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November 1979 75p

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# studio sound

**AND BROADCAST ENGINEERING**

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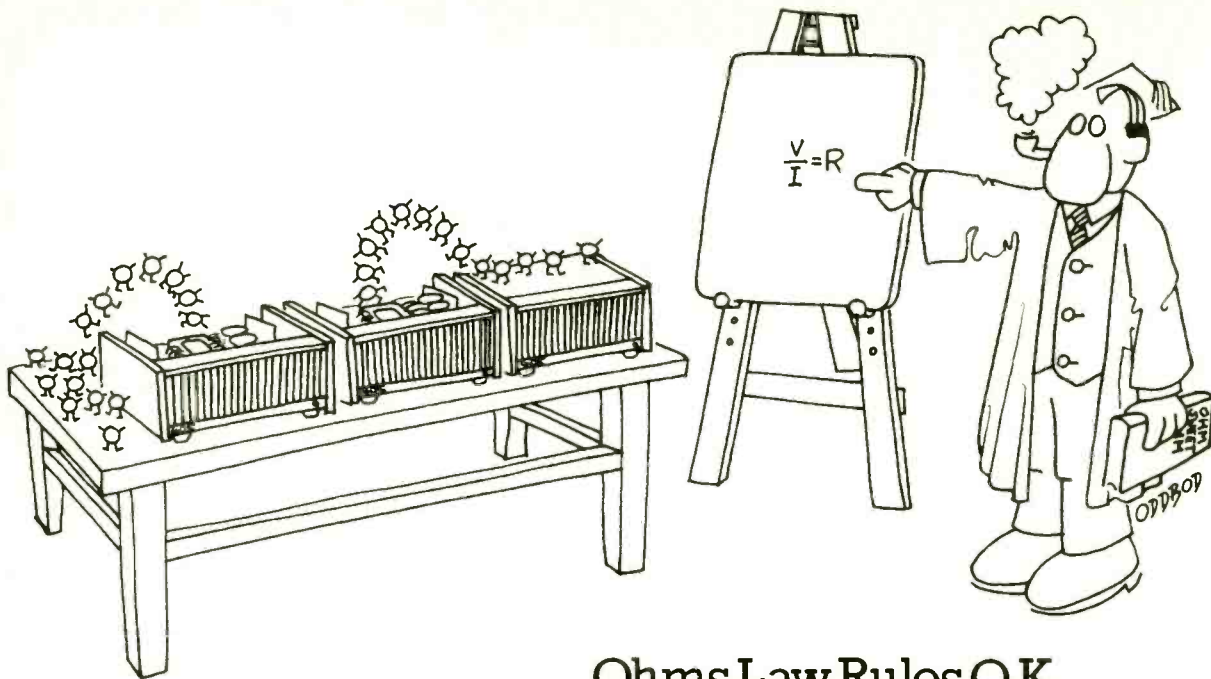
In my September editorial I mentioned the impending onslaught of related audio exhibitions next Spring in London, and I was pleased to receive a reply from Raymond Cooke, vice president of the European region of the AES which is published in Letters on page 76 of this issue. Basically, Mr Cooke makes the point that the AES Conventions are primarily concerned with a lecture programme, and the exhibition side has only grown up through demand. This is of course absolutely correct, because the AES is principally a society for academics and this is where both their Journal and the lecture programmes are aimed; rather than at the practical side of the industry which is of course where the money is actually spent—notably recording studios. Neither the lecture programme nor the Journal has little direct relevance to the operation and daily running of a recording studio, which is where the technology is aimed. Indeed, an increasing number of lectures at AES Conventions are purely concerned with consumer products such as hi-fi speakers and cassette decks, and these are even less concerned with studios.

But to run a 4-day lecture programme accommodating a couple of hundred delegates and include the production of all the preprints, would cost in the region of £100 or \$200 a day. The present cost is far lower than this because the exhibition runs at the same time, for the practical side of the industry is actually financially supporting the academics in the lecture programme. Without the exhibition, the AES would have considerable difficulty in running as substantial a lecture programme as at present. But according to Raymond Cooke, this does not seem to worry the AES who are quite prepared to continue running the lecture programme without a supporting exhibition. So this will potentially leave the gate open for a third party to step in and run a substantial audio exhibition in Britain, one that will for once satisfy the requirements of both exhibitors and visitors alike, and be held in a proper exhibition centre with adequate access and facilities, rather than rambling hotel rooms and suites where existing AES exhibitions are invariably held, creating difficulties for all concerned.

Likewise, the attitude of the APRS has also changed over recent months, and the society now appreciates that the Connaught Rooms is not an ideal location, but is having difficulty booking an alternative London exhibition centre. They have also realised that numbers aren't everything at an exhibition, and that in the final analysis, it is actually the orders received by the exhibitors that determine the success or failure of a show — often stands are so crowded with what are loosely termed 'hangers on', that the studio managers with cheque books at the ready can't get near the stands, causing much frustration on all parts. If it is worth their while, studio managers will travel to where the exhibition is being held (within reason obviously) rather than expecting the exhibition to arrive on their door step. Which is why the USA AES only holds Conventions on the East and West coasts, rather than the other 49 States. The coast is clear for a new exhibition in Britain, so please watch this space.

Sorry but as from this issue, the cover price of *Studio Sound* has been raised to 75p. This is to cover increased production costs, paper and postage charges.

Cover of Neumann cutting lathe, Utopia  
Studios by Adrian Mott and Ray Hyden**NOVEMBER 1979 VOLUME 21 NUMBER 11**



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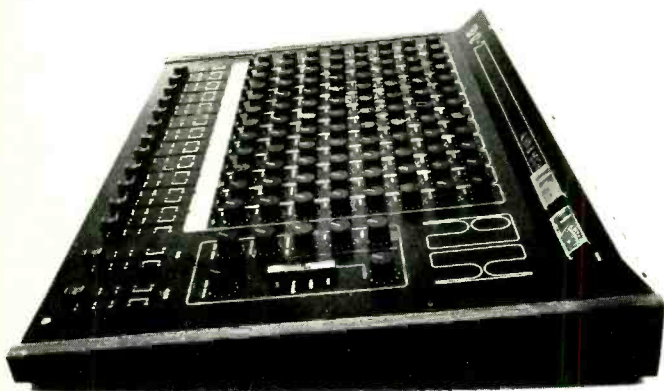
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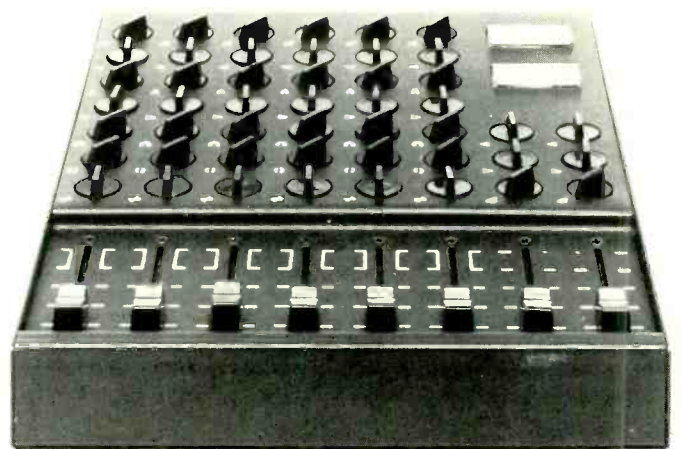
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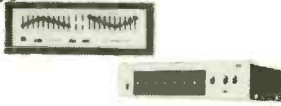
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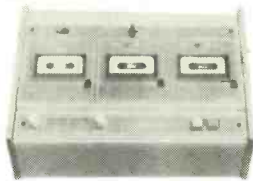
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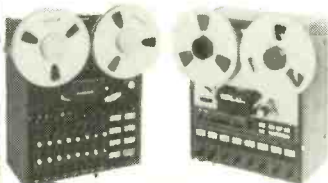
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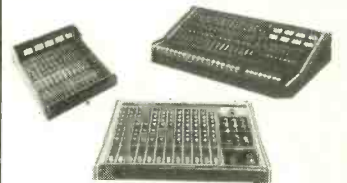
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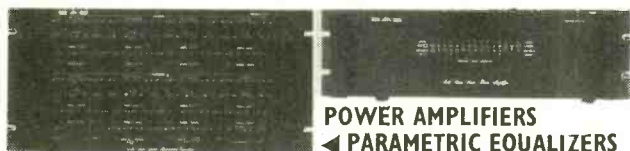
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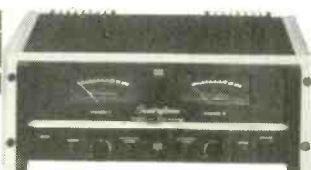
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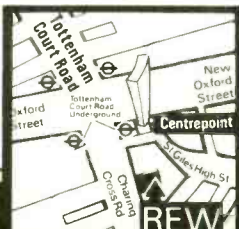
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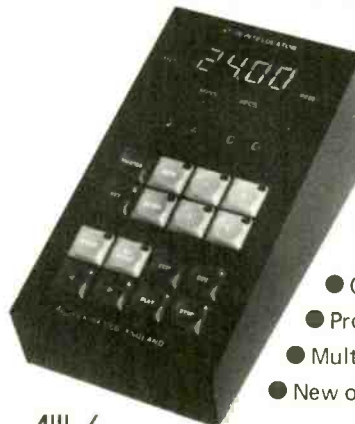
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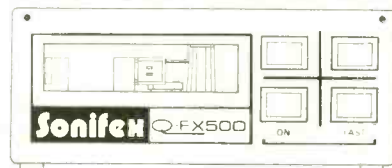


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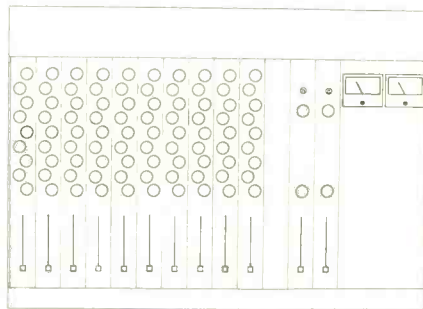


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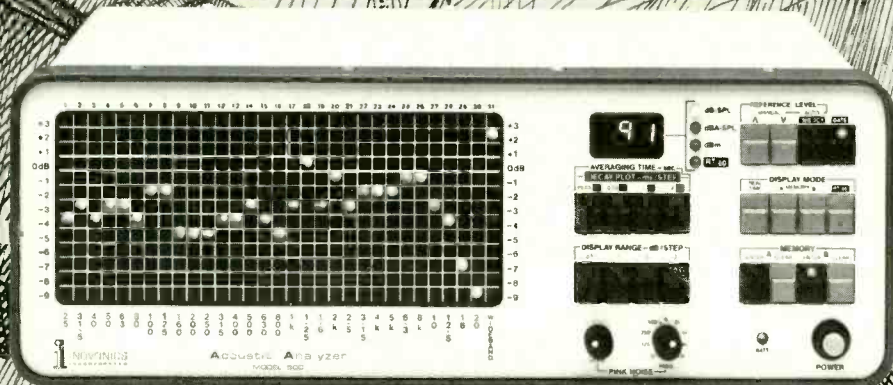
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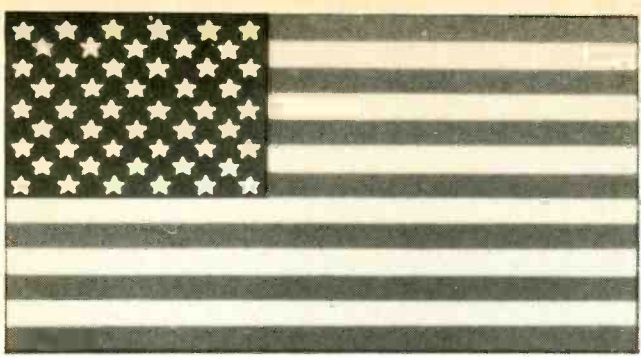


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# American Newsletter

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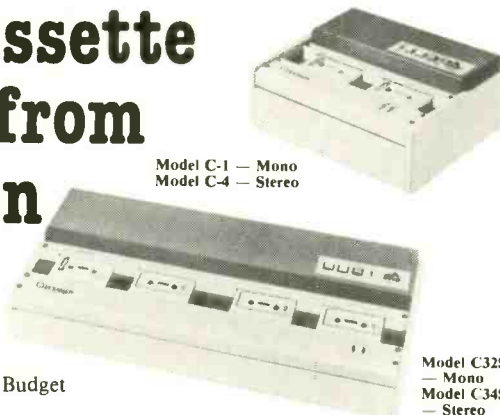
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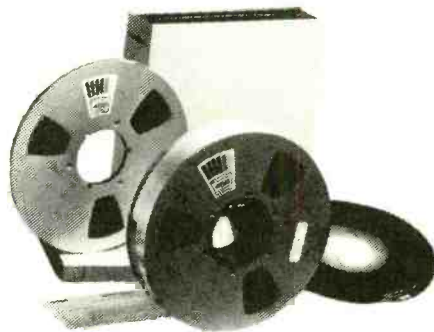
## Orban



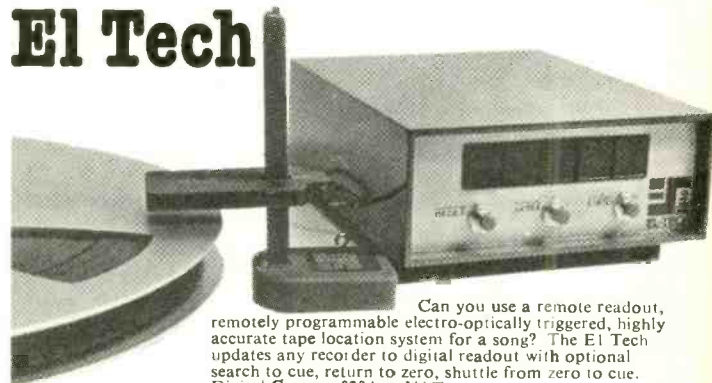
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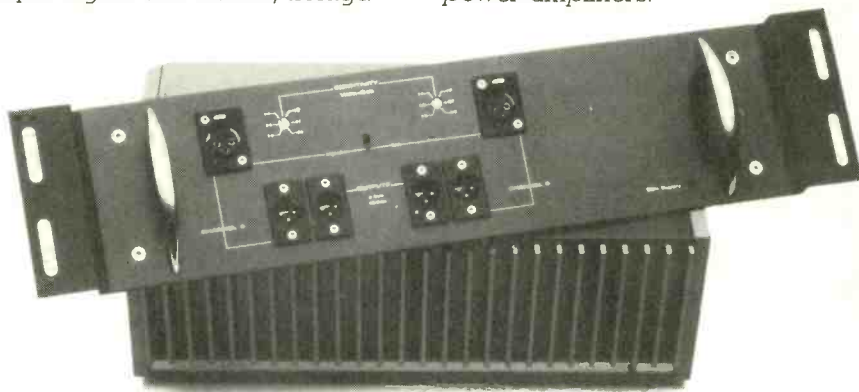
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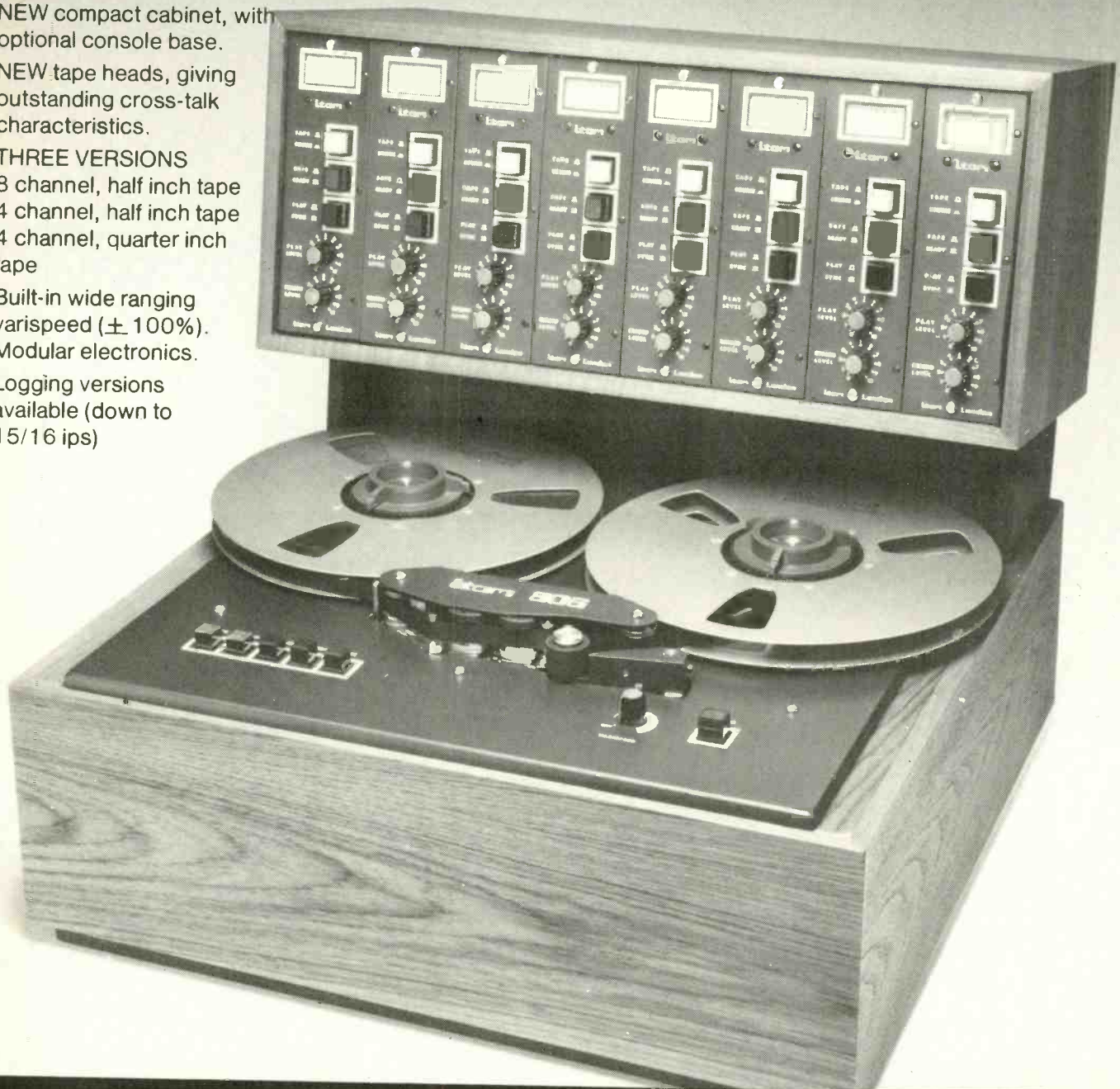
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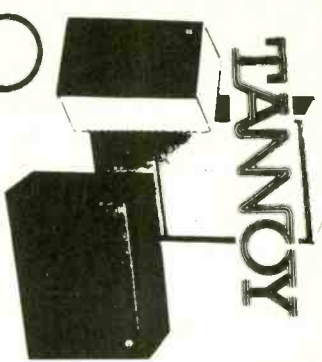
Logging versions available (down to 15/16 ips)



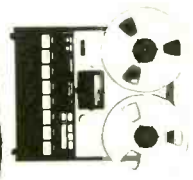
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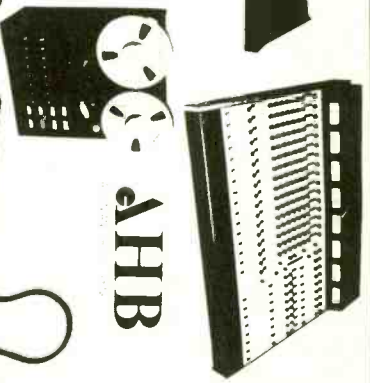
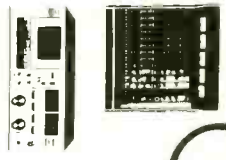
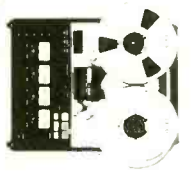
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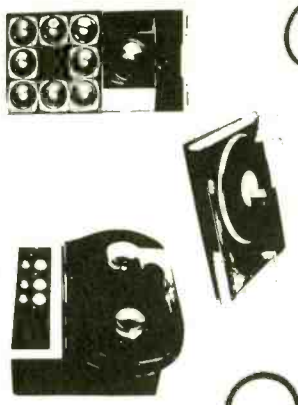
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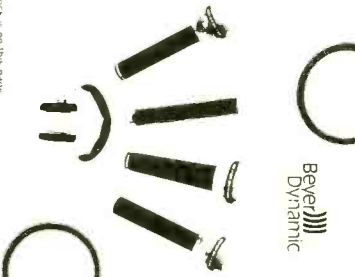
9 South Street, Epsom, Surrey  
Telephone Epsom 41822



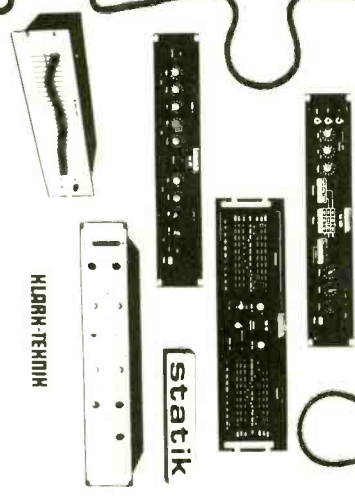
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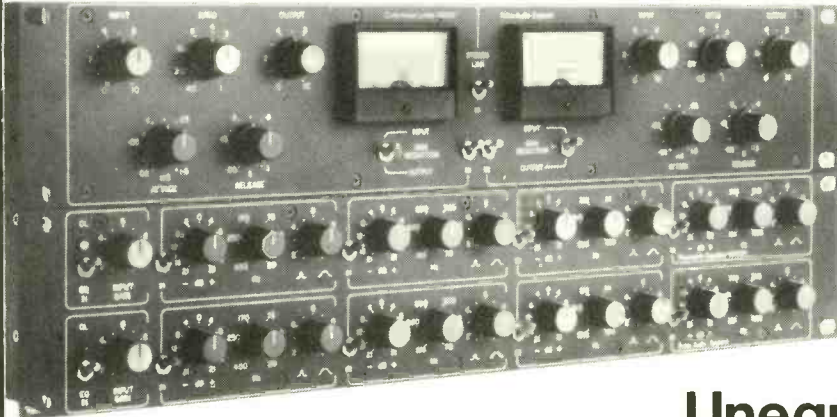
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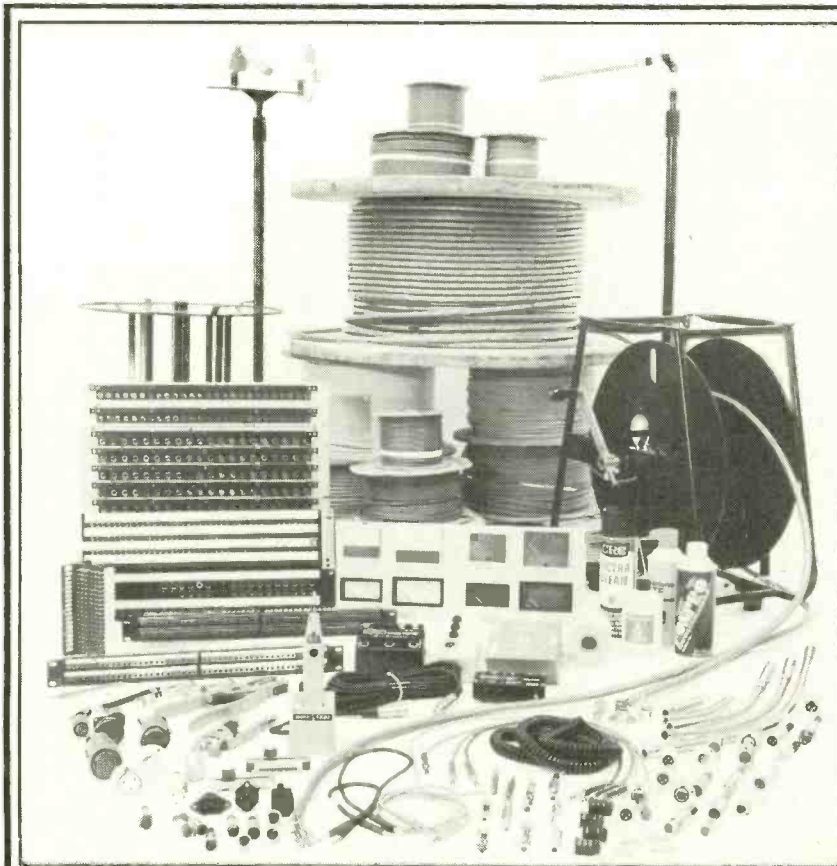
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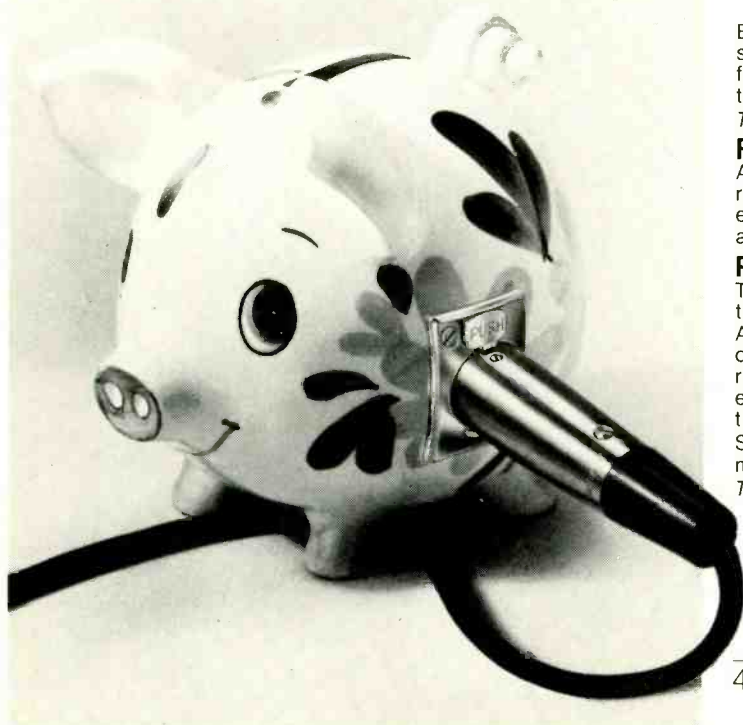
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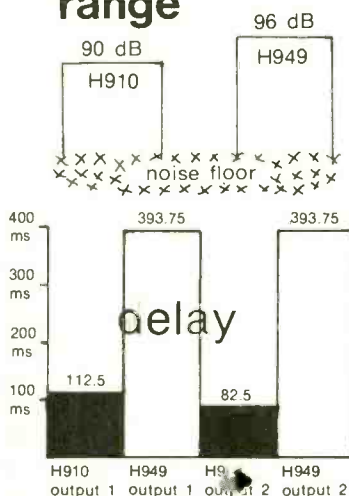
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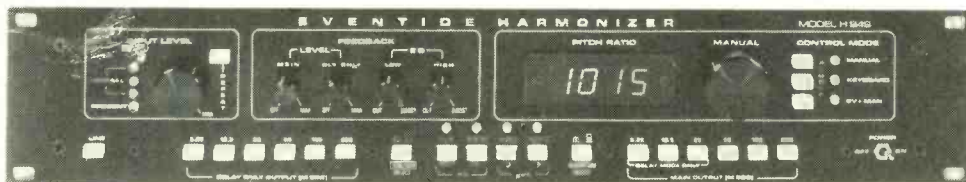
repeat repeat repeat repeat  
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**HIGH** and **low** feedback e.q.  
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 (between 1.1 and 0.9)  
 automatic flanging

frequency response



pitch change

H910: one octave up  
 to one octave down  
 H949: one octave up  
 to two octaves down



The H949 has two (2) count them one...two **ALGORITHMS** to handle those devilish pitch change glitches. Pick the best for your program material

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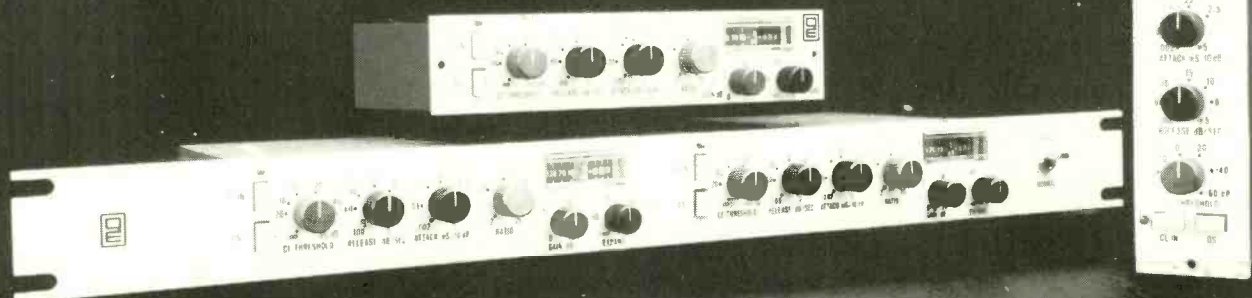
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A-30

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"The original A77 had set a standard by which I have judged other domestic and semi-professional recorders for many years. It is now clear that the new B77 sets a new standard not easily surpassed at its price"

Angus McKenzie (March 1978)

# REVOX

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# Soundcraft Series 1624—a re

Revolutionary, in that, unlike any other split console, it has a monitoring section which does not become redundant during mixdown.

Instead, with simple switching, the monitor channels become fully functional input channels, each with EQ, aux, pan, fader, solo and mute, and are assigned directly to the main mix buss.

Therefore, a 24/16 console has 40 channels in mixdown, during which the main 24 input channels may still be assigned to the 16 group faders as sub groups.

Furthermore, the auxiliary sends (cues) and pan may be lifted out of the monitor channel signal path and inserted into the subgroup signal path.

Revolutionary, in that the console provides all three conventional solo modes: pre-fade (mono), post-fade (stereo) and solo in-place.

The first two modes do not disturb any signal paths, so they may safely be used during recording or mixdown.

The in-place mode mutes all channels not soloed, except monitor channels being used as effects returns or input channels in "safe" mode.

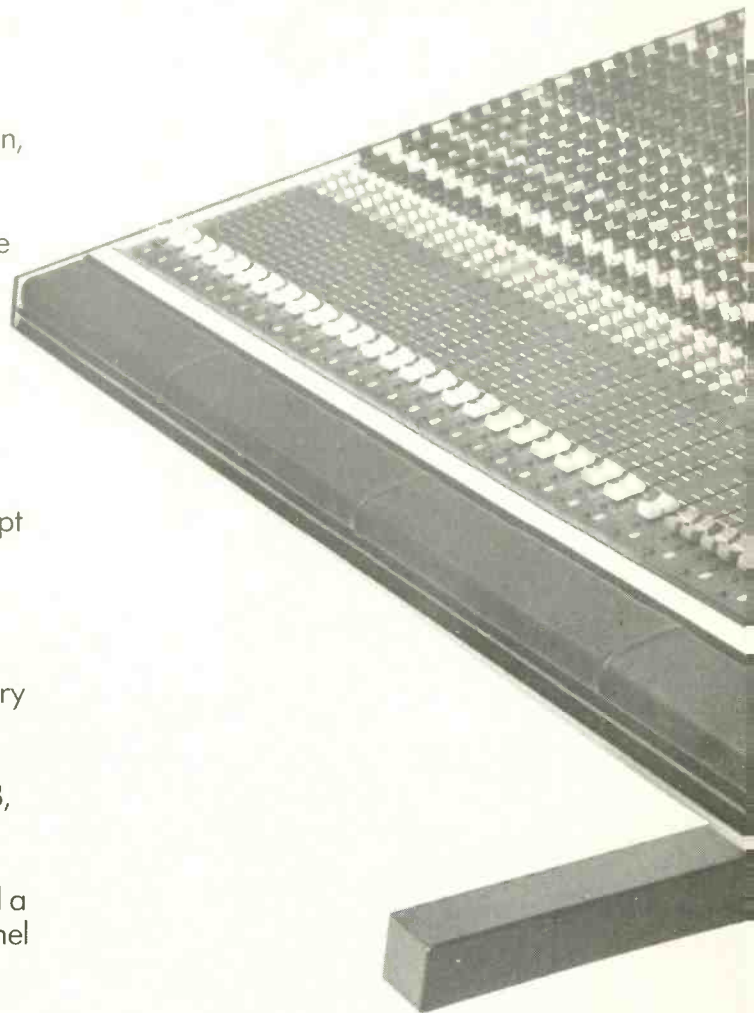
Other sophisticated features include: two programmable mute busses; six auxiliary sends, two of which may be assigned to follow the pan pot; a proprietary transformerless mic pre-amplifier; 41-position detented potentiometers, which are so precise that volume tracking between two similar controls will be typically between 1dB, and frequency tracking within 2 semitones.

Console equalisation is particularly versatile. Input channel equalisers have 4 variable-frequency bands, and a separate variable high-pass filter, while the monitor channel equalisers have 3 bands, the mid band with variable frequency.

All sections of the console electronics have been carefully designed to minimise phase deviation through the signal path, so that, typically, channel to track phase error is within 20° at 20kHz.

Conventional VU meters with peak level LED indicators are standard (as illustrated), but Soundcraft bargraph displays are available as an option.

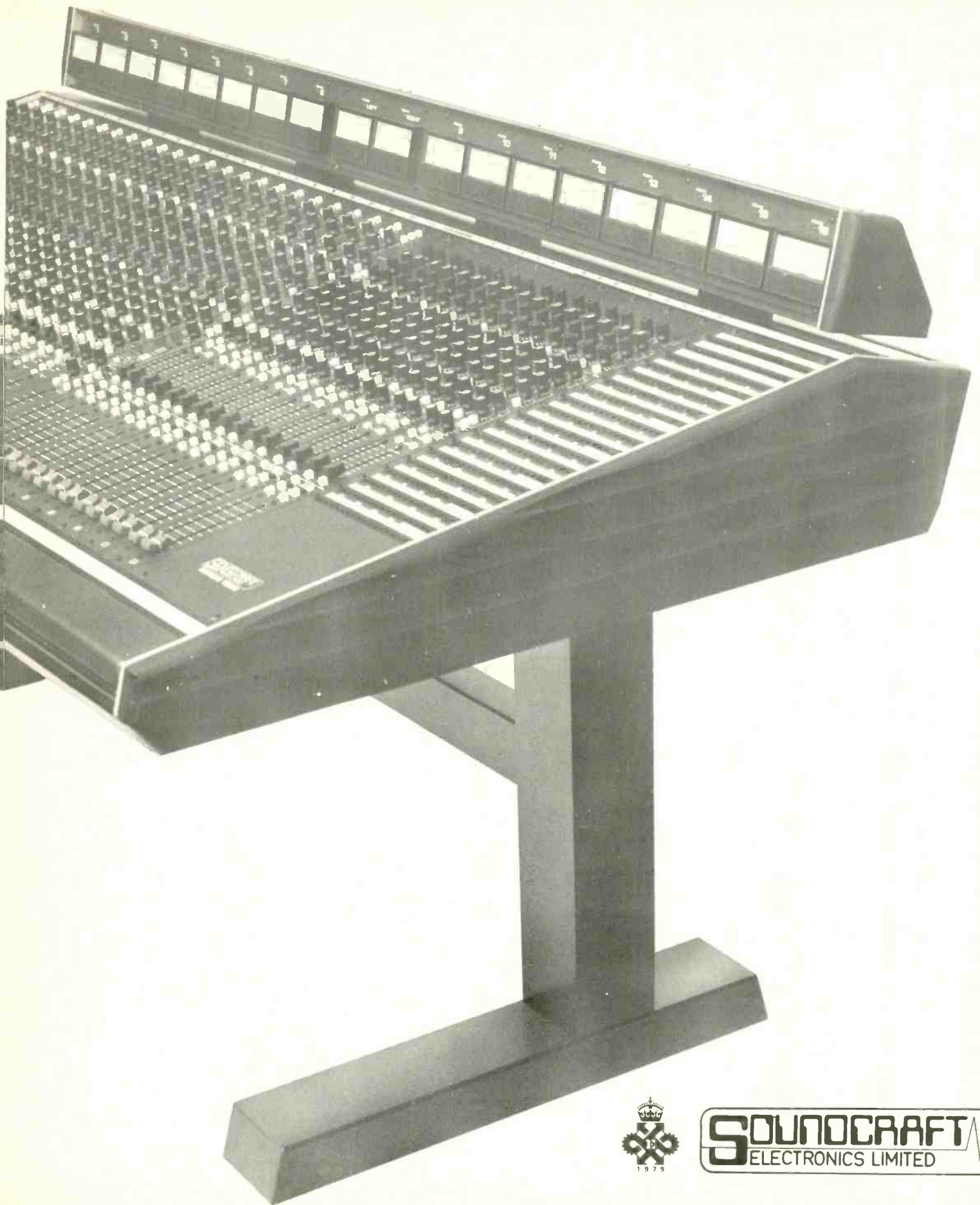
The Series 1624 is available in two mainframe sizes – 24/16 (which with an optional 8 channel module provides 24 track monitoring) and 16/16, either of which can be supplied part filled.



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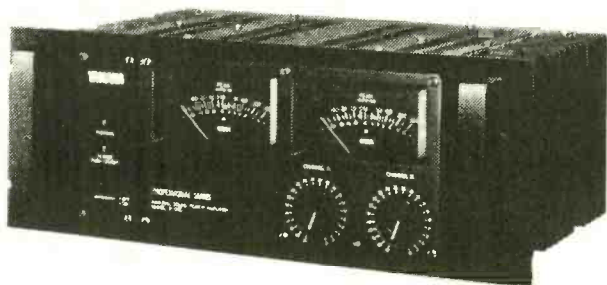
# revolutionary 24 track console



**SOUNDCRAFT**  
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# INTRODUCING THE YAMAHA FAMILY...

## P2200



### Output power

Average sine wave power output at clipping both channels driven. 285 w into 8ohms. 400w into 4ohms.

Power limiting operates 630w into 2½ohms.

Slew rate 45 volts per micro second.

The P2200 has peak reading meters which display a full 50db of output level with a rise time of 10 mili seconds and a release time of less the 0.8secs.

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Also, comprehensive protection and thermal limiting. All 19" rack mounting. The P2100 and P2050 have a rear panel switch for monaural bridged operation.

## P2201

Same specification as P2200.

350w into 4ohms with less than 0.05% t.h.d.

Both channels driven over a band width of 20 h.z. to 20 k.h.z.

## P2100



Average sine wave power output at clipping both channels driven 110w into 8 ohms and 150w into 4 ohms.

T.h.d. less than 0.02% over a band width of 20 h.z. to 20 k.h.z.

Both channels driven.

## P2050

Average sine wave power output at clipping both channels driven 45w into 8 ohms and 60w into 4 ohms.

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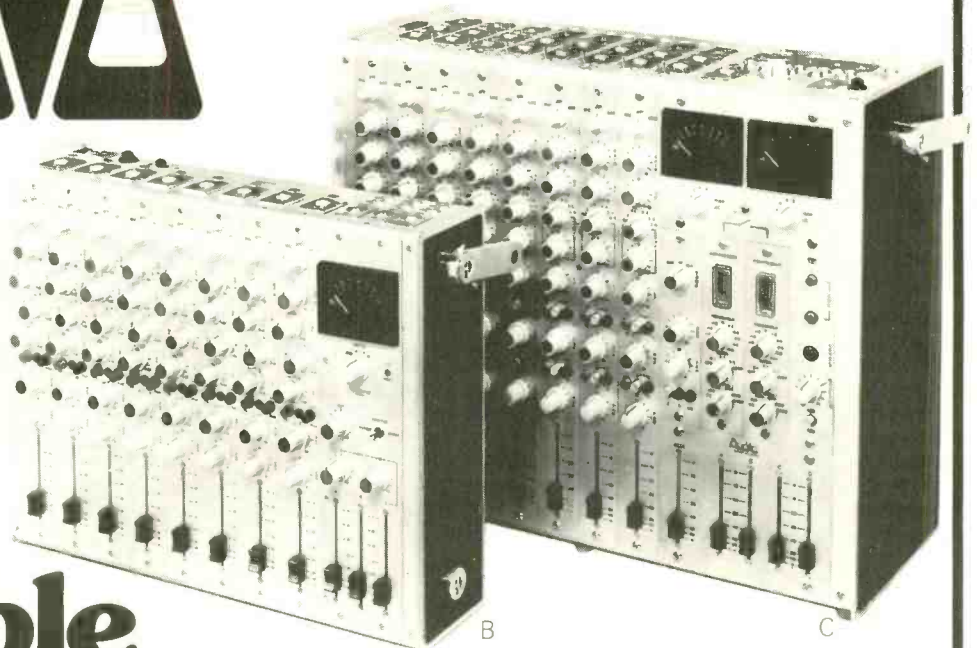
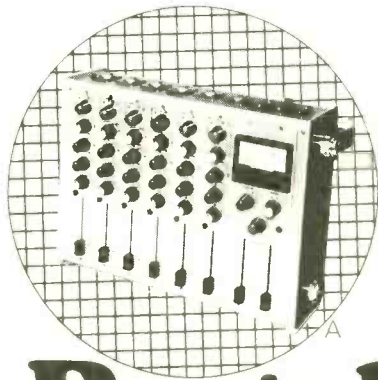
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8 in 2 + 1 out + options size 420 x 335 x 127mm Weight 10 kg

**PICOMIXER AD 045**

6 in 2 out size 340 x 265 x 110mm Weight 6.2 kg

**PICOMIXER AD 045**

Mk II

**AD 075 Super System**

**AD 055 Stereo Compressor Limiter**

A - Picomixer AD 045

B - Micromixer AD 031

C - Minimixer AD 007

**New Studio Compressor Limiter**

The ADO55 Compressor is a dual channel compressor/limiter with a comprehensive range of useful facilities. The two identical systems may be linked for stereo operation.

**Specification**

RATIOS 2 1 3 1 5 1 Limit (20 1)  
 RELEASE TIME Adjustable — 75mS 150mS 300mS 600mS  
 1 2 sec 2 4 sec  
 ATTACK TIME Adjustable 0 25mS 0 5mS 1mS 2mS 4mS  
 RmS  
 FREQUENCY RESPONSE 1dB 20 Hz to 30 kHz NO  
 COMPRESSION  
 DISTORTION 0 1% at 1kHz to 10kHz NO COMPRESSION  
 + 8dB input  
 MAX. COMPRESSION 25dB  
 MAX. OUTPUT + 19dB at 1kHz + 12dB at 20Hz  
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# Audio

Developments

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**PICO** Series Mixers From

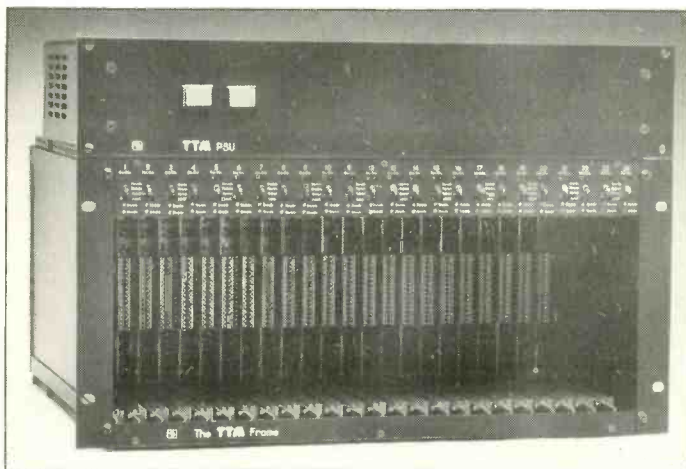
**Scenic Sounds Equipment**

97-99 Dean Street London W1V 5RA

## TTM noise reduction frame

Scenic Sounds Equipment has announced the availability in the UK of the *TTM* noise reduction frame manufactured in Sweden by Fabec. This is a 19in rack which can accommodate 24 channels of noise reduction in card format. The frame will accept cards for dbx, Dolby and Telcom and two or three frames may be series connected allowing a choice of noise reduction systems with the desired system operating while the others are bypassed. The basic frame is a building block into which the user can insert up to 24 identical pc carrier boards, each of these having transformerless interface electronics and switching relays for one noise reduction card. A separate *TTM* power supply unit provides regulated, current limited and short circuit proof powering for any combination of cards. The *TTM* carrier boards form a totally integrated and expandable system and have encode/decode switching and bypass on each channel, plus LED indication of operating mode and level. Price of the frame system is £3,300.

Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA, UK. Phone: 01-734 2812.



## International Entertainment Exposition

December 11 to 14 sees the first International Entertainment Exposition being held at the Las Vegas Convention Centre. While the exhibition contains companies showing lighting equipment, video systems, audio equipment, game rooms, disco equipment, theatrical stage equipment, and concert equipment, the conference has no

## Teac A-108 Sync

Teac has introduced the world's first cassette machine to offer synchronised overdubbing. Designated the *A-108 Sync*, the machine is a 2-head cassette deck with the same transport as the Teac *A-103*, and has memory rewind and Dolby noise reduction facilities. The *A-108 Sync* has independent bias/equalisation selection, a 'crossfeed' switch allowing the left and right channels to be blended, mic/line mixing on record and mic/tape mixing for playback, plus of course the simul-sync facility allowing left and right tracks to be recorded individually and in sync. Price of the *A-108 Sync* is £200.

Harman (Audio) UK Limited, St John's Road, Tylers Green, High Wycombe, Bucks HP10 8HR, UK. Phone: 049481 5331.

## Apologies

The telephone number which appeared in the Keith Monks Audio advertisement in September for their American Distributor was incorrect, and should read: Phone (213) 348-4969.

Also omitted was their Canadian Distributor, BSR (Canada) Ltd,



PO Box 7003, Station B, 26 Clairville Drive, Rexdale, Ontario, Canada M9V 4B3: Phone (416) 675-2425.

## Automatic cable tester

Canford Audio has introduced an automatic cable tester which can test any audio cable fitted with XLR or PO jacks without the need for both ends of the cable under test to be brought to the unit. This makes the unit ideal for fault finding in situ and makes it especially valuable for field work. The cable tester will make seven cable tests including tests for open circuits, phasing and short circuits and if any test proves positive, one of seven LEDs illuminates and a legend by each describes the nature of the fault. If the cable is satisfactory a green LED will illuminate. A further feature of the unit is that it automatically switches off at the end of each test to conserve power. Price of the automatic cable tester is £95.

Canford Audio, Stargate Works, Ryton, Tyne and Wear NE40 3EX, UK. Phone: 089422 4515.



## MicMix XL-305 Master-Room reverberation chamber

MicMix has introduced its new *XL-305 Master-Room* rack mount portable stereo reverb unit. Designed specifically with mobile, stage and theatre use in mind, the unit uses an electro-mechanical spring matrix which is isolated from acoustic feedback and mechanical shock or vibration. The *XL-305* features stereo enhancement of the reverberant field, including full stereo imaging of a monaural signal, and offers a decay of 3.25s at 1kHz with a reverb frequency range of 125Hz-8kHz (direct channel 20Hz-20kHz). The unit includes reverb/dry signal mixing controls, LED peak signal indicators, and 4-band (150Hz, 600Hz, 2.5kHz and 6kHz  $\pm 12$ dB) reciprocal peak/dip eq on each channel. Both input level and output gain are front panel adjustable and the unit has auxiliary front panel input/output connections and monaural mix switching of reverb inputs or outputs. The unit is available in two versions, with or without a balanced transformer option. Prices are £750 (\$1,195) unbalanced and £825 (\$1,320) balanced.

MicMix Audio Products Inc, 2995 Ladybird Lane, Dallas, Texas 75220, USA. Phone: (214) 352-3811.

UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA. Phone: 01-734 2812. 28 ▶

## North London Polytechnic studio course

Dr Roger Driscoll is once again offering his part-time *Sound Studio and Recording* course at the Polytechnic of North London which commences in late October. The course is run for two hours each Thursday afternoon, for three terms, leading to an examination in June 1980, and provides a knowledge of the fundamental principles and techniques of the subject. Course fee is £21 and application forms can be obtained from: Dept of Electronic and Communications Engineering, The Polytechnic of North London, Holloway Road, London N7 8DB. Phone: 01-607 2789.



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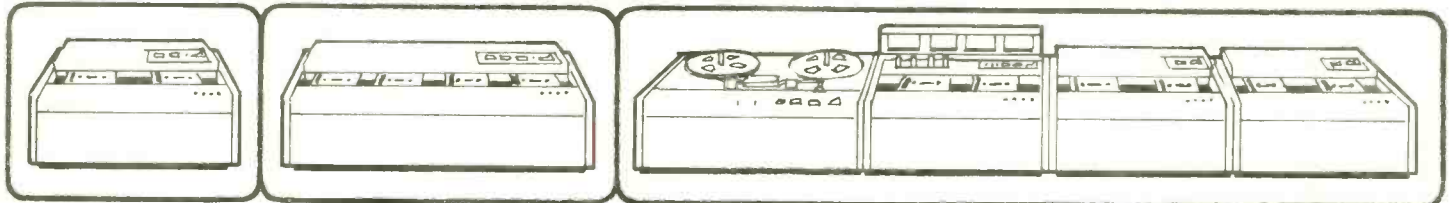
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## Address Changes

Rycote Microphone Windshields Ltd has moved to Unit 6, Slad Road, Stroud, Gloucestershire GL5 1RN, UK. Phone: 04536 79338.

EMS informs us that all sales enquiries for its products should now be sent to EMS (Sales), 277 Putney Bridge Road, London SW15. Phone: 01-788 3491. All service and technical enquiries to EMS Music Manufacturers Ltd, John's Road, Wareham, Dorset. Phone: 09295 3621. All research and development enquiries should be directed to Dr Peter Zinovieff, EMS Research and Development, Isle of Raasay, Inverness-shire, Scotland.

Atlantex Music, distributor of the MXR, Ashly and Sescom ranges, has changed its address. All enquiries should now be sent to Atlantex Music Ltd, 34 Bancroft, Hitchin, Herts SG5 1LA, UK. Phone: 0462 31511. Telex: 826967.



### Carlsbro S800 power amplifier

A new 2-channel 19in rack mount power amplifier, the *S800*, has been introduced by Carlsbro. The new unit uses a quasi-complementary circuit configuration with a fan-blown heatsink assembly and has full thermal bias compensation. The front panel features an LED power output display for each channel and independent channel gain controls, plus variable inputs allowing the amplifier to be driven from either 100k $\Omega$  balanced or unbalanced signal sources. The

amplifier can be used in a bridged mono mode and the input stages can also provide an output capable of driving further power amplifiers. Quoted frequency response is  $\pm 0$  -0.5dB 20Hz to 20kHz at 150W into 8 $\Omega$ , with THD less than 0.01%. Maximum power output into 8 $\Omega$  both channels driven at 1kHz is 200W. Price of the *S800* is £289 for the professional studio XLR version.

Carlsbro (Sales) Limited, Cross Drive, Lowmoor Road Industrial Estate, Kirkby-in-Ashfield, Notts, UK. Phone: 0623 753902. Telex: 377472.

### Inovonics Model 215 Audio Processor

A multiple option audio processor, *Model 215*, has been introduced by Inovonics for broadcast use and is available in a number of equipment options. As an AM or FM peak controller, it maintains programme peaks within desired limits at the transmitter site, while allowing AGC's and compressors to be operated in the studio. It can also be equipped for use only as an AGC or as an AGC and compressor. The AGC option is gated to provide a slow, gain-riding function for wandering programme levels, while a pink noise generator, an integral part of the AGC, delivers a quasi-programme test signal to ease setup. The compressor option features a 'soft-knee' transfer function for smooth, unobtrusive control over average programme dynamics. Two peak controllers are available for the *Model 215*, a phase-following, asymmetrical version for AM; and a 25/75 $\mu$ s FM limiter. Both options utilise the Inovonics feedback limiter/clipping circuit which gives absolute control over programme peaks and provides variable clipping depth. The price of the *Model 215* varies between \$375 and \$785, depending on the options selected.

Inovonics Inc, 503-B Vandell Way, Campbell, Cal 95008, USA. Phone: (408) 374-8300.



### Aphex patent

As reported briefly in our News pages of April 1979 (p38) a US patent has now been granted on the Aphex *Aural Exciter*. Although the Washington Patent Office formally accepted the patent application in the early winter of 1978, the formal document, carrying the US patent number 4150253, was not published until April 17, 1979. Copies are now available to the public from patent office libraries around the world, eg from the British Patent Office (Foreign Section) just off Chancery Lane in London. Most libraries (including the UK library) will sell an on-the-spot photocopy of the patent document to callers at a reasonable price. The Aphex patent (formerly titled 'Signal distortion circuit and method of use') dates back to 1976 and is in the joint names of Curt Knoppel and Inter-Technology Exchange Ltd, both of Los Angeles, California. The patent is required reading for studio engineers because for the first time it makes public a clear, concise description by the inventor of how Aphex works, and offers full circuit

diagrams for both valve and transistor designs, complete with component values.

Block schematics clearly show how each sound channel is split into two paths. The input signal is unaffected through one path but along the second path is fed first through an exciter circuit and then through a variable attenuator. The two signals are then re-combined at the output. The exciter includes a high pass filter and an harmonic generator which creates low order harmonics above a preset threshold of frequencies passed by filter. In the valve circuit version, the exciter is made up from six triodes, a filter circuit, a signal splitting network, two bridge circuits and various auxiliary components. The solid state circuit version uses a Butterworth filter, variable gain amplifier and harmonics generator which is based on a diode, adjustable potentiometer and op amp. The transient peaks of the incoming signal are softly clipped at a pot-set threshold so that low order harmonics are created. Only one side of the signal is clipped so that both odd and even harmonics are

produced.

Interestingly the wording of the invention leaves no doubt that the inventor was, at least at the time of filing the patent application, somewhat unsure over how the system actually worked and why. Audio plots show the circuit to produce a linear frequency dependent phase shift of about 360° over the frequency range 100Hz to 22kHz with a gain of between  $\pm 5$ dB over a frequency range of about 200Hz through to 22kHz. The point of zero phase shift is about 2kHz. "Although it cannot be said with absolute certainty which specific elements in the exciter circuit perform which function," admits the inventor with delightful candour. "A comparison actually performed on the input and output waveforms of a circuit actually constructed and tested has shown that it passes frequencies above a certain level and generates low order, odd and even, phase shifted and amplitude dependent harmonics of the frequencies so passed." Although the patent claims that such processing improves 'quality, clarity, intelligibility, presence, depth and reality,' it offers no psycho-acoustic explanation of why this should be!

The Aphex company has so far been silent about its patent rights in other countries, but a search through the official records of the UK Patent Office show that a corresponding application is on file in the UK. If a British patent is granted on this application, this is likely to be in the next year or so.

Adrian Hope

### Allen and Heath demonstration studio

Allen and Heath/Brenell has recently completed constructing a remix demonstration studio at its Islington factory. Equipped with a 28/28 *Syncon* console the studio is designed to give the company's agents and clients 'hands-on' experience of the company's multitrack products. Auxiliary equipment includes Altec monitors and Quad amplification and a full range of effects units is available with the provision of patchbay facilities for connecting other units. Throughout this autumn the company is organising a number of mixdown sessions where the opportunity will be given to remaster tracks provided by well known musicians who own AHB equipped studios. Further details are available from Iain Everington on 01-340 3291 or Dave Whittaker on 01-607 8271.

# The Technology Must Serve The Music

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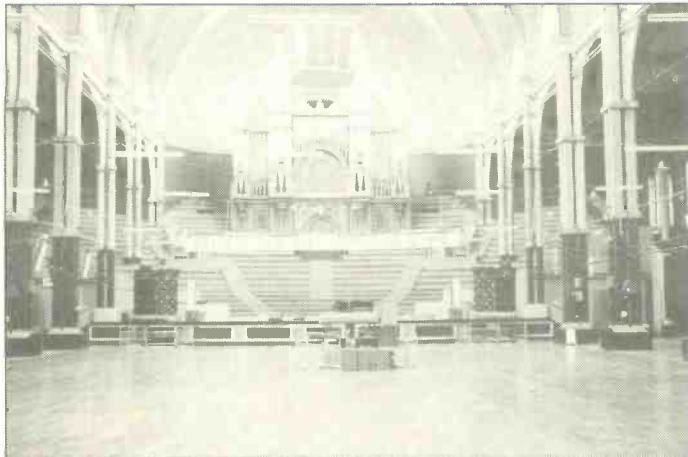
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# studio diary



**Above:** Alley Palley's hall, in which the festival would have moved to had it rained.

**Right L to R:** Illustrating the PA setup on Stage One. Close-up on the men behind the mixing and sold equipment.

**Below:** Stage Two and its mixing team



## A Capital idea

By the summer (ha ha that's a laugh) of 1979 a short-sighted tourist could have left England with the impression that Capital Radio was the major promoter of live music in London. Who'd have thought, back in October 1973, when Capital lurched uncertainly into business with a very heavy emphasis on pop music needletime, that London's commercial music station would within a few years be promoting so much live music. And classical music to boot, along with that most difficult of all music to promote—jazz. At the time when Capital joined with American impresario George Wein to put on the 6-day Alexandra Jazz Festival, there were no less than 10 not-pop concerts lined up for the South Bank. Capital's attitude is now that: "Anyone with up-front readies and the chance to plug it on-air can put on a Dionne Warwick concert and make a small fortune. In that respect commercial radio does have a licence to print money. The real challenge is to put on more

minority interest music like classical or jazz and come out even."

To no one's surprise the first Alexandra Palace Jazz Festival did *not* come out even. Capital didn't expect to make money and neither did George Wein who approached the radio station in the first place, looking for a British partner for a UK version of Newport. Capital and Wein certainly made (and acknowledge) some mistakes, like

staging weekday concerts during school term-time. But they also got one heck of a lot of things right and plans are already afoot for a repeat performance next year. As soon as dates are fixed I for one am earmarking a week's holiday to coincide.

As a rule of thumb, open-air festivals tend to be a nightmare for all but the masochist who enjoys sitting in mud, paying rip-off prices for yukky food and queueing all day for the privilege of suffering a few minutes in an over-flowing toilet. You can, some people say, judge a pop festival by the standard

After a considerable amount of shopping around, Britannia Row were booked to provide the staging, PA and lighting. Around 12kW of audio power was used on each stage, with Court and Martin bins and horns. PA mix was handled from a console half-way up the slope from each stage, mid-audience, and on-stage foldback was balanced from a separate console at the side of each stage. I didn't hear one complaint about on or off-stage sound, which is some achievement. A stereo music line phone link (backed up by an unused radio link) was used for

live inserts. Those inserts that I heard were not notably impressive. One in particular merited inclusion in the bloopers series: "Hello Alexandra Palace, how's it going out there?" said the DJ from Euston Tower—sound of distant piano—"Hello Alexandra Palace, how's it going?"—sound of flustered Alexandra Palace reporter grabbing microphone—"Fine"—"Who's on next?"—"I don't know"—"Who's on tomorrow?"—"I really don't know"—"Thanks Alexandra Palace for another well researched insert, and now back to the records."

Apart from such occasional lapses into happy amateurism it was all highly professional. The Stones and Manor Mobiles had been booked to record everything in 16-track. Interestingly, although Capital now books an outside mobile at least once a week, such is the cost of equipping and maintaining a decent mobile that it still isn't viable for Capital to have one of its own. Doubtless with sad memories of the trials and tribulations of trying to record The Who at Charlton a few years ago,

of its toilets. On that score Capital come out pretty well, even providing a special tent for the disabled. (You can hardly blame Capital for the fact that the disabled toilet tent was usually full of able-bodied males in a hurry.)

On a technical level the expertise was daunting. The plan was to have two separate stages on the slopes below Alexandra Palace, one-time home of all BBC TV.

Capital gave the mobile mic feeds priority at all times. At Charlton the lighting and PA had ended up on the same phase of the mains supply. Result—thyristor buzzes. And at Charlton the mics had been rigged by the PA crew and Capital given a split feed for its mobile recording almost as an afterthought. Result—no useful recording. At Alexandra Palace all the mics on stage were rigged for the benefit of the recording engineers and a split feed given to the PA. Because lighting was on one phase of the supply, ancillaries like hot dog stalls on another, and the PA and mobiles on the third, thyristor breakthrough presented virtually no problems. PA and mobiles also co-existed happily on the same feed. Result—some good recordings and consistently good PA. In fact the only real problem arose on the last half hour of the last night while Lionel Hampton's big band was in full spate. The generator, a beautiful 600A 3-phase (200A per phase) beast from Cinequip, had performed like a dream throughout the whole festival. In fact puzzled passers-by could often be seen skulking round the parked generator, first listening closely and then touching the truck in disbelief that it could actually be working and yet remain so quiet. But in that fateful last half hour, the diesel fuel ran low, the feed line blocked with bottom of the tank sludge and the lights went out. It took a dramatic 20 minutes to bleed the fuel system, replenish the tanks and restart the system. In the meantime Lionel Hampton's band had provided an object lesson in how to cope with any situation. In the semi-darkness, and stripped of the electronic half of their rhythm section, Hamp's band played on to arguably the most rousing crowd sympathy of the whole festival. Prior to the blackout the band had been peaking at around 100dB down at the audience front of stage; after the blackout with the brass, saxes and drums blowing truly live and acoustic, they were still peaking at 90dB. George Wein claimed afterwards that it had all been intentional. By clogging up the generator's fuel supply he had given some people their first taste of what a real live band sounds like!

Why incidentally use a generator anyway? Why not pull power down from Alexandra Palace where the BBC once had its 405-line TV transmitter and where there must surely be oodles of amps? This

was considered but rejected early on. To run a total of 600A down the hill, a distance of several hundred yards, would have required such massively heavy cable to avoid voltage drop that it was cheaper to hire the generator. Pity the poor contract engineer who let the fuel run so low, because it's thanks to him that there is no tape of Hamp's finale.

In many respects Capital and Wein's handling of the Alley Palley Jazz bash offers as much of an object lesson in how to run a festival, as Hamp's acoustic gallantry in the face of darkness and no volts offered an object lesson in the show - must - go - on - manship. Although as many as 30 mics were used on each stage at any one time (often eight on a drum kit) there was no chance for any miking up rehearsal. As each band went on, the engineers just miked it up as best they could. In some cases, where for instance a guest drummer joined in halfway through a set, he was miked up as he played. Changeover between bands was remarkably fast and certainly never delayed by miking.

One lesson learned for next year will probably be to angle the stages obliquely so that their sound does not overlap when the wind blows across the hill. Angling might ensure also no sound from the stages can bounce off the front-facing wall of Alexandra Palace like a giant reflector poised to beam delayed signals over the audiences and into the residential valleys of North London.

With a glum eye to the unpredictability of British weather, Capital and Wein had tried to raise an anti-rain insurance. The premium quoted them was 20% of the estimated gross at the gate. As the whole festival cost around a quarter of a million pounds to put on, the estimated gross equated with that figure, and as the insurers required so many cc's of rain within so many minutes for a pay-out, the organisers declined. Instead they took out their own insurance. They booked the entire interior of Alexandra Palace and fitted out three concert halls, including the Great Hall complete with historic organ, with stages, lighting and PA. In the event no one, other than a few inquisitive press, ever saw the inside of those halls. No one wanted to use them but they were ready to 'go' within a matter of minutes. Transport stood by to shift the musicians and their

instruments at the first sign of rain. The audience were asked to retain their ticket stubbs for entrance to the inside halls if it started to rain. The most difficult job would have been shifting the heavy mobiles up the steep grass hill. The cost of equipping the inside halls was only around £5,000 and to the organiser's delight it was money down the drain. There wasn't a drop of rain in all the six days. But for the next two days in London it rained heavily.

In the end, around 30,000 people turned up and paid their honest five or so for 10 hours entertainment a day. (A clever move was to charge children only £1 a time.) An even cleverer move next year might be to have an evening-only reduced charge. Capital had hoped for up to 50,000 paying customers and they might just get them next year, or at least the year after. So jazz at Alexandra Palace might become an annual British institution. If it does, how ironical that it will be thanks to a predominantly pop music station that hardly ever transmits any jazz. But to mix metaphors, let's not knock a gift horse in the mouth. More power to their elbow.

Only one mystery remains. How on earth did Capital contrive to fly a helicopter over the Alley Palley site, at exactly the moment when one of the groups roared into the theme "Flying Home"?

Adrian Hope

### Wisseloord Studios (division of Phonogram) Netherlands

Designing a large purpose-built studio complex from scratch is a once-in-a-lifetime thing—so when you do it, you have to do it right and with an eye cocked to future developments. Especially when you have one of the world's largest recording organisations behind you and a budget of (approx) £1.5 million. For a start, you can choose a pleasing site, like Phonogram's 'Wisseloord Studios' set in wooded surroundings on the outskirts of Hilversum—Holland's vinyl and video valley.

Vinyl and video could be an important combination if the VLP video disc fulfils its promise. It's an appropriate combination for the Phonogram studios too since it has an underground studio link with Cinecentrum, with which it shares the Wisseloord site, for direct video

recording synchronised with studio sound.

From outside, the separate aircraft hangar like shells of the three studios can be discerned. Inside, a deliberate and successful attempt has been made to achieve a relaxed and intimate atmosphere. Nothing luxurious, just lots of bare concrete, reminiscent of a college building. An internal street suitably furnished with a genuine red GPO telephone box, a bus stop, and more, runs the length of the building with the four studios opening on to it.

"Four farms would have been ideal for atmosphere," says studio manager Ruud van Lieshout. "We tried to get this relaxed atmosphere using basic materials, the architecture of course, and by not having forbidding notices or commissions." Architect Hans Ruijsse naars won first prize in a European contest for the building.

Tom Hidley of Eastlake Audio designed all four studios, and his design philosophy is recognisable in the stepped ceilings and walls of the studios and control rooms. In the 18 months since the studios opened in January 1978, teething problems have been solved, changes made for unforeseen circumstances, and fine tuning done by the collective ears and measurements of the Polygram people.

Studio One is large, 42,400 cubic ft, with an effective floor area of 1,665 sq ft, and can accommodate an orchestra, a full military, or big band. The studio is 'liveish' and like the other three it has a hard wooden floor, cavity walls lined with vertical strips of glass wool for adjustment and tuning, and the aforementioned stepped walls and ceilings. There is a large piano trap for the concert Steinway D274 and an isolated podium for live, mainly jazz, recordings, or jamming.

Steve Hackett, who wanted a 'live' sound, occupied Studio One for the whole of January recording his new album, miking a 23-piece drum kit with 30 microphones in the process.

Up till now there have been few classical music sessions in Studio One but the business of the medium and small Pop Studios, Two and Three, has seen it quite full. Rhythm, bass and strings for various Pop recordings are recorded here with appropriate adjustments being made with sound boards, drapes and the walls.

The Dutch group Kayak who made their *Phantom Of The Night*

album here, recorded the majority in Studio Two, but used Studio One and its Steinway with omnidirectional miking for the classical element in their sound. Here the group made use of one of the studio's features: each one of the three main control rooms can be used with any of the four studios. The control rooms can be shut off from the studios with blinds for privacy.

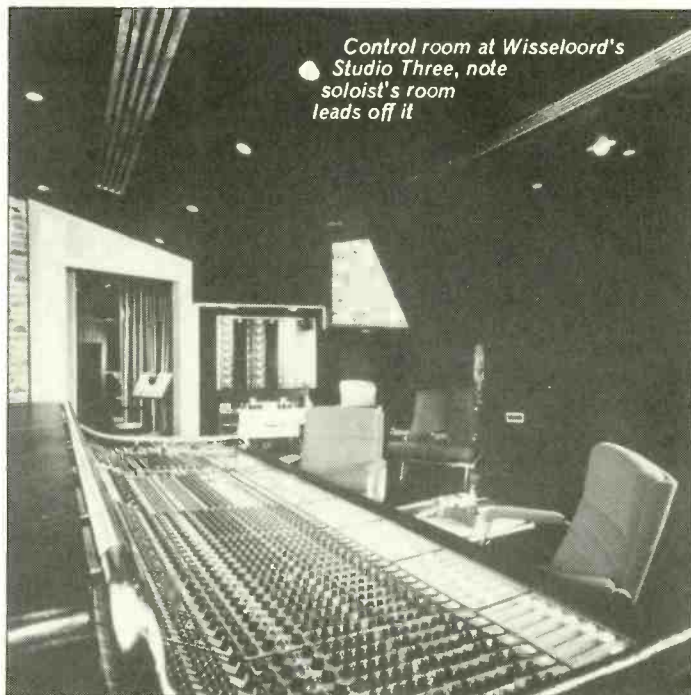
Studio One has been used for live jazz recordings with an audience of 120. Each of the studios has its own entrance for equipment and fire escaping. If there is a fire in the studio you are in, you can save yourself without disturbing anyone else's session!

There is a wide range of instruments: marimbas, harpsichord, tympany, keyboards, Hammond, vibes, etc, and a good selection of mics throughout the studios including BBC jobs. "The STC 4038 is marvellous for brass," says Van Lieshout, "choice of mics is a personal thing with engineers so we have a selection to decrease their risk".

The three main control rooms are identical, and are separated from the studios by 12mm and 16mm glass. The acoustic separation goes right down into the sand below. For once the long shaggy carpets are not red but brown. Tape machines are 24-track Studer A80s (A800 coming) with Dolby. The mixing consoles are Polygram's own design, with 24 outputs. Some of the functions are automated. The registration of digital information for this automation being directly written between tracks; again Polygram's own design. The monitoring is done with JBL 4350s and JBL amps 6233, and the standard Auratone small speakers.

Sound metering is by Polygram's own bargraph system with built-in memory function and spectrum analyser, which can be used to show, eg, maximum modulation, in total, or over a certain period. Each studio has a trolley of exchangeable modules to meet particular needs. These include: flangers and harmonisers, parametric equalisers, sibilant controllers, noise gates, selective limiters, ADT machines, digital delays, instant phaser and a variety of compressor/limiters, etc.

A special feature of the large 22,500 cubic ft volume, 1,000 sq ft Pop Studio Two is the large glass-walled isolation room for hard acoustics, eg, voice, guitar, strings, piano. Artists are separated but still in sight, and a nice bright sound can be achieved. Studio



Control room at Wisseloord's Studio Three, note soloist's room leads off it

Two also has an insulated isolated drum booth with sand-filled walls and doors, two guitar amp traps, and a piano trap for the Steinway B. Separation with omnidirectional mics and open piano is better than 20dB.

Status Quo were 12 weeks in Studio Two recording their *Can't Stand the Heat* album which went gold in three weeks.

The control room, like the other two, has an effective area of 400 sq ft.

Studio Three, the medium-small Pop Studio, has a volume of 8,800 cubic ft and an effective area of 420 sq ft. It has a small Steinway, drum, guitar and bass traps. Special feature of this studio is an acoustically separated soloist room, where vocals or other soloist can accompany the backing track, 'live'.

Studio Four, effective area 250 sq ft, is mostly used for demo tapes, advertising jingles and rehearsals for albums. It has a 20/4 Philips mixing console LDC 25, and two EMT turntables and an ARP 2500 synthesiser. Other preprogrammed synthesisers as well as a complete range of musical instruments are available throughout the studios. The studio also has a mobile recording unit.

Keeping all this ticking over is a crew of four maintenance engineers who give each studio its service.

And down in the bowels of the studio is a room with a range of reverberation facilities: seven EMT 140s, two EMT 240s and three AKC BX20s all with remote

control from any of the four control rooms. There is also a natural echo chamber and a special echo delay wheel, Polygram's own design. It has four tracks and a speed of 60in/s or 120in/s giving a delay from 8 to 880ms.

The studio is mainly concerned with recording artists from Polygram's own stable, about 85% in fact. This is largely Popular and Pop Repertoire, 60% of the bookings are Popular, 40% Pop although in actual studio time these figures are reversed. The hourly rate for the three larger studios is about £65, and about £32 for the demo studio. Obviously the rate comes down for longer bookings. For longer than two weeks for instance the studios only charge for 12 hours a day; anything above that is free.

Apart from the studio manager Van Lieshout and assistant Joke Dijkstra, there is a crew of 14, some of them freelance. The producers on contract to Polygram reads like a who's who of the Dutch Pop scene, with names like Piet Souer, Harry van Hoof, Peter Koelewijn and Hans van Hemert, not forgetting a lady producer Johanna Duller.

With an eye to the future Polygram is also investigating the ramifications of digital recording techniques in connection with the recently introduced Compact audio disc from Philips.

Wisseloord Studios, C. van Renneslaan 10, Hilversum, Holland. Phone: 35 14956.

Bill Third

## Studio B Boston

Following damage suffered in this year's severe winter, Studio B in Boston has just reopened for business in time to celebrate its fifth birthday. Opened in 1974 as an 8-track facility devoted to recording master and demo tapes for local musicians, the studio went 16-track in 1976, and prior to suffering severe damage from water pipes which froze and then burst in February after a protracted cold spell, was devoting its efforts to promoting the Boston music scene.

Studio B celebrated its reopening with a party for a select gathering of Boston's film, record and television producers, plus a contingent of New York record company and music publishing reps. The reopening also saw Studio B proudly unveil a new custom-built Sound Workshop 1600 Series 28-input console with full parametric and standard eq, Transamp mic pre-amps, and dual stereo cue systems for monitoring while recording.

The console is automation ready and can be expanded to 24-track operation as required. Other features unveiled at the reopening include MicMix Master Room reverb chambers, and new control room acoustics and monitoring systems. The new monitoring system offers a choice between six different loudspeaker systems including JBL and dB Engineering custom monitors.

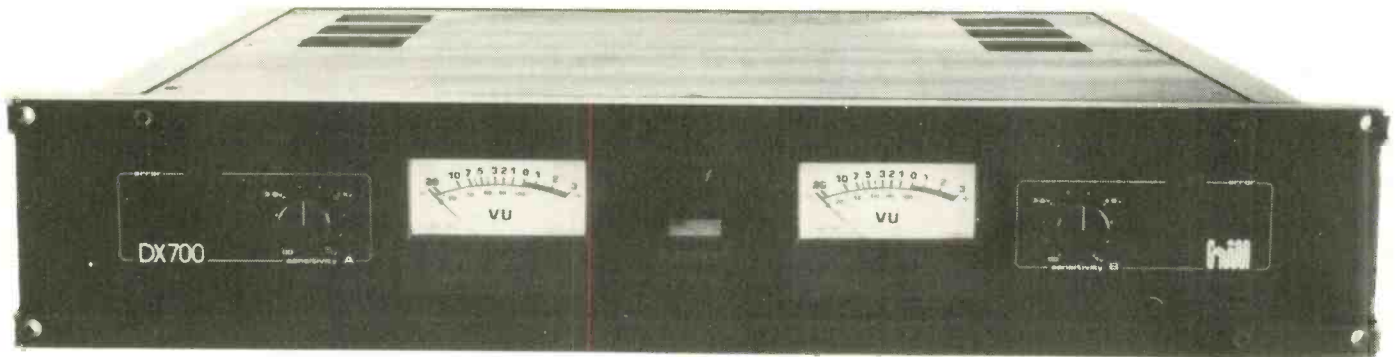
Studio B, 419 Boylston Street, Room 209, Boston, Mass 02116, USA. Phone: (617) 266-5464.

## Kent Duncan acquires Artisan

Kendun Recorders president, Kent Duncan, has acquired the assets of the Artisan Audio Corporation of Hollywood and formed a new corporation, Artisan Sound Recorders Inc. Artisan was a pioneer in the field of independent disc mastering and was previously owned and operated by Robert Macleod. Artisan's two cutting rooms we understand are to be renovated by Sierra Audio and a new mixdown room is to be built by the Sierra/Hidley team. Kendun Recorders presently operates three studios and two disc mastering rooms in Burbank. Commenting on the acquisition, Kendun president Kent Duncan said: "this expansion of our recording activities will significantly increase our involvement with the California record industry, giving us a location in the heart of Hollywood and providing services in both recording and disc mastering".



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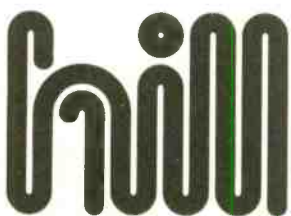
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**Mobile radio station for Nigeria**

Happenings in the more remote regions of Ondo State, Nigeria, will no longer go unreported by the State's Broadcasting Corporation, thanks to a £100,000 mobile outside broadcast sound recording and radio relay station which has been designed and constructed by Uxbridge-based communications facilities company, Zoom Television. The unit, built around a basic Bedford lorry chassis, is intended for use by the OSBC in two principle roles: firstly as a conventional OB programme originating unit working within Ondo State; and secondly as a satellite mobile sound studio working independently in isolated, rural areas. For its secondary function, the vehicle has been equipped with a 12.5kVa 3-phase power generator and FM stereo radio link system.

For its more usual role the vehicle is equipped with an Alice 12-channel mixer, Spotmaster 2000 RPS cartridge machine, AKG BX15E reverb unit, two Studer B67 2-track recorders, two EMT 930ST turntables, and a Klein & Hummell monitoring system. An unusual feature of the mobile is that it is fitted with Ferranti twin cell solar panels, mounted on the roof, enabling the unit's 24V technical battery supply to be charged at a rate of one ampere per hour minimum, even in subdued English sunlight. The prevailing Nigerian climate has also necessitated a vehicle cab cooling system to improve the driver's comfort in transit to and from base and location. Construction of the vehicle commenced in January and it was shipped to Nigeria in July. In addition to constructing the vehicle, Zoom Television have also been responsible for instructing OSBC engineers in the use of the mobile studio.

**Bavaria Musik Studios**

One of the older established studios in Munich, Bavaria is a division of K S Global Cine & Television, as well as being formerly attached to the Bavaria film studios and, as can be expected, does a lot of work for the film and TV industries. The studios themselves are housed in buildings each side of Schornstrasse. No 13 is the main large Studio One, mixdown suite for film and TV work and one of two dialogue and sound effects studios, plus the complex's own cafeteria which serves meals and drinks at all times to studio users. Studio



Left: Studio One of Bavarian Musik



Right: Studio Two of Bavarian Musik

One is a legacy from the Bavaria film studio days and has remained pretty much the same apart from the addition of two isolation rooms, plus a drum 'hut' and some acoustic treatment to pull the reverberation time down to about 1 to 1.2s. The overall size — 140,000 cu ft — is pretty impressive and there is room to accommodate a large orchestra comfortably, up to 150 musicians, though there have been times when up to 180 have been squeezed in there! As might be expected, the bulk of the microphones are Neumann and AKG with some Electro-Voice.

The control room overlooks the studio from the far end and thus affords good visual contact for the engineers during sessions, both on the studio floor and large cinema screen mounted on the opposite wall above the two isolation booths. The control room itself is very roomy and has an impressively large Siemens desk linked up to a Telefunken M15 24-track recorder. The desk is, however, scheduled for replacement as it is rather old and limited in facilities. Bavaria have a close relationship with Siemens and it is likely the new desk will be one of the new automated versions currently being developed. As well as straight 24-track music recording facilities, the control room has an adjoining room with 6-track film recorders as well as full projection equipment. To this end the monitoring (all Tannoy) consists of five front speakers and

two rear enabling individual monitoring on left front and rear, right front and rear, centre and far left and right channels as would be used in elaborate film productions using 6-channel sound.

I couldn't fail to notice the patch bay at right angles to the right of the console. This alone is the size of a medium desk and uses the large Tuchel 5-pole connectors. Though very large, the bay does offer 'at a glance' patching indications, the main panel being engraved with block diagrams of the circuits used with insertion points in the appropriate places. The other novelty is the 24-track monitor mixer built into a drawer in the patch desk by the Bavarian technicians; this facility is lacking in the Siemens console. I am tempted to say that for a console that large it doesn't do much to justify all that space but that is without taking the IRT (Institut Fur Radioteknik) regulations into account based on the standard 40mm replacement module system. IRT rules say that all equipment used in broadcasting studios (and into that you can lump the older film studios) must conform to the 40mm module as introduced by Telefunken down to the last pin and connection. This means that a console, be it built by Telefunken, Siemens or whoever, can be serviced by a replacement module of any make providing it corresponds to the function that needs to be replaced, eg: eq section, monitor, etc. In the same way layout is

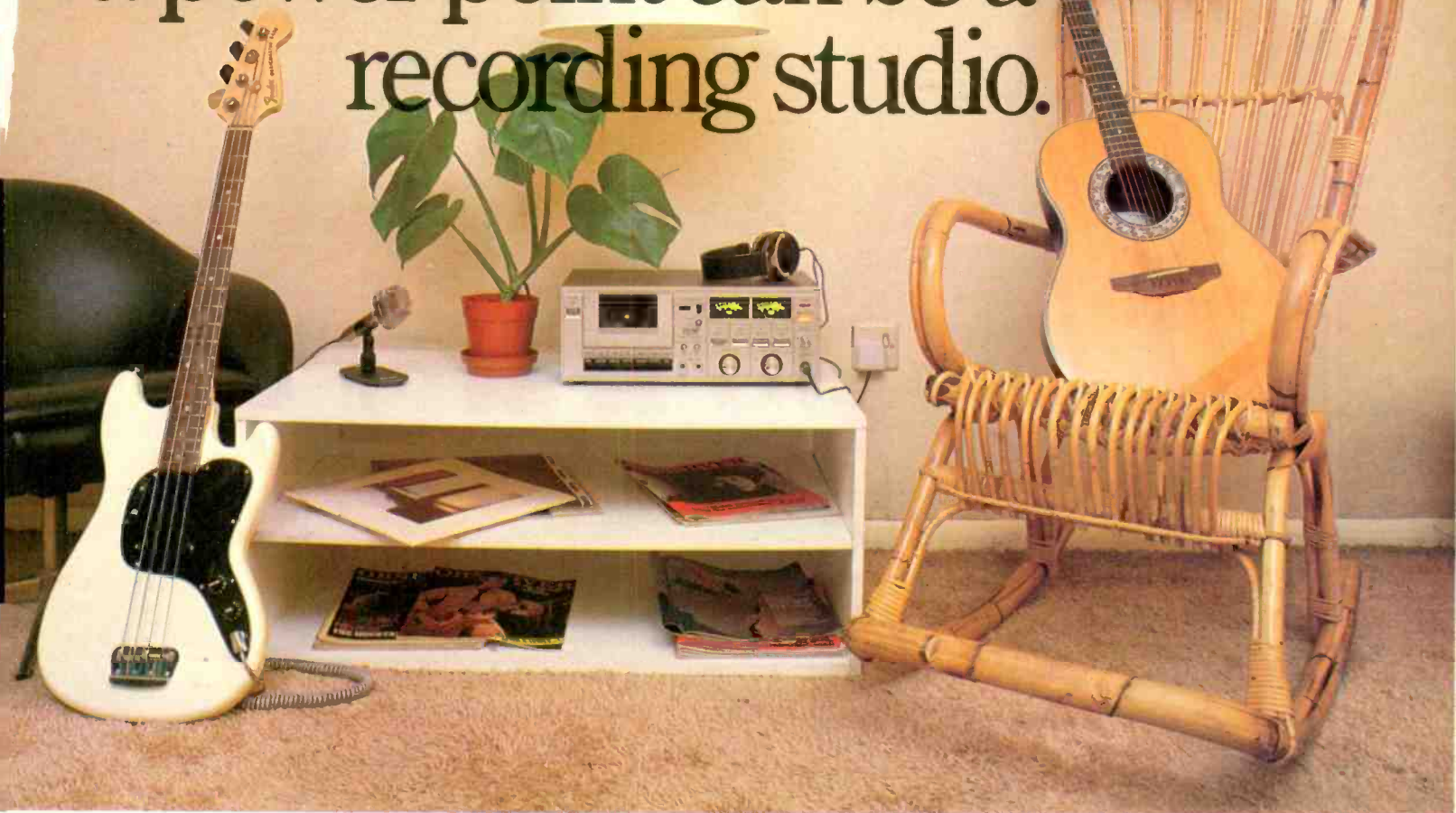
very much standardised with the emphasis on space and fast accessibility—and not too many knobs to twiddle around with! Outboard equipment featured three Audio & Design 760 complex limiters, Eventide DDL and AEC spectrum analyser. Studio One's time is about half and half for film and TV soundtracks and large orchestra recording, classical or otherwise. However there are occasions when groups want more of a 'live' feel and enough space to set up in a near-concert situation and let it roar. The German group Amon Duul II recorded this way.

Above the Studio One control room is the mixdown suite for films and here much of the work is producing German language versions of foreign films and TV series.

The dialogue studio, within this No 13 complex, is medium-sized with the acoustics varying in each part of the room, depending on the situation to be created within the film. Outdoor speech is created by using an isolation booth made out of a frame with very heavy curtains on all sides. (There is also a room with full film editing facilities.)

The other side of the Schornstrasse are the modern additions to Bavaria, music Studio Two, the new dialogue studio and copy room. The control room of Studio Two has a more 'international' aspect with its 32/24 Cadac desk and Telefunken 24-track and stereo

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## Where we did stop.

There is, however, one feature of the A-108 Sync that's conspicuous by its absence: the hefty price tag.

Incredible though it may sound, you'll find the machine retailing at around £200.00 plus VAT.

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# TEAC

mastering recorders. Also ancillary equipment is more in abundance and includes Audio & Design compex limiter, well filled *Scamp* rack, Lexicon *Prime Time*, Eventide *Harmonizer* with keyboard and various other goodies—all of which come up at the extensive patchbay to the left of the console. Monitoring is again by Tannoy, standard for all of Bavaria, powered by Harman-Kardon and equalised by Klark-Teknik. In addition the input to the monitors is controlled by an AEC spectrum analyser enabling 'holes' or power hungry peaks to be instantly spotted. Noise reduction is by Dolby.

The acoustic design of the studio bears more than a passing resemblance to the work of Sandy Brown Associates and was carried out by a Hamburg company who represent Sandy Brown in Germany, Dr Hillerbrecht. Unfortunately, due to the construction of the main building, the control room is asymmetrical—meaning that each monitor is equalised differently—not an ideal situation but deemed necessary by the studio in order to have the monitors working coherently.

At the time of my visit a session organised and produced by Sigg Schwab was taking place. Sigg Schwab is a very well known sessioneer who is now devoting more time to the classical guitar, featuring himself on concert guitar with two colleagues on flute and viola, playing 19th-century chamber music—and the result sounded very natural. Microphone arrangement was a main stereo pair with a 'spot' mic on each instrument mixed down low to broaden the sound. Multitrack was not being used, the mix going straight to the mastering machine. Engineering the session was Tonmeister Jörg Scheuermaan, who also commented that it made a change to have to follow through the musicians with the musical score. The session was also giving Jörg the chance to try out the new Neumann rifle mic (that he had literally only received several days earlier) on the flute with interesting results. (Though brand new, the Neumann had already become one of his personal favourites.) The studio itself is quite small and holds up to about 10 musicians before elbow room gets to be a problem. Resident instruments include grand

piano and Rhodes plus a ready miked up drum kit in the separate drum booth. For overdub work the drum booth is often used as a vocal or separation room leaving the studio free for other instruments and/or vocal sections. Though limited in space, the studio is capable of a wide variety of acoustic conditions and these are available at the turn of a wall module or pull of a drape.

Most of the work in Studio Two is for the German home market and consists of folk music, traditional groups and hit parade, or what they call 'Schlager' music, though some local rock groups have been in as well. I tended to get the feeling that Jörg would like to see a bit more activity on the rock side and that it is for this reason that the studio is also becoming popular for chamber music ensembles and associated types of classical music—as evidenced by the presence of Sigg Schwab's chamber trio. On the international front business has yet to be developed, though Swedish hit parade singer Marion has done a fair bit of recording at Bavaria.

Last on the list was the new

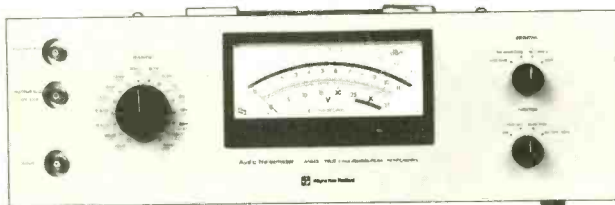
dialogue studio for film work. The size of a small music studio, this offers ample room and facilities for the creation of sound effects and dialogue as well as having an additional booth that is completely dead for simulation of outdoor scenes, car interiors, etc. The control room boasts a 24-input Cadac desk with 2- and 8-track Studer recorders, the omnipresent 760 compex limiters and Tannoy monitors. In addition the control room can be linked through to Studio Two should the need arise.

Naturally enough, my visit ended at the well appointed cafeteria and bar where I was able to thank Herr Hans Endrulat, the studio manager, for taking the time to show me around so thoroughly and introduce me to the Munich scene. As can be seen, Bavaria has a lot to offer to all sides of the recording industry—music recording, film and TV—and it will be interesting to see whether the rock market will also start to become part of their present large customer list. Bavaria Music Studios, Schornstrasse 13, D-8000 Munich 80. Phone: 089 41641.

Terry Nelson

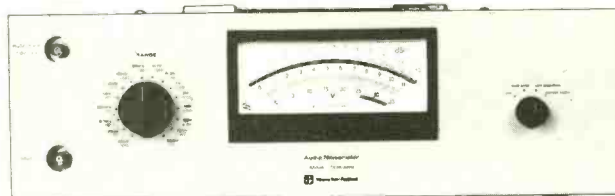


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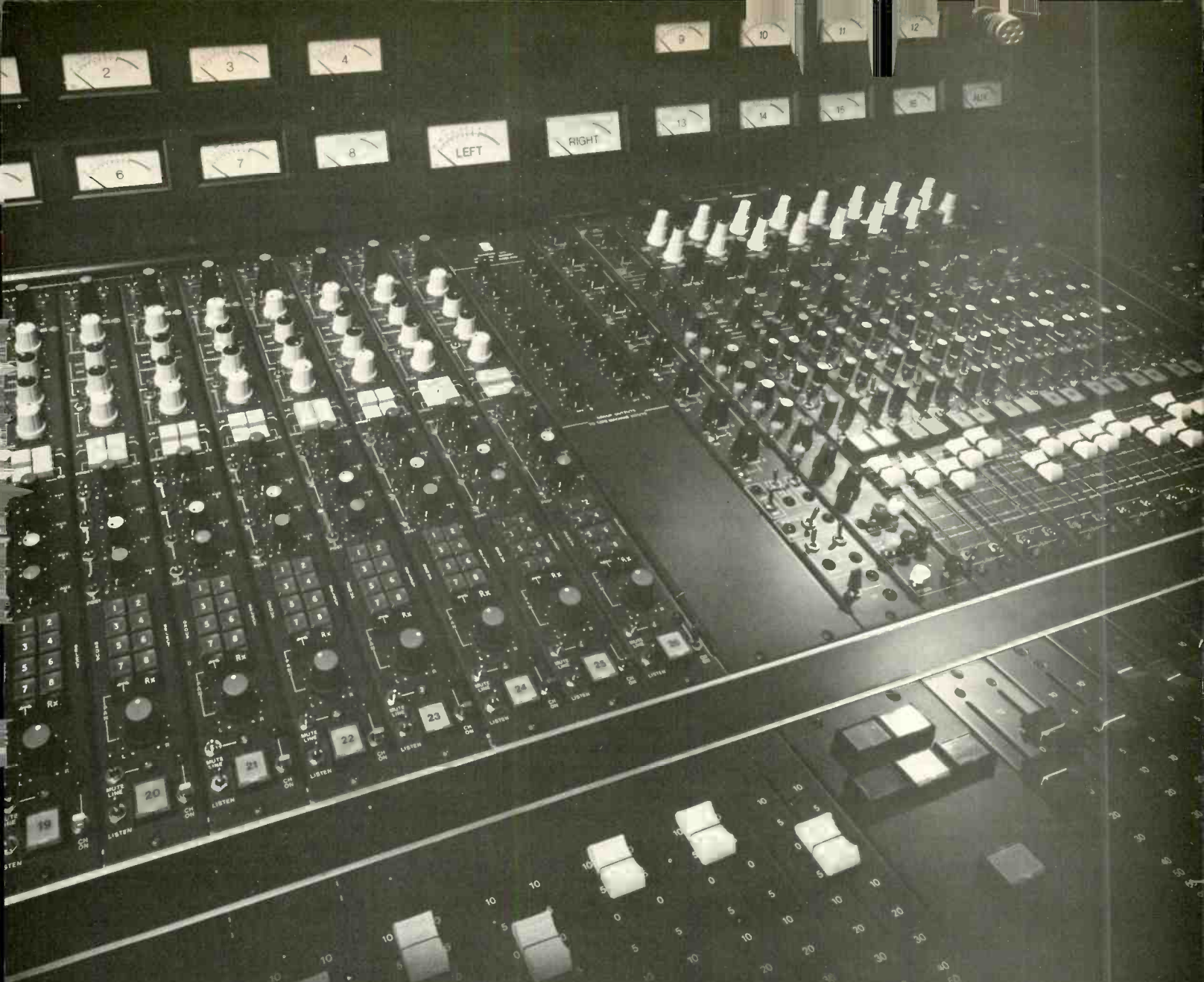
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Elkham, Upper Level Pretoria Street,  
Hillbrow, Johannesburg 2001,  
South Africa. Tel. 642-8721/1209

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Madrid, Spain. Tel. 1 231 7840

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62-66 Rue Louis Ampere,  
93330 Neuilly/ Marne, France  
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# Into the groove

John Valvo (Cybersonics)

**S**INCE the name Cybersonics is probably new to you, we thought it would be a good idea to let you know why we decided to design a new disc mastering lathe. It started in early 1973 when the choice of lathes available was limited to two or three major manufacturers of such equipment. The general mechanical designs were pretty much the same in principle and the electronics were doing a good job at what they were designed to do. But, the new cutter heads were being asked to go through some motions that they had not in the past been faced with. Recordings were expanding their dynamic range, and low frequency information at high levels was becoming more and more difficult to deal with in the cutting rooms. Many people were modifying their older equipment and some new 'add on' equipment was being introduced in order to cope.

Mastering lathes also seemed to suffer from a lack of aesthetic value. The new studios were works of art as well as the general look of consoles, tape machines, and other equipment in use. Lots of digits, LEDs, computers, and what have you quickly becoming the norm. But the mastering lathe stayed the same.

Aerospace technology was beginning to filter down to the level of professional and consumer devices and the record business was booming. So, we saw this as a challenge.

We decided to utilise as much new technology as practical, come up with some new ideas for elect-

**It is not often that a new disc mastering lathe is introduced onto the market, and the new Cybersonics is rather different from existing lathes.**

ronic control and design, and be pleasant to look at as well as simple to operate. Our key word in the design became simplicity. The mechanical aspects were to be as uncomplicated as possible and relatively easy to manufacture, in order to keep costs down and maintenance at a minimum. Through the use of direct drive servo systems we were able to eliminate all belts, flywheels, pulleys, springs, dashpots, and almost everything else that was prone to wear, and periodic replacement.

The electronics were designed utilising some of the newer logic elements and signal conversion integrated circuits as well as random access memories which are now so predominant in the world of computers. The operator of the new equipment was also of prime consideration, so front panel controls were purposely kept to the minimum required for day-to-day use. Special controls not normally used too often were easily accessible but hidden. An attempt was also made to eliminate all of the extra manipulation that a mastering engineer must go through prior to cutting a disc.

The *DM2002* incorporates a direct drive crystal locked turntable with a vacuum hold down system that will accommodate any of the most commonly used disc diameters without having to change or switch any vacuum routing

valves. The vacuum is brought up from beneath the turntable, thereby eliminating the hose connection between the vacuum source and the turntable spindle. Thus cutting out an irritating step for the operator.

The lead screw and carriage uses a direct drive dc servo system with positional information derived from a shaft encoder connected to it. The linear resolution is about  $1 \times 10^{-5}$  in and their formation is used in the logic to control functions related to disc diameters such as cutter set down, concentric lockout, etc. It is also used to give an exact readout to within .01 in of cutting diameter anywhere on the disc. This eliminates the need for any mechanical switching such as micro switches since the logic always has positional information and may easily be decoded. The cutter carriage rides on ultra low friction linear bearings which allows very precise control of carriage movements by the servo system since the frictional loads are negligible.

A similar system is used to move the microscope back and forth for inspection purposes. Its movements are controlled by a pair of push buttons on the front panel for fast slewing, and a knob for extremely slow movements in either direction.

Finally, the head suspension is unique in that it also uses a servo system. A brushless dc limited rotation motion is used to achieve depth of cut, lifting and dropping of

the cutter, as well as damping. The use of this system has proven to be extremely repeatable from day-to-day, in spite of temperature variation, and from lathe to lathe.

As you can see, the system has been simplified for longevity and maintenance ease as well as operational freedom. This was and still is the guiding concern of Cybersonics in the development of this product. Because of its size and simple operation the independent recording house can now involve itself with mastering and not send its client to another source to complete the recording cycle of tape to disc. With this machine it is not necessary to build a special mastering room. You could place the *DM2002* right in the studio booth alongside a typical 16- or 24-track tape deck and utilise the same console and associated equipment for the mastering process. Neither are fancy variable looped mastering tape decks, required because of the 3 in head spacing for preview and program to feed the *DM2002*. Cybersonics has converted an Ampex *ATR104* for their use with very little modification involved. And, it works beautifully as a mastering tape deck.

The Ortofon cutting equipment matches beautifully to the Cybersonics *DM2002*, the *DSS731* or *732* head on our suspension works ideally—the head weighing only 9oz. With our electro dynamically balanced system, the Neumann interchanges with a minor balance adjustment, (it weighing in at 15oz approximately). ■

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# Survey: disc cutting systems

Coverage in this survey has been broadened to include not only disc cutting lathes and cutterheads, but also specialised consoles and related equipment, mastering tape machines with preview facilities, disc blanks and cutting styli.

## AMPEX (USA)

Ampex Corp, 401 Broadway, Redwood City, Cal 94063, USA.

Phone: (415) 367-2011.

UK: Ampex GB Ltd, Acre Road, Reading RG2 0QR. Phone: 0734 85200. Telex: 848346.

## ADD-1

Audio digital delay unit for disc mastering preview (2-channel). Allows a standard tape recorder to be used as the mastering machine, the standard output being fed to the lathe preview input and the *ADD-1* input, while the delayed output of the *ADD-1* becomes the programme input to the lathe cutter amplifiers, suitably delayed. Delay time may be preset up to 5.12s in 5ms increments, while the digital delay uses 16-bits for 90dB dynamic range with samples frequencies of 25kHz, 50kHz or 100kHz. The unit is totally compatible with half-speed cutting. Frequency response is 5Hz to 18kHz  $\pm 0.5$ dB, to 20kHz  $-1.5$ dB.

Price: on application.

## ATR-100 series

Ampex produce a preview kit which fits to the *ATR-100* transport, comprising three movable guides fitted on the front of the deck, which may be shifted to produce preview times for different speeds.

Price: on application.

## AUDIODISC (USA)

Capitol Magnetic Products, 1750 N Vine Street, Hollywood, Cal 90028.

Phone: (213) 462-6252.

UK: EMI Tape Ltd, Tape House, Dawley Road, Hayes, Middx UB3 1BT. Phone 01-573 3888.

Disc recording blanks.

## CAPPS (USA)

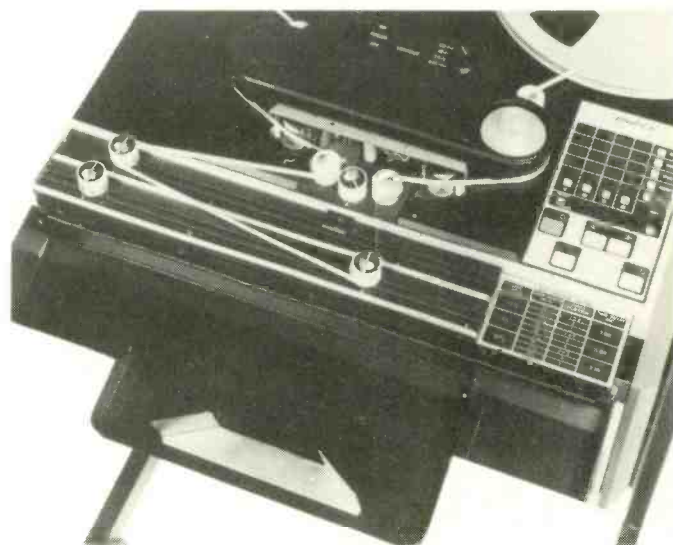
Capps and Co Inc, 20 Addison Place, Valley Stream, NY 11580, USA.

Phone: (516) 825-4413.

## VARI-DEPTH COMPUTER

Features 30dB dynamic range of vertical gain and 15dB lateral, 150ms attack time and 400ms decay time. Modes: manual deepen; auto deepen on lateral, vertical or both; and auto deepen on lead-

Ampex ATR-100 with disc-mastering preview accessory



in, band, expand and/or finish. Requires input from left and right preview and left and right program. Outputs for Westrex solid-state or tube drive, HAECO solid-state drive, Neumann suspension drive, or high-current suspension drive.

## VARI-PITCH COMPUTER

For 50-1000 grooves-per-inch (variable or fixed pitch) at 78, 45, 33 $\frac{1}{2}$  and 16rpm. Lead-in pitch adjustable by internal control between 8 and 32gpi. Expand pitch variable 30-300gpi; band pitch 16-64gpi; expand time 0-5s; and band time 0-5s.

Also specialise in cutting styli.

## COUNTY RECORDING (UK)

County Recording Service, London Road, Bracknell, Berks.

Phone: 0344 54935.

The company make a complete system less lathe, incorporating their *ME76UK* cutter head. Frequency response is claimed to be within 3dB from 40Hz to 18.5kHz. Driver amp is the Quad 405, and the system operates without requiring motional feedback. Control desk features slider controls, VU metering, a/b comparison, bass and treble adjustment, stylus heater control and meter, mono/stereo button, monitor preamp and psu.

Also specialise in cutting styli.

## CYBERSONICS (USA)

Cybersonics Inc, 11128 Weddington Street, North Hollywood, Cal 91601, USA.

Phone: (213) 766-7104.

Europe: Ortofon Manufacturing A/S, 11B Mose-dalvej, DK-2500 Copenhagen-Valby, Denmark.

Phone: 01 46.24.22. Telex: 27587.

UK: Feldon Audio Ltd, 128 Great Portland Street, London W1N 5PH.

Phone: 01-580 4314. Telex: 28668.

## DISC MASTER 2002

Electronically controlled compact desk top cutting lathe providing all the facilities of larger floor mounted units. Makes extensive use of servo motors and electronics to replace mechanical functions such as thread screws for positioning cutter head and microscope. Turntable control is by a direct drive high torque motor with a hollow shaft to feed the vacuum, and the precise speed is digitally displayed. The Compu-drive is normally fed from the tape recorder preview head and includes a variable delay to compensate for different head distances, and provides from two to 18 updates to pitch and depth of cut per revolution. The unit may also be interfaced to automation systems for completely automatic control.

Price: £23,030.

## MCI (USA)

MCI, 4007 NE 6th Avenue, Fort Lauderdale, Florida 33334, USA.

Phone: (305) 566-2853. Telex: 514362.

UK: MCI, MCI House, 54-56 Stanhope Street, London NW1 3EX.

Phone: 01-388 7867. Telex: 261116.

## JH-110M

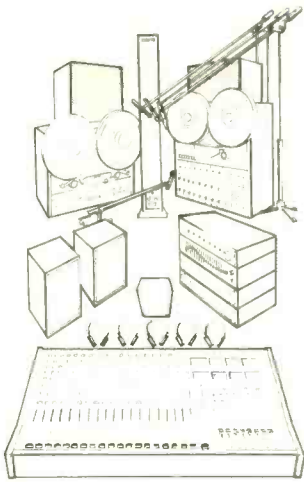
Mastering tape recorder designed specifically for disc cutting. Accepts 14in spools for greater than half-hour playing time, 3-speed 7 $\frac{1}{2}$ , 15 and 30in/s,

42 ►



# Our business is helping you with yours

Considering or upgrading a multitrack system?  
We offer a select range of studio equipment, backed with advice, demonstration and service. Turnkey sell, install, lease or hire.



## SYSTEMS

As our name implies, at **TURNKEY** we specialise in systems.

From the simplest four channel setup to large eight or sixteen track installations, we can tailor a package to fit your exact needs.

This can include acoustics advice, wiring, consoles, training and so on.

Ask for our 'Quotation Sheet' or call Andrew Stirling now, on 01-440 9221 and discuss your requirements first hand.

## MONITORING

**QUAD** is a remarkable company that has stayed in the forefront of monitor amplifiers for over a decade. Their current series, the 303 and 405 are available for medium and high power use.

**JB L** and **TANNOY** share the market for studio monitors worldwide. We demonstrate and supply matched systems for budget and big-time monitoring. The renowned **AURATONE** mini-mighty speaker cubes, are also in stock.



## SIGNAL PROCESSORS

The choice is immense. We cannot sell them all so we pick and choose the best.

Take **MXR** for example. This American based company has grown from making effects for guitars to studio equipment for professionals. Their digital

## MICROPHONES

As with speaker systems, the choice of microphones is very much one of personal preference and we stock a range to satisfy most requirements. Our current favourites are the new **CSE** range by **AKG**. This is a system (in similar lines to the revolutionary **C451** range some years ago) of interchangeable bodies and capsules. As electret technology is used, the prices are correspondingly low.



delay and graphics are second to none.

**Roland** of synthesiser fame, have introduced their 'Studio Series' of rack-mount units, including a phaser/flanger with extensive control facilities. We also have the budget **ACCESSIT** range.

## ACCESSORIES

As well as supplying standard plugs, tapes etc., We have developed an exclusive range of 'hard to find' studio accessories.



Take for example our 'Great British Spring' - a high quality stereo reverb developed for the budget conscious studio.

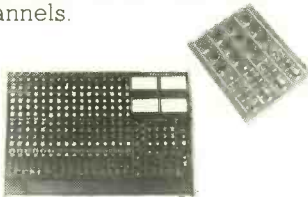


We also have . . . mike boxes . . . track sheets . . . preamplifiers . . . direct boxes . . . rolling consoles . . . and much more.

Full details in our 'TURNKEY by mail' catalogue.

## MIXERS

Our exclusive 1478 is a freebie with all four track recorders. Treble, bass, pan and level on four channels.



The **RSD**, 16 by 4, offers great value for money in budget multitrack mixers. Packed with features and our own mods for 8 track.

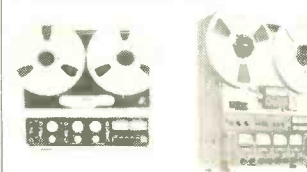
**SOUNDCRAFT** is well known for its' state of the art performance. We have extensive experience of the Series Two, 16 by 8.



**SYNCON** by **A&H** is a major breakthrough in the design of big consoles for 16 and 24 track. We offer fast delivery and installation.

## TAPE RECORDERS

**REVOX** lead in the field of 2 track mastering. The new **B77** includes all the features that were hot-rodded to the **A77**.



**TEAC's** new 3440 is the updated version of the 3440S. Now with varispeed, logic switching, monitoring and motion sensing.



The 8 track, one inch from **SOUNDCRAFT MAGNETICS** is a sophisticated workhorse with unique remote control facilities.



Write or call for a free copy of the 'Turnkey Book', the 'Turnkey by mail' catalogue and **TEAC's** 'Are you ready for Multitrack' book.

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**Supply & Installation  
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**turnkey**

## SURVEY: DISC CUTTING

preview head with variable delay time for 0.5, 0.6 or 1 turntable revolution, available with DIN or NAB head assemblies, it incorporates the RTZ III-M microprocessor based return to zero with four standard memories and 20 additional memories for banding and spiralling, expand and echo, and leadout functions etc.

Price: on application.

### 3M MINCOM (USA)

3M Mincom Division, 3M Centre, St Paul, Minn 55101, USA.

Phone: (612) 733-1110. Telex: 297434.

UK: 3M UK Ltd, PO Box 1, Bracknell, Berks RG12 1JU.

Phone: 0344 26726. Telex: 849371.

### DIGITAL MASTERING SYSTEM

As the final link in the recording chain, 3M has now made available a preview head on its 4-track digital audio tape recorder enabling the recorder to directly drive disc cutting lathes.

### MSR (UK)

MSR Electronics Ltd, Meeting House Lane, Balsall Common, Nr Coventry, Warwickshire, UK.

Phone: 0676 32468.

USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, Conn 06801.

Phone: (203) 774-6230. Telex: 969638.

### MSR 2000

Disc mastering lathe using dc servo controlled motor driven turntable, servo controlled pitch drive covering range from 50 to 1,000 grooves per inch for high groove density, optimised pitch and depth control based on amplitude phase and frequency content of programme resulting in high level on disc and greater playing time. Lacquer hold down is via the centre of the turntable drive, carriage assembly slide machined of PTFE Teflon composition reducing friction and rumble. Microscope with TV camera and display for continuous monitoring of groove, cutter head suspension position servo controlled with depth compensation for inner grooves. Complete systems available including Ortofon cutting equipment and Neve mastering consoles.

Price: basic lathe £32,000, cutter head £4,500, drive amps £11,000.

### NEUMANN (West Germany)

Georg Neumann GmbH, Charlottenstrasse 3, 1 Berlin 6, West Germany.

Phone: 0311 251.40.91. Telex: 184595.

UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ.

Phone: 01-953 0091. Telex: 27502.

USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014.

Phone: (212) 741-7411. Telex: 129269.



### VMS80 LATHE

Computer controlled cutting lathe using direct drive, crystal locked using a turntable floating on oil, and a neoprene cushioned lathe bed. A realtime digital processor controls the lead screw and depth of cut, enabling grooves to be optimally spaced under control from the mastering machine. While the lathe comes fitted with a microscope as standard, there is also an optional video monitor system.

Prices: basic £36,000, video monitor system £2,000.

### SX74 CUTTERHEAD

Stereo cutting head providing 7Hz to 25kHz response ( $\pm 0.5$ dB 15Hz to 16kHz), 35dB channel separation. Operates in conjunction with SAL74 cutting amplifier system.

Price: £4,500.

### SAL74 CUTTER AMPLIFIER

Complete drive system for SX74 cutter head comprising power supplies, 2-channel amplifiers, limiter, and tracing simulator.

Price: £15,000.

### SP79 CUTTING CONSOLE

Cutting console with adjustable eq and level controls, available in various configurations which may include Dolby-A noise reduction, Orban parametric equalisers, Neumann U473 limiters, PPM, VU and phase metering.

Price: £25,000.

### NEVE (UK)

Neve Electronics International Ltd, Cambridge House, Melbourn, Royston, Herts SG8 6AU, UK.

Phone: 0763 60776. Telex: 81381.

USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, Conn 06801.

Phone: (203) 744-6230. Telex: 969638.

### SYSTEM 9022

Disc mastering console providing comprehensive monitoring facilities, remote controls, interlock systems etc, and would typically include four channels for programme and preview left and right, all with full equalisation, and provided with manual or auto changeover, plus level adjustment (both overall and balance). Facilities are included for various types of noise reduction, stereo width controls, vertical bass cut, phase meter and scope.

Custom systems are also manufactured.

### ORTOFON (Denmark)

Ortofon Manufacturing A/S, 11B Mosedalvej, DK-2500 Copenhagen-Valby, Denmark.

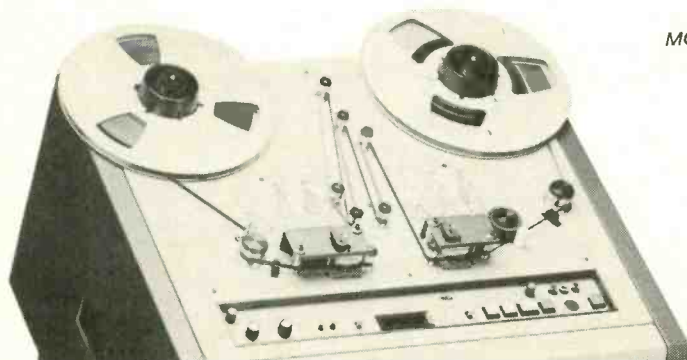
Phone: 01 46.24.22. Telex: 27587.

UK: Feldon Audio Ltd, 128 Great Portland Street, London W1N 5PH.

Phone: 01-580 4314. Telex: 28668.

USA: Cybersonics Inc, 11128 Weddington Street, North Hollywood, Cal 91601.

Phone: (213) 766-7104.



MCI JH-110M  
Series



# For the Artist in Every Engineer.

Send us the coupon and we'll rush you a free Coronado Console cutout you can build yourself. (Pictured above)

Please rush me your Coronado Automated Console literature and a free Coronado Console I can build myself. Have a sales engineer call me so we can get down to business.  
 Please send me your beautiful brochures and a free Coronado Console I can build myself. Don't contact me, I'm just looking.  
 I'm an artistic engineer. Please send me my free Coronado Console.

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 Company: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

## SURVEY: DISC CUTTING

### Ortofon cont'd

#### DSS731/732 DYNAMIC CUTTERHEADS

Stereo cutter heads designed to operate with Ortofon GO741 cutting amplifiers, provide motional feedback to amp, vertical cutting angle 15° (optional 20°), max permissible constant current 0.8A air filled, 1A helium filled, max stylus tip excursion 45° direction, 100µm. DSS732 is designed for normal stereo recording with response 10Hz to 20kHz, DSS731 has improved response 5Hz to 25kHz and is designed for half-speed cutting of 4-channel discrete recording systems with ultrasonic carriers. Prices: DSS731 £4,800, DSS732 £4,460.

#### GO741/GE741 CUTTING AMPLIFIER SET

Pair of amplifiers and common power supply module, designed to operate with DSS731/732 cutter heads. Provides HF equalisation, summing of motional feedback input, power amplifier driving 500W at 20kHz into impedance matching circuit, to cutterhead. Temperature feedback cuts power if cutterhead overheats, current and temperature meters, monitoring amp with replay cartridge equalisation, for AB monitoring. Price: £8,703.

#### CPS741 CORRECTION AMPLIFIER

4-channel correction amplifier accepting two programme and two preview channels, with 4-ganged setting of levels, but lefts and rights ganged for equalisation. Provides ±15dB of bass and treble, ±8dB of presence switchable from 440Hz through three octaves to 3,520Hz. Stereo image provides a balance control with ±4dB correction, and width (S factor) from mono to emphasised stereo (S=2). A special condition 'compatible recording' may be switched in providing similar L and R at lower frequencies, while stereo is maintained at mid and high frequencies. Other features include one channel phase reversal, bass and treble cut filters, monitoring outputs, metering outputs, monitoring inputs, automatic control from cutting equipment. Price: £3,369.

#### STL732 REGULATED FILTER

2-channel regulated filter (treble limiter) designed for disc cutting, variable attack (0.3ms to 100ms) and release (3ms to 1,000ms), control threshold selectable, minimum 0.35V, maximum turning of Bessel filter 2kHz to 20 kHz. Price: £1,260.

#### SM721 STEREOSCOPIC MICROSCOPE

Designed specifically for examining cutting styli, and it enables the stylus and its fixture to be examined from two angles either direct from the tip or in its length direction. The cutterhead is held in a special fixture which allows it to swing between the positions. Price: £484 (normally supplied with heads).

### PYRAL (France)

Pyral SA, 70-72 Avenue du General de Gaulle, F-94020 Creteil, France.

Phone: (1) 377.12.51.

UK: Pyral Magnetics Ltd, Airport House, Purley Way, Croydon CR0 0XZ.

Phone: 01-681 2272.

USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014.

Phone: (212) 741-7411. Telex: 129269.

Disc recording blanks.

### SCULLY (USA)

LJ Scully Manufacturing Co, 138 Hurd Avenue, Bridgeport, Conn 06604, USA.

Phone: (203) 368-2332.

Europe: Identimation Ltd, Stratheden House, 38 Heath Road, Helpston, Peterborough PE6 7EG.

Phone: 0733 253075. Telex: 32225.

#### MODEL LS76 'THE LATHE'

The top of the lathe is isolated from vibrations from either the floor or operating panel, built-in microscope (75x and 150x), fitted tone arm for monitoring three speeds, electronic control of cutting pitch and depth with multiple samples per revolution, built-in vacuum pump in isolator box with high vacuum cycle, helium input, remote control of most functions, lead in and finish grooves, 95 to 600 grooves per inch, continuously variable, many other features. Price: from about \$50,000.

#### AUTO/MASTER

Automated disc mastering console that uses static and floppy disc memory digitally store all level, equalisation and corrective actions taken during disc cutting, the information finally being stored on a separate tape which may then later be used to produce an identical master cut. Interfaces to both Scully and Neumann lathes. Price: about \$15,000.

### STUDER (Switzerland)

Studer International AG, CH-5430 Wettigen, Switzerland.

Phone: 056 26.87.35. Telex: 63682.

UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ.

Phone: 01-953 0091. Telex: 27502.

USA: Willi Studer America Inc, 3916 Broadway, Buffalo, NY 14227.

Phone: (716) 681-5450. Telex: 919138.

#### A80/VU PREVIEW

Special model of standard A80 master tape recorder, with preview head providing prelisten, 12in spools. Price: on application.



Westrex 3D2AH cutting head mounted on Scully lathe

### TRANSCO (USA)

Transco Products International, 1 World Trade Centre, Suite 2365, New York, NY 10048, USA.

Phone: (212) 432-1400.

Europe: Transco Europe, Stratheden House, 38 Heath Road, Helpston, Peterborough PE6 7EG, UK. Phone: 0733 253075. Telex: 32225.

UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ.

Phone: 01-953 0091. Telex: 27502.

Disc recording blanks.

### WESTREX (USA)

Westrex Company, 2629 W Olive Av, Burbank, Cal 91505, USA.

Phone: (213) 846-3394. Telex: 698254.

UK: Westrex Co Ltd, 152 Coles Green Road, Cricklewood, London NW2 7HE.

Phone: 01-452 5401. Telex: 923003.

#### RA1700 SYSTEM

Comprises RA1701A equipment shelf and panel; two RA1703 input amps; two 98609 recording equaliser units (matched to 3D2AH recorder); two RA1704 feedback/monitor amps; two 98610 monitor equaliser units (matched to 3D2AH recorder); RA1701B equipment shelf and panel, two RA1706 power amps and RA1705 psu.

#### 3D2AH RECORDER

Stereo head equipped with aluminium formless coils, phase and impedance correction networks, advance ball holder with advance ball, suction tube, stylus with heating coil, and helium cooling.

#### RA1706 HF REDUCTION AMPLIFIER

Reduces high-frequency gain in the cutting system whenever the program energy towards upper end of audio spectrum exceeds preset level, to avoid damage to cut groove and ensure tracking of playback cartridges.

Price: cutting system cutter head, electronics and reduction amp \$15,900.

#### DISKMASTER SYSTEMS

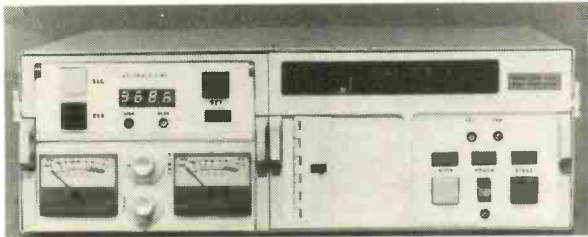
Diskmaster System I includes cutter system, LJ Scully 'The Lathe' and console \$111,500. Diskmaster System II includes cutter system, rack cabinet for simplicity, automated rebuilt Scully Recording lathe with Westrex DC servo drive motor, \$71,520. Diskmaster System III is similar to System II, but with console, \$92,200.



Above:  
DSS 731  
cutter head  
from  
Ortofon

Left:  
LJ Scully  
'The Lathe'  
LS76

## MODEL 126 CARTRIDGE MACHINE



Stereo Record/Reproducer with Recorded Time Indication  
(other models available)

### FEATURES

- ★ MEETS NAB, IEC CARTRIDGE SPECIFICATIONS
- ★ COMPATIBLE WITH COMMERCIAL RADIO USE
- ★ FLUTTER .15% WEIGHTED
- ★ NOISE AND HUM LESS THAN -47dB (STEREO)  
-50dB (MONO) RE 160 nWb/m
- ★ HIGH AND LOW EQUALISATION
- ★ HINGED FRONT PANEL AFFORDS ACCESS TO ALL MAINTENANCE CONTROLS
- ★ COMPATIBLE WITH NEW HIGH OUTPUT TAPE

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AVAILABLE SOON - SQL - 3 Control Unit for  
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# Noise Gates from Roger Mayer Electronics

- ★ 150 nano second Attack Capability
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- ★ .05% Distortion
- ★ -56 Dbm Maximum Input Sensitivity
- ★ Keying Input
- ★ 2 LED's Red (Gating) Green (Non-Gating)
- ★ LED Indication of Non-Gating/  
Gating Operation



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**Scenic Sounds Equipment,**  
97-99 Dean Street,  
London W1V 5RA  
Telephone: 01-734 2812/3/4/5

**Lake Audio APS,**  
Artillerivej 40,  
DK-2300 Copenhagen S  
Tel: Copenhagen 570 600

**A.R.C. SPRL,**  
Rue Th. Decuyper 134,  
1200 Bruxelles  
Tel: Bruxelles 771 3063

**Mike Llewelyn-Jones,**  
AP Postal 8.178  
Madrid  
Tel: Madrid 637 0752

**S.E.D.,**  
Rue Bara Straat 146,  
1070 Bruxelles  
Tel: Bruxelles 552 7064

**3M France SA, Mincom Div.,**  
Boulevard de l'Oise,  
95000 Cergy  
Tel: Paris 749 0275

**Pieter Bollen Geluidstechnik,**  
Hastelweg 6,  
Eindhoven  
Tel: Eindhoven 512 777

**Audiotron**  
Tollbugt 7,  
Oslo 1  
Tel: Oslo 417 535



Model RM68



Model RM68X  
(retrofits into  
Kepex Rack)

# OUR COMPETITORS SWEAR THIS KIND OF DIGITAL QUALITY IS STILL THREE YEARS OFF.



Almost everybody admits digital recording will someday be the ideal way to make records. With a Sony PCM-1600 system, you can stop waiting for that someday to happen.

And start recording now.

**IN THEORY, ALL DIGITAL SOUNDS TERRIFIC.  
IN REALITY, SONY ACTUALLY DOES.**

If your ears are even in semi-reliable condition, you've no doubt been exposed to incredible amounts of digital audio hype.

"The most dramatic change in audio since flat records," says one prestigious audio publication. "At last... perfect sound reproduction," notes another.

So instead of dwelling on how digital can improve the sound of your recordings, we'd rather dwell on how Sony—and only Sony—has finally made digital performance live up to its promise.

**"WE'D LIKE TO DEDICATE  
THE NEXT FEW NUMBERS TO THE SONY  
ENGINEERING DEPARTMENT."**

In order to convert regular audio signals into digital, the Sony PCM-1600 digital recorder uses a pulse code modulation system developed and perfected by Sony engineers.

The same people who have been behind virtually every audio and video breakthrough since the late 1940's.

Consequently, the dynamic range of the two track PCM-1600 is greater than 90dB.

Frequency response is 20 to 20kHz.

The total harmonic distortion of the PCM-1600 is inaudible over the entire audio spectrum.

There is no measurable wow and flutter.

And because the PCM-1600 puts binary code on tape instead of audio signals, it's not susceptible to tape hiss or print-through; there's no need to subject your music to noise reduction equipment or realign your recorder for bias and equalization.

**EDITING PROBLEMS HAVE BEEN FADED OUT.**

Since the PCM-1600 works in conjunction with two Sony video recorders, a standard Sony video editor, the BVE-500A or the new DEC-1000 will fill your every editing need.

**DROP-OUTS HAVE BEEN DROPPED.**

Based on a technique used by computers (where the loss of a single bit of information could mean millions), Sony engineers have created an ultra-sophisticated digital correcting code that can actually restore "dropped out" information.

And considering that Sony video recorders are virtually immune to this problem in the first place, the chances of it plaguing your sessions are all but negligible.

**DIRECT-TO-DISC QUALITY  
WITHOUT DIRECT-TO-DISC LIMITATIONS.**

Because digital quality doesn't deteriorate from one tape generation to another, the PCM-1600 lets you make generation after generation of lacquers, all with direct-to-disc quality—but without any limitation on the number of lacquers you can press.

And if you use the digital format for distribution to your foreign affiliates, you're guaranteed that your last digital master will be absolutely identical to your first.

**SONY INTRODUCES TWO  
NEW WORDS TO THE DIGITAL VOCABULARY:  
AVAILABLE NOW.**

Unlike other digital equipment, the PCM-1600 is actually available for delivery today. Not six months from now. Or "when we finally get all the bugs out."

PCM-1600's are currently being used by well-known recording stars, and are already in operation at Polygram, CBS, Spectrum Sound and Digital Recording Services in Los Angeles, and Digital Recording Systems in Philadelphia.

**A FEW SONY DIGITAL  
ADVANTAGES  
YOU CAN'T HEAR.**

Besides the quality and reliability Sony equipment is legendary for, we've set up a 24-hour

digital hot line to service our customers.

We're prepared to provide as much technical expertise and engineering assistance as only Sony possibly can.

And we intend to continue our exhaustive research in digital audio—and share future insights with the growing Sony digital family.

If you'd like more information about any facet of Sony digital equipment, contact Roger Pryor at (415) 467-4900.

You may think you've heard a lot about digital in the past.

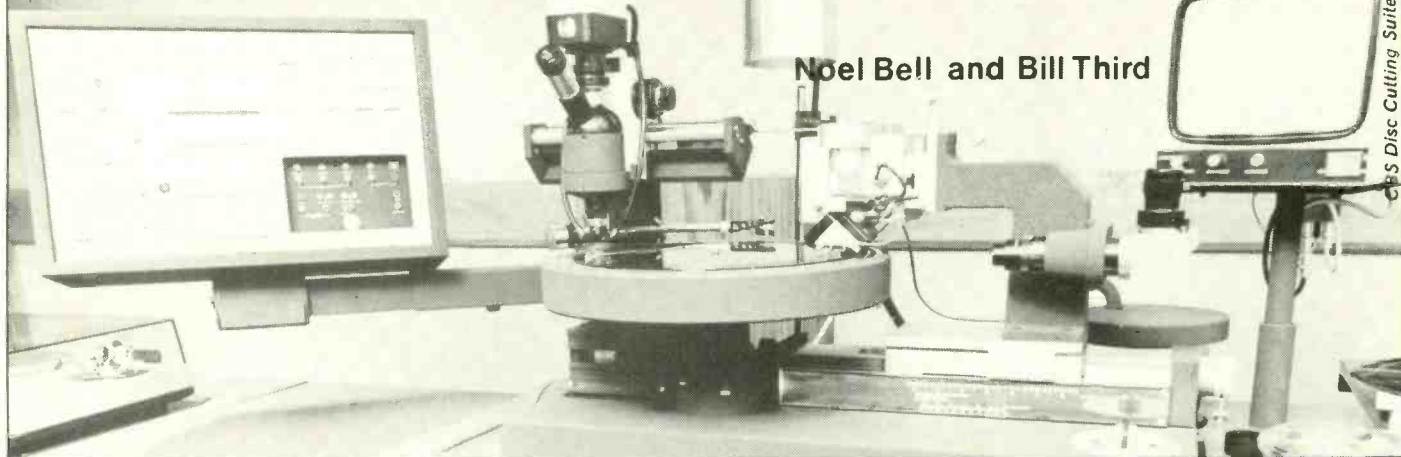
But until you've heard Sony, you haven't heard anything yet.

**SONY  
DIGITAL AUDIO**

We've never put our name on anything that wasn't the best.



# Inside four cutting rooms



Noel Bell and Bill Third

CBS Disc Cutting Suite

## CBS Cutting Suite, London

CBS Studios has just opened what is probably the world's most advanced disc cutting facility at its London, Whitfield Street location. George Balla (technical manager and chief engineer at CBS' London studios), and lathe-manufacturers Neumann, in conjunction with other studio equipment designers, have got together to produce a cutting suite which offers excellent quality, but which is as free from mechanical worries as possible. Basis of the new facility is the UK's first (by a couple of weeks) Neumann *VMS-80* but more of that anon.

The cutting suite uses a micro-processor-controlled MCI *JH-110M* disc mastering tape machine as its signal source. This machine is specifically designed to assist disc cutting and can send timed commands direct to the disc-cutter for correct banding, groove-expansion and lead-out functions—these timings are stored in up to 20 memories. The machine also has a 4-memory autolocate function, a digital timer, pre-listen replay head (separated from the main head by an adjustable loop system offering delays equivalent to 0.5 or 1.0 turntable revolution at any speed), and crystal-controlled reference speeds of 7½, 15 and 30in/s plus full varispeed with repeatable accuracy.

Next link in the disc cutting chain is a Neumann *SP79c* cutting console with adjustable eq and level controls, plus the facility to add a degree of limiting and compression when required. This console includes two pairs of switchable in/out (bypass) Dolby *A361* noise reduction, (one pair for the advance signal), together with two stereo Orban parametric equalisers, again switchable under the

## Disc cutting rooms remain somewhat of an enigma to most engineers but all is revealed in our report on CBS Disc Cutting Suite, The Reference Point Cutting Room, Tape 1 Studios and RCA Custom Recording.

same conditions, plus two pairs of Neumann *U473* limiters. In addition the console has two separate eq systems, designated A and B which may be set up alternatively from track to track on a cut with the eq being switched in either manually during the scrolling time between tracks, or automatically by the scroll function of the *VMS-80* lathe. Other features of the console include rotary switched attenuator level controls with LED indication, a pair of faders for fading in and out only, VU and light-bar PPMs (both sets capable of different level adjustment), and a phase meter. Incidentally, at CBS low frequency out-of-phase signals above a certain level are automatically phase-corrected by the CBS custom-designed *Quasta* phase-correction unit.

From the console we move to the new Neumann *VMS-80* cutting lathe, the first such machine to be installed in the UK. This is fitted with a *SX74* cutter-head and operates in conjunction with a pair of *SAL74* drive amplifiers providing

some 500W peak per channel. The *VMS-80* is a computer-controlled, direct drive, crystal-controlled and servo-corrected lathe with a massive oil-floated turntable and neoprene cushioned lathe bed. These features make it an extremely versatile lathe which is very stable and vibration free. The lathe has a comprehensive range of controls offering adjustment of all cutting parameters including cutting depth, groove pitch, lead-in and lead-out spiral diameters, and control over the heating of the cutting stylus. Many of the cutting parameters such as spirals and lead-in/out grooves are preset at the lathe but are physically actuated on command from the tape machine. In addition, using the pre-listen head on the MCI mastering machine allows the cutter head to anticipate difficult passages in a cut and in conjunction with the microprocessor the *VMS-80* can varicut to very small tolerances. Such are the tolerances, that CBS can obtain an increase of up to 30% in time per side or alternatively a similar in-

crease in level. The lathe is fitted with a microscope which George Balla has arranged to track across the lacquer with the cutter head and this can be viewed either directly or via a TV camera and monitor. Also, when the lathe is in use the TV monitor can be switched to display the frequency spectrum of the left and right channels plus the overall stereo level in the form of a bar-graph. Other features of the lathe include a 'percentage used' counter for monitoring the position of the cutter head, and an SME pick-up arm with detachable headshell fitted with a Shure *V15* cartridge for checking test cuts and demo acetates and with the facility to track the disc just behind the cutter head.

Alongside the lathe is a Technics direct drive turntable fitted with an identical SME/Shure combination for direct A/B comparisons. The monitoring system comprises a pair of Auratones, plus modified Altec monitors driven by Amcron *DC300A* amplifiers via ½-octave room equalisers. The Altec's are fairly massive beasts and are hung from the ceiling on anti-vibration mountings. Although the cutting suite is situated in a fairly small room the acoustics have been designed to compensate for the size by provision of a hard surfaced wall with a mirror running the length of it, behind the monitors.

So there we have it, one of the most up-to-date disc cutting facilities in the world capable of producing top quality lacquers. All we need now is for the pressing plants to match this standard and we'll be on the receiving end of top quality discs. The only problem area of course is the pressing quality, but that's another story.

CBS Cutting Suite, CBS Recording Studio, 31-37 Whitfield Street, London W1. Phone: 01-636 3434.



CBS Cutting Room



## The Reference Point Cutting Room

After 12 years as a cutting engineer, Richard Simpson figured he would probably be with the company till pension time. However, RCA closed down their recording and cutting facility in Los Angeles, so Richard bought a cutting lathe and some other equipment that was for sale, stored it in his back room and went out to find a job. There then followed a year doing high quality jazz cuts for Contemporary Records and the late Lester Koenig. During this period Doug Sax Labs borrowed Richard's lathe for a direct-to-disc recording of the Los Angeles Philharmonic. After upgrading his equipment, Richard had a years' involvement with the Crystal Clear label, recording such names as the late Arthur Fiedler, Cal Tjader, and Almeida. This period of work, coupled to his 12 years in the business, enabled him to get The Reference Point into existence in April 1978. It is housed in a 1-storey shop unit, typical of the kind in suburban America—only this is Burbank, and it is suburban to Hollywood—Los Angeles.

"It's not elaborate, but I offer a personalised cutting service for people who want it," says Richard. "This is what I want to be doing. I could have become an engineer at RCA, but I figured cutting suited my temperament and family lifestyle better. Sometimes in the larger companies, you have someone cutting who has other functions, or would like to have other functions. With the independents it's different—they are doing what they want to do. And, of course, we have upgraded the service and the space from a cubby hole to a well-appointed room where you can receive clients."

The record being cut at the time was a replacement master for the pressing plant of the new Charlie Daniel's Band LP which indicated that it was doing well in the charts. "The record company might press up to 500,000 in the first run depending on the stature of the artist. Then they need new masters. The major companies often can't get into their own rooms, or the major independent cutting rooms, so they come to the small 'indies' who have the flexibility and the capacity to do it within the time limits. I service these clients, and obviously, since this is a fairly new operation, I do tend to get a lot of this kind of job. But I do original masters too."

The master machine at The Reference Point is a 3M 4000 series 2-track master with full Dolby, and Neumann lathe and gear, using Micropoint and Adamant styli Plus an Orban parametric equaliser and Inovonics limiter. "These are



The Reference Point Cutting Room. Below: Complete with Richard Simpson

the two basic tools I use, that and what I have learned of the craft. We also have a Pultec equaliser as backup, and we have a Universal Audio 1176. Sometimes I have to cut masters at intervals up to one month and you have to be able to reproduce the references that you used on the original. The Universal lets you do that.

"There are a few other things which I can hire in when the client, or I, might feel the job needs it, but basically all you need, apart from the lathe gear and master, is a good set of equalisers and limiters. We might enhance a tape in certain circumstances, but basically the tape is the way the producer wants it to be. It's only when the tape is poorly mixed that you have to get into heavy equalising. Sometimes when things are done in a semi-professional situation, and it isn't quite right, we can save it at the mastering stage. But it's strange the way a record can sound different in varying situations. For instance just by chance I happened to find a song being played on the radio in exact sync by two different radio stations, and it was like night and day switching between the two. One station's broadcast was 10 times better than the other. Either that radio station had done something to the tape, or they hadn't, but they knew how it should sound over the air."

To make sure that his ears are not deceiving him Richard relies on Little Reds, smaller brother to studio Big Reds. He also has the omnipresent Auratones and JBL 4315s which he bought after hearing them at the last AES. For client home listening tape copies are made on Nakamichi cassettes and Technics Panasonic reel-to-reel.

"One of the things that is a little different here compared to many larger setups is that I have no big console: all my equalisers etc are patched in so it goes straight from the tape to the lathe. Consequently I can cut things totally flat. When the signal goes through many



different stages, it can colour the sound. The less there is to go through, the less chance there is of things going wrong. I enjoy helping the client to get what he wants, and have him come back and say it sounded just the way he wanted it. Most of the facilities around town are on a par technically, it's the individual running of the equipment, and communication with the artist and producer that makes the difference. When a producer finds he likes the sound in the cutting room, he likes what he hears at home and he still likes it when he hears it on radio, then it sounds like he planned it. If he gets that he returns to the same cutting room because he knows he's not getting hyped.

"Price-wise, I'm obviously lower than the majors, although in the same category as them and the major indies. But my overheads are lower, I'm not in downtown Hollywood or Los Angeles and the layout is not so elaborate."

The layout may not be so elaborate but there are a few gold discs hanging on the wall which look kind of nice. The 12 gold discs include Rock the Boat from The Hughes Corporation and Take Me Home Country Roads by John Denver, the first gold for Richard. "That record had been out for six months and nothing was happening. So we thought 'what can we do to make it better?'. We did a remaster, distributed the new copies and within two weeks it was a hit. We

put in a little effort and it worked. Other golds include *Afternoon Delight* and *An Evening With John Denver*."

Getting good vinyl remains a record industry problem point. The Reference Point uses Transco for masters and Allied Records for much reference type work. "I do a lot of promotion work. For instance I just cut 200 sides as promo samplers for a new rock band and when the Jacksons did *Blame It On The Boogie* I had to do 50 to 60 copies for radio station distribution. A lot of my work is in that servicing region. I also do an increasing amount of 'music from the soundtrack' things. Putting all those 30s and 1-minute spots together to make the album. It requires a lot of editing, done in conjunction with the record producer. We change it around a little bit, so there is some creative input from me, but it can be real tedious work. At the moment I'm doing the record from a series of horror movies.

"In practically all cases, before cutting the master for the production plant, you cut a reference disc. After the producer and/or artist has listened to it at home, and if it sounds the way they want it to, I cut it exactly the same way. The reference is cut on a 12in, the master is a little bigger. If the producer finds something he wants changed, or if there are any problems, we can correct them at this reference stage. It's an additional

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## Inside four cutting rooms

cut, but very necessary. Some people do test pressing runs, but the reference disc is the best method.

"Again the whole thing is down to the person who is using the equipment, knowing the room you are working in and how it sounds, and knowing the producer. If you get a tape that sounds 'narrow' you might add low bottom and a dip in the mid-range, the upper-low end, to give it some depth. I suppose if you have been listening to a couple of hit records, you get into the sound and try to reproduce the formula. For instance people out here would sometimes strive to achieve 'the English Sound' as it used to be called. The voices a little farther back with a little more echo. But basically, as a cutter, you are the tool of the producer and you have to remember that. He has the sound in his head and you have to keep that in mind.

"Cutting is very important, many people, artists included, have very little idea of what happens once the final mix has been done. The Reference Point is for everybody from the little people to the majors. I try to treat everything like it's my own project. There can often be a sneering attitude in the big companies towards the little guy. But when you are little yourself you have to try and give everyone the best."

Richard Simpson, The Reference Point Cutting Room, 4020 W. Magnolia Blvd Suite, F Burbank, Cal 91506. Phone: (213) 845-5184.

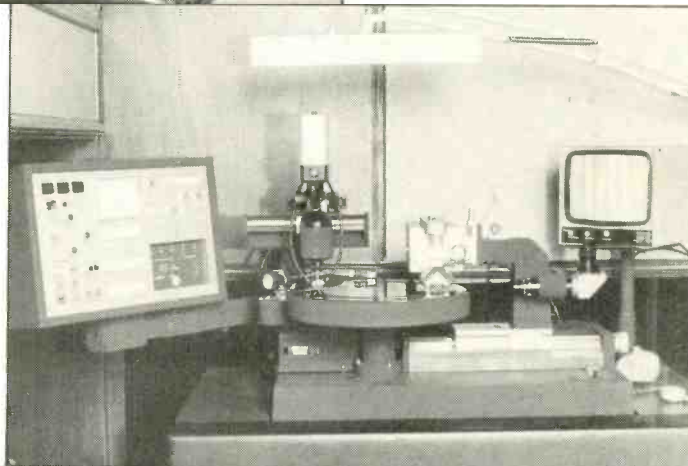
### Tape 1 Studios

Following hard on the heels of the delivery of the first Neumann *VMS-80* lathe to the UK—at London's CBS Cutting Suite—Tape 1 Studios has taken delivery of a *VMS-80* and, hence, become the first independent UK studio to be equipped with the new lathe.

Tape 1 Studios is situated just off London's Tottenham Court Road, in Windmill Street, and is co-owned by Bill Foster and Barry Ainsworth—who operates the Mobile One recording unit (see page 60, *Studio Sound*, August 1979). Tape 1 has been on the scene for about four years now, the first three were spent at Carburton Street and they moved to their present location in September 1978. Tape 1 presently consists of two cutting rooms; a voice-over studio; a tape copying room; a cassette copying room; and an equalisation, compilation and mastering room. When I visited the studios to meet Bill Foster and cutting engineer Denis Blackham I discovered that they



*Tape 1 Studios:*  
**Above:** Overall view of the new cutting room with JBL 4343 monitoring and Neumann SAL 74 drive amplifiers in evidence.  
**Right:** Neumann *VMS-80* lathe  
**Below:** the customised Neumann *SP79* cutting console



were mid-stream in a long term re-equipment and modernisation programme which will not be completed until early 1980. A major factor in this programme has been the recent arrival of the new *VMS-80* lathe which has displaced the older Neumann *AM-32* lathe to a temporary location in the basement of the building. Bill informed me that this situation is temporary in as much as Tape 1 has just obtained additional premises further down Windmill Road which will be the new premises for the *AM-32*. The new premises will additionally house a cassette mastering room

and it is hoped that both these facilities will be operational by the New Year.

The pride and joy of Tape 1 is undoubtedly the new *VMS-80* lathe. This is fitted with an *SX74* cutter-head and operates in conjunction with a pair of *SAL74* drive amplifiers providing some 500W peak per channel. The signal source for the lathe is a Studer *A80* pre-listen tape machine specifically designed for use with the *VMS-80* and with a 3-speed capability of either 7½, 15 or 30in/s. This Studer *A80* is basically the same as the normal *VU* machine, however, the

position of the preview head and pulleys has been changed to accommodate 12½in reels, the loop delay is fixed at 0.5s, and the loop tolerance is better than 1%. The pre-listen machine has the normal *A80* logic control and also has an optical scroll device.

The cutting console is a Neumann *SP79* with custom equalisation designed by Tape 1, and has an analogue phase meter in preference to a digital phase meter. The console is used in conjunction with Neumann *U473* limiters, Orban *622* equalisation, and Dolby *A360* noise reduction. The *VMS-80* has the same features as those described

in the accompanying piece on the CBS lathe, but differs in using an SME pick-up arm with a Stanton *681EEE* cartridge for checking test cuts and demo acetates. Ancillary equipment includes a Studer *B67* for equalisation and copy mastering while monitoring is via JBL *4343s* driven by bi-amped Amcron *DC300s* and with White room equalisers. Auratone loudspeakers are also available for monitoring, these being driven by a spare set of Neumann amplifiers. This spare set of Neumann amplifiers is a useful backup as they can be used to replace the normal Neumann cutter amplifiers should any disaster befall them. Incidentally, this cutting room is extremely spacious and well laid out and as with all the Tape 1 facilities was designed in-house by Barry Ainsworth and Bill Foster.

Prior to the arrival of the *VMS-80*, Tape 1 was operating with a Neumann *AM-32* lathe with an *SX68* cutter-head and a modified *VG1* amplifier rack giving in Bill's words "a nice clean valve sound". As previously stated this lathe is temporarily housed in the basement and is operated in conjunction with an in-house designed console utilising standard Neu-

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## Inside four cutting rooms

mann equipment. Other units include an Audio & Design (Recording) *Compex* limiter, an Ortofon *STL731* treble limiter, and Orban eq. Monitoring is temporarily Tannoys driven by Amcron, but they intend to change to JBLs driven by bi-amped Amcron *DC300s*. The tape machine is Tape 1's standard, a Studer *A80*.

Turning to the voice-over studio this is equipped with an Alice broadcast console offering 12 mono inputs and five stereo outputs. Tape machines include two Studer *A80s*—an 8-track and a 2-track—plus a Revox and a Teac *A3340*. Alongside the console are also two turntables and an Aiwa cassette machine. Monitoring is over JBLs driven by bi-amped Amcron *D150s* and the studio has Dolby *A301* noise reduction plus tie lines to Tape 1's EMT valve echo plate.

The equalisation, compilation and mastering room is equipped with a custom-built Alice console with both VU and PPM meters, elliptical eq, and a Neumann phase meter. Tape machines are again Studer *A80s* and ancillary equipment includes Dolby *A301*, Orban eq, and an Audio & Design (Recording) *F760X/RS* limiter. Monitoring here is via Tannoys driven by Quad *50Es*.

They have two copying rooms: the tape copying room offers standard 1:1 copying and is equip-

ped with two Studer *A80s*, a custom-built Alice desk, Dolby *A301*, with monitoring over Tannoys driven by a Quad *303*; the cassette copying room has a bank of 10 Aiwa *6550* cassette machines and is also equipped with an Ampex 2-track and Dolby *A301*. All cassette copies are transferred onto Ampex *Professional* cassettes and monitoring is again over Tannoys driven by a Quad *303*.

In the four years of its existence Tape 1 has grown progressively. Bill Foster and Barry Ainsworth have steadily increased the number and quality of the studios' facilities, and the purchase of the *VMS-80*, plus the expansion and modernisation programme presently underway, illustrates that they are not content to sit on their laurels. By early 1980 the additional new premises will be completed and in full swing, and the studios will then be able to offer some of the most comprehensive copying and disc cutting facilities in London. As it is the studios are on a par with anything currently available in the UK in this rather specialist field, therefore, it would seem that the future can only see Tape 1 becoming even better.

Tape 1 Studios, 29/30 Windmill Street, Tottenham Court Road, London W1P 1HG. Phone: 01-580 0444.

Edwards of Glendale. As many of you will know Jack uses similar

design techniques to those employed by his former colleague Tom Hidley, so accordingly the rooms have excellent clean acoustics, are roomy, and are decorated in soft hued colours which in conjunction with subdued lighting make for pleasant working conditions. One of the features of the design is the provision of underfloor piping for the removal of swarf from the lathes.

The two disc cutting rooms are identically equipped, each has a Studer *A80* pre-listen machine together with a remote Studer *A80* for tape copying. The pre-listen machines feed Neumann *VG66* consoles which have built-in eq and level control and hi/lo pass filters, plus custom stereo width control. The lathes are Neumann *VMS66* lathes fitted with Ortofon *DSS732* cutter heads and are driven by pairs of Ortofon *G0741* cutting amplifiers providing some 500W peak per channel. The cutting amplifiers are presently housed in rack units together with Urei *I176* limiters, KH *UE400* and Lang *PEQ-2* eq, but it is intended that all the ancillary equipment will be built into the console housing in the near future, as and when time permits. With regard to monitoring equipment this comprises pairs of JBL *4343s* driven by Amcron *DC300A* amplifiers. As might be expected Pete and Dave cut all the RCA records released in the UK. Pete's predilection is to cut the majority of the classical albums including those for the Camden and Erato labels, while the remaining RCA repertoire is split between them.

Below the cutting rooms in the basement are two rooms devoted to copying. The first room is used for straightforward tape copying and is equipped with a Neve 10-channel console, a pair of Studer *A80* 2-track machines with Dolby *A360* noise reduction, plus a Technics *RS678* cassette deck and Technics turntable. Monitoring is over JBL *4315s* driven by an Amcron *DC300A* amplifier. The other copy room operated by Dave Kerr, is a cassette copy facility equipped with a pair of Studer *A80s*—one 2-track and one 8-track—and is fitted with Dolby *A360s* and Technics *RS678* cassette decks. Monitoring here, is again JBL *4315s* driven by an Amcron *DC300A*. Alongside the copying rooms is an extremely well equipped maintenance room which is the preserve of Simon Dass, the chief maintenance engineer.

Now RCA Custom Recording has moved to its new premises, it offers some of the best disc mastering facilities available. Although without the most up-to-date Neumann lathes (*à la* CBS Cutting Suite and Tape 1 Studios) the facility is more than adequate for RCA's needs. Without doubt it is an excellent facility and with a friendly, knowledgeable and approachable team operating the facility it augurs well for the quality of RCA's disc standards—with the proviso of course that their Washington (County Durham) pressing plant can produce the goods!

RCA Custom Recording, 1 Bedford Avenue, London WC1, UK. Phone: 01-499 4100.

### RCA Custom Recording, London

Situated just off London's hi-fi mecca, Tottenham Court Road, RCA Custom Recording is now at its third location in central London. Originally RCA's disc cutting facility was opened at the same time as the company's London office and was established in Exmoor Street (1967-73), moving to New Burlington Place (1974-79), prior to arriving at its present location. The facility is now in sparkling new premises in Bedford Avenue housed in the same building as RCA Records. Here I met mastering engineers Pete Norman and Dave Tucker to look over the new facilities which comprise two disc cutting rooms known as Suites A and B; a reception area and office; and in the basement a tape copying room and a cassette copying room, plus a maintenance area and master tape storeroom.

The disc cutting rooms are identically equipped and virtually the same size, the only real difference between them is that Suite A is Pete's 'home-from-home', while Suite B is Dave's. Both rooms are fully air conditioned and fully floating, and were designed by Jack





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# Cassette copying

David Tuckman (Fraser-Peacock)

**T**HE extent to which music cassettes have penetrated the recorded music market in Britain is still not fully realised today—not even in those specialist circles which ought to be aware of market trends. This is probably due to the unending weight of publicity given to LP records in the media and at point of sale. It is also, I think, partly due to the past attitudes, whether intentional or otherwise, for music cassettes to be regarded as in some way inferior to records.

It is useful to remind ourselves that among the people who matter—the buying public—cassettes are not always regarded as 'second best' and just as there are good, indifferent and in some cases, inferior quality examples of LP records, so these categories can be matched in the world of music cassettes. According to the BPI, the number of LP records delivered in the UK for 1978 were 86,060,000 units, whereas music cassettes for 1978 were 20,604,000 units. As you will see, music cassette sales amount to nearly a quarter of LP records sales.

A deeper scrutiny of these figures, however, reveals a much more complex marketing position. Whilst in 1978 the sales of prerecorded music cassettes were in fact well below those of LP records, you must take into consideration the sale of blank cassettes in this country in order to get a more realistic picture. Again, from the BPI figures, estimated sales of blank cassettes in the UK for 1978 were a staggering 61,000,000 units. According to BPI 41,000,000 units were purchased for in-home copying from radio and TV, records and tapes. The remaining 20,000,000 are used for commercial and industrial purposes such as talking newspapers etc. If one adds 41,000,000 blanks to the 20,604,000 one begins to see that the total is fast approaching the sales of LP records. For instance it is estimated by the BPI that in

**Since its launch only 15 years ago, the Philips Compact cassette has achieved absolute impact and totally replaced the prerecorded  $\frac{1}{4}$  in tape, but it has also had a poor reputation for quality, never having been conceived as a high quality medium. David Tuckman, whose company copies over 1,000,000 cassettes a year, argues that quality is possible, but at a price.**

1979—59,000,000 blanks will be used for home taping of an estimated total sales of 83,000,000. Whilst one may deplore and lament this widespread flouting of the copyright laws, the important point is that sales of cassettes, whether prerecorded or blank for music reproduction, are almost as great as sales of LP records. Here is a situation which will not please many people in the tape/LP business, except perhaps those who depend on the sale of blank cassettes for their living.

Some of us who invested fairly heavily in prerecorded cassette duplicating equipment might do worse than ponder over possible reasons for the proportional decline in sales of the 'legitimate' prerecorded cassette. Could it be, for example, that in their eagerness to make a 'fast buck' in the hi-fi world, some manufacturers have failed to supply the 'quality level' which the selling price of music cassettes warrants? As explained later, equipment exists which is able to deliver on a commercial basis, cassette copies of very high quality, provided suitable standards of maintenance and quality control are observed. But if the raw materials are of poor quality, no equipment will be able to transform them into an acceptable product. Over the years there has been a great improvement in the manufacture of cassette tape. For example, if you compare a standard low noise tape widely used by the industry with a new cassette tape made by the same manufacturer with a 2% distortion figure

using the same reference level of 250nWb/m on both tapes, from the new tape you can obtain a 6dB improvement at 10kHz with the cassette sounding far better, and this for only a very modest increase in the cost of the raw material.

Another reason why sales of prerecorded music cassettes are not making headway is, I suggest, the marketing stance of the major suppliers of recorded music. The tendency is still to give maximum weight to LP record marketing and little or nothing to the music cassette. The phrase 'also available on cassette' seen at the bottom of an advertisement or TV commercial is about the total promotional support the majority of music cassettes receive from record companies. With the correct attention to product quality by the cassette duplicating companies, along with good promotion and marketing—not least in the area of packaging which has been sadly neglected, with the notable exception of 'Music for Pleasure' and Marks & Spencer, I am certain that sales of prerecorded music cassettes would rapidly increase. This could only be in the best interests of those companies who are suffering from home taping which is so widespread today.

Having stated the market position, I shall now go on to discuss the problems involved in producing prerecorded music cassettes of the highest possible quality on a commercial basis. I emphasise the last point since there is little difficulty in producing superb sound under research laboratory conditions—at a

cost! Incidentally, commercial considerations are often overlooked by companies who find themselves having to make small or medium sized production runs of music cassettes for various purposes. For example, take the making of demo cassettes by recording companies after the master has been made. Because this is regarded as an incidental stage, an irritating but necessary chore, companies often use dubbing room facilities to make these cassettes on a one to one basis. In my view this is grossly uneconomic because it effectively ties up expensive dubbing room equipment and time. Modest expenditure on a high-speed desk top cassette copier would allow the demo cassettes to be made by juniors and leave the dubbing room free. Such copiers, capable of producing cassettes of high quality, are ideal where small runs are required.

The simplest method of duplication is of course from one cassette recorder to another on a one-to-one basis at real time—obviously a lengthy process and practical only where time is unimportant and the number of copies required is the absolute minimum. A typical desk top cassette duplicator will provide high quality copies from a master cassette at 13.3 times the original speed. A frequency response of 40-10,000Hz $\pm$ 3db can be obtained with a signal to noise ratio within 3db of the master cassette. Slave modules can be added when required to give additional copies in one pass.

Where larger runs are needed, it is almost certainly more economical to have them made by a company specialising in high-speed mass production of prerecorded cassettes. But here capital expenditure can be considerable and quality production on a mass production basis will only be achieved by using the most reliable high-speed duplicating and tape winding equipment in

near clinical conditions. To set up a medium sized duplicating plant, an investment of approximately £200,000 is required to manufacture a high quality product on a commercial basis. As with all professional equipment the costs might seem to be very expensive—for instance a machine to wind cassette tape into the empty C-O housing costs approximately £7,500 and a number of these are required to mass produce music cassettes.

At the heart of a mass duplicating system is the master reproducer. The master tape is a standard 1in tape recorded at  $3\frac{3}{4}$ in/s and replayed on the duplicating system at 240in/s. The recording is made to an international standard, the 1in tape being divided up into four tracks, giving two stereo pairs on the master tape. The loop bin system is used to give continuous replay working at 64:1 and the system has a frequency response of 40Hz to  $15\text{kHz} \pm 3\text{db}$ , the bias frequency being 10MHz. The use of this frequency eliminates the problem of biased beat distortion as the bias frequency is approximately 10 times that of the audio frequency. As the  $3\frac{3}{4}$ in/s production master is replayed at 240in/s this necessitates having a bandwidth of approximately 1MHz. The music cassette made on this type of equipment will typically have a frequency response of 40Hz to  $15\text{kHz} \pm 3\text{db}$ .

Heavy investment in the best equipment and a good factory layout are only part of the story. Just as important are the highest possible standards of engineering maintenance and product quality control. By quality control, I mean not merely systematic checking of the duplicated pancakes but also the checking of a reasonable proportion of the finished cassettes. In my view, a quality control check of one in four duplicated cassettes is not an unreasonable proportion. Some interesting technical developments have taken place in the area of quality control. A very useful aid was the introduction of a torque test unit for cassettes. This unit allows an accurate measurement of the friction in a cassette before and after tape is loaded into an empty C-O housing.

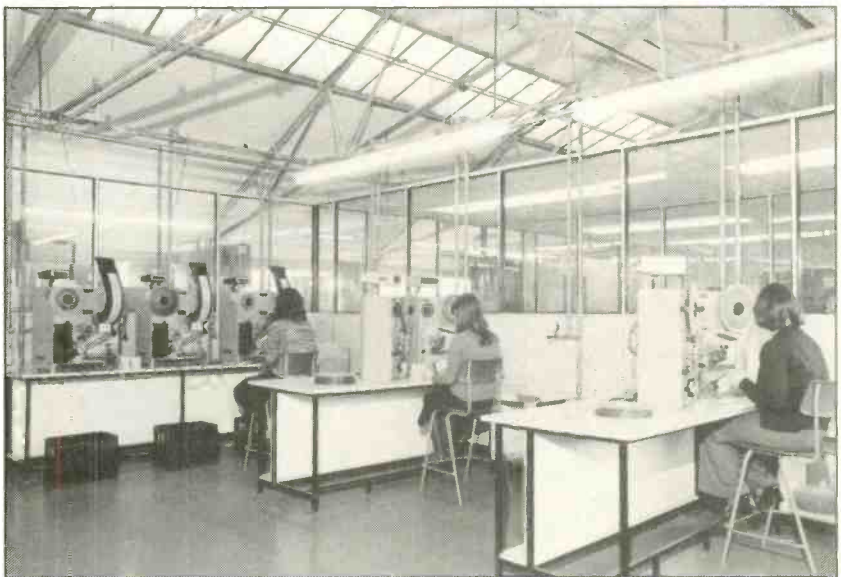
One of the problems of high-speed production is how to ensure that the ferrite recording heads are reproducing properly. Under normal conditions an oscilloscope and microscope are needed to check the recording heads for wear. When checking the recording heads under a microscope, it is usual that this operation is not carried out in situ. This is very expensive in down time of equipment. My own company was instrumental in having P & J Sibert develop a tape photo micro-

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*Tape duplicating room using Gauss 1" mastering playback machine with loop bin, and four tape duplicators*



*Winding of tape into cassette housings, manual machines in foreground, automatic machines in background. In both cases, the tape is precisely measured and leaders added*



*Automatic labelling and packing machine*



## Cassette copying

scope which allows regular examination of recording heads on the duplicating slave to be made in situ. Advantages in using this instrument include allowing one to optically examine recording tape head gaps, with a magnification of 312. The viewing screen has a cross line for measuring track widths connected to a micrometer gauge which allows the measuring of recording head dimensions, to check that they meet manufacturers' specifications, and finally the built in Polaroid back allows a photograph of the tape head to be taken for further analysis and to be kept on file for reference.

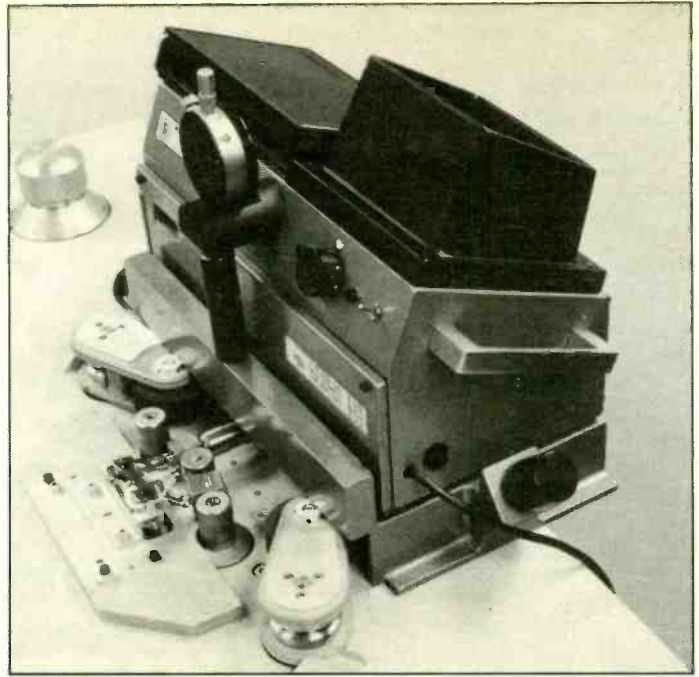
If quality is the aim, no cassette duplicating company can afford to neglect developments of this kind. They must be prepared to invest in such equipment and accept manufacturers' modifications to ensure better quality of the end product. All this attention to detail becomes ever more necessary as duplicating speeds increase. About 12 years ago we all thought that cassette copying systems capable of duplicating at a ratio of 8:1 were impressive while, incredibly, we are today duplicating at 64:1 and the results being obtained, are in my opinion, equivalent to the record without the static 'clicks and bumps' that we have all sadly come to accept! But the faster we go the better we have to be. Planned preventive maintenance and strict quality control at all stages must be considered as essentials and not as luxuries.

My own view is that meticulous attention to detail can more easily and constantly be achieved by a medium sized company than by larger manufacturers. Whether that view is shared or not, what is certain is that any company in the cassette duplicating business must be able to offer a high standard of personal service and have the flexibility to accommodate small production runs whether it be the record producer or the record company itself that requires them.

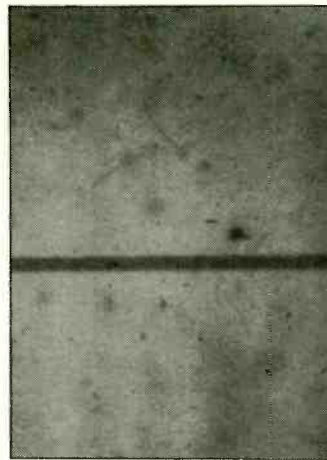
Service is not the only thing the record industry requires. They also need, and are surely entitled to, protection against the piracy of tapes which is so widespread today. In the industrial and music field particularly, those who wish to protect their interests should take care to deal only with reputable firms and to look suspiciously at 'bargain basement' offers—the pirates who make and sell illicit copies on the side have given the music cassette business a bad name.

With 61% of households now possessing a cassette player/recorder and one in 10 cars fitted with a cassette player (these figures from BRMB/Forte survey 1978) I believe there is an expanding future for the mass produced cassette.

*Tape photo microscope being used to examine heads on Gauss tape duplicators, allowing visual and permanent Polaroid records to be kept of actual head gap*

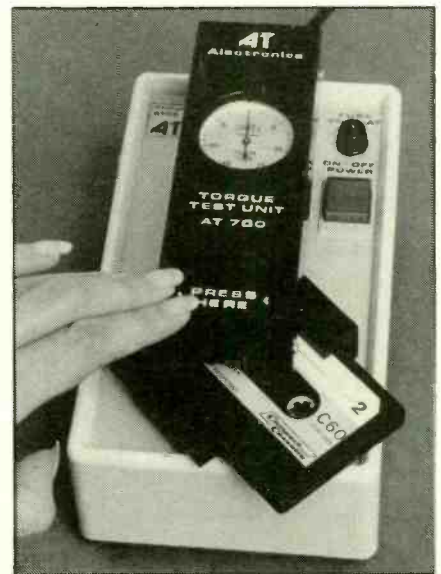
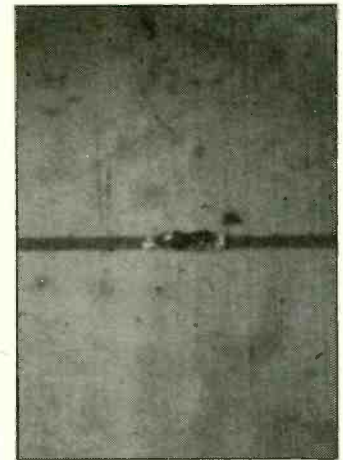


*Good and poor head gaps, the latter crumbling at the edge*



**Bottom far right:**  
*Cassette tape torque test unit*

**Below:**  
*Typical small scale copying set up with 3M/Wollensak equipment*







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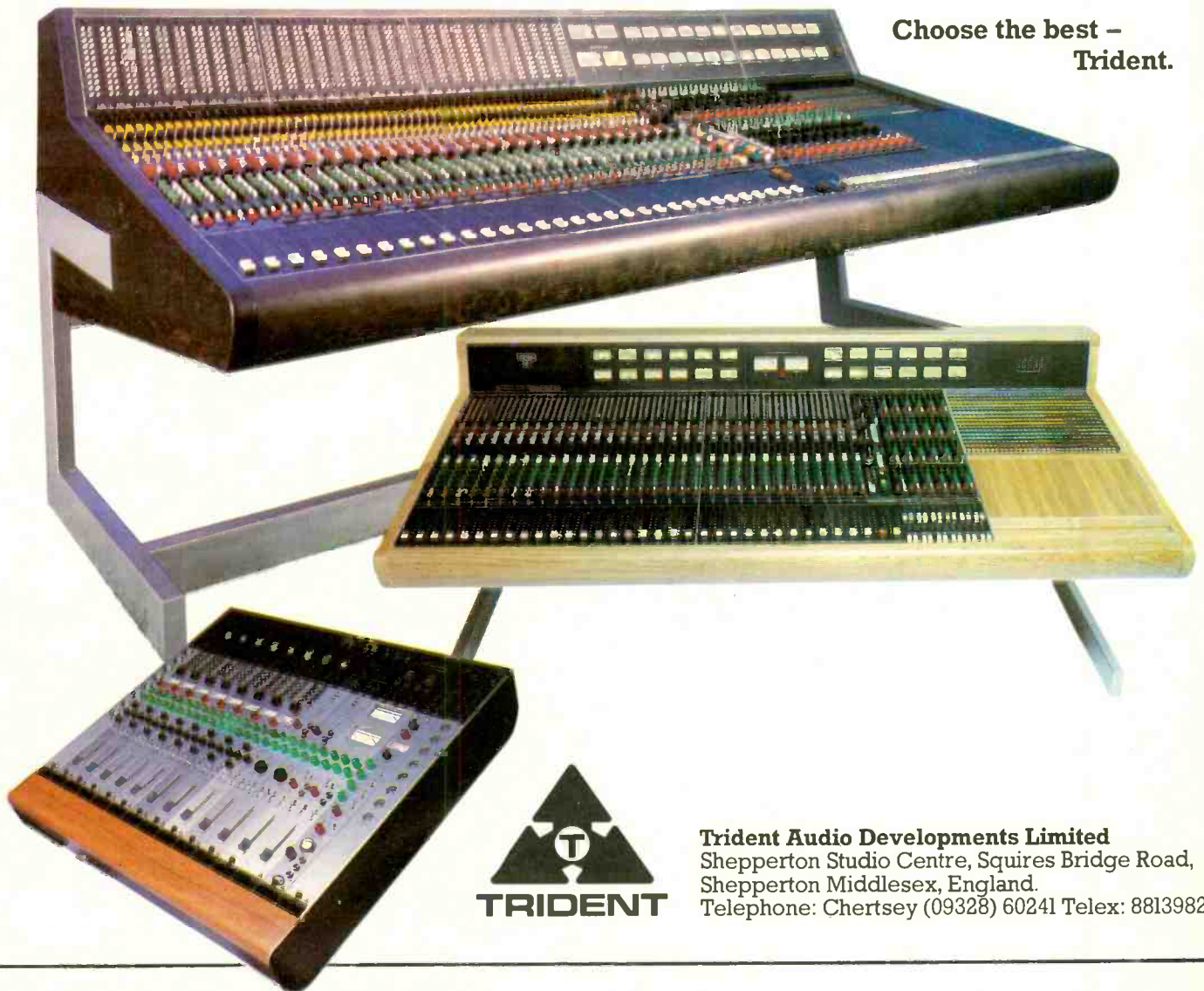
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# Survey: tape duplicating equipment



Unlike the previously published survey of Tape Duplicating Equipment, this time around we have only included equipment capable of producing finished *Compact* cassettes, rather than that producing recorded tape and requiring additional loading machinery. This is primarily because the latter equipment is used for 'manufacturing' cassettes, rather than studio applications for copying small runs, which is where *Studio Sound* is aimed. Likewise, we have not yet published a survey of disc presses or compound mixing vats.

## ACCURATE SOUND (USA)

Accurate Sound International Inc, 114 5th Avenue, Redwood City, Cal 94063, USA.  
Phone: (415) 365-2843. Telex: 348327.

### MODEL 2400

Available in a variety of formats for reel-to-reel, reel-to-cassette, etc. 'Constant tension holdback' is said to extend head life, reduce tape stretch and ensure speed and timing accuracy by eliminating capstan slippage. A slow-start option, which delays capstan motor start until play mode is initiated and capstan idler is engaged, is claimed to reduce start-up problems with large pancakes. An automatic cue option may be used for single runs, or preset for any number of copies; a digital readout shows the number of cycles remaining. Extended frequency response is said to be achieved by integrating plug-in master playback amplifier (with special gap loss equalisers) into the head assembly. Slave head assembly incorporates bias and record level calibrations for rapid format changes. Eq and playback level on master can be changed via plug-in preamp cards in head assembly.

Tape width: 0.15in,  $\frac{1}{2}$ in,  $\frac{3}{4}$ in.

Duplicating ratio: 4, 8 or 16:1 ('full bandwidth'); 32:1 ('educational applications').

Duplicating speed: 30/60 or 60/120in/s standard; 15/30/ins to special order.

Reel size: 14in max.

Frequency response: 30-18kHz +1, -3dB.

Signal-to-noise: better than 3dB below blank biased tape. (Scotch 176, 1-10kHz realtime.)

Speed error: <0.5% (overall).

Flutter contribution: 0.15% rms, NAB-weighted (overall).

Stereo phase error: <45° at 18kHz.

Dimensions (h x w x d): slave 77.5 x 67.9 x 74.3cm; master 109.8 x 67.9 x 74.3cm.

Weight: slave 69kg; master 86.3kg.

## ALPHA (USA)

International Audio Inc, 2934 Malmo Drive, Arlington Heights, Illinois 6005, USA.  
Phone: (312) 956-6030.

### ALPHA SERIES

Available in four different models for mono or

stereo cassettes, in either master/slave or slave/slave combinations. Originates and records on cassette. Decks have five motors to eliminate pulleys etc, with common capstan motor and individual winding motors, and copy at 16x normal speed. Automatic rewind of cassettes at end of programme, visual warning cassette length insufficient for programme, visual indication of cassette malfunction during run, auto record levels.

Track format: mono 2-track, or stereo 4-track.

Duplicating ratio: 16:1.

Duplicating speed: 30in/s.

Frequency response: 40Hz to 10kHz  $\pm$ 3dB.

Signal to noise: within 3dB of master.

Wow and flutter: 0.2% max rms.

Crosstalk: 50dB.

Dimensions: 33 x 22 x 37cm, 13kg.

Prices: on application.

## INFONICS (USA)

Infonics Inc, PO Box 111, 238 Hwy 212, Michigan City, Indiana 46360, USA.

Phone: (219) 879-3381. Telex: 233111.

France: Audiomatic Inc, 4 rue Ficatier, F-92400 Courbenoie, France.

Phone: (1) 333.30.90. Telex: 620282.

### 200 SERIES

Range of cassette duplicators using either open reel or cassette masters. Slaves come in banks of four, in 2- or 4-track for mono or stereo, and slaves are available with either 2 or 4 motors, the latter providing fail stop, trouble lights and auto rewind. Masters are available using  $\frac{1}{2}$ in tape with two or four tracks (optional  $\frac{3}{4}$ in tape transport), and in versions with auto stop, and cue, or a model for Dolby-B playback. Master cassettes have auto stop, and track select. All cassettes have ferrite heads.

Duplication ratio: 10:1.

Duplicating speed: 20in/s cassette, open reel 40, 80 or 160in/s.

Frequency response: 30Hz to 16kHz within 3dB.

Signal to noise: not stated.

Distortion: 0.9% thd.

Crosstalk: better than 60dB, stereo pair 40dB.

Wow and flutter: 0.1%.

Prices: on application.

## 3M WOLLENSAK (USA)

3M Mincom Division, 3M Centre, St Paul, Minn 55101, USA.

Phone: (612) 733-1110. Telex: 297434.

UK: 3M UK Ltd, PO Box 1, Bracknell, Berks RG12 1JU.

Phone: 0344 26726. Telex: 849371.

### 2770 ES

Desktop cassette copying system comprising one master and two slaves. One or both tracks can be duplicated in a single pass; C-30 copy and rewind in 100s, C-60 in 200s. Manual or automatic recording level, plus adjustable bias.

Track format: half-track 2-channel mono.

Duplicating ratio: 13.3:1.

Duplicating speed: 25in/s.

Frequency response: 40-10kHz  $\pm$ 3dB.

Signal-to-noise: within 3dB of master.

Distortion: <1%, typically 0.5%.

Wow and flutter: within 0.15% (DIN-weighted) of master.

Crosstalk: better than 50dB at 1kHz.

Dimensions: 46.9 x 31.7 x 16.5cm.

Weight: 15kg.

Power: 240V 50Hz 200W.

Price: £1,102.

### 2780 ES

Add-on unit for 2770 comprising three slaves. Dimensions, weight and mechanical and recording specifications similar to 2770.

Price: £1,030.

### 2780ES/S

Basically similar to 2780ES, but stereo.

Price: £1,158.

### 2772ES

Desktop cassette copying system comprising one master and two slaves.

Track format:  $\frac{1}{2}$ -track-2-channel stereo.

Duplicating ratio: 13.3:1.

Duplicating speed: 25in/s.

Signal-to-noise: within 3 dB of master.

Wow and flutter: 0.15% rms max.

Crosstalk: 40dB min at 1kHz.

Dimensions: 46.9 x 31.7 x 16.5 cm.

Weight: 15 kg.

Price: £1,152.

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France **3M France SA, Mincom Div.** Boulevard de l'Oise, 95000 Cergy Tel: Paris 749 0275  
 Germany **Audiolive** Kyffhauserstrasse 10A, 5 Köln 1 Tel: Köln 230910  
 Holland **Pieter Bollen Geluidstechnik** Hastelweg 6, Eindhoven Tel: Eindhoven 512 777  
 Sweden **Tal & Ton Musik & Electronic AB** Kungsgatan 5, 411-19 Gothenburg Tel: Gothenburg 130 216  
 Spain **Mike Llewelyn-Jones** AP Postal 8.178 Madrid Tel: Madrid 637 0752

## SURVEYING: TAPE DUPLICATING

### 2790ES

Portable cassette duplicator with master and slave transports mounted in carrying case. Specification basically similar to 2770ES, but only single slave.

**Weight:** 9.5kg.  
**Price:** £792.

### OTARI (Japan)

**USA:** Otari Corp, 981 Industrial Road, San Carlos, Cal 94070.

**Phone:** (415) 593-1648.

**UK:** Industrial Tape Applications, 1-7 Harewood Avenue, Marylebone Road, London NW1.  
**Phone:** 01-724 2497. **Telex:** 21879.

### DP-4050-OCF

A self-contained unit comprising one reel-to-reel master and six cassette slave transports.

**Track format:** master, two head stacks switchable as 4-track stereo or 2-track mono on  $\frac{1}{2}$  in tape; slaves, 4-track in-line heads.

**Duplicating ratio:** 8:1.

**Duplicating speed:** master 60 and 30in/s ( $7\frac{1}{2}$  or  $3\frac{1}{2}$ in/s original); slave 15in/s.

**Reel size:** master  $10\frac{1}{2}$ in; slave C-30, C-60 or C-90.

**Frequency response:** 50-10kHz  $\pm 3$ dB.

**Signal-to-noise:** >50dB.

**Crosstalk:** >45dB between channels 2 and 3; 30dB between 1 and 2.

**Bias frequency:** 400kHz (adjustable).

**Dimensions (w x d x h):** 53.3 x 79.4 x 76.8 cm.

**Price:** £4,190.

### PENTAGON (USA)

**Pentagon Industries Inc,** 4751 North Olcott, Chicago, Ill 60656.

**Phone:** (312) 867-9200. **Telex:** 253058.

**UK:** Visual Marcom Systems Ltd, 49A Thames Road, Strand on the Green, London W4 3PP.

**Phone:** 01-995 8345. **Telex:** 23678.

### C100/C400

Desktop unit comprising master and slave cassette decks providing copying with a 16x ratio, and a duplication speed of 30in/s. Units include automatic rewind, adjustable bias, and a 'short copy' light which indicates insufficient tape to complete copy. Available in either mono 2-track C100 or stereo 4-track C400.

**Price:** on application.

### C8

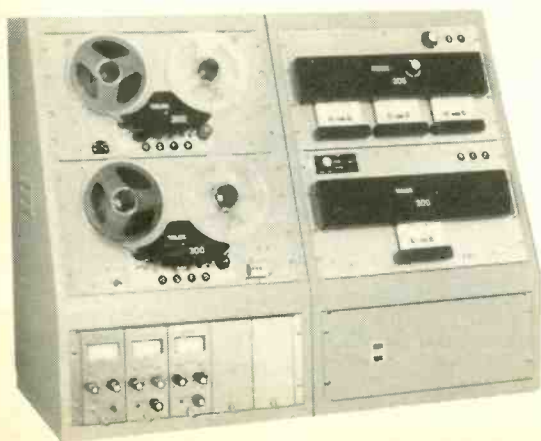
Desktop 8-track cartridge copier which copies all four stereo programmes in one pass, with master and slave decks in same unit. Duplication ratio is 8x with a duplication speed of 30in/s. A single capstan drives both transports. Features include a 'short copy' indicator, and an edit mode to chop programme material to fit cartridge.

**Price:** on application.

### PRO-SERIES

Reel-to-reel, reel-to-cassette, cassette-to-cassette

*Telex 300 tape duplicating system.*



systems available. Modular system with variety of master/slave configurations. Table-top or console versions of reel-to-reel masters and slaves. Features include: 'failsafe audio/bias monitoring'; automatic rewind, cue and restart; and individual cassette audio/bias adjustment.

**Track format:** 2-track mono, 4 or 8-track stereo, on  $\frac{1}{2}$ ,  $\frac{1}{4}$  and 1in reel-to-reel or 0.15in cassettes or pancake.

**Duplicating ratio:** 8 or 12:1.

**Duplicating speed:** reel master and slaves 30 and 60in/s, and 45 and 90in/s; pancake slaves 15 and 60in/s, and 22 $\frac{1}{2}$  and 45in/s; cassette master and slaves 15 and 22 $\frac{1}{2}$ in/s.

**Reel size:** master and slaves  $10\frac{1}{2}$ in.

**Frequency response:** reel-to-reel ( $\frac{1}{2}$ in) 40-12.5kHz  $\pm 3$ dB ( $3\frac{1}{2}$ in/s copy from  $3\frac{1}{2}$ in or  $7\frac{1}{2}$ in/s master), 40-15kHz  $\pm 3$ dB ( $7\frac{1}{2}$ in/s copy and master) and 40-15kHz  $\pm 2$ dB (15in/s copy and master); reel-to-cassette 40-12.5kHz  $\pm 3$ dB; cassette-to-cassette 40-10kHz  $\pm 3$ dB; reel-to-pancake 40-12.5kHz  $\pm 3$ dB.

**Signal-to-noise:** adds no more than 3dB to inherent noise level of bulk-erased tape.

**Distortion:** <0.2% thd at normal operating level; record amp overload margin 35dB.

**Bias frequency:** 500kHz.

**Wow and flutter:** reel-to-reel 0.12%; reel-to-cassette 0.2%; cassette-to-cassette 0.25%.

**Crosstalk rejection:** (at 1kHz) 2-track cassette 55dB min 'between stereo programs'; 4-track cassette 50dB min between adjacent stereo tracks.

**Equalisation:**  $\frac{1}{2}$ in masters NAB; cassette masters Philips 120-1590 'micro-inch curve'.

**Dimensions (w x h x d):** reel master, reel slave, and 4-position cassette slave 63.5 x 21.6 x 36.8cm; electronics 63.5 x 44.4 x 31.7cm. (Table top versions; consoles measure 51.4 x 76.2 x 63.5cm.)

**Weight:** reel master and reel slave 23kg; electronics 16kg; 4-position cassette 19kg. (Table top versions; console weights vary.)

### SONY (Japan)

**USA:** Sony Corp of America, 9W 57St, New York, NY 10019.

**Phone:** (212) 371-2823.

**UK:** Sony UK Ltd, Pyrene House, Sunbury-on-Thames, Middx.

**Phone:** 09327 89581. **Telex:** 266371.

### CCP/ORM SERIES

Cassette duplication system using either open reel or cassette for masters, with various combinations of master and slave units. ORM-10 is the open reel  $\frac{1}{2}$ -track master machine taking 7in spools, CCP-13A is a master plus three slaves duplicator, CCP-11 master and one slave, CCP-04A contains four slaves, and CCP-02 only two slaves. Units are switchable 2 or 4-channel, have automatic rewind and automatic stop. The normal master unit will drive to separate slaves systems (with two or four decks), and for larger systems, the AA-10 allows up to 10 slave units to be added.

**Duplicating ratio:** 8:1.

**Duplicating speed:** open reel 30 or 60in/s, cassette 15in/s.

**Frequency response:** 50Hz to 10kHz.

**Signal to noise:** 45dB.

**Wow and flutter:** 0.2%.

**Prices:** about ORM-10 £1,495, CCP-13A £1,995, CCP-11 £1,050, CCP-04A £1,895, CCP-02 £995, AA-10 £240.

### TELEX (USA)

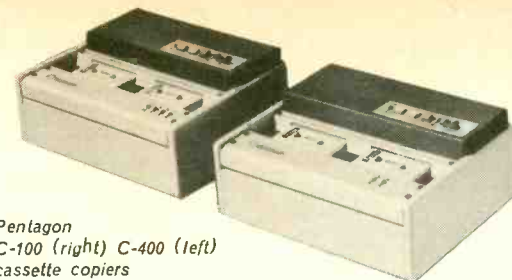
**Telex Communications Inc,** 9600 Aldrich Avenue South, Minneapolis, Mn 55420, USA.

**Phone:** (612) 884-4051. **Telex:** 297053.

**UK:** Avcom Systems Limited, Newton Works, Stanlake Mews, Stanlake Villas, London W12 7HA.  
**Phone:** 01-749 2201. **Telex:** 897749.

### MODEL 300

A modular console-mounted system available in reel-to-reel, reel-to-cassette, and cassette-to-cassette configurations, or in any combination. Basic



Pentagon C-100 (right) C-400 (left) cassette copiers

units comprise: open-reel master transport; open; reel slave transport; cassette master transport; slave module containing three cassette transports; plus record amp and bias oscillator modules. Each console will accept two transports and up to five modules.

**Track format:** half-track 2-channel, or quarter-track 2 and 4-channel.

**Duplicating speed:** reel master 15 and 30 in/s; reel slave  $7\frac{1}{2}$  and 15in/s; cassette master and slave  $7\frac{1}{2}$  and 15in/s.

