

December 1977 50p

# studio sound

AND BROADCAST ENGINEERING



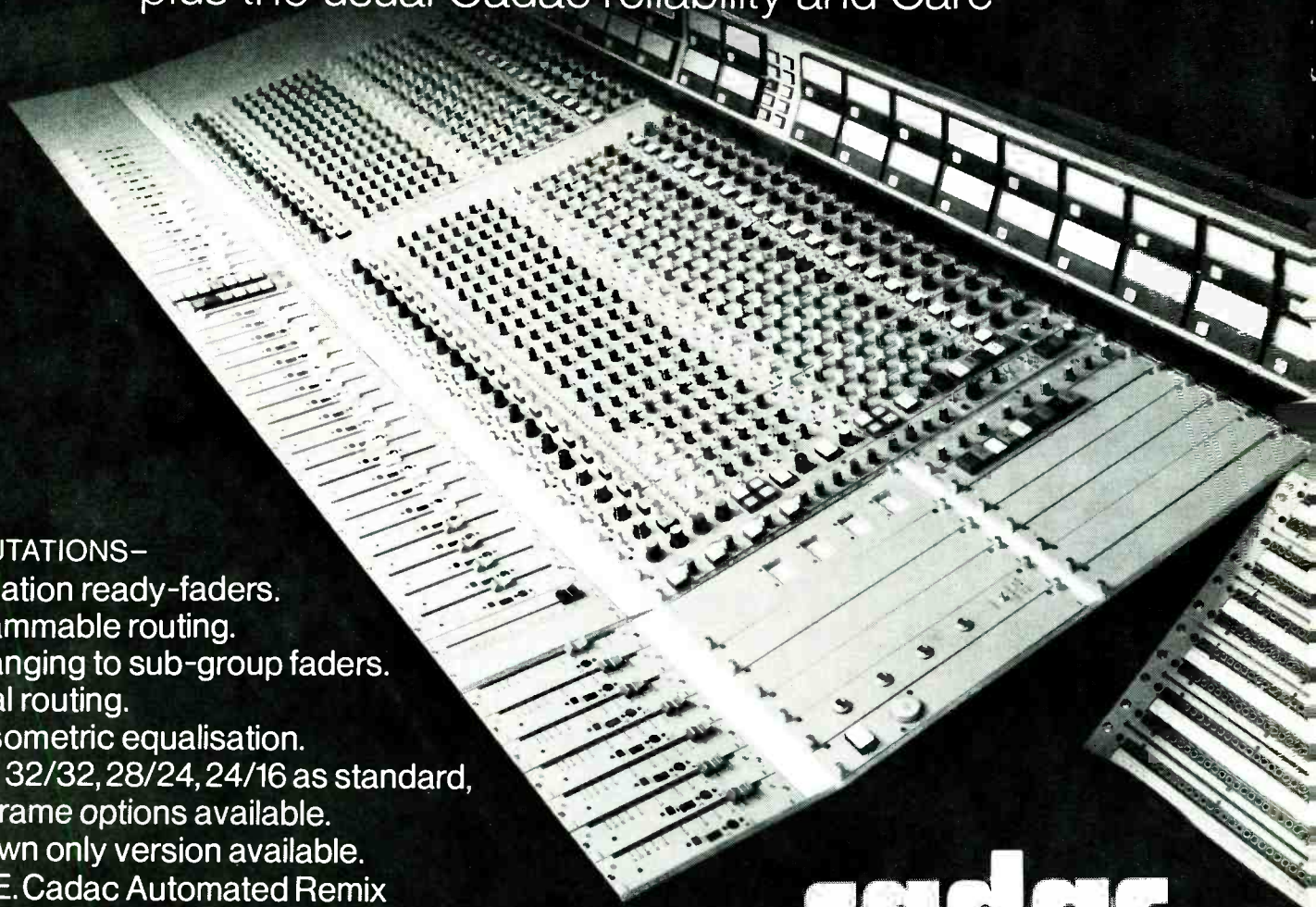
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*STUDIO SOUND is published on the 17th of the preceding month unless that date falls on a Sunday, when it appears on the Saturday.*

#### **SUBSCRIPTIONS**

*STUDIO SOUND is available at an annual subscription of £8.20. All enquiries to: Subscription Dept, Link House, 25 West Street, Poole, Dorset BH15 1LL. Poole (02013) 71171.*

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# studio sound

**AND BROADCAST ENGINEERING**

## **Music is a 5-letter word**

It appears that everybody in the recording industry, except manufacturers of course, is becoming increasingly concerned about the equipment spiral. Although most studios will probably deny that they are 'keeping up with the Joneses', it's a fact of life that installing the latest gear is an important factor in selling studio time. This seems to lay the blame at the door of the record producer who naturally goes for the best; and for best, read latest.

And what's wrong with this approach? It's emasculating the music—that's what. Almost all records at the top of the charts (apart from the 20 Golden Greats syndrome which must also be saying something) achieve their status by being fabricated in vogue—but how long do they last? Current record company 'policy' seems to state that a producer should take the raw material of an up-and-coming group, and run it through the multitrack mincing machine to try and emulate last week's hit sound.

But surely the first record from any new group, recently picked up by some benevolent a & r man, will probably sell just as well if it sounded as much as possible like their stage performance. What self-respecting producer can't do that with eight tracks? When the group is established as a recording group, then is the time to add the overdubs and technical subtleties.

OK, every record company is looking for another Stevie Wonder or Pink Floyd. But as soon as they walk through the door it would be obvious that they're '46-track' material, and could make good musical use of whatever's put at their disposal.

So, a proposition to ponder on these lengthening winter evenings (or on balmy summer evenings for those in the antipodes): restrict every new group to eight tracks. In that way the group can then develop both musically and technically in harmony; and be appreciative of the limitations and advantages of keeping it simple. (The Beatles were perhaps fortunate in that their music developed in sync with technology.) We know that most New Wave groups choose to record 8-track . . . that's a matter of principle . . . but there again, they've got room to expand. If New Wave 'wants' to become sophisticated in the correct sense of the word—because in the eyes of the record company it will sell more—it can.

Walk. Don't Run—1978.

## **contents**

### **FEATURES**

#### **MAKING COMMERCIALS**

Dave Hodge

32

#### **MICROPHONE TECHNIQUES FOR LIVE RECORDING**

Johnny Rosen

36

#### **SURVEY: 2 AND 4-TRACK TAPE MACHINES**

40

### **REGULARS**

#### **NEWS**

24

#### **BUSINESS**

34

#### **WORK**

52

#### **AGONY**

68

#### **INDEX**

78

### **REVIEWS**

#### **TEAC TASCAM SERIES 80-8 TAPE MACHINE**

Hugh Ford

58

#### **REVOX B77 TAPE MACHINE**

Hugh Ford

64

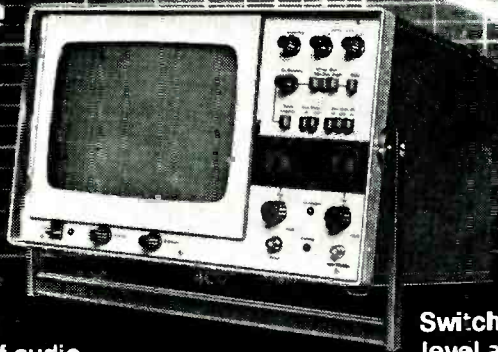
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Hugh Ford

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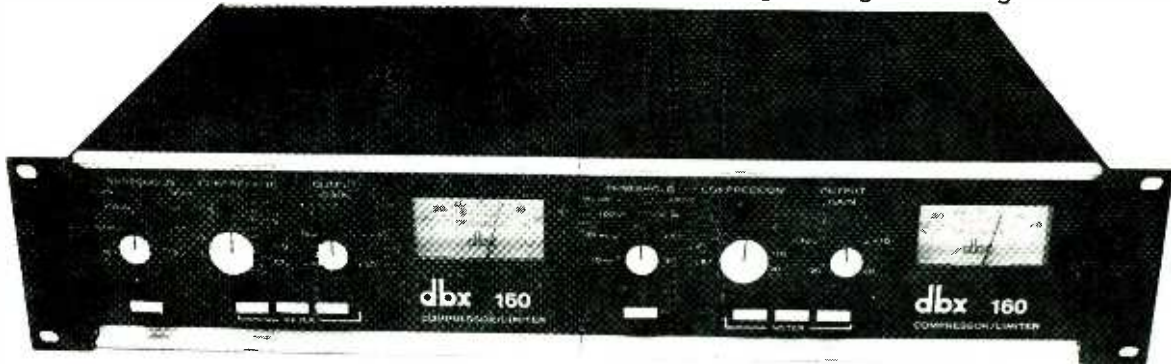


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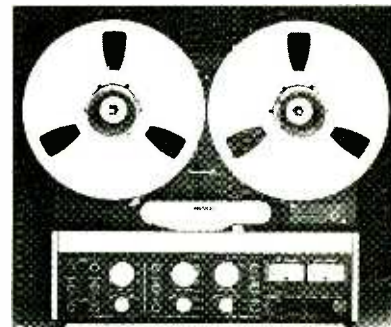
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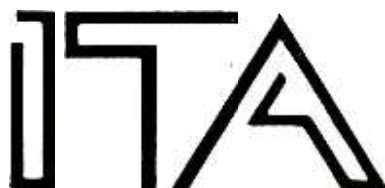
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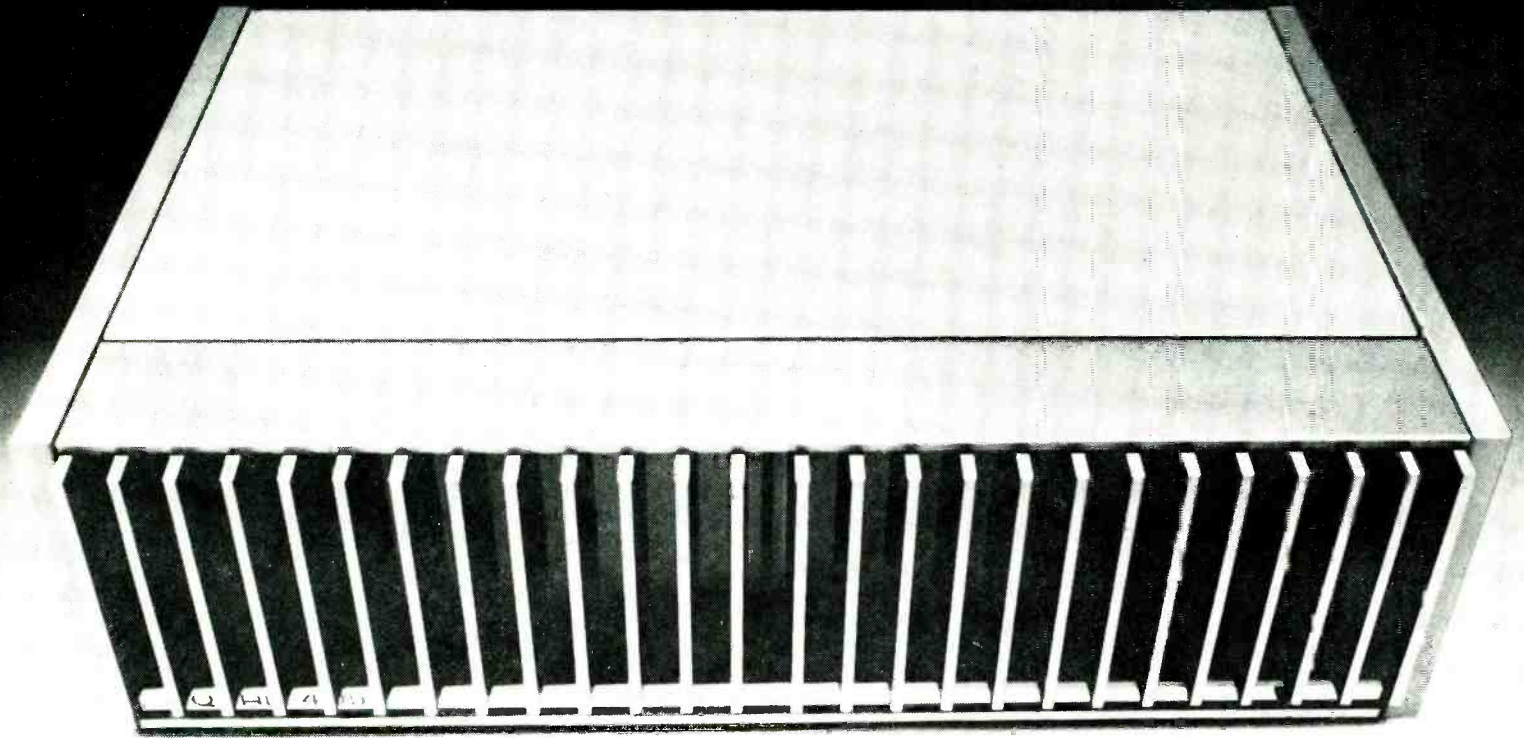


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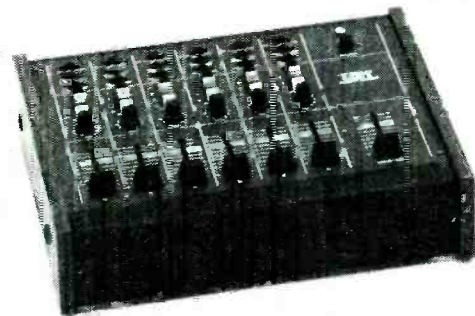


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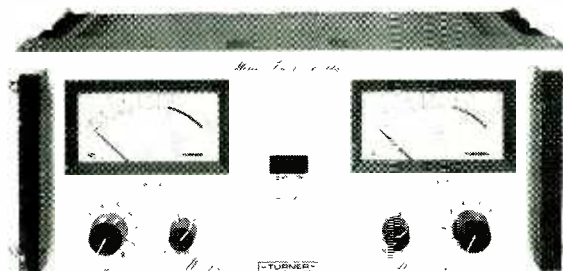
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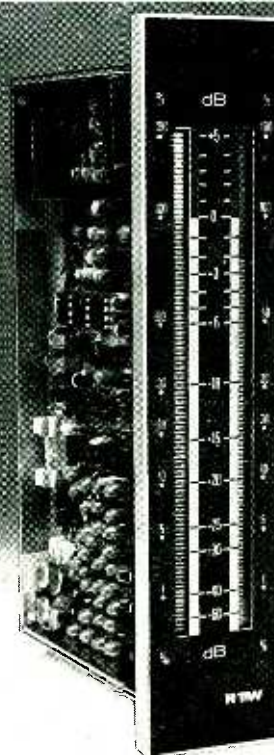
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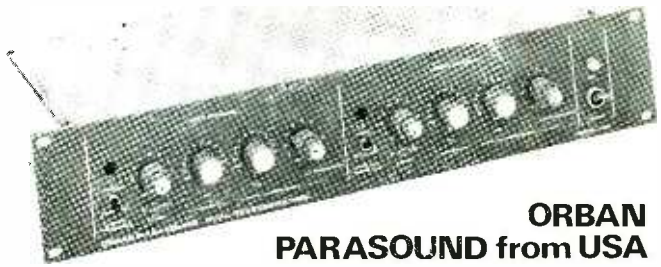
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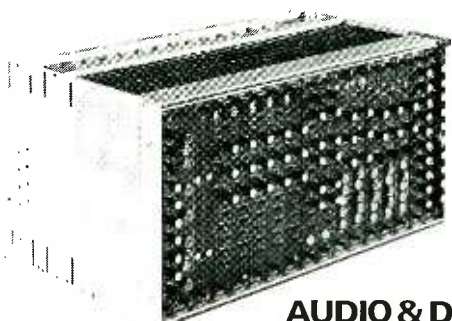
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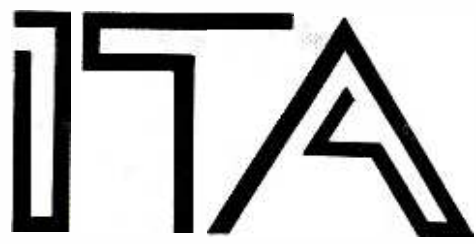


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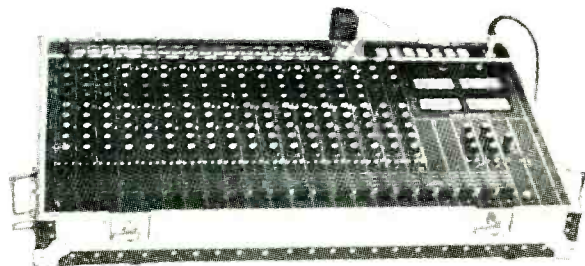
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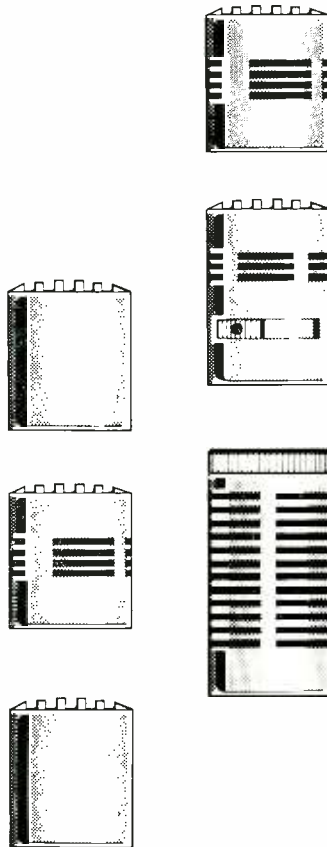
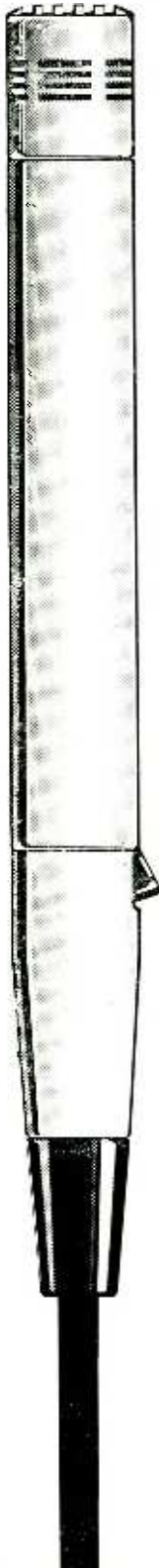
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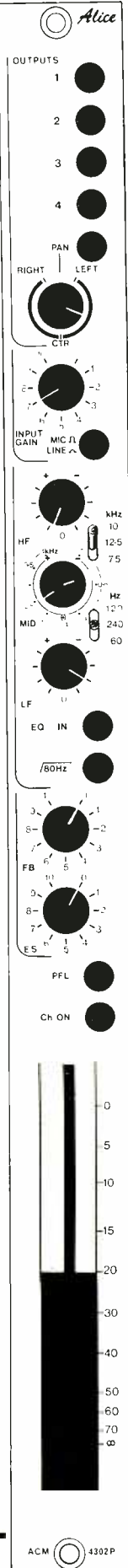
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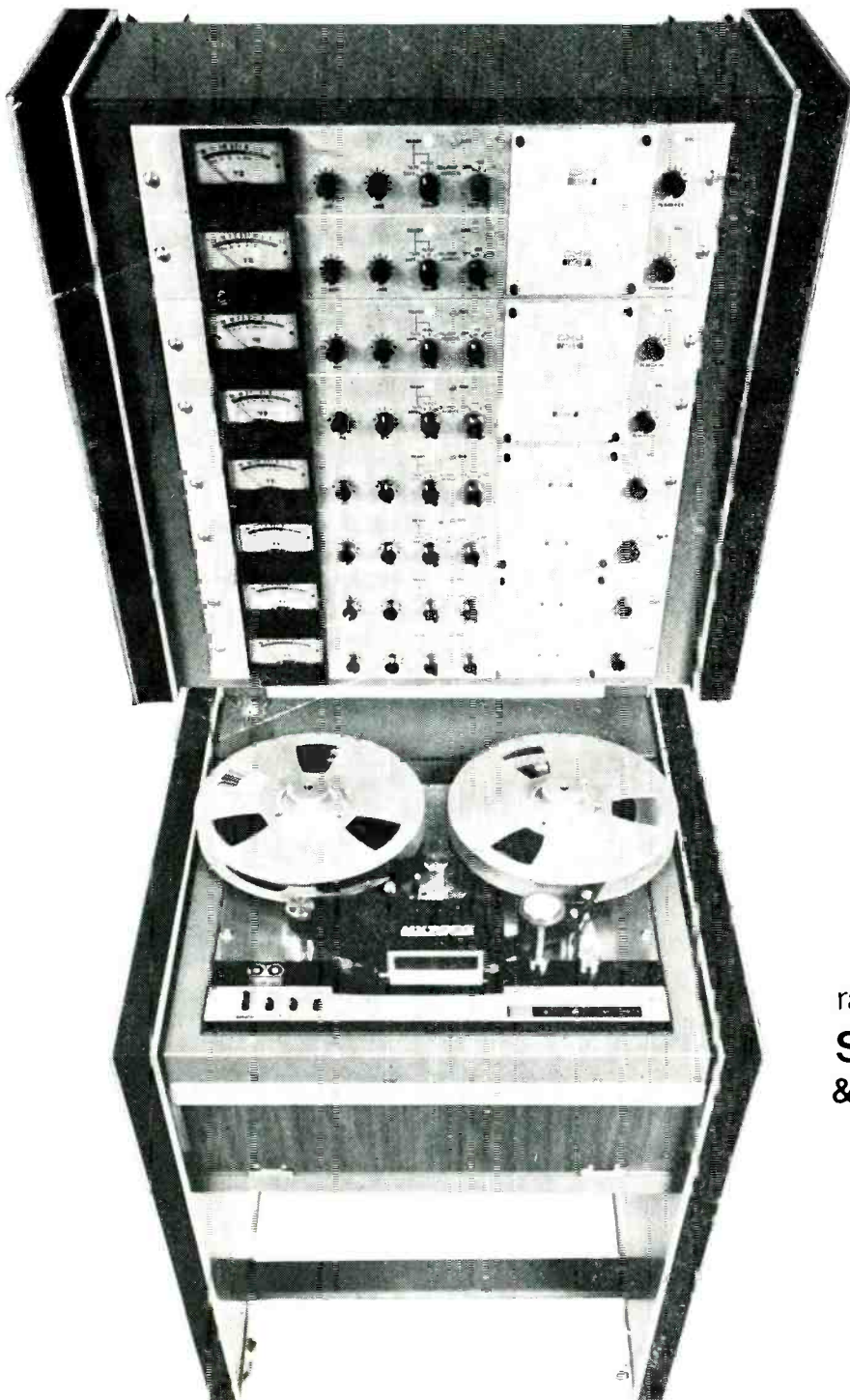
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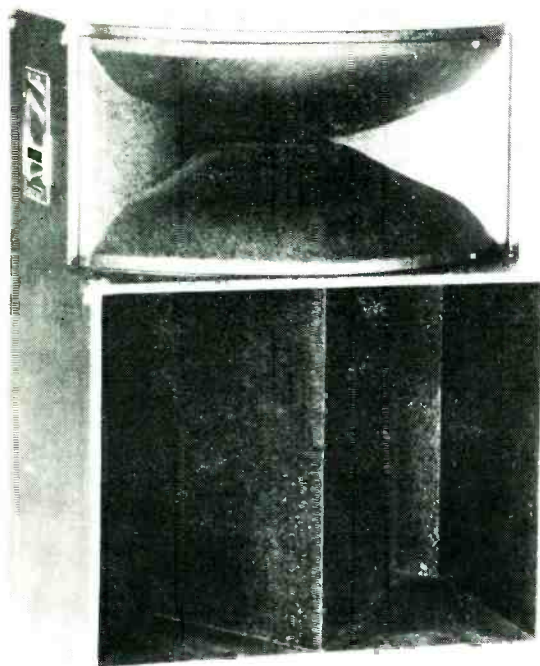
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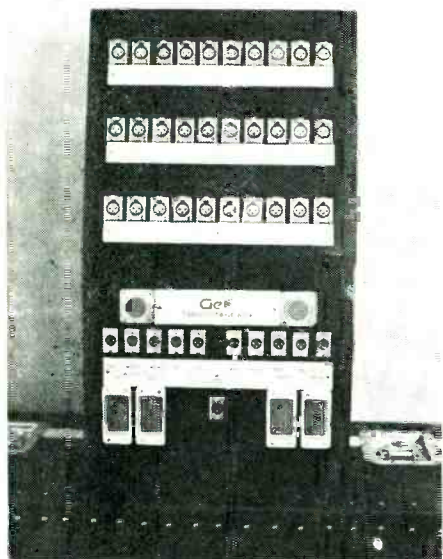
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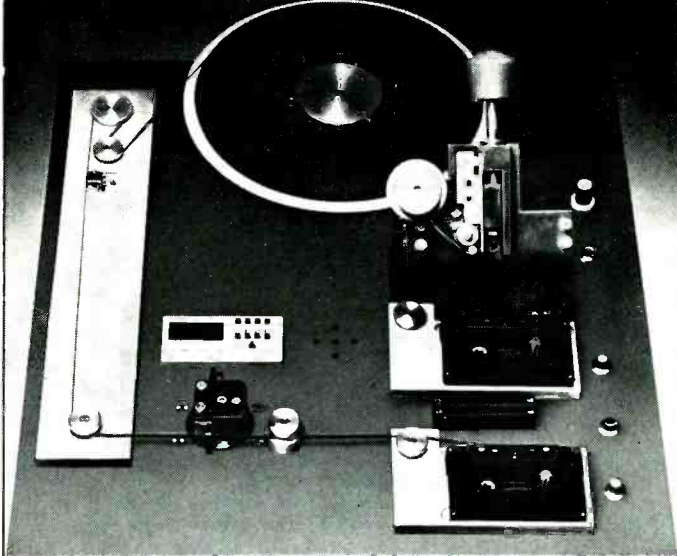


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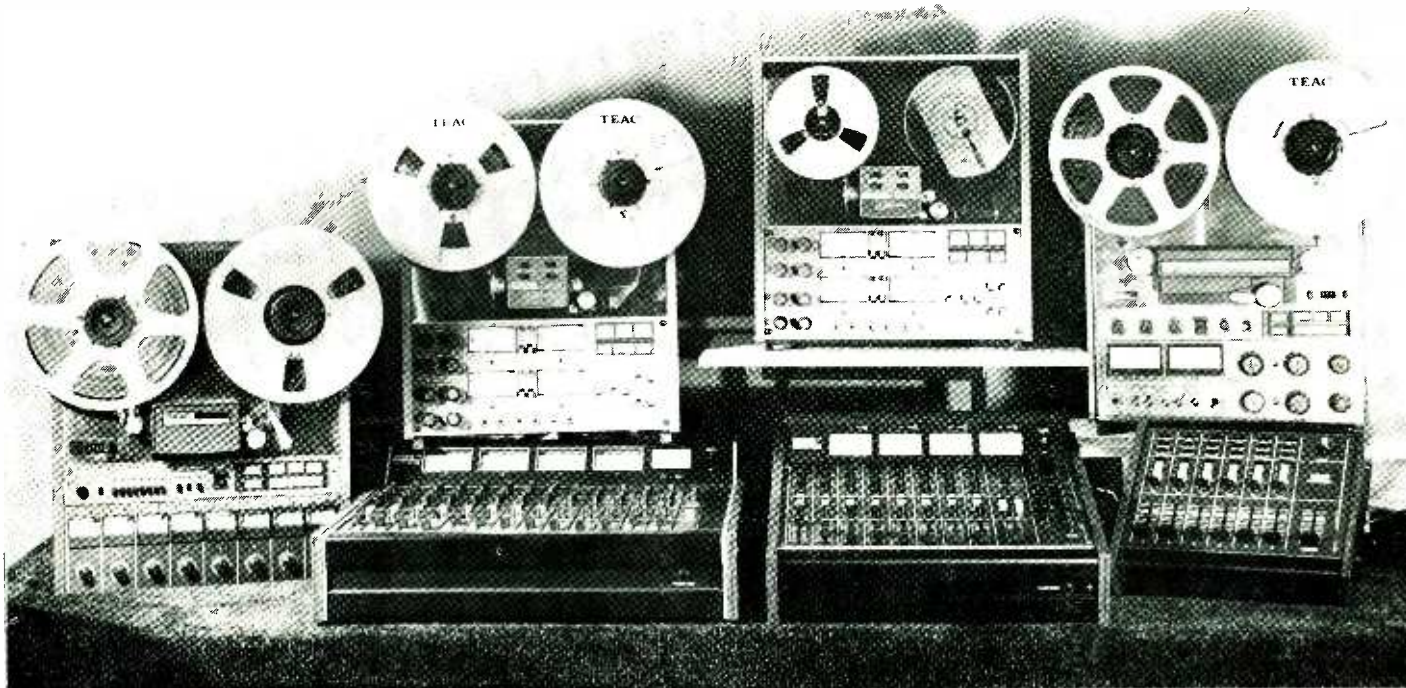
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## TASCAM Model 5

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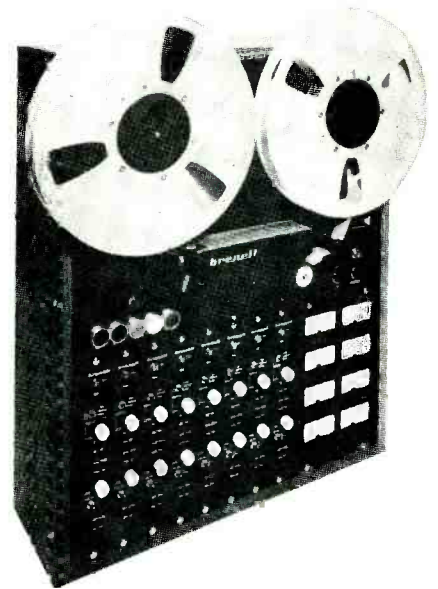
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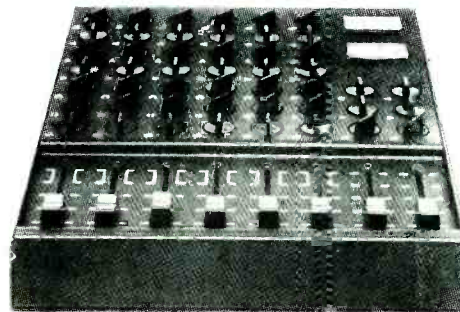
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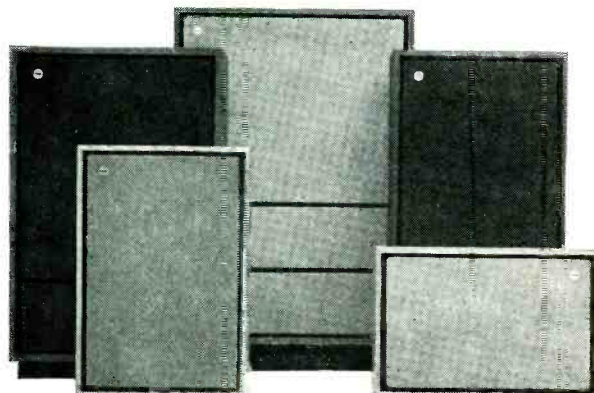
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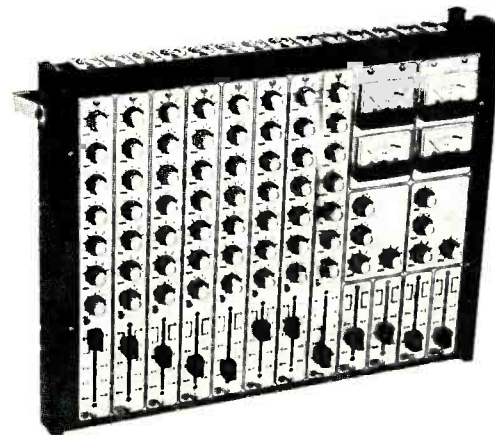
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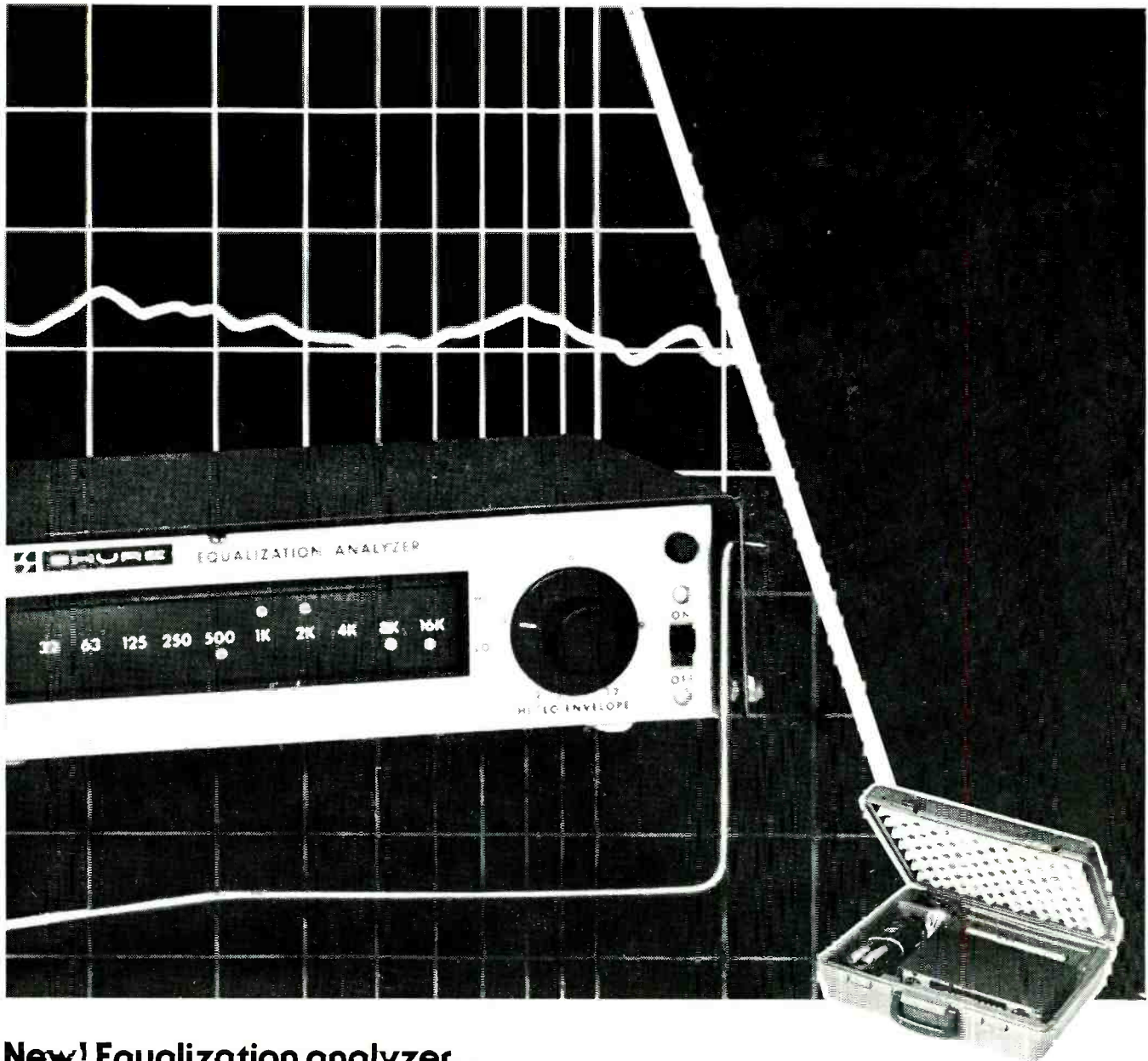
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Quick and accurate adjustment of sound system frequency response is finally within the reach of most budgets. The Shure M615AS Equalization Analyzer System is a revolutionary breakthrough that lets you "see" room response trouble spots in sound reinforcement and hi-fi systems—without bulky equipment, and at a fraction of the cost of conventional analyzers.

The portable, 11-pound system (which includes the analyzer, special microphone, accessories, and carrying case) puts an equal-energy-per-octave "pink noise" test signal

into your sound system. You place the microphone in the listening area and simply adjust the filters of an octave equalizer (such as the Shure SR107 or M610) until the M615 display indicates that each of 10 octaves are properly balanced. You can achieve accuracy within  $\pm 1$  dB, without having to "play it by ear."

Send for complete descriptive brochure.

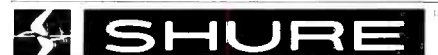
Shure Electronics Limited  
Eccleston Road  
Maidstone ME15 6AU  
Telephone: Maidstone (0622) 59881

#### TECHNICORNER

The M615 Analyzer's display contains 20 LEDs that indicate frequency response level in each of 10 octave bands from 32 Hz to 16,000 Hz.

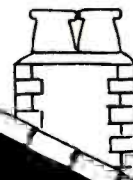
A rotary hi/lo envelope control adjusts the HI LED threshold relative to the LO LED threshold. At minimum setting, the resulting frequency response is correct within  $\pm 1$  dB. Includes input and microphone preamplifier overload LEDs. A front panel switch selects either flat or "house curve" equalization.

The ES615 Omnidirectional Analyzer Microphone (also available separately) is designed specifically for equalization analyzer systems.





# All under one roof

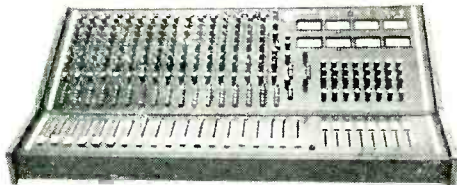


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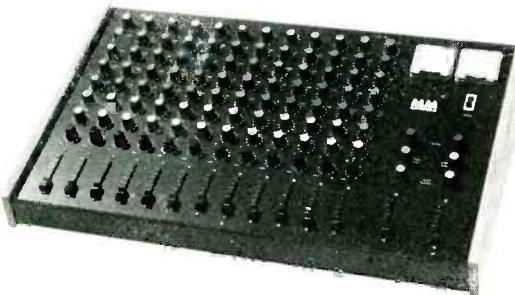
The unparalleled range of facilities include: full EQ on all channels, remix controls, LED overload indicators, pre and post fade cue send, output routing, comprehensive monitoring, plus much more. Full details and specs on request. Price dependent on configuration.

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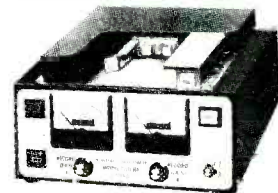


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Electronically controlled reverberation and delay effects are a reality today with the Eventide *Model 1745M Digital Delay System*. Unequalled versatility and portability combine with studio quality specs to provide the optimum solution to any delay line requirement. Pitch change card optional.

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The Eventide *Harmonizer* may well be the most versatile special effects instrument ever packaged in a single chassis! Judge for yourself it's a full-fledged Digital Delay Line including a pitch changer with a 2 octave range. An anti-feedback unit allows boosting sound levels. It can be used to speed up and slow down tapes and can create some of the wildest effects on record.

## INSTANT FLANGER

Old model phasing units used analog circuitry to modify the frequency spectrum. Eventide's *Instant Flanger* uses a true time delay circuit, producing many more nulls and thus a much deeper effect than previously available with an all-electronic unit.

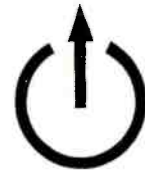
## OMNIPRESSOR

The Eventide *Omnipressor* is a professional-quality dynamic modifier, combining the characteristics of a compressor, expander, noise gate, and limiter in one convenient package. Its dynamic reversal feature makes high level input signals lower than corresponding low level inputs.

## The choice of these professionals

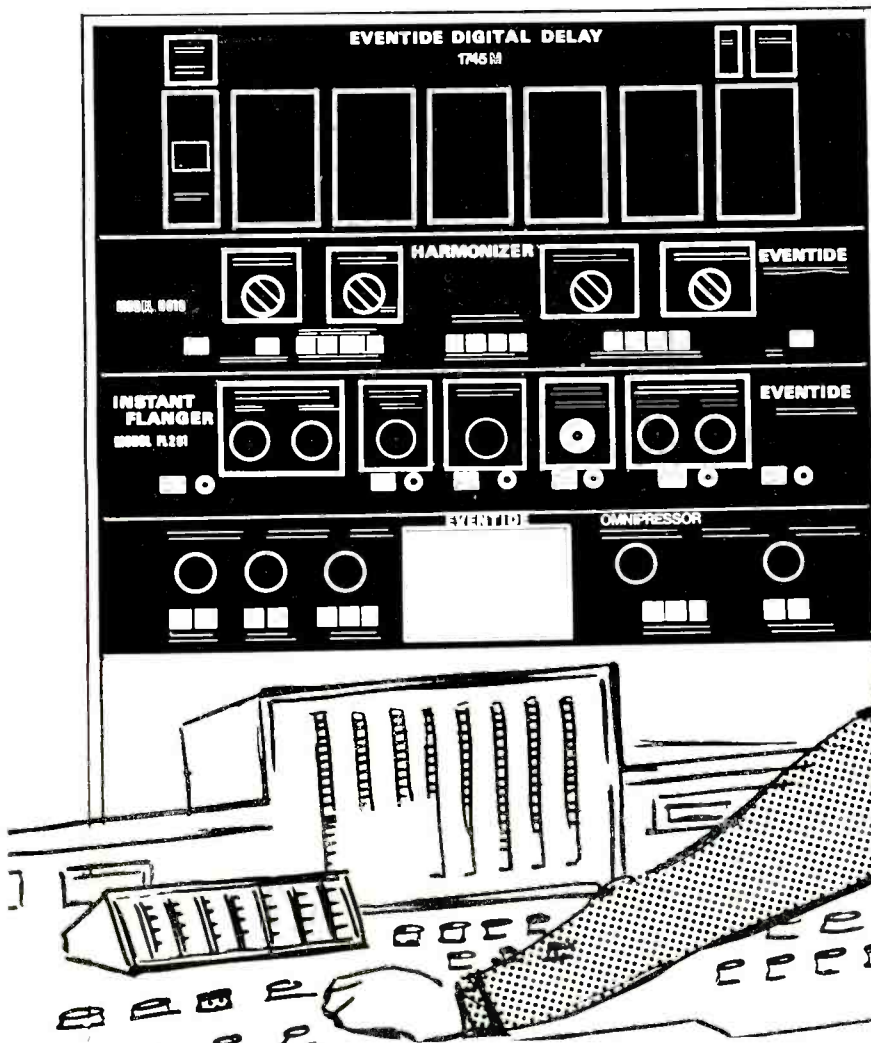
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## Immobile

Maison Rouge has opened a new purpose-built 24-track studio in Fulham, London. The control room sports a Helios 32/24 console equipped with vca faders and eight subgroups linked to an Allison 65k programmer. The studio proper can accommodate up to 25 musicians, and houses a specially-designed musical director's rostrum equipped with comprehensive talk-back facilities.

The console features 3-band parametric eq on the first 24 channels, and 4-band eq on the remaining eight. This allows extra equalisation to be put on only those tracks that really need it. Four foldback, four echo sends and stereo returns are provided. Main and auxiliary metering is on vus, plus switchable ppms for monitoring individual tracks.

A Helios-built interface controls and displays the status of the Dolby noise reduction system. Other signal processing gear includes four UREI graphic equalisers, four UREI peak limiters, Eventide and Lexicon digital delay units, Eventide *Instant Flanger*, two Audio & Design compressor-limiters, four Allison *Kepex* limiters and a Marshal *Time Modulator*. Echo is provided by EMT and MICMIX units. Monitoring is via Amcron *DC300A* amps linked to Tannoy's in Lockwood cabinets. Tape machines are Studer *A80s*: a 24/16-track, three 2-tracks and one 4-track.

The mobile can also be brought into service if required. A desk-to-desk link allows duplicate tapes to be made during a session, or a tape mixed in the mobile to be replayed in the studio.

Maison Rouge, 2 Wandsworth Place, Fulham Broadway, London SW6 1DN. Phone: (01) 381 2001.

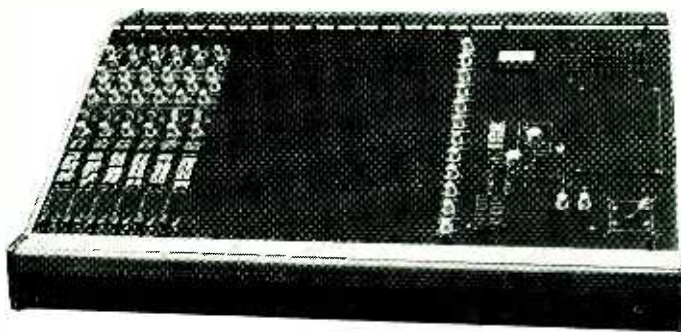
## IVIE in UK

FWO Bauch has been appointed UK agents for the company's sound analysers. These include the *IE10A* spectrum analyser and *IE20A* self-contained pink noise source (see January '77 issue, p40) plus the *IE15A* accessory for making distortion measurements on the *IE10A* (see October '77 issue, p20).

## EECO brochure

General specifications, features, controls, operation and applications of the *MQS-100* synchronisation system are described in a new 12-page brochure. The microprocessor-based system can cue and synchronise three magnetic tape transports, including video, audio and mag film. The SMPTE/EBU edit code used for indexing the tapes need not be identical, and tapes with drop-frame and non-drop-frame formats can be intermixed.

Copies of the brochure are available from Ampex sales offices, or direct from EECO Broadcast Products, 1441 East Chestnut Avenue, Santa Ana, Ca 91701, USA. Phone: (714) 835 6000.



## Theatre console system

Libra Electronics has introduced a new range of desks developed primarily for use in theatres and conference/arts centres, where live sound reinforcement and the reproduction of music and effects from tape or disc are required. The system is of modular construction for ease of maintenance and subsequent expansion to larger formats.

Of particular interest is the flexibility of input and output selection. To each module can be selected any input and any combination of outputs, thus allowing a single input to be assigned through any fader to any configuration of outputs. Furthermore, because of a network of input busses a single input can be assigned to several faders. This allows cues to be preset on inactive modules without affecting those in use. The number of inputs and outputs available does

## Stereo am system

Harris has released details of the new *CPM* (compatible phase multiplex) system for stereo am broadcasting. A modified 'quadrature' system, the *CPM* consists of right and left channel sideband pairs being transmitted at  $\pm 15^\circ$  from the carrier. The technique is claimed to involve absolutely no increase in occupied bandwidth or spectral density, thus eliminating interference problems. Unlike the transition in fm broadcasting from mono to stereo, there should be no loss of 'catchment area' with the new system.

Tests conducted by Harris show that existing integrated circuits can be used for the *CPM* stereo receiver. Furthermore, since bandwidth is no greater than that required for monaural am, there is good envelope-detector compatibility, even with narrowband receivers. And, unlike non-linear systems, the *CPM* does not require flat receiver response and complex distortion correction functions. Other performance benefits claimed for the new system include loudness equal to the monaural signal (unlike fm which has a loudness reduction when

going from mono to stereo); a stereo pilot indicator; and no stereo breakup with high modulation. Harris Corporation, Broadcast Products Division, PO Box 290, Quincy, Ill 62301, USA. Phone: (217) 222 8200.

## Electronic optical recording

Westrex has announced a new electronic system for recording optical soundtracks using conventional Westrex light valves. The *Nuoptix FR-1* is designed for simple retrofit upgrading of existing systems, or for incorporation in new Westrex recording channels. The old constraints of optical tracks are said to be eliminated by providing greatly improved transient characteristics and frequency response to 12.5 kHz.

The system uses direct feedback coupling to the light valve and an analogue signal delay in a special anticipatory noise-reduction circuit. This assures that the optimum noise-reduction envelope is used to reduce valve clash on transients, and minimise valve opening for optimum signal-to-noise performance.

Westrex, 390 North Alpine Drive, Beverly Hills, Ca 90210, USA. Phone: (213) 274 9303.

## Audio-Cord/Lee Engineering

The American manufacturer of NAB cartridge machines recently appointed Lee as its sole UK agent. Latest models feature 'true elapsed' time on a digital indicator; full access to control presets through the front panel; a pressure-regulating solenoid coupling said to reduce tape skew; and solid-state switching. Mono or stereo versions with single and treble cue options are available.

Lee Engineering, Napier House, Bridge Street, Walton-on-Thames, Surrey KT12 1AP. Phone: Walton-on-Thames 43124. Telex: 928475.

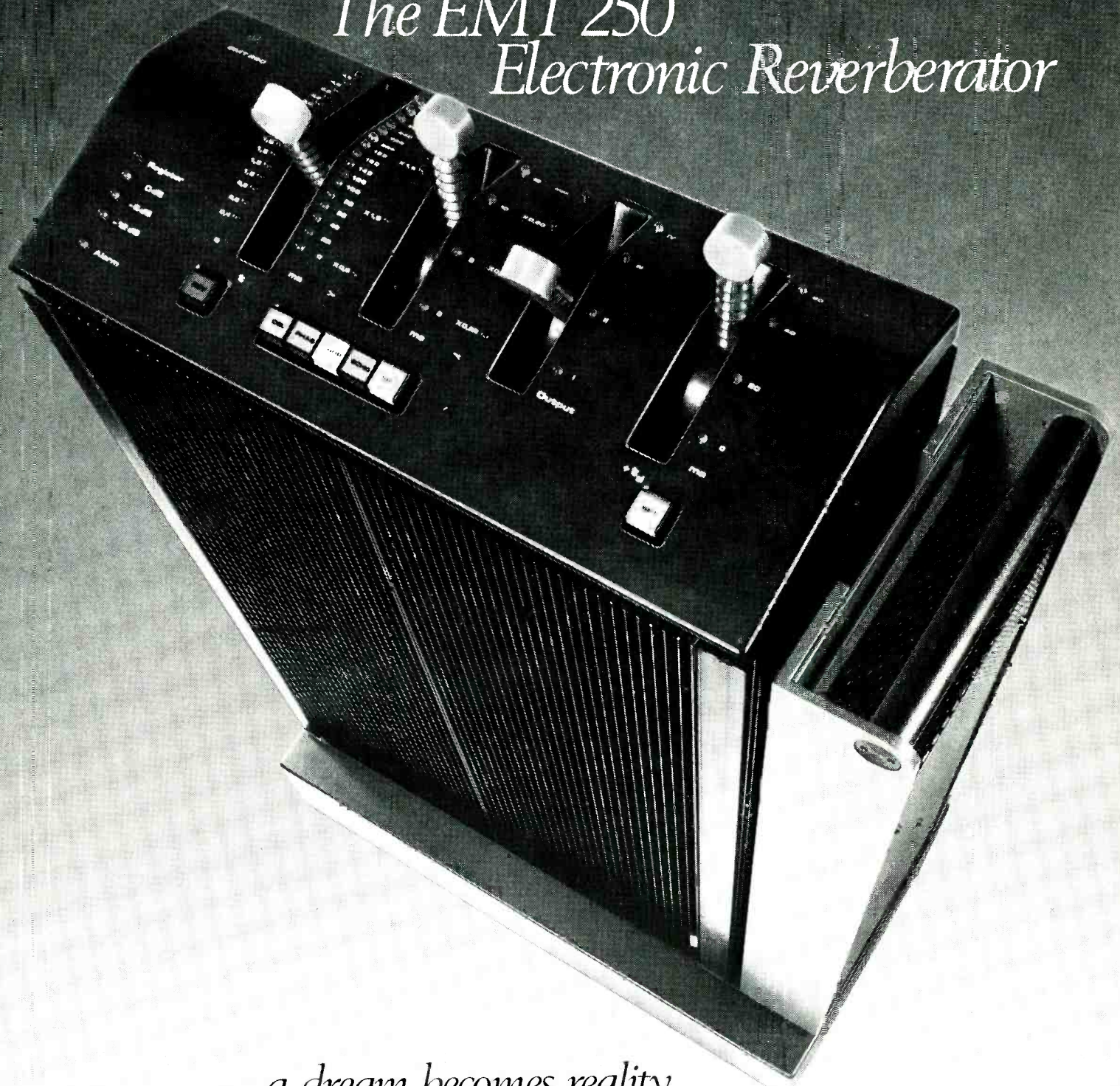
## High-output NAB cartridges

Fidelipac has introduced a new high-output tape for its *300*, *350*, *600*, *1200* and *Master Carts*. Known as *TAS-500*, the new material is said to deliver up to 6 dB greater output over that of normal tape, which means less tape noise, increased headroom and reduced im. The tape is also available in bulk for reloading carts.

Fidelipac, 109 Gaither Drive, Mount Laurel, NJ 08057, USA. Phone: (609) 235 3511. 26 ▶



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### Neal acquire Ferrograph

North East Audio Ltd has taken over the assets and products of the Ferrograph Company from its former owners, Wilmot Breedon. The acquisition was funded by an investment of some £400 000 in NEAL by the National Enterprises Board, who become a substantial minority shareholder.

The company will move its operations to the Ferrograph factory at South Shields, from where it will manufacture and market the Ferrograph products alongside its own range of cassette machines. Production of the *Studio 8* tape machine and the *RTS* and *ATU* test equipment has also been transferred to South Shields. It is possible that the new *ARA 1* audio response analyser (reviewed in the May 1977 issue, p76) will be manufactured by both NEAL and Wilmot Breedon, but a firm decision has yet to be made.

Back in the driving seat at Ferrograph will be Alan Helliwell, who left the company in 1972 to form NEAL. Moving with him to South Shields will be technical director Dr Duncan Mitchell, and Tom Batey as financial and production director. A new addition to the NEAL board is sales director Richard Farnell.

All enquiries for NEAL and Ferrograph products in the UK should be directed to the Sales Office, Simonside Works, South Shields, Tyne and Wear NE34 9NY. Phone: South Shields (0632) 566321.

Hammond Industries will retain responsibility for marketing Ferrograph gear in the US; they may eventually be given the same job for the NEAL range. Their address is 155 Michael Drive, Syosset, NY 11791. Phone: (516) 364 1900. Telex: 961396.

### Fm reference receiver

The BBC regularly release engineering design information sheets describing designs that are available for licensing. Often such designs are pretty novel, since the Beeb is well-known for its ability to design and manufacture electronic gear for its own use, and which cannot be obtained from conventional sources. The majority of BBC-designed equipment is available to British industry for commercial exploitation under a manufacturing licence agreement, and many such licences are in force.

The latest batch of information sheets are concerned mainly with tv—a low-noise video amp and a pulse delay unit, for example—but one should be of interest to companies making radio broadcast

equipment. The *RC1/12* is a high-sensitivity band II stereo receiver for monitoring an fm transmission signal. Channel selection from 88-108 MHz is by means of a pre-tuned crystal oscillator, but can be altered once installed by changing the crystal and making a few adjustments.

Further information is available from Steve Snook, Design Department, BBC, Broadcasting House, London W1A 1AA. Phone: (01) 580 4468 Ext 4345/4325.

### Monitor loudspeaker

Its compact size, low coloration and 'clean and well extended' bass response are said to make the new Lentek *S1* suitable for low-level studio and broadcast monitoring. Two drive units are utilised: a 200-mm bass/mid-range, and a 25-mm hemispherical dome tweeter for frequencies above 2.5 kHz.

Extract from manufacturer's specification:

**Impedance:** 8 ohm nominal.

**Sensitivity:** 78 dBA spl at 1m for 2.83V applied (anechoic).

**Power handling:** 100W peak music programme.

**Frequency response:**  $\pm 3$  dB, 60-18k Hz.

**Dimensions** (h x w x d): 495 x 250 x 255 mm.

**Weight:** 11.7 kg.

The *S1* costs approximately £180. Lentek Audio Ltd, Edison Road, Industrial Estate, St Ives, Huntingdon, Cambs PE17 4LF, UK. Phone: St Ives (0480) 62225. Telex: 32303.

### Sound field microphone

Calrec has released further details of the microphone setup used in recent IBA/Radio City experimental broadcasts of the NRDC Ambisonics surround-sound system (see last month's issue, page 30).

The mic contains a closely-spaced array of capsules, and utilises a sampling technique to characterise the first-order directivity of the sound reaching it.

The four outputs generated by the mic are 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*, any first-order microphone characteristic can be synthesised; that is any combination of omnidirectional, cardioid, hypercardioid or figure-of-eight.

Although, in theory, any number of microphone types could be produced, Calrec tells us that the most conventional format will be outputs for one stereo pair and a mono. A special microphone control unit allows the angle between the two (virtual) microphones of the pair to be varied, as well as their directivity patterns (including, in the case of hypercardioids, the position of the nulls). It will also be possible to pan or tilt the stereo pair in any direction.

It is claimed that the sound field microphone offers an additional advantage. Over most of the audio spectrum the 'stereo pair' are strictly coincident, thereby reducing the phase-error (which in the usual

type of close-spaced stereo pairs can exceed 180° at high frequencies). In addition, the four *B-format* signals can be recorded directly on tape, and used to re-create a variety of microphone positions and response characteristics on subsequent playback.

Calrec Audio Ltd, Hangingroyd Lane, Hebden Bridge, Yorkshire HX7 7DD. Phone: Hebden Bridge (042284) 2159. Telex: 517479.

### IBA propose ILR expansion

Included on the IBA's list for the next phase of growth in the ILR network are Cardiff, Tayside, Aberdeen, the Fylde in Lancashire, Bournemouth, Coventry, Northampton, Luton, Norwich, a West Yorkshire site (such as Huddersfield), Peterborough, Southend, Gloucester/Cheltenham, Exeter/Torbay, and the western side of Northern Ireland. The main aim is to bring ILR coverage to areas of the UK where no form of local radio (meaning, presumably, the BBC also) now exists.

Initially the IBA plans to select six or eight locations from the list of 15 as the first batch in the expansion. Also suggested is the introduction of 'associate' stations developing from the existing franchise areas, and the 'twinning' of pairs of small stations. In addition, there are plans to create a new style of ILR station offering extensive rural coverage, possibly located in the Highlands, Wales, or Lincolnshire.

Net advertising revenue has been growing for the present 19 stations. For the year ending July 31 1977 it was £17M, 60% above the previous year; for the three months to July 31, the revenue was running at an annual rate of £20M.

### Back to school

The latest issue of *MCI News and Views* (volume 1, number 4) gives details of the company's week-long product training course, which is held at their Fort Lauderdale headquarters for MCI equipment owners and maintenance personnel. Due to the length and 'intensity' of the course, each school session will be limited to a maximum of ten students. With certain exceptions due to public holidays, courses begin on the first day of every other month; the next one starts on January 9.

Reservations and details of available dates can be obtained from: Terry Stewart, MCI Service Department, 4007 NE 6th Avenue, Fort Lauderdale, Florida 33334, USA. Phone: (305) 566 2853. 28 ▶



The wiring shop at Neve's new factory at Melbourn, Hertfordshire, which provides nearly 1900m<sup>2</sup> of extra production facilities. Annual turnover is now in excess of £3M, with over 80% of the products destined for export. Consoles are installed in some 58 countries. The company has certainly come a long way since its founder, Rupert Neve, built a mixer in his living room in the early Sixties. One of the largest consoles ever built by Neve—a 40-input/24-output wrap-around unit measuring almost 5.8m in length—was recently delivered to ORT, the Austrian state broadcasting service. The console was so long that it had to be shipped in three sections.





# If this is the result of your sound experience... Join us.

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- 350 Effects and Illustrations fully explored on 6 Cassettes, to guide you through every aspect of sound.
- 6 Concise Colour Illustrated Booklets to complement the cassettes.
- A practical explanatory glossary to make you the best informed.

No prior knowledge necessary.

TO ALL PURCHASERS

- **free** visit by appointment to Anemone Sound Studios to see and hear a studio in operation.
- **free** use of SOUND SWAP SHOP for introductions of purchasers to creative and technical partners for professional or amateur associations in all areas of sound.
- **free** direct line to THEATRICAL AND MUSICAL PROMOTIONS which will provide written assessments of all original material submitted by D.S.S.W. purchasers. Should they see sufficient creative and commercial potential they will undertake promotion through the facilities at their disposal:—

**FREE DEMO RECORDINGS & FINANCIAL SUPPORT**

Due to physical limitations the above launching offer can only be guaranteed to the first 10,000 orders received. Thereafter purchasers will be duly advised and credited.

Please send me D'arblay Sound Studio Workshop(s)  
 I enclose £ Being Payment in full/Initial Payment of installment plan.

I wish to pay by Barclaycard/Access and I authorise you to debit my account with the amount of £30.  
 My Barclaycard/Access No. is

NAME \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 POST CODE \_\_\_\_\_  
 SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

Terms of Payment:  
 (1) DSSW is yours for a single payment of £30 by Postal Order or Cheque OR  
 (2) An Initial Payment with order of £15 and a further 3 consecutive monthly payments of £7 each making a total price of £36.\*

All Cheques and Postal Orders to be made payable to:  
 D'arblay Sound Studio Workshop  
 D'arblay House, Poland Street  
 London W1V 3DE

\* Sound visit/"Sound Swap Shop" and "Theatrical and Musical Promotions" are available on completion of payment only.

The D'arblay Sound Studio Workshop

IF YOU'RE A SOUND THINKER THIS £30 COULD BE THE BEST INVESTMENT YOU EVER MAKE.

D'arblay Sound Studio Workshop, D'arblay House, Poland Street, London W1V 3DE.

### Tape duplicating and a-v facilities

James Yorke, a company formed in 1973 to provide specialist facilities for the recording and processing of audio-visual programmes on to cassettes, is expanding its high-speed duplicating facilities. It can now offer a comprehensive service covering recording, dubbing, mixing and synchronisation.

Cassettes can also be loaded to any length from C2 to C95, with a tolerance typically better than 5s of running time. Tapes up to C120 length can be provided at a slightly lower accuracy. Labelling, inlay card design and all forms of packaging can be supplied as part of the service.

James Yorke Ltd, The Old Post Office, Fossebridge, Cheltenham, Glos GL54 3JW, UK.  
Phone: Fossebridge (028 572) 423.

### Test gear catalogue

A new 3-language catalogue from Wayne Kerr includes details of self-balancing af bridges, automatic test equipment, and contactless gauging by the Dimeq (dimensional measuring equipment) system. Copies may be obtained from: Wilmot Breeden Electronics Ltd, 422 Bath Road, Slough SL1 6BB. Phone: Burnham (06286) 62511.

### Electroconductive materials

Troubled by static electricity in your control room? Need a flexible material for lining consoles that also acts as an electrostatic screen? Canespa may have the answer with a new range of materials impregnated with an electroconductive fluid that dissipates unwanted electrical charges.

The materials currently available include open-cell polyether foam (useful for packing gear sensitive to static, or for lining a wooden case to form a shield); needle-felt carpeting designed to reduce static pickup; and a synthetic leather-look fabric for covering floors, benches etc.

Canespa (UK) Ltd, Staton House, Birds Hill, Letchworth, Herts SG6 1HX.  
Phone: Letchworth (04626) 73282.  
Telex: 825752.

### Bose UK move

Its new address is: Trinity Trading Estate, Sittingbourne, Kent ME10 2PB. Their telephone and telex numbers, however, are unchanged: Sittingbourne (0795) 75341 and 965559, respectively.

### New IBA information head

Barbara Hosking will be taking up her appointment as Head of Information at the beginning of December. Her previous duties include Chief Information Officer at the DoE, and Assistant Press Secretary at 10 Downing Street. IBA, 70 Brompton Road, London SW3 1EY.  
Phone: (01) 584 7011.

### Are you ready for multitrack?

... is the title of a booklet for musicians and others who want to make a demo tape themselves, but are not sure of the intricacies involved. The text, written by Carl Anthony, leads the budding multitracker through the complexities (including selsync) of an 8-track tape machine and what facilities to look for on a desk. The booklet ends with an example of how to use an 8/4 mixer to make an 8-track recording, with bump-tracking as an extra complication.

Although the 16-page booklet is published by TEAC, no mention is made of any particular piece of equipment bearing the company's name. Thus the reader can make an objective assessment of what he needs without an advertising copywriter's purple prose clouding the issue.

For a copy of the booklet write to one of the addresses given in the tape machine survey, p 48.

### Tape duplicating survey omission

Our apologies to Asona for leaving them out of the survey of tape duplicating equipment published in the August issue. Their entry should have read as follows:

#### ASONA

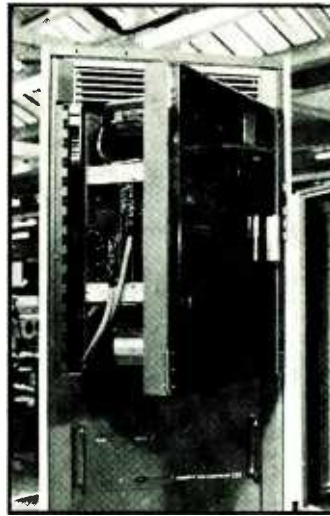
**Auvis-Asona Kg, Stellbergstrasse 7, D8000 Munchen 22, West Germany.**  
Phone: (089) 225057. Telex: 22084.  
**UK:** Lennard Developments Ltd, 206 Chase Side, Enfield EN2 0QX.  
Phone: (01) 363 8238.  
Agents in most countries.

#### HS16-M-1

A master unit housing a Revox A77 or A700 running at 19 or 38 cm/s; a pre-emphasis unit with a limiter and/or de-esser; and a second tape machine (usually an A77) to produce sub-master duplication tapes complete with pulses for the Asona 4-track time-shifting system. A built-in cassette machine is provided for quality control. Price: DM 17754.

#### HS16-L1 LOOP BIN

The bin handles 6.35 mm tape recorded at 9.5 cm/s. Duplicating ratio is 16:1.



Heavy-duty STR rack system from Langley Metal Products.

### From far and wide

The Devon and Cornwall Centre of the Royal Television Society has organised the following meetings: December 7: a continuation of last year's lecture by John Jenkins, entitled 'Synthesisers in electronic music', with demonstrations. January 18 (1978): a talk with demonstrations by Geoffrey Watts of the NECAM system, entitled 'Computer-aided sound mixing'.

Further details from Keith Lloyd, Westward Television Limited, Plymouth.

Phone: Plymouth (0752) 69311.

Up to three slave units can be connected. Price: DM 14 762 for 4-track cassette format; DM 16 093 for 8-track cartridge format.

#### HS16-S1/2 SLAVE

A single, twin or triple-transport unit running at 76 cm/s (16:1 duplicating ratio). Up to 35.5 cm pancake reels can be accommodated. Production capacity is approximately 700 cassettes or cartridges per 8-hour shift.

Frequency response:  $\pm 2$  dB, 40-12.5k Hz.

Total harmonic distortion:  $\leq 2.5\%$ .

Signal-to-noise:  $\leq 53$  dB (unweighted).

Wow and flutter:  $\leq 0.15\%$  from master (DIN 45 513).

Price: single-transport unit for cartridges: DM11 132; twin-transport unit for cassettes: DM22 748; triple-transport unit for cassettes: DM 31 218.

#### HS16-W1/2 LOADER

A twin-transport unit for blank, pre-leaded or pre-recorded cassette or cartridge tape. A digital pre-selection counter allows any length of tape in steps of 10 cm to be loaded. Full stop from winding speed of approximately 610 cm/s within 30 ms. About 700 cassettes can be filled in an 8-hour shift. Price: DM 11 616.

### Racked again

For those of you who need to rack mount heavy ancillary equipment or tape transports, Langley Metal Products may have a solution to sagging frames and trapped fingers. The company has introduced a modified version of its STR rack, which incorporates strengthening brackets in the main columns and tie rods across the front. This additional reinforcement is said to minimise load distortion and allow heavy equipment to be supported on a hinge on one side of the rack. Thus the equipment can be swung out for easier access than that gained by removing rear or side panels.

Versions are available in 122, 152, 183 and 213 cm heights, and in depths between 43 and 76 cm. Langley Metal Products Ltd, Unit 4a, Lyon Industrial Estate, Hartspring Lane, Watford, Herts WD2 8JU.  
Phone: Watford 48327.

### Magnetic film recorder

The new Sondor *Libra M03a* has been designed to handle acetate or polyester film stock, and features a straight-line lacing path and combination pinch wheel and sprocket drive. The machine uses the standard Sondor synchronisation technique and, as a result, can easily be locked to projectors or telecine machines (including the *Cintel Mark III*). It can also be interfaced with most of the accessories for the *OMA3* range, including the recently-announced SMPTE/EBU timecode interlock equipment.

Sondor, CH-8702 Zollikon, Zurich, Switzerland.  
Phone: (01) 658090. Telex: 55670.  
UK: Hayden Laboratories Ltd, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW.  
Phone: Gerrards Cross 88447.  
Telex: 849469.

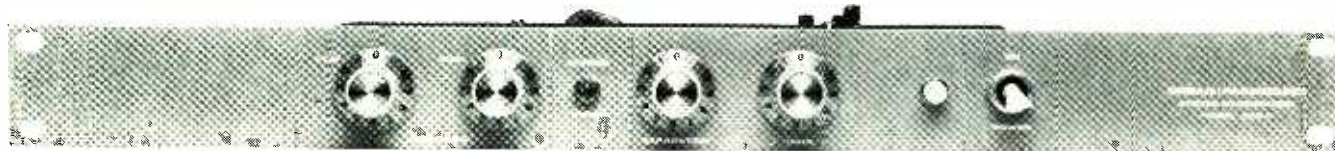
### IEA 78

The twelfth Instruments, Electronics and Automation Exhibition is to be held at the National Exhibition Centre, Birmingham, from March 13-17, 1978. Products on show will include professional and industrial electronics, active and passive components, process control and scientific instrumentation, computer techniques and data handling.

Industrial and Trade Fairs Ltd, Radcliffe House, Blenheim Court, Solihull, West Midlands B91 2BG.  
Phone: (021) 705 6707.  
Telex: 337073.



# Four of the Best from Orban/Parasound



## Model 245E Stereo Synthesiser

Uses a unique and patented process to create a realistic and mono compatible synthesised stereo from a mono source.



## Model 516EC Dynamic Sibilance Controller

Three independent channels of easily adjusted and effective de-essing. Tracking automatically over a wide range of input signals.



## NEW Model 622B Parametric Equaliser

Two channels of overlapping four band parametric equalisation with continuously variable tuning, equalisation level and bandwidth. 'Constant Q' rather than reciprocal equalisation curves for musically useful extremes of EQ.



## NEW Model 418A Stereo Compressor/Limiter

Variable time-constant H.F. limiter section. Accurately ganged stereo controls. 'Programme controlled' attack and release times. Simple and sensible front-panel controls.

For full information or a demonstration of any of the Orban products, contact:

### Scenic Sounds Equipment

97-99 Dean Street, London W1V 5RA. Telephone: 01-734 3812/3/4/5

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



**Delay unit/flanger**

The new 900-A from WMS can produce a variety of effects, including negative and positive flanging, Doppler, vibrato and chorus, pitch shifting, double tracking, 'Leslie speaker simulation', as well as something the manufacturer refers to as 'cardboard tube echo'.

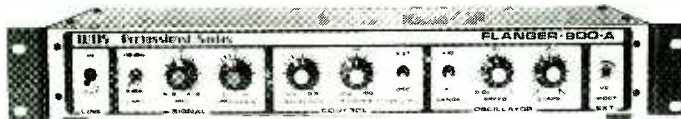
Delay is variable up to a maximum of 20 ms, and special filters are claimed to eliminate input aliasing and quantisation noise—a problem that can often occur in special effects units using digital delay circuitry.

Front-panel controls comprise: *signal mix* to select positive, negative or pitch shift mode of operation; *emphasis* for adding resonant peaks and notches to the flanging effect; *% mix* which determines whether the delay is a function of the manual delay control or the sweep oscillator, or proportions of both; and *oscillator*, which produces a variety of ramped waveforms over the range 0.01-30 Hz. In addition, an external control source, such as a foot pedal or voltage sequencer, can be substituted for the internal oscillator.

The unit costs a 'tentative' \$350. Wasatch Music Systems, Box 9175, Salt Lake City, Utah 84109, USA. Phone: (801) 467 4722.



All India Radio (AIR) has ordered 48 Proline 1000SC servo-capstan machines from Leavers-Rich. And here they all are awaiting dispatch at the factory. Eighteen of the machines are capable of record and replay; the remaining 30 are replay-only, but can be converted to record/replay by merely plugging in an appropriate module.



WMS 900-A delay unit/flanger designed for 483-mm rack mounting.

**STUDIO DESIGNERS AND CONSULTANTS**

The March '78 issue of *STUDIO SOUND* will contain a survey of studio designers and consultants, plus installation and commissioning engineers. Following our last survey (August '76) we received several complaints from deserving companies that had been left out. We hope that won't happen this time around, because we are giving advance notice.

If you feel that you or your company qualifies for inclusion in the survey, will you please supply:

Full company name and address  
Full list of overseas agencies/offices

Full list of directors/partners/associates and number of staff  
An indication of the fees involved for your services

A statement in about 150 words of the company's policy and guarantees offered

Several examples of your work

This information should be sent to Mel Lambert at the editorial address given on p3, to arrive not later than January 10 1978.

**PROFESSIONAL STUDIO MIXERS**

10 Channels, 4 Groups, 4 or 8 Monitors, 4 Echo Returns. Comprehensive Talkback. Line up oscillator.

2 Aux. sends, PFL, Separate Mic and Line I P's. Normalled Channel and Group inserts, Mic attenuator pad and Phase rev. Channel direct Line outputs EQ. 3 Bass and 3 Treble frequencies. Variable Mid frequency 400Hz-10kHz. Hi and Lo filters at -12dB Oct. Group reinsert facilities. 48v phantom mic. power (suitable for AKG's 9-48v).

Power supply included. £2,156.

Low noise  
High O/P  
Many options: e.g. Additional Input Channels, monitors, 10 Input channel extension units, etc., etc.



**RAINDIRK**  
Bridge Street  
Downham Market  
Norfolk  
Tel. (03663) 2165

Mini Mark II  
10/4  
with  
8 track  
monitor options

**Radford**

**THE FACILITY**



SEE THE TEAC TASCAM RANGE  
AT RADFORD HI FI LTD., 52-54 GLOUCESTER RD., BRISTOL BS7 8BH  
Tel. (0272) 422709 Telex 449135 CONTACT ROGER WALL

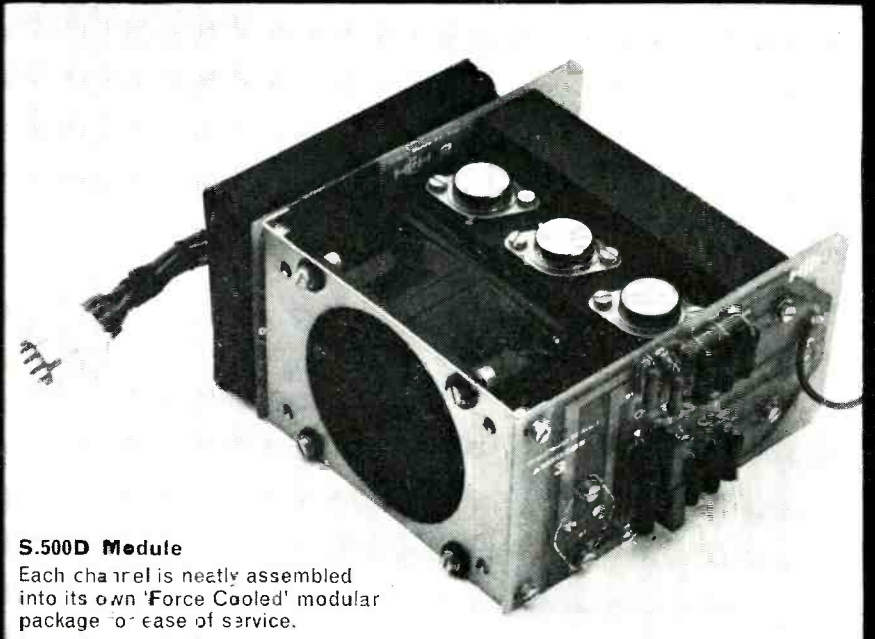


# Meet the New Leader....



## S.500D Specification Features

- \* Power output 340W R.M.S. into 4 ohms  
500W R.M.S. into 2.5 ohms
- \* Bridged Mono output 900W R.M.S. into 5 ohms  
640W R.M.S. into 8 ohms
- \* Intermodulation Distortion Less than 0.02% from 20Hz to 20KHz F1 60Hz.
- \* Integral "Force Cooled Dissipators" for reliable operation into adverse loads.
- \* Power Bandwidth +0, -1dB from D.C. to 20KHz.
- \* Very low Transient Intermodulation Distortion. Restricted rise time, fast slew rate.
- \* Input sensitivity 0.75V for 300W into 4 ohms.
- \* Noise 105dB Below 180W into 8 ohms 10Hz to 20KHz. Unweighted.
- \* Elaborate system protection against short and open circuit operation
- \* Small size 3½" x 19" Rack mounting.
- \* 1KVA Toroidal power supply providing 55 joules of energy.



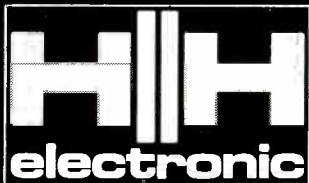
### S.500D Module

Each channel is neatly assembled into its own 'Force Cooled' modular package for ease of service.

# The S500-D

## A higher standard of power amplifier design

From the most experienced, well equipped specialist manufacturer of 'Professional Power Amplifiers' in the U.K.



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CAMBRIDGE CB3 8EL  
TEL: CRAFTS HILL (0954) 81140  
TELEX: 817515 HH ELEC G  
PROFESSIONAL  
AUDIC  
ELECTRONICS

H.H. Electronic, Viking Way, Bar Hill, Cambridge CB3 8EL  
Telephone: Crafts Hill (0954) STP-1 81140  
Please send me details of the S500-D and other new products  
Name.....  
Address.....

# Making commercials

Dave Hodge\*

\*MOLINARE

*Independent local radio has a voracious appetite for commercials. The 19 stations in the UK can play a maximum of nine minutes per hour, day and night. But the path from conception to recording of even a 'simple' 30-second commercial is not as easy as it sounds.*

IT'S NOW ten years since the demise, in force anyway, of the pirate commercial radio stations which were directly responsible not only for BBC Radio 1, but also for the current 19 local land-based commercial stations. ILR took a little time in coming and Capital (the second ILR, but first all-music station) began broadcasting on October 16 1973; six years and three months after the majority of pirates had switched off their transmitters and sailed quietly away. But it appears that ILR was certainly worth waiting for, since most of the stations have made a sizable dent in Radio 1's listening figures.

However, as this world in which we live is far from perfect, there are the inevitable criticisms. Probably the biggest, from the listener's point of view anyway, is the amount of advertising the stations carry—nine minutes in every hour. Which is not much when you consider that one Australian station I know not only carries 18 minutes of advertising in every hour, but also 20 minutes of news! In one recent issue of a well known hi-fi magazine it was suggested that a device be built into radio tuners which, when switched on, muted the commercials. It's a pity really considering the amount of work that goes into most of them. But I confess to being biased as I work at a studio in London's Soho where about 75-80% of the commercials heard on am and fm radio sets in the UK are made. And for anyone, like myself, interested in playing with sound effects, voices, and music it's a fascinating job.

How then does a commercial arrive on the air? The script is conceived in one of the 300 or so advertising agencies situated in London. It then has to be passed by the ITCA central clearing office to check for word content, and anything which might be misleading to the listener. There are very strict rules laid down by the IBA that have to be adhered to, regarding sex, religion, swearing etc. For example, nothing connected with family planning or women's pharmaceutical needs is allowed.

Generally speaking the advertising agency selects the voices to be used from either the actors directory, 'Spotlight', or an agency like 'Voice-Over' which, as the name suggests, deals almost exclusively in voices for commercials. Of course if the agency does get stuck for ideas we can always recommend someone, because we probably know more about voice-overs than most people by virtue of the fact that we're in daily contact with them.

Having chosen the voice the agency will book, hopefully, one of our four studios (soon to be six in the new building) ranging from the smallest, Studio-B, to the largest, Studio-D, which has 8-track facilities. All our studios, however, have the same basic hardware: Richardson desks with stereo channels and faders (very important as all the ILR stations are stereo); ITC 3D cart machines; Studer B62s; Spondor BCIs and BCIII; Gates turntables (although I think we'll probably install Technics SP10 MkII's in the new studios); and Neumann U47 microphones; together with a home-built echo plate, Audio & Design compressors and, very important, a 'scope for instant phase checking. Studio-B, being the smallest, is designed for relatively simple jobs with small budgets and is therefore the least well equipped, whereas Studio-D has a Studer 16-track machine (with 8-track head block) for more complex work.

But enough of the equipment; back to the recording. The agency people arrive at the studio with voice (or voices) and scripts. We then, with few exceptions, record the voice first (with a little 2:1 compression) so he, she or they can go quickly on to their next job. Most of them are very busy people, in demand as much for their voices as for their sheer professionalism. It's tempting to drop a few names here because they certainly deserve thanks; guys like David Tate (Radio 4's *Weekending*), Chris Sandford (half of Yin and Yan), Bill Mitchell (the other half), Ray Brooks (*Cathy Come Home*), Peter Hawkins (*Captain Pugwash*), the Daleks, Cadbury's Smash Martians), Tony Jackson (*Bless This House*), Gary Watson; and the girls—Anna Massey, Norma Ronald, Marise Hepworth and Sue Thompson—all of whom make our lives happier and easier. I've known people complain about how much these people charge for voice-over work, but having also worked with amateurs I'm fully convinced that they deserve every penny. Just one example: give a semi-professional a dozen sheets of paper for a script and then do the same with someone like Peter Hawkins. I guarantee you'll hear how many page turns the semi-pro makes, but you'd never detect one from Peter. Also things like 'p's; a professional can soften them as if by magic, not so the semi-pro.

Apart from compressing the voices we also do an overall expansion to get rid of any undesirable ambience.

If there are two or more voices we generally utilise both tracks of a stereo machine, so that we can pan them into situation perspective on the mix. However, we're prevented from using extreme left and right because the stations complain that the levels fluctuate too drastically in mono—just one of the problems of mono/stereo radio stations.

It's important at this stage to ensure that the commercial is running to time. Ads are made in multiples of 15 seconds, to a tolerance of  $\pm 0.5$  seconds. This is for a variety of reasons, mainly so that the engineers in the station's master control room, who play in the commercials, can quickly and accurately backtime them if necessary (in the run-up to the IRN news, for example). Also the nine-minute allowance can be easily, and therefore quickly, calculated by the traffic department of any station.

There is a school of thought, however, that suggests commercials should be of any desired length. This would have its advantages in fact since, for more times than I care to remember, an extra couple of seconds would have allowed the voice-over to put that much more feeling into his script, or for us to have given the effects or music a better fade. However, a full 15 seconds extra would have resulted in an obviously drawn-out and boring script. The 15-second multiple has now been in use in America for a long time, and the discipline also adds to our professionalism.

Having recorded the voice, if there are effects and/or music now is the time to add them. Like the agencies and their script content mentioned earlier, we are tightly governed in the use of effects. For example, car skids and police car sirens have to be kept at a very low level, and used not at all at the opening of a commercial. This rule is aimed at protecting the motoring fraternity, who have become a major part of a station's audience and could well cause



an accident if they heard a sudden squeal of brakes.

We use quite a lot of 'live' spot effects in the studio and keep a collection of odds and ends that often come in handy. These include gravel, wooden boards (very useful on a recent session when I had a Spanish flamenco dancer in for a 'Pretty Polly Tights' ad), polystyrene blocks, old 6.35 mm tape (which when trampled on with some gravel and the 'snapping of twigs' sound of the polystyrene gives a very realistic crashing-through-the-undergrowth effect), plus crockery and cutlery. We also have a big slab of slate and an old pair of boots for other types of footsteps. In addition to these spot effects that we can devise in the studio, we have a further 2500 effects ready for immediate use on NAB cartridges (the broadcasters friend). Any combination of effects can be punched up and continuous loops for things like wind, rain and traffic can be made.

It would be possible, of course, to use multitrack but there is quite simply neither the time nor the flexibility. It is true that once the tracks are laid down it's only a question of mixing, but to add, subtract or change an effect at the last minute is well-nigh impossible in the time allowed. Added to which prices would soar not only in studio costs but also tape stock. If the commercial is very complex then we do use 8-track, but these are rare. For example, all the 'Levis for Feet' ads were constructed on multitrack.

However, if we haven't a particular effect and we can't simulate it in the studio then, time permitting, we grab a Nagra and go out on location to record it. Recently I had to record a quiet country pub for a 'Heinz' commercial. It's surprising how crowded they get shortly after opening; just how many feature background *Muzak*; and the amount of strange looks you get sitting at a table with a pint and a crossed-pair of AKG *D202* microphones! It's also interesting to discover that something you thought made a fair amount of noise, actually makes very little—underground escalators, for example.

Back to the cart system. A very good example of its flexibility is the ads that we do for K-Tel and Arcade records—you know the ones: 'Arcade presents 20 greatest hits . . .' followed by a list of stars with snippets of their records strung together underneath the voice-over. Each individual snippet is recorded onto cart, and then juggled around until a suitable combination is reached for the bed (the pre-arranged music or effects sequence). This combination may well suit the British market but not necessarily the German or French (whose K-Tel and Arcade commercials we also record) so the order has to be changed—imagine doing all that with multitrack techniques.

Another wonderful technique, invented by Robert Parker, was for a music bed on an ad for a Sunday paper. Depending on what wonderful disclosures they have for us between their pages determines which length their commercial should run. So when the music bed was recorded Rob had it done in three sections: open, middle and close, and loaded onto three separate carts. Given that the 'open' is five seconds, likewise the 'close', with the bed of any length, a commercial of the required duration can be conjured up at will by simply crossfading from the open in to the middle, and then into the close; ie take a 45 second ad—five to open, five to close,

leaving 35 seconds for the script. It's very handy for making television ads too because they always have a 1.5s mute at the beginning and 0.5s at the end (ie 30-second tv ads have 28s of sound).

We've added the effects and voice but what about a little music. This is obviously a good idea, but because of copyright restrictions it's impractical, not to say expensive, to use commercial discs. Instead we use non-commercial library discs ranging in content from the dramatic, national atmosphere (bagpipes, accordion etc), romantic, popular and classics, to electronics, solo instruments, fanfares and comedy; in fact practically any type of music to make the commercial that little bit better.

These discs are supplied by companies such as KPM, Chappell, Standard, Boosey and Hawkes etc, and feature very successful and popular composers—names like Chris Karan (Dudley Moore Trio), Mike Moran (Eurovision with Lyndsey de Paul), Mike Hugg (Manfred Mann) and Malcom Lockyer (BBC) spring to mind, and there are many more.

The main problem with a library of 500 discs is getting to know them, even vaguely. Any spare is spent in the music and effects audition room ploughing through these discs.

Having selected an appropriate track it needs to be edited, faded to length or backtimed if the track has particularly good resolution. The alternative to using library music, especially if the campaign you're planning is a big one lasting several months, is to have a jingle written for the particular product by a company like Mingles, who specialise in writing music and lyrics for commercials.

So now the ad is complete: effects, voice and music, all mixed with a little compression at 20:1 for good measure, and it's got to be played on all 19 ILR stations. If the agency has made the ad in plenty of time, our traffic department will make two carts and one reel-to-reel at 30 cm/s, and then send it by Red Star to the nearest British Rail station to be collected by the radio station. If, however, it's been one of those last minute panics (not unknown in this industry) then it can be sent by landline—in glorious mono of course—from LBC after they've networked the news.

In this business, as I've already mentioned, time plays a very important role. Depending on how involved your commercial is, this entire process of recording, carting and despatching can take as little as an hour. That's how immediate radio should be; I say 'should' because unfortunately in the four short years of legalised commercial radio many of the stations have become very complacent, and refuse to take ads after 6 pm or at weekends. If, for example, an agency wanted an ad on the air during the Monday breakfast show, that ad would have to leave us on Thursday afternoon by Red Star, or Friday by landline. One way of hopefully avoiding this complacency is for the agency to ring the station and threaten to withdraw this and any future ads from the station. But because of the lack of stations this would inevitably be cutting off his nose to spite his face.

In an ironic sort of way the BBC, because it's non-commercial, offers little competition; we can either hope for more ILR stations or a return to the pirates of the Sixties, whom I'm sure would have made every effort to get an ad on air in the shortest possible time. ■



### Popcorn, ices . . . Dolby

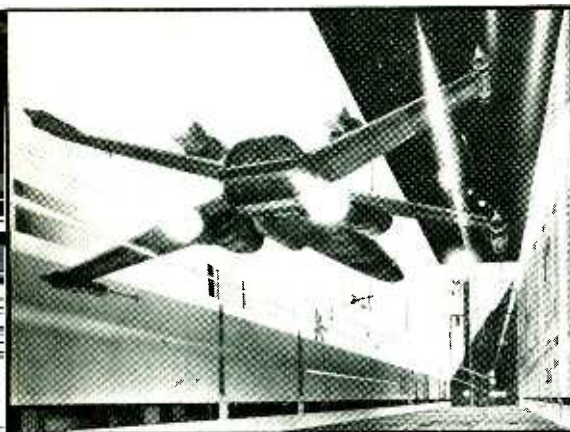
ALL ROUND THE WORLD the tv science fiction series *Star Trek* has gathered a cult following, largely because no new episodes have been made for donkey's years, and the series, like the Beatles, quit while ahead. At *Star Trek* conventions, like Beatles conventions, fans swap and sell memorabilia. Perhaps it's not so surprising then, that the science fiction feature film, *Star Wars*, is breaking box office records all over the USA. It is also doing a great deal for Dolby Labs.

Over the past five years several films have been released in various Dolby-encoded formats; first there was *Callan* in Dolby optical mono, and then there was *The Rocky Horror Show*, also in Dolby optical mono. *Starburst* and the virtually unwatchable *Lisztomania* were then printed in Dolby optical stereo. Finally came *A Star Is Born* in 70 mm, 6-track Dolby magnetic stereo. For a while it looked as if any one of these films would trigger—in an ever more hi-fi conscious public—an interest in better cinema sound. And in Wardour Street public interest spells box office, and box office has the cinema moguls looking for more of the same. