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March 1978 50p

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MEL LAMBERT

**EDITORIAL PRODUCTION**  
DRUSILLA DALRYMPLE

**CONSULTANT**  
HUGH FORD

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WENDY SMEETH

**ADVERTISEMENT CONTROLLER**  
DOUGLAS G. SHUARD

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TONY NEWMAN



**THE LINK HOUSE GROUP**

**Editorial and Advertising Offices:**

**LINK HOUSE, DINGWALL AVENUE,  
CROYDON CR9 2TA, ENGLAND**

**Telephone: 01-686 2599**

**Telex: 947709**

**Telegrams: Aviculture Croydon**

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# studio sound

**AND BROADCAST ENGINEERING**

## Why don't you write us?

It seems that most professional people have a journal to turn to where they can report their good ideas and inventions for other people to read and inwardly digest. And this must surely be one of the main methods by which any profession moves ever onwards. In our own fields of sound recording and sound reinforcement, however, it appears that only the technological side is adequately catered for (by the AES journal and others).

But the *operational* people in our business don't really have anywhere to explain their techniques and/or ideas in print. Though maybe they don't want to? This seems unlikely, however, because it's fairly apparent that no matter how much a good balance engineer, for example, explains his technique another engineer can seldom, if ever, capture his artistry. And that is all so important to great music making. The latter, if impressed will use these techniques to modify his own particular artistic style and this, hopefully, makes for even more nice sounds.

Therefore we would like to offer STUDIO SOUND as the magazine for *operational* people in the professional sound business to present 'papers' for possible publication—but we don't want it to be that formal. What we'd like is a forum page(s) for your ideas—large or small (in copy length, that is).

Further to a 'throw-away' comment in the November Business column Curtis Briggs wrote to us from Germany to explain the laser-music techniques used at a show in Munich last year. This seemed to us to contain a lot of nice ideas so we're telling you about it (p 42/3)—that's two pages.

It's also very encouraging for us to know that following the publication of our interview with Lol Creme and Kevin Godley some engineers have been noticed pulling down faders (Martin Lawrence-style) and they didn't before—that's seven lines.

So if you've got any ideas or techniques that you think would be useful and/or interesting to others, don't be shy, let us know.

Remember the Golden Rule: Do as you would be done by!

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**MARCH 1978 VOLUME 20 NUMBER 3**





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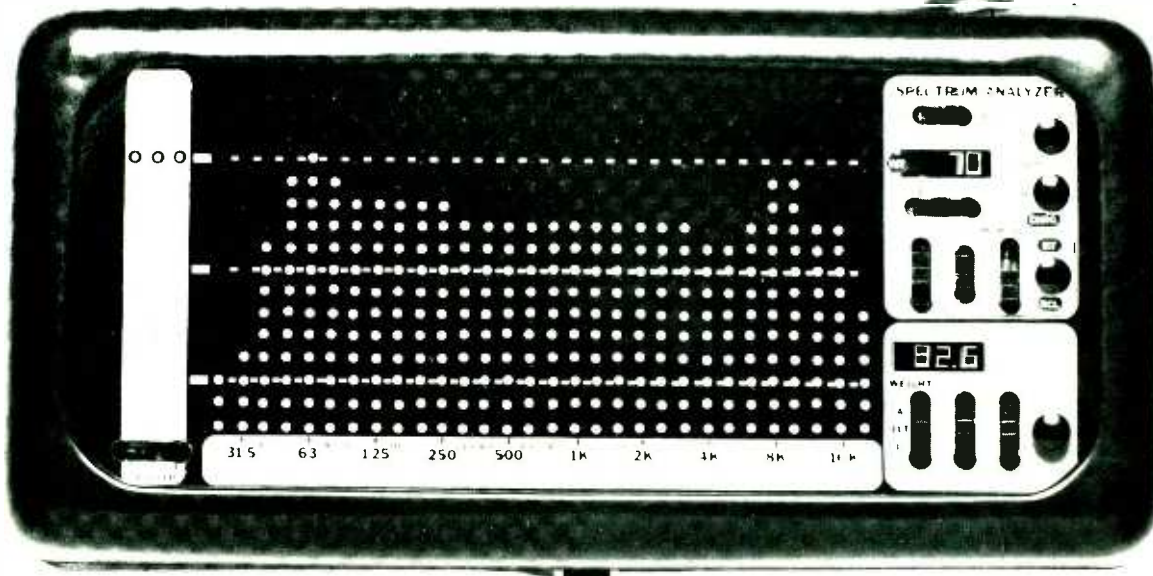
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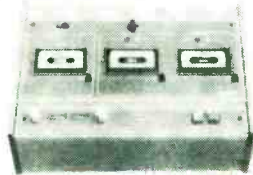
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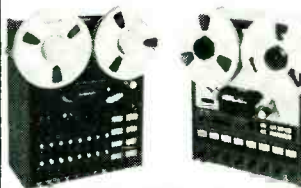
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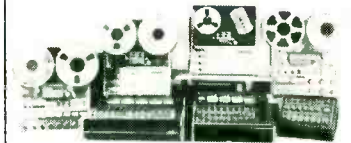
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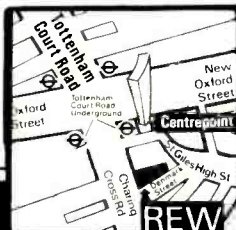
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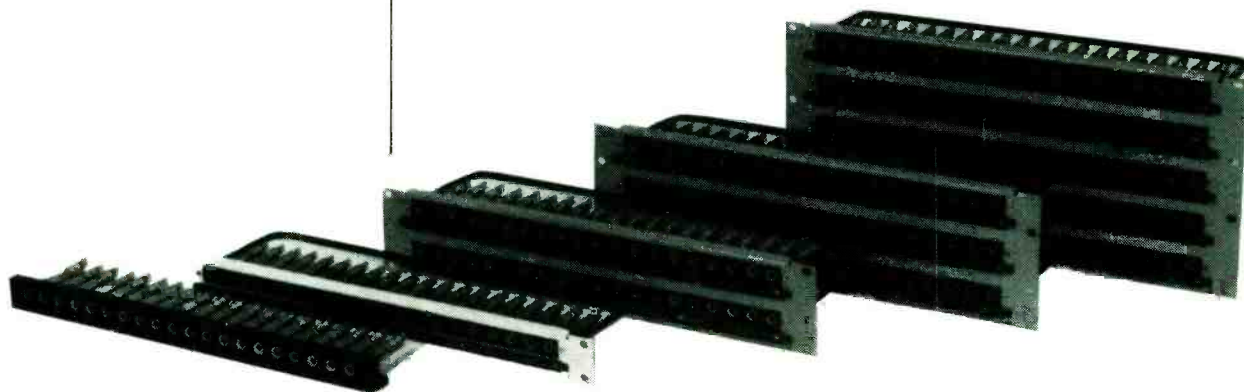
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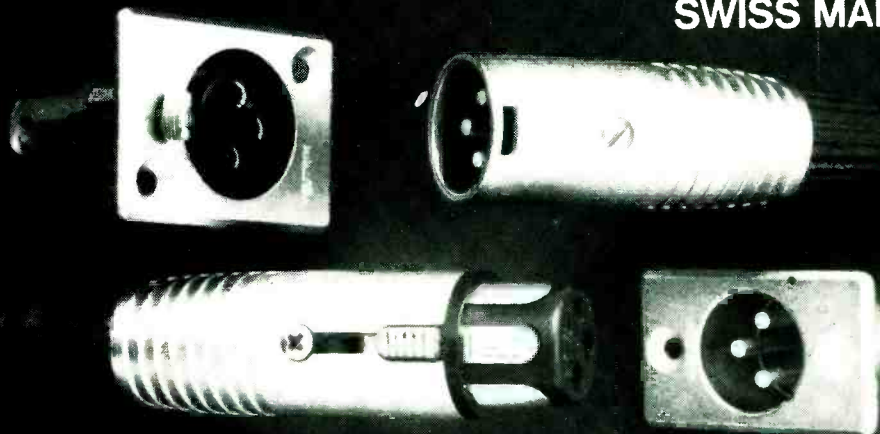
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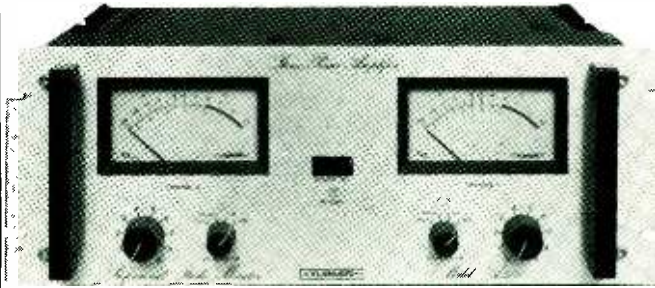
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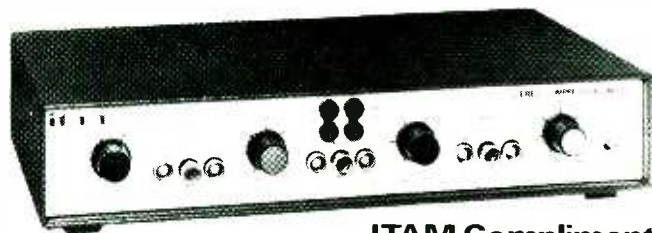
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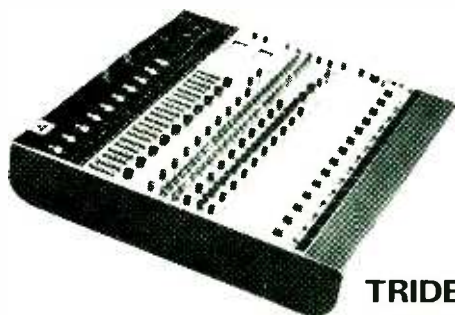
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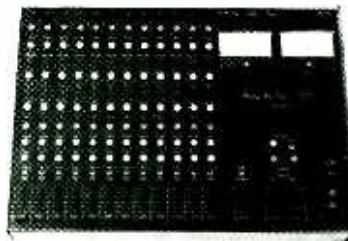
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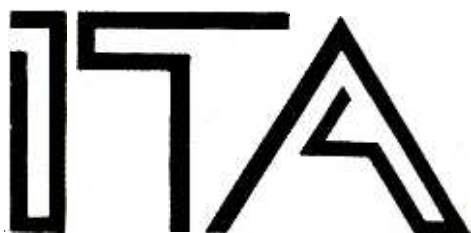
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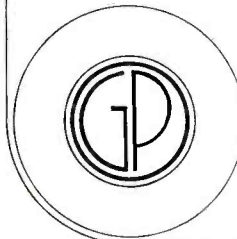
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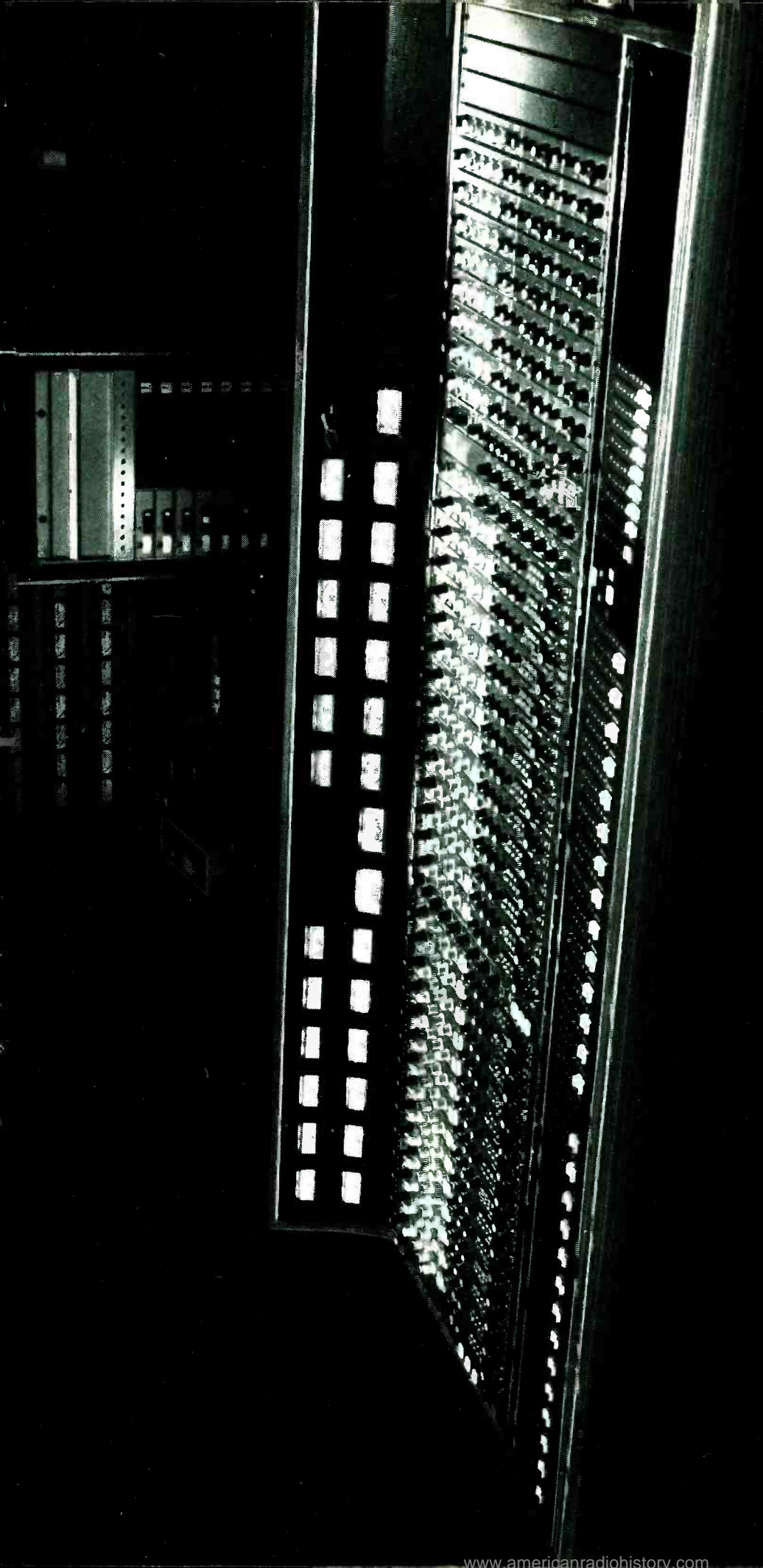
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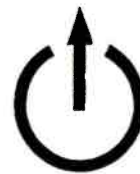
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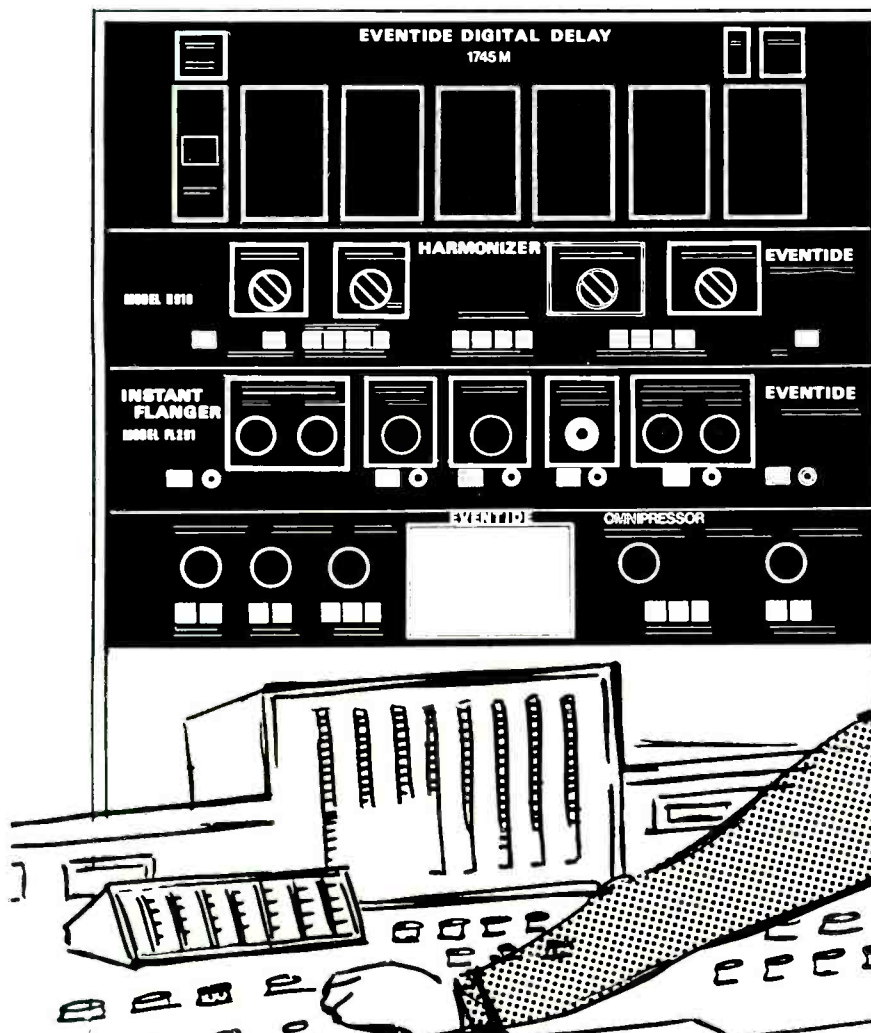
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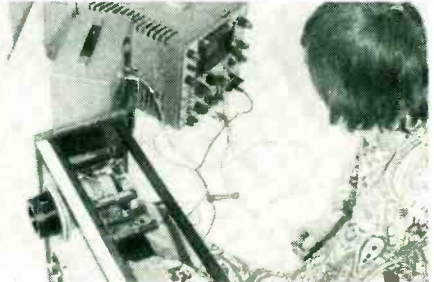




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# There is a Dolby noise reduction unit for every professional application

## Professional recording and transmission applications



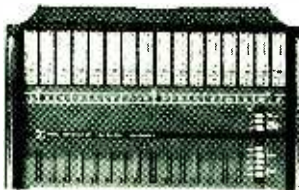
### 360

The Dolby 360 is a basic single-channel A-type noise reduction unit for encoding or decoding. This unit is normally used in a fixed mode such as in disc cutting or landline sending or receiving; the operating mode is manually selected.



### 361

The Dolby 361 is similar to the 360, providing a single channel of A-type noise reduction, but with relay switching of operating mode and tape recorder connections. The changeover can be controlled automatically by the recorder.



### M-Series

The Dolby M16H A-type unit is designed specifically for professional multi-track recording and incorporates 16 channels of noise reduction in a compact chassis only 10 inches high. The similar M8H is an 8-track version, and the M8XH allows simple extension of the M16H for 24-track use.

## Noise reduction module



### Cat no. 22

The Dolby noise reduction module, Cat no. 22, is the basic functional unit employed in all A-type equipment. The Cat no. 22 is available as a spare or in quantity to OEM users for factory installation. A half-speed version of the module (Cat no. 40) is also available.



**Dolby Laboratories Inc.**  
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## Motion picture industry



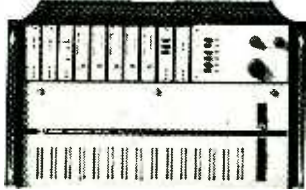
### 364

The Dolby 364 Cinema Noise Reduction Unit is intended primarily for use with Dolby A-type encoded optical sound-tracks. The 364 also includes a standard academy filter for conventional tracks, and provision for playback of magnetic sound tracks with or without Dolby system encoding.



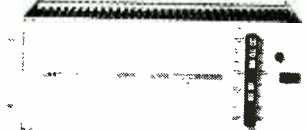
### E2

The Dolby E2 Cinema Equalizer is a companion unit to the 364, and has been specifically designed to solve the response equalization problems of cinemas. Used with the 364 and Dolbyized optical sound-tracks, the E2 enables most cinemas to achieve modern sound reproduction standards without replacement of existing equipment.



### CP100

The Dolby CP100 Cinema Processor is designed for the reproduction of all current and presently foreseeable film sound-track formats including conventional optical and magnetic tracks, Dolby encoded monaural optical tracks, Dolby encoded magnetic sound-tracks and the new stereo optical release prints. Up to three noise reduction modules can be incorporated. Typically, three channels of theatre equalization, as in the E2, will be incorporated, but facilities exist for five channels of equalization and the connection of an external quadrasonic decoder.



### CP50

The new Model CP50 is intended for the reproduction of all optical soundtrack formats, Dolby encoded and conventional mono and stereo. The unit is designed to interface with an existing fader and magnetic stereo installation. A wide range of accessories is available.

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### 334

The 334 FM Broadcast Unit allows broadcast stations to encode stereo FM broadcasts with the Dolby B-type characteristic. The unit also provides for a reduction of high frequency pre-emphasis to 25 microseconds, thus reducing the need for high frequency limiting, thus allowing a significant additional improvement in reception quality.

## Test set (A-type)



### Cat no. 35

The Dolby NRM Test set, Cat no. 35, permits rapid verification of performance of Cat no. 22 noise reduction modules without their removal or the need for additional test equipment.

## Noise weighting filter



### Cat. Nr. 98A

Noise weighting filter to CCIR/ARM characteristic (recommended by Dolby Laboratories). Filter is used with average responding meter (ordinary millivoltmeter) allowing noise measurements to be made on tape recorders, tapes, FM tuners, etc. with results which correlate closely with the subjective effect of the noise. Filter can be used for the testing of professional and consumer equipment.

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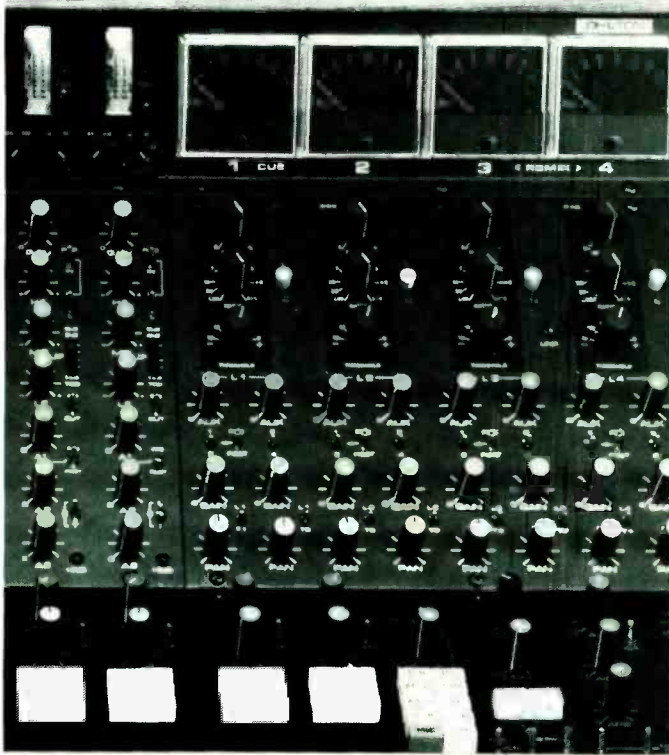


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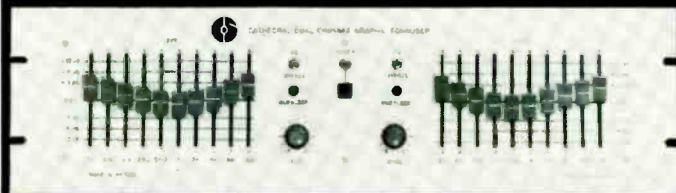
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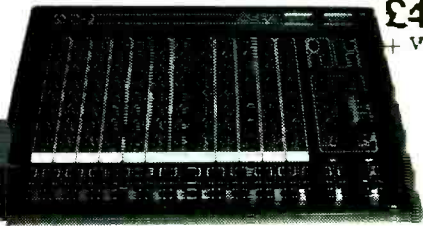
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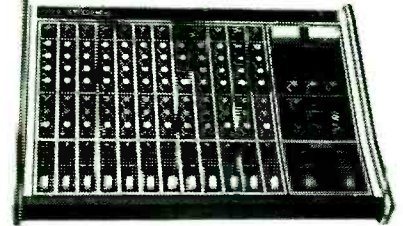


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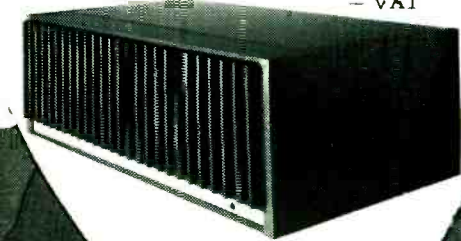
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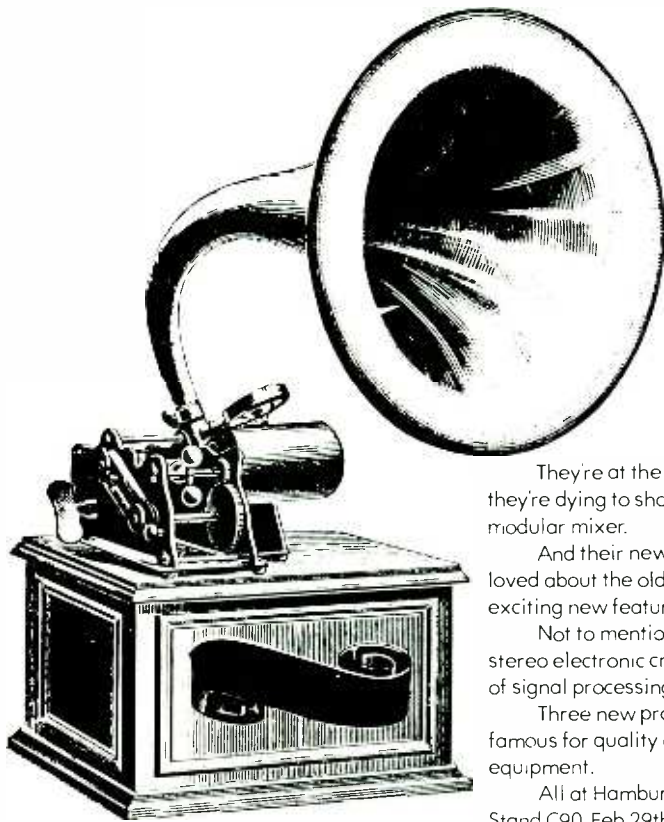
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## Get ready to hear from Soundcraft at Hamburg.

They're at the 59th AES Convention and they're dying to show off their Series III fully modular mixer.

And their new Series I—everything you loved about the old Series I, plus a lot of exciting new features.

Not to mention their new four-way stereo electronic crossover, first in a series of signal processing devices.

Three new products from Soundcraft, famous for quality audio engineering equipment.

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Telephone 01-251 3631. Telex 21198.

Soundcraft North America Division, PO Box 883, JFK Station, Jamaica, New York 11430, USA.

Telephone (212) 528 8158.

Telex 01-2203.

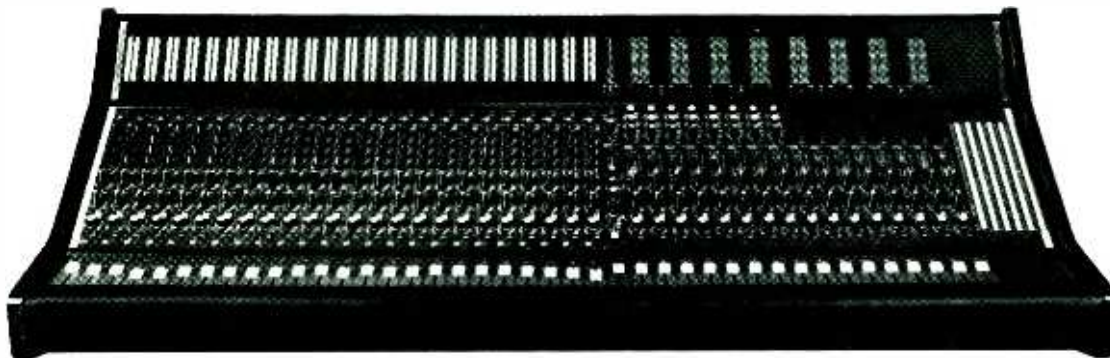
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APRS

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## It'll cost you around £10,000 to get your feet under our new executive desk.



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It's fully modular, with up to 32 input channels and 24 output groups. Standard format is 24/16.

Standard facilities include: 4 band equalisation (each band sweepable); auto solo (pre/post fade) throughout; 8 aux. busses; TT patch bay; LED VU/PPM meters (conventional VU's optional); P & G faders.

Performance is of course excellent:

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All thanks to some nice new op-amps—the first good enough for us to use throughout the console—and the usual Soundcraft quality.

In the UK, the Series III 24/16 will cost you from £10,500; in the USA, from \$22,500 (FOB New York).

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# R. D. G. Audio Visual Ltd.

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## Used Equipment

Note: all secondhand goods guaranteed 6 months

|  |       |
|--|-------|
| Ampex MM1100 16 Tracks ... ..            | 9,500 |
| Ampex MM1000 16 Tracks ... ..            | 7,000 |
| Ampex AG 440 8 Tracks ... ..             | 3,900 |
| Ampex AG 440 4 Tracks ... ..             | 1,600 |
| Ampex AG 440 Stereo ... ..               | 1,200 |
| Ampex AG 440 4 Track Head Block ... ..   | 250   |
| Ampex Electronics x 2 for above ... ..   | 200   |
| 3M M79 16 Tracks ... ..                  | 9,200 |
| Studer A80 Mk2 8 Tracks ... ..           | 8,750 |
| Studer A80r Stereo 200 hours ... ..      | 3,400 |
| Studer A80 Mk1 16 Tracks ... ..          | 9,500 |
| Studer B62 on BBC Console, as new ... .. | 2,100 |
| 2 x Leevers Rich G9 8 Tracks ... ..      | 3,000 |
| Otari MX 730 8 Tracks, as new ... ..     | 4,500 |
| Otari MX 7000 4 Tracks 1/4 inch ... ..   | 900   |
| Otari MX 7000 Stereo, as new ... ..      | 800   |
| Revox A700 ... ..                        | 600   |
| Revox A77 Mk4 H/S, as new ... ..         | 400   |
| Amity Schroeder Cart Mach. St. ... ..    | 300   |
| TEAC 3340S ... ..                        | 500   |

## Consoles

|                                    |        |
|------------------------------------|--------|
| Sonag 24 x 24 ... ..               | 9,000  |
| API 16 x 8 x 16 Prewired 24... ..  | 10,000 |
| Trident B 18-8 ... ..              | 6,500  |
| Trident B 24-16-16 ... ..          | 15,000 |
| Allen & Heath Mod 2 16-8-16 ... .. | 2,100  |
| Studer 12-4-2, 1 year old ... ..   | 6,000  |
| Alice AD62 Mod 2 ... ..            | 200    |

## Microphones

|                            |     |
|----------------------------|-----|
| Neumann U87, as new ... .. | 225 |
| Neumann U67, as new ... .. | 240 |
| Beyer M160, as new ... ..  | 85  |
| AKG D202, as new ... ..    | 55  |

We have a large selection of Neumann valve mikes in stock, including models M49, M50, KM54, KM56, KM256, KM264. OFFERS.

## Disc Cutting Equipment

|  |        |
|--|--------|
| Neumann St. Variable Pitch/Depth ... ..  | 5,200  |
| Neumann Mono head for above ... ..   | 680    |
| Westrex 3c Cutting Head ... ..   | OFFERS |
| Heaco Stereo Amp. SD59 ... ..  | OFFERS |
| Neumann Stereo Rack, complete ... ..   | 1,260  |
| Ortofon Mono Cutting Head ... ..   | 675    |
| Ortofon Stereo Cutting Head DSS661 ... ..  | 2,200  |
| Sansui Pro. QS 4ch en/decoder Type QSE-4/QSD-4 brand new ... ..  | 2,850  |
| Complete cutting room including early Neumann lathe, Haeco stereo head SC1 Haeco 100w. per. ch.amp. A&D cmp/lims TEAC playback 3 speed. And all other equipment ... .. | 3,750  |

## Miscellaneous

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|---|--------|
| Lockwood Major copies(REDS) ... ..                                  | 250    |
| Crown D 300A ... ..   | 525    |
| Crown DC 150 ... ..   | 250    |
| Crown D60 ... ..  | 150    |
| Master Room MR3, as new ... ..                                      | 850    |
| Audio and Design F760 XRS Compressor/limiter/Expander Stereo ... .. | 500    |
| Eventide Instant Phase ... ..                                       | OFFERS |
| Ampex 406 on NAB centres ... ..                                     | 4-25   |

## Brand New Equipment

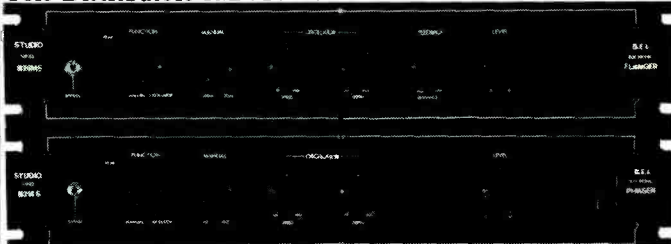
|   |            |
|---|------------|
| Telefunken M15 24 Tracks ... ..   | 19,500     |
| B.E.L. Studio Phaser 19inch ... ..  | 280        |
| B.E.L. Studio Flanger 19 inch ... ..  | 290        |
| R.D.G. Acoustic Screens 6ft x 4ft. ... ..                                       | 168        |
| BGW 250B ... ..   | 398        |
| DBX, Mic Mix, Master Room, Rebis, Schoeps, White Instruments, JBL, Lockwood ... | ALL P.O.A. |

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Sole Agents: R.D.G. Audio Visual Ltd.  
 A Vendre Studio complet avec bureaux. Centre de Paris.  
 Equipement comprend.  
 Sonag 24 x 24 console  
 Ampex MM 1100 16 pistes  
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 3 Revox A77 H/S  
 AKG BX20  
 JBL 4320 3 voies  
 1 Crown D150  
 3 Crown D60  
 2 Urie 1176  
 1 Urie LA3  
 Eventide Synthesiser  
 4 Keepex  
 4 API 550  
 Freevox correcteurs  
 API Parametrics  
 Neumann U87's, U47's, KM84's  
 AKG 224's, 202's, D12's, C451's, C412's  
 Beyer 360's  
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 Prix clef en main. Utilisation immediate £56,000 504,000FF

## Bel Electronics Phasers and Flangers

Sole Distributors R.D.G. Audio Visual



A complete new range of studio effects. 19 inch rack mounting units with unbal jack connectors at rear (bal o/puts with cannons optional ex.). Auto and manual voltage controls, variable output control, bypass switch, PPI, noise ref. to 0dB —70dB.



# news

## Equaliser survey omission

Because the company is possibly new to readers of *STUDIO SOUND*, we publish the following information that arrived too late for inclusion in last month's survey of equalisers. Manufacturers and their agents are reminded once again that a list of forthcoming surveys is available from the editorial offices (address, p3).

## SOLIDYNE

**Sistemas Solidyne, Tres de Febrero 3254, 1429 Buenos Aires, Argentina. Phone: 701 8622.**

### 9180 System

A modular system comprising the following units, all of which are available with band centre frequencies on octave spacings in the range 32-16k Hz: **SY-9181** graphic module provides  $\pm 15$  dB control at single frequency fo.

