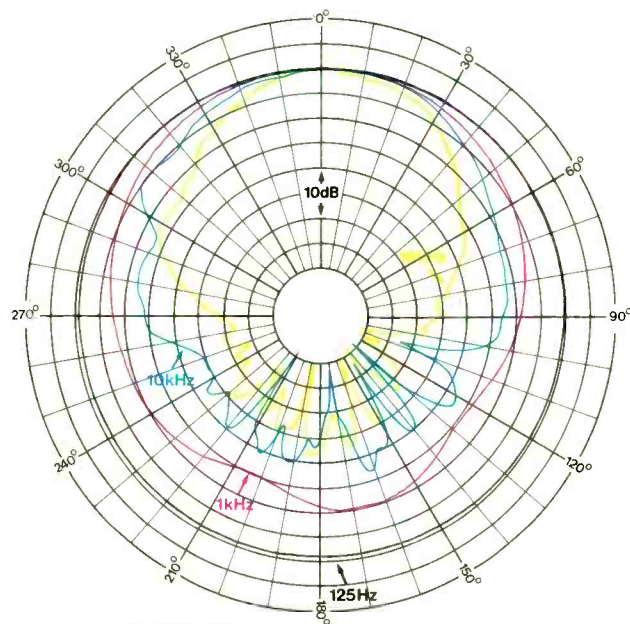
The complete loudspeaker appeared to be of particularly solid construction with stick-on feet being provided for table top use in the horizontal or vertical aspects.

At 86 dB SPL the measured sensitivity was close to that specified with the maximum output levels being well up at 83 dB at 100 Hz and increasing to 104 dB at 1 kHz and 101 dB SPL at 10 kHz.

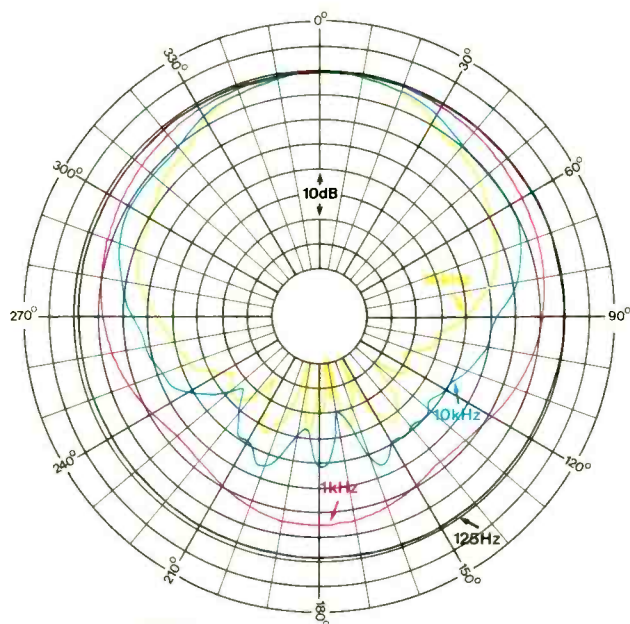
The nominal impedance of 4 Ω was exceeded at all frequencies falling to a minimum of 5.5 Ω at high frequencies with the modulus of the impedance peculiarly having three peaks within the audio band without any severe phase effects.

As is a JBL characteristic the low frequency response shows a significant lift with a relatively smooth (for this sized loudspeaker) response up to 15 kHz above which there is a peak at 18 kHz.

The polar diagram to the front was quite good in either the horizontal or vertical positions, the position having quite a large effect to the sides and rear. A particularly good feature was the complete absence of any notches or lobes in the front response.

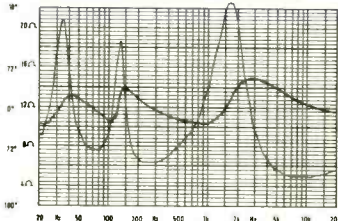


HORIZONTAL

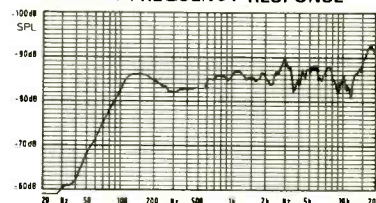


VERTICAL

JBL LT-1 IMPEDANCE/PHASE



JBL LT-1 FREQUENCY RESPONSE



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REVIEW REVIEW



Teac LS-X7
(Twin drive unit)

Employing a 4 in woofer/mid unit and a soft dome tweeter the Teac *LS-X7* is a very small unit mounted into a brown rectangular diecast aluminium box which appeared to be well damped with a black perforated metal grille covering the front. Efficient push-in type spring terminals are recessed well into the rear for the loudspeaker connections, with the back being tapped for screwing on mounting brackets. Wall mounting brackets are supplied.