**Frequency response:** cassette-to-cassette and reel-to-cassette 30-10kHz  $\pm 3$ dB at  $1\frac{1}{2}$ in/s; reel-to-reel 80-40kHz  $\pm 3$ dB (sic) at 15in/s and 40-20kHz  $\pm 3$ dB at  $7\frac{1}{2}$ in/s.

**Signal-to-noise:** cassette-to-cassette 45dB; reel-to-cassette and reel-to-reel <3dB degradation from master tape, 55dB peak at  $7\frac{1}{2}$  or 15in/s.

**Distortion:** <1% thd at 1kHz at '0' vu and  $7\frac{1}{2}$ in/s.

**Bias frequency:** 300kHz.

**Wow and flutter:** cassette to-cassette and reel-to-cassette 0.25% rms; reel-to-reel 0.17% rms at 15in/s and 0.2% rms at  $7\frac{1}{2}$ in/s.

**Crosstalk rejection:** cassette-to-cassette and reel-to-cassette  $\frac{1}{2}$ -track 2-channel 45dB at 1kHz,  $\frac{1}{2}$ -track 2-channel 30dB stereo channel separation at 1kHz,  $\frac{1}{2}$ -track 4-channel 50dB stereo channel separation at 1kHz and 50dB adjacent stereo program at 1kHz-reel-to-reel >50dB at all frequencies.

**Equalisation:** cassette-to-cassette front-panel switching, Philips (unspecified) standard; reel-to-cassette and reel-to-reel front-panel switching NAB and FIA.

**Rewind times:** C-30 in 24s, C-90 in 62s; 366m of tape in 60s.

**Speed regulation:** cassette-to-cassette 0.8%; reel-to-cassette master 0.5% and slave 0.8%; reel-to-reel 0.5% long term.

**Dimensions:** console 80.3cm high, 52.7cm wide, 47cm deep at base, and 21.9cm deep at top. Front panel accepts two transports mounted at 67° angle.  
**Weight:** transports 16kg; consoles 8.2kg; electronics 13.6kg.

**Prices:** reel-to-cassette, three to nine slaves £2,191 to £4,677; cassette-to-cassette, three to nine slaves £2,285 to £4,789; reel-to-reel with a single slave £1,892 to £2,614; extra slaves £640 to £678 each.

### COPIER I, II, IV, V AND COPYETTE 1+1

Desktop, self-contained cassette copying system. Copier I and IV are master/slave units; Copier II and V add-on slaves containing two transports. Two slaves can be added to one master, the slaves depending on the master for power and operating control. Copiers IV and V feature additional track-select facilities, and a bias select switch for ferric oxide or chromium dioxide tape. Copyette I+I is similar to I, but less auto erase and add-on capability.

**Track format:** I and II half-track 2-channel; IV and V quarter-track 4-channel.

**Duplicating speed:** I and II 30in/s; IV and V 'over 20in/s'.

**Frequency response:** 40-10kHz.

**Signal-to-noise:** 45dB below reference level.

**Distortion:** typically <1% thd at 7dB below 'zero' level.

**Bias frequency:** I and II 600kHz; IV and V 500kHz.

**Wow and flutter:** less than 0.25% contribution to cassette copy (ANSI Standard S4.3-1972).

**Crosstalk rejection:** >45dB at 1kHz.

**Equalisation:** RIAA and DIN.

**Rewind time:** automatic at 70in/s.

**Dimensions:** (w x d x h): 39.4 x 45.1 x 19.1cm.

**Weight:** 14.5kg.

**Prices:** Copyette I+I £350; I £740; II £740; IV £950; V £950.

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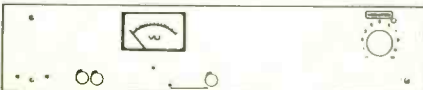
Tick the facilities that interest you



Stereo + Mono Track Selection + Dolby



Stereo + Mono Track Selection + Mic inputs



Mono



Mono + Mic input

### Basic Type

Mono

Stereo

(incl. Mono Selection)

Line in/Line out

Microphone Input(s)

### Heads

Mono - Full Track

- Half Track

Stereo - Half Track

- Quarter Track

### Tape Speeds (3)

High 15"/7 1/2"/3 3/4"

Medium 7 1/2"/3 3/4"/1 7/8"

Low 3 3/4"/1 7/8"/1/2"

### Equalisation

IEC/CCIR

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### Optional Facilities

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# NEAL FERROGRAPH



### Oh Rats

TALKING of cinema sound I have it on good authority that when Sensurround (the system which sets out to replicate the thundering sound of a real live earthquake) was first tried out in one large American movie theatre the installation revealed unexpected benefits in the area of pest control. As the engineers installing the system cranked it up to full power under test, the cinema was suddenly filled with a plague of rats. The unfortunate creatures had rapidly evacuated the basement as it started to shudder with what they assumed was an earthquake. And when a cinema in the Deep South of the USA first installed Dolby equipment to screen *Days of Heaven* they too came face to face with nature. The film soundtrack features the dulcet tones of crickets in hi-fi. On opening night all went well. But as the movie finished and the curtains closed the insect sound persisted. As the house lights came up all was revealed. The stalls were full of happy crickets lured in from the surrounding fields by the hi-fi reproduction of what they took to be mating calls.

### Film sound, again

WE REPORTED on several Dolby film sound developments and, despite them, the continuing overall poor state of cinema sound reproduction. Here is the latest news. *The Buddy Holly Story* is one of the very few non-Dolby, 4-track magnetic sound films to be released recently. Most stereo films are now either in 70mm magnetic 6-track or Dolby optical stereo format with matrix-encoded surround and derived centre front tracks. Sadly, the Buddy Holly press screening was yet another disaster in the annals of cinema sound. After a delayed start, due to a faulty arc-rectifier at the Classic Haymarket, the film was finally unleashed with the surround-sound wick turned up so high that the amps clipped, the effects speakers buzzed and the unfortunate audience was left gasping for aspirin. In physical pain at the awfulness of it all I went off looking for the manager. He was out in the foyer discussing seating plans on the telephone. "You're lucky to be seeing it in stereo at all," was his considered view of the situation.

Too many cinema managers and projectionists seem to work on the principle that it's a waste of money to have a surround-sound track available and not play it loud. Magnetic projectors have readily accessible pre-amp gain controls for each separate track. But, wisely, Dolby have buried their surround-sound gain control inside the electronics as a preset pot, safe away from over enthusiastic fingers.

Until recently Dolby Labs were the only people making any serious attempts at improving the overall standard of film sound reproduction. It seems that once the film industry had arrived empirically at their Academy Curve in the early Thirties, as the best possible compromise for squeezing

intelligibility out of the relatively primitive sound systems then available, everyone just sat back, relaxed and forgot about audio—at least until the advent of magnetic sound in the Fifties and Dolby sound in the Seventies.

In London recently, John Mosely released a few more details of the Kintek sound system. Mosely will of course be known to many engineers for his involvement over the years in a wide range of projects, including Sansui QS quadraphonics and the Quintophonic sound system used for the movie version of *Tommy*. Indeed some of the liveliest ever AES meetings featured Mosely and the late Ben Bauer at loggerheads.

Whereas the Dolby stereo optical track is a logical and superficially simple development of the conventional mono optical track, achieved simply by splitting it down the middle as Blumlein had done in the Thirties, Mosely's Kintek system represents a whole new approach to optical sound recording and reproduction.

Kintek uses dbx encoding and crams seven separate audio channels in the space normally occupied by a single optical mono or Dolby stereo track. One of these seven is a conventional Academy mono optical bilateral variable area track. This makes a Kintek track compatible with all existing cinema projectors, albeit with a worsened signal-to-noise ratio due to the reduced Academy track width. The other six Kintek tracks are very narrow snakes which are AM modulated in push-pull. Four tracks offer discrete right, centre and left of the screen plus surround. The other two tracks are locator and command tracks which serve four functions. The locators provide a reference point for anti-weave, they confirm to the projector electronics the presence of a Kintek track, they can carry up to around a million coded control functions (for instance to operate cinema lights and so on) and by FM encoding they can carry any low frequency information which should be handled by a separate bank of speakers, eg for music or effects bass enhancement. The crux of the Kintek system is a CCD (Charge Coupled Device) array of 256 cells which is used to read the tracks instead of a conventional photo cell. Because the tracks are push-pull modulated the CCD array produces a quasi digital output (of standard video type) which depends solely on the transitions between light and dark registered for each track. In this way the system ignores any dirt or scratches except those which cross a light/dark boundary and produce a signal which exceeds a preset slicing level. Mosely claims that the system is capable of offering a 20Hz-20kHz band width of the four audio channels, with a dbx decoded signal-to-noise ratio of 80dB and crosstalk between tracks in excess of -70dB. So the system could be used for multi-lingual tracks as well as multi-channel stereo. More details of the snake waveforms used will be available when the next batch of Kintek patents have been filed.

It is clear that the Kintek system warrants serious consideration, even though competition within the audio engineering ranks is what the future of cinema sound needs like a hole in the head. The dead wood still actively passive in the film business is always looking for any excuse to stick with the Academy Curve and leave well alone. Compatibility is one crucial issue. Another is cost to the parsimonious film industry. As far as can be established from the information so far available, existing mono projectors will play either a Dolby stereo or a Kintek track, in mono only of course. A Dolby stereo projector can only hope to play a Kintek track in mono but a Kintek projector could perhaps (by suitable switching of the CCD array cells) be persuaded to play a Dolby stereo track in stereo. Dolby has an obvious commercial advantage over Kintek, because so many films and cinemas are now Dolbied and at reasonable cost. But Kintek appears to have technical advantages over Dolby. Some are obvious, such as push-pull track reading and discreteness of separate tracks for multi-lingual issues, and some not so obvious. For instance, although Dolby stereo tracks are in theory mono-compatible, in practice most Dolby films are issued in dual inventory, some prints being mono-optical and others stereo-optical. The incompatibility is artistic rather than technical. Surround-sound, plus centre, left and right of screen tracks are all matrix-encoded into the basic Dolby 2-channel stereo format. As any engineer who's ever mixed a matrix-encoded stereo recording will know only too well, it's well nigh impossible to find a mix which is equally ideal for mono, stereo and surround reproduction. Is it too much to ask for Dolby and Kintek to get together and talk behind the scenes, and so avoid encouraging the film moguls to run for shelter under their Academy Curve?

### Cheers, mine's a Bosendorfer

ONE NOTABLE exception from the recent Honours Lists was the Sex Pistols group. A few musicians around London reckon this to be an oversight. The group, they say, deserves at least one award for 'services to music'. How come? Well there's a certain London recording studio that for years had muddled along with a piano that made a lot of musicians very unhappy but was never quite bad enough to merit junking. Then one day, shortly before their much publicised EMI and Bill Grundy excursions, the Sex Pistols came in to record a couple of tracks. By the end of the session there was no longer any doubt over the piano's future. It was sold off to a percussionist who had apparently been searching for a piano that sounded like a xylophone. It's replacement is a lovely Bosendorfer, which cost around six grand. Keyboard session players enjoying its splendour daily drink a toast to the late unlamented Pistols.

## Concerts, inside or out?

I RECENTLY saw the pre-publication draft of a series of hi-fi reviews which, although anonymous, had been sourced from some eminent gentlemen of audio. To evaluate the hi-fi equipment, recordings of classical music and solo classical instruments had been used. Why? Because, according to the reviewers, the listeners involved were generally familiar with the sound of live musical instruments. Maybe. Maybe not. I wonder how many people today actually listen to real live musical instruments? They go to live music concerts, yes. But do they hear the music acoustically live? I wonder for instance how many people who go along to the summer concerts held at the Crystal Palace and the Kenwood open air bowls subsequently talk down to their pop oriented acquaintances about the sound of 'real live music'. For years I've been making occasional visits to the Kenwood bowl for summer Saturday night concerts, and in 1978 was surprised to hear the strings suddenly sounding just a little bit boxy, the woodwinds just a little bit edgy and some odd audio peaks on sudden brass entries. On the other hand, it was the first time in years that I'd actually heard most of what the strings were playing despite the usual noise of jumbos overhead, wind in the trees and German au pairs wondering aloud how the concert-meister had managed to train the Kenwood swans to swim out across the lake at just the right Tchaikovsky ballet music climax. I checked with the GLC who run the Kenwood Concerts and sure enough they confirmed that the music is now being miked up. For a couple of years it was just by way of experiment for the odd concert, usually by youth orchestras who can't muster the wind and lip of the RPO. Then a policy decision was taken for the 1978 season and R G Jones of Wimbledon were contracted to add a little electronic aid to both the Crystal Palace and Kenwood concerts on a regular basis. The GLC's brief to R G J was to give the strings and woodwind just enough lift to cut through whatever extraneous noise is floating round at the time. It's all on an ad hoc basis; the more wind and the more jumbos the more the electronic lift. In other words those 'real live' acoustic concerts are now electronically compressed. And rather a pity, I feel, they're manually rather than automatically compressed. That's to say an engineer rides the faders. Six AKG 202 mics are used, each high on a boom above the first violins, second violins, woodwinds, violi, celi and harp if there is one. The mics feed a relatively simple 120W, 100V line PA system with an R G J 60W fibreglass column speaker hidden in the bushes, one each side of the Kenwood bowl and angled to fire out across the water of the lake. Because the mics are high and loose, the trick is to ride the faders so that only the strings and woodwinds get any lift. As I heard for myself it's usually, but not always, successful. Also, although cranking up the level to defeat the wind in the willows has its advantages, there's

no way you can pipe the whole string and woodwind sections of an orchestra through a couple of PA columns and not end up with a slightly boxy sound.

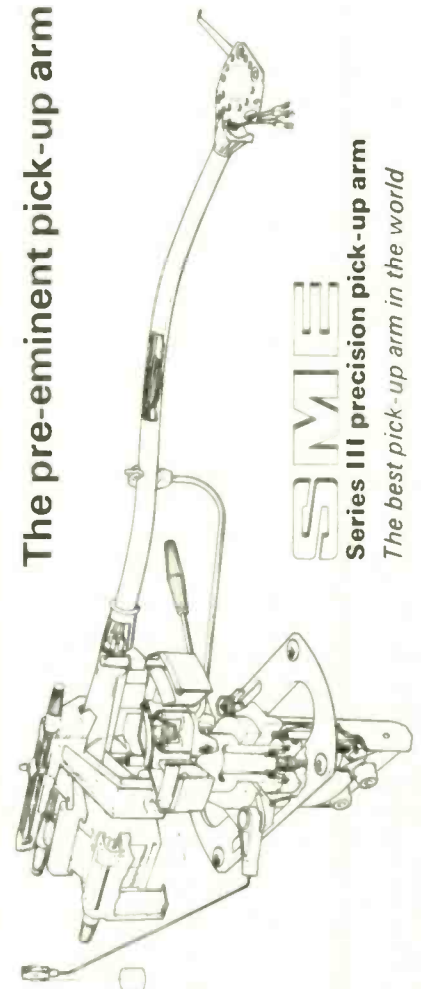
Predictably the musicians involved have mixed feelings. As one string player put it to me: "In the old days we just played everything louder, *pp* for *p* and *ff* for *f*". But even that wasn't always enough. After all, I doubt whether even Beethoven when he wrote his Pastoral had in mind several thousand picnics on a grassy slope beneath the main 747 flight path into London's Heathrow. The only thing that bothers me now is how many of those thousands of picnics go away thinking they've heard 'real live' acoustic music. Perhaps even a few of them are hi-fi reviewers all set to spend Monday judging the performance of audio equipment. At Crystal Palace they're now using Crown DC300s into 100V lines. Now there's nothing wrong with DC300s into 100V lines. They can produce a very creditable PA sound. But heaven forbid that anyone confuse it for the real thing.

## Action, at last

WE previously reported on how the BPI had promised to consider at their next council meeting a request that their Wolfson Report be made public. Memo: the BPI had paid the Wolfson Unit of Southampton University £10,000 to come up with nothing on the BPI's chimeral dream. This dream is a spoiler signal on records that somehow, magically, makes them immune from unauthorised copying. Wolfson's failure to produce the requisite magical solution was, of course, hardly surprising to anyone in daily contact with records and recording technology.

Well the BPI hath spoken, albeit briefly and unhelpfully. "We cannot authorise Southampton University or the Wolfson unit to discuss with you the work they have done on our behalf," declared John Deacon, Director General Designate of the BPI, adding only that "this decision is final". Reports in a national newspaper that the BPI had finally given up the spoiler nonsense as a bad job were hastily denied. "International research has proved that this (a spoiler) is a possibility . . . there is obviously no question of us abandoning the search" huffed and puffed the BPI. International research; what international research? Possibility? Of course it's a possibility; like recording on a piece of wet string or teaching ravens to swim under water. Anything's possible. It's what's practicable and feasible that matters. By definition any spoiler will have to be outside the audio band and by definition can thus be filtered off. This can be either deliberate, by conventional tone controls or an add-on anti-spoiler filter, or accidental by poor gramophone design, cheap connecting leads or a Dolby multiplex filter. Just for a giggle try talking to the BPI hierarchy about such things as multiplex filters . . .

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# AES 64th Convention, New York—a preview

The 64th Convention of the Audio Engineering Society will be held from Friday, November 2 to Monday, November 5 at the Waldorf-Astoria, New York. Some 150 manufacturers will be showing a wide range of products, which is a substantial increase in the number of exhibitors since the last New York AES Convention.

●**AB Systems Design:** *Model 2400* electronic frequency divider, designed for bi-amplification use. Features include selectable 6, 12 or 18dB crossover slopes at any frequency from 50Hz to 20kHz and Butterworth or Bessel type filters. Also *Model 912* pre-amp/mixer and *Model 730* tri-amp system. ●**Acoustic Design by Jeff Cooper:** display of their professional recording studio, control room, and film studio designs. Featured will be a computerised film mixing facility for Fantasy Films of California and new studio designs for Polygram in Singapore. ●**Acoustilog:** *Model 232A* reverberation timer, which measures reverberation time in 19 frequency bands; and the new Impulse Excitation Option which allows checking of loudspeaker polarity, phase and alignment of multi-speaker systems. Also the company's Time Delay Spectrometry equipment used in conjunction with its acoustic consultation service. ●**Agfa-Gevaert:** range of tapes including *PEM-468* and *PEM-368* mastering tapes; *PEM-526* bin tape; *PE-611*, *PE-811* and *PE-1211* bulk cassette tapes; and *PE-36* duplicating tape. ●**AKG:** introduction of the *D-300 Series* of vocalists microphones fitted with a new type of elastic suspension of the mic capsule. Also the *BX5* portable stereo reverberation unit; the new *C33*, *C34* and *C422* stereo condenser mics; the new *CK22* and *CK4 CMS* capsules; and the *TDU 7000* modular time delay unit. ●**Allen & Heath/Brenell:** first US showing of the *SR 28* stage console which features a 28-input frame and 11 mix busses, and a new mic pre-amplifier specifically designed to accommodate split-lead

linking to an auxiliary monitor mixer. Also the *Syncon 16/24/28-track* console and demonstrations of the *AHB 8-track* package system.

●**Allison Research:** *Kepex II* keyable program expander — a new version of the original *Kepex*—utilising the new *EGC-101* gain cell as the gain control element. Features include adjustable expansion ratio and attack time, and automation capability. The expansion range is 0 to 80dB; signal-to-noise ratio is claimed to be better than 90dB and distortion is  $\leq 0.05\%$ . The expander has remote control capability, and auxiliary VCA inputs. Also the *Fadex* programmable fader system and the *65K* automation programmer. ●**Amber:** new *Model 3500* miniature distortion analyser with built-in oscillator, automatic operation, battery powering, and performance to 0.002% residual. Also the *Model 5500* computer based audio analysis system, and the *Model 4400A* multipurpose audio test set. ●**Ampex:** *ADD-1* audio digital delay system for use with the Ampex disc mastering system comprising an *ATR-100* recorder with  $\frac{1}{2}$ in, 2-track head assembly, the *ADD-1* and Ampex *Grand Master* mastering tape. Also Ampex tape recorders and tapes.

●**AMS (Advanced Music Systems):** *DMX 15-80* digital delay line of modular design with various options including extended max delay to over 4s; a new microprocessor controlled harmoniser module; and a new reverb option allowing any one of nine different reverb programmes to be selected and controlled. Also the *DM 2-20* phaser/flanger unit.

●**Aphex Systems:** *Model 1537A* voltage controlled attenuator; the *Aural Exciter* sound enhancement system; *OAS-24* grouping and automation system; *CX-1* compressor/expander; and *EQF-2* parametric equaliser. ●**APSI (Audio Processing Systems):** range of units including the *Model 559*, *561* and *562* equalisers.

●**Ashly Audio:** *SC-Series* of signal processing equipment including the *SC-66/A* parametric equaliser featuring an input gain control with 30dB range, an eq bypass switch, and a peak overload indicator. ●**Audico:** range of cassette rewriter/exerciser/timer units for duplication operations including the *Model 200-9* featuring automatic reverse, counting up to 9999, and a 5-digit minutes/seconds/ $\frac{1}{16}$ -seconds tape timer.

This unit can be used to verify cassette length and to time masters for duplication. ●**Audio Arts:** *Model 4100* parametric equaliser; *Model 2100A* parametric electronic crossover.

●**Audio & Design (Recording):** the recently introduced stereo *Express Limiter*, a compact compressor/limiter/expander featuring function mode control by digital logic momentary switches, a memory system, LED indication of function status, stereo input/output attenuators, variable attack and release times, and an auto release network. Also the full range of *Scamp* units; plus the *F600* broadcast limiter; the *F690* voiceover limiter; and the *E900* parametric sweep equaliser. ●**Audio by Zimet:** professional and semi-professional recording studio packages. ●**Audio Kinetics:** the *QLOCK 210* SMPTE time code generator, synchroniser, reader; and the *XT-24* Intelocator. ●**Audio Technica:** the *AT803R* tie-clip electret condenser phantom powered mic; the *ATM11R* and *ATM91R* phantom powered mics; and the *AT8501* remote 9V battery supply unit.

●**Audiotechniques:** details of the company's sales, rental and service operations, and a selection of professional recording equipment.

●**Audiotronics:** new *532* automated modular console with up to 32 input channels and eight master effects modules. Features include 48V phantom power supply; sockets for active integrated-circuit components; multipin connectors for console terminals; 32 VU meters; 4-band parametric eq; and *Auto-Trak* automatic track selector. Also the *Model 110A* expandable, modular recording/remixing/on-air console designed to accommodate up to 16-track mixing. ●**Automated Processes:** modular console systems and range of consoles including the *1604 16/4* console; *2483 24/16/24* console; and the *2824* and *3224* modular consoles available in various configurations. Also *Maglink* synchronising equipment. ●**BAG END Modular Sound Systems:** range of over 40 modular loudspeaker enclosures and rack mount cabinets. All surfaces are smooth and handles are flush-mounted to facilitate stable column stacking up to 30ft. Loudspeaker drivers are front-mounted with machined aluminium blocks for rapid replacement, and high-current banana input connectors are used throughout.

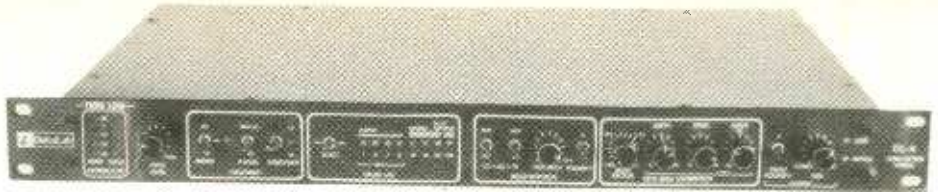
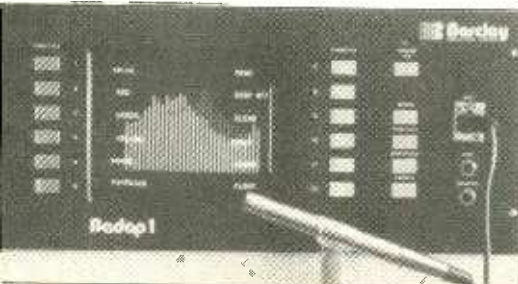
●**Barclay Analytical:** *Badap 1* audio micro-computer providing a wide range of audio measurements which are program dependent. The unit has a full colour display, several measurement programs may be used at one time, and ROMs can be interchanged to provide new capabilities.  $\frac{1}{3}$ -octave spectral, RT60, cutter head monitoring, chromatic spectral decay and other programs are available. Multiple memories extend analysis capabili-

New third harmonic distortion analyser from B & O



tics, with simultaneous display of eight or more data sets. A new stereo analyser accessory will be shown which allows simultaneous display of left and right  $\frac{1}{3}$ -octave peak and average readings, or L+R and L-R, for cutter monitoring and mastering analysis. ●**Bang & Olufsen**: range of measuring instruments, including wow and flutter meters, wattmeters, voltmeters and power supplies. ●**BASF**: professional duplicating products including the new *DPS* duplicating tape; plus an improved version of the *LHB* tape; and the *E-Z* stack hub designed to save storage space and provide ease of bulk handling. Also a range of DIN calibration cassettes for the professional market. ●**Beyer**: range of dynamic and condenser mics. ●**B & W Loudspeakers**: *Model 801* professional monitor loudspeaker, a 3-way vertical in-line system with minimum linear phase interference. ●**BGW**: range of amplifiers including the *Model 50A* 2-channel power amplifier offering 25W per channel into 8 $\Omega$  from 20Hz to 20kHz with a maximum THD of  $\leq 0.02\%$ . ●**Bose**: *Model 802* loudspeaker together with the *802-E* active equaliser and other units. ●**BTX**: *Model 4600* SMPTE tape controller—an audio controller and editing system for two, three or four audio or video recorders. A single keyboard allows individual control of each recorder or simultaneous command to autolocate to either identical or different SMPTE locations. Multiple events including punch in/out may be programmed or assembled via the keyboard or by use of the units' 'self-learning' capability. ●**Burns Auditorics**: range of ribbon, dynamic, and condenser mics; plus a new range of studio condenser mics with interchangeable capsules and pre-amplifier sections which can operate on 12V or 48V phantom supplies. Also studio monitor headphones and broadcast usage headphones. ●**CA Audio Systems**: improved version of the Cadac 'In-line' series of consoles including full function flexibility and optional dc subgrouping, automation, and centralised routing. ●**Calzone**: range of floating, vibration free flight cases for amplifier rack units, mixers, effects units, etc, and several new cases. ●**Cetec-Gauss**: tape duplication system for a master and up to 20 slaves, plus the company's range of loudspeakers. ●**Coastal Speciality Tapes**: range of splicing and sensing tapes with new silicon treated adhesives and releases, designed specifically for automatic loaders. ●**Columbia Magnetics**: range of low noise, high energy bulk lubricated 8-track cartridge tape pancakes and an improved version of the *Ultra III* cassette tape. Also numerous duplication accessories including the *Magna-See* tape developer. ●**Community Light & Sound**: range of high-level sound reinforcement equipment including the new *PBL-90* cabinet. Also the *Z10D* range of radial horns. ●**Crest**: range of power amplifiers featuring LED VU meters, dual power supplies, mono bridging switches and thermal protection. ●**Crown International**:

Barday's Badap 1



Deltalab new DL-4 Time Line

range of amplifiers including the *PSA-2*, 2-channel, 400W per channel (4 $\Omega$ ) power amplifier; the *FM1* tuner; and the *SA-2* self analysing power amplifier. ●**Cybersonics**: *DM 2002* disc mastering lathe. ●**David Lint Associates**: *ITI P-1* 2-colour label printer and *L-1* cassette labeller; *QC-8/Q* quality control playback unit; and laminated sendust recording heads suitable for use with metal particle tapes. ●**dbx**: variety of noise reduction units and comp/limiters including the new *Model 164* compressor/limiter—a stereo version of the *Model 163*. ●**Deltalab Research**: introduction of the *DL-4* Time Line, a multi-function special effects digital delay line with a 90dB dynamic

Eventide realtime analyser



range and a bandwidth of 20Hz to 15kHz at all delay settings. Maximum delay is 512ms at full bandwidth, and may be increased to 2.5s by the addition of a memory module. The unit can be used to produce flanging, doubling, echo, resonance and doppler effects, plus 'digital octave' flanging. The unit features footswitch control of effects; a VCO with infinitely variable waveshape control, and an infinite 'non-deteriorating' repeat. Also the *DL-1* digital delay module, the *DL-2 Acousticcomputer*, and the *DL-3* digital delay line. ●**Dolby Laboratories**: range of professional Dolby A noise reduction units, including the *NRU-10* unit for videotape recorders, and the *CP-200* unit for the reproduction of encoded stereo films. ●**Dynacord**: range of sound reinforcement units, plus digital/analogous ancillary effects units. ●**Edcor**: *MA Series* of integrated mixer/power amplifiers with modular inputs and outputs. ●**Electro-Voice**: full range of dynamic and condenser mics, monitor loudspeaker systems, component loudspeakers, and accessories. ●**Emilar**: *EW15* low frequency loudspeaker unit designed for sound reinforcement applications, together with *EA175* high frequency compression driver, *EH500* and *EH800* exponential horns, *EX800* dividing network; and a new 40W driver with a ceramic element. ●**Eventide**: *Model H949 Harmonizer*; range of low cost realtime spectrum analysers for use with home computers; the *BD955* broadcast delay line; and the *RD770 Monstermat* mono/

stereo broadcast matrix unit. Additionally, the *Instant Flanger* and the *Omnipressor*. ●**Furman Sound**: *RV-1* spring reverberation system which includes a fast peak limiter, quasi-parametric midrange controls, a shelving control for treble adjustment, and independent wet and dry mix level controls. Also *TX-2* tunable crossover/bandpass filter; *PQ-3* parametric equaliser/pre-amplifier; and *PQ-6* stereo parametric equaliser/pre-amp. ●**Gotham Audio**: showing *Telefunken M15A* 32-track tape-recorder; *TTM* 24-channel noise reduction frame and power supply unit; *EMT* reverb units, console components and test equipment; *Neumann U89* condenser mic; *Beyer* input transformers; and *NTP* PPM meters. Also other units from the above manufacturers.

●**Grandy**: *Promix 1* adjustable multitrack head assembly with independent control of azimuth, zenith tape height and wrap. Also replacement tape heads and a range of single crystal ferrite record heads for high speed duplicating. ●**Harrison**: demonstration of the *Model 864 Autoset*, microcomputer based control system. Introduction of selected modules from the new *5648* master recording/remix console. Also the *3232C* and *3624 Series* automated consoles. ●**Heino Ilsemann**: *Type KZM3* automatic cassette loader with a capacity of up to 4800 cassettes per hour; *Type ETK-1* cassette labelling machine with a capacity of 4800 per hour; and *Type ETK-1S* machine with a capacity of up to 7200 cassettes per hour. ●**H H Electronic**: *TPA Series D* and *S500D* professional power amplifiers and the recently introduced *MOSFET* power amps. Also electronic echo units and portable stereo sound control mixers. ●**HM Electronics**: wide range of radio mics and receivers including road-cases and accessories. ●**ITAM**: *Model 1610* lin compact 16-track recorder with modular electronics and full function remote control; *Model 806*  $\frac{1}{2}$ in 8-track recorder; and the *10-4* and *Model 882* mixers. ●**Infonics**: *200 Series* of tape duplicators including a high speed metal tape cassette duplicator. ●**Inovonics**: range of audio processing, recording and instrumentation equipment including the *Model 500* audio analyser and the *MAP-II* broadcast audio processor. ●**Institute of Audio Research**: president Al Grundy and executive director Phil Stein will be available to give details of the Institute's training programmes for technical personnel. ●**Interface Electronics**: range of mixers designed for recording, sound systems, theatres, stage monitoring and other applications. Available configurations range from 8/2 to 48/16 and new features include wide range parametric equalisers. ●**IRV Joel & Associates**: variety of equipment from several manufacturers, including the *JL-412* broadcast console from IRV. ●**Ivie Electronics**: *IE-17A* microprocessor controlled acoustics analyser and *IE-30A* spectrum analyser. ●**JBL**: complete range of monitor loudspeakers. ●**Keith Monks**: range of mic floor stands and boom arms in various colours; the new *MT/1* stand also suitable for use as a loudspeaker stand; a new version of the *Phase Tester*; plus cable

## AES CONVENTION

drums, radio mics, LSI-8 loudspeaker and the company's record cleaning machine. ●**King Instruments**: self-feed cassette loader which can load up to 1,000 C-60 cassettes in eight hours. Also the *Basic 1* cassette loader and various video tape loaders. ●**Klark-Teknik**: professional DN27 and DN22 graphic equalisers; DN70 digital delay line and DN71 controller; and the DN34 and DN36 analogue time processors. Also the *Statik Acoustic* range including the SA30 electronic crossover; SA20 dual reverberation system; SA10 octave equaliser; and SA100 dynamic delay/flanger. ●**Lexicon**: Model 224 digital reverberation system; Model 102-S stereo delay system; Model 92 and new Model 91 digital delay units; and the Model 93 *Prime Time* digital delay/processor/mixer. ●**Marshall**: *Mini Modulator* special effects unit; 5002A time modulator; 5050 stereo effects expander; HP400 expander; P250 pre-reverberation delay unit; and P500 half-time variable delay unit. ●**Martin Audio Video**: a 14kHz film sync generator, and ranges of toroidal power transformers, metal rack cases and other components and hardware. ●**MCI**: first US showing of the JH-220 digital stereo master recorder. Other tape machines include the JH-16 and JH-110 series in various configurations. Also the JH-600 and JH-500C consoles; the JH-50 automation system; and the *Autolock III* and *RTZ III* locating devices. ●**Meyer Sound Lab**: range of studio monitor loudspeakers including the Swiss-produced ACD/Meyer reference monitor system for direct-to-disc and digital recording. ●**MicMix**: XL-305 reverberation unit featuring stereo enhancement of the reverberant field, reverberation/dry signal mixing controls, LED peak-signal indicators, and 4-band peak/dip equalisers on each channel. ●**Midas**: range of modular PR System consoles in configurations from 2 to 32-track and with over 20 standard modules available. Also specialised modules and a VCA-controlled mixer. ●**Millbank Electronics**: *Pac-System* modular sound system comprising input pre-amplifiers and combiners, power amplifiers, timers, and system accessories. Also the *MIL Series Two* amplifiers and tuner amplifiers. ●**3M (Magnetic Tape Division)**: introduction of the *Scotch 226/227* mastering tapes, bias compatible with *Scotch 206*. Also *Scotch 265* digital mastering tape in 1/2in and 1in widths. ●**3M (Minicom Division)**: digital mastering system comprising a 32-track pre-mix recorder and 2/4-track master recorder. The system has remote logic control with 10-location memory storage and recall. Playback of digital recordings produced on the system is planned.

●**MXR**: range of ancillary equipment including 31-band and dual 15-band graphic equalisers; the flanger/doubler; the digital delay, and the pitch transposer. ●**Nady Systems**: range of 'Nady Cordless' and 'Nasty Cordless' radio transmission systems. Also the recently introduced Nady VHF 600 and VHF 700 transmitter/receiver systems. ●**NEAL-Ferrograph**: first US showing of the new modular SP7 1/4in tape recorder, available in a number of customised configurations. Also the *Ferrograph Logic 7* and *Studio 8* tape recorders; the NEAL 302, 330 and 340 cassette recorders; and the RTS/2 and ATU/1 test instruments. ●**Neutrik**: *Audiotracer 3201* which measures and makes hard-copy recordings of the audio response of electronic and electro-acoustic systems. Also the AD-4 analogue delay line and the company's range of connectors and modular in-line components. ●**Neve**: Model 8108 56/48 console with centralised microprocessor-controlled assignment facility. Features include channel to track routing memory; 4-band parametric eq; high and lowpass parametric filters; quad mixdown; 4-mono and one stereo aux send; in line monitor facilities; programmable muting of inputs; and optional manual, VCA, or *Necam* fader system. ●**Noise Ltd**: introduction of prototype custom-built portable console cabinets designed to accommodate various manufacturers modules. ●**Orange County**: VS-1 *Stressor* and the PEQ parametric equaliser. Also the *Stereo Processor*, a self contained signal processing system including peak limiter/compressor/expander/noise gate. ●**Orban**: Model 672A quasi-parametric equaliser; 526A single-channel de-esser; and an improved version of the 111B dual spring reverberation unit. Also the 245E stereo synthesiser; 418A stereo comp/limiter; and 622B parametric equaliser. ●**Otari**: MTR-90 2in, 16/24-track master recorder featuring symmetrical tape path and pinch-roller-free direct-drive capstan controlled by a phase-locked closed-loop servo system. ●**Peavey**: SP-2 loudspeaker system which utilises a 15in *Black Widow* transducer for low frequencies and a 22A driver with a multiflare horn for high frequencies. Also CS-800 power amplifier and full range of loudspeakers, amplifiers, and ancillary equipment. ●**Penny & Giles**: complete range of faders in various configurations plus the QCPI Series quadraphonic joystick controller. ●**Pentagon**: range of cassette copiers including the *Pro-Series* and *1100 Series*. Also cassette-to-cassette copiers. ●**Pioneer**: a 16-bit PCM audio laser disc system; ribbon sendust tape heads; and a linear tracking turntable. Also a new 12in midbass driver for professional sound systems. ●**Quad-Eight**: new MS-4024CX *Coronado 40/40* console which includes the *Compumix III* automation system and has

equalised automated echo returns, automated programmable muting and group solo features, and discrete amplifiers in the main signal path. Also the new CL-22 comp/limiter which has a new feed-forward VCA design, and the EQ-333 equaliser. ●**Quantum Audio**: mid-priced *Gamma A* modular 8-buss automated console, with separate stereo mixdown busses and 4-buss special effects. The main frame is available in 20/28/32-input configurations with or without patchbay. ●**Raindirk**: *Series III 28/24* console and the S2000 16-track console for smaller studio, broadcast and sound reinforcement applications. ●**Rank Strand Electric**: modular *Theatre Series* and *Concert Series* consoles available in various configurations for live and recording applications. Also examples from the company's range of theatre loudspeakers. ●**Roland**: RSS Series of rack-mount signal processing units plus the RE Series of units. ●**RTS Systems**: range of intercom systems; a small battery-operated mixer; a phono pre-amplifier; audio distribution amplifiers; and dual-buffered amplifiers. Also the TW-1 telephone interface equipment. ●**SAE**: Model 180 2-band per channel parametric equaliser; Model 2800 4-band parametric eq; and the Model 1800 dual 2-band parametric eq. Also the company's range of power amplifiers. ●**Sansui**: B-1 250W per channel power amplifier; P-1 4-band stereo parametric equaliser; and E-1 phono pre-amplifier/mixer unit. ●**Selco Products**: range of nylon collet and push-on style knobs and accessories in a wide variety of shapes and sizes. ●**Sescom**: introduction of a range of recording and sound reinforcement equipment including a 4-channel mic mixer; 10-band graphic equaliser; 3-band parametric equaliser; stereo phono pre-amplifier; and stereo headphone amplifier with stage box. ●**Shure**: SM81 cardioid condenser mic; SM14 lightweight head-worn mic with dual-earphone monitoring capability; SC39 Series phono cartridges; and *Pro Master* sound system. ●**Sierra Audio**: details of the Sierra/Hidley facilities which have been designed and constructed over the past year and information on the company's consultation services and monitor systems. ●**Solid State Logic**: SL-4000 E Series automated console and SSL studio computer system. ●**Sontec**: *Comudisc* digital control system for use with Neumann and Scully lathes. Also the DTC-400 disc transfer console, the DRC-400 dynamic range controllers, and a range of equalisers. ●**Sony**: PCM-1600 2-channel, 16-bit digital audio processor for recording PCM audio onto Sony BVU-200A U-Matic video cassette recorders. Also the DEC-1000 digital editing controller; DXR-2000 digital reverb; DSX-87 digital sampling rate converter; and the PCM-3224 24-track, lin digital recorder. Additionally, the MX-5, MX-7 and MX-670 mixers; TC-D5 Pro professional portable stereo cassette recorder; C-48 studio condenser mic; and APM-8 4-way loudspeaker system. ●**Soundcraft**: range of consoles and multitrack tape recorders. Tape recorders comprise the SCM-381-8, 8-track, lin recorder and the new SCM 381-16, 16-track, lin recorder. Consoles include the *Series 400* for 4/8-track studios; *Series 3B* automated console in 16/24/32-track configurations; *Series 1S* portable PA console; and the modular *Series 1624* featuring 16-group busses, up to 24-track monitoring, 3-solo status, flexibility of subgrouping and effects returns facilities, and a standard patchbay. ●**Sound Technology**: new Model 1500A microprocessor based automatic tape recorder



Quantum Audio  
new Gamma A  
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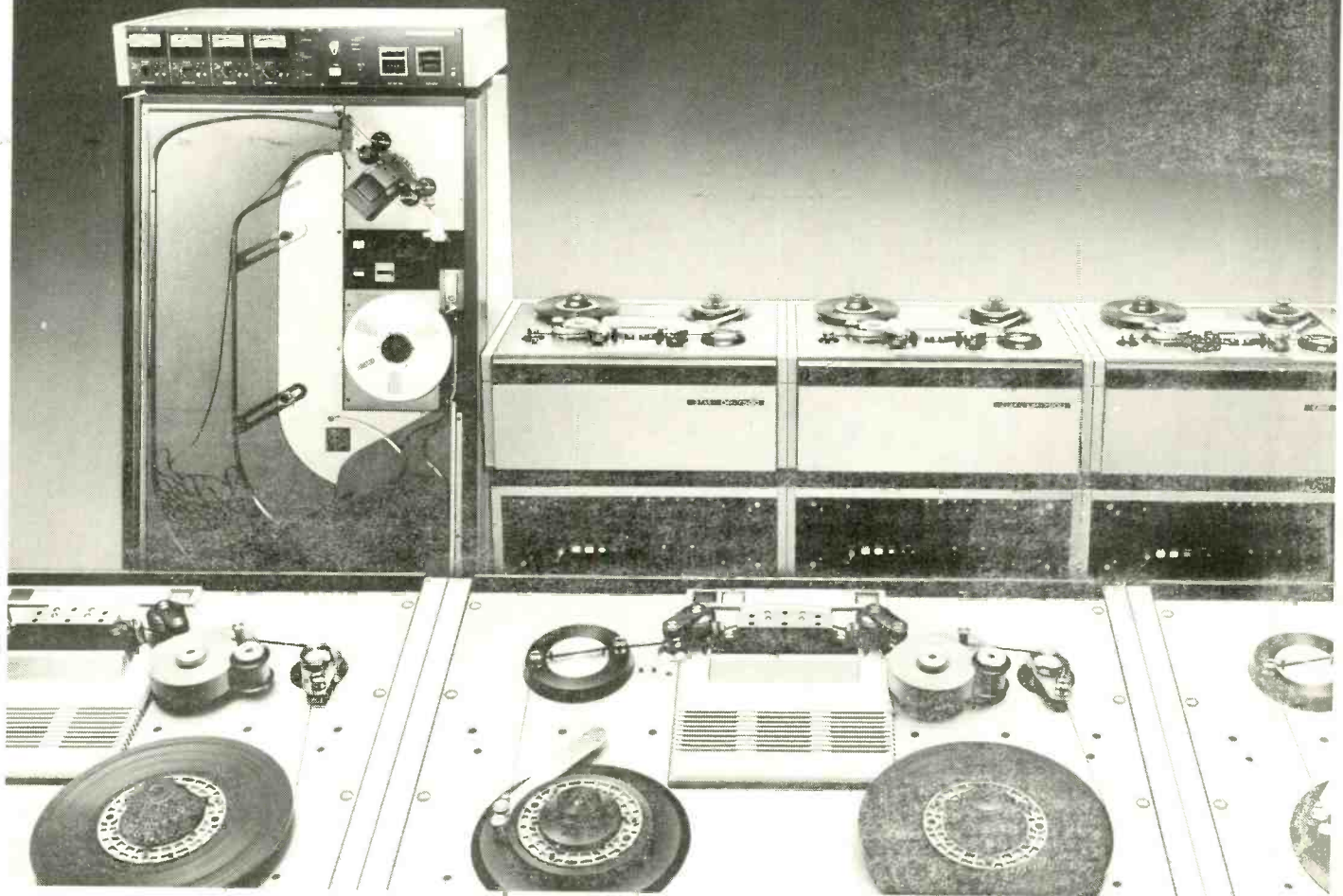
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## AES CONVENTION

Right:  
Sony DRX  
2000  
digital reverberator



Above: Synlovox 222 Vocoder

test instrument. Also *Model 1710A*, *Model 1700B*, and *Model 1701A* distortion measurement systems. ●**Sound Workshop**: new console series which offers performance and features similar to the *1600 Series* console including several mainframe sizes and options. Also the *1280 Series* console; the *421* broadcast/disco mixer; *242* and *262* stereo reverberation systems; and *Super-Group* which extends the grouping capability of the *ARMS* automation system. ●**Spectra Sonics**: new *Model 712* stereo power amplifier and the new *Model 3100* portable self-powered loudspeaker system. Also consoles, loudspeakers, power amplifiers, and ancillary units. ●**Stanton**: *680SL* and *680EL* pick-up cartridges designed for rugged applications together with the new *Permostat* anti-static record preservative. ●**Stephens Electronics**: *821B* range of tape recorders featuring capstan-less and pinch roller-free drive. Models on show will include a 40-track, 2in machine, and a 24-track portable machine. Also the *Q-II* autolocator and other accessories. ●**Stramp**: range of products including the *Echo 700* effects unit plus autolocators, synchronisers and a noise limiting system. ●**Strand Century**: range of intercom equipment; the *TP* range of semi-professional mixers; the *Mark II* portable concert mixer; and a range of amplifiers. ●**Studer Revox**: full range of Studer products including the *A800* and *A80VU* multitrack recorders; *TLS 2000* SMPTE sync/edit system; new 20-memory autolocator; plus a new remote control unit for the *A80VU*. Also a new *A80* disc cutting preview machine for use with the Neumann *VMS80* lathe, and the Revox range. ●**Swintek**: *Q-dB-S* pocket receiver for radio mics, range of radio mic systems; hand held lavalier cordless mics with multiple diversity antennas; and *MK200* communicator. ●**Synergetic Audio Concepts**: pressure zone microphones and details of time-energy-frequency measurement systems. ●**Synton**: *Syntovox 222* vocoder, a simplified version of the *Syntovox 221* effects vocoder; new *Syntovox 202* vocoder designed for guitar players; new *Syntovox 232* 16-channel vocoder with a voltage controlled filter bank; and the *Voice Follower 216* frequency-to-voltage converter. ●**TAD (Technical Audio Devices)**: new 12in mid-bass loudspeaker drive unit capable of handling 300W. Also the company's beryllium diaphragm compression drivers. ●**Taber**: *Taberaser* bulk tape erasing unit and a range of reconditioned and replace-

ment tape heads. ●**Tandberg**: new *TCD 440A* cassette deck with the Dyneq record equaliser circuitry and the Actilinear recording system. Also full range of Tandberg equipment. ●**Tangent**: *Model 3216* console available in 16/24/32-channel configurations and with parametric eq, 16 submaster groups, five echo/cue/monitor busses, and FET switching. ●**Tapco**: range of mixers and ancillary equipment including four new products: the *C-12* mixer; and the *CP-X* electronic crossover; *8201 REB* mixer expander/reverb unit; and the *C-201* 10-band per channel graphic equaliser rack-mount unit. ●**Teac**: comprehensive range of units from the *Tascam Series* including consoles, tape recorders and accessories. ●**Technics**: *SP-02* direct drive motor and drive electronics for a disc cutting turntable, plug-in compatible with Neumann lathes. Also turntable console for recording and broadcast use; professional PCM recording system; digital audio disc system; new *SP-15* and *SP-25* studio turntables; and range of tape recorders, turntables, equalisers, amplifiers, tuners and loudspeakers. ●**Tentel**: range of *Tentelometer* tape tension gauges for professional tape recorders. ●**Toa**: modular pre-amplifier/mixer system from the *VMS-2000 Series* designed for commercial and professional applications. Also the company's range of amplifiers, signal generators, power supply units, equalisers, monitors, meter units, filters, loudspeakers and accessories. ●**Trident**: *Series 80* modular console with push-button routing to 24 groups; *TSM Series* console available in 32/24 or 40/32 configurations; and *Fleximix* modular console system expandable to 24-track. Also the rack-mount parametric equaliser/filter and stereo limiter/compressor. ●**Unicord**: new *Korg PS-3100* polyphonic synthesiser; plus *KP-30* synthesiser; *ES-50* polyphonic ensemble; *PS-300* polyphonic synthesiser; *VC-10* vocoder; *SE-500* tape echo with noise reduction; and *X-911* guitar synthesiser. ●**Urei**: wide range of signal processing units including several new products: the *Model 562* feedback suppressor; *Model 533* (single) and *Model 535* (dual) 10-band octave graphic equalisers; and the *Model 811* single-duplex and *Model 815* super woofer time aligned loudspeaker systems. ●**Ursa Major**: *SST-282 Space Station* digital reverberation system comprising a digital delay line and digital reverberation synthesiser. ●**Vitavox**: range of multicellular high frequency horns,

# ADVANCED MUSIC SYSTEMS



## A GLOSSARY OF TERMS

- AMS:** The British company whose audio delay equipment is widely regarded as being simply the best in the world.
- DMX 15-80** The top product of the AMS range . . . A digital delay line of unquestionable pedigree: maximum delay of over one second at a bandwidth of 18kHz, and a signal-to-noise ratio of better than 90dB. Versatile plug-in options are available, such as the new additional memory to give over 8 seconds of delay.
- PITCH CHANGER** The latest of the add-on cards for the DMX 15-80. A computer controlled harmoniser which is the result of over 18 months of design effort, directed towards glitch elimination.
- QUINTEK** The USA distribution company who will be delighted to give you further information on AMS products, or direct you to your nearest stockist.
- AES (NY)** Booth 74—The place to be convinced.

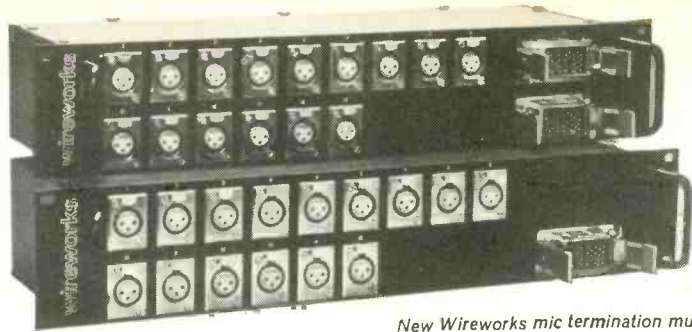
**STOP PRESS! FIRST SHOWING OF THE STEREO BROADCAST DDL AT N.Y. AES**

**ENGLAND:** A.M.S., Burnley; Cue, London. **FRANCE:** Studio Equipment SA., Paris. **GERMANY:** Elmus GmbH Berlin. **HOLLAND:** Pieter Bollen, Eindhoven. **ITALY:** Roje Telecom' FTA, Milan. **NEW ZEALAND:** G.V.C. Kilburnie. **SPAIN:** Singleton Productions, Barcelona. **SWEDEN:** Tal & Ton, Gottenburg. **U.S.A. Quintek** Distrib. Inc., N. Hollywood, Ca.; Audio Consultants, Nashville; Audio Techniques, Stamford.

**A.M.S. WALLSTREAMS LANE, WORSTHORNE, BURNLEY. U.K.**  
**0282 36943**

## AES CONVENTION

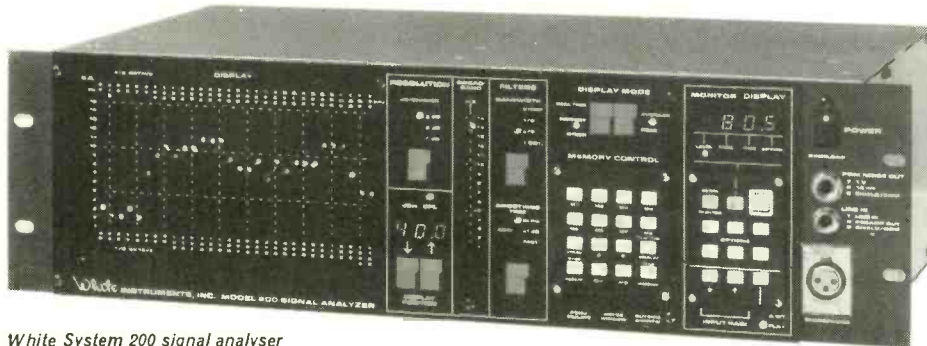
compression drivers, bass drivers, and passive dividing networks. ●**White Instruments:** *System 200* signal analyser which features interchangeable filters, software dependent micro-processor control, RT60, eight non-volatile memories, dual mode display and a number of software dependent features and functions. Also two new  $\frac{1}{3}$ -octave equalisers—*Model 4240* and *Model 4310*. ●**Wireworks:** range of hard-wired mic cables and multicables together with a number of audio accessories. ●**Woelke:** new range of professional record, playback and erase heads for 16/24-channel multitracks, plus the company's other ranges of multitrack heads. Also wow and flutter meters including the new *ME110*; wave analysers; and bias/distortion meters. ●**Xedit:** drift and flutter meter plus splicing blocks and a film strip



New Wireworks mic termination multitrack units

pulsar/converter. ●**Yamaha:** wide range of audio products including the *PM-2000* console available in 24 or 32-input channel configurations. ●**Studio Sound:** editor Angus Robertson and assistant editor Noel Bell will be

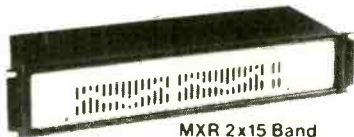
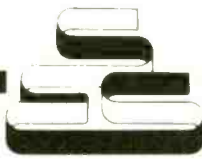
attending the exhibition together with Phil Guy who will be available to meet advertisers. Additionally, Richard Elen, editor of our sister magazine *Sound International* will also be in attendance. ■



White System 200 signal analyser

### Other exhibitors present but from whom no information was received:

Anvil Cases; Ashford Audio; Boralynn; Domain Communication; Eastern Acoustic Works; International Audio; Kimball International; Mitsubishi Electric; MTI; Music Technology; Renkus-Heinz; Rohde & Schwartz; SFW Audio; Tapemaker Sales; Tonmeister Instruments; Valley Audio; and the Victor Company of Japan.



MXR 2 x 15 Band Graphic Equaliser



MXR Digital Delay



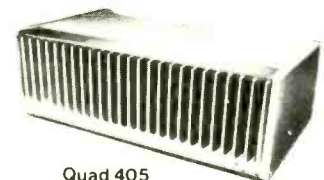
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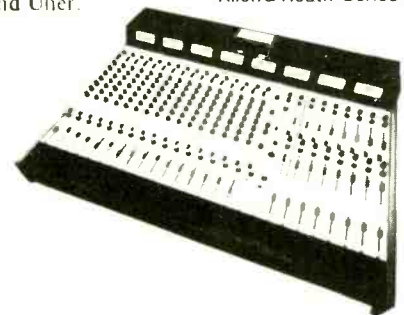
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Quad 405

Allen & Heath Series 3

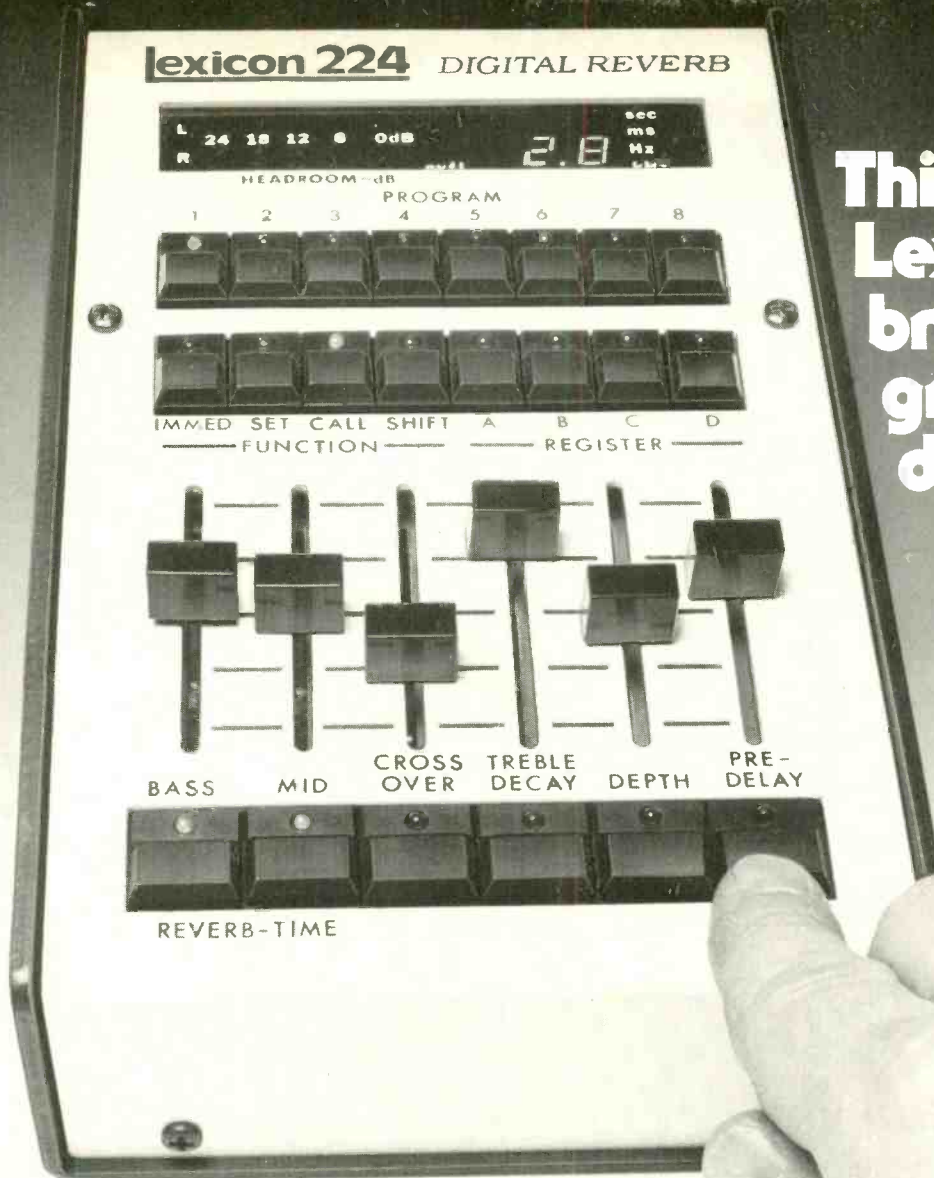


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**lexicon**

# letters

## British exhibitions

Dear Sir, Your editorial piece published in September 1979 Studio Sound seems based on entirely the wrong assumption that the AES 65th Convention is simply a professional audio exhibition in competition with other regular shows such as those organised by the APRS and the ASCE.

All AES Conventions are primarily concerned with a programme of technical lectures designed to educate and inform the audio engineering fraternity. It also provides an important opportunity for the exchange of ideas between practising engineers, academics and press which has not so far been duplicated by any other organisation.

Whilst it is true that the associated exhibition of professional audio equipment has now reached a significant size having started some years ago as a green baize table affair, it would be entirely wrong to consider these AES activities as largely exhibition led. AES Conventions originated in a period where there was little demand for exhibition of professional audio equipment. The exhibition side has since expanded in line with the general requirements of its sustaining

members and others in the industry who wish to be associated with these events, but continuance on the present scale is by no means assured and the exhibition requirement may ultimately dwindle either in the face of more formidable competition or in response to a general diminution in this kind of activity. If such an eventuality comes to pass, you may be assured that the lecture programme itself will continue.

The Audio Engineering Society does in fact hold three Conventions each year, the earliest of which always takes place in Europe. This pattern of events was established many years ago, long before many of the other societies commenced holding exhibitions. In the normal course of events the 1980 European Convention would have been held in Vienna followed by a London based Convention at the Barbican in 1981. However, plans for the Vienna Convention next spring suddenly collapsed and the British Section offered to step into the breach by bringing the London Convention forward by one year. As the Barbican project is still incomplete, we were obliged to settle for a split venue at the London Hilton and the London Park Lane Hotels as it was considered essential to have a location in Central London rather than at some


outlying place. You will appreciate that the decision to hold the 1980 Convention in London only represents a change of venue and not of policy.

The Governors of the AES are very mindful of the problems which are created when the trade is faced with too many exhibitions and we are continually studying all the possible venues in Europe as well as monitoring the requirements of our industry. We have always been ready to discuss future arrangements with any of the trade associations which are already active in the field, not only in the UK but throughout Europe. It is possible that some condensation of events could be achieved but not without the sacrifice of some degree of sovereignty by the various parties.

Yours faithfully, Raymond E. Cooke, Vice-President AES Europe Region, c/o Kef Electronics Ltd, Maidstone.

The editorial this month offers a reply to this particular letter—Ed.

76 ▶



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\*For safe delivery of Revox A77, B77, 700 and Teac 3340 3440 we can arrange the use of flight cases. Charged at cost.

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syntovox vocoders by



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**Mobile re-issues**

Dear Sir, Whilst not wishing to belittle the efforts being made by Stan Ricker on behalf of 'Mobile' Records, California, it does seem that Adrian Hope's article in *Business*, August Studio Sound, was something of a 'hype'. We feel it is necessary to point out that although one may often think that it is possible to improve on the sound from many commercially released albums, one is treading dangerous ground in a very subjective area where opinions often count for very little.

In an era where technology has been made available at a rate which seems to outstrip many people's ability to use it, the function of a mastering room should be purely one of flat transfer, and of course it is part of the job of any mastering engineer to recognise a good tape and treat it with the respect it deserves. It may amaze a few people to realize that this often happens! Flat cuts are not unknown, and mastering engineers do like to do them.

Often, however, tapes come into a mastering room that do need equalisation (and occasionally limiting) in order to enhance the recording. In cases like this the producer or engineer of the offending tape will usually be on hand to discuss these points, with the aim of producing a better record. Furthermore, these considerations are usually based on aesthetics, and it is in fact quite rare for a tape to be limited etc purely to "cram the same amount of recording time on a single master side." On the contrary, it is the job of a mastering engineer to come to terms with the mechanics involved in cutting any tape, whatever its length or content, with as little degradation as possible, and this often involves not inconsiderable expertise.

In the light of this background information, one may now be driven to ask why the tapes which Mr Ricker is currently remastering were not cut flat in the first place! The answer is, of course, that the equalised cut was obviously considered preferable, by both the record company and the record's producer/engineer/artist, none of whom could be described as uncaring!

One may also ask why the record companies involved in Mobiles' remastering are leasing their tapes in this way, this was not explained in Mr Hope's article, but it surely cannot be that they are now unhappy with the efforts of their own technical staff. (For instance A&M, Los Angeles has one of the most capable mastering teams in the world.) No Sir, it is more likely for the sound commercial reason of a few more sales in another section of the market—that of the Hi-Fi Snob, a rapidly growing community!

In conclusion, although Stan Ricker may be doing an excellent job with these particular records, it is easy, after reading Adrian's article, for people to run away with the idea that no one else is! Hopefully, this background information, which was omitted from the article, has redressed the balance somewhat.

Yours faithfully, Mike Brown and Tony Bridge, Mastering Rooms, Pye Studios, London.

**Adrian Hope replies:**

I can't help wondering whether Messrs Brown and Bridge (whose cutting work I incidentally know to be widely respected) actually listened to any Mobile re-issues in direct comparison with the commercially released originals. Their criticism would carry much more weight if it were based on comparative listening.

**Allison programmer**

Dear Sir, Referring to Michael Tapes' letter (February 1979 issue) regarding storage of mutes in automated mixing systems, some clarification is needed. Mr Tapes stated that the Allison 65K Programme does not store mute information independent of fader level data. Firstly, this statement is in error. The 65K stores whatever information the system designer connects to it. Witness the fact that our Memory Plus system, vintage 1975, separately writes not only channel mutes into the 65K, but also writes group mutes, group and channel solos, and performs programme assignments of channels to groups, as well as two insert functions. The system while performing all of these functions on 48 channels and 16 groups has still used only 1/64th of the 65K Programmer's 65,536 bit capacity. The 65K Programmer also has the unique ability to put to memory, any change, in any parameter, in systems utilising any amount of the device's data capacity, within 4ms of the occurrence of the change.

In contrast, the Sound Workshop system is limited, I believe, to programming only 64 channels of level information and 64 one bit mute words, for a total capacity of 576 bits. Due to its sequential scanning format, delays of up to 100ms may occur in putting a mute (or fader change) to memory. Additionally, in the event of a tape dropout, while the 65K need only delete one data word (4ms), the Sound Workshop system must delete one entire scan

of the console (100ms). Thus, the likelihood of having to reprogramme a mute is very much greater in the Sound Workshop system due to the higher probability of it being 'off cue' (from delay) or deleted during a dropout.

I take issue with Mr Tapes' remarks about the 'proper' method of dealing with mutes. What is 'proper' with respect to one system may not be advantageous with another. In the case of Harrison's choice of muting configurations, as well as that of Trident, Sphere, Tangent, Auditorics, API, and other 65K users, field use has shown that the necessity to reprogramme mutes occurs so rarely as to not cause any inconvenience to the user. In contrast, the need to reprogramme mutes, with the Sound Workshop system may be more pronounced, due to the longer access times and greater dropout deletion probability.

On another subject, it should be noted that OEM users of the Allison 65K system choose to carry group fader information as separately recoverable and alterable data, while, I understand, Sound Workshop and MCI do not. If it comes down to a contest, I would personally place more emphasis on being able to recover and alter grouping movements than I would on the much simpler operation of reprogramming a simple mute function.

Still, who am I to say what is 'proper'!  
Yours faithfully, Paul C Buff, Allison Research Inc, 2817 Erica Place, PO Box 40288, Nashville, Tenn 37204, USA.

**TOWARD BETTER UNDERSTANDING ...**



The Model 4240 Active Equalizer is a hybrid of ONE-SIXTH octave filters, which are concentrated in the speech intelligibility region between 250 and 2000 Hz, and broader bandwidth filters on either end. The intended application of the Model 4240 is the equalization of sound reinforcement systems employing voice as the main program material as in corporate boardrooms, meeting halls, legislative chambers and courtrooms.

Extremely high Q room modes which cause feedback, ringing and loss of intelligibility are excited by these mid-range frequencies. Equalization to suppress these modes using one-third octave or broader bandwidth filters can attenuate other frequencies necessary to voice intelligibility. Loss of intelligibility can not be compensated by increased gain.

By comparison the ONE-SIXTH octave filters used in the Model 4240 have TWICE the resolution as one-third octave filters. It is possible to equalize a sound system and affect only HALF as much program material.

The Model 4240 Equalizer is highly cost-effective for these applications since it is built on the same chassis as our one-third octave models. It has 27 filters like the one-third octave units, but 19 are ONE-SIXTH octave and concentrated in the midrange. The broader bandwidth filters on either end are more than adequate to shape the extreme low and high ends of the spectrum.

Our new System 200 Signal Analyzer features field interchangeable, plug-in filters and may be equipped to match the Model 4240 Equalizer making ONE-SIXTH octave adjustment as convenient as one-third octave.

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C 34



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● The C 422 comb. is a new stereo condenser microphone based on the tradition of the well known C 24, whilst the AKG C 424 comb. was designed as a quadrophonic condenser microphone for 4-channel recordings. The C 422 comb. has two twin diaphragm systems, which allows each channel's polar response to be electronically adjusted with the remote control unit S 42 E. Suitable for MS and XY stereo technique. The upper capsule can be rotated through 180° for selection of the base angle in any recording situation.

● In the top of the housing of the C 424 comb. are two elastically suspended twin diaphragm capsules, of which the upper one is also rotatable for selection of the base angle between front left/rear right and front right/rear left. Colour coded channels.

● The C 34 comb. is a small stereo condenser mic for studio and mobile use. The polar pattern for each channel may be selected in 9 steps via remote control unit S 42. Upper system rotatable through an angle of 180°.



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## Ivie IE-30A audio analysis system



### MANUFACTURER'S SPECIFICATION

#### Realtime analyser

**Third octave filters:**  $\frac{1}{3}$ -octave operation provided from 25Hz to 20kHz in 30 ISO bands. Highly selective three pole-pair filters exceed ANSI S1.11-1966 class III, BS2475-1964, DIN 45652 and IEC225-1966. Relative filter flatness  $\pm 0.5$ dB.  $\frac{2}{3}$ -octave filter display can be weighted with A, C or flat filters.

**Octave filters:** 1-octave operation provided from 25Hz to 20kHz in 10 ISO bands. Octave filter skirt selectivity satisfies ANSI S1.11-1966 class II, BS2475-1964, DIN 45652 and IEC225-1966.

**Memories:** dual memories store or accumulate (maximum hold) any display pattern. Involatile memories remember data for weeks with the IE-30A switched off. Touch button alternate mode provided signal comparison capability between any memory, or real time signal.

**Other:** digital gating mode provides for remote controlled analysis of delayed signal events. Three selectable detector responses provide signal monitoring, peak detection or noise integration. Filters are calibrated in dB $\mu$ V with a direct range of  $-5$  to  $+149$ dB $\mu$ V (0.5 $\mu$ V to 28V) or to  $+174$ dB $\mu$ V (500V) with probe.

#### Sound level meter

**Response modes:** fast, slow, impulse and peak.  
**Range:** 30dB SPL to 149dB SPL. 20dB $\mu$ V to 149dB $\mu$ V  
**Rectifiers:** true rms or peak. 20dB crest factor for full scale.

**Display:** 4-digit LED readout with 0.1dB SLM resolution. Digital display modes for continuous sample or display hold. Overload and under-range indicators.

**Filters:** A- and C-weighted and flat. Flat filter bandwidth 7Hz to 35kHz.

**Other:** calibration microphone is removable. Strip chart recorder outputs. Meets requirements of ANSI S1.4-1971 type S1A, S1C. BS4197-1967. DIN 45633 B1.1, B1.2 (impulse), IEC179-1973.

#### Microphone

**Element:** omnidirectional electret condenser, pressure type.

**Level stability:** loss of no more than 3dB/100 years.  
**Dynamic range:** greater than 120dB (with supplied electronics).

**Frequency response:** 10Hz to 20kHz.

**Dimensions:** 7 $\frac{1}{2}$ in long,  $\frac{3}{4}$ in largest diameter (190.5x19mm).

**Weight:** 3oz (85g).

#### Pre-amplifier attenuator

**Input impedance:** 100k $\Omega$ .

**Attenuator:**  $-30$ dB to  $+80$ dB in 10dB steps

**Filters:** A- or C-weighting or flat.

**Flatness:**  $\pm 0.5$ dB (20Hz to 20kHz).

**THD:** less than or equal to 0.1% at 2V output level.

**Input damage level:**  $\pm 100$ V dc or 300V ac (above 20Hz). Output short circuit protected.

**Type:** 30-channel LED array. Intensity automatically adjusts for room brightness. Control panel lights up automatically in low light environments.

**Ranges:** 15, 30 and 45dB are selectable with resolution of 1, 2 or 3dB.

**Construction:** all modular, provides dependable operation with ease of maintenance.

**Dimensions (whd):** 8x3 $\frac{1}{2}$ x2 $\frac{1}{4}$ in (203x98x54mm).

**Input connector:** 6-pin XLR.

**Weight:** net 2.9lb (1.3kg). Shipping 7.41lb (3.4kg).

**Operating temperature:**  $-10$  C to  $+50$  C. Non-operating temperature  $-30$  C to  $+65$  C.

**Operating humidity:** 0 to 90%.

**Battery operation:** nickel cadmium rechargeable cells. Operating time approximately three hours for continuous operation. Fast charge cycle of 1.5 hours. Low battery indicator.

**Ac line operation:** from ac adaptor/charger. 115Vac 50/60Hz (230Vac available), full charge indicator light.

**Price:** £2,286.

**Manufacturer:** Ivie Electronics Inc, 500 West 1200 South, Orem, Utah 84057, USA.

**UK:** FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Hertfordshire.

THE IVIE IE-30A is a miniature hand held spectrum analyser with the capability of realtime analysis in either octave or  $\frac{1}{3}$ -octave bands, the latter covering the standard ISO frequencies from 25Hz up to 20kHz. The analysed spectrum is displayed on a matrix of LED indicators which automatically adjust their brightness according to ambient light conditions.

The 480 LEDs are arranged in 30 vertical arrays each representing a  $\frac{1}{3}$ -octave band and consisting of 16 level LEDs. This level display may be switched so that each step between indicators is either 1, 2 or 3dB with three vertical scales provided to correspond with these steps. Scale calibrations are from  $+3$ dB/ $-12$ dB,  $+6$ dB/ $-24$ dB and  $+9$ dB/ $-36$ dB with a red LED indicator illuminated within the selected scale range.

A graticule covering the display has horizontal lines at 0dB and also at the 5/10/15dB point and the 10/20/30dB point to ease reading, with horizontal frequency calibrations at the bottom of the display.

All remaining features are on the right of the display matrix with a window to the right of the 0dB line showing a 3-digit 7-segment digital display of the zero level. Right again are two pushbuttons for increasing or decreasing the zero level in 10dB steps, between 30dB and 140dB which when using the microphone,

corresponds to unweighted SPL or when using other inputs to dB $\mu$ V thus providing a maximum sensitivity of  $-6$ dB $\mu$ V (0.5 $\mu$ V) on the 3dB per step range.

Beneath this display is a 3-position miniature switch which selects either octave band analysis,  $\frac{1}{3}$ -octave band analysis, or weighted  $\frac{1}{3}$ -octave band analysis, in which case the display may be the output of either an A-weighting or C-weighting curve according to the setting of a weighting switch. In these circumstances a green warning LED is illuminated within the zero level display.

A further miniature 3-position slide switch provides a selection of three decay times for the spectrum with two further switches controlling the display memories which are a particularly useful feature. The two memories are selected by slide switches—the second one being a 3-position memory function selector. The store position of this switch stores the current spectrum display in the memory selected by the memory select switch. Switching from the store position to the alternate position holds the store and both memories are retained in their current state even when the power is switched off. The third position accumulates peak values of the spectrum display in the selected memory.

A pushbutton switch with two adjacent LED indicators turns the spectrum display from realtime to recalled memory with the LEDs indicating if the display is in realtime or memory recall.

The bottom right hand corner of the front panel is the sound level meter section and this is coloured gold for easy identification. Within this section a 4-decimal digit display shows the sound level in decibels, and tenths of a decibel, with an adjacent 3-position slide switch selecting a fast or slow true rms display or a peak display. A further switch selects a flat response or standard A- or C-weighting with the final slide switch providing either a continuous display, impulse type display or an impulse hold function. Lastly there is a pushbutton with an

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- Breath and "pop" filter
- On-off switch
- Professional three-pin audio connector



## DESCRIPTION AND APPLICATIONS

The Beyer Dynamic model M 400 N (C) soundstar mk II is a unidirectional moving coil microphone, especially designed to meet the demand of musicians, singers and entertainers for an elegant and superb sounding microphone. It is also an excellent microphone for instrument pick up and well suited for a variety of broadcast, recording and stage applications. Its supercardioid pickup pattern minimizes background noise and other undesirable acoustic effects. A highly effective built-in burst filter controls explosive breath and "pop" noises. For boom, stand and hand use, indoor and out, the M 400 is unaffected by humidity and temperature extremes. Its rugged construction makes this microphone particularly suited to withstand the rigors of professional use. The microphone is fully fieldserviceable.

**M 400 N (C)**  
soundstar mk II

**Beyer**   
**Dynamic**

Beyer Dynamic (GB) Ltd. 1 Clair Road, Haywards Heath, Sussex RH16 3DP. Tel: (0444) 51003.

adjacent LED which freezes the indicated sound level when pressed and illuminates the LED as a warning. Pressing the button again restores to continuous display.

The final feature of the front panel is a red and a green LED charge indicator. During normal battery operation both LEDs are extinguished, but the red and green LEDs illuminate when about 15 minutes operation is left. But application of the Ivic IE-190A charger/mains adaptor will illuminate the red LED only to show that a fast charge is being applied. After about an hour the charger senses that the batteries are almost charged and illuminates the green instead of the red LED whilst reducing the charging rate to a trickle. Operation of the instrument from the charger/mains adaptor results in the red and the green LED, being illuminated alternately, because the instrument draws more current than the trickle charge rate and thus drains the batteries until the full charge rate is initiated. Normal charging takes about an hour and a half and then provides about three hours continuous operation on batteries.

At the right hand side of the instrument are three connectors; a phono socket providing output from the internal pre-amplifier as an unweighted signal; a co-axial socket providing input for the battery charger/mains adaptor; and a 7-pin locking plug interfaces a number of functions for external equipment. The following features are interfaced: 1 a dc output proportional to the SPL display. 2 a 4.8V logic level which is low when a display LED comes on and a particular frequency band is being scanned. 3 a sawtooth output synchronised with the display scanning. 4 a level output synchronised with the display scanning. 5 a gate input which interrupts the signal within the analyser when pulled low. 6 a 4.8V dc supply at up to 200mA for external equipment.

These features allow the complete spectrum display to be reproduced on an oscilloscope or permit continuous level monitoring on a chart recorder.

On top of the instrument is a 6-pin XLR connector for the signal input. This input is unbalanced and, the sensitivity may be changed from the normal dB/ $\mu$ V setting to 0.1dB/ $\mu$ V by removing a link between two pins. A further pin allows the gain to be trimmed by about 15dB by varying its resistance to earth while there is also a 12V dc 10mA power for microphones.

When used as a sound level meter an omnidirectional electret microphone is plugged directly into this connector. Alternatively a probe is supplied with 20dB or 40dB switchable attenuation for direct input purposes.

In spite of the instrument being small, operation is simple and the controls present little difficulty. And although all the features are identified by abbreviations, I quickly learnt what they stood for.

Externally the finish is good but I found it was possible to push the spectrum display back into the instrument leaving gaps around its edge for the ingress of dirt or foreign bodies. Also the thread in the tripod mounting was too short for many tripods.

A brief inspection inside the instrument showed that the form of construction was a number of sandwiched fibreglass printed circuit boards occupying the full cross section of the instrument. It appears that these boards

FIG 1  
IVIE IE-30A TRANSMISSION LOSS LIMITS -  $\frac{1}{3}$  OCTAVE BAND FILTER

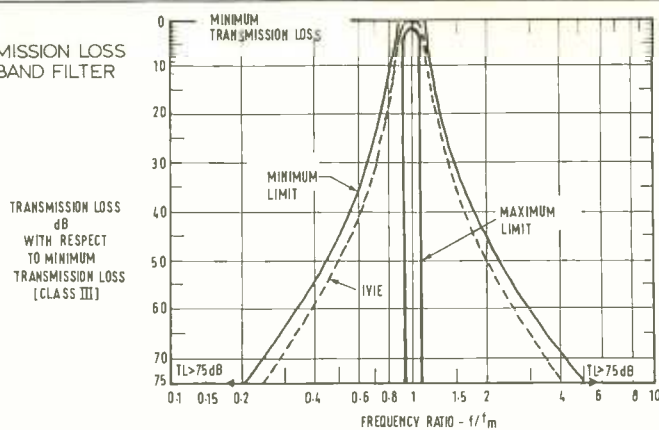


FIG 2  
IVIE IE 30A TRANSMISSION LOSS LIMITS - OCTAVE BAND FILTER

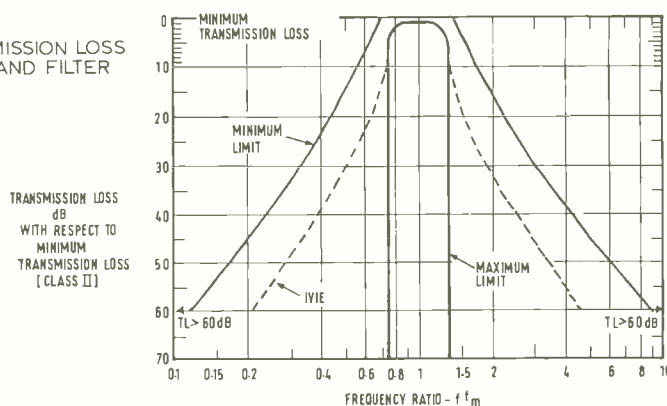


FIG 3  
IVIE IE-30A  
FREQUENCY RESPONSE

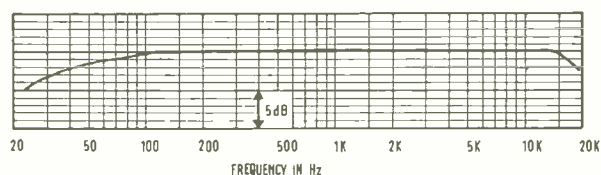
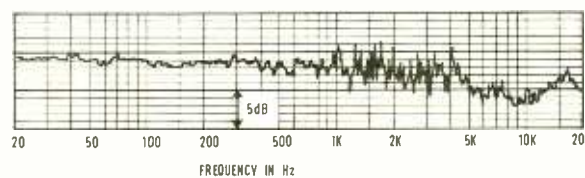


FIG 4  
IVIE IE-30A  
MICROPHONE  
FREQUENCY RESPONSE  
AT 180°



are interconnected by solder pins with pairs of boards back-to-back. Widespread use of integrated circuits was apparent and the general layout and component quality appeared to be good.

**The display**

The accuracy of the display increments was checked on the three display increment ranges and were within 0.1dB in the 1dB per step mode, within 0.5dB in the 2dB per step mode and within 1.5dB in the 3dB per step mode—all adequately accurate.

The centre frequency of a number of  $\frac{1}{3}$ -octave filters was checked and was very close to the nominal centre frequency as was the curve shape in comparison with the ANSI Class III standard for the  $\frac{1}{3}$ -octave filters and Class II

standard for the octave filters. Figs 1 and 2 show the performance of the 1kHz filters in comparison with the ANSI standards which incidentally are the toughest classes within the ANSI standard.

The three decay times for the displays were well balanced for handling various types of signal, the fastest decay being too fast for use with pink noise but useful with steadier signals.

Operation of the two stores, which are available to store display data, was excellent and it was thought that the maximum level accumulate feature had much to offer. As far as frequency response is concerned, with an electrical input, both the spectrum display and the SPL indicator were not absolutely flat, the



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errors for both are shown in fig 3—for most applications these small errors are of little significance.

**The sound pressure level meter**

The step accuracy of this decimal indicator was within the resolution of 0.1dB as was the accuracy of the zero level setting for the spectrum display over its complete range. True rms rectification was confirmed with a crest factor of 10, with the peak rectifier being a fast true peak indicator.

Checking the 'ballistics' of the metering in the fast and slow settings showed that it was virtually impossible to check to the IEC 'fast' standard and I felt it difficult to apply the IEC standard to a digital readout. However in the 'slow' setting the readout is more meaningful and the 'ballistics' correspond to the IEC standard. However, the application of a continuous tone did not produce any overshoot in the display, as is required to fully meet the IEC standard.

**Noise**

Checking the frequency response of the internal A- and C-weighting curves showed that the internal curves were remarkably close to the IEC requirements even where infinite tolerances are permitted. However, I found during this exercise that the indicated SPL could be in error if the input levels were not sufficient to produce a spectrum display around the zero dB line. Normally the complete display flashes if the input level is out of limits but it appears that the lower input level should be increased by the manufacturer.

The residual noise within the instrument depended upon the gain setting link in the input plug which gives a 20dB change in input sensitivity. At the lower gain setting where the display is in dBµV no internal noise showed on the spectrum display or the SPL display. At the higher gain setting of 0.1dBµV the SPL indication due to noise was 22dB in the flat mode, or 18.3dB A-weighted with the 1/3-octave spectrum showing -36dB reference, 0.1µV below the

*Carrying case with IE-30A realtime analyser, mains adaptor, IE-17A microprocessor analyser, probes and leads, and measuring mic in lid.*



1.25kHz 1/3-octave band and then rising by 12dB at 20kHz.

**Inputs and outputs**

Without the probe the input impedance was 101kΩ in parallel with 38.5pF which is adequately high for most purposes. With the probe, which has 20dB and 40dB attenuations accurate to better than 0.1dB, the input impedance became 990.1kΩ in parallel with 15.9pF at 20dB attenuation, or 999kΩ in parallel with 16.4pF at 40dB attenuation.

The pre-amplifier output level depends upon the zero level setting so that the zero dB line corresponded to an output of 30mV from a low source impedance suitable for driving loads above 600Ω. This output is of course an ac output directly proportional to the microphone or audio input at the input socket.

A further dc output is available at the interface socket and the voltage of this output is proportional to the reading of the SPL digital display with the specified output level at 0.01V per dB and the measured output at 100dB indication being 1.004V dc. The remaining interface outputs are primarily designed for interfacing with the Ivie IE-17A microprocessor audio analyser but also provide suitable X, Y and trigger signals for reproducing the spectrum analyser display on any oscilloscope.

**The microphone**

The electret microphone which plugs into the input connector via a long stalk to avoid reflections from the instrument's case is provided with a calibration adaptor suitable for using Bruel & Kjaer pistonphones. Calibration is achieved by a screwdriver operated potentiometer in the microphone's stalk and this potentiometer was too coarse in action for accurate calibration to tenths of a decibel.

The approximate microphone frequency response at 180° angle of incidence, which is the worst case, is shown in fig 4, which with reference to 1kHz indicates approximately a 3dB drop in sensitivity at high frequencies.

Inherent microphone and system noise was found to be 34.5dBA equivalent SPL or 46dB unweighted. In terms of 1/3-octave bands the noise above 315Hz was 23dB rising at lower frequencies.

**Summary**

The Ivie IE-30A analyser is a very compact and versatile instrument which will find many applications in the measurement of the acoustic properties of rooms. In addition it can readily be used as an accurate analyser for the alignment of studio equipment in conjunction with oscillators or noise sources.

The filters and weighting networks met the appropriate standards with ease, but, the interpretation of the digital readout for SPL in terms of the existing standards for mechanical meters is not clear.

Once used for a short time, it was easy to operate the instrument and to remember the abbreviations which are used on the controls, there being insufficient space to identify each control fully.

As mentioned some care is required in setting suitable levels for the SPL display to be accurate, but, in all other respects, this instrument is a delight to use.

Hugh Ford

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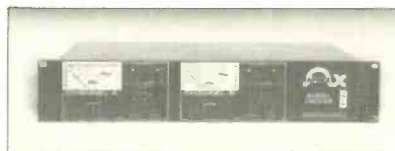
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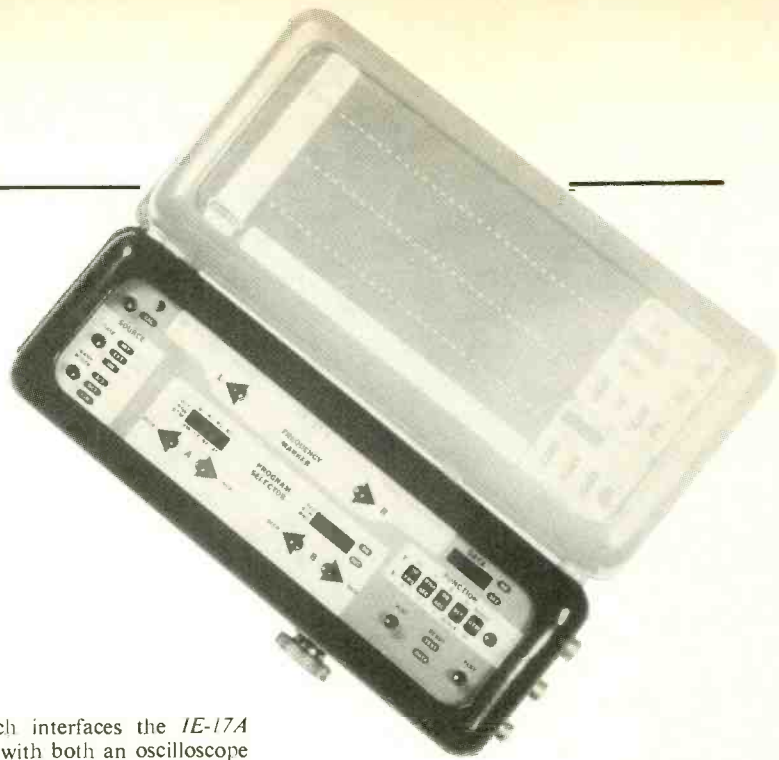
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Source: Studio Sound Effects Survey, Sept 1979.

# reviews

## Ivie IE-17A microprocessor audio analyser



### MANUFACTURER'S SPECIFICATION

**Measurement ranges:** dB SPL and dB $\mu$ V with the same range as the IE-30A. RT is  $\frac{1}{3}$ -octave or octave with 30  $\frac{1}{3}$ -octave or 10-octave bands in eight ranges from 0.5 to 100s full scale and a resolution of 10ms. dB/s in  $\frac{1}{3}$ -octave or octave, or broadband from 100ms to 100s full scale in 10 ranges with a resolution of 10ms. Delay from 200 $\mu$ s to 99.99s with a maximum resolution of 100 $\mu$ s. GTM with fully programmable pulse width, cycle time, delay time and aperture time. **Peripheral interface:** interface for X/Y plotter with output levels of 0 to 2.5V. Adjustable plotter speed. Oscilloscope interface with a Y-axis output of 0 to 2.5V and X-axis sync for either positive or negative triggering.

**Internal signal generation:** snare pulse with full spectrum (25Hz to 20kHz) response. Single 10ms pulse repeatability  $\pm 1$ dB full spectrum. Output level 2V peak-to-peak.

**Mechanical:** all modular construction provides dependable operation with ease of maintenance.

**Dimensions (whd):** 8x2 $\frac{3}{4}$ x2 $\frac{1}{2}$ in (203x70x54mm).

**Weight:** 1.8lbs (0.85kg). Shipping weight: 4.5lbs (2kg).

**Operating temperature:** -10°C to +50°C.

**Non-operating temperature:** -30°C to +65°C.

**Operating humidity:** 0 to 90%.

**Power:** from IE-30A (battery or ac operation).

**Price:** £813 (operates with IE-30A).

**Manufacturer:** Ivie Electronics Inc, 500 West 1200 South, Orem, Utah 84057, USA.

**UK:** FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Hertfordshire.

THE Ivie IE-17A microprocessor audio analyser is basically an accessory unit to the IE-30A spectrum analyser (also reviewed here). The IE-17A obtains its power by two links; one to the interface socket of the IE-30A and the other from its pre-amplifier output.

These links are provided by the manufacturer so the IE-17A clips onto the base of the IE-30A and is secured into the tripod mounting bush by a long screw. This passes through the IE-17A and also provides a new tripod mounting bush at the bottom of the combination units. (Like the mounting bush on the spectrum analyser reviewed in *Studio Sound* April 78 the depth of the new bush is also too shallow for many tripods.)

On the right of the IE-17A are two 7-pole Amphenol sockets, one of which provides the interface with the IE-30A spectrum analyser,

and the other which interfaces the IE-17A microprocessor unit with both an oscilloscope and an X/Y recorder; this produces oscillograms of plots of various functions. There is a Y-axis output, to be used with an oscilloscope's timebase. Referring to the X/Y recorder outputs there are 0—2.5V dc in addition to a pen lift output. Three phono sockets to the right of the microprocessor analyser allow the single connection to the spectrum analyser, an input signal connection for external signal sources and an audio output which may be derived from the latter or from an internal signal source.

The IE-17A has five basic functions: (1) that of providing oscillograms or hard copy plots of the level indicated by the spectrum analyser SPL indication, versus frequency in octave or  $\frac{1}{3}$ -octave bands. (2) That of measuring reverberation time in octave or  $\frac{1}{3}$ -octave bands and providing oscillograms or hard copy X/Y plots of reverberation decay curves, together with the computed reverberation time in relation to decay time. (3) That of making oscillograms or hard copy X/Y plots of sound level versus time. (4) That of measuring the time between an emitted electrical waveform and the receipt of an electrical waveform. (5) A gated time measurement mode whereby a burst is emitted and the received burst is gated into the analyser for a given period after a given emitted time.

These five functions are selected by sequentially pressing a pushbutton which illuminates indicators showing which function is selected. This function select arrangement also has a second use for calibrating the oscilloscope and the X/Y recorder. When a calibrate button is pressed a calibrate lamp is illuminated and a full scale X and Y waveform is put out of the oscilloscope. The oscilloscope Y gain and the timebase are then adjusted for full scale X and Y deflections. At the same time the X/Y recorder is calibrated using the function select button which initially provides three static pen positions at X = 0 Y = 0, X = 0 Y = 1 and X = 1 Y = 0. Pressing the function select button again draws a full scale X-axis at Y = 0 with tick marks dividing the axis into 10 parts. A further depression of the function select button repeats the performance for the Y-axis at X = 0. This completes the calibration pro-

cedure.

Following calibration and subsequent selection of the required function and its parameters, the pressing of a 'test' button initiates the function with a 'data' light flashing until the function is complete. The resulting data is then shown on a 3-decimal digit display indicating in either decibels or seconds according to the function being performed, a 'sec' or 'dB' light is illuminated accordingly. In addition, the oscilloscope display is initiated and continuously repeated from an internal store so that there is no need for a storage oscilloscope or special long persistence tubes. If an X/Y plot is required a 'plot' button initiates the plot with a recessed screwdriver operated potentiometer pre-setting the X-axis speed of the X/Y plotter.

A flashing vertical line in the spectrum analyser shows which octave or  $\frac{1}{3}$ -octave band has been selected for the analyser, this cursor is moved to the left or right by two pushbuttons on the microprocessor analyser. Additionally, within the IE-17A are two 4-digit displays, each of which is associated with two pushbuttons for increasing or decreasing their settings, depending upon the selected mode.

Completing the microprocessor controls are two pushbuttons in the signal source section of the analyser; one selects the bandwidth of the electrical output signal between linear, octave or  $\frac{1}{3}$ -octave and the other controls the gating of the output signal, and its selection either from the internal or the external source.

### The dB/frequency mode

In the normal mode the IE-30A filter resolution is 1dB, but use of the IE-17A provides a 0.1dB resolution in any octave or  $\frac{1}{3}$ -octave band within the level range of the display on the IE-30A. In normal operation one of the 4-digit displays in the IE-17A is set to correspond with the selected range in the IE-30A. However, if you wish to have readings relative to the 0dB level in the IE-30A the 4-digit display in the IE-17A is set to zero.

In the plot mode as with the oscilloscope display, the full Y-axis represents 50dB but in

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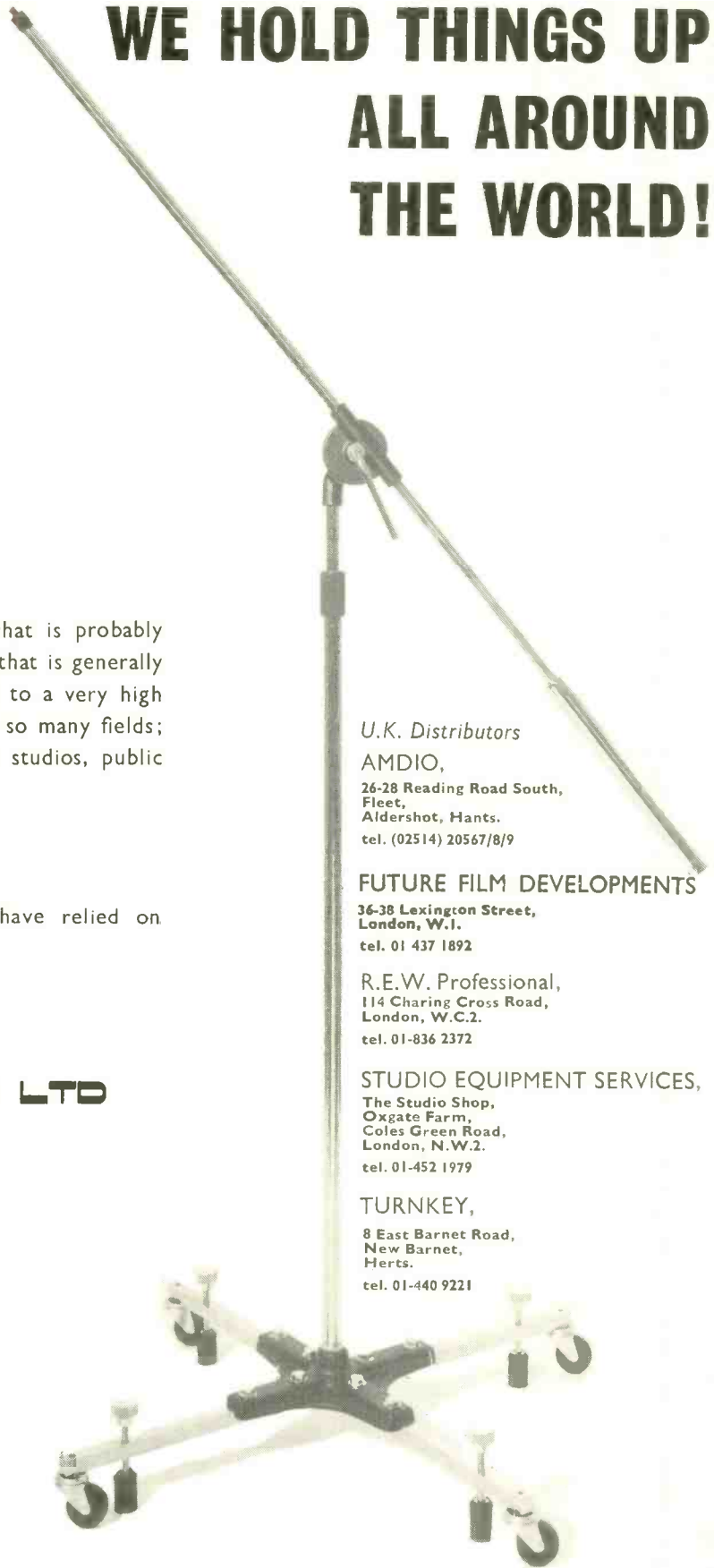
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addition to plotting the current realtime data, it is also possible to plot the contents of the memories in the spectrum analyser.

**The reverberation time mode**

The reverberation time of a room is normally quoted as the time required for a signal-to-decay to 60dB below its initial value, this is known commonly as RT60 (but is seldom measured as such) and is interpolated from higher levels due to the available dynamic range in most rooms.

To measure reverberation time it's necessary to apply the output of a noise generator (such as the Ivie IE-20) to the microprocessor unit which then gates the noise output to a loud-speaker system. Reverberation time may then be measured in octave or 1/3-octave bands, as desired, with the reverberation time being selected by one of the 4-digit displays providing ranges of 0.5, 1, 2, 5, 10, 20, 50 and 100s.

The other 4-digit display is used to select the method of measurement for the reverberation time such that the RT60 is interpolated and over a selected change in level. The selectable sections are the first 5, 10, 15, 20 or 30dB of decay, the second 5, 10 or 15dB of decay, the third 5 or 10dB of decay or the fourth, fifth or sixth 5dB of decay.

One of the particularly attractive aspects of the microprocessor unit is the available reverberation time plot which first plots the decay curve for the chosen frequency band and then plots the reverberation time as the decay curve progresses. An example of such a plot is shown in fig 1 for 1/3-octave bands at 1kHz and 16kHz. The X-axis represents realtime using the 0.5s time range, which the Y-axis represents in one case level in decibels, and in the other case the progressively calculated RT60 with the time scale always being twice the selected reverberation time range setting.

The calculated RT60 is indicated in the data display in the microprocessor unit and another special feature is that several samples of the reverberation time may be taken with the results being statistically treated by the microprocessor unit before plotting.

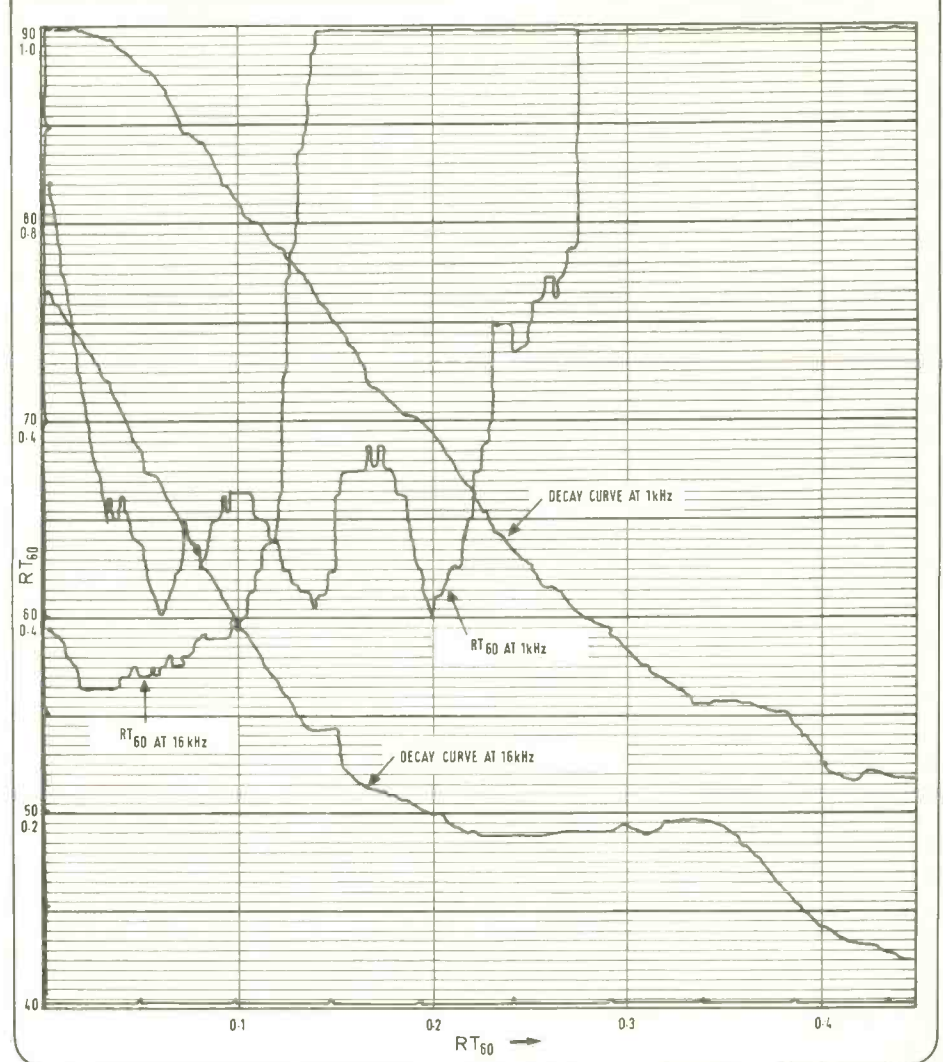
A final clever feature of the unit is that any form of noise source may be used, such as a pistol. In this mode the unit is triggered by noise exceeding a threshold 10dB below the 0dB line, it then searches for the maximum sound level and after that measures the reverberation time as per the setting of the controls.

**The 'decibels/seconds' mode**

This mode requires the use of an oscilloscope or X/Y plotter to plot the input level to the IE-30A versus time, the data to be plotted is stored in the IE-17A and the plotting can be subsequent to the measurement provided the unit is kept switched on. The time required to accumulate the data is set in one of the 4-digit displays, which provides ranges from 0.1s up to 100s in a 1:2:5 sequence. The initiation of the data capture can either be by the 'test' pushbutton or by means of external triggering once the data capture commences, when a given input level is exceeded similar to the reverberation time system using external sound sources.

The form of recorded data can be unweighted, 1/3-octave or octave according to the control

FIG.1 IVIE IE-17A REVERBERATION PLOT



settings on the IE-30A.

**The delay mode**

In the delay mode, the microprocessor unit emits a 10ms tone burst which can either be its internally generated 'snare' pulse, or derived from an external source plugged into the Ivie.

The time for the burst to return is then measured in time ranges from 0.1s up to 100s in a 1:2:5 ratio as set in one of the 4-digit displays. The actual delay time appears in the 'data' display as four digits covering 0.002s to 100s as appropriate to the range selected.

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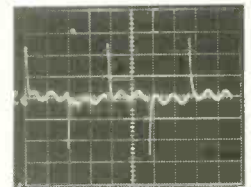
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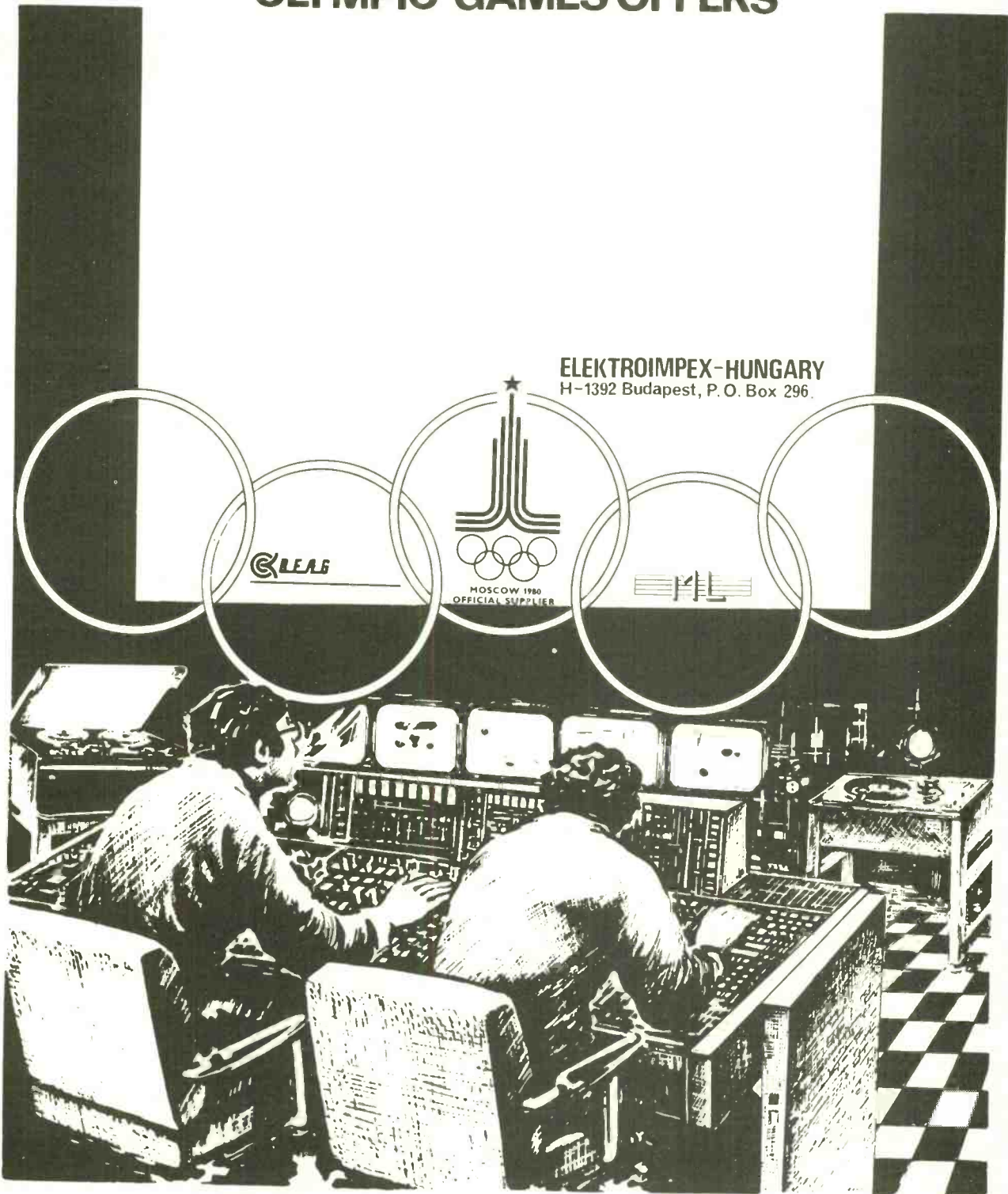
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The spectrum of the 'snare' pulse is such that at the same time as measuring time delay the frequency response may also be measured if the spectrum analyser is put in the 'accumulate' mode. Because of the short duration of the 'snare' pulse this will be the anechoic frequency response providing there are no local obstructions which can produce reflections in the 10ms burst time of the pulse.

A good point of the time delay mode is that it is possible to measure the first, second and third reflections. This is accomplished by first measuring the time delay of the direct wave and then sequentially measuring the reflections by changing a marker in the 4-digit display which is not used for the time delay range setting. The only limitation of this measurement is that the reflections must not have time to merge with each other or with the direct wave.

**The gated time mode**

This mode is for measuring the anechoic performance of transducers, etc, in an anechoic environment in addition to certain specialised room measurements. The principle is that the Ivie emits a toneburst to, for instance, a loudspeaker under test. After a certain time this toneburst arrives back at the Ivie's microphone which has meanwhile been gated off; at the time of the toneburst's return the microphone is gated on for a time long enough to measure the returned toneburst and then gated off again so that reflections do not enter into the measurement. Fig 2 shows how this system works.

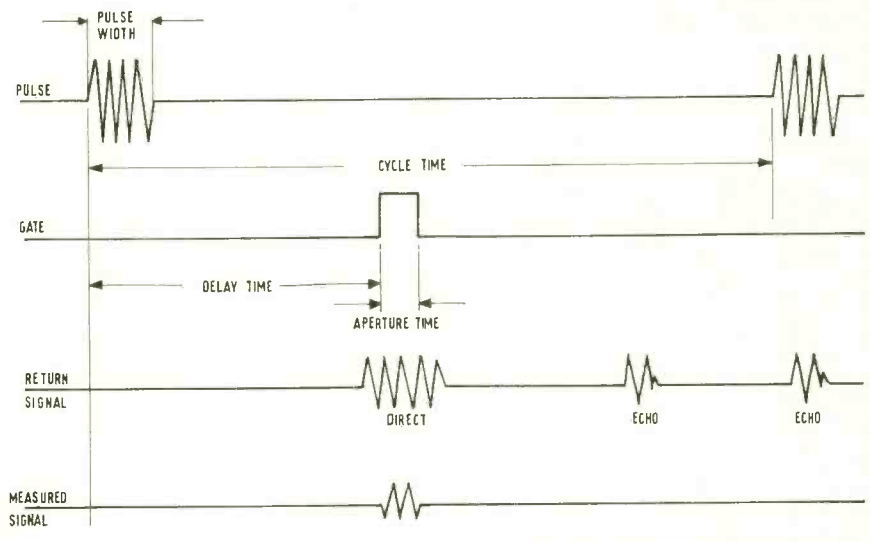
The width of the toneburst is set by the pulse width setting and the delay time for the return of the toneburst is set together with the measuring time (or aperture time) so that a long enough section of the return toneburst is gated for measurement. An oscilloscope connected to the output of the IE-30A may be used to observe the returned toneburst triggering the oscilloscope from the IE-17A unit.

When using the internal 'snare' pulse the width is fixed at 10ms, but, the width of bursts from external sources may be set between 1ms and 999ms in 1ms increments. The cycle time may be varied from 1s to 30s and the delay and aperture times from 1ms to 9.999s in 1ms increments.

The types of oscilloscope display for spectrum analysis are shown in fig 3 for the 1/3-octave mode, where the level bars all join, and the octave mode in fig 4 where each octave band is separated.

The output voltage to the oscilloscope Y-

FIG. 2  
IVIE IE-17A GATED TIME MODE FACILITY



axis was 2.9V with the trigger pulse being a V5 positive pulse of about 200ns duration and requiring approximately a 28ms sweep time. The X/Y plotter output was from 0V to 2.487V on the Y-axis and 2.409V on the X-axis, the latter is below specification.

In the decibels/frequency mode the resolution of the microprocessor display is 0.1dB and accurate to within the display resolution. Similarly in the delay mode the accuracy of the measured delay was well within the resolution of the display with a 1s indication being an actual 1.0018s.

Gated time uses the internal gate for external signals and the frequency response of the gating system was within 0.1dB from 20Hz to 20kHz. The signal handling capability of the gating system depends upon the selection of

linear, octave or 1/3-octave filtering in the gate, with the following maximum input and output levels obtainable before the onset of severe distortion (see Table 1)

I found that the turn on of the gate was relatively slow (see fig 5) for a 1kHz sinewave. I also found that the turn off could occur at any time in the waveform, and not only at zero crossings. As with the delay mode the timing of all the waveforms in the gating system was extremely accurate.

Unfortunately time did not allow a full investigation into the performance of the reverberation time mode but with a linear decay it appeared that the different time measurement methods correlated.

**Summary**

This IE-17A microprocessor analyser in conjunction with the IE-30A spectrum analyser is a most powerful tool and the complete system is portable, battery operated and very small.

Clearly this setup will find a home not only for room measuring but also in the laboratory.

Hugh Ford

	Linear	Octave	1/3-Octave
Maximum input	-10dBm	+5dBm	+5dBm
Maximum output	+10dBm	-5dBm	-2dBm

Fig 3

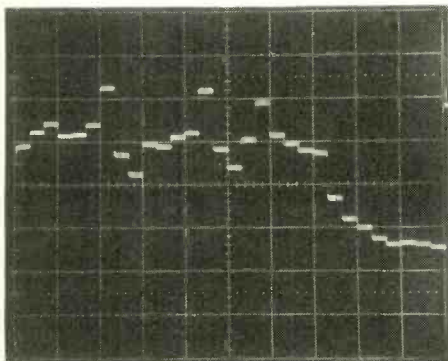


Fig 4

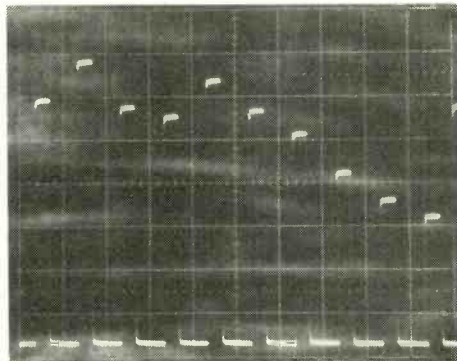
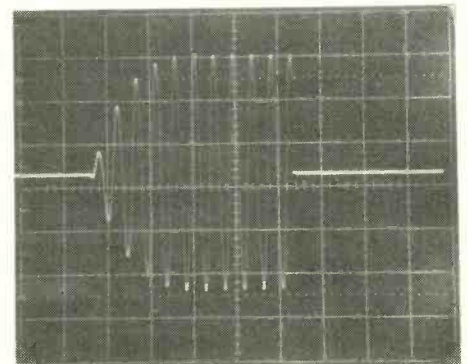
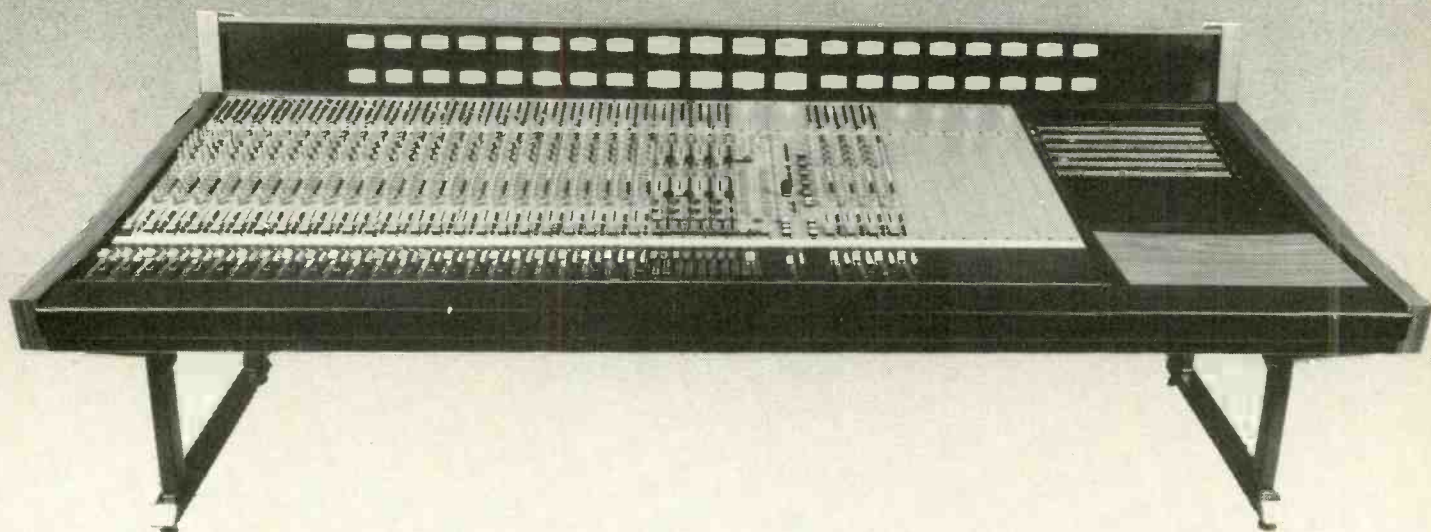


Fig 5





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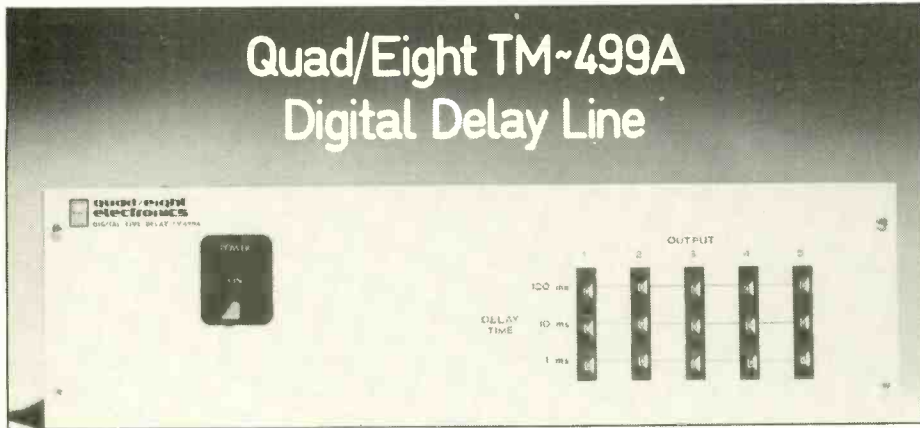
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# reviews



## MANUFACTURER'S SPECIFICATION

**Delay capacity:** random access memory, 85ms per module, selectable in 1ms increments, 510ms maximum with six memory modules.

**Delay accuracy:** 0.005% of selected delay. Note—at a setting of 0ms the time delay is 0.2ms.

**Frequency response:** 20Hz to 15kHz  $\pm$ 1dB.

**Harmonic distortion:** less than 0.1% from 20Hz to 10kHz at +18dBm (6.16V) input level. Less than 0.2% from 20Hz to 10kHz at -12dbm (195mV) input level.

**Dynamic range:** greater than 93dB unweighted.

**Inputs:** one transformer coupled balanced (floating) input with XLR type female connector.

**Input impedance:** greater than 6.6k $\Omega$  ( $\leq$ 600 $\Omega$  source) transformer isolated.

**Maximum input level:** adjustable from +5dBm to greater than +20dBm (1.38V to 7.75V).

**Gain:** 15dB with input and output level controls at maximum clockwise rotation.

**Outputs:** five transformer coupled balanced (floating) outputs with XLR type male connectors.

**Output impedance:** 120 $\Omega$  ( $\geq$ 600 $\Omega$  load), transformer isolated.

**Maximum output level:** adjustable from less than -10dBm to +20dBm into 600 $\Omega$  load.

**Power requirements:** 100/110/120/200/220/240V AC, 50/60Hz, 100W maximum.

**Controls:** one input level control, one output level control per module, three delay time selectors per output module (1ms, 10ms, 100ms)

**Indicator:** one input overload indicator (LED)

**Connectors:** one Cannon XLR-3-12C input connector, five Cannon XLR-3-11C output connectors.

**Mounting:** standard 19in rack

**Dimensions hwd:** 5 $\frac{1}{2}$  x 19 x 13in (12.95 x 48.3 x 32cm)\*

**Weight:** 36lbs 12oz (16.44kg)\* with all modules installed.

\*Note—these conversions are incorrect, but from the manufacturer's specification.

**Price:** £1560 basic unit, \$2795 ex works. Memory cards £355 each, output modules £210 each.

**Manufacturer:** Quad/Eight Electronics, 11929 Vose Street, North Hollywood, California 91605, USA.

UK Agent: Audio Kinetics (UK) Ltd, Verulam Road, St Albans, Hertfordshire.

**T**HE Quad/Eight digital time delay unit is a single input delay with up to five separate audio outputs which have individual delay settings up to 510ms in 1ms increments. The unit is therefore eminently suitable for public address systems, sound reinforcement, and similar applications.

The minimum configuration of the unit is a single input and a single output with up to 85ms delay capability. Further outputs may be readily added by inserting up to the maximum of five output cards, each of which has time delay selector switches which address the random access memory. Similarly the basic 85ms time delay may be expanded in 85ms blocks by adding up to the maximum of six random access memory cards which provide the full 510ms delay capability.

In addition to the memory and output circuit cards the unit has two further plug-in printed circuit cards which comprise: an input module and a logic module all the boards plugging into a mother board in the base of the unit. Whilst the boards are of good quality with a clear and uncrowded layout, no component identifications are provided for servicing and the information about the unit provided by the

manufacturer was minimal. The input and output transformers to the rear of the mother board are said to provide balanced (floating) input and output connections at the rear XLR connectors. The power supply is to the left of the card frame with the power supply stabilisers

fitted to a heatsink at the rear of the unit. The power input is via an IEC connector at the rear with a nearby imperial size power fuse which is properly identified.

Access is gained to the power line voltage selector by removing the front panel, the power on/off switch, power indicator light and the time delay selector switches protruding through the front panel. The latter consist of three thumbwheel switches for each output module; the first switch selects 1ms increments, the second 10ms increments and the third 100ms increments, each switch having 10 positions calibrated from zero to nine.

Other than the preset potentiometer level controls on the input card and on the output cards there are no other adjustments except a position switch on each memory card and a switch on the logic card which is set to the number of memory cards installed. An LED overload indicator is fitted to the front of the input card, but for some peculiar reason this cannot be seen with the front panel in position. Unfortunately this indicator is illuminated just short of the input clipping level and is rather slow acting with no hold circuit. Taking 6ms to be illuminated and operating at clipping this is not a very satisfactory feature.

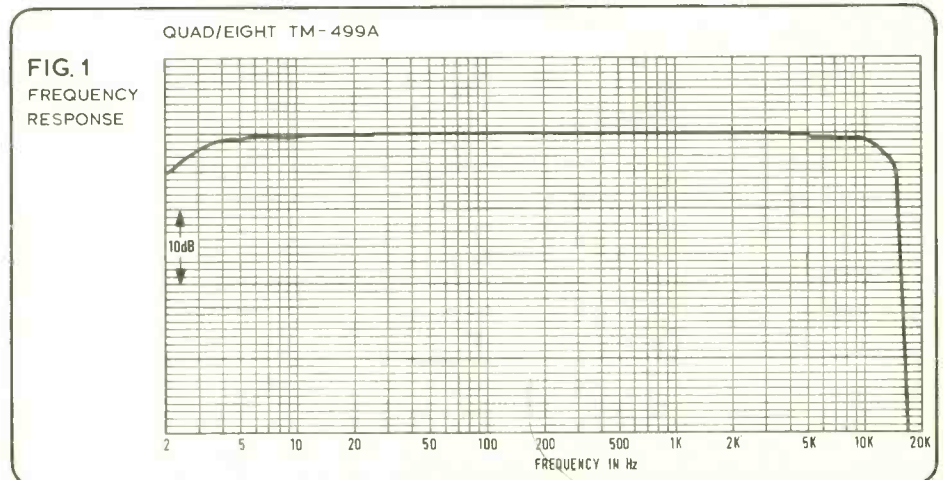
The galvanised sheet steel unit is assembled with self tapping screws—a form of construction that I don't particularly favour—with 'ears' provided for mounting into a standard 19in rack. The printed circuit boards are rather loosely held up by a slotted metal angle secured to the top cover with the logic board which has a metal screen mounted on four pillars, one with a screw missing.

Because of some problems with the first unit (which after testing was completed, we learned was only a 'mechanical sample' for exhibition purposes) a second sample was sent directly from the factory for testing. Unfortunately, this suffered some damage in transit, but the damage was such that the basic performance was unlikely to have altered.

## Frequency response and noise

The overall frequency response as shown in fig 1 was found to be constant irrespective of input level or delay time settings with the

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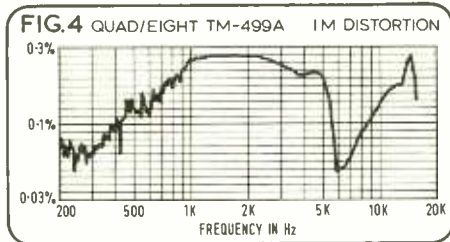
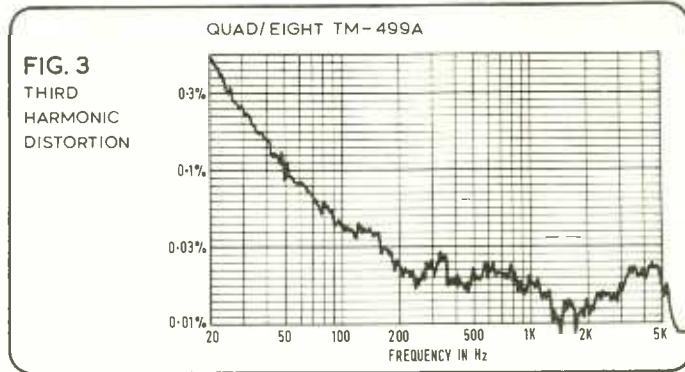
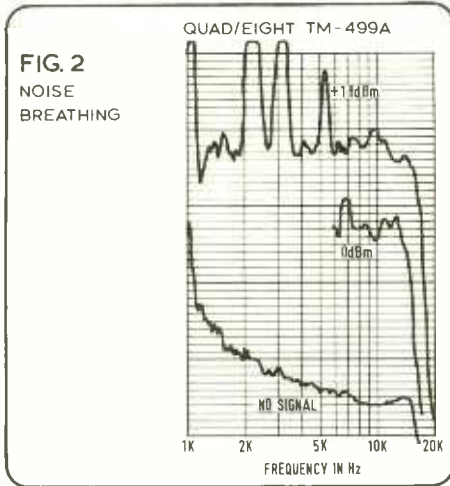


TABLE I

Frequency	Hum level in outputs
50Hz	-61dBm
150Hz	-58dBm
250Hz	-68dBm
<b>Maximum Signal-to-noise (reference +20dBm)</b>	
22Hz to 22kHz band limited rms	77dB
A-weighted rms	89dB
CCIR-weighted rms	90dB
CCIR-weighted quasipeak	86dB

-3dB point at high frequencies occurring at 13kHz which is well outside the manufacturer's specification of  $\pm 1$ dB from 20Hz to 15kHz. This is in spite of a high sampling rate of 48kHz derived from a 6.144MHz crystal.

The output was found to be effectively free from sampling rate tones with the 48kHz sampling frequency and its 96kHz second harmonic being at least below -70dBm in all five outputs.

On the other hand mains hum was found to be a problem not only in the outputs but also a relatively loud mechanic hum from the case, which was similar in both samples tested. The hum in the outputs varied with the output level control setting, but not with the input level control setting, the following hum and noise figures were obtained with the delay unit set for unit gain and +20dBm maximum level (Table 1).

The above figures fall short of the manufacturer's specification of 93dB unweighted and unfortunately this is not the whole story as the above relate to a no-signal condition and the delay unit uses some form of compression and expansion, but apparently not pre-emphasis.

Fig 2 shows a spectrum analysis on the no-signal noise and the noise with a 1kHz tone at +18dBm and at 0dBm, it can be seen that up to more than 30dB noise breathing occurs with the +18dBm signal, and 20dB with the 0dBm signal.

While the time constant of the compressor/expander has been set so that the noise breathing is not obvious on much programme material, it was found to be clearly audible on transients.

There was however a considerable improvement in the second sample tested. With reference to the maximum output level of +18dBm

the noise varied from one output to another, the figures in Table 2 being typical:

TABLE 2  
Band limited 22Hz to 22kHz rms  
A-weighted rms  
CCIR-weighted rms  
CCIR-weighted quasi-peak

	OUTPUT A	OUTPUT B
Band limited 22Hz to 22kHz rms	86.0dB	93.6dB
A-weighted rms	94.5dB	98.2dB
CCIR-weighted rms	87.8dB	89.5dB
CCIR-weighted quasi-peak	83.5dB	85.0dB

Power line frequency hum in the outputs remained a problem with substantial differences between channels and one of the worst cases was the 150Hz output in channel one at only -68dB, channel two was 11dB better.

The most significant improvement over the first unit was the reduction in noise breathing, now in the order of 20dB from maximum signal, to no signal conditions—a very sub-

stantial improvement which can be readily accounted for by misalignment of the original unit.

**Distortion**

As can be seen from fig 3 the predominant third harmonic distortion is at a satisfactorily low level at all frequencies and the distortion was found to vary little with operating level and be independent of the delay time settings. Furthermore, the twin-tone difference frequency distortion to the CCIF method is completely satisfactory as can be seen from fig. 4.

However it was found that short tonebursts suffered considerable distortion at the leading edge, typical of which is fig 5 showing the input tone burst at 1kHz and the delayed and distorted output toneburst. Also, in fig 6 a 1kHz squarewave suffered from a degree of ringing.

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In the second sample, some improvement was noted in the distortion of tone bursts but this remained significant at high operating levels with apparent clipping of the first cycle of 1kHz tone bursts.

**Input and outputs**

Initially considerable trouble was experienced with the delay unit, until it was discovered that the input is not as specified, a normal floating input but a rather unusual configuration. Measurement of the input impedance revealed that the 'low' side of the input has a capacitor of 30nF to the signal earth with the result that if the input terminals are reversed the capacitor shunts the input with disastrous results on the frequency response. Looking across the 'balanced, floating' input terminals the input impedance was found to be 6.5kΩ, perhaps a little on the low side, since I prefer to see at least 10kΩ which has an insignificant effect upon 600Ω lines.

The common mode rejection at the input varied with frequency, being 34dB at 100Hz, 14dB at 1kHz and 5dB at 10kHz, a performance which could well be improved.

The input level for the illumination of the overload lamp could be varied from in excess of +24dBm down to +5dBm by means of the input level control with the output level being variable up to +19dBm or +21dB, reference 0.775V into a high impedance from a source impedance of 115Ω. With both the input and output level controls at maximum the available gain was 15.5dB.

At 1kHz the overload indicator lamp was illuminated just before the onset of clipping, but it was found to be 2dB more sensitive at 10kHz and 1.5dB too insensitive at 15kHz.

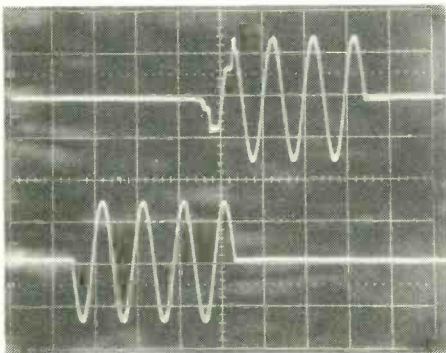
In the second sample, the alignment of the overload indicator was also improved but the input configuration remained the same, with the same common mode rejection ratio. Similarly the frequency response failed again to meet specification with the -3dB point at high frequencies occurring at 13kHz falling to -5dB at 15kHz.

**Time delay**

The inherent delay from the input to any output with the delay controls set to zero was found to be 218μs with the delay settings added to this inherent delay.

Accuracy of the delay setting was found to be

FIG 5



94 STUDIO SOUND, NOVEMBER 1979

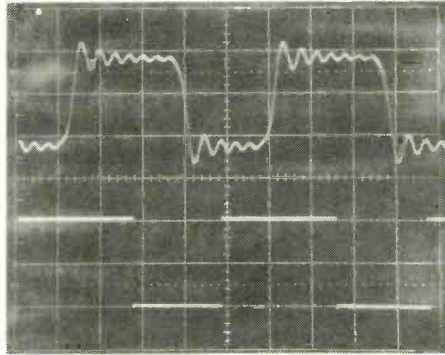


FIG 6

0.01% too long at 20°C which is clearly close enough for practical purposes but not to specification. The delay accuracy was however to specification in the second sample.

**Summary**

Clearly in concept this is a good delay unit for sound reinforcement and similar applications but the review sample did not meet the manufacturer's specification in several respects. While the second sample showed substantially less noise breathing, there were still a number of other shortcomings and peculiarities.

Hugh Ford

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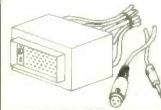
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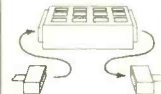
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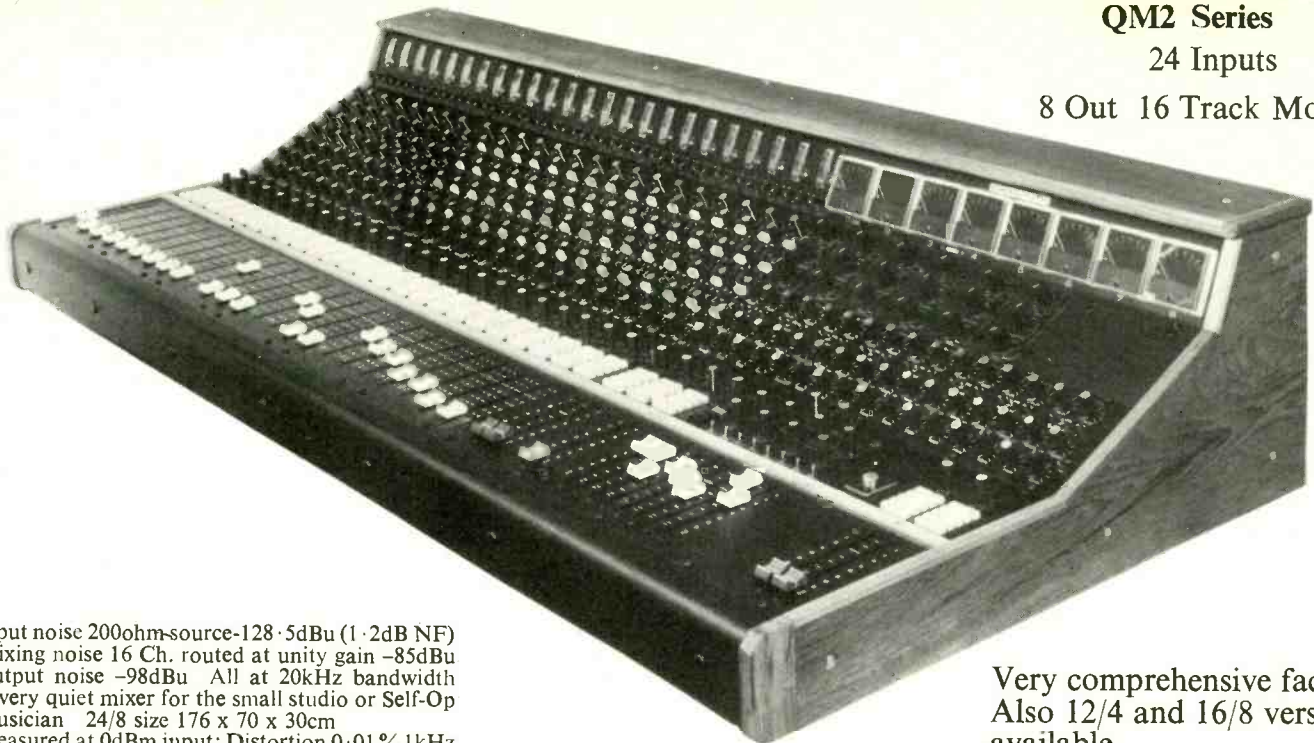


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**Package two** £2645.00  
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**Package three** £4312.50  
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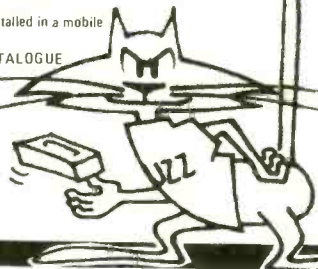
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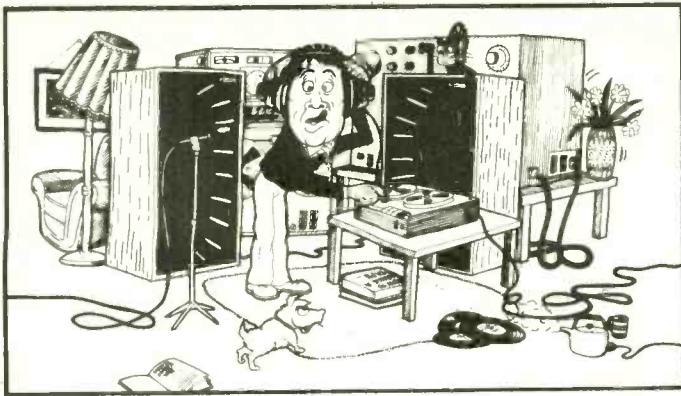
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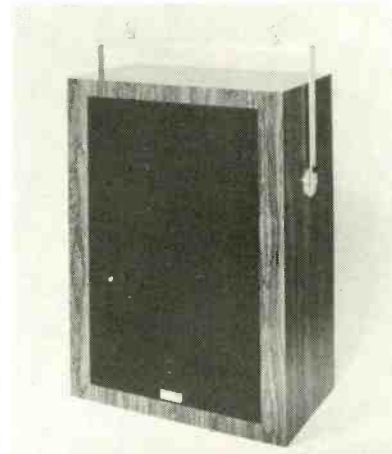
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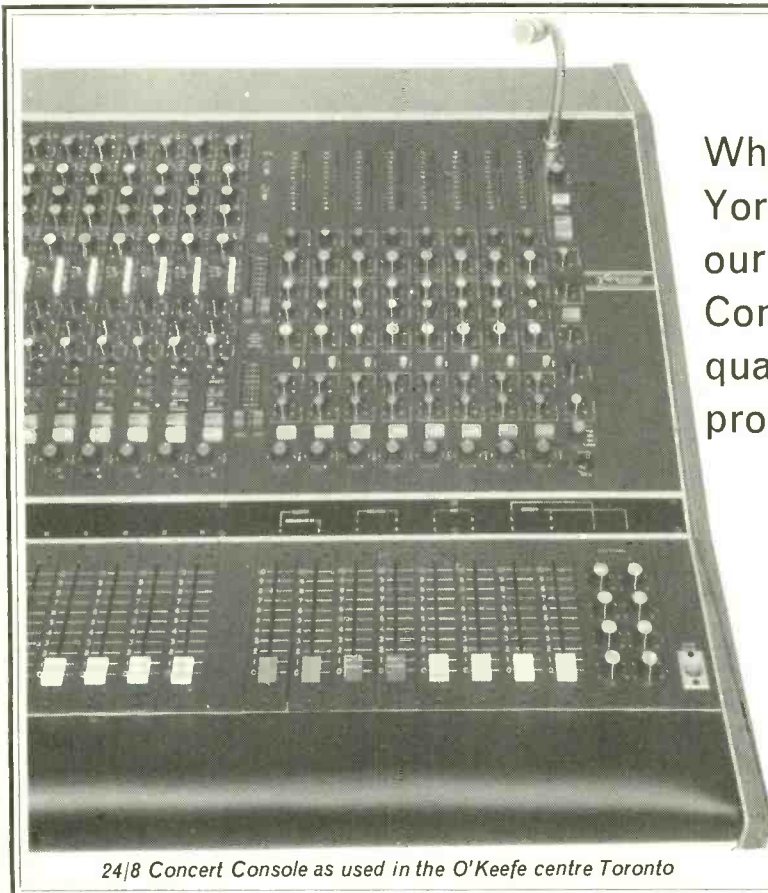
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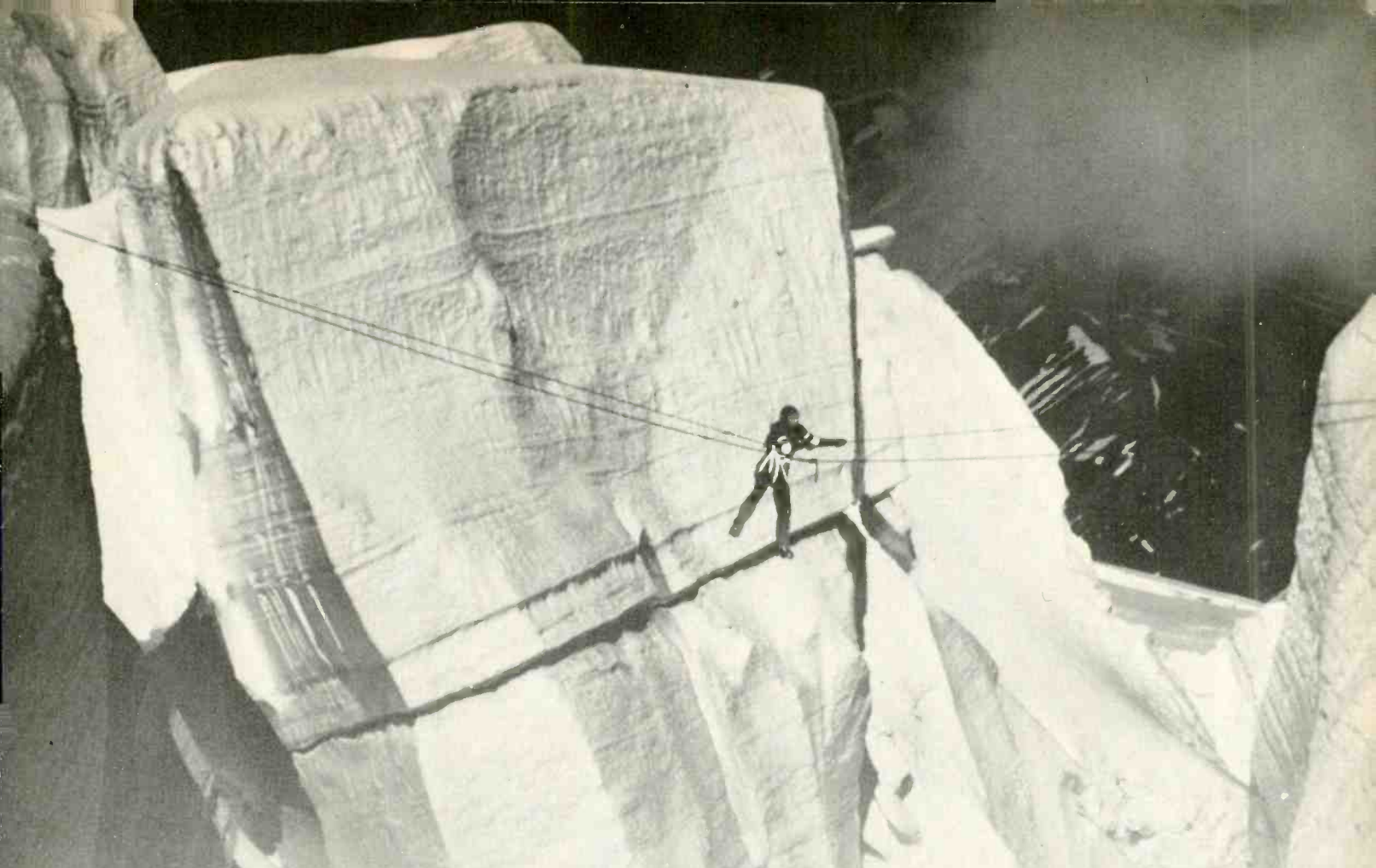
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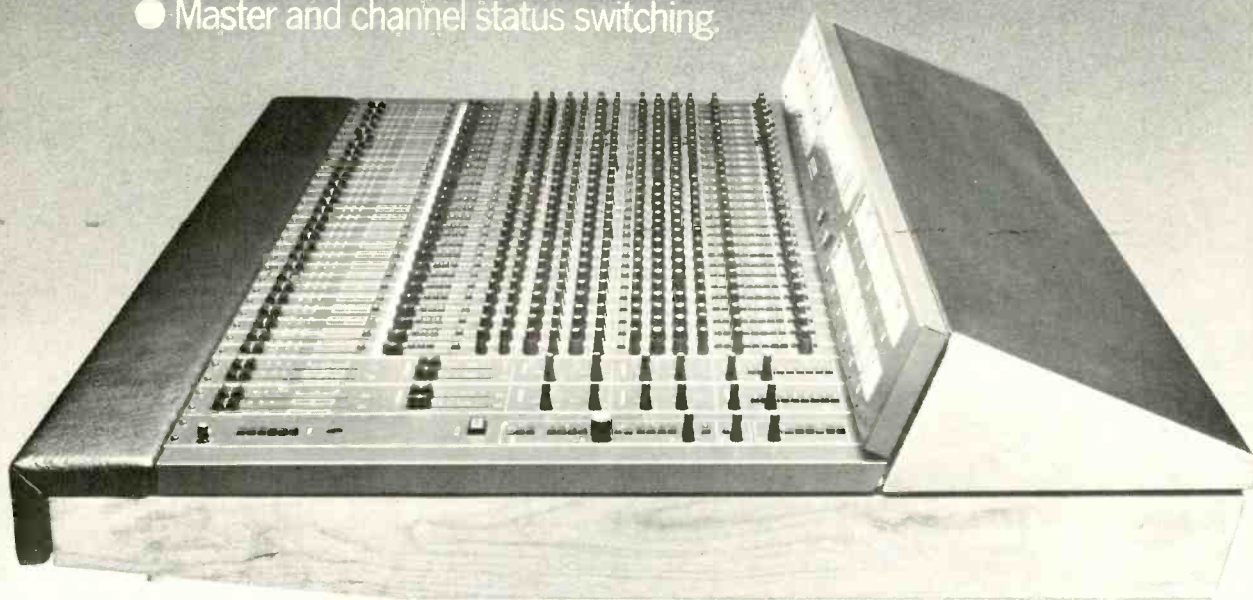
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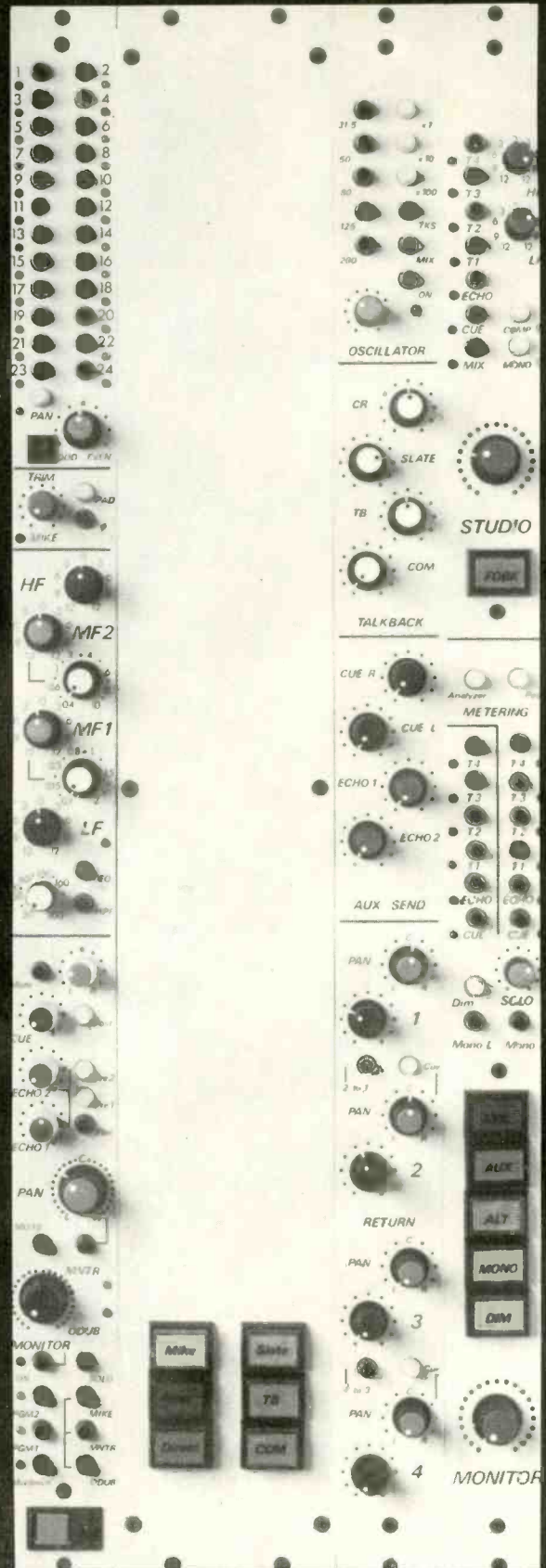
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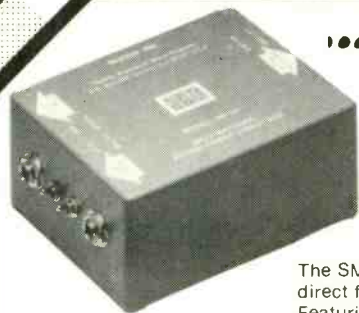


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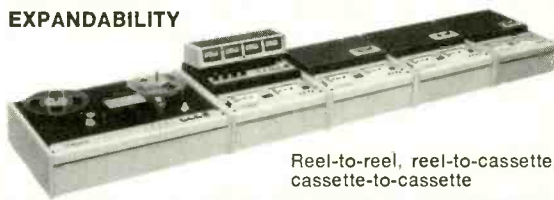
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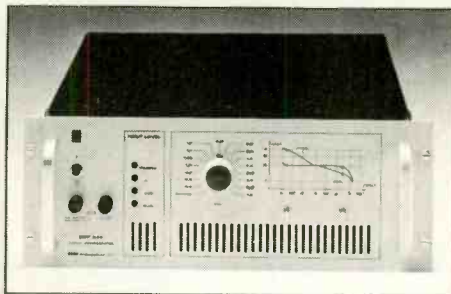
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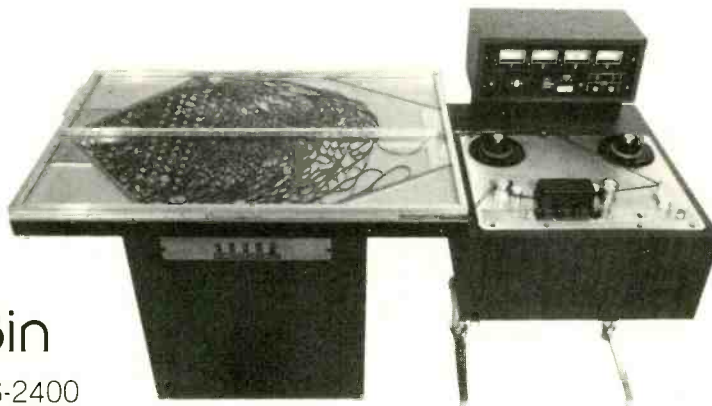
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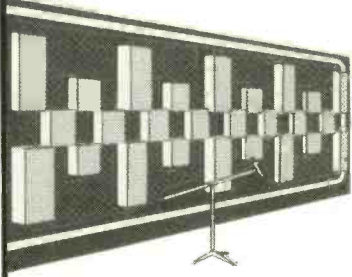
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JBL L6S	£400
Tannoy Ardens with HPDs	£300
Tannoy Devons	£200
HH TPA50 amp	£75
AUDIO & DESIGN stereo eq unit E 900RS	£350
5 feet tall equipment racks	£75
BBC 19 inch rack inc. psu 6 line drive amps 2ppm	...
Drivers and meters 2 mic amps	£300
Close circuit tv camera and 9in. monitor	£200
Various mics inc. Neumann KM 53 and KM 54 Crown D 60 amps	£130
PYE stereo comp/lms	£350
DBX 216 professional noise reduction 16 channels	£3,300
Guaranteed once used Scotch 250 2in. tape, per reel	£25
HAMMOND T100 organ	£750

**NEW EQUIPMENT**

B.E.L. Noise reduction units 8 tracks	£500
Stereo units	£130
Power supplies for valve mics	£60
B.E.L. BF20 stereo flangers	£450
WASP synth	£160
SENNHEISER MKH 110 condenser mics and psu's	£120
TRIDENT Fleximix	...
PA:CE 27 way graphic equalisers	£199
Revox A77 high speed	£450
REVOX B77 high speed	£500
REVOX B77 low speed	£450
All MXR and SESCOM products	...

**STUDIOS FOR SALE**

Large country house, 40 minutes west London. Large grounds, fully equipped 16 track studio. No external noise problems. Would suit producer or wealthy musician. Details upon request. Well-established West Midlands commercial studio, A.C.T.T. recognised. Very well equipped on large site comprising 800sq. ft. studios, large control room, offices, rest room, workshop, 3-bedroom house and car park. Details upon request.

ALL PRICES EXCLUSIVE OF V.A.T.

**Don Larking**  
 Audio Sales

50 CHEAPSIDE, LUTON, BEDS.

Telephone: Luton 27195, 26693, 422387

Telex No. 825488

**THE PROFESSIONALS SHOP**

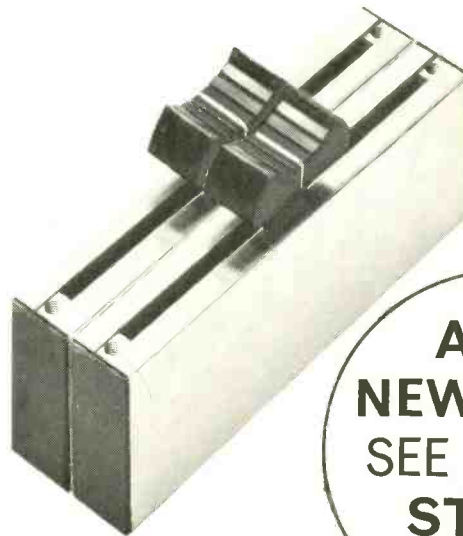
# SLIMLINE

## Penny & Giles small development in the fader business

Penny & Giles new Slimline fader is only 12.7mm wide with a 65mm electrical stroke. Yet, within that 12.7mm body width you can have mono or stereo outputs, optional switch linear or audio taper with an infinitely smooth and stepless fade - plus the other performance advantages of Penny & Giles conductive plastic faders.

Our small development sounds good - and has a small price to match.

Write for full details or phone our sales office.



**AES  
 NEW YORK  
 SEE US ON  
 STAND  
 C10**

**Penny & Giles Conductive Plastics Limited**

**United Kingdom:**

Newbridge Road Industrial Estate  
 Pontllanfraith Blackwood Gwent South Wales  
 Telephone: Blackwood (0495) 223771

**Germany:**

Nibelungenstrasse 25 8900 Augsburg  
 Telephone: Augsburg (0821) 518 251  
 Telex: 53790

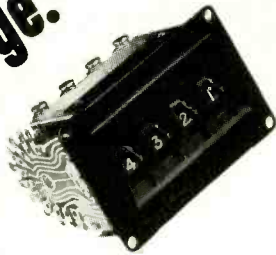
**USA:**

1640 5th Street Santa Monica California 90401  
 Telephone: (213) 393-0014



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Thumbwheel Switches from Switchcraft. Four series with proven high-quality track record. Rear mounting with 8, 10, 12 and 16 position modules. 1-20 stations. Decimal, BCD, BCO and hexadecimal codes are available as standards. Over 40 popular and unusual codes can be special ordered. Write for New Product Bulletins 325, 327, and 336.



**Canadian Instruments & Electronics Ltd.**  
Harris-Bass House, Station Road,  
Ilkeston, Derbys. DE7 5TX  
Tel.: 0602 302331 Telex: 377755

# Our Business is Sound

Cassette and open reel copying in large and small runs. Blank cassettes supplied between C-3 and C120. Dolby A and B facilities available.

Studio facilities available for voice-overs.

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SOUND COMMUNICATION



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Formula Sound help you eliminate your sound problems with the S19GA by combining the functions of an analyser and equaliser. This easy to operate unit is approximately half the cost of a conventional analyser and fits into a rack space of only 5 1/4".

The S19GA is a half octave stereo 19 band graphic equaliser/analyser with dual L.E.D. display. By using half octave filters twice the control of standard octave devices is achieved.

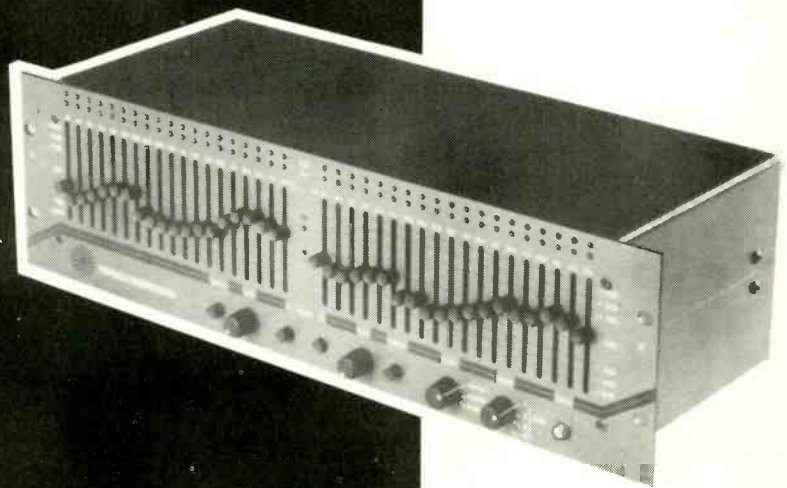
**For the Studio** the S19GA enables the engineer to adjust his monitoring equalisation with confidence, knowing that the balance he hears is what's on tape.

**For the Concert Hall** - the S19GA is an invaluable aid to compensate for poor hall acoustics.

**Sound reinforcement** - switching the S19GA analyser display to visually monitor programme lets you pinpoint and tune out acoustic feedback.

**For the serious audiophile** - the S19GA offers professional analyser facilities at a realistic price for domestic use.

**Full professional specification** - Maximum level +20dBV. Equivalent input noise -90dBV. Total distortion less than .01%.



More information from



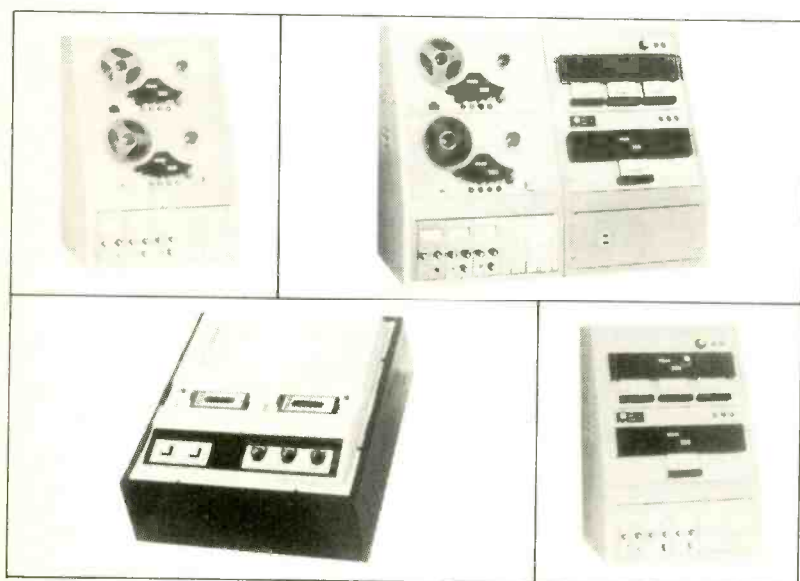
**FORMULA  
SOUND LIMITED**

3 Waterloo Road,  
Stockport SK1 3BD.  
Telephone: 061-480 3781.  
Telex: 669249.

# a new addition to the **TELEX** cassette duplicator range



**THE COPYETTE 1 & 1** a high speed audio cassette copier that will produce a duplicate C-60 in two minutes twenty seconds (including rewind time). The Copyette will automatically rewind, has auto level set, and weighing only 6kgs, is very portable. (Dimensions 370mm x 250mm x 120mm)  
Price £345.00 plus VAT



**TELEX 300** series tape duplicators are available in reel to reel, reel to cassette and cassette to cassette versions, mono or stereo formats with a duplicating rate of 8 times normal speed and multi slave capability.  
Prices from £2290 + VAT.

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For full product information contact:

**AVCOM SYSTEMS LTD.,**  
Stanlake Mews, London W.12 7HS.  
Tel: 01-749 2201 Telex: 899691



Illustrated above is the very latest addition to the well-known range of WOELKE Wow and Flutter Meters, the ME 110/ME 110E. Available from December onwards—at present the most competitively-priced Wow and Flutter Meter on the world market. Extremely simple operation, test cassette included, with built-in LED's. Fuller details on application.

## LENNARD DEVELOPMENTS LIMITED

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Tel. (01) 363-8238/9



**NEW**

Two Cue Tone,  
Mono or Stereo,  
Direct Drive

### SPOTMASTER 2100 CART MACHINE

Broadcast Electronics' advanced engineering and cost saving production techniques produces a brand new Series 2100 line of direct drive cartridge machines at an affordable price. Series 2100 handles A, B & C size carts, includes two cue tones (1kHz and 150Hz) as standard, and provides unique designed-in electronic switching for monaural/stereo compatibility.

Then, there's modular construction for easy maintenance, 1/2 inch aluminum transport for rugged, reliable operation and low voltage air damped solenoid. Available in playback and record/playback models, mono or stereo, for NAB or CCIR/EIC equalization.

Compare prices...compare features... you'll agree that the new 2100 gives you more for your money than any other direct drive cart machine.

For details call or write our distributor for the UK and Ireland, Broadcast Audio (Equipment) Ltd., P.O. Box 31, Douglas Isle of Man, Great Britain, Telephone (0624) 4701, or contact:



**BROADCAST ELECTRONICS INC.**

4100 N. 24th ST. • P.O. BOX 3606 • QUINCY, IL 62301 U.S.A. • TELEX: 25-0142



The JH-110M System in operation at CBS Studios with VSM 80 lathe

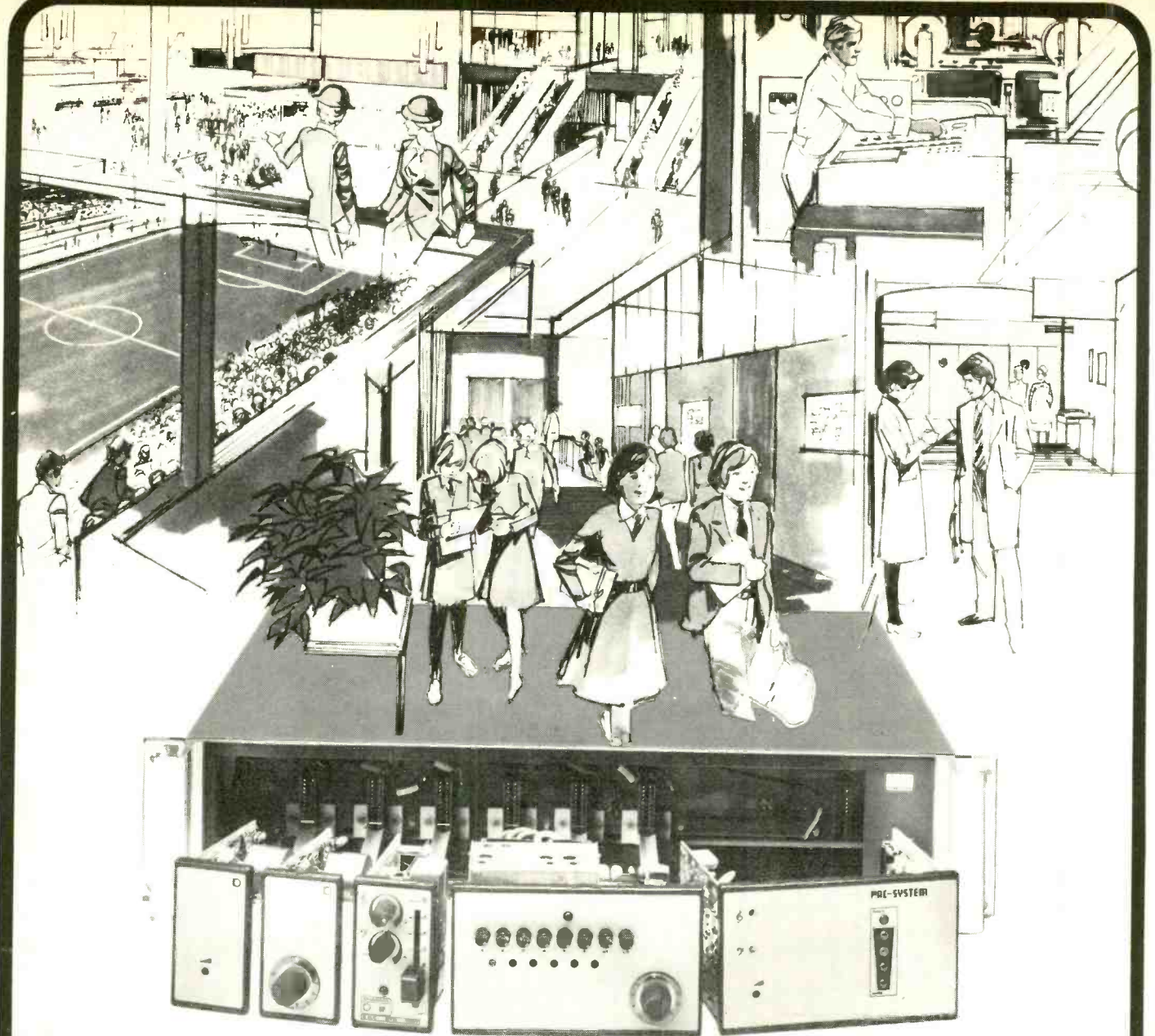
## The **MCI** JH-110M SYSTEM Microprocessor-controlled Tape System

Specifically designed as a tape to disc transfer reproducer for disc-mastering application, is provided with a photo cell for spiralling and other pitch drive sensing as well as the RTZ 111/M which provides 20 memory positions for "banding/spiralling", "expand/echo" and "leadout" lathe functions, 4 tape position memories and the RTZ function as well as a tape velocity indication.



MCI (PROFESSIONAL STUDIO EQUIPMENT) LTD.

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We can supply everything you need for a reliable installation, simply and economically. Because every unit just plugs in, there is never any need for costly special units, and with this versatile plug-in system expansion is virtually limitless.

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*Please tick as required*

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72-74 Eversholt Street, London NW1.  
Telephone 01-388 5392

# HIRE DEPARTMENT

## PRICE LIST

### SUMMER 1979

	1 DAY	3 DAYS	WEEK
<b>TAPE RECORDERS</b>			
2 Track Revox A77	12.00	25.00	35.00
2 Track Revox B77	15.00	27.00	40.00
4 Track Teac 3440	18.00	30.00	45.00
8 Track Teac 80 8 with DBX	45.00	85.00	130.00
8 Track Brenel Mini 8	45.00	85.00	130.00
<b>POWER AMPS</b>			
Quad 405	12.00	20.00	25.00
Bose 1800	15.00	25.00	35.00
Quatre GC 500	15.00	25.00	35.00
<b>MIXERS</b>			
Teac Model 2A 6.4	12.00	17.00	22.00
Teac Model 5 8.4	25.00	45.00	65.00
Yamaha PM430 8.2	15.00	25.00	35.00
Yamaha PM700 12.2	20.00	35.00	50.00
Yamaha PM1000 16.4	35.00	50.00	75.00
Allen Heath Mod 3 16.8	40.00	60.00	85.00
<b>SPEAKERS (per pair)</b>			
Tannoy Devons	15.00	25.00	30.00
Bose 802	20.00	30.00	40.00
Auratonos	5.00	10.00	15.00
<b>MICS</b>			
Neumann U47 inc. power supply	10.00	20.00	25.00
Neumann U87 inc. power supply	10.00	20.00	25.00
Neumann KM86 inc. power supply	10.00	20.00	25.00
Shure SM58	5.00	8.00	10.00
AKG D12	5.00	8.00	10.00
AKG D202	5.00	8.00	10.00
AKG C451 inc. power supply	5.00	8.00	10.00
<b>NOISE REDUCTION UNITS</b>			
DBX 155	10.00	15.00	25.00
Dolby 361	10.00	15.00	25.00
<b>ECHO/DELAY UNITS</b>			
Roland Space Echo	10.00	20.00	25.00
Orban Stereo Reverb	15.00	25.00	30.00
Yamaha Analog Delay	10.00	20.00	25.00
MXR Digital Delay	15.00	25.00	40.00
<b>MICROPHONE STANDS</b>			
Floor	3.00	4.00	6.00
Table	3.00	4.00	6.00
Boom	3.00	4.00	6.00
Base	3.00	4.00	6.00
<b>COMPRESSORS</b>			
DBX 160	10.00	15.00	25.00
<b>GRAPHIC EQUALISERS</b>			
MXR 2 x 15	10.00	15.00	25.00
MXR 1 x 31	10.00	15.00	25.00
<b>HEADPHONE EQUIPMENT</b>			
Beyer DT 100 Headphones	3.00	4.00	6.00
Music Lab 6 Way Splitter Box	3.00	4.00	6.00
<b>TAPE RECORDER ACCESSORIES</b>			
Remote Control Revox A77	3.00	4.00	6.00
Remote Control Revox B77	3.00	4.00	6.00
Remote Control Teac 3440	3.00	4.00	6.00
Remote Control Teac 80 8	3.00	4.00	6.00
Varispeed Revox B77	3.00	4.00	6.00
<b>EDITING BLOCKS</b>			
1/4" x 1/2" x 1' 2"	3.00	4.00	6.00
<b>DIRECT INJECTION BOXES</b>			
Music Lab D.I. Box	3.00	4.00	6.00
<b>HIFI</b>			
Cassette	10.00	15.00	20.00
Record Deck	10.00	15.00	20.00
Amps	10.00	15.00	20.00
Tuner	10.00	15.00	20.00
<b>EFFECTS</b>			
Roland Stereo Phaser	10.00	20.00	25.00
MXR Flanger Doubler	10.00	20.00	25.00
MXR Harmonizer	15.00	25.00	40.00
Roland Rhythm Unit	15.00	25.00	40.00

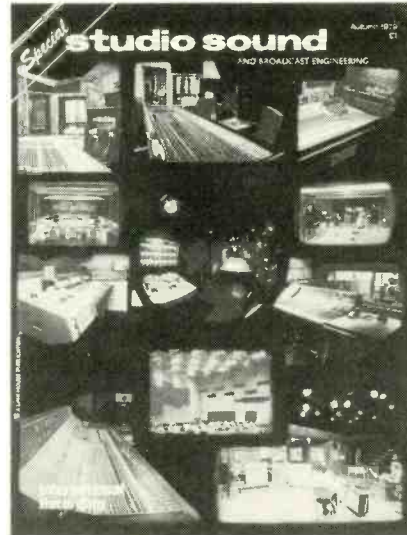
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Music Laboratory  
72-74 Eversholt Street  
London NW1  
Tel: 01-388 5392

## SPECIAL INTERNATIONAL WORLD WIDE OVERVIEW EDITION

Three years ago, as part of a normal monthly issue, STUDIO SOUND published an overview on the state of recording world wide.



Since then, a tremendous amount has happened in the industry.

With this in mind, STUDIO SOUND is bringing out a totally separate edition this time, concentrating on independent reports and surveys from many different geographical areas throughout the world. Covering the current state and growth of the recording industry, music and live entertainment markets, local market aspects and talent, and the relationship of the local industry with that of other countries.

Combined with these reports will be announcements from manufacturers and distributors, giving details of up-to-date product lines.

If you wish to purchase a copy of this Special International Issue, please fill in the coupon below and return it with the correct remittance.

Please send me ..... copy/copies of the International Issue. I enclose a cheque/postal order for .....

Name .....

Company .....

Address .....

Surface rate world wide (including £1.00 cover price) — £1.40. Air mail (including cover price) — £3.00 Cheque or International Money Order.

Return coupon to: Studio Sound Subscription Department, (Ref: Int.), Robert Rogers House, New Orchard, Poole, Dorset, England BH15 1LU.

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Advertisements for this section must be pre-paid. The rate is 22p per word, minimum £4.40. Box Nos. 60p extra. Semi-display rates on application. Copy and remittance for advertisements in **DECEMBER 1979** issue must reach these offices by **10th NOVEMBER 1979** addressed to: The Advertisement Manager, **Studio Sound**, Link House, Dingwall Avenue, Croydon CR9 2TA.

**Note:** Advertisement copy must be clearly printed in block capitals or typewritten.

Replies to Box Nos. should be addressed to the Advertisement Manager, Studio Sound, Link House, Dingwall Avenue, Croydon CR9 2TA, and the Box No. quoted on the outside of the envelope. The district after Box No. indicates its locality. **SEX DISCRIMINATION ACT 1975:** No job advertisement which indicates or can reasonably be understood as indicating an intention to discriminate on grounds of sex (e.g. by inviting applications only from males or only from females) may be accepted, unless (1) the job is for the purpose of a private householder or (2) it is in a business employing less than six persons or (3) it is otherwise excepted from the requirements of the Sex Discrimination Act. A statement must be made at the time the advertisement is placed saying which of the exceptions in the Act is considered to apply.

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## STUDIO FACILITIES

★**Fanfare Records.** Tape-disc pressings, demo's, masters, any quantity. Studio/mobile Neumann disc cutter. S.A.E. brochure. 1 Broomfield Close, Rydes Hill, Guildford. Tel. 0483 61684. X

★**Radio Production Studios for Commercials, Voice-Overs, A.V. Soundtracks, Audio Promotions.** D.I.Y. or complete service. Mark Stevens Productions Limited. 01-485 8087. L

★**Vinyl pressings from your tapes.** Labels. S.A.E. for list. Deroy Records, P.O. Box 2, Morecambe, Lancs. X

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MASTER Quality at Demo. prices: Ampex 16 and 8 Track; Alice ACM 20-16; A and D Compressor Limiters; Digital ADT Sennheiser AKG Neumann. Friendly service.

**Grand Opening Offer**  
16 Track £12.50 per hour; 8 Track £7.50 per hour; Long Runs, Cassette Copying, Tape Duplicating, Record Pressing. Call us now: 01-654 1197

★**Pentagon spares, most parts, ex-stock, service nationwide, prompt personal engineer, ten years high speed experience. Other makes also.** Phone 24 hours 0628-33011. A

### METROTONE STUDIO INSTALLATIONS LTD.

WIRING SPECIALISTS  
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ACOUSTIC DESIGN

All recording studio wiring undertaken: free estimates.  
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**MEDIATAPE LIMITED, 29a Tolworth Park Road, Surbiton, Surrey.**  
01-399 2476/7

## CASSETTE FAST-COPYING

Stereo or Mono. High Quality. Prompt Personal Service. Also bulk supplies of excellent virgin cassettes.

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Tel. 02813 84409

★**Worn tape heads recut to high standard, facilities for most types of head. No loss of sound quality.** Tel. 01-883 6775. L

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Fast turnaround, reliable service  
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HIGH SPEED CASSETTE COPYING IN MONO OR STEREO AT COMPETITIVE PRICES

Long or short runs.  
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Write for FREE details and information to:



Audio and Design Recording Ltd.  
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Reading  
Berks RG1 1BR



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**CASSETTE FAST COPIERS**  
2770 mono & 2772 stereo, meticulously aligned.  
REDUCED PRICES

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Tel. 02813 84409



SPEECH RECORDING  
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## SPEECH-PLUS RECORDINGS LTD

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01-231 0961/2

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From your master tape only first-class quality, any quantity supplied. Example 100 C90 cassettes 75p each, including library case.

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Hi-Speed Mono One to One stereo 10-250 36hr service  
From 32p each inclusive

Write or phone for rate card to:

#### SIMON STABLE PROMOTIONS

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### CASSETTE COPYING IN THE MIDLANDS

Specialists in short-run productions. Prices from 1p per minute, including cassette and library case. In-house facilities for the small record producer and agent.

Cassette labels printed 4p per pair (no minimum).  
Blank cassette labels for self-typing £1.10 per 100 roll.  
Inlay cards designed and printed 5p to 10p each (minimum 100).

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Cassette library cases 8p each (no minimum).  
Blank cassettes (Pyrall) C31 22p each, C41 28p each (no minimum).

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NAB Broadcast cartridges, 50-second, £1.30 each (no minimum).

30cc bottles tape head cleaner 40p.  
Chinagraph pencils, white or yellow, £2.88 per 10  
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Editing gloves, essential for handling tape or film, 55p per pair.

Carriage and VAT extra on all orders

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★Bose 802 speakers with equalisation £475 per pair or £432 without equalisation. Amcron DC 300 £498 and D150A at £310. All prices plus VAT. Contact Geoff Yates, C.A.V.S. Ltd., 01-363 6125. A

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has a vacancy for a

**Maintenance Engineer**

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WITH 37 YEARS' EXPERIENCE

we have the expertise to design and manufacture  
ANY TYPE OF AUDIO TRANSFORMER  
AT THE RIGHT PRICE

WE SUPPLY ALL TYPES OF MICROPHONE,  
TRANSFORMERS, BRIDGING TRANSFORMERS,  
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BROADCASTING AND PUBLIC ADDRESS  
APPLICATION.

We call your attention to our very successful  
MICROPHONE

SPLITTER/COMBINER TRANSFORMER  
type 4079

with a high impedance 200ohm primary and two  
200ohm secondaries. It will handle up to 2.3 volts  
rms at 30Hz and has a frequency response of plus/  
minus ½dB from 20Hz to 20kHz. It is contained in a  
Mumetal Can 33mm diam x 37mm high and **WORK-  
ING DETAILS OF THE CONSTRUCTION OF  
A SPLITTER ARE AVAILABLE ON REQUEST.**

WE HAVE AVAILABLE STANDARD DESIGNS OF  
OUTPUT TRANSFORMERS WITH EXCEP-  
TIONAL PERFORMANCE FOR ALL TYPES OF  
VALVE AMPLIFIERS.

**E. A. SOWTER LTD.**

Manufacturers and Designers

P.O. Box 36 Ipswich IPI 2EG England  
Tel. Ipswich (0473) 52794 and 219390

★Add accurate level control to your mixer with the Cathedral LA3 comp/limiter module. Excellent performance at moderate cost. Build your own mixer with Cathedral low noise channel modules dispatched post free to any part of the world. Cathedral Sound Ltd., Fourways, Morris Lane, Halsall, Lancs L39. Tel. Halsall (0704) 840328. X

★Yorkshire Erricks of Bradford. Tascam, JBL, Bose, AKG, Beyer, Calrec, Revox, Ferrograph, Spondor. Sales, servicing, exchanges, leasing. Bradford (0274) 22972 (Paul). X

★Perfectone 3 channel portable mixer, £179. Simmon of Halifax, 0422 57442. A

★E.M.I. L2 recorder in excellent condition, £75. Simmon of Halifax. 0422 57442. A

★5" BASF low noise tapes. Ex. TV, used once. Erased. Ten for £6 including VAT and post. Simmon of Halifax. 0422 57442. A

★Heavy duty shoulder pads for Nagras. £9.95 plus VAT. Simmon of Halifax. 0422 57442. A

★Sennheiser 803 Electret gun mike. New, £88 plus VAT. Simmon of Halifax, 0422 57442. A

★Six channel minimixer for CP16 cine cameras. New, normally £660. Two at £295 each plus VAT. Simmon of Halifax, 0422 57442. A

★Two Electrosund cassette/cartridge loading machines, fitted into workbench and complete with splicers, control boxes and other spares/extras. £1650 plus V.A.T. Also one Brenell made cassette loading machine with footage counter—£300 plus V.A.T. 01-399 2476/7. L

★Uher Synchro 1000 Pilotone. Overhauled to makers spec. From £325 plus VAT and carriage. Paul Simmon Ltd., 2 Market Street, Halifax, W. Yorks. 0422 57442. A

★Endless cassettes from 10 seconds to 20 minutes, exact length blanks from 13p, cassette duplication; opsis sound. Freepost, Romford RM2 1BR (04024) 53424. L

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DBX 122	...	...	...	£117
Tapecaster Record/Playback machine	...	...	...	£225
Tapecaster Playback machine	...	...	...	£150
Shure Mic Mixer	...	...	...	£50
MXR Comander	...	...	...	£100
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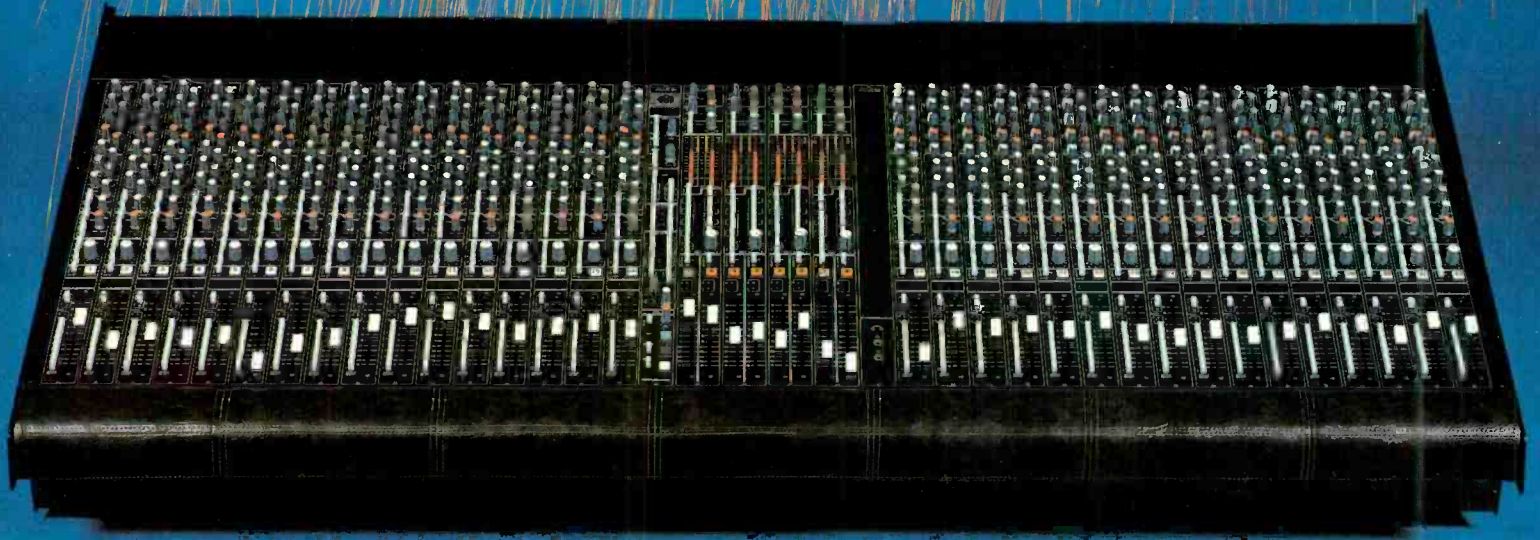
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