**SY-9182** graphic module provides  $\pm 15$  dB of control at fo and 2fo.

**SY-9182M** graphic module provides  $\pm 15$  dB on  $\frac{1}{3}$ -octave intervals centred around fo.

**SY-9183** equaliser module provides  $\pm 15$  dB on  $\frac{1}{3}$ -octave intervals centred around fo.

**SY-9185** parametric module provides  $\pm 15$  dB control (or -30 dB as notch filter) at band centre frequency continuously variable in the range 32-16k Hz with 'Q' variable between half and two octaves (8.6-0.67).

**SY-9186** high or lowpass filter with 6 or 12 dB/octave cutoff.

Up to nine modules can be fitted into a 483 mm rack-mounting or free-standing cabinet, which also houses power supply and input/output XLR connectors.

## High quality Star Wars?

Mono, Dolbied mono, Dolbied stereo (with QS surround-sound) or 6-channel Dolbied magnetic, that is the question. Because *Star Wars* is presently being shown in all these different formats at different theatres around the UK. According to Dolby, the 'perfect' theatre is the Dominion Tottenham Court Road, London, where a 70 mm widescreen print (higher quality than anamorphic prints) using 6-channel Dolby-encoded magnetic tracks is currently playing to packed audiences. Acoustics of the Dominion are excellent (as theatres go) and the addition of special bass drivers and a bass-enhancement system provide a memorable experience. The Leicester Square Theatre, the other London venue of *Star Wars*, uses the same magnetic 70 mm print, although acoustics are apparently not quite as good as the Dominion.

Around the country, 14 theatres are showing Dolby optical stereo (sva) prints; these being Odeons in Southampton, Bristol, Cardiff, Leeds, Nottingham, Manchester,

Liverpool, Newcastle, Glasgow and Edinburgh, Gaumonts in Birmingham and Sheffield, and finally the Savoy and Metropole in Dublin. Although all these theatres are equipped to replay the Dolby stereo 35 mm optical print with QS encoded surround-sound, acoustics do vary considerably. Eventually all release prints distributed in the UK will be the same Dolby stereo 35 mm prints, so other theatres equipped with Dolby decoding will maintain good quality sound, albeit mono. However, those backward theatres still using the Academy optical filter in their sound systems (with its cut-off at 7 kHz) will only be able to offer typical lousy-quality film sound.

So, ideally, travel to one of these regional theatres, otherwise call the projectionist at nearby Odeons to ascertain whether mono Dolby has yet arrived in your area. Incidentally, Dolby is just equipping the Odeon Leicester Square with 6-channel Dolby in preparation for the release of *Close Encounters of the Third Kind*, a new sci-fi film that is apparently doing even better business in America than *Star Wars*! Doubtless it will follow *Star Wars* around the provinces to the same Odeons and Gaumonts.

**Angus Robertson**

## Stereo reverb

Quantum Audio Labs have released details of the *QA 201* stereo reverb chamber. It utilises two *Accutronics*

reverb units with a compressor/limiter in circuit with each spring unit. The manufacturer claims that the compressor circuit 'permits optimum drive to each chamber'. A front-panel indicator senses conditions at three points in the circuit to detect overload.

The *QA 201* operates at 0 dBm nominal and features an input circuit quoted as having a common mode rejection in excess of 60 dB. Both XLR and jacks are provided at the rear panel.

Quantum Audio Labs Inc, 1905 Riverside Drive, Glendale, Ca 91201, USA.

Phone: (213) 841 0970.

## AKG Acoustics

... has been AKG's new trading name since January 1. Their address, however, remains the same: 182/4 Campden Hill Road, London W8.

Phone (01) 727 0788/229 3695.

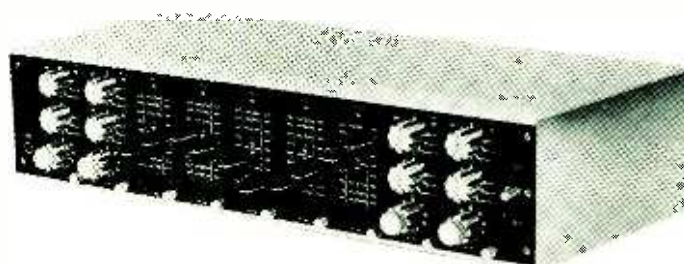
## Automated broadcasting

In its basic form, the new Cetec Schafer *Series 7000* automated broadcast system comprises a single crt control terminal, a choice of 16 sources (the first nine of which are random selectable to 999 trays), and a 1000-event memory. The system can be expanded to incorporate four separate crt channels, up to 10 000 events, and as many as 64 audio sources.

'Exclusive' features claimed for the *Series 7000* include 'plain English programming', programming error detection, 'programming lookahead' (19 program and nine time events, with optional clock), multi-crt capability, dual (music and voice) program busses, programmable source cards that can be adjusted to match various types of audio sources, a 6-source multi-cue system, and provision for multilevel subroutines.

Cetec Broadcast Group, 75 Castilian Drive, Goleta, Ca 93017, USA. Phone: (805) 968 1561. 30 ▶

*Solidyne modular graphic and parametric equalisers*



*An automated broadcasting system from Cetec Schafer*



## Audio Kinetics move

Ian Southern's company, Audio Kinetics (UK) Ltd, has changed address to: Verulam Road, St Albans, Herts AL3 4DH. Phone: St Albans 32191. The company formerly traded as Sonaplan Ltd.

## Westrex move

It appears that since we published the survey of equalisers (February '78 issue, p40) Westrex have moved to 2629 West Olive Avenue, Burbank, Ca 91505, USA. Phone: (213) 846 3394. Telex: 698254. Needless to say, the information arrived too late for us to amend their survey entry.

## PTMA move

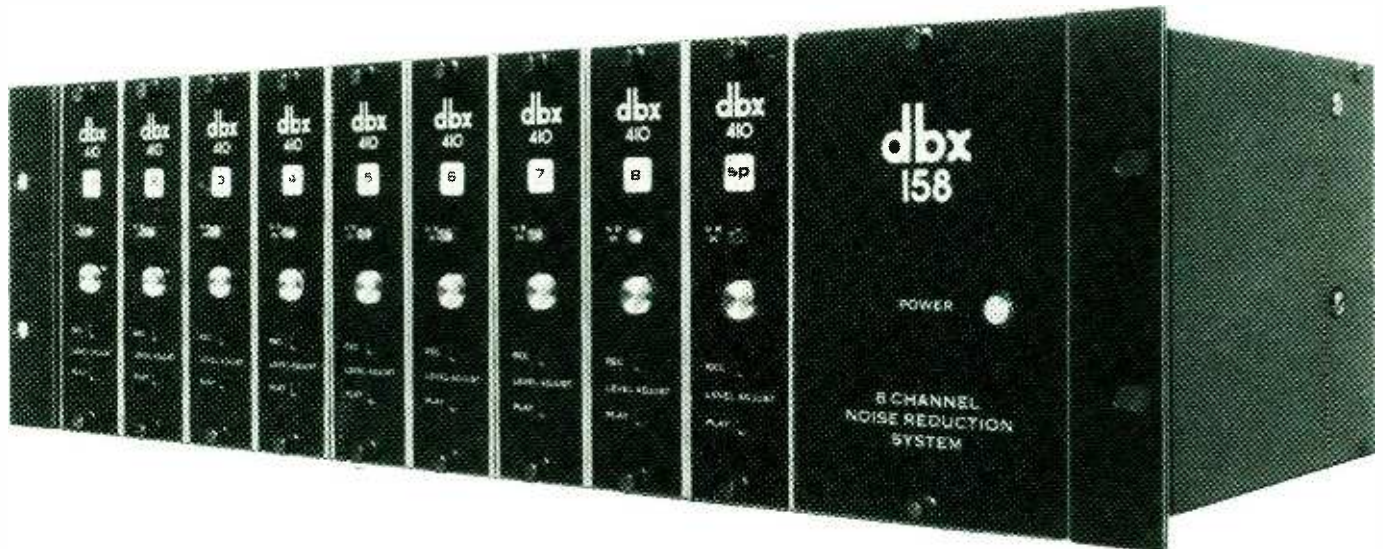
Professional Tape Marketing Associates have moved from Edgware and now reside at 329 Hunslet Road, Leeds LS10 1NJ, UK. Phone: Leeds (0532) 706066. Total annual sales of the company, which describes itself as 'probably the largest UK manufacturer of special length cassettes for in-cassette duplicators', is claimed to exceed £1M.

## Racal-Zonal move

The company's new address is: Station Hill, Pound Hill, Crawley, Sussex RH10 4RZ. Phone: Crawley (0293) 34982. Telex: 87651.



# DBX Announce the New Model 158 Budget DBX Noise Reduction for the Small Multi-Track Studio



The dbx 158 is a semi-professional version of the well-established dbx professional series of noise reduction units. Recordings made with a dbx 158 may be decoded by any studio using dbx professional equipment.

At a U.K. List Price of £1614, the dbx 158 provides 8 tracks of *simultaneous* encode and decode noise reduction, obviating the need for mode switching of noise reduction system by operator or machine.

By reducing tape noise by more than 30db, it significantly increases the multiple overdub capability of any recorder – especially those using  $\frac{1}{2}$ " 8 track recording formats.

dbx's unique and patented circuitry does not require critical matching of encode (record) and decode (play) levels, therefore no reference tones or metering are necessary.

Phono and Molex multi-pin connections allow rapid interface to the unit and modular construction with inclusive spare module ensures minimum downtime in the event of breakdown.

- ★ **Unbeatable 30db noise reduction**
- ★ **Total compatability with dbx professional studio noise reduction equipment**
- ★ **Modular format**
- ★ **Simplicity of operation**

For full details on the dbx 158 or any dbx professional or semi-professional product, please contact



U.K. Distributors  
Scenic Sounds Equipment,  
97-99 Dean Street,  
London W1V 5RA  
Tel: 01-734 2812

Denmark  
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Artillerivej 40,  
DK-2300 Copenhagen S  
Tel: Copenhagen 570 600

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

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

Norway  
Kvam Audio,  
Tollbugt 7,  
Oslo 1  
Tel: Oslo 412 996

Sweden  
Tal & Ton Musik & Elektronik AB,  
Kungsgatan 5,  
411-19 Gothenburg  
Tel: Gothenburg 130 216



A prototype of the new pcm digital tape machine from Mitsubishi. The machine is expected to be available in June 1978 for an approximate cost of \$10 000. Further details from Melco Sales, 3030 East Victoria Street, Compton, Ca 90221, USA. Phone: (213) 537 7132.

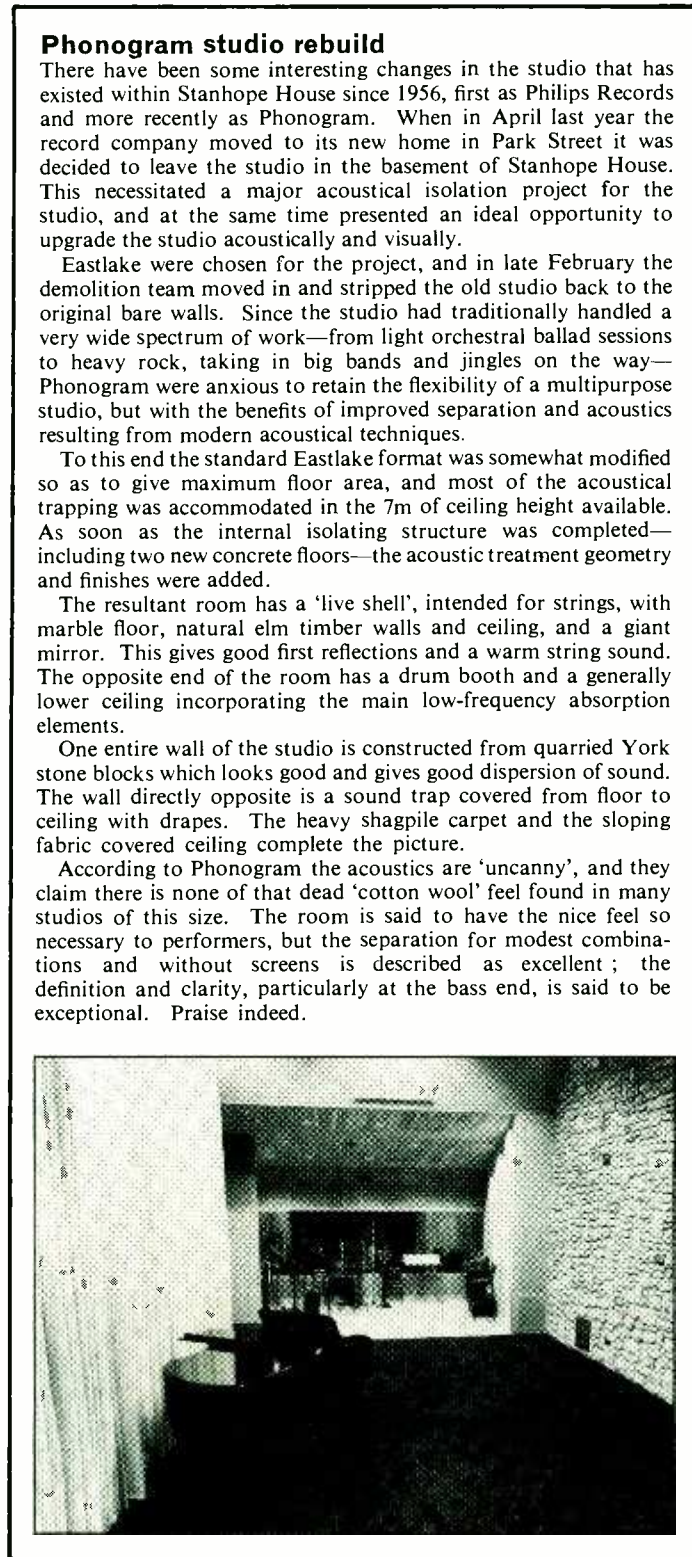
### Digital standards

Following a move sponsored by the AES at the New York 58th convention, a steering committee was formed in an attempt to bring some sense into digital standards for professional audio.

The first meeting took place during the beginning of December at Salt Lake City. Fifteen members from both the USA and Japan were present; European members intend to make some representation at the next meeting to be held during mid-February at Atlanta, Georgia.

Topics under discussion at the first meeting principally included communications between interested parties and, specifically, sampling rate.

Naturally, no firm conclusions were reached because everyone had their own particular axe to grind, depending on application. The committee looked at existing professional standards and those used by the Japanese consumer systems in the areas of video tape and disc. Frequencies discussed included 44.05594 kHz, 45 kHz, 50 kHz and 54 kHz. Since none of these is suitable for all applications, reports are being compiled on the relative advantages and disadvantages for each frequency. These will then be discussed by the committee at



further sessions.

Analogue to digital conversions were also discussed. The general consensus was that 16 bits is desirable, though not presently used in consumer systems. Pre and de-emphasis were also discussed but were generally frowned on for professional systems.

Those who wish to contribute to this technical debate should write to John G McKnight at the Magnetic Reference Laboratory, 229 Polaris Avenue, Suite 4, Mountain View, Ca 94043, USA. Phone: (415) 965 8187. The outcome of deliberations will be published in the AES Journal.

### Phonogram studio rebuild

There have been some interesting changes in the studio that has existed within Stanhope House since 1956, first as Philips Records and more recently as Phonogram. When in April last year the record company moved to its new home in Park Street it was decided to leave the studio in the basement of Stanhope House. This necessitated a major acoustical isolation project for the studio, and at the same time presented an ideal opportunity to upgrade the studio acoustically and visually.

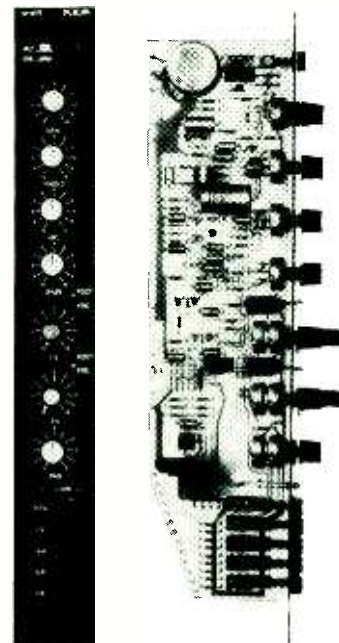
Eastlake were chosen for the project, and in late February the demolition team moved in and stripped the old studio back to the original bare walls. Since the studio had traditionally handled a very wide spectrum of work—from light orchestral ballad sessions to heavy rock, taking in big bands and jingles on the way—Phonogram were anxious to retain the flexibility of a multipurpose studio, but with the benefits of improved separation and acoustics resulting from modern acoustical techniques.

To this end the standard Eastlake format was somewhat modified so as to give maximum floor area, and most of the acoustical trapping was accommodated in the 7m of ceiling height available. As soon as the internal isolating structure was completed—including two new concrete floors—the acoustic treatment geometry and finishes were added.

The resultant room has a 'live shell', intended for strings, with marble floor, natural elm timber walls and ceiling, and a giant mirror. This gives good first reflections and a warm string sound. The opposite end of the room has a drum booth and a generally lower ceiling incorporating the main low-frequency absorption elements.

One entire wall of the studio is constructed from quarried York stone blocks which looks good and gives good dispersion of sound. The wall directly opposite is a sound trap covered from floor to ceiling with drapes. The heavy shagpile carpet and the sloping fabric covered ceiling complete the picture.

According to Phonogram the acoustics are 'uncanny', and they claim there is none of that dead 'cotton wool' feel found in many studios of this size. The room is said to have the nice feel so necessary to performers, but the separation for modest combinations and without screens is described as excellent; the definition and clarity, particularly at the bass end, is said to be exceptional. Praise indeed.



### Channel module

For those of you who want to put together your own mixer, but cannot be bothered with actually building up each module from its components, Progressive Electronic Products may have the answer. The model CM-1 channel module has mic/line switching; fully-variable input gain in both mic and line mode; 3-section eq; overload indicators; four aux sends switchable in groups of two to either pre or post fader; facilities for virtual-earth pfl; and eight outputs arranged in four stereo pairs with pan between odd and even groups.

All that is needed to make the module work is an input, a supply voltage between +24 and -30V and an external 20 or 25 kohm log fader. PEP recommends that the mix busses be terminated in a suitable virtual-earth combining amp, such as their VEM-1. Price of the CM-1 module is £38.50. Progressive Electronic Products, 593 High Road, Leyton, London E10 6PY, UK. Phone: (01) 558 0678.

### VAT on recording services

Ed Mazek tells us that changes advised in Supplement to VAT Notice 701 dated November 1977 are the subject of discussion between APRS and HM Customs and Excise. Copies of an authoritative letter from HM C&E are being circulated to APRS members shortly. Non-members can get a copy by writing to Ed at 23 Chestnut Avenue, Chorleywood, Herts WD3 4HA. Phone: Rickmansworth 72907.



# STUDIO TECHNOLOGY



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## of worldwide fame

Through numerous progressive and innovative developments in studio and measurement engineering, EMT has become a byword throughout the world for instruments and systems oriented toward the future, for export and import marketing services, factory representation of renowned manufacturers, and customer assistance through applications information, intensive documentation, and field and factory service.

- 1 The Classic Studio Turntable - EMT 930. A proven concept for over 25 years, designed for a decade of hard service.
- 2 A Modern Disk Reproduction System - EMT 950. Direct drive, rapid starting, motor driven back-cueing of the extremely light weight platter.
- 3 Professional Turntable EMT 928 in wood base with protective dust cover.
- 4 Reverberation Plate EMT 140. For two decades the worldwide studio standard for the production of room-analogous reverberation for music recordings.
- 5 Gold Reverberation Foil EMT 240. A system in miniature format retaining all the advantages of two-dimensional reverberation.
- 6 Electronic Reverberation Unit EMT 250. Digital signal conversion and programmed computer processing provides numerous variations in reverberation, tone coloration, and delay of the first reflected wave. Additional programs for signal delay, chorus, phasing, and space reverberation effects.
- 7 Wow-and Flutter Meter EMT 422. With adjustable threshold for production quality determination.
- 8 Stereo Dynamic Compressor EMT 156. Puls-width modulation employed for gain control, enabling extensive variations in compression and limiting and expansion characteristics.
- 9 Mono Dynamic Compressor EMT 156 TV embodying the identical control flexibility, intended for AM and TV studios and transmissions.
- 10 Dynamic Signal Controllers in modular Plug-in Design. EMT 256 II Compressor with expander feature, EMT 257 Limiter with selectable pre-emphasis, EMT 258 Noise Filter with dynamic cut-off frequency and expander, EMT 260 Limiter for speech de-essing, 19" Mounting Rack EMT 259-10 including power supply.
- 11 Electronic Delay Unit EMT 440. Digital signal conversion, delay circuitry using integrated shift registers.
- 12 Wow-and-Flutter Analyzer EMT 424. Establishes new test criteria for measurements of audio signal carriers, using a new sigma circuit for retention of data.
- 13 Wow-and-Flutter Analyzer EMT 425. Specialized design employing increased test frequency for high speed tape dubbing systems.
- 14 Micro-Impedance Meter EMT 328.
- 15 Audio Frequency Polarity Tester EMT 160/161.



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**NEWS**

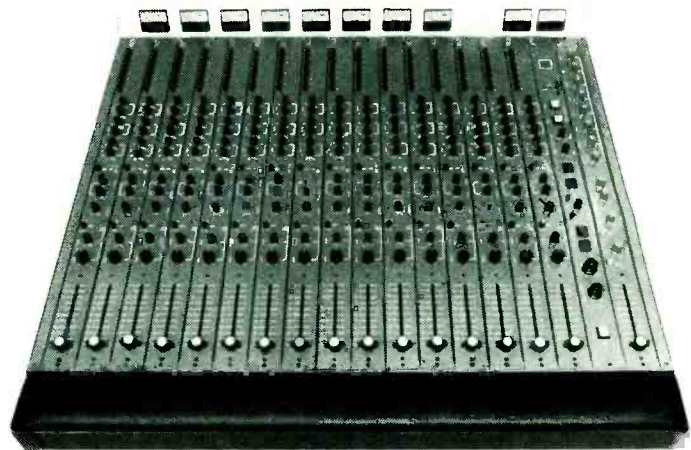
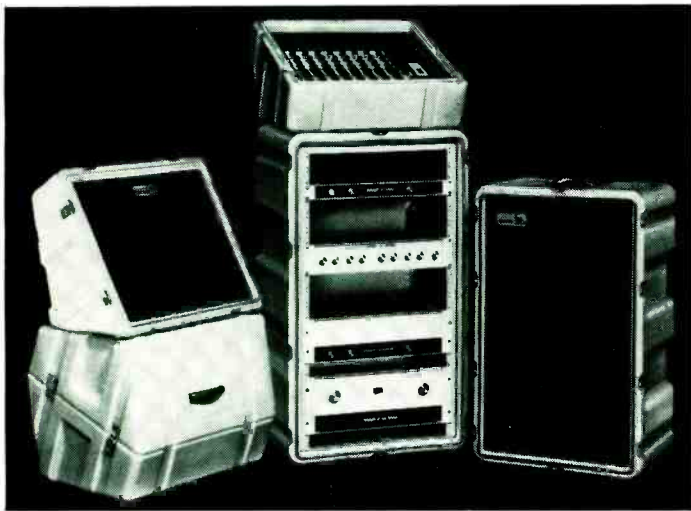
**Pa enclosures**

Amanita's new range of protective enclosures for loudspeakers and rack-mounting equipment is designed to withstand the ultimate in heavy road use. The enclosures are constructed of light-weight, low-density polyethylene with low resonance characteristics, and are available in five colours.

Each unit, including monitors, combines the functions of both wooden enclosures and foam-lined carrying case, and is thus more compact than a separate enclosure and case. Handles and clasps are recessed, and stacking ribs are provided to facilitate handling and transit.

Amanita Sound Inc, 40 Maine Avenue, Easthampton, Ma 01027, USA.

Phone: (413) 527 6910.



**Speck console**

The *SP800C* features 16 inputs, 8 or 16 subgroup outputs and two group outputs. It can easily be expanded to 24-track operation by the addition of *O1* or *O2* options.

Each input module is equipped with 3-band parametric eq, 8 or 16-track assignment buttons, post-fader echo send, monitor send, two cue sends, solo button with stereo panning facility, a mic/line switch and program/sync selection.

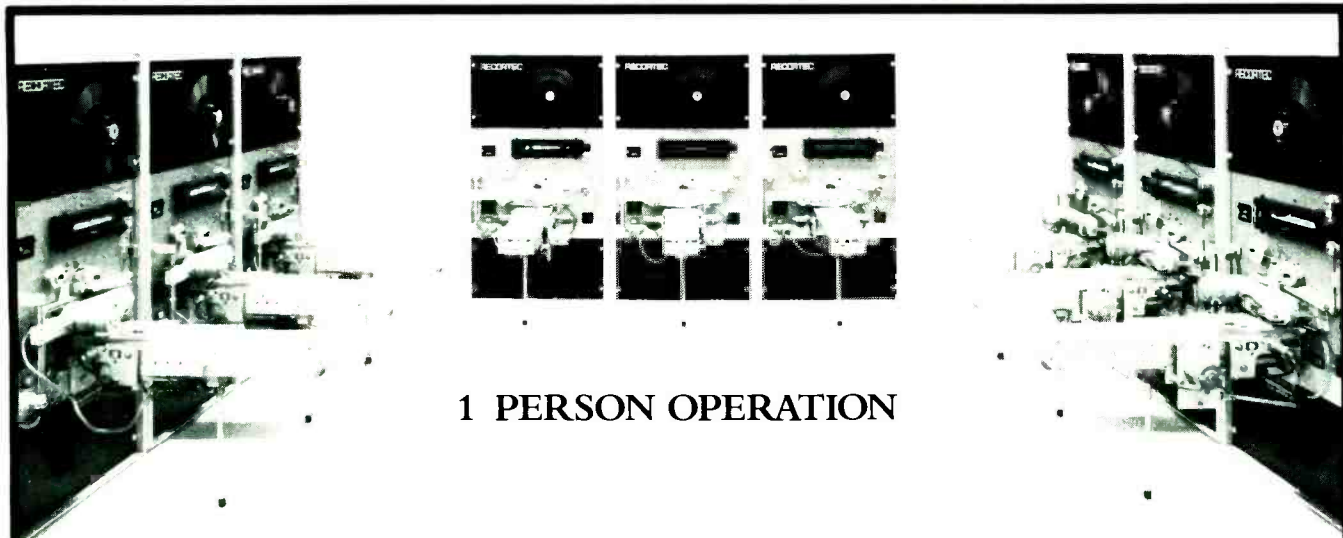
An output section houses the

stereo master fader, eight sub-master level controls, control room and studio monitoring level controls, plus controls for the two cue busses (each of which can be soloed), 2-track playback, two echo returns and two cue returns.

The desk measures (wdh) 96 x 94 x 19 cm, and costs \$6.5k.

Speck Electronics, 5642 Lankershim Boulevard, North Hollywood, Ca 91601, USA.

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### Kajaani desks for FBC

Following an order for 41 small to medium sized consoles worth some £1 million, Kajaani has received a further order from the Finnish Broadcasting Company for four 18-channel effects consoles and seven 20-channel drama mixers worth approximately £500 000. All the consoles on order are from the new 10A series, which will be shown at the forthcoming AES Hamburg exhibition (see Preview, p46).

Kajaani also tells us that it has recently been appointed as distributor for Cadac gear in Finland.

Kajaani Oy Electronics, Nuaskatu 11, SF-87400 Kajaani 40, Finland. Phone: 986 37311. Telex: 45148.

### APRS 78

This year's APRS exhibition will be held on June 21, 22 and 23 at its regular venue, the Connaught Rooms. But if you want to buy a stand, forget it. Despite an increase of 10% on last year's allocation, they are all sold out. Tickets for the exhibition will be available in May, but put the date in your diaries now. You know it makes sense.

### Guy Fountain

Guy Rupert Fountain, founder of Tannoy and honorary president of the company, died peacefully on December 10 1977 in an Epsom hospital. He was 76.

### Gilbert Briggs

Gilbert Arthur Briggs, founder of Wharfedale, died on January 10 aged 87.

### Peter Carl Goldmark

Dr Peter Carl Goldmark was born in Budapest on December 2 1906 and died, a naturalised citizen of the United States, on December 7 1977.

Goldmark obtained a BSc degree at the Vienna Technical University in 1930 and went on to obtain his PhD in Physics one year later at the Fairfield University, USA. His early engineering career was with Pye Radio in Britain from 1931 to 1933, from where he moved to become a consultant in New York between 1933 and 1936.

From 1936 to 1944 Goldmark worked as the chief television engineer for Columbia Broadcast-

ing Systems, where he was instrumental in developing a practical colour television system which was first demonstrated in 1940. From 1944 to 1951 he moved to become the director of engineering in the Research and Development Department of CBS, during which time he and his staff developed the Columbia microgroove 33 $\frac{1}{3}$  rpm disc. This was announced in 1948 and by 1950 had been adopted as a standard by the rest of the record industry.

In 1951 Goldmark became the vice-president and in 1954 president of CBS Laboratories, a post he held until 1971. During that period he headed projects including the EVR (electronic video recording), and a picture scanning and transmission system used to relay moon pictures back to earth from orbiting spacecraft.

During his illustrious career, Goldmark won over 14 medals and awards from universities and professional bodies. Goldmark in his autobiography described himself as a 'maverick inventor'—maverick or no, his brilliance and invention have assured him a permanent place in the history of recording.

Basil Lane



Peter Goldmark illustrating the space-saving advantage of the microgroove 33 $\frac{1}{3}$  rpm disc, developed during his time at CBS. The pile of albums he is holding is equivalent in recording time to the column of 78s.



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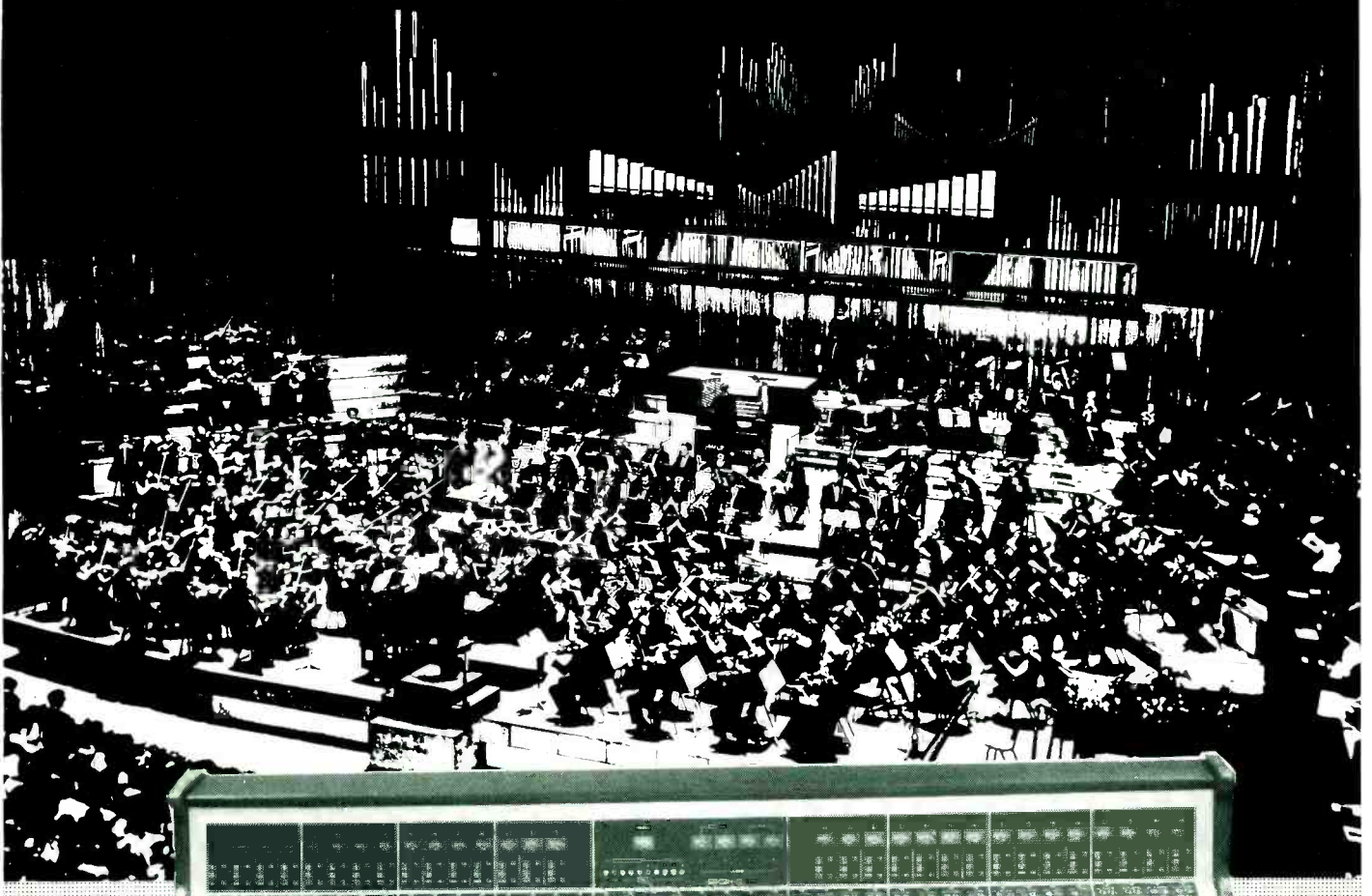
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# Improving cartridge machines

John Lumsden RADIO CLYDE

*Despite their convenience and simplicity of operation, broadcast cartridge machines seldom match the specification of reel-to-reel tape machines. Which isn't surprising when one considers the design of the NAB cartridge. Nevertheless, fitting different heads and modifying, very slightly, the record and replay amplifiers can radically improve matters.*

THE YEAR 1973 saw the start of legalised commercial broadcasting in the UK and an upsurge of interest in cartridge machines. The system provides a very easy means of playing short-duration taped material. Obviously this is a necessity for easy handling of commercials and station identifications. The cartridge format also allows newscasts to be made more interesting by the insertion of recorded news items from a variety of presenters.

Cartridge machines were born out of necessity in the USA, where the first machines made use of the conventional 'stereo' format of tracks—one for programme material and the other for control. This was back in 1958 and the gentlemen responsible were Jack Jenkins and Ted Bailey. Four years later a stereo version of the system appeared using a 3-track format—two for programme material and the third for control. These first machines were rather basic and used a mechanical latch on the tape pinch roller. The evolution of the present machines has taken eight years, and a fair degree of sophistication has resulted. Although the present equipment is very reliable indeed it still suffers from poor,

rather non-professional signal path specifications. This need not be the case.

## The problem and the solution

All commercial broadcasting in the UK is under the control of the Independent Broadcasting Authority. Prior to 1973 the Authority introduced a document called the Code of Practice for technical performance of independent local radio contractors. The document specified performance figures to be aimed for on a day-to-day basis. Initially reel-to-reel specifications were applied to cartridge machines, but experience was to show that no cartridge equipment could meet the code. The 19 ilr contractors have brought considerable pressure to bear on the cart machine manufacturers to improve specifications but little improvement resulted; probably due to the fact that the largest market for these machines is in the USA, Canada and Australia where the existing specifications are acceptable. Ultimately, the IBA under pressure from the 19 contractors relaxed the specifications, as can be seen from **table 1**.

## Frequency response

The figures given in **table 1** relating to cart machines are typical of what can be achieved by careful alignment, and the poor frequency figures are largely attributable to the heads used. These are of American manufacture and are specially designed to eliminate 'hum' pick-up, which in cart machines is a more serious problem than in reel-to-reel. This is mainly due to the very close proximity of electromagnetic components and the compact design of the equipment. Additionally the cart machines have all been modified from NAB to CCIR equalisation as required by the IBA code.

Dealing firstly with the head, a British company, Magnetic Components, have done a lot of work on a radical new design of head which does not suffer from the +3.5 dB lift at 128 Hz exhibited by existing replay heads, and this certainly represents a step forward.

The shape of the low frequency response curve of playback heads is determined by a number of factors: the length of the laminated core in the direction of the tape path; the length of the window in the shield case through which the core protrudes; the shape of the core within the head, and the tape speed.

For smooth low frequency response with the lowest cut-off frequency, as required by professional equipment, long exposed cores and long windows are required. This, however, increases susceptibility to 'hum', which in reel-to-reel machines is not a great problem because additional external screening can be provided. Unfortunately this is not possible with NAB carts due to their mechanical construction and therefore other ways of retaining the low 'hum' pick-up characteristic and smooth response have to be sought.

Magnetic Components have solved this problem by incorporating an internal shield and by careful selection of the above parameters.

We have tested five sample prototypes of these heads and

**TABLE 1**  
**IBA Code of Practice:**  
**Magnetic tape recorders and reproducers**

| Parameters   | Tolerances      |                 |
|--|-----------------|-----------------|
|  | Reel-to-reel    | Cartridge       |
| <b>1 INSERTION GAIN ADJUSTMENT ERROR</b>           |                 |                 |
|  | ±1.0 dB         | ±1.5 dB         |
| <b>2 AMPLITUDE-FREQUENCY RESPONSE (wrt 1kHz)</b>   |                 |                 |
| (i) 40 Hz to 15 kHz                                | +2.0 dB/-2.5 dB | +3.5 dB/-2.5 dB |
| (ii) 125 Hz to 10 kHz                              | ±1.0 dB         | —               |
| (iii) 250 Hz to 10 kHz                             | —               | ±1.5 dB         |
| <b>3 SIGNAL/NOISE RATIO</b>                        |                 |                 |
| (i) Weighted, random, peak                         | 40 dB           | 36 dB           |
| (ii) Unweighted, random, peak                      | 45 dB           | 40 dB           |
| <b>4 HARMONIC DISTORTION</b>                       |                 |                 |
| (i) 1 kHz at +8 dBu                                | 2%              | 4%              |
| (ii) 80 Hz at +8 dBu                               | 2%              | 4%              |
| <b>5 WOW AND FLUTTER</b>                           |                 |                 |
| Weighted, peak                                     | 0.12%           | 0.15%           |
| <b>6 LEVEL DIFFERENCE BETWEEN A AND B CHANNELS</b> |                 |                 |
| (i) 40 Hz to 15 kHz                                | 3.0 dB          | 3.0 dB          |
| (ii) 125 Hz to 10 kHz                              | 1.5 dB          | 2.0 dB          |
| <b>7 CROSSTALK BETWEEN A AND B CHANNELS</b>        |                 |                 |
| (i) 40 Hz to 300 Hz                                | -6 dB/octave    | -6 dB/octave    |
| (ii) 300 Hz to 7.5 kHz                             | -40 dB          | -40 dB          |
| (iii) 7.5 kHz to 15 kHz                            | +6 dB/octave    | +6 dB/octave    |
| <b>8 PHASE DIFFERENCE BETWEEN A AND B CHANNELS</b> |                 |                 |
| (i) 40 Hz  | 60°             | —               |
| (ii) 40 Hz to 200 Hz                               | oblique segment | —               |
| (iii) 200 Hz to 4 kHz                              | 15°             | —               |
| (iv) 4 kHz to 15 kHz                               | oblique segment | —               |
| (v) 15 kHz   | 60°             | —               |
| (vi) 50 Hz to 12 kHz                               | —               | 90°             |



installed them in an ITC 3D, an ITC RP and a Spotmaster 4000 series RP. Using an EMI SRT18C test cart, the Spotmaster was found, with minor modifications, to be capable of resolving 40 Hz to 16 kHz  $\pm 1$  dB. The ITC equipment required slightly more work and the inclusion of an If preset on the playback board. It was found on installation of the head that although the mf/hf frequency tolerance could easily be met, ie  $\pm 1$  dB, the If end was 6 dB down at 40 Hz. Investigation confirmed that the amplifiers ran out of gain below 80 Hz so the playback amplifier was modified accordingly (see fig. 1). The gain was increased by altering the ratio of unbypassed to bypass resistance in the emitter of the second transistor. Q101 and Q102 were replaced by BC 109C transistors, and a 100pF capacitor was installed across the amplifier in order to give some additional top lift and bypass rf pick-up. An If preset was also fitted.

It is also sensible to replace the frequency correction components with closer tolerance types (eg 5%). The modifications together with the Magnetic Components head gave a frequency response better than  $\pm 1$  dB, from 40 Hz to 20 kHz using the EMI SRT18C test cartridge, and improved the signal-to-noise ratio in the amplifier (wide band) by up to 10 dB.

So far so good. However, both the ITC and the Spotmaster record-replay machines exhibited poor record to replay responses. This is partly due to the manufacturers not paying proper attention to their modifications for the CCIR curve and retaining the

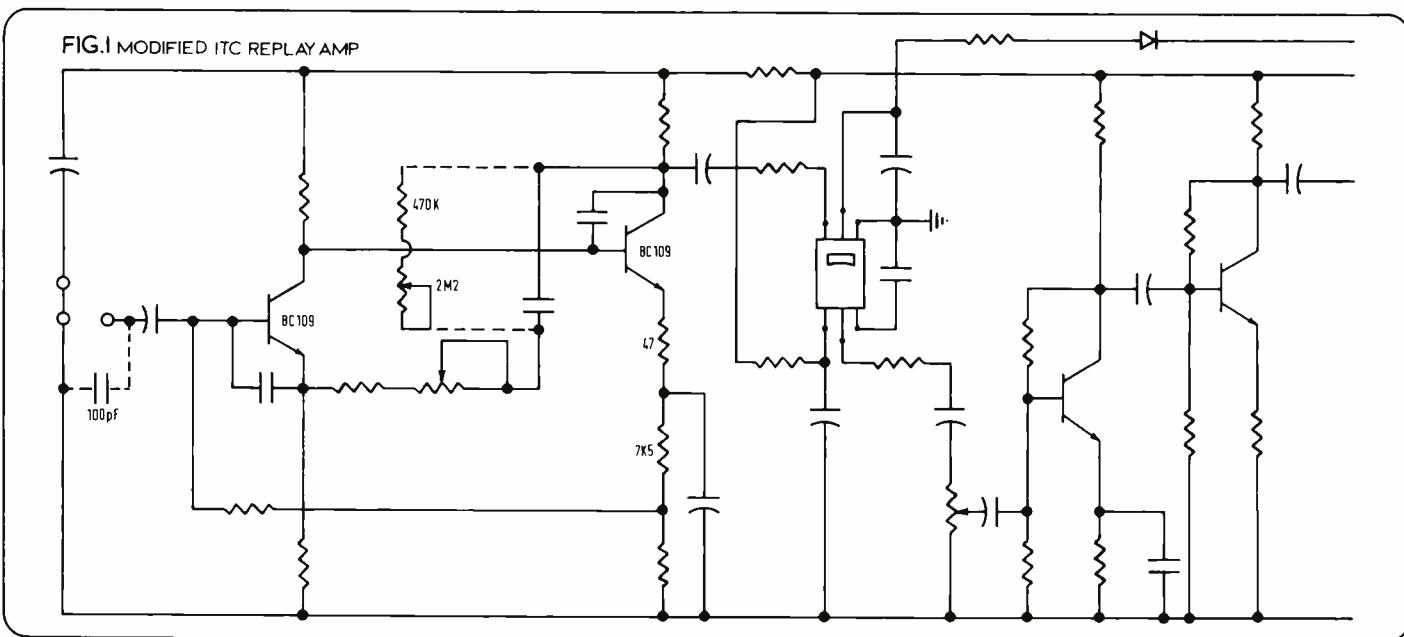
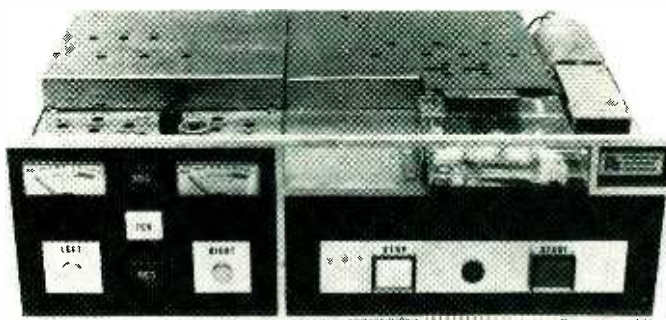
If tie-up on record, as per NAB, and also the compromise of the record amp/head, so as to compensate in part for the deficiency of the playback head. The equalisation of the record amplifier of the ITC was modified (see fig. 2) and this resulted in a record/replay response of  $\pm 1$  dB, 40 Hz to 20 kHz. The Spotmaster also exhibited a good specification of  $\pm 1$  dB, 40 Hz to 16 kHz after modifications to the record amplifier. This machine has the advantage of having a low frequency control fitted to the replay amplifier. Referring back to table 1, the above frequency response is well within the IBA Code of Practice for reel-to-reel tape machines.

### Signal-to-noise ratio

The above improvements do not impair the signal-to-noise ratio which is normally rather poor. This is due entirely to the poor quality of tape presently being loaded into cartridges, but need not be the case. Better tape is available, but to achieve better noise figures more level has to be recorded on the tape, which allows a reduction of the replay amplifier gain. This obviously results in better noise figures and seems a simple solution. But consider for a moment the problem with the broadcast. Our station, Radio Clyde, plays on air in the course of a week around 1000 carts comprising commercials, trails, stings, signature tunes, fillers, intros, news items, etc—all recorded to precisely the same level to assist in smooth operation. Obviously it is not possible to change overnight, nor is it practical to have some 38 ▶



**Left:** Studio A at Radio Clyde has a pair of 3-hole ITC cartridge machines arranged either side of the dj's self-op Alice desk. The AKG D202 microphone has now been replaced with a Neumann U47 tet. **Below:** an ITC RP record/replay machine.



## IMPROVING CARTRIDGE MACHINES

machines lined up to one level and some to another. Some automatic switching arrangement must be found, similar to the record-enable switch on a cassette or the stereo/quad switch on an 8-track cartridge. Also the new tape would have to be 'bias compatible' otherwise the switching becomes very complex.

Capital Audiopack will have available for NAB 1978 a new tape and a new cartridge, type AA, and we recently had the opportunity of testing this tape loaded in a type AA cartridge, ie the new type. The bias point was found to be compatible, the frequency response smooth and 6 dB improvement was seen in the signal-to-noise ratio. A further benefit was an improvement in the distortion at peak flux of 0.5-0.75%. This could, of course, be traded off in favour of further improved noise figures but we feel that insufficient headroom exists at present since distortion increases rapidly above +8 dB (ie peak flux) and at present it is difficult to meet the 3% figure quoted in the Code of Practice.

### Phase

The type AA also offers a much more repeatable phase performance at the hf end, due to a long straight tape path and a back tension pad immediately prior to the guide post. Other cart manufacturers claim similar improvements due to better tape paths and handling within the cart. Further improvements in phase stability and jitter could be achieved by incorporating a locked pinch roller and

by reducing thermal dissipation from the deck and motor spindle.

### Wow and flutter

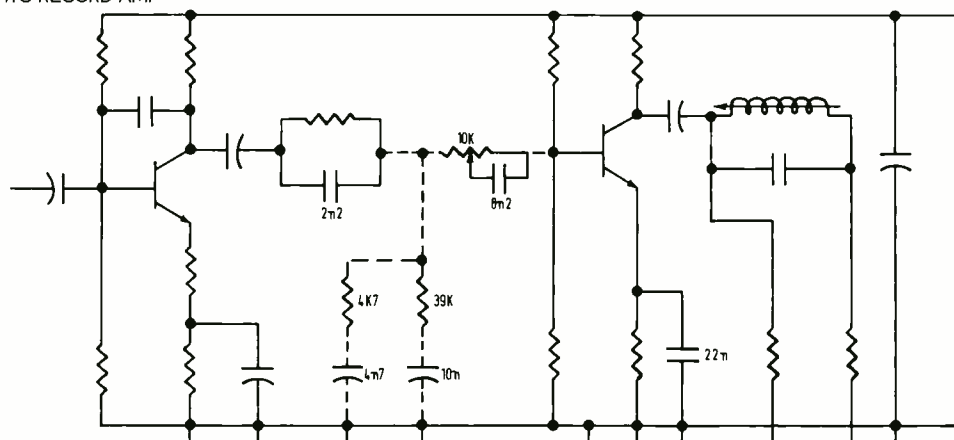
It has been shown that the frequency response can be improved, also the distortion/signal-to-noise; even the chances of getting the phase correct are reasonable. The main remaining problem is wow and flutter. Most professional tape machines today are capable of about 0.05% total wow and flutter and some, like the *Proline 2000TC*, are even better than 0.02%. Turntables like the Technics *SP10 MKII* can achieve 0.06% total wow and flutter. At present cart machines rarely exhibit better than 0.13-0.15% and this is assuming, of course, that the cart is not wound too tightly. The following factors determine the wow and flutter:

- 1 Motor speed stability.
- 2 Choice of pinch roller material.
- 3 Thermal rise of the pinch solenoid, which approaches the Curie temperature and therefore loses magnetism resulting in less pull.

These are the main problems but most of them are solvable in the following ways:

- 1 Motor stability can be improved with servo drive and crystal lock as used in the direct-drive turntables now available.
- 2 Plastic material could be used, such as polyurethane, for the pinch roller. This material does not distort, is stable and has a higher coefficient of friction, and is capable of twice the pull with the same pinch pressure. It is also not absorbent and

FIG. 2 MODIFIED ITC RECORD AMP



In both figures 1 and 2 the broken lines denote new or modified wiring. Only changed or added components are marked with their new values; all other components are unchanged in value.

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Boreham Wood, Hertfordshire WD6 4RZ.

# STUDER REVOX

# letters

## Music is a 5-letter word

Dear Sir, I have just purchased STUDIO SOUND of December 1977. I finished reading the editorial comment at 4.20 pm; it is now 4.30 pm and I am typing this letter of unlimited praise for the most fantastic, RELEVANT, exciting (what?), 'saying-in-words-what-I-have-always-thought-but-could-not-quite-put-into-words' article I have ever read.

I am (hopefully) a future sound recording engineer/producer who, due to the very limited openings into the established business, plans to eventually open his own studio—indeed, that or nothing. Initially it will be a 4-track set-up and if I continue to think along my present lines it will never exceed 8-track. Why? COST—to myself and the artists; and like you said 'Sergeant Pepper' was recorded on a 4-track . . . so?

Another thing I liked was where I found the article. If I had read it in 'Sniffin' Glue' I would not have been so surprised (save their use of English). But to find it in a magazine that deals with the most sophisticated of sound equipment seems a strange contradiction. I worry not, this article will be a standard to shove under the noses of the 'technical-is-best' brigade. Guess who?

Let's hear the musicians not the advanced facilities.

Yours faithfully, Andrew Peters, 151 Coronation Avenue, Keynsham, Bristol BS18 2QC, UK.

## There is a limit

Dear Sir, After reading George Peckham's 'Compressor-limiter: a cutter's best friend' in the October 1977 issue of STUDIO SOUND, I must say that I disagree strongly with his rather peculiar notion that a limiter, of any sort, is necessary in the process of transferring from tape to disc. The use of a limiter, or compressor, as a means of facilitating the transfer process cannot help but be detrimental to the sound. This was pointed out by Mr Peckham himself, when he referred to the limiter as 'the lifesaver, the dynamic range masher, the peaky bass end basher'. He goes on to say it's 'the cutting engineer's face saver'. I dare say it is, if you don't know what you're about and I submit that he doesn't if he advocates the use of limiters with almost a total disregard for their adverse effect on the quality of the sound.

As for his contention that limiters are a necessity for getting level on a disc: that is utter nonsense.

Yours faithfully, Michael Reese, The Mastering Lab, 6033 Hollywood Blvd, Los Angeles, California 90028.

## George Peckham replies:

I note some aggression in Michael Reese's letter concerning my article on the uses and misuses of the compressor/limiter. His quote on using the limiter as the cutting engineer's

face saver, being 'I dare say it is, if you don't know what you're about and I submit that he doesn't,' almost brought tears to my eyes. How could he be so cruel to me? Ho, Ho! Here am I mashing peaks and bashing bass ends and life saving to my little heart's content and making people happy that we can get their tapes on disc a little louder than they had hoped; and some meany comes along and smacks my wrist, with the intention of dismissing me to the lonely echo chamber in the dark unknown.

Perhaps he has misread the article, which was basically intended to help the poor reader who doesn't have a vast technical knowledge and understanding of the jargon so much used within the reproduction-of-sound studios. Plus many of my clients, technical and famous alike, inform me that they are pleased with the finished results of my work which disputes his remark that I have total disregard for the quality of sound. As for his last paragraph—How does he do it?

And by the way, please warn him I've got a big brother.

PS I've also included a little sonnet to show it isn't sour grapes; this is still a fun business!

A cutting engineer named Peckham,  
Bought a device to limit tapes, not wreck 'em,  
He squashed and he squeezed,  
'Til the client was pleased  
And some couldn't even detect 'em.

Then he wrote some lines for STUDIO SOUND,  
A magazine, yes, of world renown,  
He received a reply, brought a tear to his eye,  
With a feeling of being put down.

But no not Peck to be upset,  
I will write some more lines, I'm not upset,  
A poem to Michael Reese,  
The man who quaked my knees,  
Any comment is fair comment, you bet!

## IMPROVING CARTRIDGE MACHINES

therefore does not absorb the tape lubrication.

- 3 The adoption of a mechanical latch or aid to allow the pinch pressure to be more accurately calibrated. One further improvement that could be made is if the motor has a ceramic spindle (as MCI use in their tape machines). This is thoroughly stable, does not conduct heat and can be machined to closer tolerance with a centreless grind, consequently giving less run out. It also has a matt surface which reduces slip. Lastly the diameter could be increased, which has the advantage of increasing the effective contact area of the pinch roller.

If the above ideas are adopted wow and flutter figures of 0.06% should be relatively easy to achieve on a day-to-day basis—and our cart machine becomes a really professional piece of equipment.

### Future developments

The future of the cartridge machine is healthy. Rival systems—for example the Elcassette and C-type cassettes—offer little competition at present. The cartridge wins easily because it has an endless loop, whereas any other system has to be rewound. This takes time and is also mechanically noisy.

Cartridge machines of the future will offer extremely sophisticated designs with 'state-of-art' electronics. The heart of the control system will probably be a microprocessor, which will provide motor control pulses, synthesised and timed cue-tones, digital cue-tone filters, and DIN alignment tones stepped automatically at the required rate. Stereo phase of the cartridge

machine will be automatically adjusted by a servo-driven record head. Bulk erasing facilities fitted to the machine would automatically erase the tones that had recorded during the automatic phase alignment sequence. And finally, the machine will even find the splice automatically.

You may find all this rather difficult to believe. But be prepared for the introduction of this sort of equipment in about 1½ to 2 years time. Prototypes have been built and I have had the opportunity to test them.

How will this affect radio? Possibly all stations in the UK using cartridge machines will emerge similar to American stations. At least we will probably see top 40s or top 100s being played off cartridge. And all this made possible due to the considerable improvements in specification.

Greater use will be made of the cue track, and the machines will have built-in fsk (frequency shift keying) tone facilities both on input and output. Serial data fed into the machine will be converted to fsk, which on replay will be demodulated to provide the serial data. Applications are numerous—for example, station computers could be given immediately on playout of the commercial verification that it has been played, the time at which it was played, and even any special invoicing information.

It is indeed a high technological world we live in. But unfortunately for the moment we have to live with high wow and flutter, poor frequency response, phase jitter, high distortion and poor signal-to-noise ratios. So for the moment, like me, you will just have to wait for the next generation of cartridge machines. ■



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+4dBm fixed output with XLR connectors. And it comes with the latest plug-in card electronics. The compactness and performance make it ideal for live recording.

In short, the MX5050-8SD is an exception of eight-track professional recorders with performance, reliability and economy internationally proven in hundreds of applications producing high quality 15 and 7-1/2 ips masters. For the full story of this unique model, get in contact with your nearest Otari distributor.

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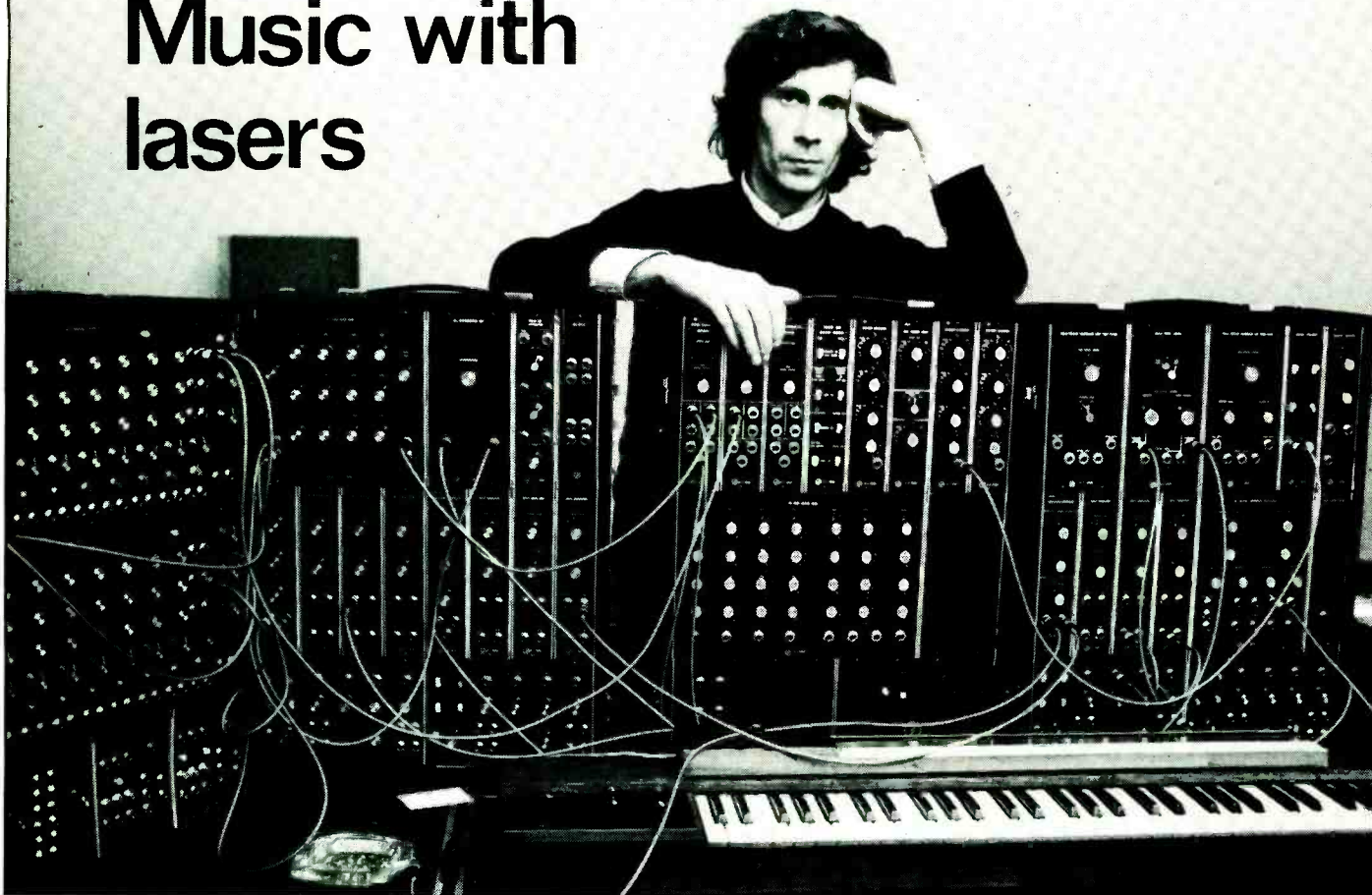
Japan: Otari Electric Co., Ltd., 4-29-18 Minami Ogikubo, Suginami-ku, Tokyo 167, Japan U.K.: C E Hammond & Co., Ltd., 111 Chertsey Road, Byfleet, Surrey KT14 7LA

France: Reditec, 62-66, Rue Louis Ampère, Zone Industrielle des Chanoux, 93330 Neuilly-s/Seine West Germany: Peter Struven GmbH, 2 Hamburg 53, Bornheide 19

Belgium: Trans European Music S.A., Koelivverstraat 105, 1710 Dilbeek, Brussels Italy: Exhibo Italiana S R L., 20052 Monza, Via F. Frisi, 22

Switzerland: Audio Bauer AG, CH-8048 Zürich, Bernerstrasse-Nord 182, Haus Atlant Australia: Klarion Enterprises Proprietary Ltd., Regent House, 63, Kingsway, South Melbourne, 3205

# Music with lasers



*In a Business item about laser shows in the November issue, Adrian Hope suggested that it wouldn't be long before bands and musicians started to use a laserist as part of a concert performance. As so often happens when one looks into a crystal ball, no sooner had that issue been published than we heard of just such an integrated sound and light concert that was held in Munich at the end of October.*

**Curtis Briggs**, production manager of the show, and **Reiner Oppelland** tell us how it was put together.

**E**BERHARD SCHOENER is a well-known German composer of electronic music, conductor, film-maker and musician who has worked with Jon Lord of Deep Purple, Procol Harum, as well as J P Ponnelle and the singers of the Scala di Milano. On a visit to New York last August he saw Laserium; and fascinated, he immediately decided to experiment with lasers in live concert performance. After several weeks of preproduction work, the concert show, called 'TRANCE-FORMATION Laser in Concert', took place in Munich during the Munich International Theatre Festival Weeks as the closing and main event. Between October 27 and November 4, 10 000 people saw and heard one of the most unusual and exciting combinations of light and music today.

Eberhard Schoener brought together rock and jazz musicians from Germany, England and the US, electronic music played by himself on a Moog 3, an Oberheim Polyphonic synthesiser and a Mellotron, plus 25 members of the Boys Choir of Bad Toelz and a huge new laser cannon by Laserium of Los Angeles. The whole event took place in a large round circus tent with a seating capacity of 1300. The stage was built in the centre, with the laser projecting straight up to the tent roof onto a large 12 metre diameter hemispherical

screen, thus creating the same optical 3D effects previously achieved at Planetariums. The soft mediating, luring electronic music, combined with the feeling of witnessing a couple of universes explode, created an illusion of '2001' and 'Star Wars' combined.

On the sound side, the situation of performing in a round tent led Reiner Oppelland to the idea of putting the speakers in a circle around the auditorium, thus providing the opportunity of surround-sound effects. The equipment consisted of: Mixing console-I (24-in/stereo) for live instruments, choir and synthesisers. Mixing console-II, a Studer 169 (8-in/4-out) for the final mix.

Tape machine, Revox A77 HS (modified model with tape tension regulation). EMT 250 digital reverberation unit. Rotosizer (prototype from the Technical University, Berlin) with 2 inputs, 4 outputs switched continuously, with variable rotation frequencies ( $0.1 < f < 20$  Hz) and direction.

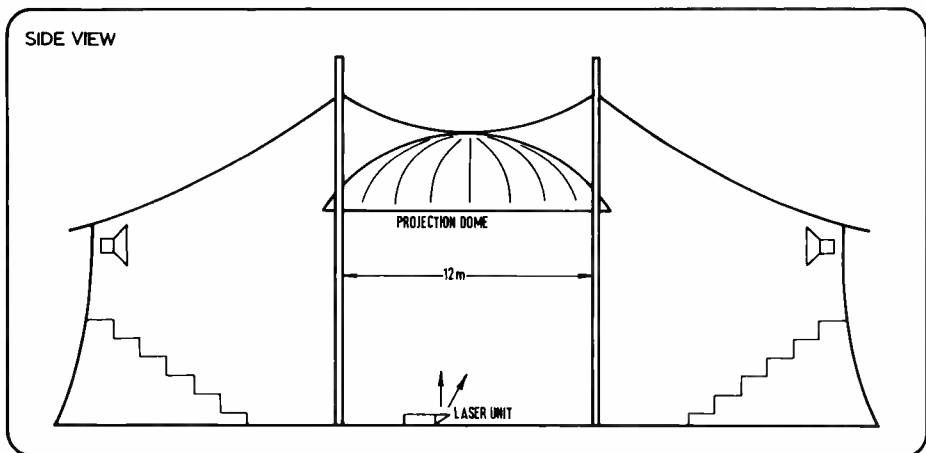
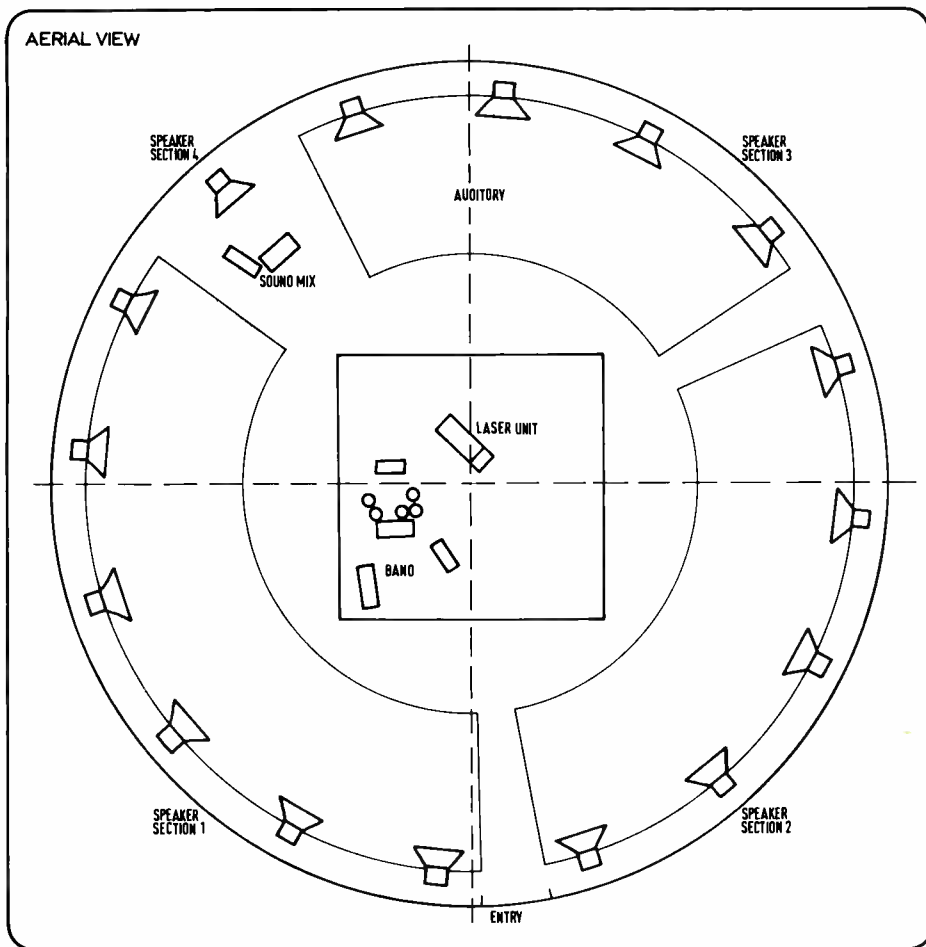
4 Bose power amplifiers.

16 Bose loudspeakers.

Several Electro-Voice microphones.

Three mics were used for the choir, two for the solo vocals and four for guitar, bass and percussion. These were mixed in console-I together with echo-return (outputs





2 and 3 of the EMT 250 unit), the synthesizers and the Mellotron. These premixed stereo signals were fed into console-II and, at the insertion points, split into the faders of channels 1 and 2 as well as into the inputs of the *Rotosizer*. The four outputs of the *Rotosizer* were connected to inputs 5, 6, 7 and 8 of console-II; inputs 3 and 4 were fed by echo-return (outputs 1 and 4 of the EMT unit). The eight channels were routed in such a way that the basic stereo signals fed the speakers in one half of the tent per channel, whereas the outputs of the *Rotosizer* fed one master output, or in other words, one

loudspeaker section each (see aerial view).

The assignments seem to be a bit complicated, but they were not—the reason for doing it this way was because of the operating mode of the *Rotosizer*. The level of a signal in one output decreased to zero while it started to increase in the next output, instead of remaining on a defined, possibly adjustable, level. So there would have been periodical moments when the whole sound image broke down, if this gap had not been covered with a constant-level signal, provided by channels 1 and 2 of console-II.

It is worth mentioning the difference which

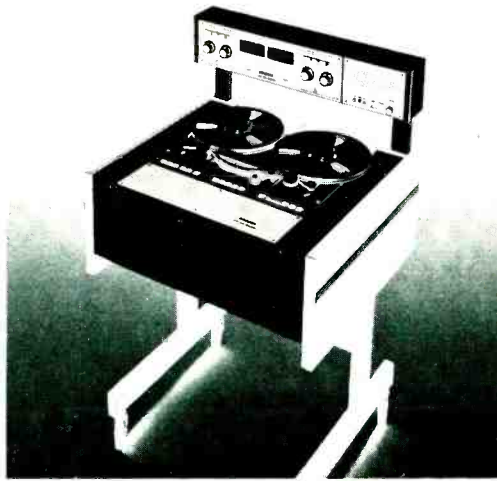
is established by performing in a tent as opposed to a hall. In the case of a music hall there may be lots of reflected sound, so the periodical interruption of sound generation may well cause a pleasant effect (at least that is our experience from rehearsals in a movie hall). But if you are located in a tent you cannot expect as much reflected sound, though there is still *some*! (In this case there was a 'feedback' frequency of about 400 Hz.) Here these interruptions are extremely audible and would consequently be considered unacceptable.

The music for the show consisted of parts which were previously recorded on backing tapes, and of some others performed live. A listener once asked about the percentage of live and recorded music—a question that cannot be answered. If you are working hard with experimental electronic music, you will probably climb to very sophisticated musical patterns which nowadays demand the use of multitrack techniques. So it is evident that for a performance you have to prepare basic materials while playing other material, maybe totally new ideas, live. And that has nothing to do with putting highlights on a simple playback tape, of course.

There was an opening piece done by the rock band, followed by pieces with tape, the band and live electronic music. Whenever the guitar or the percussion were playing, the 'echo' mode of the reverb unit was used together with the longest delay time available. In connection with special panning and the rotating sound, this created an astonishingly clean echo effect going round the tent. With the guitar it sounded more like long-time reverberation, but it was preferable to the 'reverb' mode. This mode was also very suitable for those pieces with the choir. With a chosen delay time of 3.5s it provided a fine reverb—very clean again, which was needed to achieve a 'melting' mix of the choir live and its voices on tape. The other modes of the unit were not so useful for the show, but were applied with great success later on in the studio.

By means of all these devices it was possible to create a sound image, that not only impressed the audience but generated a reaction to the music as well as the laser images—and vice versa. It was found, for instance, that normally the rotating sound effect had to be in time with the music. But in some parts of the music the faster rotation frequencies would have destroyed the rhythmic structure; so the laserist would follow or even anticipate such development.

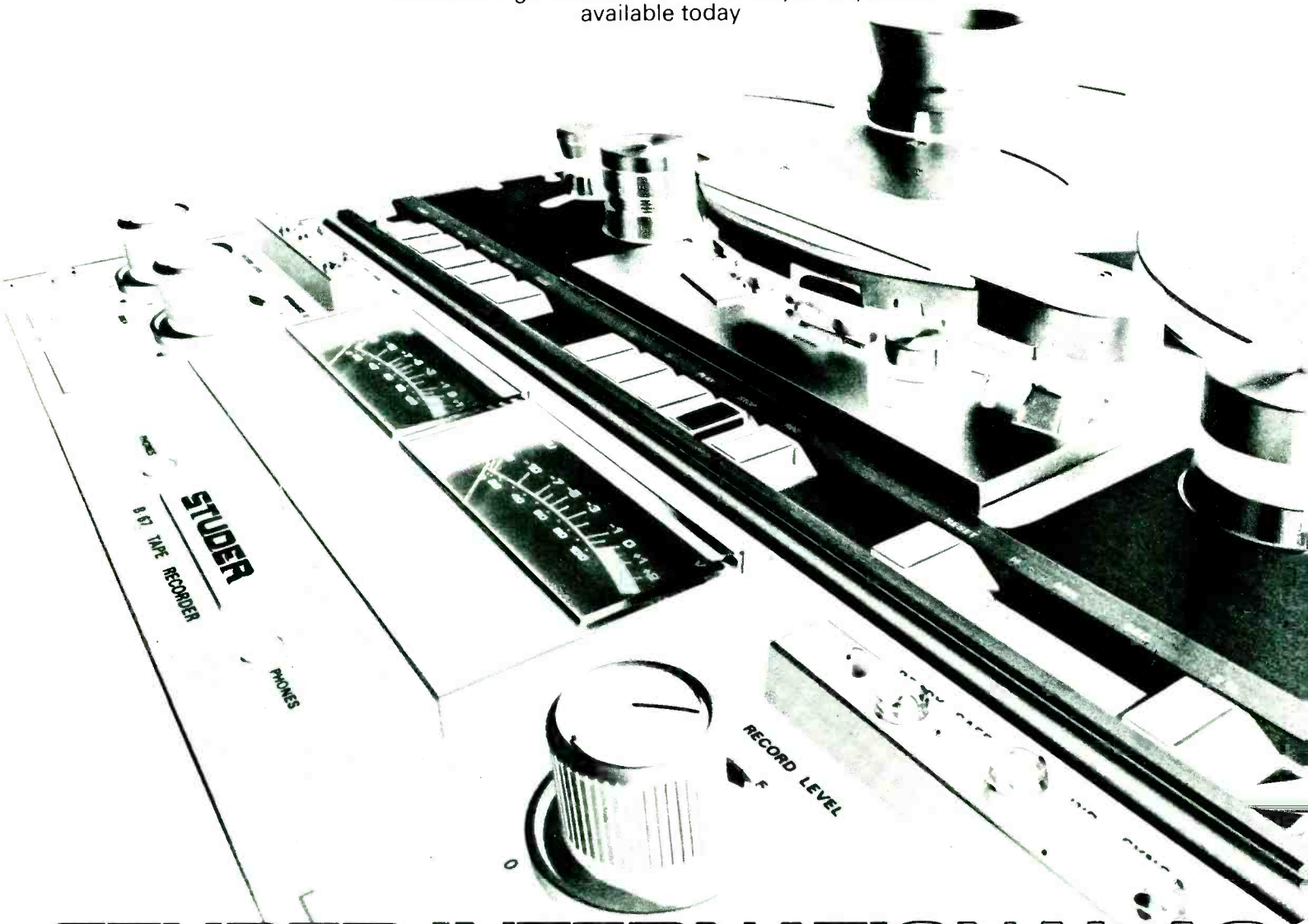
Although the laser was not linked to the music technically, it seemed possible to get a uniform impression of sound and laser image. But maybe the relationship was the other way round: the laserist had the freedom to operate according to his knowledge of the music and incorporate his time-variable feelings that occurred whilst perceiving the music. And although we can imagine how to improve the cooperation of the music and laser for the benefit of the audience, it is our opinion that up to now this has been one of the most interesting experiments of a laser-music show. ■



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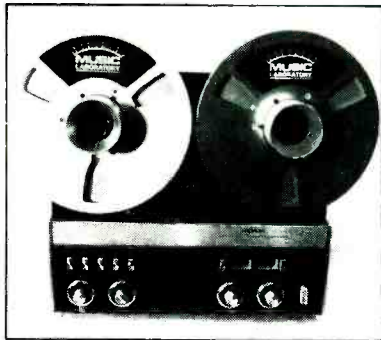
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# AES 59th Convention, Hamburg

## a preview

*The 59th AES Convention will be held from February 28 to March 3 at the Plaza Hotel, Hamburg. Nearly 100 manufacturers will be showing a wide range of their products. A full list of exhibitors is to be found on page 56.*

Allen and Heath/Brenell will be showing their 'synergetic' console. *Syncon* is available in any format up to 28-in/28-out with split assigned mix busses. A 'unique' routing system allows free sub-grouping in record and mix-down modes without affecting normal channel capability. The desk features quad mix-down and monitoring, and is supplied with P & G faders as standard. To be demonstrated alongside *Syncon* will be the Brenell *Mini 8* 8-track tape machine, which is now available with full remote control, digital counter and return-to-zero. Also on display will be the complete range of Allen and Heath mixers and signal-processing equipment, including an adt unit and a feed-forward limiter.

A wide range of gear will be shown by Altec, including the *1640* time-delay system which features shift-register type digital circuits and a 85 dB unweighted dynamic range; the *1660/1661* time-delay unit which has digital random-access memories and a frequency response  $\pm 1$  dB, 20-15k Hz; the *808-8B* hf driver; the *1630A* dividing network with crossover points selectable between 80 Hz and 10 kHz; the *1628A* 8-channel automatic

mic mixer; the *1590C* power amp rated at 200W 50-12k Hz; the *9440A* power amp rated at 250W/channel into 8 or 450W into 4 ohm; the *1650* active equaliser which has 28  $\frac{1}{3}$ -octave filters on the range 31.5-16k Hz; plus a selection of microphones.

Ampex are to show a full range of multitrack and mastering machines, recording tape and associated equipment. Highlight of their stand is to be a demonstration of the EECO *MQS-100* synchronisation system linked to a 24-track *MM-1200*, an *ATR-100* and a *VPR-1* video recorder. The *MM-1200* will also be equipped with the new multipoint search-to-cue accessory. Recording tape products will be represented in a display of *Grand Master 456* tapes and *406/407* series mastering tapes. Also at Hamburg Ampex will introduce into Europe its *460 series* tape, specially designed for recording digital audio signals. The tape is said to combine high bit-packing densities with extremely low dropout rates, and can resolve signal wavelengths down to 1.5 micron.

The mastering units to be exhibited by Asona are fully equipped with a goniometer,

two compressor/de-essers, a bar-graph level meter, compression indicator and four monitor buttons for immediate quality comparison. Units are available with a digital counter for use with the Asona time-shifting system. The company also manufactures reel-to-reel tape duplicating equipment for 16:1 and 32:1 dubbings, as well as a loop-bin master for simultaneously feeding up to 30 slaves. An electronically controlled cartridge winder, the first model of a new line of fully automated tape duplicating equipment, will also be featured.

Audio and Design will exhibit their complete product range of studio and broadcast electronic signal processing equipment. These include: *F600* broadcast limiter; *F690* voice-over limiter; *E900* sweep equaliser; *E500/560* band selection processors for selective envelope processing at spot places in the audio band; and the *E950-RS Paragrophic* equaliser.

Audio Engineering Components will be showing a range of real-time analysers, including the *EA-75* octave rta with led readout; the *ARA414*  $\frac{1}{3}$ -octave rta with crt display; the *EA-27* filter set and noise generator for use with external oscilloscopes; and the *AFA415* dual-channel rta and matching *G-26* noise generator. Also to be found on the AEC stand are products bearing the Klipsch and Sound Technology brands. New from Klipsch will be two loudspeakers for theatre and pa use. Both feature three-way horn-loaded designs. The *La Scala* is fitted with a new *K-43* 150W bass driver, while the bass section of the *MCM 1900* houses two *K-43s*. The *ST1710A* broadcast distortion analyser and combined oscillator from Sound Technology allows measurements down to 0.002% to be made in under 5s. The instrument is equipped with auto-null and differential input, and is designed for use in strong rf fields. Also available separately is the *ST1410A*, the oscillator section of the *ST1710A* analyser.

Audio Kinetics will exhibit the new *XT24 Interlocator*, which is capable of learning the ballistics of a given tape plus transport. The unit can be interfaced to *M79*, *A80* or *MM1200* tape machines and is claimed to be the fastest locator yet developed. Cyclic

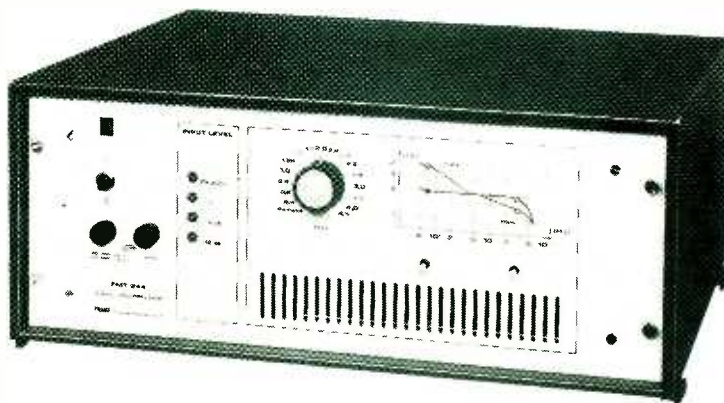
*Deck transport and general view of the new Studer A800 multitrack to be shown for the first time anywhere at the Hamburg exhibition. The machine goes into production at the end of this year, and should be available by spring 1979. What price second-hand A80s?*







**Left:** multipoint search-to-cue accessory from Ampex for ATR100 and MM1200 machines. **Right:** the new EMT 244 digital reverberator. **Below:** the ubiquitous Leavers-Rich Proline 2000TC mastering machine.



Beyer will show its 48V phantom-powered condenser microphones, the range of which has been increased with the addition of two shotgun-type condenser microphones *MC716* and *MC717*. Also to be seen: the *ISS88* infrared sound transmitting system; the new *M260* ribbon microphone; and the *ET1000* electrostatic headphones.

**B & K** will be highlighting the measurement of frequency response, impulse response and distortion using the new model *2031* narrow-band spectrum analyser and model *2131* octave/ $\frac{1}{3}$ -octave analyser under calculator control. Also to be shown is instrumentation for automatic measurement of wow and flutter, tim and bim, loudspeaker 'box sound', loudspeaker phase and transient response, as well as two new digital sound level meters, a tracking filter, waveform retriever, and various generators, filters, amplifiers, instrumentation microphones and recorders. (Hope there's room for visitors on their crowded stand.)

**Calrec** are to show for the first time the *Soundfield* microphone which is said to offer operational flexibility and accuracy in stereo recording. A closely spaced array of capsules and associated matching circuitry completely characterise the first-order directivity of the sound reaching the microphone. Four outputs are generated proportional respectively to the sound-field pressure and to the three components of pressure-gradient (left minus right, front minus back, and up minus down). From these four signals (known as B-format) Calrec say that any combination of omnidirectional, cardioid, hypercardioid or figure-of-eight characteristics can be created. Any number of such microphones can be synthesised simultaneously while a microphone control unit provides, in addition to mono and multichannel feeds, the output of a stereo pair. Controls are provided that enables the angle between the two microphones of the pair to be varied, as well as the directivity patterns of the individual microphones (including the position of the nulls in the case of hypercardioids). The whole stereo pair can then be panned or tilted in any direction.

**Cetec** will be displaying their range of *Gauss* high-speed tape duplicating equipment that incorporates all the latest innovations to produce music cassettes at a ratio of 64:1.

Also on display will be the established range of high-power instrumental loudspeakers and a new 150W model, plus studio monitors.

**Dolby** will have on show their full range of noise reduction equipment. There are no new additions for the Hamburg show. Dolby states that they are continuing to make good ground in cinema sales—the *Star Wars* production sound track was Dolby-encoded, which should certainly ensure more sales for the *CP50* and *CP 100* processors.

**Electro-Voice** will be demonstrating for the first time in Europe two new floor monitors and two new stage loudspeaker systems. The model *FM12-3* is a 3-way floor monitor offering a frequency range of 80-16k Hz, and is said to be capable of delivering spls of up to 116 dB at 1.3m on axis from an input of 100W. Drivers comprise a *T35* tweeter with blowout protection, an *EVM12L* bass unit and a Thiele-design 165 mm vented mid-range. The model *FM12-2* is a small brother to the *FM12-3* without the mid-range unit. The stage loudspeakers to be shown are the *S15-3* (3-way) and *S15-2* (2-way). The *S15-3* has a frequency range of 50-16k Hz and a quoted spl of up to 116 dB. Common to all four models is a long-term power handling capacity of 100W 'shaped' white noise. Also to be seen: the full range of E-V microphones, including the new *System C*.

**EMI** will be showing their series of studio mastering tapes available in 6.35, 12.7, 25.4 and 50.8 mm widths, plus a range of duplicating tapes for all applications.

**EMT** are showing a new model this year: the *244* digital reverberator. Fitting into a 483 mm rack, the all-electronic unit simulates room and plate reverberation controlled by a 16-step switch which varies the decay time between 0.4 and 4.5s. Another front-panel control provides frequency dependent decay characteristics—in one position the decay is frequency linear, while in the other the high-frequencies decay before the lower ones. The electrical performance matches that of the more familiar electromechanical plates, and the company will continue to manufacture the latter type of reverberator. It will also show the *EMT 444* time delay unit, an updated version of the *440*.

**Estemac** plan to exhibit products bearing the *Eventide* and *Quad/Eight* brand names. 48 ▶

sequences can be programmed between any of six aim points, and the display can be switched to give an 'ips' readout for future varispeed reference. The same company will also exhibit acoustic screens plus recently-developed *Sonapanel*s. The latter are designed for economical studio acoustic treatment.

**Audiomatic** will be exhibiting the new **Electro Sound 64:1** high-speed tape duplicating system which used a 9.5 cm/s master. Even at this speed the manufacturer quotes an equivalent frequency response of within  $\pm 2$  dB from 40 to 15k Hz. The slave bias frequency is 8 MHz. The company produces a special 9.5 cm/s mastering machine for producing the low-speed master tapes. This tape recorder is designated type *ES505*. There will also be a *QCV* quality control reproducer for testing and sampling duped pancakes. Audiomatic will also have a **Superscope** automatic cassette loader on their stand.

**BASF** is to show the range of professional tapes in width sizes 6.25 to 50 mm. Standard play tapes on 1.5 mil base include the matt back *SPR50 LH* and the *LGR30P* intended for long-storage purposes. Long play tapes include *PES40* with yellow matt back and *LPR35LH*, also of low-noise characteristic. There will be a range of magnetic film stock on hand as well as reference tapes for all purposes covering a width between 3.81 to 50 mm. The *Unisette* format will also be shown.

## AES PREVIEW

On show and demonstration for the first time in Europe will be the Quad/Eight *CPR16* computer-programmed reverb unit. Also to be seen: a *Pacifica* modular console featuring 28 input and 16 output channels. The Eventide *H910 Harmoniser* with 'phase-locked keyboard', *Omnipressor*, *Instant Flanger* and *ddls* will be exhibited. It may also be possible to examine a prototype of the *S1066* special effects delay line, which was first shown at the New York AES exhibition last November. The unit is essentially a 16-output delay line. However, instead of the delay times being set by knobs or switches, a programmed read-only memory selects the time of each output and its amplitude and phase. For one input the 16 delays are spread to two outputs in a sequence determined by the roms, enabling stereo effects to be achieved. The unit can store up to 32 individual programs selectable from a front-panel switch block or keyboard.

**Helios** will be focusing on broadcasting equipment. A console for live television programming will be shown, en route to Mainos TV, Finland. It has 30 input channels and is described as a 'free grouping' desk. Which means that groups of any number of channels can be put under the control of another channel used as a group master. These can again be grouped and then all pass to two main outputs. There are four metered auxiliary groups per channel, and a separate parametric equaliser module is located above each channel. Intercom modules are built into the console. The company will also be announcing the new *Nordic* series of general purpose radio and tv consoles, available in various sizes and optionally equipped for multitrack recording.

The new *IE-30A* hand-held analysis system from **Ivie** combines a real-time analyser (both octave and  $\frac{1}{3}$ -octave) and a spl meter in a package measuring just 12x9x5 cm. The instrument can be used to perform a wide variety of measurements, including amplifier gain, frequency response, output power, weighted or unweighted sound levels (to

within 0.1 dB), peak accumulation and impulse values. Coupled to optional accessories, the *IE-30A* will also measure distortion and reverb time.

**JBL** will be demonstrating their latest studio monitors and professional electronic products, including the *4301* broadcast monitor and new single-channel power amps.

**Kajaani** will show a new portable commentary mixer, details of which were released earlier last year (see September '77 issue, p28). Also on display will be some new modules for the *10EA* broadcast mixer system and a stereo phase oscilloscope. There will also be a triamp monitor produced by **KLT** of Helsinki.

**Keith Monks** will be showing their full range of microphone stands, including the colour versions. In addition there will be a range of studio stands and booms in chrome as well as many other models on display. There will also be a selection of goosenecks, side clamps, stereo bars and cable clips. Four cable drums are now in the range taking twin screened mic cable up to multicore.

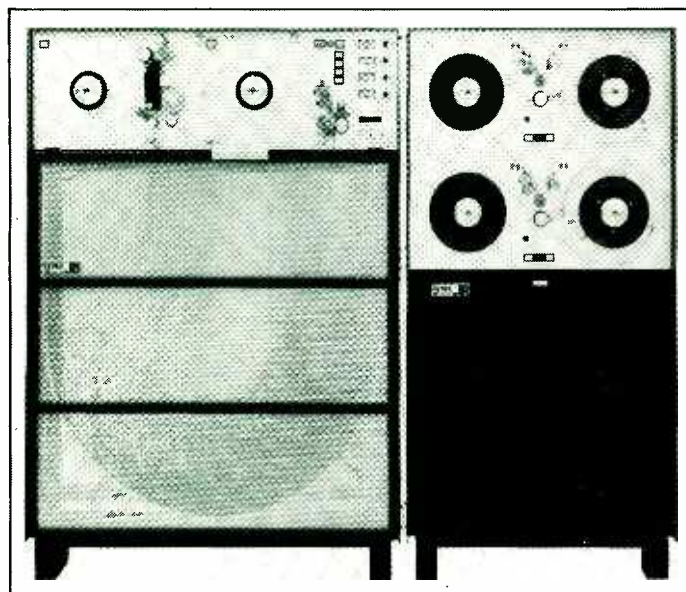
**Klark-Teknik** will be exhibiting their full range of graphic equalisers, including the *DN27*  $\frac{1}{3}$ -octave mono unit, the *DN22* dual-channel 11-way unit, and the *DN15*, which is similar to the *DN22* but with the addition of a pre-amp. To be seen for the first time on exhibition in Germany will be the *DN36* analogue time processor, a dual-channel voltage controlled delay system. The delay section uses the latest charge transfer devices, which are operated in a balanced multiplexed mode, giving 'extremely good noise and distortion performance'. Multipath feedback controls enable the user of synthesise innumerable special effects. The company will also be showing working pre-production models of their new *DN34* analogue time processor and the *DN70* digital delay line. The *DN34* is a mono version of the *DN36*, but with the addition of an internal mixer. The *DN70* ddl has three outputs, each with a digital readout of delay time in milliseconds. Maximum delay is 160 ms, expandable to 640 ms.

Highlight of the **Leever-Rich** stand will be the *Proline 2000TC* range of 6.35 mm tape machines, which can be supplied in two console housings—standard and penthouse—with three control-panel arrangements to suit the differing requirements of tv stations, radio stations and recording studios. The machines feature dual dc servo-controlled capstans; constant electronically controlled tape tension in all modes; a constant velocity spooling system; ttl logic; and NAB/DIN switching. Also to be seen: the *Proline 1000* machine which is available in rack-mount, transportable and console versions, and which can be supplied with either servo-controlled or direct-drive capstan motors. Featuring electronic servo-controlled tape tension, motion-sensing logic, and modular construction, the *1000* is claimed to be the ideal general-purpose workhorse for all professional applications.

**Lyrec** will exhibit the *TR532* multitrack machine, together with the new micro processor-based taped position controller. The *TPC* enables searching to three different preset tape positions and recycling between two positions. It can also store 16 different tape positions that can be recalled and searched at the operator's convenience. All tape machines come complete with a comprehensive remote control unit containing search function, varispeed with 4-digit readout and tape timer, plus controls for all functions. Each track can be selected between ready, safe, line, sync, repro and solo. Also on display will be the company's cassette duplicating equipment, including a new master and loop bin.

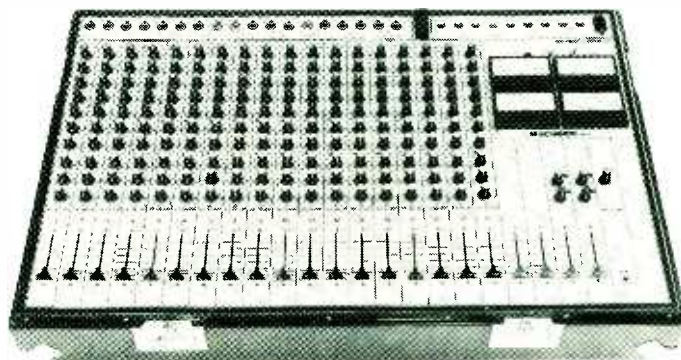
**Macinnes Labs** are exhibiting the latest version of their portable mixing console designed for mobile recording or high-quality pa applications. In standard form it is an 18-input mixer with the facility of any channel being selected for echo return. The *18/4* is built into a sturdy glass-fibre flight case with heavily reinforced corner pieces. In addition to the four main outputs, there are two echo outputs and two foldback outputs. All 18 inputs may be balanced mic or line, and all channels are routable to any group. Options include jack line input connectors, and an insert facility on all channels.

**Midas** will be exhibiting several consoles from the *PR* modular system, including a rugged and compact multitrack console designed for mobile recording applications. The other consoles on show will feature the complete range of modules currently available within the system, and which cater for a wide variety of application including high-quality sound reinforcement, recording and broadcast consoles. 50 ▶



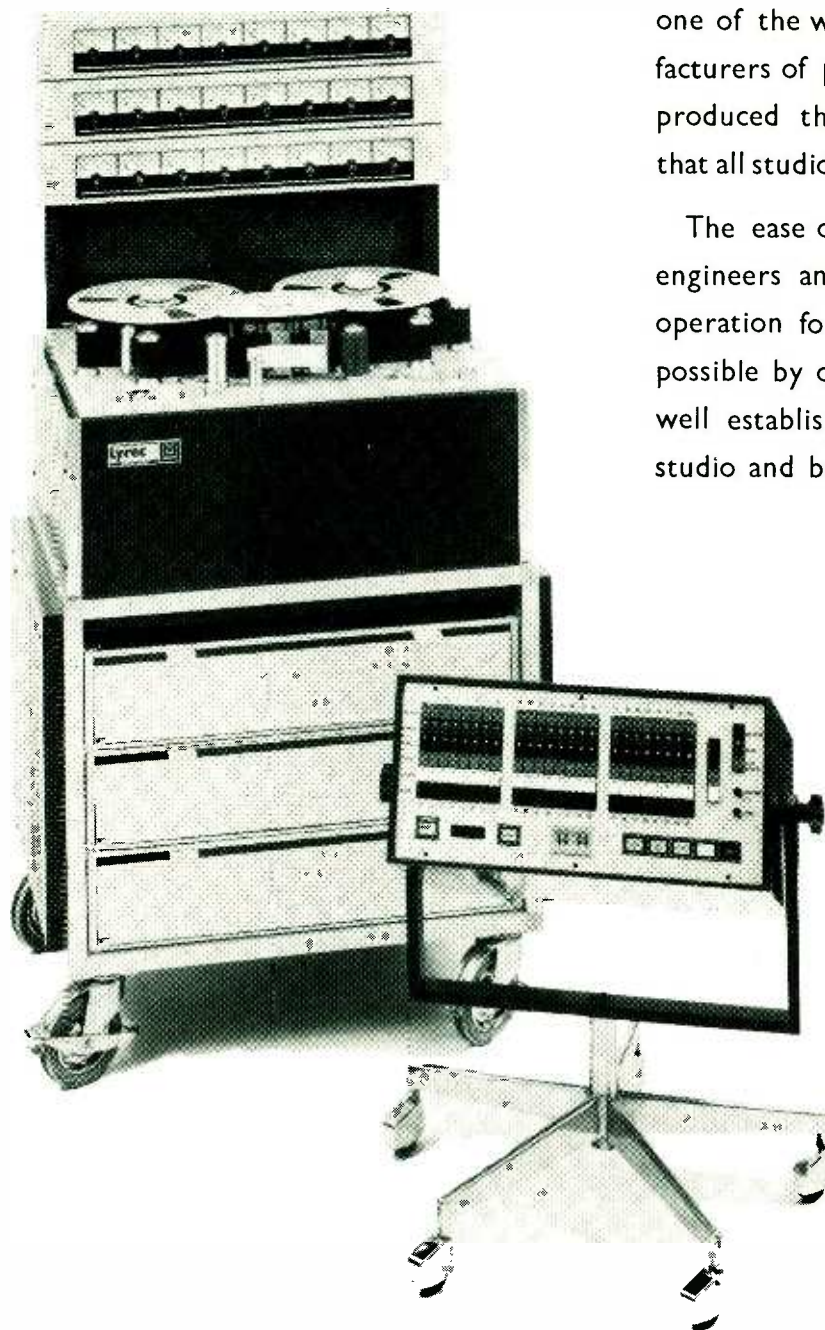
Left: Lyrec high-speed duplicating system.

Below: Macinnes 18/4 portable mixer





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**France:** Soracitel, 161 Boulevard Lefebvre, 75015 Paris. Tel. 01 828 05 64.

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## AES PREVIEW

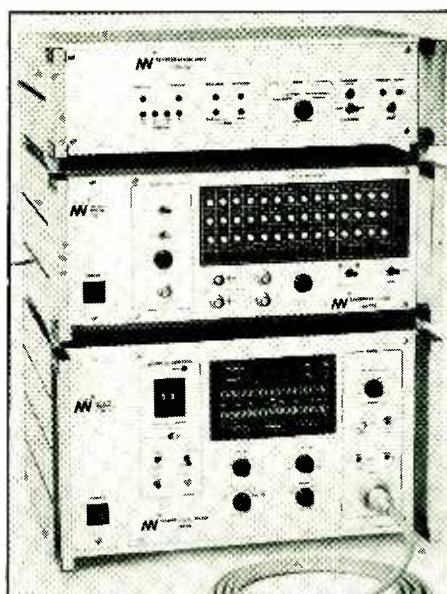
Mosses and Mitchell will show their range of jacks and jackfields, all of which are said to conform to BBC and PO specification. Jackfields are available in either standard 483 mm rack, or a new 32 jacks per row size which fits into a 560 mm frame. The company claims that all jacks are thoroughly tested before despatch for continuity, insulation, gap width, withdrawal force, spring pressure and contact resistance.

Neal will be showing the *Ferrograph* range for the first time at an AES exhibition. On show will be *Logic 7* series and the *Studio 8* tape machines, and the *RTS2* test set which can be used to measure frequency response, noise, wow and flutter, distortion, input sensitivity, output power etc. Also to be seen: the Neal range of studio-quality cassette machines, including the new *Model 302* which features logic control and a three-motor transport.

Neve will have on show a selection from their wide range of consoles. Featured will be *Necam*, which is already in use in many studios in the UK and the USA and will shortly be installed in Europe and the Far East. The AES Hamburg exhibition will be the first time the system has been shown in Germany.

Neumann will exhibit condenser microphones, disc cutting equipment and mixing console modules. Among the microphones to be exhibited will be models *U87*, *U47fet*, *KM84*, *SM69fet* (stereo), *QM69* (quadraphonic), *KU80* dummy head and the new soloist condenser microphone *KMS84*. Among the equipment for disc cutting the stereo cutterhead *SX 74* will be shown. Other stands will show products for Audio Export George Neumann & Co, Heilbronn and Gotham Export Corporation.

Nordisk will be showing the *Unimatic* automated tape machines, which are intended to be a serious competitor to the NAB cartridge machines used by broadcast stations. The machine's design is based on the BASF *Uniset* cassette using 6.35 mm tape. Maximum recording time is 21 minutes. Two tracks handle stereo program signals, while a third provides automatic stop and recue. Full remote control is available, including pre-fade listen with automatic return to the start of the recorded item.



Nortronic's modular series of sound measuring instruments

Nortronic will show sound level apparatus to monitor airborne sound transmission in buildings according to ISO Recommendation 140. A small portable system, *811*, will perform all the necessary functions in an automatic mode—even the reverb time is automatically calibrated. For advanced laboratory applications there is a modular series of digital controlled instruments. The multifunction sound meter type *108* measures spl, max, Leg, Ln and peak; it has digital display and dynamic signal display. The type *719* dual-channel filter with noise generator and type *210* reverberation calculator will extend the capabilities of the system.

NTP plan to show their range of ppms, compressors, limiters, equalisers etc. New products include an EBU-meter with gas discharge tube as display unit (whatever that is); a new compressor amplifier; a tone burst generator for adjusting ppms; an override unit for speech control of a program; a compatibility meter for control of a stereo signal; and a programmable equaliser.

Ortofon, who are now distributing the Scully cutting lathe in Europe, will exhibit a complete set of their own cutting equipment.

This will include the type *CPS741* correction amplifier, the type *STL732* treble limiter, the type *GO/GE741* cutting amplifiers, plus the type *DSS731* cutter head. In addition Scully's cutting lathe *LS-76* will be shown.

Penny & Giles will be presenting their range of faders and quadraphonic joystick controllers. All of these products utilise special conductive plastic tracks which have been developed and manufactured for the last 10 years. This track, together with multiple finger previous-metal wipers, are said to ensure a noise-free, stepless fade and give a long and reliable life.

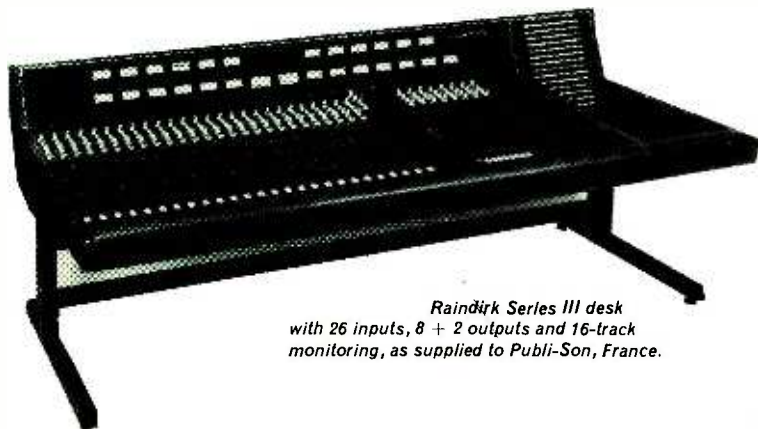
Philips are to show a 'quality' sound system for theatres and concert halls. The company also appears to be inviting a scrap with CBS by referring to the equipment line as the *SQ sound system*; the quadraphonic system of the latter company doesn't appear to enter into it. Regarding system details, the company states that it was designed to cover large audiences uniformly at high sound levels. It claims to have achieved this by using speaker units 'over a wide horizontal angle, carefully avoiding phase shifts between the high and low frequencies.' There will also be a new mixing desk, type *LDC35*, which uses a selection of standard 30 mm modules combined in a larger stock frame size.

The principal attraction on the *Raindirk* stand will be their *Series III* mixing console. It has been company policy to manufacture a mixer which has a standard but very flexible basic format that can be readily developed into a custom console. The technical specification of the *Series III* is described as 'comprehensive but not gimmicky'. The desk is finished in Indian laurel veneer with leather armrest. The standard format is 18 input channels, eight group plus two master group outputs and 16-track monitoring; or 26 inputs, 8 + 2 outputs and 24-track monitoring. The largest mixer based on *Series III* modules has so far incorporated 40 input channels and 32-track monitoring in a wrap L-shaped console.

Recortec will display details and highlights of their cassette duplicating system. The automated cassette duplicator combines high speed duplication and automatic cassette loading into one operation. Each system comprises a bi-directional master reproducer and one or more cassette slave loader units. An automated feeder may be added to each slave unit to achieve fully automated operation. The normal duplicating ratio is 32:1 using a master recorded at 19 cm/s. However the company states that good quality dupes can be obtained at 64:1 with a master recorded at 9.5 cm/s.

Sait is to exhibit a range of multipurpose broadcast and recording consoles. The company states that its desks can be provided in any format by the use of a modular construction system. Output arrangements can be either stereo or quad. There is also a smaller range of console suited to sound reinforcement, small studio and theatre use.

SATT will be showing the *SAM82* portable mixer which is equipped with eight mic/line inputs and two main output channels. All input and outputs are equipped with transformers, and an internal phantom supply



Raindirk Series III desk with 26 inputs, 8 + 2 outputs and 16-track monitoring, as supplied to Publi-Son, France.



# Broadcasting Helios

Helios are justly well known in the recording industry for their technical excellence. During the past year, Helios has invested heavily in new circuit designs and advanced production engineering methods, all of which have added to the performance and effectiveness of console design.

Yet few realise that the impetus for these high standards has come from the need to meet the specifications of the Broadcast Industry, such as Nordic (N10) and those of the British Independent Broadcasting Authority. These are amongst the highest in the world and Helios at least meets and normally exceeds them. Illustrating this at the Hamburg ABS, Helios are showing a 'live' TV Programme 30 Input 'free grouping' desk en route for Mainos TV Finland and will be inviting discussion of their new Nordic Broadcast Desks.

Every new Helios console incorporates the latest and best circuitry with individually specified modules as required, and, importantly, as the Company is geared to custom building, its prices and deliveries are competitive with other standard, compromise consoles.

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## AES PREVIEW

can be switched on to all mic inputs. Other functions included in the desk are two auxiliary outputs for cue and echo or studio playback, echo returns, monitoring, tape monitor input, talk back and test oscillator.

Schoeps will exhibit its line of studio condenser microphones and accessories. As well as the pressure gradient stereo microphone with switchable single diaphragm 3-pattern capsules, there is now another type—the stereo twin microphone. The exchangeable capsules are identical to the standard range of mono types, and are mounted at a spacing of 170 mm and at an angle of 110° (ORTF principle). There are now alternative methods of mounting the CMO3 lavalier microphone, including new supports and fixtures. Schoeps claims a dynamic range of 110 dB for this model.

Sennheiser will be demonstrating the VSM201 sound effect vocoder. Microphones on show include studio dynamic models and capacitor mics for 48V phantom and 12V AB supply. There will also be wireless Microport microphones, pocket transmitter and receivers, and Infraport infrared headphones and transmission equipment. The newly-developed UPM550 test gear and a new electret-capacitor headphone, Unipolar 2000, are also to be exhibited.

Skatron of Oslo is an independent manufacturer of mobile units for broadcast and recording use. A stereo sound recording van for a Norwegian radio and tv company will be shown at the exhibition. Six of the same type have been delivered, with four more on order, to the Norwegian Broadcasting Corporation. The vans have been built to withstand the extreme climatic conditions prevailing in the northern part of Scandinavia, where temperature often falls to -50°C.

Solid State Logic will introduce their 'revolutionary' computer-assisted consoles. The units feature comprehensive parametric equalisation and dynamic control sections. The computer system provides not only conventional level automation but a fast learning autolocate, drop-in memory and a 24-line video display and keyboard. Simple commands in English allow virtual elimination of many routine tasks and note-taking, including cue points, track and mix listings, tape directories and producer's comments.

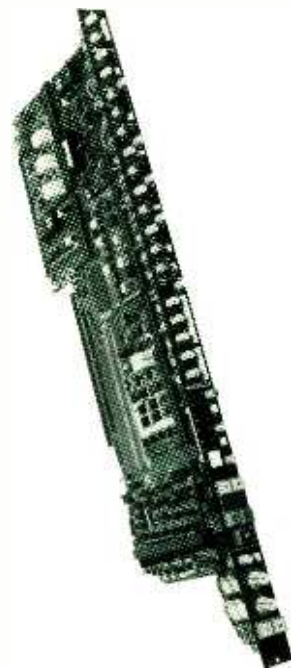
Soundcraft are to exhibit three new products at Hamburg. The first is a Series 3 modular console for 16/24-track working, for which a modular approach has been taken throughout. Facilities offered include a 4-band equaliser, auto solo on inputs, groups and aux sends switchable to pre or post fade, led array



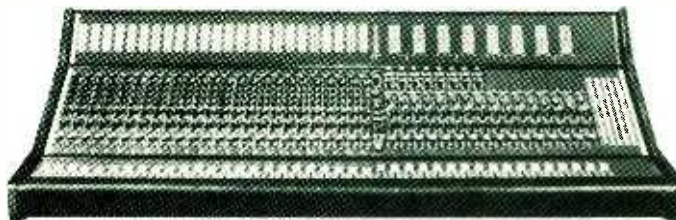
Inside a Skatron ob van

metering, eight auxiliary busses and a bantam jackfield. The second product is an updated version of the original Series 1 portable mixing console, first introduced in 1974. The third new product is an electronic crossover that will be the first device in a range of external equipment. Fitting into a 483 mm rack the unit may be used in two, three or 4-way stereo modes. Crossover points (24 dB/octave) are variable for plug-in resistor cards that are available for any frequency.

Stanford will show its complete range of mixers—models M1173, M1774, M1771, and the Digifader—together with their B2271 and B4272 power amplifiers and the UPL100 loudspeaker system. These units are specially designed for discotheque and domestic use. The power amplifiers are rated at 75W per 54 ▶

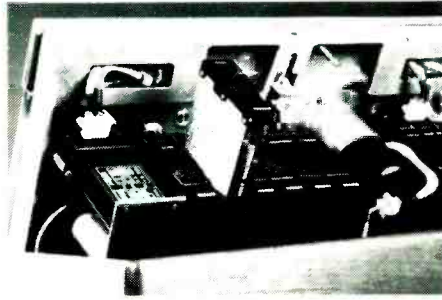


**Above:** Solid State Logic automated channel module



**Left:** Soundcraft Series III modular console





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## AES PREVIEW

channel, and are equipped with led peak level reading and input attenuators.

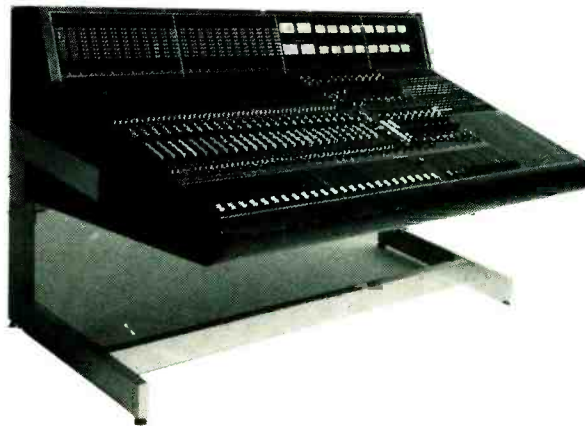
Studer is to show a completely new 'state of the art' multichannel machine, type *A800*, which will be shown for the first time anywhere, at the Hamburg exhibition. The main features of the *A800* include: intelligent microprocessor-controlled transport; built-in autolocator and varispeed control; 35 cm reel capability; brushless spooling motors with very high torque; controlled winding speed; phase-corrected playback and record electronics; improved signal-to-noise spectrum of the playback electronics; and microprocessor-controlled audio, bias and erase switching for electronic editing. The new machine will be shown in conjunction with the *TLS2000* tape synchronisation system. Additionally, the type 269 mixing console will be exhibited.

**TAB**, the West German company Tonographische Apparatebau, will display an integrated mixing system using 30 mm modules. These are intended for use in space-conscious applications such as ob vans and small control rooms. The company states that

56 ►



**Right:** *TSM*  
*12-2/4 mixer*  
from *Tore Seem AIS*



**Left:**  
*Trident*  
*TSM*  
series  
desk



# Amazing Auratones

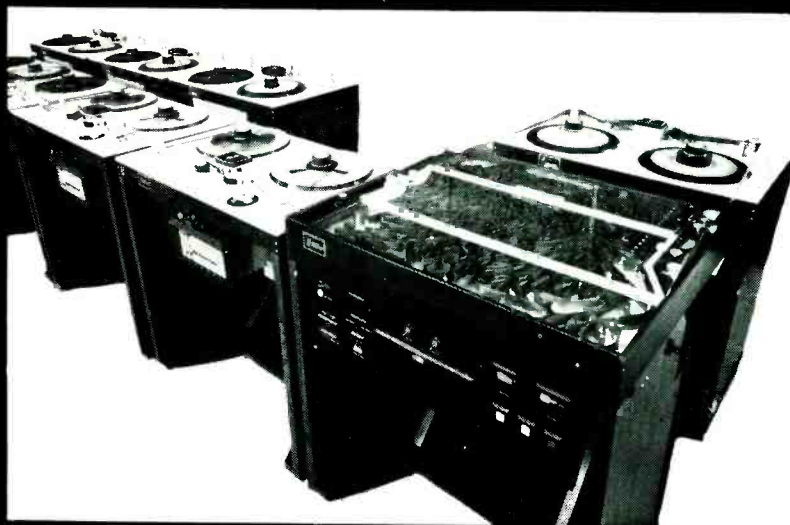
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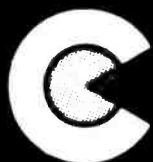
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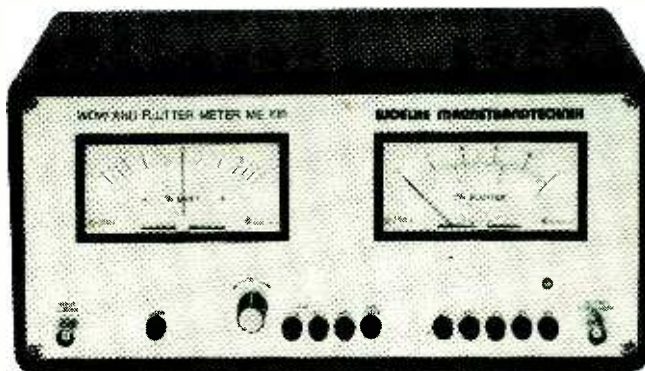
## AES PREVIEW

desks built using its system can be installed in the 'smallest space'. Each channel is coupled to a range of processing facilities.

Telefunken will once again be showing the new *M15A* series of multitrack machines available in 8, 16, 24 and 32-track format. Transport logic uses cmos with Hall contactless switching on all the pushbuttons. The capstan drive system is based upon a quartz servo brushless dc motor. The company claims easy tape threading and a mechanical servo system that is said to maintain constant tape tension in all modes of operation—even at high spooling rates. There is a real-time led timer which counts both sides of zero. The *M15A* series is available in either high or low-speed version, and will accept reel sizes up to 30 cm.

Tore Seem are to exhibit the *TSM 12-2/4* mixer developed specially for use in small radio and tv studios, ob vans, theatres, av systems etc. The desk is also said to be well suited as an auxiliary mixer where the permanent board is to small. The *TSM 12-2/4* has 12 input channels, two echo return channels, two output channels and four auxiliary outputs. For monitoring two stereo ppm bar graph instruments are provided.

Trident's principal exhibit will be the new *TSM* console. The company states that the desk represents 2½ years of development work, both by in-house engineers and in consultation



Woelke ME108  
wow and flutter  
meter

with 'many top studios around the world'. The *TSM* console is claimed to be of rugged construction being built from aluminium panels enclosing a rigid steel girder frame. New circuitry is used throughout; Trident quotes a slew rate of typically 20V/μs at every stage within the console. All multiple switching functions are carried out by low-noise, click-free solid state relays, and Jensen transformers are used throughout. Other goodies on display will include the successful *Fleximix* modular mixing system, the *CB9076* parametric equaliser and the *CB9109* low-distortion oscillator. The company's stereo compressor-limiter will also be shown.

The new *SPM-11* selective level meter, which is equipped with switchable bandwidths

of 8 or 40 Hz over the range 15-200k Hz and -110 dB sensitivity, will be shown by Wandel & Goltermann. By plugging in the *PSE-11* generator, the unit can be used to measure gain, attenuation and distortion ratios. Also to be seen: the *PM-10* digital level meter, which has a frequency range 200-4k Hz and a resolution of 0.1 dB; and the *WM-20* af sweep measuring set.

Woelke will exhibit its updated range of wow and flutter measuring systems based on the earlier *ME102* and *ME104* series of equipment. The new *ME106* and *ME108* series claim to offer a 'more cost effective' solution to the problem of measuring wow and flutter down to fine limits. The company will also show its range of wave analysers and automatic distortion meters.

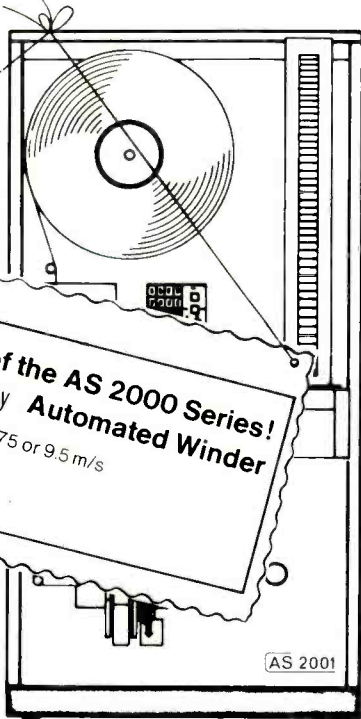
## EXHIBITORS LIST

|                                      |                |                           |                |                             |              |
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| Accurate Sound .. .. .               | .. P2          | Ferro Fluidics .. .. .    | .. M3          | Publison .. .. .            | .. Q1        |
| ADI .. .. .                          | .. P9          | Filetek .. .. .           | .. A7          | Pyral .. .. .               | .. N1        |
| AGFA .. .. .                         | .. B12         | FM-Acoustics .. .. .      | .. M2          | Raindirk .. .. .            | .. Q4        |
| AKG .. .. .                          | .. P34         | Harrison .. .. .          | .. A23         | Recortec .. .. .            | .. Q9        |
| Allen & Heath .. .. .                | .. E76         | Helios .. .. .            | .. V45         | RTW .. .. .                 | .. L3        |
| Allotrope .. .. .                    | .. A6          | ICM .. .. .               | .. W6          | Sait .. .. .                | .. P8        |
| Altec .. .. .                        | .. K8          | Ilsemann .. .. .          | .. W5          | SATT .. .. .                | .. H6        |
| Amek .. .. .                         | .. Q6          | IRCAM .. .. .             | .. Demo 8      | Schoeps .. .. .             | .. B5        |
| Ampex .. .. .                        | .. E345        | ITA .. .. .               | .. C8          | Schlumberger .. .. .        | .. H123      |
| Audio & Design .. .. .               | .. M1          | Ivie .. .. .              | .. B6          | Scully .. .. .              | .. V8        |
| Audio Developments .. .. .           | .. L4          | JBL .. .. .               | .. G5, Demo 12 | Sennheiser .. .. .          | .. H78       |
| Audio Engineering Components .. .. . | .. M4          | JVC .. .. .               | .. Demo 15     | Sensitive Audio .. .. .     | .. Demo 14   |
| Audio Kinetics .. .. .               | .. C6          | Kajaani .. .. .           | .. F10         | Sescom .. .. .              | .. A1        |
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| Barth Elektronik .. .. .             | .. D3          | Klein + Hummel .. .. .    | .. M78         | Skatron .. .. .             | .. Mobile    |
| BASF .. .. .                         | .. K67         | Leevers-Rich .. .. .      | .. D78         | Solid State Logic .. .. .   | .. F23       |
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| B&K .. .. .                          | .. K12         | 3M .. .. .                | .. N45         | Stanford .. .. .            | .. F8        |
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| dbx .. .. .                          | .. Demo 9      | Mosses & Mitchell .. .. . | .. B7          | Studer .. .. .              | .. A459, 10  |
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| EAB-Geiling .. .. .                  | .. Q8          | Neal .. .. .              | .. Q7          | Teac .. .. .                | .. G4        |
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|                                      |                | Penny & Giles .. .. .     | .. L5          |                             |              |



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Illustrated above are the two latest additions to the well-known range of WOELKE Wow and Flutter Meters, the ME 201 Flutter Classification Unit, and the ME 401 Automatic Distortion Meter. Fuller details on application.

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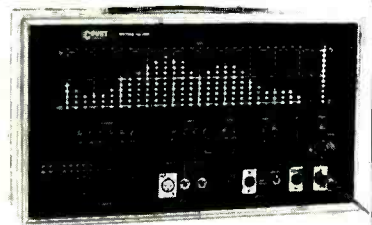
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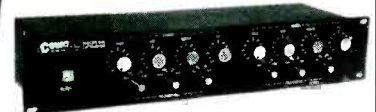
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## 'Here is a special news fla...'

The two London independent local radio stations, Capital and LBC, currently pay the IBA a total of £650 000 a year for transmitter rental. That covers VHF transmission from Croydon and medium wave from Saffron Green. Even taking into account the fact that these rentals, for the plumb London area, are geared to subsidise lower rentals for less rewarding areas, it's a fair whack. And for a sum like that you would expect that the transmitters would stay on the air during a mains power failure. But, as was proved by recent industrial disputes, when Capital went off the air on both VHF and medium wave almost simultaneously, neither Croydon nor Saffron Green had a standby generator!

It clearly bothers both Capital and LBC that their stations go off the air if there is a power cut, even though standby generators at the studios can keep their signals going down the line to the transmitters. It should also bother the GLC and local borough councils and, for that matter, any Londoners living or working in low-lying areas. Why?

Currently the GLC and government are spending £200 million on building a barrier across the River Thames at Silvertown, to prevent any freak tides from flooding London. The barrier won't be ready until the end of the decade, and in the meantime the GLC and boroughs are continually printing and circulating leaflets and posters advising people what to do if a flood looks imminent. 'After any warning, stay tuned to the radio,' screams the massive poster of which 10 000 are now being plastered around London. 'Information and advice will be broadcast on medium wave Radio London 206 metres, London Broadcasting 261 metres, and Capital Radio 194 metres,' says the GLC leaflet, of which 250 000 have just been printed. Not if there is a power cut it won't. And is it so ridiculous to associate power cuts with freak weather and flooding? In fact Radio London could stay on the air, because BBC national and Local transmissions can continue despite mains failure, although there would almost certainly be a gap and probably reduced transmission power.

So for Heaven's sake, will the GLC alter their publicity, to explain the true radio situation; or join with the IBA to install standby generators at Saffron Green; now, rather than in a year or so that is currently mooted? Incidentally, the GLC should also qualify their advice that 'warning captions will be shown on all BBC and ITV channels broadcasting in the London area'. Not if there's a power cut they won't, because neither the BBC Television nor the ITV transmitters have standby power. So if the flood coincides with a power cut all tv will be

off the air, along with all commercial radio. By an interesting coincidence, it cost the GLC £6000 to print the last batch of leaflets and posters—almost exactly the cost reliably quoted to me for installing standby generators at both the Saffron Green and Croydon transmitters (or 1% of the annual rent paid by Capital and LBC to the IBA).

### A shattering experience

For more than a year now I have been squabbling with Memorex over their tv adverts which show Ella Fitzgerald shattering a glass with her amplified voice both live and off tape. To cut, what I assure you, is a very long story short, Memorex declined to give any hard fact information about how the shatter was achieved; but finally the IBA released a crucial detail from the *affidavit* which Memorex had filed to substantiate the advert and prove that what was depicted on screen was genuine. Studio engineers, better than anyone, will understand the significance of the vital detail released by the IBA, namely that a sound level of 146 dB was employed to do the shattering trick.

This is at least 20 dB over the highest level ever likely to be encountered in even the hardest rock studio control room, and is 10 dB over the maximum level which the human ear should ever suffer without earmuff protection. It is in fact into the area of sound pressure level where the brain and other body organs start to suffer damage, even if the ears are protected. Anyone interested in finer details might like to refer back to the series of pieces which STUDIO SOUND carried a couple of years ago on the whole business of hearing damage at high sound levels. By the way, it would take no less than 10 megawatts of power to produce 146 dB at a listening seat a couple of metres in front of an audio system normally capable of producing 96 dB from 50W per channel. To continue cutting the story short, it seemed to me that the public, seeing a glass shattered in what appeared from the advert to be fairly domestic conditions (but, what in fact was a 146 dB *maelström*) were being taken for something of a ride. So I lodged a complaint with the ASA. The complaint was rejected, on the grounds that the public weren't being misled. What seems to have swayed the ASA is advice from the 'Authority's independent consultant... that under certain conditions it is technically possible for the human voice to break a wine glass, and that this feat had been achieved by a singer using no amplification at all'. After a full six weeks of first promising to give a source reference for this fascinating factual statement, then hedging, and then finally refusing, the ASA

eventually owned up that the evidence on which they had based their decision was purely hearsay.

According to ASA Secretary Peter Thomson, the consultant (who, out of confidentiality, the ASA wouldn't name) had talked to a colleague (who, out of confidentiality, the ASA also wouldn't name) at an Audio Engineering Society meeting, who told him that he had seen a singer shatter a glass. Now it is on the record (preprint 943-G7) of the 46th Convention of the AES that Peter Tappan, then of the firm involved in the Memorex ads, concluded that '... it is not difficult to believe that Caruso may indeed have shattered one or more goblets with his voice'. But, it is also on the record that Tappan went on to ask: 'If any reader can document the legend, the writer would appreciate hearing about it'. So surely this surmise couldn't have been the hearsay evidence on which the anonymous audio consultant had based his advice to the ASA—or could it?

Inevitably the question was raised in the national press as to how many more ASA judgements on scientific points may have been founded in the past on hearsay evidence. Presumably acknowledging that such publicity hardly enhanced their public image, the ASA soon afterwards advertised for an additional member of staff to handle public and press relations. The ASA then stated that the person who had supposedly broken the wineglass in front of an audience of audio engineers, using nothing but his own unaided voice, was in fact Peter Tappan. The ASA also revealed the name of the previously anonymous witness who had told the ASA's (still anonymous) consultant that he had seen Tappan break the glass with his own unamplified voice. And the witness subsequently confirmed to me in person that he had indeed seen it done.

Now, although the ASA released his name for publication, I prefer not to mention it here. The incident was way back in 1973 and the witness is highly respected in the audio field. My quarrel has always been with Memorex, who made the adverts, and the ASA who allowed them, not with a respected member of the audio profession who one day casually happened to tell the ASA's anonymous consultant what he thought he remembered from an AES meeting in the USA several years ago. For the fact is, that when I recently approached Tappan he readily confirmed that he did *not* break a glass at the meeting with an unamplified voice—the glass was shattered using amplification. Sorry ASA, but the hearsay evidence which you cite in your decision is *wrong*. So how about a public acknowledgement of the fact that your judgement contains an error of fact?

But quite apart from all this the real question for me is still whether Memorex or the ASA have any real understanding of what 146 dB means in terms of actual sound at the ear. So I'd like to issue a challenge and offer a deal. If a director of Memorex and another of the ASA would like to show good faith in the adverts and listen without wearing earplugs or muffers to just one 3-minute track of an Ella Fitzgerald album played at 146 dB, I'll ensure that STUDIO SOUND readers hear about it. ■





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Popularity which has been earned by its uncomplicated sophistication – by its modular construction which enables the “replay only” model to be quickly adapted to “record replay” – by its easy conversion from mono to stereo and by its high precision manufacture at Leavers-Rich Equipment Ltd.

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[www.americanradiohistory.com](http://www.americanradiohistory.com)



# Survey: studio designers and consultants

While attempts have been made to filter out or declare the interest of listed consultants, **STUDIO SOUND** accept no responsibility for the results of any errors contained within the survey—caveat emptor. Forthcoming surveys include noise reduction equipment (May), test equipment (July) and power amplifiers (August). Manufacturers and agents are invited to submit product details for publication to reach editorial offices (address page 3) at least six weeks before the issue publication date (preferably a lot earlier).

## ACOUSTIC TECHNOLOGY

**Acoustic Technology Limited, 58 The Avenue, Southampton SO1 2TA, UK.**  
Phone: Southampton (0703) 32995. Telex: 47156.

The company has considerable experience in the field of noise and vibration consultancy, but as yet has not designed a studio. However, its staff now includes several members with experience in studio design and sound reinforcement.

## MALDWIN BOWDEN ASSOCIATES

**Maldwyn Bowden Associates Limited, 168 Edward Street, Brighton, Sussex BN2 2JB, UK.**  
Phone: Brighton (0273) 67384.

**Officers:** include Maldwyn Bowden, Christopher Humphrey, Michael Fabricant, David Rudge and Andrew Clark.

The company operates two main divisions: one for the sale and hire of professional/broadcast sound and lighting equipment for studio use, theatres and clubs; and the other offering a consultancy/design/installation service. MBA has consulted upon and installed equipment for broadcast and music studios (up to 4-track), mobiles and theatres. It is not tied to any manufacturer and is free to recommend the most suitable equipment for a particular use. As a number of the company's staff have been users of equipment both in broadcast and theatre applications, particular care is taken in the layout and ergonomics of an installation. MBA can provide a turnkey service in studio construction from the initial consultation through to the design, installation and final commissioning (when detailed wiring manuals are provided for the studio engineer). It employs its own wiremen and carpenters, which reduces the cost to

Sandy Brown Associates/R. G. Jones Studios



the client. Realising the need to limit the studio downtime, MBA also operates its own specialised workshops that obviate the need to return equipment to its original manufacturers if it cannot be repaired on site.

**Fees:** provided that MBA supply and install the studio equipment, consultancy services are completely free.

**Guarantee:** The company guarantees all its installations for one year under normal operating conditions.

**Examples:** AVT studios, Radio England, University of Sussex Arts Centre and Adams Club, London.

## SANDY BROWN ASSOCIATES

**Sandy Brown Associates, 6 Fareham Street, London W1V 3AH.**

Phone: (01) 439 8391. Telex: 268312.

and 16 West Terrace, South Queensferry, West Lothian, Scotland.

Phone: (031) 331 2020.

**Iran:** Sandy Brown Associates, 8 Niku Street, Iranshahr Avenue, Teheran.

Phone: Teheran 824829.

**US:** Sandy Brown Associates Inc, 32 East Main Street, Berryville, Virginia 22611.

Phone: (703) 995 1711.

**West Germany:** Sandy Brown Associates Deutschland, D-1 Berlin 12, Herderstrasse 16.

Phone: (030) 312 3332.

**Partners:** David Binns, Richard Bowdler, Neil Spring, Alex Burd and David Lamberty.

**Associates:** Frank Ward and Richard Galbraith.

**Associate consultants:** Michael Barron and Christopher Gifford.

SBA takes its name from the late Sandy Brown, who for 13 years was the Acoustic Architect in the BBC, and a jazz clarinettist of international repute. The partnership, which is bound by the code of ethics of the Royal Institute of British Architects and the Association of Consulting Engineers, was formed in 1968 by Sandy Brown and David Binns who gathered a team of architects, physicists and engineers with international reputations in acoustics to form an expert consultancy service, covering acoustics, architecture, building services and electronics from initial design through to supervision of all projects.

As with other professional practices SBA are completely independent of ties with manufacturers and suppliers, and offer 'a long-established reputation and unlimited liability in the field of studio design and construction'.

**Fees:** as a percentage, which is usually quoted where a co-ordinated design service is offered; as a lump sum, which is usually used for smaller jobs

where the company's involvement can be defined precisely; or on a time basis.

**Examples:** R G Jones, London and Maison Rouge, London.

## COURT ACOUSTICS

**Court Acoustics, 50 Dennington Park Road, West Hampstead, London NW6, UK.**

Phone: (01) 435 0532 plus Air Call: 828 5621 code 5396.

**Austria:** Hi-fi Stereo Center, 5020 Salzburg, Rainerstrasse 24.

Phone: 0222 838235.

**Belgium:** Delta Equipment, Rue de Calevoet 112, B-1180 Brussels.

Phone: 376 6034.

**Denmark:** Quali-fi, Strandvejen 730, DK 2930 Klampenborg, Copenhagen.

Phone: (01) 631711.

**Finland:** Audiotron, Kiskontie 7, 00280 Helsinki 28.

Phone: 410688.

**Germany:** Elmus GmbH, Herderstrasse 16, D1 Berlin 12.

Phone: (030) 312 2012.

**Italy:** AEG-Telefunken, DET 276 Via Pirelli 12, 20124 Milan.

Phone: 92798.

**Japan:** CMC Inc. Shuura Shoto Building 206, 15-5 Shoto 2-chome, Shibuya Ku, Tokyo 150.

Phone: 465 5592.

**Sweden:** KMH AB, Hornsgated 78, 11721 Stockholm.

Phone: (08) 698800.

**Switzerland:** Pajac, Chemin du Genevrey, CH-1603 Grandvaux, Geneva.

Phone: (021) 993393.

**Director:** Stephen Court.

**Services:** complete studio, theatre and concert hall systems designed and installed. Off the shelf or custom-built monitoring to suit exact requirements of the client, with complete spectrum analysis of final installation to ensure maximum performance with minimum equalisation. In addition to complete range of JBL and Tannoy monitors, the company's own monitors include JBL-Yamaha classical monitors, and Tannoy-JBL high-powered systems.

When supplying equipment, package deal prices can be supplied by arrangement with most manufacturers and importers of tape machines, noise reduction systems, consoles etc.

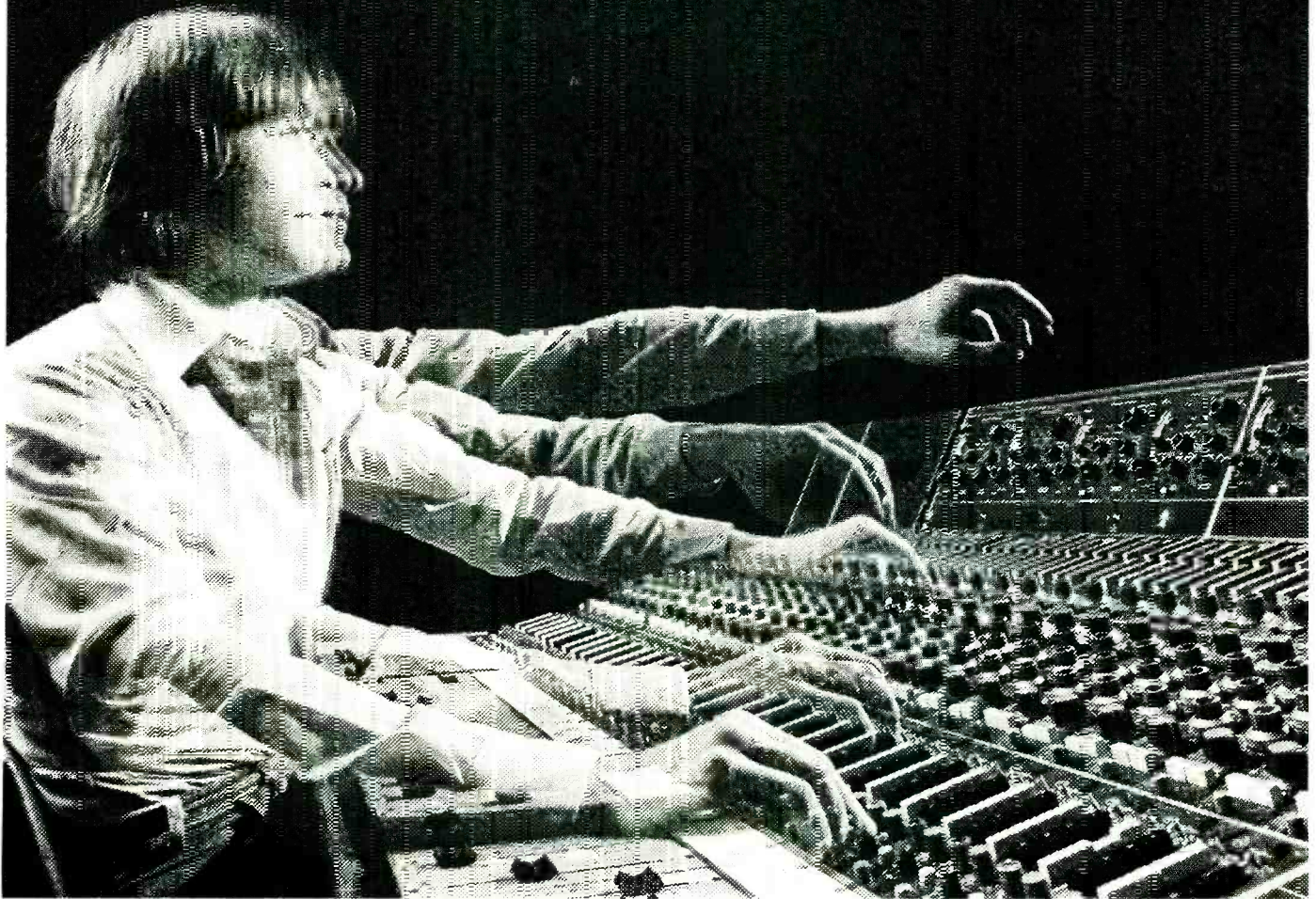
**Fees:** no fees charged when supplying equipment; otherwise £12 per hour plus equipment hire and expenses.

**Guarantee:** all equipment supplied is guaranteed for 1 year, and against manufacturers defect without time limitation.

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**NECAM** — see it. Try it. AES Hamburg, 28 February-3 March.

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Rupert Neve & Co., Ltd., Cambridge House, Melbourn, Royston, Herts. SG8 6AU, England.

Telephone Royston (0763) 60776. Telex 81381. Cables NEVE Cambridge.

Rupert Neve Inc., Berkshire Industrial Park, Bethel, Ct. 06801, USA. Telephone (203) 744 6230. Telex 969638

Rupert Neve of Canada Ltd., Malton, Ontario. Rupert Neve GmbH, 6100 Darmstadt, W. Germany.



## SURVEY: STUDIO DESIGNERS AND CONSULTANTS

### EASTLAKE

Eastlake Audio SA, 21 Avenue Nestle, 1820 Montreux, Switzerland.

Phone: (021) 621944. Telex: 25546.

Australia, Central and South America: Sierra Audio, 621 South Glenwood Place, Burbank, Ca 91506, USA.

Phone: (213) 843 8115.

France: 3M France, Boulevard Serrurier, 75019 Paris.

Phone: (01) 031 6420.

Italy: Studer Italy, Audio Products International, Via Gaspare Spontini 3, 20131 Milan.

Phone: (02) 273896/228130.

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

Phone: (01) 734 2812. Telex: 27939.

A statement by Tom Hidley:

'The design, construction and subsequent acoustical measurements of completed studios and control rooms have yielded one element of control room performance that is probably the most important of all in its relationship to the control room environment, yet is seldom discussed in our industry. Comments from producers such as: "Ear fatigue seems to be less"; "It seems as if there is no window between me and the band"; and "The sound is transparent and so easy to get on tape", must be related to an acoustic measurement by the designer. These comments were first heard about three years ago when approximately 80 rooms has been completed. Since then the number of finished rooms has doubled with a corresponding increase in evidence that *subjective evaluation time after time picks the room with the highest left and right sum image of direct and random field sound as the favourite*. The maximum acoustic sum image in a control room between the left and the right monitors is 6 dB. During 1976 and 1977 all control rooms commissioned by Eastlake achieved at least 5 dB acoustic sum image, with some rooms demonstrating up to 5.75 dB (bandwidth 40-12.5k Hz); 1978 promises 6 dB.'

### W A HINES & PARTNERS

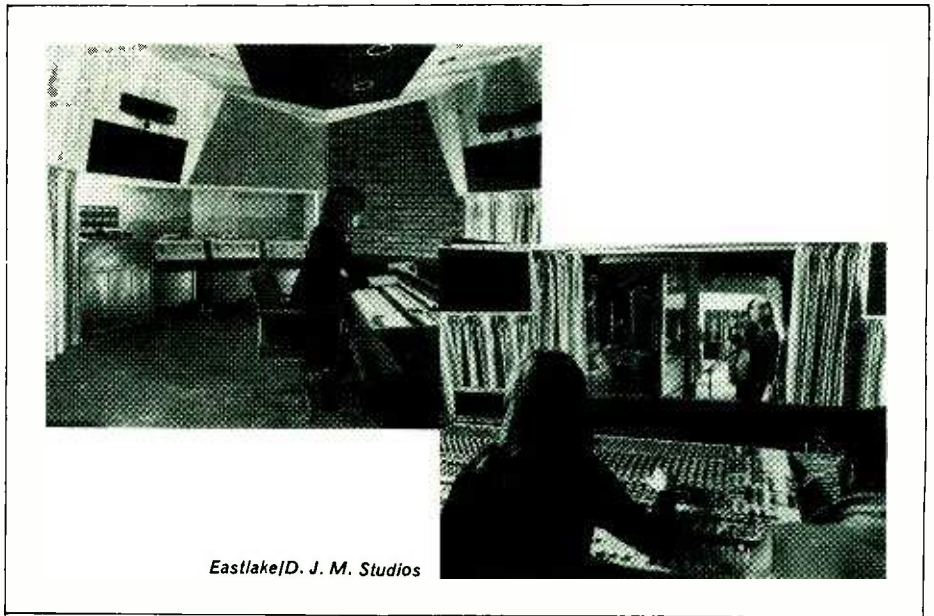
W A Hines & Partners, The Red House, 37 The Broadway, Stanmore, Middlesex HA7 4DJ, UK. Phone: (01) 954 2008/0995.

Partners: D S Higgins and P W Hines.

Consultant: W A Hines.

Staff: three.

Fees: £12 per hour for principals, £8 for assistants.



Eastlake/D. J. M. Studios

The company's experience in studio design is not extensive, since it does not specialise in this type of work. However, the partners are general practitioners in the field of acoustics and noise control, and have a few private cinemas, conference rooms, board rooms and sound-proofed control rooms to their credit.

hard work and ability to complete projects on or before schedule'.

### NEVE

Rupert Neve & Company Limited, Cambridge House, Melbourn, Royston, Hertfordshire SG8 6AU, UK.

Phone: Royston (0763) 60776. Telex: 81381.

For overseas addresses and telephone numbers see October '77 issue, p38.

The company's engagement in many studio projects has enabled it to accumulate extensive knowledge of professional, technical and operating techniques. This experience is offered on a consultancy basis or together with engineering and production resources as part of its complete involvement in a turnkey project. For this it offers as the centre of each installation a Neve console and peripheral equipment. Installations are carried out by 'experienced personnel who are fully conversant with the equipment involved and have achieved a reputation for their

### SIMON PARRATT

Simon Parratt, 17 Campbell Close, Twickenham, Middlesex TW2 5BZ, UK.

Phone: (01) 894 7323.

The company can handle all kinds of audio installations, ranging from high-quality music systems for private use to professional multitrack recording studios in the UK and abroad. Enquiries are welcomed from both amateur and professional musicians for all types of equipment.

Video systems for educational, industrial and professional use can also be installed, including videocassette systems for multistandard use both in the UK and abroad. Several installations have been carried out in the Middle East during 1977. Systems include colour studios with telecine and all post-production facilities, programmed (tape) distribution systems for schools, hospitals etc.

### PAOLETTI/LEWITZ

Paoletti/Lewitz Associates, 40 Gold Street, San Francisco, Ca 94233, USA.

Phone: (415) 391 7610.

The company offers 'comprehensive' services in the areas of architectural acoustics and sound-system design. The principals, Dennis Paoletti (architecture) and Joel Lewitz (electrical engineering), have consulted on numerous studios, including radio, television, listening and recording facilities, as well as major arena, stadium and auditorium projects.

### ANDRE PATROUILLIE/AUDIOTECHNIEK

Andre Patrouillie/Audiotechniek, Bouestraat 18, 1050 Brussels, Belgium.

Phone: (02) 5116648

and Gemeenteplein 30, 8300 Knokke, Belgium.

Phone: (050) 603549.

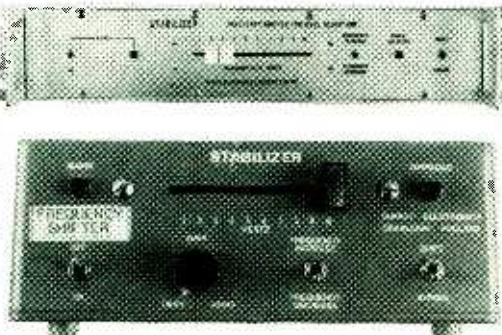
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### STABILIZER

The stabilizer is a high quality frequency shifter for howl reduction on speech and music. It offers variable shifts either up or down between 1 and 10 Hertz so allowing choice of the optimum shift for the particular acoustics and sound sources involved in each installation.

A shifter not only allows more usable gain (4-8 dB) but also gives a greater stability margin between the onset of warbling and actual howling. With a shifter this is something between 3 and 5 dB whereas a conventional system will go from "ringing" to howling with a gain increase of 1 or 2 dB. Available as a boxed unit with either balanced or unbalanced signal lines or rack mounting version offering studio quality "SHIFT" control, duplicated, jack and XLR connectors and a smart anodised finish with engraved front panel. Stabilizers include a signal overload LED, a 24 Hz high pass filter to remove VLF signals, before connection to power amplifiers and a mumetal shrouded mains transformer to achieve very low noise levels.

**SURREY ELECTRONICS** The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG (STD 04866) 5997





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## SURVEY: STUDIO DESIGNERS AND CONSULTANTS

The company provides overall design, equipment selection, ordering and installation. It can also specify and supervise the construction work, and provide a freelance acoustic expert and architect. It acts as an independent source of information on hardware, having no commercial obligations to existing suppliers. If necessary, gear which is not readily available can be imported, or be custom-built.

### RADIO SERVICE

**Radio Service Inc, 2500 Bates Road, Room 102, Montreal, Quebec H3S 1A6, Canada.**  
Phone: (514) 342 4503. Telex: 60070.

**Officers:** Jaques Bogos, Paul Fleury and Jean Louis Ostrowski.

**Staff:** 26, including 12 maintenance and installation technicians.

The company sells, rents, services and installs a wide range of studio equipment. It is also the Canadian distributor for Helios and Chilton desks.

### PETER SARONY & ASSOCIATES

**Peter Sarony and Associates, 30 Old Bond Street, London W1X 3AD, UK.**

Phone: (01) 493 2046.

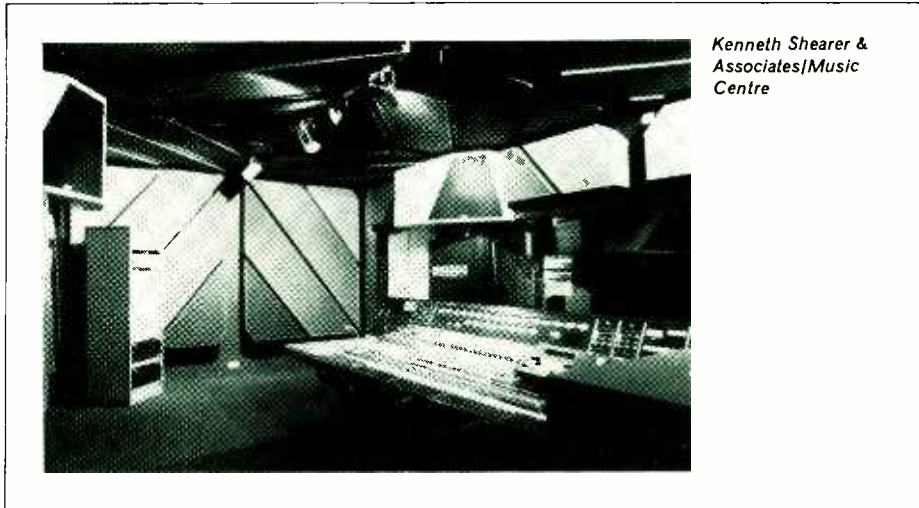
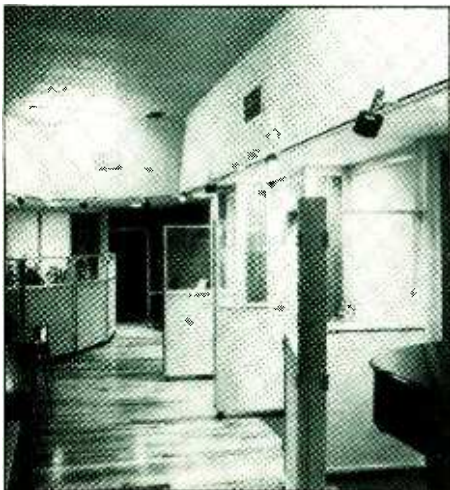
**French Associate:** Peter Fiennes-Lennard, Res Ravel, 19 Boulevard de Bellechasse, 94100 Saint Maur, Paris.  
Phone: (331) 885 7313.

**Principal:** Peter Sarony.

**Staff:** a total of 11 (Europe only). The consultants receive, advise upon and interpret the client's individual requirements, setting out essential performance criteria to be met, upon which their recommendations are based. Every job is therefore different, taking account of ambient conditions and the client's personal design and equipment preferences.

Anything from a simple consultancy to the full service is offered. The company also performs a further acoustic survey when the job is completed,

*Peter Sarony & Associates/Chipping Norton Studios*



*Kenneth Shearer & Associates/Music Centre*

to illustrate that design criteria have been achieved and define the precise acoustic environment created, in terms of sound isolation, background noise levels, frequency response, reverberation times, diffusion, absence of colourations etc.

**Fees:** for simple consultancy work are normally time based at a rate between £10 and £20 per hour; fees for the complete professional service vary between approx 15% and 25% of the total construction and furnishing costs, dependent upon the extent of services required and the size of the project.

**Examples:** Konk Studios (see February '77 issue, p42); Ibass (ATV) Studios, London; Chipping Norton Recording Studios; Le Riffi, London; Penta, London; and Ivan Berg Associates (see October '77 issue, p54).

### ACOUSTIKIT

Peter Sarony and Associates are also the permanently-retained architects and coordinates for the Acoustik consultant design team, which includes acousticians, mechanical and electrical engineers, quantity surveyors, structural engineers and electronics specialists. Acoustikit offers a complete design service to determine the precise requirements and return an itemised quotation covering the necessary components required to achieve the appropriate acoustic environment. The kit of components can extend to all timber and constructional materials and fixings, sound-resistant doors and windows, seals, gaskets, sound absorbent materials, attenuated air-conditioning plant, acoustic absorbers and resonators, suspended ceilings, air isolators, acoustic screens, isolation platforms, cable trunkings, wall panelling and finishes, carpeting, storage fitments, lighting fittings, furniture and furnishings etc. An optional installation service is offered, or the customer may opt to carry out the work himself or use his own contractor, following Acoustikit specifications. The individual components may also be supplied separately if required.

### SHE AUDIO

**SHE Audio, 114-5 Tottenham Court Road, London W1, UK.**

Phone: (01) 388 1833/834 7886.

**Partners:** Dave Smith, Steve Hoyland and Bruce Elliott.

**Staff:** four.

In addition to the installation and design of studios, the company provides a maintenance service for studios without suitable staff. The studio is visited regularly and should an emergency arise help is available round the clock.

**Fees:** normally to a fixed quotation; should there be work outside the quote (or if an hourly rate is

required) this is costed at between £3-10 per hour, dependent on the complexity of the job.

**Examples:** Utopia, Pye studio two (see May '77 issue, p22); Ramport; Marque mix room (see December '77 issue, p54); Jimmy Page, Sussex; Super Bear, France (see January '78 issue, p30); Oceanic Studios; Roundhouse mix room, London; London Palladium.

### KENNETH SHEARER & ASSOCIATES

**Kenneth Shearer and Associates, Acorn House, 1 Bartel Close, Leverstock Green, Hemel Hempstead, Herts HP3 8LX, UK.**

Phone: Hemel Hempstead (0442) 54821.

**Officers:** Ken Shearer and Graham Anthony.

**Staff:** three.

The company's field of activity covers design—including structural isolation, acoustical treatment and low-noise air-conditioning—of recording, radio and tv studios. These cover control rooms, monitoring rooms, remix rooms, overdub booths, isolation booths, built-in percussion areas etc; design of remedial treatment, including air-conditioning, noise attenuation of existing studios and audio-acoustic facilities of all kinds; design of audio-visual facilities for universities, colleges, music schools etc; and design of new concert halls and theatres together with advice on remedial measures in existing halls, lecture theatres, legitimate theatres etc.

'We are not contractors; we are purely consultants and have no financial connection or arrangements with acoustical contractors, acoustical and audio equipment manufacturers, agencies or suppliers. We do not offer guarantees—we stand by our reputation. We do not sub-contract any of our work.'

**Examples:** Apple; Air London; Eden Studios; Sonoland Studios, Madrid; Island control room; Wessex acoustics and noise control; De Lane Lea control rooms and noise control; Indigo control room; Advision studio and remix room; Sutton mobile control room; ATV bandroom including new air conditioning; London Weekend Television's new studio facilities; Dublin University and Portsmouth Polytechnic audio-visual arts buildings; Royal Albert Hall acoustics; and KEF Electronics audio test rooms.

### SIERRA AUDIO

**Sierra Audio Corporation, 621 South Glenwood Place, Burbank, Ca 91506, USA.**

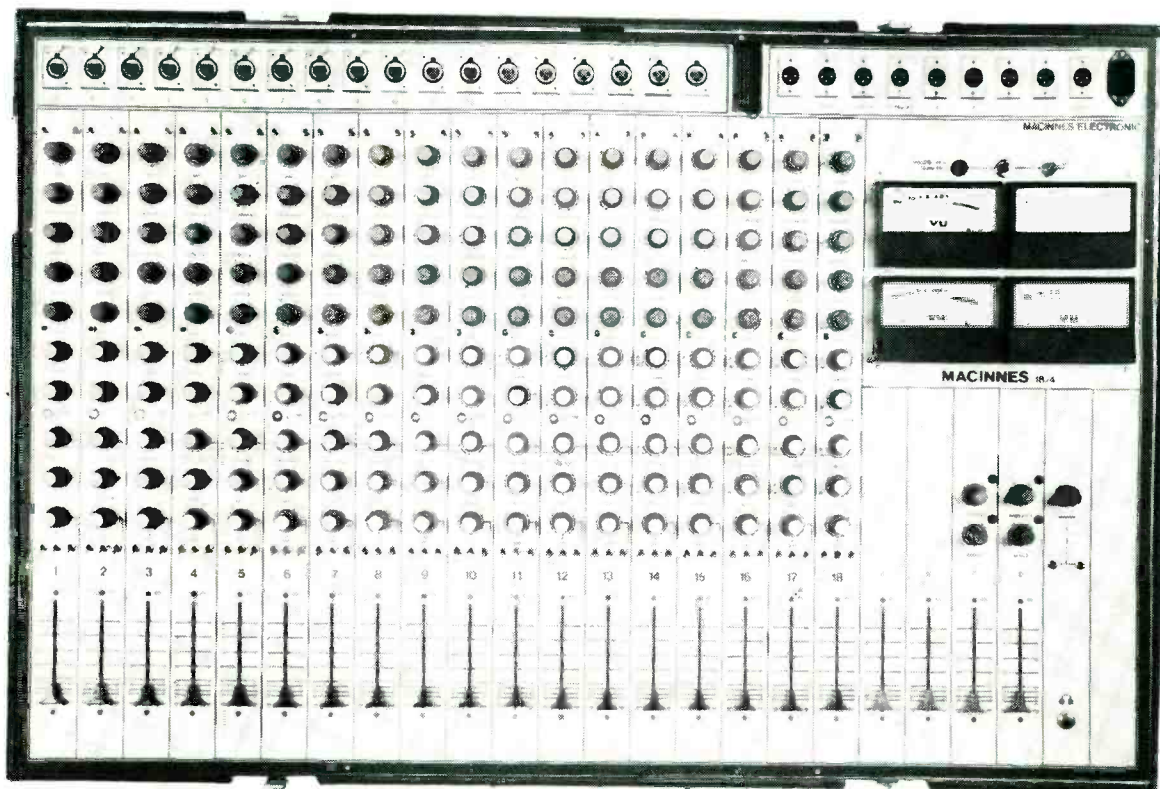
Phone: (213) 843 8115. Telex: 691138.

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# MACINNES MIXER 18/4

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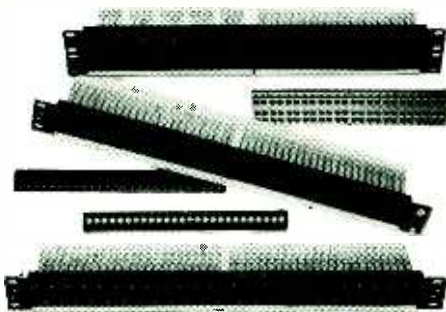
**MACINNES LABORATORIES LIMITED,  
MACINNES HOUSE,  
CARLTON PARK INDUSTRIAL ESTATE,  
SAXMUNDHAM, SUFFOLK IP17 2NL**

TEL:- (0728) 2262 2615

**MACINNES FRANCE,  
18 RUE BOTZARIS,  
75019 PARIS**

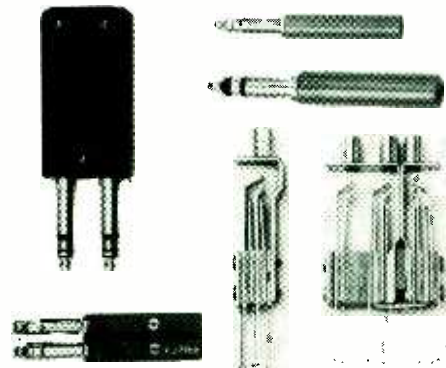
TEL:- 206 60 80 et 206 83 61.

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Please send us copy of current catalogue

NAME .....

COMPANY .....

POSITION..... Tel.....

ADDRESS .....

.....

.....

## SURVEY: STUDIO DESIGNERS AND CONSULTANTS

Overseas representatives in Australia, New Zealand, New Guinea, Taiwan, Japan, Korea, Singapore, Malaysia, Brunei, Indonesia and Sri Lanka.

**Officers:** Kent Duncan and Carl Yanchar.

**Staff:** 11.

As well as being the Eastlake agents for North and Central America, Asia, Australia, Japan and the Pacific, the company also provides studio concept and traffic flow planning, site analysis, turnkey construction, cash-flow studies and market assessment, equipment consultation, procurement and interface, and employee training in maintenance, office, booking and credit policy.

**Fees:** quoted on a per job basis, dependent upon client's requirements.

**Examples:** Kendun Recorders; Sounds Interchange, Toronto; Pierce Arrow, Chicago.

The company can provide a fully integrated service of consultancy, research and product development related to any aspect of studio design. A comprehensive laboratory facility enables measurements and tests to be undertaken on all elements of studio structures, treatments, equipment and building services; on-site measurements and surveys of studio acoustics are undertaken using the most up to date instrumentation. The design team can call on the expertise of in-house architects, mechanical services consultants, electrical engineers and building technologists to provide a total guaranteed design service on all aspects of architectural acoustics'. Current work includes a high proportion of consulting services on tv broadcasting studios and auditoria in the UK, Africa and the Middle East.

**Fees:** based on an hourly rate of £15.00.

**Guarantee:** SRL carries full professional indemnity and provides a 'no-quibble guarantee' of satisfaction to its clients.

**Examples:** BBC Leeds; Open University tv centre; radio studios in Bahrein; tv centre for Qatar.

## SPECTRA SONICS

Spectra Sonics Inc, 770 Wall Avenue, Ogden, Utah 84404, USA.

Phone: (801) 392 7531.

and 6430 Sunset Boulevard, Suite 1117, Hollywood, Ca 90028, USA.

**Officers:** William G Dille, Gregory D Dille and Robert A Ponto.

The company provides complete studio system design and will guarantee that the system will meet all specifications of performance as mutually agreed at the time of the signing of the contract.

**Examples:** Great American Music Machine, Colorado; Spectra Sound, Utah; Osmond Productions television complex, Utah; Todd Fisher Enterprises, California; St Louis Municipal Opera.

## SUGARLOAF VIEW

Sugarloaf View Inc, 75 East 55th Street, New York, NY 10022, USA.

Phone: (212) 759 7588.

Canada: Bill Edwards, Chromacord Corp, 2343 43rd Avenue, Lachine, Quebec H8T 2K1.

Phone: (514) 636 8183.

France: François Dentan, Studio Equipment, 19 Rue Poussin, 75016 Paris.

Phone: 647 6401.

UK: Dag Felner, MCI (Professional Studio Equipment) Ltd, MCI House, 54-56 Stanhope Street, London NW1 3EX.

Phone: (01) 388 7867. Telex: 261116.

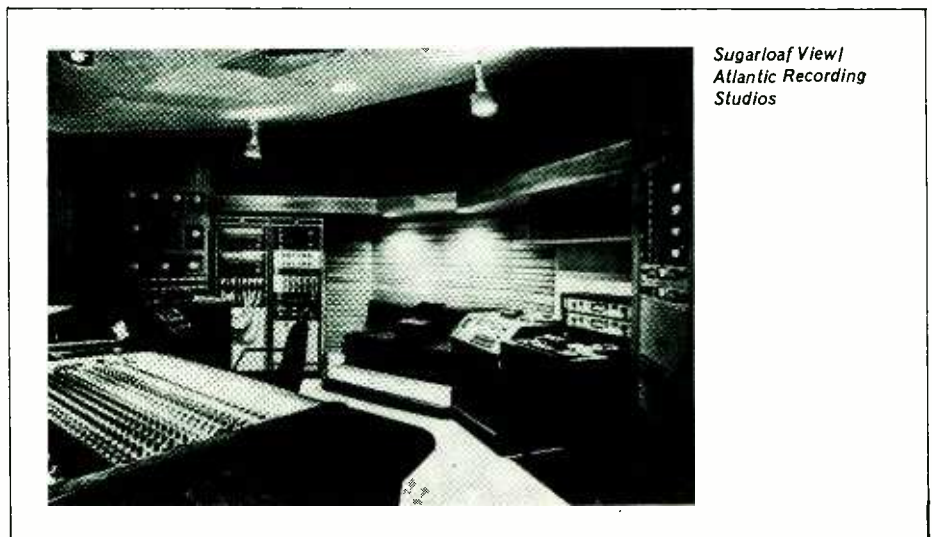
**Officers:** John Storyk and Robert Wolsch.

The company offers the following services: recording studio and related support facility planning and design, which includes architectural and acoustical design of all studio areas, electrical and signal lay-out and design, climatization (HVAC), design etc; room monitor system analysis and equalisation, including  $\frac{1}{3}$ -octave frequency response check and tune over the complete audio spectrum; specialised acoustics consulting and materials supply; and equipment recommendation.

**Fees:** each job is negotiated separately.

**Examples:** Bearsville Recording Studio, New York; Howard M Schwartz Recording, New York; Sigma Sound, New York; Atlantic Recording Studios, New York; Bob Marley Studios, Jamaica; Isaac Hayes Studios, Memphis.

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Sugarloaf View/  
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Rupert Taylor & Partners Ltd, 113 Westbourne Grove, London W2, UK.  
Phone: (01) 229 1705/7743. Telex: 8951525.

**Directors:** R M Taylor and D J Saunders.

**Staff:** three.

The company is made up primarily of acousticians but includes architectural and design skills. Studios are designed to meet closely specified criteria, in particular reverberation time spectra to meet a client's wishes. Structures for high sound insulation are a speciality, and service includes control of noise from mechanical services. Advanced instrumentation is available for calibration and testing.

**Fees:** between £100/day for a senior consultant and £50/day for a technician; typical fees for recording studio acoustical design £3-4k.

**Examples:** RAK Records studio and control rooms one and two; Hard Rock, Manchester; Roxy Theatre, London; and Thames Television Studios.



Rupert Taylor & Partners/RAK Records Studio

### EDWARD J VEALE & ASSOCIATES

Edward J Veale and Associates Limited, Farringdon House, St Albans Road East, Hatfield, Hertfordshire AL10 0ET, UK.  
Phone: Hatfield 65251. Telex: 25102 (message prefix EVA).

**Holland:** Dick Swaneveld, Cadac Holland BV, Gysbrecht Van Amstelstraat 97, Hilversum.  
Phone: (035) 17722. Telex: 43834.

**Italy:** Roberto Beppato, Audio Productions International, Via G Spontini 3, 20131 Milan.  
Phone: 273896/228120. Telex: 32402.

**US:** Terry Doran, Rehearse and Tape Studios, 3191-3197 Cahuenga Blvd, Hollywood, Ca 90028.  
Phone: (213) 874 4062.

**Directors:** E J Veale, D Veale and L Veale.

**Consultant architect:** D R Norris.

**Staff:** seven.

**Services:** acoustic and architectural design; electro-acoustic and systems design; project supervision; equipment installation and full checkout/test facilities; acoustical investigations; turnkey projects.

**Policy:** to promote at high technical standard throughout the audio industry; to provide full technical assistance to clients engaged in the audio industry; to disseminate new ideas and foster new techniques throughout the industry; to produce designs to satisfy each client's image; not to be

limited in the scope of any design, but to employ every possible technique and to develop new methods to meet the needs of the clients and new projects.

**Guarantee:** that designs will comply with all relevant codes of practice and statutory requirements; that equipment installations will comply with those codes of practice and BS/IEC standards applicable to the industry; and that each commission will comply in every possible respect to the client's brief.

**Examples:** Lansdowne; Moonlight Recordings; Trident; Advision; Beacon Broadcasting; Gus Dudgeon; Rampart Enterprises; Circle Studios, Milan; Nova Sound Studios; Space Studios; Editoriale Sciascia, Milan.

### WESTLAKE

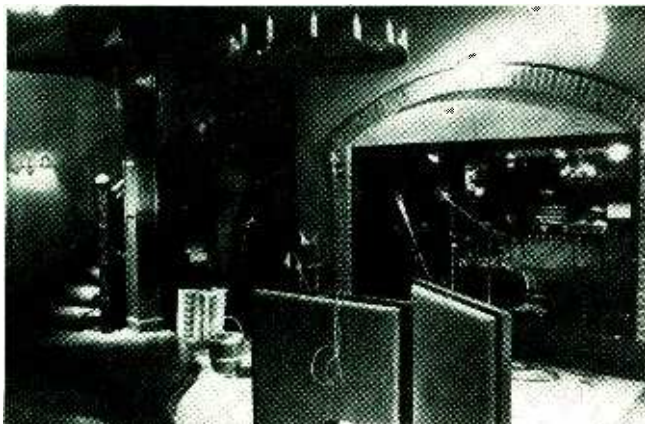
Westlake Audio, 6311 Wiltshire Boulevard, Los Angeles, Ca 90048, USA.  
Phone: (213) 655 0303.

**President:** Glenn Phoenix.

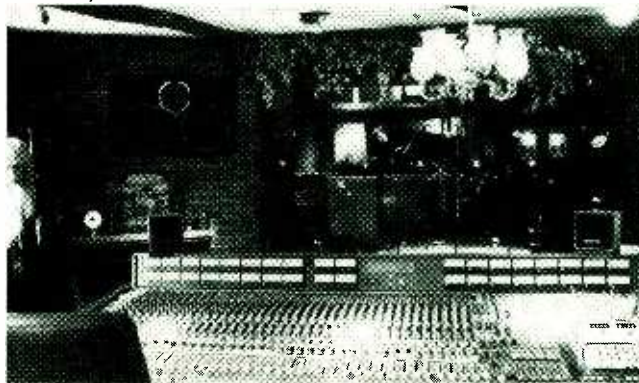
The company offers a complete array of products and services, including acoustic design and consultation, execution of the design (construction), electronic system designs, equipment procurement

and installation, and interfacing of electronic equipment. Acoustic design and consultation covers all areas from the site selection to detailed construction drawings. Design fees for a single control room/studio run from \$13k to \$19k, depending on complexity, and a general formula might be 10% of the construction costs. On a daily basis fees are \$375 per day plus round trip air fare and expenses. Construction of the facility can be handled in various ways: Westlake design only, construction to be handled completely by client; Westlake design and foreman, a method providing day to day working supervision by a 'seasoned' Westlake foreman, while allowing the client access to local labour and/or contractors for cost effectiveness; or, if desired, Westlake can bid for complete construction of the facility. Westlake is currently experiencing costs in the area of \$85 to \$95 per square foot for studio/control room areas requiring maximum acoustical isolation; non-music areas, of course, would be less. These figures exclude exterior shell and do not include any audio equipment or audio wiring. The figures do reflect interior wall system, finish materials, carpets, drapes, air conditioning, electrical fixtures and wiring.

**Examples:** International Automated Media studio, California; tv sound control center for Oral Roberts University, Oklahoma; and studio and disc-mastering facility for Fantasy Records.

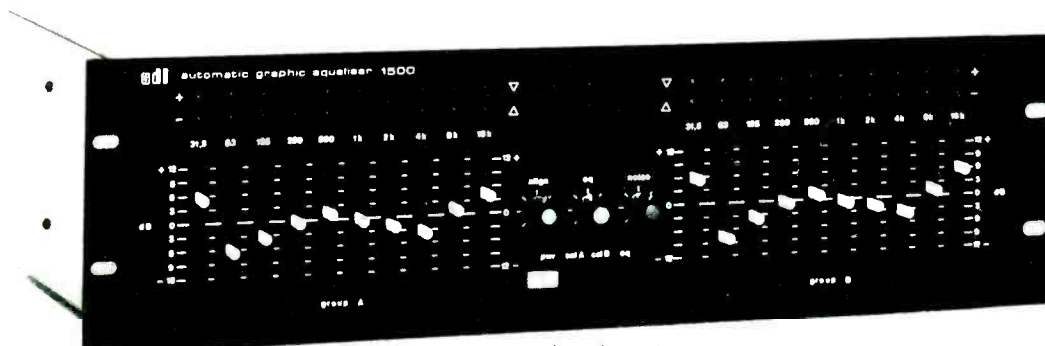


Edward J. Veale & Associates/Gus Dudgeon's Studios (monitoring by Court Acoustics)





# adi 1500 automatic graphic equaliser



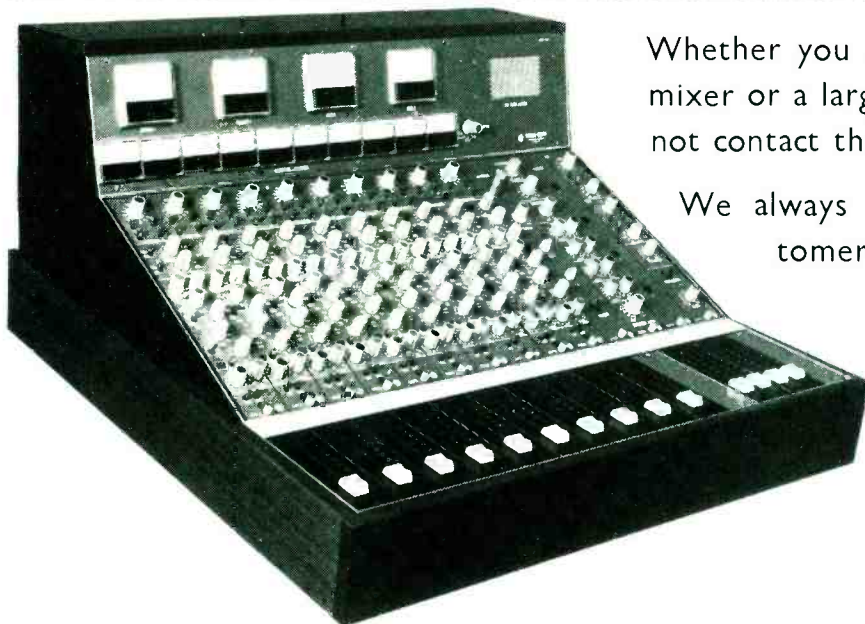
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# work

## I heard that—pardon?

The national press has not unnaturally jumped at the chance of publicising complaints about poor acoustics from members of the audience at the National Theatre. The first proposal for a national theatre was made in 1848, and it took 125 years for the theatre to be erected, on a site provided by the GLC and opened by the Queen. It cost the public a great deal of money to erect, and it currently costs £1M a year to maintain, even before the production costs of plays are considered. The theatre now receives £2.5M a year from the Arts Council and £0.35M a year from the GLC but is still incurring losses of £100 000 a month. So when people attending the large Olivier Theatre started complaining that the dialogue from the stage was unintelligible, especially during 'Volpone', sparks were bound to fly. Publicity in the national press inevitably produced more complaints, many of them from theatre-goers reassured that they hadn't imagined the problems they thought they'd heard at the Olivier.

With the co-operation of the National Theatre, I attended two performances, one of 'Volpone' and the other of 'The Madras House'. Although I could walk through life with a smile on my face if I had sure knowledge that I need never sit through 'Volpone' again, I had to admit that I could hear every ham word. 'The Madras House' was a far more enjoyable experience and equally intelligible. In fact, both down in the stalls and up at the rear of the balcony, audibility and intelligibility were as good if not better than I've heard in any other London theatre. So where then were the problems, and why are a few people still complaining? To get the answer, I talked to the National Theatre architects Denys Lasdun & Partners.

It was back in the Sixties that the original acoustic design decisions were taken. The acoustic consultant for Lasdun worked on the principle that no large building can be expected to be acoustically perfect from the moment the building is complete. Inevitably the acoustics will be slightly too live or slightly

too dead for the consensus of taste. Although excessive reverberation is generally regarded as the more serious defect where speech is concerned, and insufficient reverberation is unacceptable for music, a policy decision was taken during construction that was later to produce the complaints over unintelligible speech from the stage in some parts of the auditorium. This decision was that, on balance, it was better to design the theatre for excessive liveness of sound and add whatever extra damping proved necessary. Rather than overdamp from the outset and then be left with the possible difficulty of deciding what and how much absorbent material to remove and

from where. In the event the overall reverberation time for the Olivier Theatre was (initially) 1.3 seconds, which some observers would regard as a little on the high side for a theatre coping only with speech and no music.

As is by now well known, the National Theatre was finished and opened in what is euphemistically called something of a hurry, and there was no time to check out the acoustics before it was opened to the public. Very soon it became clear that, in addition to the direct sound from the stage and the wanted or helpful reflections from the rough concrete side walls, there were some unwanted reflections coming down from the upper reaches of the auditorium. These produced cancellations, muddling and even semi-echo sounds in the area of the front row of the balcony. It was hardly surprising that most audience complaints originated from the front row of the balcony. Perhaps here it is opportune to point out that, although the National Theatre has an extensive and impressive array of electronic sound equipment, this is used only for sound effects, public address and communication. There is no

overall sound reinforcement in the auditorium. In other words (with one minor exception of which more later) what you hear from the stage is truly live sound.

Sound Research Laboratories of Essex were brought into help check out the acoustics, and track down the surfaces responsible for the muddling reflections. This is a time consuming business, because at all times the temptation must be resisted to simply install more than enough extra damping and so be sure of killing the unwanted reflections in buckshot manner. The buckshot approach may silence the critics but inevitably risks overdamping the acoustics and creating an overall dead sound.

SRL and architects from Denys Lasdun had no alternative but to track down the surfaces responsible for the muddling reflections by a process of laborious elimination. Using an eht spark on stage to generate a transient crack, they methodically moved highly directional gun mics around the auditorium, pointing at each possible source of unwanted reflection in turn. An oscilloscope readout clearly distinguished between offensive and inoffensive pickup.

By good fortune a one-eighth-full-size model of the theatre had been built several years ago by the Building Research Establishment at Watford. The original intention had been to study whether it was possible to design and predict the acoustics of a large hall, using only a relatively small model. In this respect the model work parallels some of that carried out by the BBC on studio acoustics and the behaviour of monitor speakers under different circumstances. In the event, the theatre model has proved of particular value in correcting what was wrong with the full-sized hall acoustics. The sound tests carried out in the theatre were replicated in the model, using light beams and mirrors rather than a sound source and microphone. It was found that there was good correlation between the results obtained from the theatre and the model, and so work has continued with the model as a supplement to work in the theatre.

Most of the offending surfaces have now been tracked down and damped and, in consequence, the overall reverberation time of the hall has dropped from 1.3s to 1.15s and it may go slightly lower to 1.1s. Although, as previously mentioned, overall sound in the hall is totally live (without electronic reinforcement) there is currently a very low level of reinforcement in the front of the balcony. Microphones in the

National Theatre

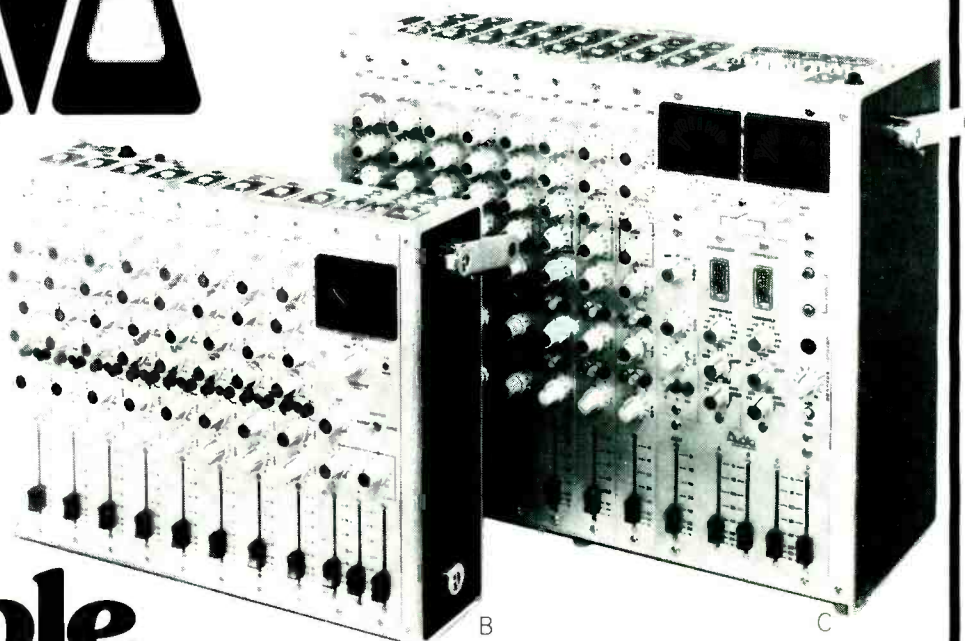
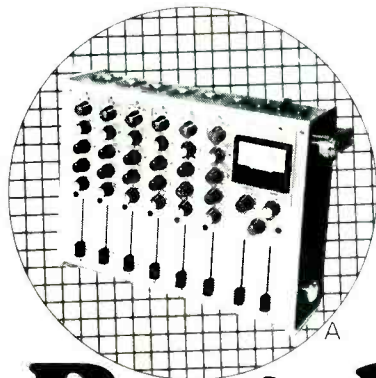
Photo: Donald Mill





# Audio

## Developments



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### PICOMIXER AD 045

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

### PICOMIXER AD 045

Mk II

**AD 075 Multiple arrangement**

**AD 055 Stereo Compressor Limiter**

A - Picomixer AD 045  
B - Micromixer AD 031  
C - Minimixer AD 007

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# Audio

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## WORK

roof pick up the early and wanted reflections and these are relayed at low level to speakers above the balcony front. Although unnoticeable in their own right, these slightly boosted early sounds give body to the direct sound and help overcome the effect of any unwanted late reflections that still linger.

Apparently, complaints are now almost non-existent, but are investigated when received. The only other outstanding acoustic problems in-

volve leakage of mechanical noise, for instance from motor-powered equipment, up from the bowels of the building. But certainly nothing was noticeable on either of the two nights that I attended. By interesting contrast, in at least one West End theatre subtle dialogue is frequently drowned out in the balcony by the sound of underground trains rumbling past below. Anyone looking for a sensational exposé of poor theatre sound would do far better to look in the West End than at the South Bank.

**Adrian Hope**

## Valves rule, maybe

A decade ago there was pressure on Acoustical Manufacturing Co, makers of Quad equipment, to move over from valves to transistors. Quad took their time and finally produced the 33/303; and then the 405. Now those old Quad II amps that everyone wanted Quad to stop making are like gold dust and fetching ridiculous prices on the Continent and in Japan. Reputedly, Quad was approached by one Japanese firm and asked to start making Quad IIs again—they declined. 'We are only interested in making the best amplifier we can,' they told me. 'And what we are making now is better than what we were making then'.

It's reasonable to assume that Quad will not start making valve amps again until they are sure there is good reason to do so. But others are already going back to valves (or 'vacuum state' as it is now grandly termed) and it remains to be seen whether the new generation of valve amps sound as good as bandwaggon-thinking has led us to expect. Almost every audio journalist, along with their aunts and grannies, has now written something on the valve-versus-transistor sound controversy.

To save anyone who is short of time the effort of actually reading what has been written, it can all be very easily and briefly summed up. No one can say for sure that valves sound better than transistors because there are good and bad transistor amps just as there were good and bad valve amps. The question is really whether a good valve amp can sound better than a good transistor amp. More and more people, not given to hopping on bandwaggons, are inclined to say, 'yes, valves can sound better'. But as to why and as to what makes any amp sound good or bad, there is even more confusion.

One particularly interesting and provocative sortie in this area has been made by Richard Elen and George Chkiantz, who both have

an impressive professional audio pedigree. Essentially, the Elen-Chkiantz theory is that it is all down to feedback. There are two basic types of feedback. One—call it the 'overall' loop—shunts part of the overall output signal back to the input to cancel distortions that have arisen the first time through. The other type—call it the 'multiple' loop—shunts signal from the output of each individual stage back to the input of that stage for the same purpose. In addition to these two types of feedback there is also a great deal of difference between the amount of feedback used in different amplifiers—it can be as little as 10 dB or as much as 100 dB. The Elen-Chkiantz theory is that, whether valves or transistors are involved, multiple loop feedback is better than overall loop feedback, and that a little feedback is better than a lot of feedback. Here's the reasoning.

First of all the disadvantage of overall feedback. If a fast-rise transient arrives at the amplifier input, the leading edge of the waveform may pass through so quickly that it is distorted, out and en route to the loudspeakers before the feedback loop has a chance to handle and correct it. So the loudspeaker produces distortion that wouldn't otherwise be there. For a brief moment the amplifier is no longer in control of the loudspeakers. If the amplifier stages each have individual feedback loops, there is more chance of the feedback coping with even the fastest, ie highest frequency, waveform edge. By the same token, there is likely to be less trouble under the same circumstances with an amplifier that only has a relatively small amount of feedback. If the amplifier works reasonably well without feedback then it will produce less overall distortion of a signal that is moving too fast to be influenced by feedback. But if the amplifier relies heavily on feedback to smooth out a response that

is non-linear in amplitude characteristic, then a signal that whips through untouched by feedback will be heavily distorted.

To reduce things to a practical level, some of the 'better sounding' old valve amps, especially the Leak models *TL 12* and *50*, had multiple feedback loops, and a relatively low overall feedback level into the bargain. The *TL 12*, for instance, had a triple loop totalling 30 dB, of which only around 10 dB is controlled by the overall loop. Currently Elen and Chkiantz monitor on a pair of *TL 50s* driving Tannoys in Lockwoods. And very clean and loud they sound too. In fact they are convinced that they can mix more reliably using these antiquated amps, than with the highly respected Amcron *DC 300* or *300A* amps which have a higher level of feedback. It isn't necessary (or possible without lengthy listening tests) to agree or disagree with this personal point of view; what matters is whether anyone else in the studio business agrees or disagrees with them. Accordingly, they will be pleased to read or hear what anyone has to say.

They will be even more interested to hear, however, whether anyone else agrees with their ideas on what they have christened the 'Ricochet Effect'. They noticed an odd thing when mastering on some specific amp/loudspeaker combinations: for instance, Amcron feeding Tannoys. As a sound panned from left to right, they heard a change in character. This prompted further experiments: the speaker was connected to a long lead and moved out of the control room while driven by an Amcron. They heard a change in the character of the reproduced sound. Room acoustics? Maybe! Instability corrected by a long or coiled lead? Maybe! But on the other hand, maybe not. Certainly when the driving amp was changed to a *TL 12* or *TL 50* the sound stayed constant. Now suppose, just suppose, that the monitor speakers were behaving in exactly the way that any engineer knows a loudspeaker will behave when it receives a sound signal. That is to say, like a microphone—and Tannoy loudspeakers behave very well as microphones.

Although details of where and when are perhaps best not disclosed (for security reasons) it is a fact that some Tannoy pa and music dissemination installations have the built-in facility to work in reverse; ie they can relay sound back from a room or corridor to a central security point, as well as relaying music or announcements out into the room or corridor. Could it be that the studio monitors are picking

up sound that is ricocheting around the room and feeding it back into the amplifier output terminals? From there it would go into the feedback loops to muzz the raw programme signal. If this were the case, then the effect would surely be far more noticeable with an overall loop feedback amplifier than with a multiple loop amp. And Elen and Chkiantz believe it is more noticeable with an Amcron than a *TL 50*, *TL 12* or *Quad 405*. It's also more noticeable with a *Quad II*, which has overall single loop feedback.

The makers of the *Quad* amp rightly point out that the monitor speakers will be seeing what is virtually a dead short, and so will be hard put to inject any appreciable amount of signal back into the amp. But how much signal would have to go back, to produce the effect? As yet no one knows, but it would be kind of nice to find out. By the way, don't forget that one of the ways in which am radio transmissions can break through into an audio system is to be picked up by the loudspeaker leads which act as an aerial, then rectified by a dry joint or component in the speaker crossover and fed up into the front-end of the amplifier by way of the output terminals and feedback loop.

So if you are an open-minded studio engineer with an old but good valve amp kicking about in the maintenance room, try connecting it up next time you have an hour or so's downtime. Apart from any other considerations, if you're using Tannoys as monitors then the consistency of Tannoy production over the years surely means that the speakers you are driving today with transistors were originally designed to be driven by valves. They might just sound surprisingly nice. Who knows—nothing ventured, nothing gained.

And in this connection it was fascinating to read Peter Baxandall writing in 'Wireless World' recently that 'once the designer has freed himself from the various quite irrational and unfounded beliefs, eg that there is an inherent subtle difference between valve and transistor sound (and) that feedback should only be used in small amounts etc, he can then proceed in a proper scientific manner to develop designs of good economy and reliability, and immaculate subjective performance' (my italics).

I love to see people put their heads on a block. It now only remains to be seen whether it is the head of Baxandall or those of Elen and Chkiantz that roll.

**Adrian Hope**



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Telex: 651485

# reviews

## Telefunken Telcom c4 noise reduction system

Hugh Ford

### MANUFACTURER'S SPECIFICATION

**Operating voltage:** 24V  $\pm 15\%$ .  
**Current consumption:** 170 mA  $\pm 15\%$ .  
**Frequency range:** 30-20k Hz.  
**Control systems:** four.  
**Frequency bands:** four—30-215 Hz, 215-1.4k Hz, 1.4-4.8 kHz, 4.8-20 kHz.  
**Compression ratio:** 1:1.5 (33%, dB-linear).  
**Nominal levels:** compander input and monitor output 300 mV; compander output 500 mV; test output 1.85V; power stage input 90/116 mV.  
**Input level range:** -92 dB to +16 dB (0 dB equivalent to 300 mV).  
**Dynamic gain:**  $\geq 30$  dB (with studio tape machines).  
**Total harmonic distortion:**  $\leq 0.2\%$ .  
**Transient time of control system:** 350/53/22/8  $\mu$ s for 30 dB level increase.  
**Decay time of control system:** 2200/320/50/16 ms for 30 dB level decrease.  
**Weight:** approx 450g.  
**Dimensions (w.h.d.):** 154 x 18 x 201 mm.  
**Price:** from £372 per 2-channel unit.  
**Manufacturer:** AEG - Telefunken, Lindener Strasse 15, D-3340 Wolfenbittel, Germany.  
**UK Agent:** Hayden Laboratories Ltd, Churchfield Road, Chalfont St Peter, Bucks.

THE TELCOM noise reduction system has certain similarities to both Dolby A and dbx; like Dolby A it uses a band-splitting arrangement to make use of the masking effect, and like dbx it uses a straight compression/expansion system, thus eliminating the need for a reference level.

Four separate frequency bands (30-215 Hz, 215-1.45k Hz, 1.45-4.8 kHz and 4.8-20 kHz) have their individual compressors with different attack and release times designed to be optimum for the frequencies within the band, which has a rate of attenuation of 6 dB/octave, while the transfer characteristic of all channels is the same with a 1:1.5 dB-linear curve. This means that in the compression mode (recording onto tape) a 10 dB difference in input leads to a 7 dB difference in recorded level—or 6  $\frac{2}{3}$  dB to be precise.

Similarly, in the replay mode a 7 dB level difference on tape leads to a 10 dB difference in output level. Thus, the Telcom system uses a lower compression/expansion ratio than dbx that has a 2:1 ratio and which is similar to the maximum slope in the Dolby A compressor/expander. The consequence of this is that editing tape is less critical so far as recorded levels are concerned, and also tape uniformity errors are of less consequence—a significant matter when considering the edge track of multitrack tapes.

Because, unlike Dolby A, the compression/expansion curve is dB-linear over the complete working range, there is no need to align the

operating levels in order to achieve correct tracking of the expansion mode on replay—a matter which has caused much irritation with the Dolby A system when interchanging tapes.

A further consequence of the reduced maximum compression/expansion ratio is that frequency response errors in the tape system



are magnified to a lesser degree than with Dolby A or dbx. But of course the amount by which print-through and modulation noise are reduced is less than with the dbx system. So far as actual noise reduction is concerned the Telcom system reduces noise by about 25 dB and gives about 5 dB extra headroom—a total of approximately 30 dB increase in dynamic range. Thus the benefit of Telcom is substantially more noise reduction than Dolby A but less than dbx; but Telcom overcomes the various objections to the dbx system. Unfortunately the cost of the Telcom system is about twice that of dbx or Dolby A. The reason for this is obvious when one inspects the printed circuit board which is beautifully made and absolutely packed with high-quality components.

For this review the Telcom system was part of a Telefunken M15A 24-track machine (see last month's issue, p62) and for this reason it was not possible to gain access to the interface between the Telcom system and the machine's electronics. Therefore the review is restricted so far as measurements are concerned, but it will become clear that the unit has many desirable characteristics.

While no reference level tone is necessary for the Telcom system, an identifying tone is included so that 'Telcomised' tapes can be recognised. This comprises nominal 550 and 650 Hz tones interchanging every 500 ms. In the case of the Telefunken M15A recorder these tones were recorded at 0 vu corresponding to a recorded fluxivity of 200 nWb/m.

### Noise reduction and dynamic range

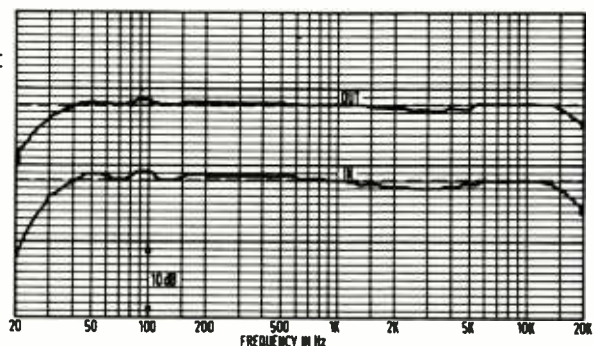
As with any noise reduction system the improvement in dynamic range depends upon the capabilities of the original recording system. The following figures relate to a single track on the Telefunken M15A machine when operating at a tape speed of 38 cm/s with BASF SPR50LH tape. The tape was first recorded without any input signal and without Telcom, and then with Telcom switched into circuit (it not being possible to monitor off tape when recording with Telcom in the standard system). The tape was then replayed with or without Telcom as appropriate, the

76 ▶

TABLE 1

|                         | A-WEIGHTED rms | CCIR-WEIGHTED ref 1 kHz rms | quasi-peak |
|-------------------------|----------------|-----------------------------|------------|
| Without Telcom          | -53.1 dBm      | -44.4 dBm                   | -39.6 dBm  |
| With Telcom             | -78.3 dBm      | -68.7 dBm                   | -64.2 dBm  |
| Improvement with Telcom | 25.2 dB        | 24.3 dB                     | 24.6 dB    |

FIG.1  
 TELCOM c4  
 FREQUENCY RESPONSE  
 (SEE TEXT)





# Bend our ears in Hamburg



The decades most exciting achievement in sound transducers makes its world premiere at the Hamburg AES Exhibition.

The Calrec sound-field microphone represents a new departure in microphone technology, giving unprecedented operational flexibility and accuracy of stereo recording.

Based on an application of the mathematical theory of Sampling in which a closely spaced array of capsules and associated matching electronic circuitry completely characterise the first-order directivity of the sound reaching the microphone.

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minus right, front minus back, and up minus down). From these four signals, known as B-format, any first-order microphone characteristic can be synthesised. That is to say—any combination of omni-directional, cardioid, hyper-cardioid, or figure-of-eight.

Any number of such microphones can be synthesised simultaneously and the microphone control unit provides, in addition to mono and multi-channel feeds, the output of a stereo pair.

Controls are provided which enable the angle between the two microphones of the pair to be varied, as well as the directivity patterns of the

individual microphones. The whole stereo pair can then be panned or tilted in any direction. These controls can be exercised either live, or in post-session processing of the B-format tape.

This new facility goes of course much beyond the capability of the usual kinds of variable-pattern microphone. An additional advantage is that over most of the audio spectrum the virtual microphones of the stereo pair are strictly coincident. This gives worthwhile improvement over the usual kind of close-spaced stereo pair in which phase-errors can exceed 180° at the top of the audio band.



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## TELCOM c4 NOISE REDUCTION SYSTEM

resultant output noise measured with various weightings being shown in table 1. In addition to this reduction in noise, the *Telcom* system gives a 5 dB increase in headroom at a recorded fluxivity of 510 nWb/m (8.1 dB above 200 nWb/m equivalent to 0 vu) and appropriately more headroom at higher recorded levels. It follows that at least an extra 5 dB can be added to the improvement in noise levels, which means a minimum overall improvement in dynamic range of 30 dB.

### Frequency response and distortion

Fig. 1 shows the frequency response of a single channel of the Telefunken *M15A* machine with and without the *Telcom* noise reduction system in circuit, there being the anticipated small increase in frequency response errors with noise reduction in use. The errors introduced were found to be completely independent of recorded level over the range of normal operation, and both random noise and pure tones gave similar results.

Harmonic distortion at 1 kHz was distinctly improved by *Telcom* at a recorded fluxivity of 200 nWb/m, where the third harmonic content fell by 5 dB and the second harmonic by 3 dB—both very useful improvements on the already excellent performance of the Telefunken *M15A*. However, intermodulation distortion to the CCIR twin-tone method using 1 kHz and 1.07 kHz remained constant so far as the products close in frequency were concerned, but the difference component became slightly worse.

### Recorded signal

All noise reduction systems suffer to one degree or another from overshoots, and these

Fig. 2

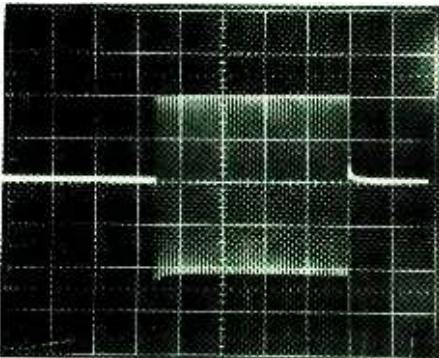
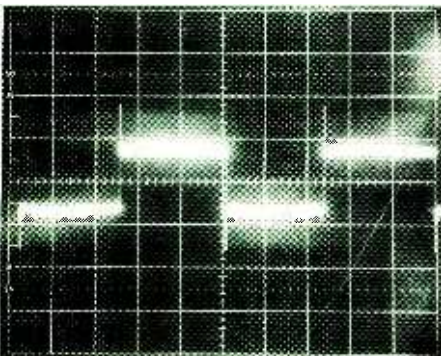


Fig. 3



parameters were investigated in some detail using various sorts of tonebursts, pulses and squarewaves. It transpired that while some overshoot was present in all frequency bands, it was worst at the higher frequencies. A typical degree of overshoot is shown in fig. 2, which is the recorded signal at the input to the record amplifier when a 10 kHz toneburst is applied to the noise reduction system's input. This performance does not give me cause for concern, as the duration and amplitude of the overshoot are unlikely to provoke troubles in any respectable tape machine or transmission system. The degree of overshoot is confirmed by fig. 3, which shows the effect of an input squarewave under the same circumstances.

As with other systems, the amount of intermodulation and harmonic distortion actually recorded onto tape is very high. However, by the time the tape has been decoded the signal again recovers and this matter is not of practical significance so far as the end product is concerned.

### Input and output

The input to the recorder when using the *Telcom* system becomes a genuine balanced input (as opposed to a floating input) with an input impedance of 10.1k ohm between the outputs or 5k ohm between either conductor and earth. On the output end the connection is again balanced, with a very low associated output impedance—both the input and output arrangements having adequate headroom.

### Subjective tests

The *Telcom* system was tried with a number of live recordings of various noises that have been found in the past to upset other compression/expansion systems. Ticking clocks, metronomes, rattling keys and other such noises all failed to find fault with the system. In addition the system was used with music recordings and also various combinations of tones and random noise, all of which were re-recorded and replayed without any apparent defects.

While I cannot hear the Dolby *A* system working, the extra noise reduction offered by the *Telcom* system makes a substantial improvement to the subjective quality of recordings. The system could not be faulted for 'noise breathing'—something I have against the dbx system, particularly if it is used to record classical music as opposed to pop music.

### Summary

Because the *Telcom* system was built-in to a Telefunken *M15A* machine it was not possible to do exhaustive testing, but certainly I was unable to fault the system. The degree of extra noise reduction offered by *Telcom* in comparison with Dolby is well worth having; an even greater advantage was the doing away of a reference level, such as 'Dolby level,' which can be such a source of confusion and error when tapes are interchanged. While the amount of extra dynamic range is short of the dbx system's performance, the audible breathing effects do not exist and the inherent frequency response errors in tape machines are not magnified to such a large degree.

*Telcom* appears to be a very good system if maximum dynamic range is not the only requirement, but the price to pay for its benefits is high. ■

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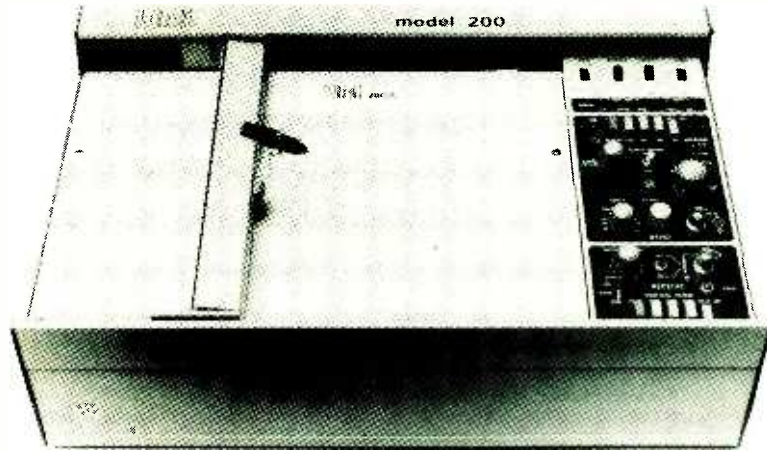
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# Urei model 200 automatic response plotting system

Hugh Ford



## MANUFACTURER'S SPECIFICATION MAIN FRAME

**Front panel controls:** power on/off; servo standby; chart hold; and pen lift.

**Writing system:** Disposable pens and universal pen holder for most fibre tipped pens.

**Platen size:** holds 21.5 x 27.5 or DIN A4 size chart paper.

**Dimensions (h x w x d):** 226 x 437 x 135 mm; rack-mounting kit for 48 cm or DIN-size rack available.

**Power:** switch selectable for 100, 115, 200, 230V ac 47.5-440 Hz; power consumption, 70W maximum.

**Input ranges:** vertical range 1V/inch; horizontal range 0.1V/inch.

**Type of input:** connectors to accept UREI plug-in modules.

**Accuracy:**  $\pm 0.3\%$  of full scale at 25°C (includes linearity and deadband); temperature coefficient  $\pm 0.25\%/^{\circ}\text{C}$ .

**Deadband:**  $< 0.2\%$  of full scale.

**Overshoot:** 2% full scale maximum.

**Slewing speed:** 508 mm/s minimum.

**Peak acceleration:** X-axis 1270  $\text{cm/s}^2$ ; Y-axis 2540  $\text{cm/s}^2$  minimum.

**Zero conditions:** resolution—pen positioned within  $\pm 0.127$  mm of any point on chart; zero drift—pen will not move more than 2.5 mm/day independent of temperature.

**Prices:** plotter-only £868; modules £868 each.

**Manufacturer:** United Recording Electronics Industries, 8460 San Fernando Road, Sun Valley, Ca 91352, USA.

**UK Agent:** FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Hertfordshire.

THE UREI Model 200 automatic response plotting system comprises a Hewlett Packard type 7010 X/Y plotter installed into a main frame that accepts plug-in modules. Two types of module are currently available and it is believed that more are to come. The existing modules are the type 2000 frequency response plug-in, and the type 2010 level and frequency detector plug-in. The former is a swept oscillator, the frequency of which controls the pen position in the X direction with the Y direction being controlled by the input level. The more complex type 2010 module does not contain an oscillator but locates the pen on the X-axis according to the frequency of the input tone, and on the Y-axis according to the level of the input tone. Thus this module is useful for measuring the frequency response of transmission systems, or for plotting frequency response when using calibration tapes or discs and similar applications.

The plotter itself is designed to be either used on a bench, or mounted vertically or horizontally in a standard 483 mm rack using optional rack adaptors, the modules being included in the plotter's frame. Either imperial or metric paper may be used on the platen, which locates the paper by electrostatic hold-down. The pens are either disposable fibre-tip pens available in a range of colours, or ordinary fibre pens that are fitted by means of an adaptor.

Four slide switches are the only operational controls on the plotter: power on/off for the system; chart hold/release; servo on/standby that disengages the plotter's servo system for paper loading etc; and pen record/lift that permits the pen to be held off the recording paper for doing dummy runs before a final plot.

Underneath the plotter to the rear are two screwdriver-operated switches for changing the mains voltage tapplings; an imperial size mains fuse; and the IEC-type power connector. The frequency response modules slip into the top of the plotter's frame and locate in two printed-circuit connectors. In addition they are secured in place by a single bolt equipped with a large knurled knob.

The modules themselves are based on four good quality pcbs arranged in a box shape, the two larger boards having printed connectors that mate with the plotter's main frame. Good quality components are used throughout, with widespread use of integrated circuits and multi-turn potentiometers for all preset controls.

The type 2000 frequency response module consists of two parts—a send section and a receive section. The latter has a BNC input socket that can be terminated in either 50k ohm or 600 ohm by means of a miniature toggle switch. The incoming signal then passes to an attenuator, which is in the form of a rotary potentiometer for setting the pen position on the Y-axis. In addition to this function the potentiometer has a switch at the end of its travel that provides a 0 dB reference level to the pen recorder. Further controls comprise a pushbutton for altering the Y-gain by 10 dB for calibration purposes, and a red pushbutton switch for selecting either inch or centimetre operation—the selected calibration being shown by two red led indicators. The final controls in the receive section are four interlocked pushbuttons that select the scale factor on the Y-axis—the available factors

being 1, 2, 5 or 10 dB/inch or 0.5, 1.0, 2.0 or 4.0 dB/cm.

The send section is essentially a swept oscillator, the frequency of which is controlled by a timebase that drives the plotter's pen on the X-axis. The pen travels at constant speed while the frequency increases from 20-20k Hz in a logarithmic relation to produce a conventional frequency response plot with a dB linear Y-axis and a logarithmic X-axis. A BNC socket provides a low-impedance oscillator output via a rotary attenuator that has rough calibrations from +14 to -60 dBm. The oscillator frequency can be controlled from three sources: the timebase in the plotting mode; manually by means of a potentiometer with or without plotting; or from calibration buttons which duplicate as sweep time range switches. These latter provide fixed frequencies of 20, 100, 1k or 10k Hz, and operate in conjunction with three recessed and screwdriver-operated potentiometers for calibrating the pen position at 20 Hz, 1 kHz and 10 kHz.

Sweep time from 20 Hz to 20 kHz can be selected to be 120, 60, 30 or 15s, with a vernier potentiometer control available to fine set sweep time over about a 10:1 range. In addition to this a 'slope sense' function can be switched into operation, and this function slows down the sweep speed if rapid level changes are encountered. For instance, if plotting the frequency response of a sharp notch filter the pen will not move fast enough to plot the bottom of the notch if too high a sweep speed is selected. However, the slope sense function will automatically slow down the pen while the notch is plotted.

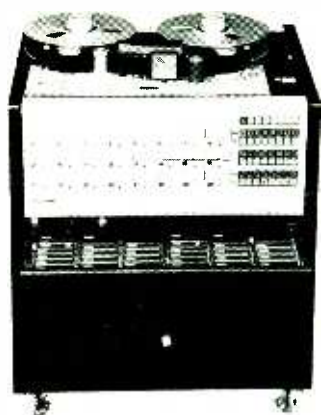
The remaining controls on this module are a 'reset' button that sets the plotter's pen to the left-hand (20 Hz) margin, and a 'start' button that initiates the timebase and hence the frequency sweep. Whenever the frequency is outside the limits of 20-20k Hz the pen is automatically lifted from the paper, as it is when the level is out of range.

Like the type 2000 module, the type 2010 level and frequency detector module has two sections; but this time a calibration and a receive section. The former is similar to the functions on the type 2000 module, in that discrete frequencies of 20, 100, 1k or 10k Hz can be selected for calibrating the plotter by means of preset controls. However, the

80 ►



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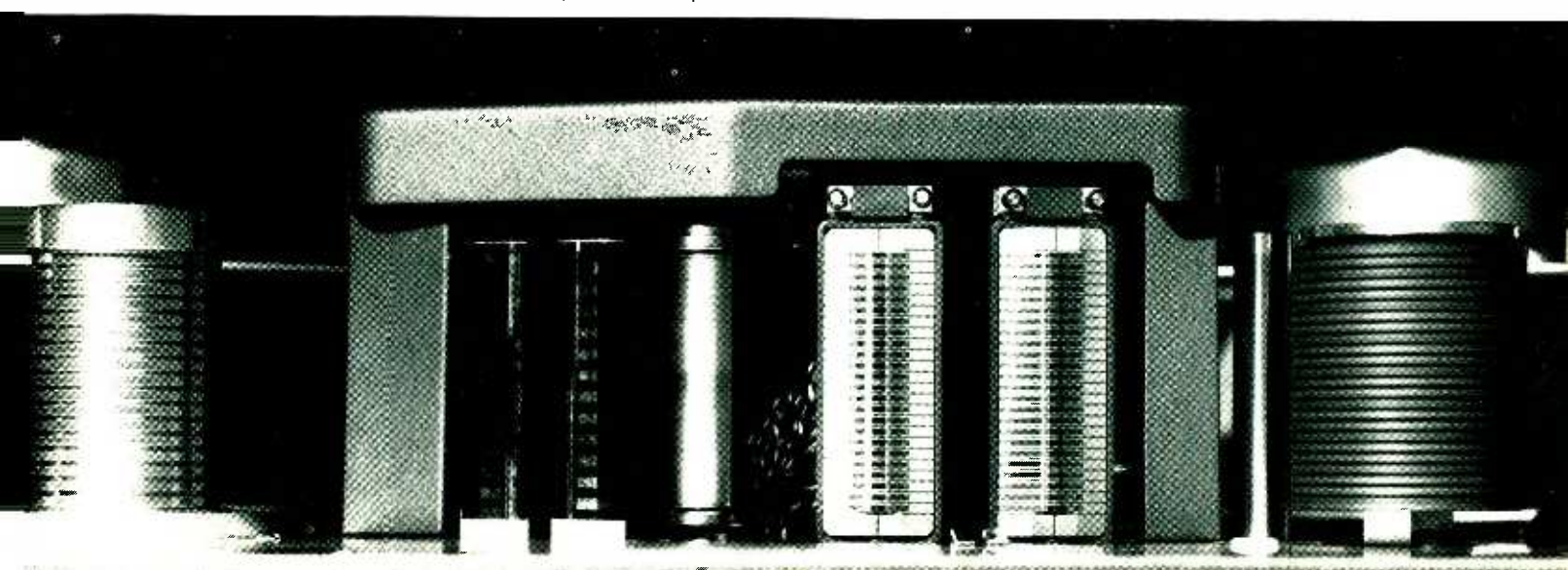
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## UREI 200 SYSTEM

selected frequency is available at a BNC output socket via a potentiometer level control that has rough calibrations from +14 to -60 dBm output level.

The receive section has similar vertical range selection to the type 2000 module and also identical input arrangements. However, because the X-drive to the plotter is derived from the frequency of the input signal there is a restriction on the minimum acceptable input level—a 'low-level' red led indicator is illuminated if the input signal level is too low. An additional feature is that the X-drive sync may be disconnected from the input signal by means of a toggle switch, and a separate signal applied to a second BNC socket for deriving the X-axis sync. This feature is useful while plotting, for instance, crosstalk in systems, when a 'clean' high-level signal is available in the driven channel. This may be applied to the sync input of the 2010 module and the low-level crosstalk to the normal receive input.

Two further toggle switches complete the controls on the type 2010 module: a pen 'automatic/down' switch; and a lf filter on/off switch. The former enabling automatic pen lifting in the absence of an input signal etc, while the latter inserts a tracking filter that should reduce the effect of low-frequency noise on the plot.

Operation of the plotter and of both modules was found to be completely straightforward, and much aided by the good identification of the controls and sensible control layout. However, particularly when using the 1 dB/inch vertical sensitivity, the attenuators were found to be exceedingly coarse in action; both modules could well benefit from the inclusion of a 10 dB step attenuator in addition to a variable attenuator. Such an arrangement could give controlled output levels and input sensitivities that would permit the measurement of absolute levels. This is not possible at the moment with either module.

### Performance of the type 2000 frequency response module

Investigations into the receive section showed that the frequency response from 20 Hz to 20 kHz was within the specified 0.05 dB at any point on the vertical scale and at any input sensitivity. The maximum sensitivity was 39.2 mV for mid scale on the Y-axis for all vertical ranges. The practical frequency response limits were such that the indicated level was 1 dB down at 80 kHz and approximately 3 Hz, the latter limit being difficult to determine due to the fast pen speed used. The input impedance with the 50k ohm setting was found to be very close to 55k ohm for any input sensitivity setting. The shunt capacitance was measured as 24 pF, except at maximum sensitivity where it increased to 53 pF. In the 600 ohm input impedance setting the measured impedance was constant at 597 ohm.

Using the pushbutton to alter the sensitivity by 10 dB gave an exact increment, and it was pleasing to note that the rectifier used in the module was a genuine rms rectifier.

Although the receive level control covered the full range, it was too coarse in action as was the send level control in the oscillator section. The latter control provides up to +14.6 dBm output (terminated in 600 ohm)

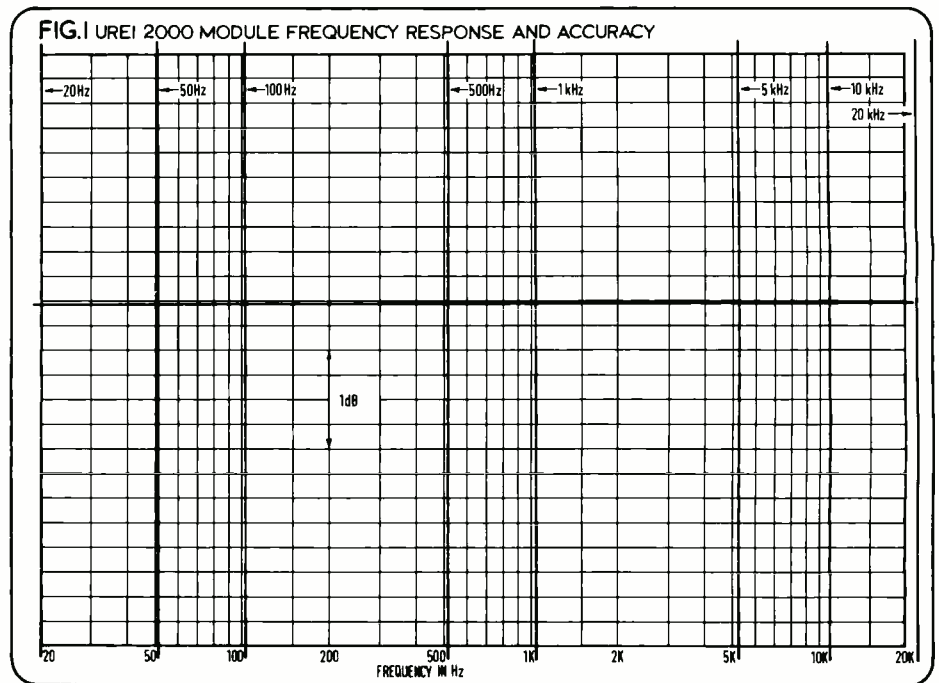


TABLE 1 HARMONIC DISTORTION

| Frequency       | 100Hz | 1 kHz | 10 kHz |
|-----------------|-------|-------|--------|
| Second harmonic | 0.71% | 0.50% | 0.50%  |
| Third harmonic  | 0.79% | 0.28% | 0.40%  |
| Fourth harmonic | 0.07% | 0.07% | 0.20%  |
| Fifth harmonic  | 0.22% | 0.35% | 0.50%  |

from a constant output impedance that was satisfactorily low at 10.1 ohm.

The frequency response of the oscillator section was found to be within  $\pm 0.05$  dB from 20 Hz to 20 kHz at any send level setting, with the maximum frequency limits being 17.7 Hz to 22.77 kHz in the manual frequency setting mode, or from 17 Hz to 30 kHz in the automatically swept mode.

Swept oscillators tend to have high levels of

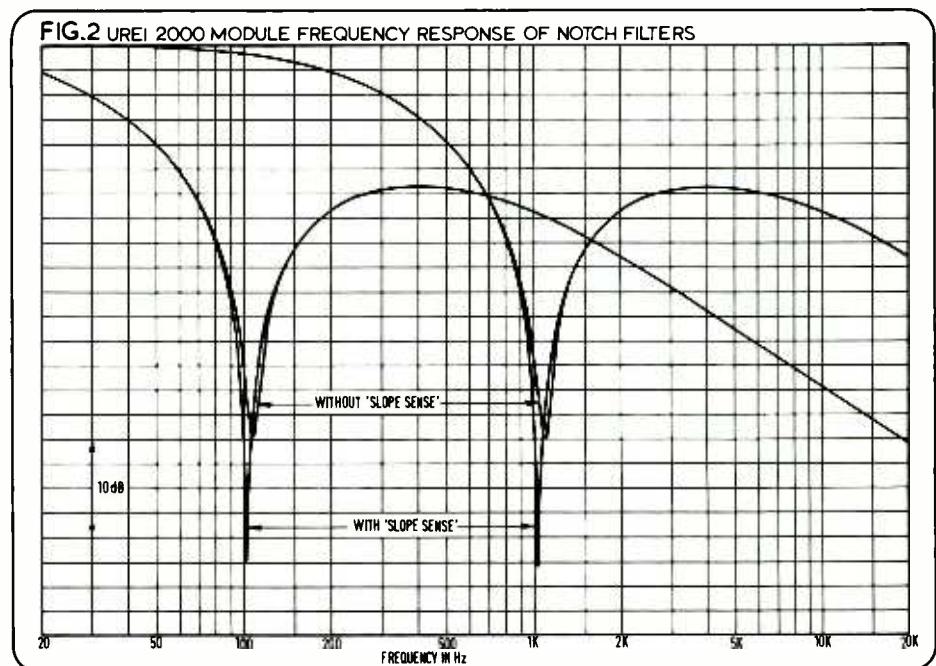
harmonic distortion, and the type 2000 module is no exception. The relatively high levels of high-order harmonics are shown in table 1, but this is of little consequence for the intended purpose of frequency response measurement.

The sweep time from 20 Hz to 20 kHz was slightly longer than the nominal time—with the 15s sweep taking 16s and the 120s sweep taking 130s—but this is not normally of consequence and anyway the variable control

TABLE 2 FREQUENCY STABILITY

| Nominal frequency | Actual frequency |           |
|-------------------|------------------|-----------|
|                   | cold             | warm      |
| 20 Hz             | 19.75 Hz         | 19.67 Hz  |
| 100 Hz            | 98.23 Hz         | 97.90 Hz  |
| 1 kHz             | 996.3 Hz         | 989.0 Hz  |
| 10 kHz            | 9905.0 Hz        | 9824.0 Hz |

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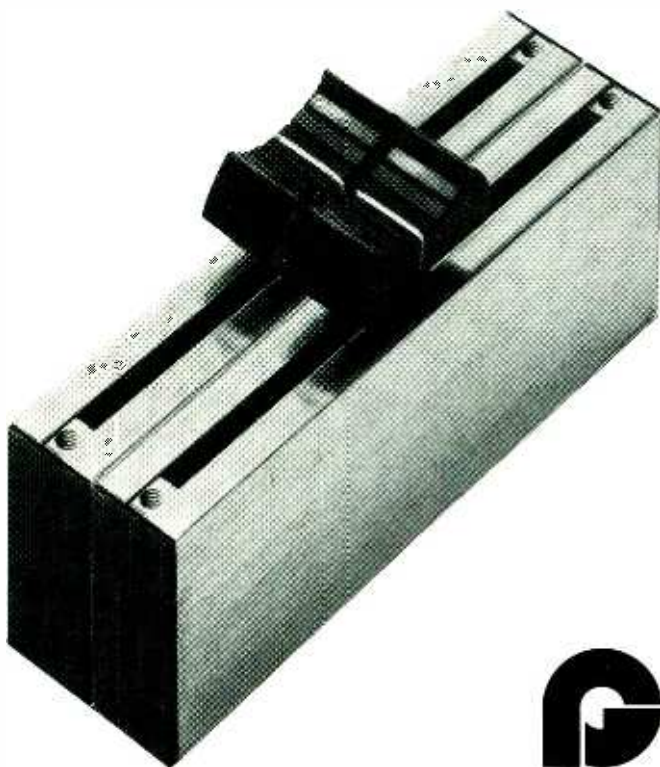
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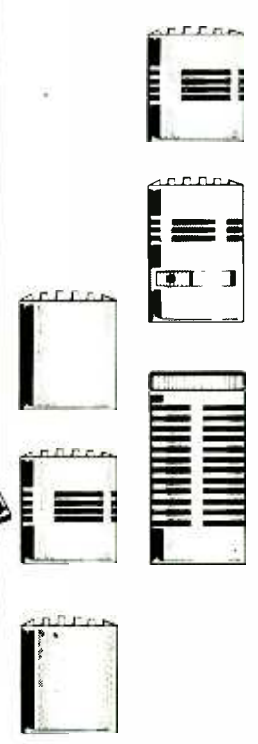
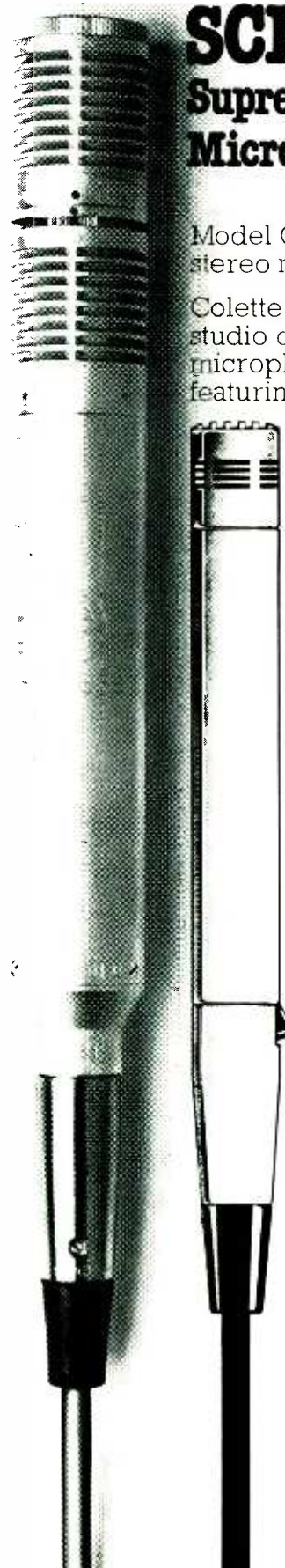
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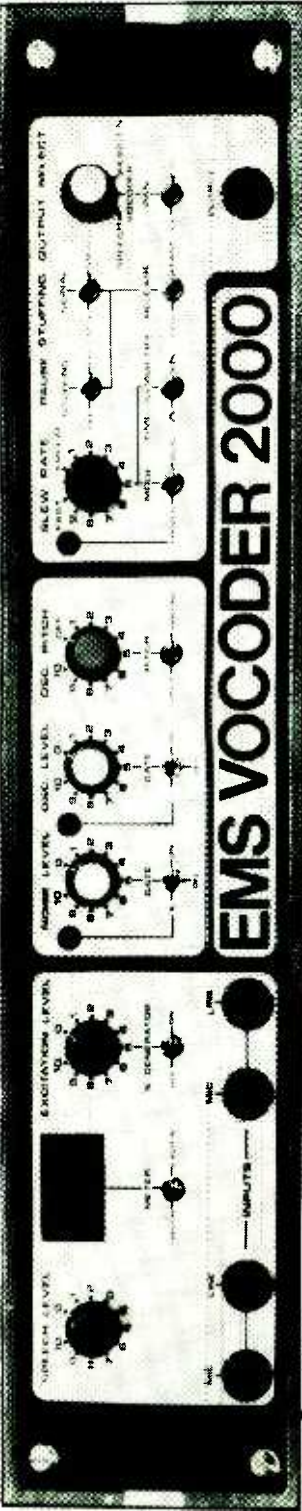


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## UREI 200 SYSTEM

extended the calibration sweep times by a factor of approximately ten times.

Checking the calibrated spot frequency points gave rather disappointing results and showed a degree of warm-up drift (see table 2).

These errors are reflected in fig. 1, which shows the actual pen position for exact frequencies of 20, 50, 100, 500, 1k, 5k, 10k and 20k Hz after the normal calibration procedure using the internal spot-frequency calibration points. Also shown in fig. 1 is the overall flatness of the combined oscillator and receive section, which was within 0.05 dB—a creditable performance in contrast with the frequency accuracy.

The function of the 'slope sense' facility is demonstrated in fig. 2, which shows frequency response plots of 100 Hz and 1 kHz notch filters with and without the use of the slope sense facility for a 15s sweep time. It is to be seen that this facility is potentially a great time saver in production line work, permitting a far faster sweep time than would otherwise be usable.

### Performance of the type 2010 level and frequency detector

Checking the frequencies of the calibration section showed that the nominal frequencies were within 1% of the actual frequencies and that no stability problems existed. The accuracy of the levels at the output was within 0.05 dB for the 20, 100 and 1k Hz frequency settings, but the 10 kHz output was found to be down by 0.3 dB. However, the frequency response of the receive section was such that this error was corrected, giving a resulting apparent flat frequency response. The maximum available output at 1 kHz was +14.6 dB reference 0.775V from a source impedance of 175 ohm, the calibrations on the output level control giving approximate indications of the output level down to -60 dBm.

The input impedance of the receive section was found to be effectively constant with input

**TABLE 3 INPUT SENSITIVITY**

| Range      | Sensitivity |
|------------|-------------|
| 1 dB/inch  | 42.6 mV     |
| 2 dB/inch  | 43.6 mV     |
| 5 dB/inch  | 48.9 mV     |
| 10 dB/inch | 54.8 mV     |

gain setting. It was measured as 55k ohm in parallel with 140 pF rising to 205 pF at maximum sensitivity, the 600 ohm setting giving an input impedance of 595 ohm. Maximum input sensitivity for the pen to rest on the 0 dB line (mid point of the Y-axis) was found to vary with the vertical range setting as shown in table 3.

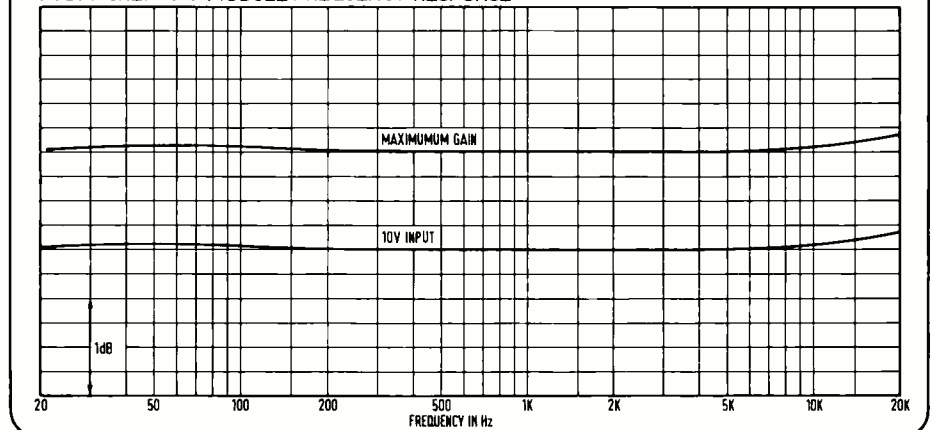
The frequency response of the receive section was found to be such that the plotted level rose by 0.3 dB at 20 kHz at all input gain settings. This is shown in fig. 3 for maximum gain and for 10V input and was apparent for all vertical range settings. Linearity of the vertical scale was generally satisfactory, with the maximum error occurring on the 10 dB/inch range when the worst case error was 0.5 dB over the full 60 dB vertical range. Similarly, the accuracy of the horizontal scale in terms of indicated versus actual input frequency was very good, and depended more on the positioning of the recording paper than the actual accuracy of the pen position. Tracking on the frequency-axis was stable with very poor signal-to-noise ratios at the input; the minimum acceptable input for proper tracking being -63.5 dBm at the receive input or -60 dBm at the sync input.

Checking the rectifier characteristic showed that a genuine rms rectifier was used. The effective pen ballistics were well chosen such that while the pen speeds were high there was no ripple recorded at low frequencies on the most sensitive range.

### Summary

The UREI plotting system offers very useful facilities at far less cost than many alternative systems that tend to include facilities not really necessary for a simple frequency response plotting system. This system functioned well as a pure frequency response measuring device. But it is a shame that it has not been designed so that input and output levels can be measured since this is so much tied up with frequency response in many transmission chains. As has been seen, both modules have certain shortcomings and it is felt that the manufacturer has aimed his specification to too high a standard. However, this is not to say that the units are very valuable tools for normal laboratory and production line work—if due allowance is given for the likely errors in measurements that will not be embarrassing for general maintenance and production line work.

**FIG. 3 UREI 2010 MODULE FREQUENCY RESPONSE**





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# Susan Blue and EMO Direct-Injection Boxes

Hugh Ford and John Atkinson

## SUSAN BLUE DI BOX

### TECHNICAL REVIEW

#### MANUFACTURER'S SPECIFICATION

##### Maximum input:

**Normal** -20 dB  
 1 kHz: 5V (+18 dBm) 50V (+38 dBm)  
 20 kHz: 4V (+14 dBm) 40V (+34 dBm)

**Impedance:** 20 megohm.

##### Mic/line output (Cannon):

20 kHz 2V (+8 dBm)  
 1 kHz 1V (+8 dBm)  
 20 Hz 2V (+2 dBm)

Noise -110 dBm at output balanced into 1k ohm.

##### Low Z output (jack):

1 kHz 5V (+18 dBm)  
 20 Hz 4V (+14 dBm)

Noise -100 dBm at output unbalanced into 10k ohm.

**Distortion:** less than 0.1% thd

**Power supplies:** phantom power: 48V via 2 x 6.8k resistors. Lower voltages may be used but output level capability will be reduced.

Internal supplies: PP3 batteries activated when jack is inserted into either input.

**Price:** £51.50.

**Manufacturer:** Sun Recording Services Ltd, 34 Crown Street, Reading, Berkshire, UK.

THIS *Susan Blue* direct injection box intended for feeding direct from instruments to amplifiers, or from instruments at high or low level to console microphone inputs, offers a very high input impedance for both the high level and the low level inputs.

The 'normal' input was found to have an input impedance of 8M ohm at mid frequencies, while the other input which offers a nominal 20 dB attenuation had an input impedance of 11.4M ohm, both inputs being unbalanced connections in the form of standard 6.35 mm jack sockets.

Two separate outputs are provided: an unbalanced 6.35 mm jack connector and a standard *XLR* microphone plug, the former offering an output impedance of 9 ohm and the latter about 130 ohm. Although the microphone output is transformer coupled it is not a floating connection, because this connector may also be used to remote power the box by the common phantom powering system.

While 48V phantom powering is recommended, lower voltages may be used if a reduced output level can be tolerated. Indeed the normal internal powering is by a 9V *PP3* type battery which only allows output levels just above 0 dBm before the onset of distortion at the microphone output, or some 10 dB



higher at the low impedance output.

When using the external 48V supply +10.4 dBm is available at the microphone output when loaded into 600 ohm, or the equivalent of +12.8 dBm into a high impedance load. A further 10 dB of output level is available at the low impedance output—this level being maintained over the freq. range 20-20k Hz.

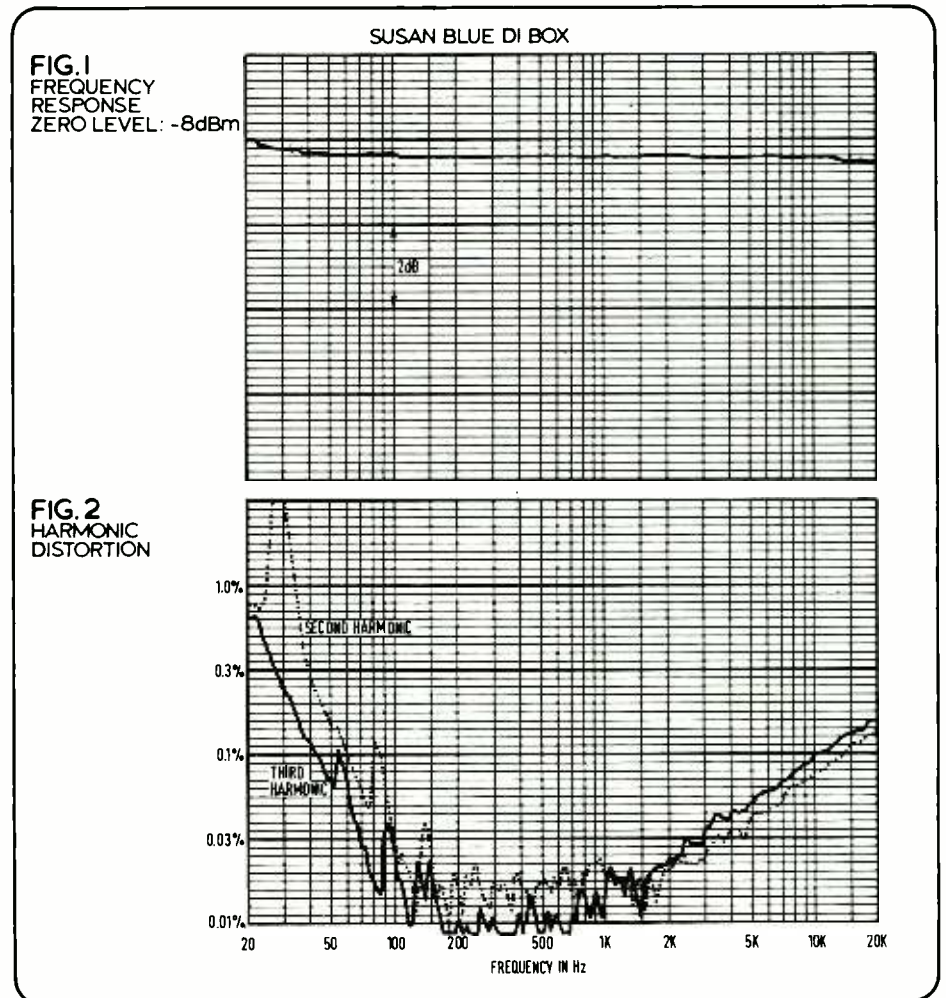
The effective gain from the normal input to the microphone output was found to be -1.5 dB

with the -20 dB input having an actual attenuation of 22 dB, yielding a resulting gain to the microphone output of -23.5 dB. Noise at the low impedance output was found to be -97 dBm rms over the frequency band 20-20k Hz; -98 dBm rms A-weighted; -65.5 dBm rms using CCIR weighting with unity gain at 1 kHz; or -61.0 dBm using a standard quasi-peak meter.

Fig. 1 shows the overall frequency response from the normal input to the microphone output at an output level of 0 dBm, the unit having a good flat response over the audio frequency band. Harmonic distortion when using the 48V external powering and an output level of 0 dBm at the microphone output is shown in fig. 2. It can be seen that the performance above 50 Hz is good. But that there is a rather rapid increase in distortion at lower frequencies leading to poor performance at 30 Hz.

The di box is based on a common type diecast alloy box, with the printed circuit board being attached to the lid by means of the three jack connectors. The board itself appeared to be hand soldered, with rather untidy connections for the transformer terminations and cut tracks in this area. Unfortunately no location is provided for the internal battery which is simply held in position by a rubber sponge, and consequently it is quite easy for the metal battery case to short tracks on the printed circuit board. Similarly, when a battery is not fitted the battery connector must be carefully stowed.

Hugh Ford 86 ▶







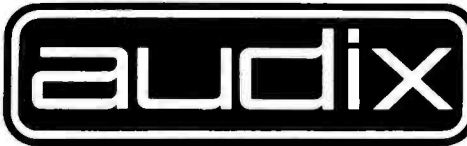
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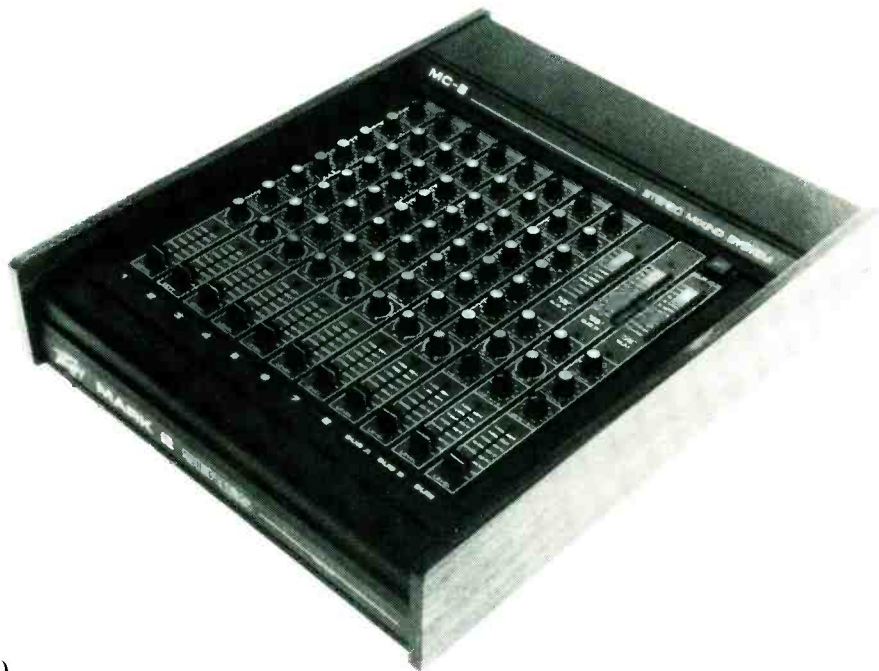
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## EMO DI BOX

### TECHNICAL REVIEW

#### MANUFACTURER'S SPECIFICATION

**Inputs:** Instrument 100k ohm impedance. 20 dB attenuation. Maximum input 1V.

**Slave** 8k ohm impedance. 40 dB attenuation. Max input 30V.

**Speaker** 100k ohm impedance. 60 dB attenuation. Maximum input 100V.

**Frequency response:** 20 Hz to 20 kHz  $\pm 1$  dB (slave input to output loaded with 600 ohm).

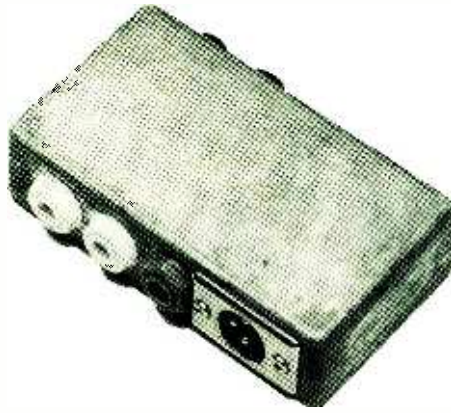
**Output:** fully floating, 3-pin XLR male connector, 10 mV nominal, suitable for impedances from 200 ohm upwards, 250V ac isolation.

**Dimensions:** 115 x 75 x 30 mm.

**Weight:** 0.4 kg.

**Price:** £27 approx.

**Manufacturer:** EMO Systems Ltd, Durham Road, Ushaw Moor, Durham City, UK.



An unlabelled prototype

THIS a direct injection box consists of a transformer-coupled output connection which presents a fully floating unbalanced output, the transformer being fed from the various inputs by resistive attenuators.

These inputs are in the form of unbalanced 6.35 mm standard jack connections with separate inputs for various anticipated input levels. With the output loaded into 600 ohm the two loudspeaker line level inputs offered an attenuation of 61.7 dB with an input impedance of 100k ohm, with the slave input having an attenuation of 39.5 dB and an impedance of 7.7k ohm, and the two instrument inputs having an attenuation of 21.5 dB with one offering an input impedance of 67.3k ohm and the other 980 ohm. With the exception of the latter the attenuation and impedances are more or less to the manufacturer's specification and make sense for their intended purposes, but the latter input seems rather peculiar!

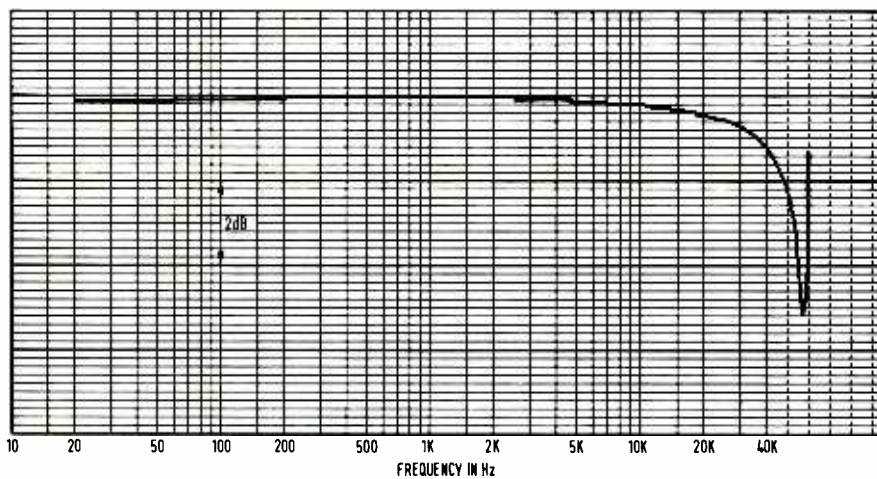
On the output end the impedance varied with the input loading in the case of the low impedance instrument input, but in other cases was about 90 ohm and capable of delivering 0 dBm output with less than 0.1% harmonic distortion over the frequency range 20 Hz to 20 kHz. However, if the low impedance instrument input was driven from a high impedance generator the output impedance rose to an excessively high 44.6k ohm.

The overall frequency response is shown in fig. 1 with the unit driven from the slave input and loaded into 600 ohm, the result being a very flat response beyond criticism.

The standard of soldering in the review sample was not very good, but this unit was a prototype and hopefully not typical of production units. Also, more seriously, the mechanical clearance between the ground side of the inputs and ground of the case, which was connected to the output ground, was too small for comfort.

Hugh Ford

FIG.1 EMO DI BOX FREQUENCY RESPONSE. ZERO LEVEL: -40dB



### OPERATIONAL ASSESSMENT

Susan Blue and EMO

WHEN I was asked to write a user's report on the *Susan Blue* and EMO direct injection boxes, I was at first somewhat perplexed. After all, what is there to write about apart from taking the unit out of the box, plugging in my Fender Precision, plugging the unit into a balanced mic input and playing?

Anyway I took both of them with me when I went down to Sawmills recording studio to play bass on some tracks by singer Bunk Dogger, recently signed by RCA. Sawmills was featured in *Work* a couple of years ago and, for those of you who throw your copies of *STUDIO SOUND* away or pass them on to your kids so that they can cut out the pretty pictures, it's probably best described as the most isolated 24-track studio in the UK, being situated on a creek off the River Fowey in Cornwall. There's no access by road, only by a path, and equipment has to be taken to the studio by boat. Now that's ok if you're a group staying for a couple of weeks. But on a

flying visit . . . to arrive at the nearest village quayside, bass and bass amp (combined weight about 100 kg) in hand and find that a) it's raining, and b) the tide's out is not exactly conducive to creative music-making. However with just a bass and a di box, the studio is just a quick quiet walk away, along a wooded path redolent with the sounds and smells of the Cornish countryside.

Now for the technical stuff. I took the units out of their boxes, plugged in my bass to each one in turn, plugged the boxes into the desk and—they worked! Both units seemed a little sensitive to various hum fields that were floating around, but careful positioning alleviated that. Both gave less output than the one I normally use (a Sawmills special) but they worked fine.

Some bass players I know would decry the use of just a di box for recording the bass: 'Great for synthesisers and the like, but you need to have an amp miked up to get enough bite, as well as giving the other musicians inspiration which you don't get from just hearing the bass over the cans'. However, in several years of recording, I've hardly ever come across an amp (and I've used a lot) which

gave as good a sound as a di'd bass. Best was a Fender *Twin Reverb* but I can't afford to have so much money tied up in a studio amp. How nice to be alone in some warm control room, playing along with the drum track and a guide vocal with your bass, a di box and foot-operated remotes for the Ampex, doing drop-ins so that you can get that perfect bass track which is so much better than any you could actually play. Most of the times I've used an amp it's only to get a sound in the studio for the drummer to relate to; and now we turn his cans up instead.

Where was I? Oh yes, the di boxes . . . they worked fine. The *Susan Blue*, being active, is for stage work as well as recording because the low impedance output would be great for driving that long cable from the stage to the pa mixer. However getting the PP3 battery in is definitely not a job for the fumble-fingered like me! The EMO box is a lot cheaper (and, like the other, housed in a nice indestructible diecast box) and, if you are a studio interested in buying several (to save your maintenance engineer the bother of making them), it would appear to be better value for money!

John Atkinson



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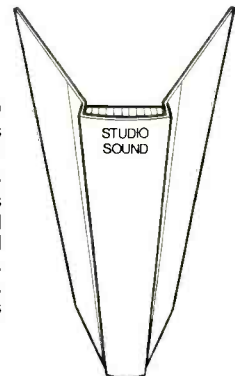
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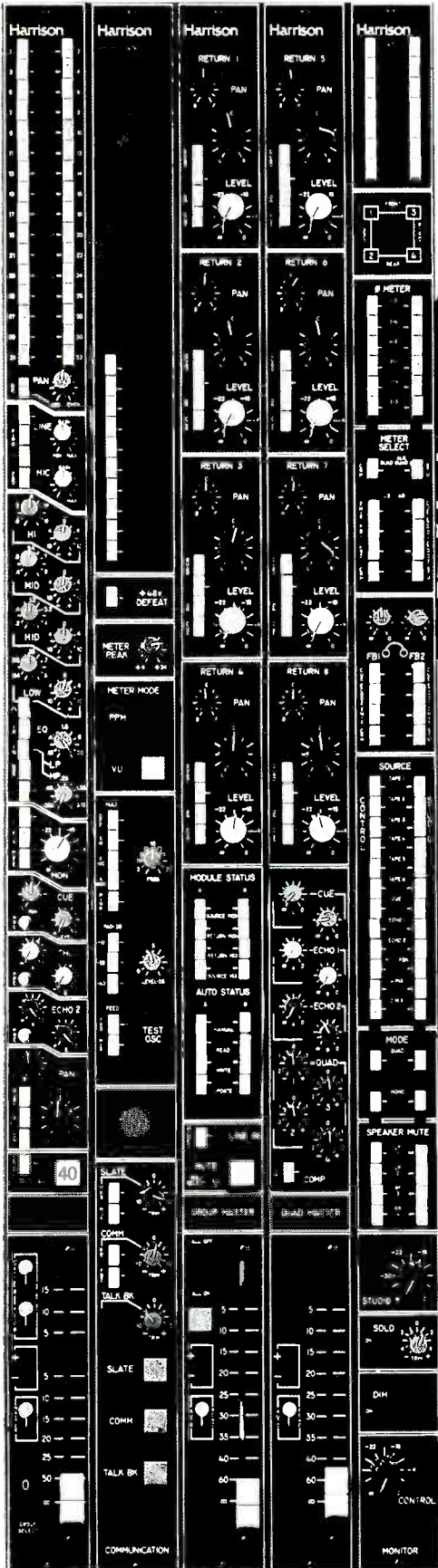
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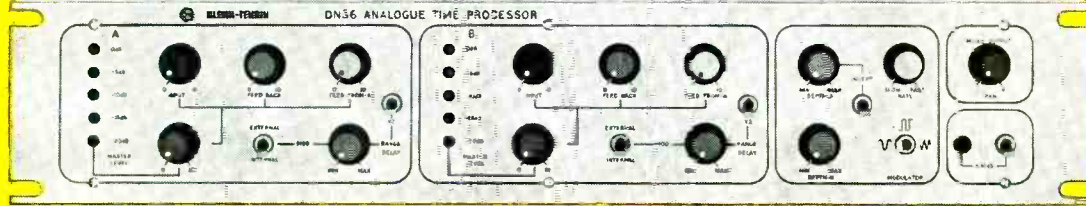
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