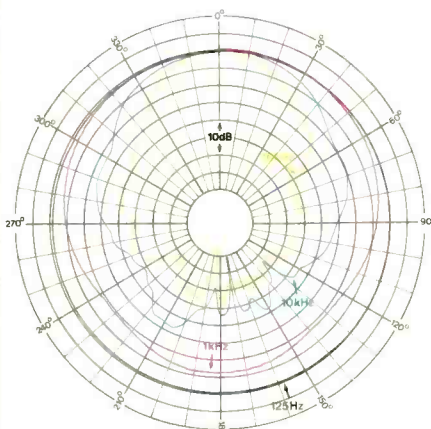
With a nominal impedance of 8 Ω the measured impedance fell to about 7 Ω at 20 Hz and 400 Hz with a further fall to 5 Ω at 7 kHz—some amplifiers might take exception to this, however, the phase angle was controlled.

Whilst the measured sensitivity was low at 83 dB SPL for 1 W at 1 m the maximum outputs for the size of unit were quite impressive giving 77 dB at 100 Hz, 104 dB at 1 kHz and 109 dB at 10 kHz.

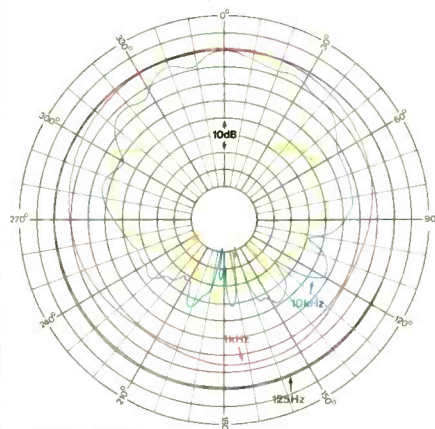
As is to be expected the low frequency response rolled off, but, above 100 Hz the response was, with the exception of a peak at 3 kHz, remarkably smooth right up to 20 kHz.

The polar response in the horizontal and vertical positions was a matter of choice between a broad frontal balance with a degree of not serious lobes or a narrow frontal balance with minimal lobes. In either position a satisfactory performance is to be expected.

TEAC LS-X7



VERTICAL



HORIZONTAL



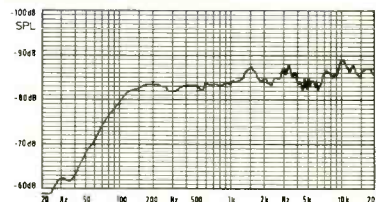
Visonik David 6000
(Twin drive unit)

Contained in a charcoal-coloured plastic moulding which appears to be acoustically 'dead', the Visonik is a dual driver unit using a 4 in woofer/mid range unit and a Heco soft dome tweeter both mounted flush with the front of the cabinet which is completely sealed.

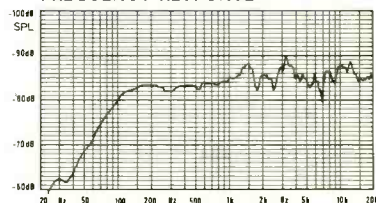
Connections are via two rather awkward spring clips for wire or pins at the rear into which is moulded a 'keyhole' for mounting. At the front a red overload LED protrudes through the front cover/perforated metal grille—the metal is supported by a rather complicated plastic moulding which fits on to four pins in the body of the loudspeaker.

Being a small infinite baffle type loudspeaker the sensitivity was on the low side at 84 dB SPL for 1 W into 8 Ω at 1 m but given adequate drive the unit could produce 80 dB SPL at 100 Hz, 103 dB at 1 kHz falling to 97 dB at 10 kHz—the latter fall being of little significance, particularly when pre-emphasised programme material is taken into account. The overload indicator

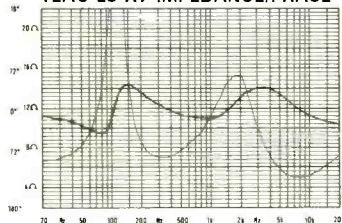
VISONIK DAVID 6000 (GRILLE REMOVED)
FREQUENCY RESPONSE



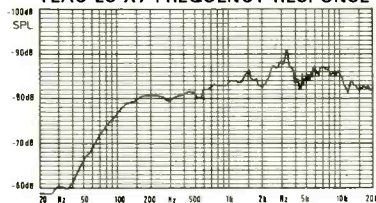
VISONIK DAVID 6000 (WITH GRILLE)
FREQUENCY RESPONSE



TEAC LS-X7 IMPEDANCE/PHASE



TEAC LS-X7 FREQUENCY RESPONSE



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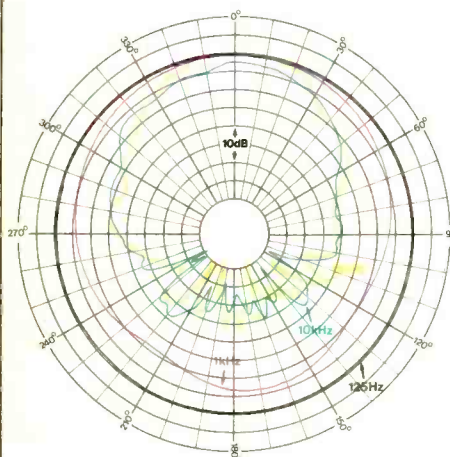
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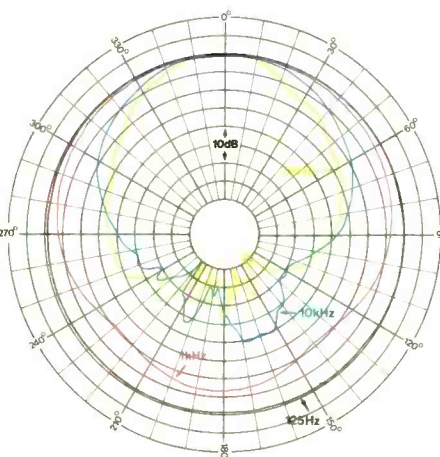


REVIEW REVIEW

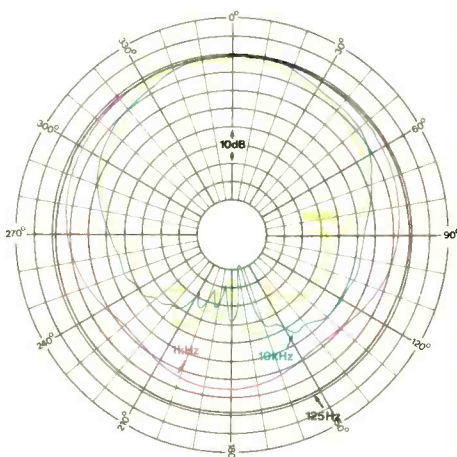
VISIONIK DAVID 6000



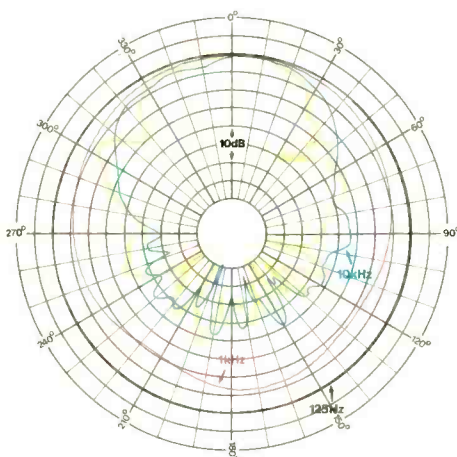
HORIZONTAL, GRILLE REMOVED



VERTICAL, GRILLE REMOVED

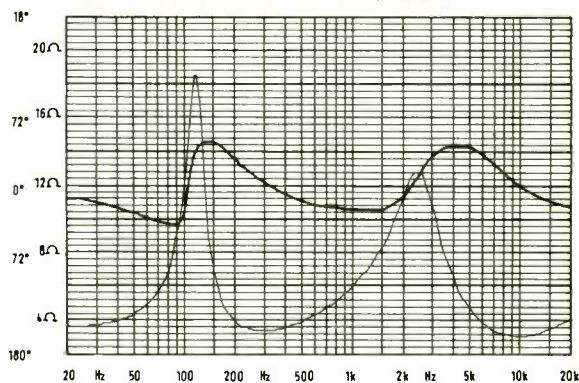


VERTICAL, WITH GRILLE



HORIZONTAL, WITH GRILLE

VISIONIK DAVID 6000 IMPEDANCE/PHASE



provided a useful function at high frequencies but was little use at mid and lower frequencies.

Although rated at 4 Ω the measured impedance fell just below this approaching 3 Ω at 10 kHz so that a 'respectable' amplifier is needed, but the following comments will make-up for this.

The complex nature of the front grille's plastic surround suggests that it would modify the frequency response, so this was measured with and without the grille in position. Reference to the plots shows that with the grille the response is pretty good and with the grille removed it is remarkably flat from 100 Hz to 20 kHz.

Similarly the polar response was measured with and without the grille in both horizontal and vertical positions. Under all four conditions the polar

response was good, but with the grille on and in the vertical position the performance was exceptionally good. Thus for illustrative purposes, we've shown the flattest frequency response without the grille and the best polar

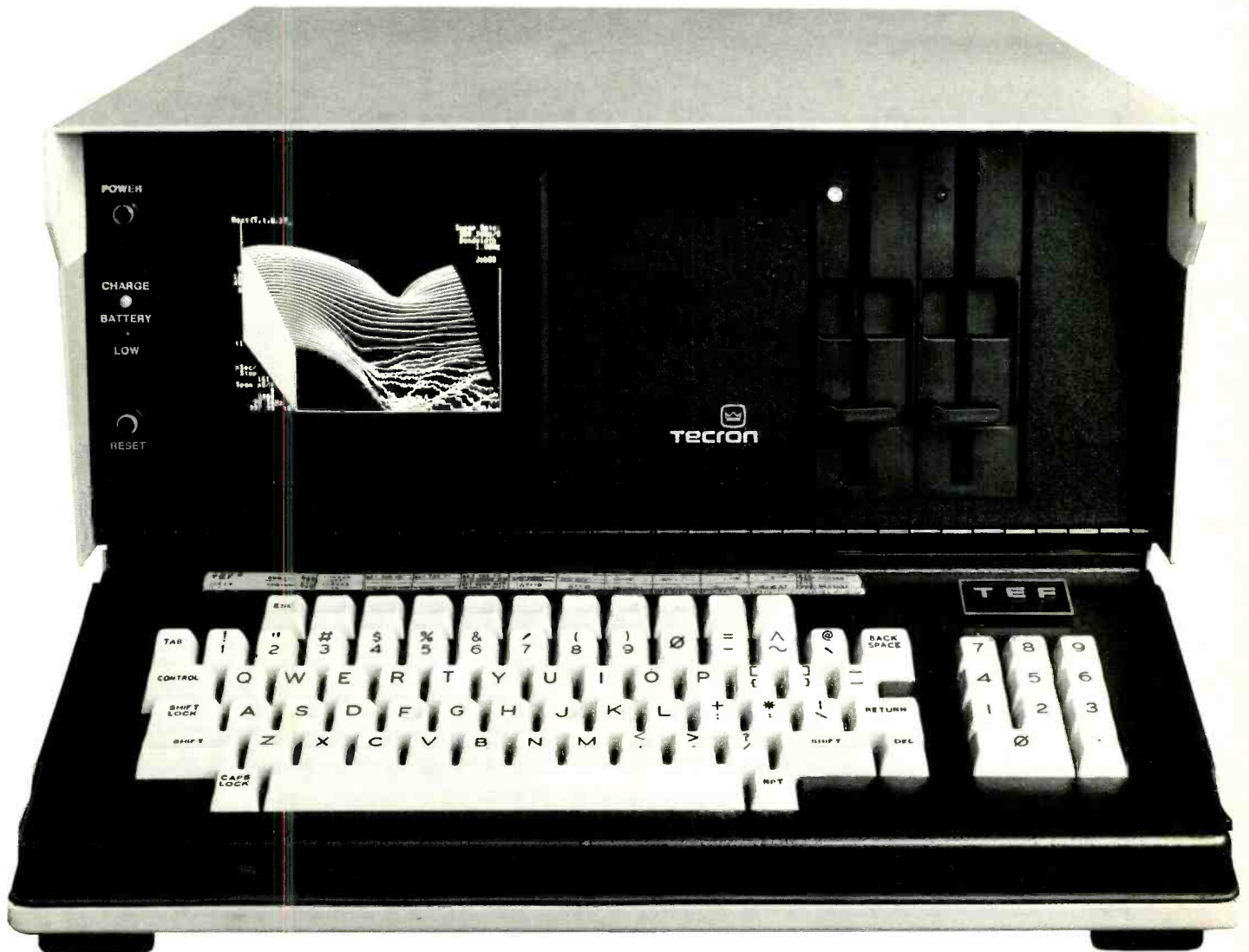
response with the grille.

Whichever choice is made this is an exceptionally good loudspeaker for its size providing a significantly better measured performance than all the other loudspeakers included in this review.

Summary of results

	Single drive units				Dual drive units		
	AKG LSM-50	Auratone 5C	Bose 101	Toa RS-21M	JBL LT1	Teac LS-X7	Visonik David 6000
Sensitivity @ 1 W	91 dB	89 dB	87 dB	87 dB	86 dB	83 dB	84 dB
Minimum impedance	8 Ω	7 Ω	4 Ω	7 Ω	5 Ω	5 Ω	3 Ω
Maximum SPL							
100 Hz	76 dB	75 dB	77 dB	77 dB	83 dB	77 dB	80 dB
1 kHz	100 dB	106 dB	104 dB	104 dB	104 dB	102 dB	103 dB
10 kHz	111 dB	105 dB	103 dB	109 dB	101 dB	102 dB	97 dB
Response ref 1 kHz							
200 Hz to 10 kHz	-8/+4 dB	-7/+4 dB	-10/+4 dB	-6/+6 dB	-6/+3 dB	-3/+8 dB	-2/+5 dB
150 Hz to 15 kHz	-12/+4 dB	-9/+4 dB	-15/+4 dB	-6/+6 dB	-6/+4 dB	-3/+8 dB	-2/+5 dB

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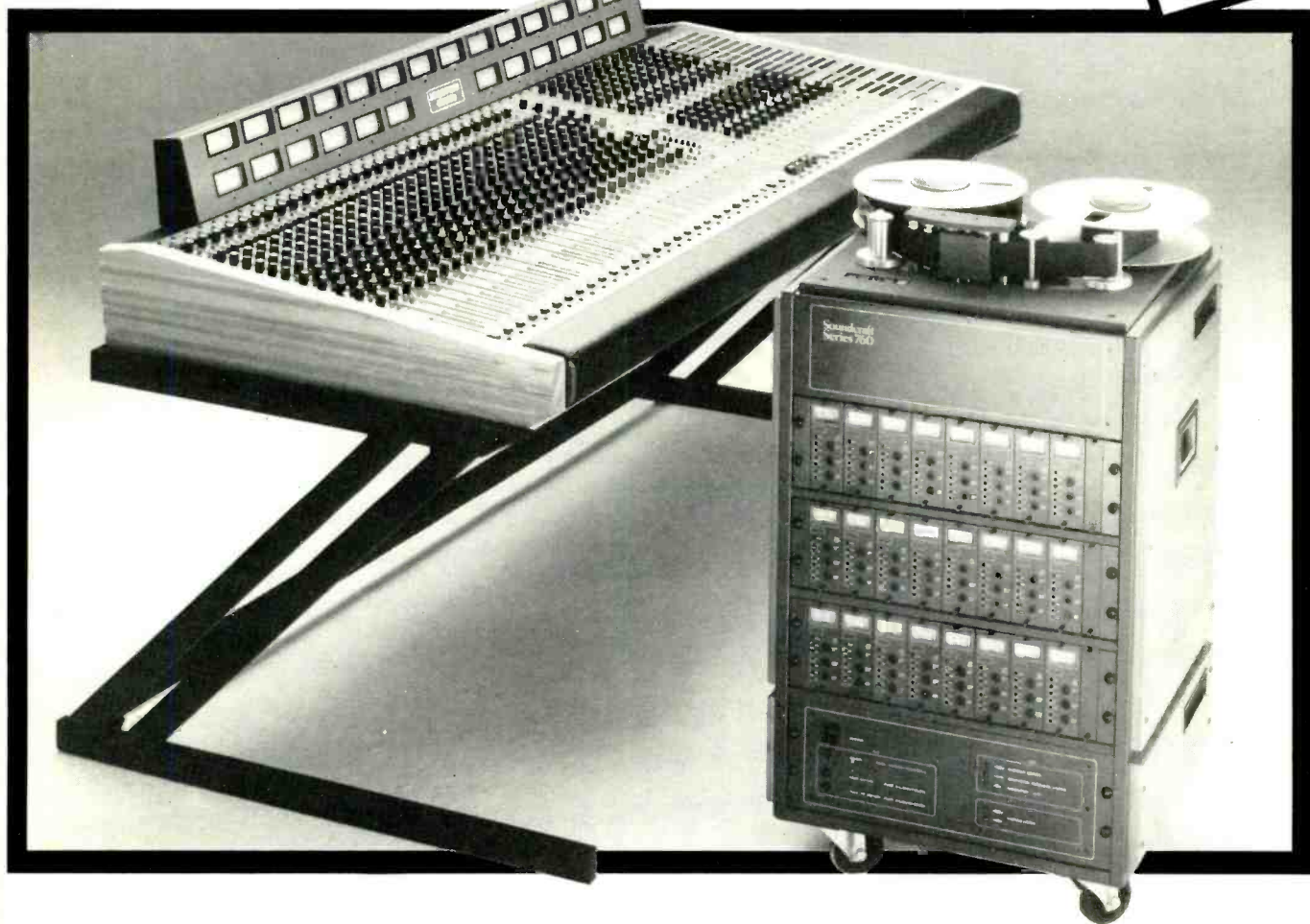
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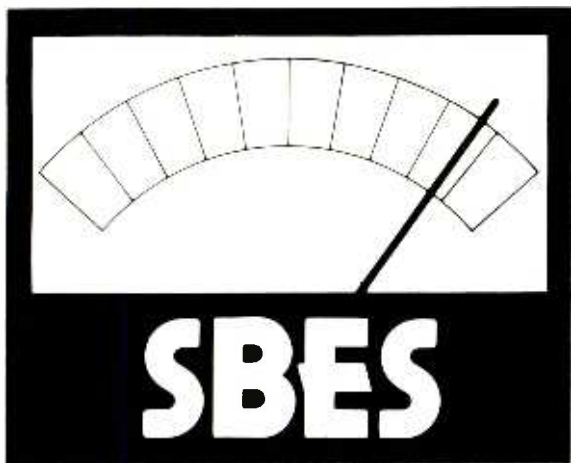
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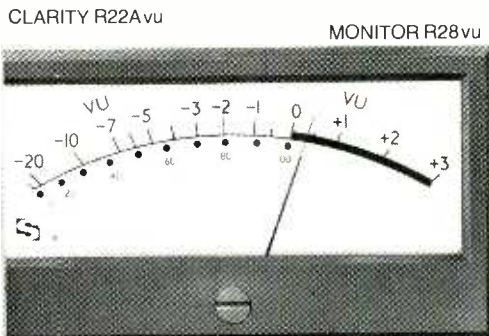
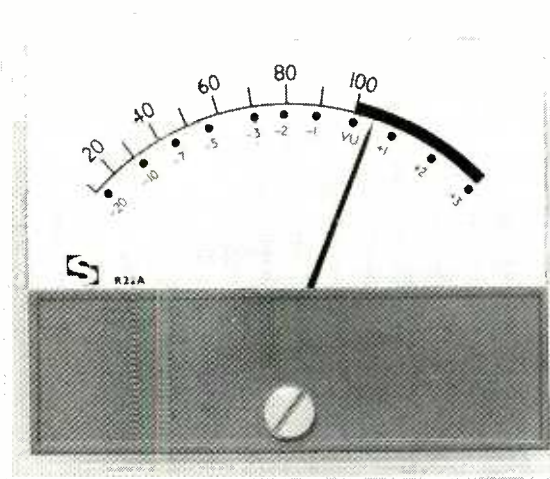
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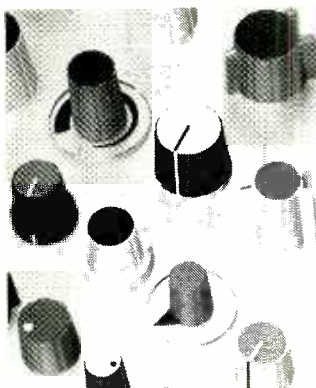


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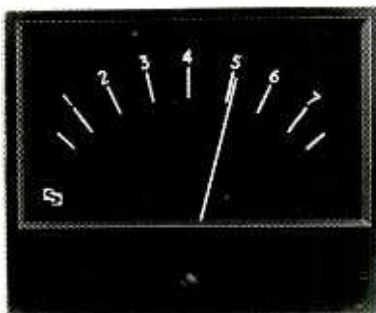
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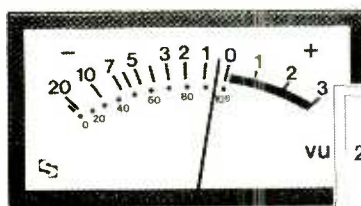
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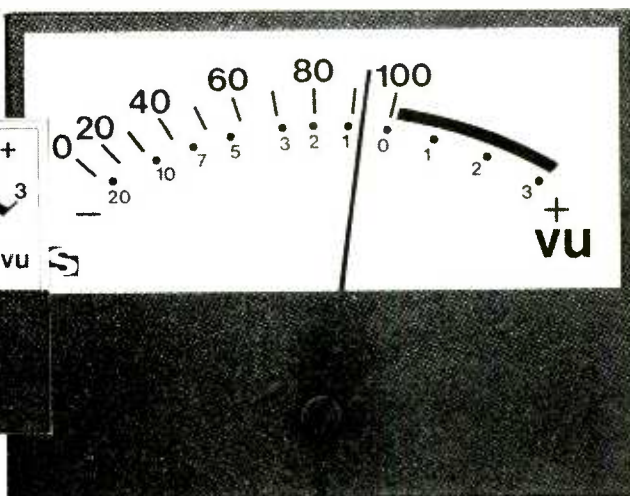


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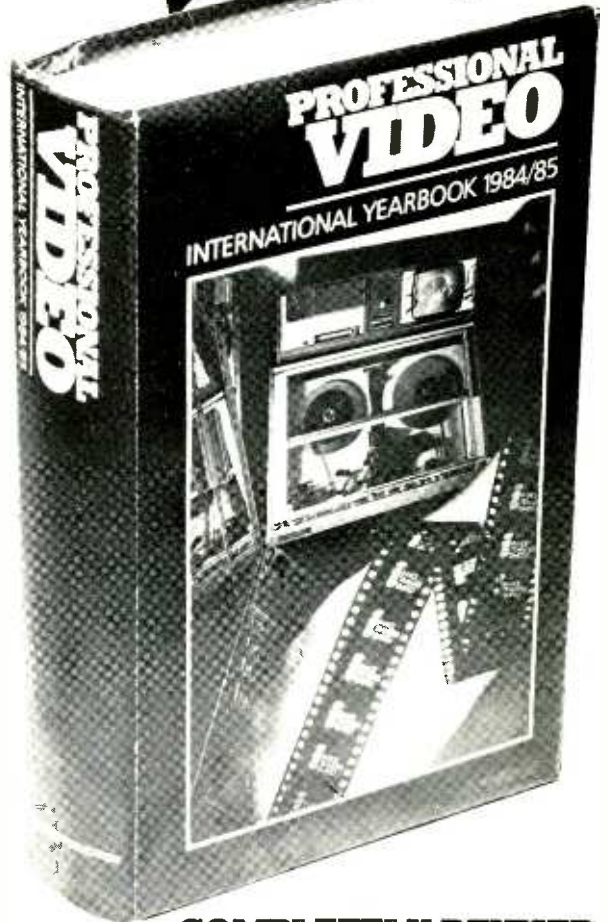
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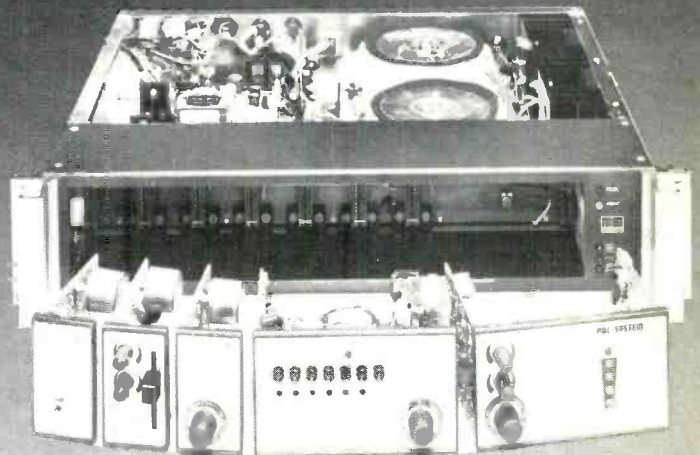
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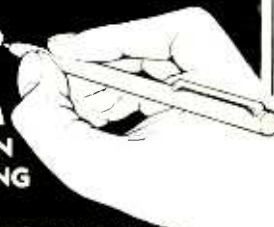
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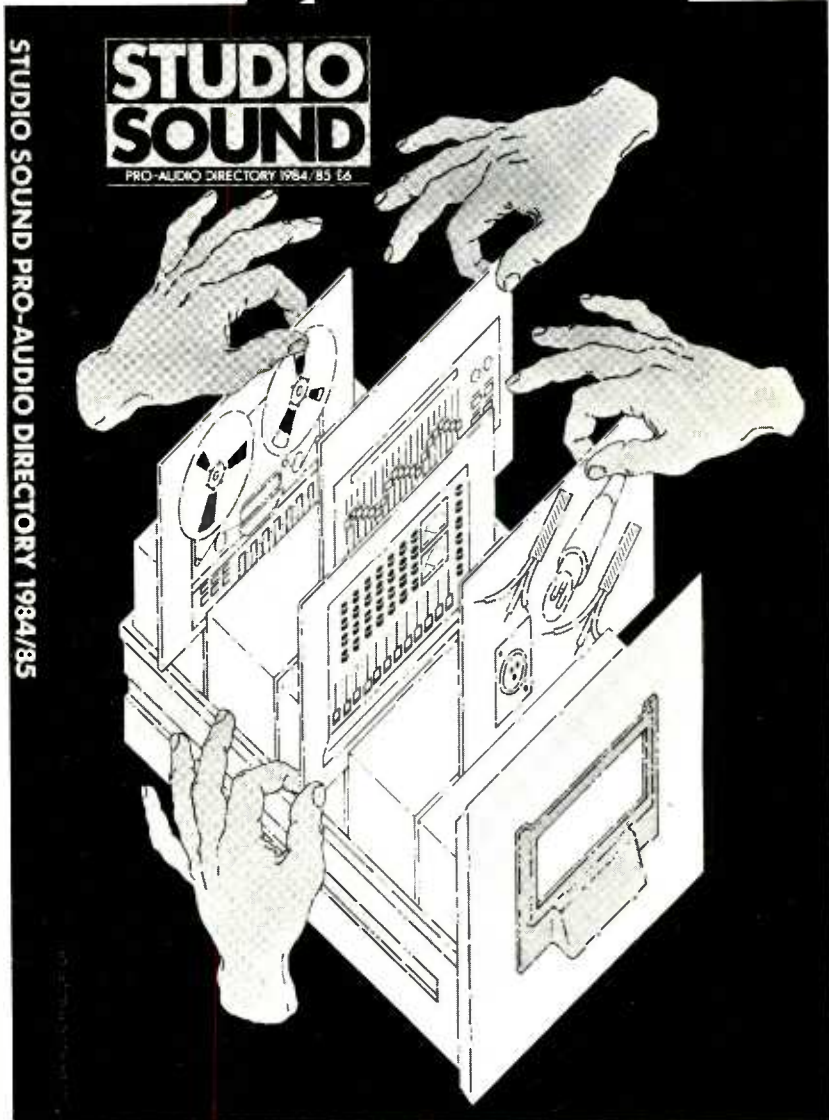
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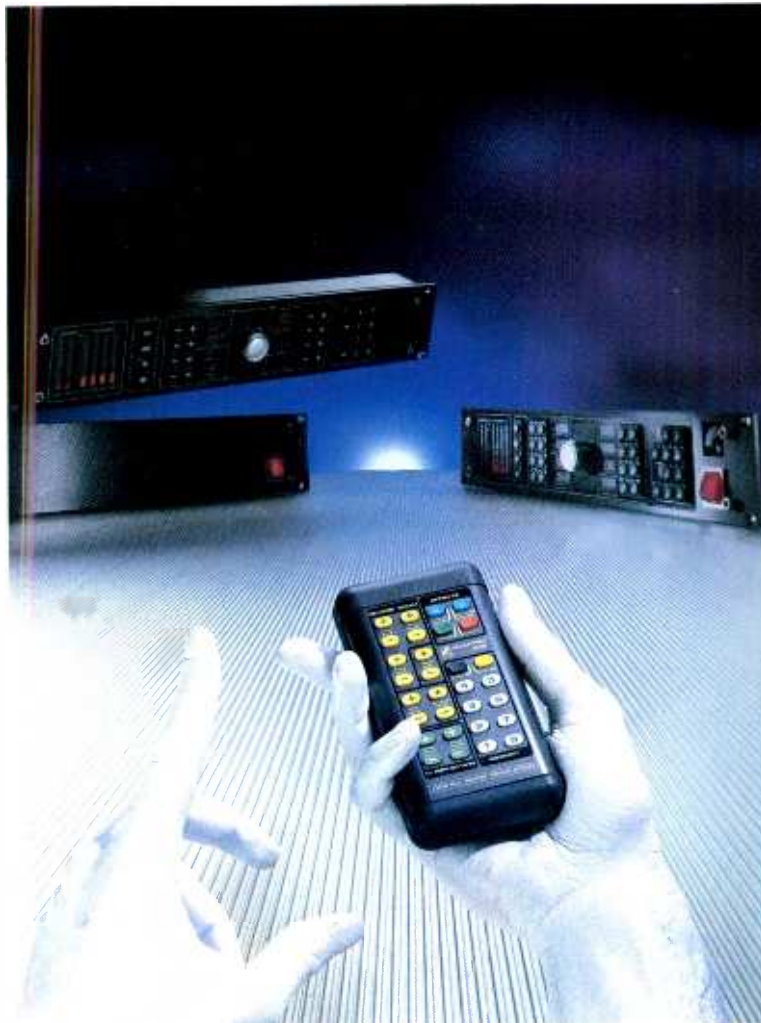
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Quantec

Room Simulation

Quantec heralds a new era. A revolution in acoustic versatility. Every sound environment is obtainable at the push of a button.

Acoustics are no longer bound by the specific configuration of a room, but can be used to emphasize a scene, enhance or improve a sound or enrich a musical composition.



Programs **Reverberation program**

Room size 1 m³ - 10⁶ m³ with 7 steps
Decay time 0.1 sec to 100 sec (up to 400 sec at 40 Hz)
Decay time - at low frequencies Coefficient of 0.1 to 10 with 11 steps related to selected decay time
Decay time - at high frequencies Coefficient of 0.1 to 2.5 with 8 steps related to selected decay time
Reverberation density More than 10,000 per sec depending on room size
Density of resonance Max 3 per Hz of bandwidth depending on room size
Reverb Preverb delay 1 ms - 200 ms in steps of 1 ms, level -30 dB to 0dB in steps of 1 dB 'OFF' Function
1st Reflection 1 ms - 200 ms in steps of 1 ms, level -30 dB to 0dB, 'OFF' Function

Enhance program

Simulation of rooms without perceptible reverberation

Freeze program

Special loop program with infinite decay time to add any number of acoustical entries

More than just a Reverberator.

Italia Rene Roubar Tel. 06-43 889 74
Holland SYNTON Tel. 034-33499
Denmark STUDIL & LYDTI NIK Tel. 01-341284
Belgium/Luxembourg HES ELECTRONICS Tel. (02) 465 2917

Japan TALK STUDIO Tel. 03-3 94 43 68
United Kingdom SYCO SYSTEMS Tel. 01-7242451
France SCV AUDIO Tel. 1 865 44 74
Norwegen P.A. SYSTEM Tel. 02-679313

South Afrika EITRON Ltd. Tel. (011) 29 30 66
Sweden TAL + TON Tel. 031-803620
U.S.A. Marshall Electronic Tel. (301) 484.22 20



If only your ears could see.

If you could see what your ears can hear, the precision which makes Tannoy monitors different would stare you in the face.

You would see the time difference in high and low frequencies on other, ordinary monitors. You would probably even spot the nasty phase incoherence and other unsightly phenomena.

Now put a Tannoy with SyncSource under the magnifying glass, and see what you can hear. Look at the phase perfection and the way in which the correct time relationships of fundamentals and harmonics are maintained.

Then look at the practical advantages. More complete audio information, and greater freedom of movement behind the recording console without being restricted to an on or off axis listening position.

For more information on Tannoy monitors with SyncSource single point sound sources, just 'phone or write.

TANNOY
The Name for Loudspeakers



FW.O. Bauch Limited

49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ
Telephone 01-953 0091, Telex 27502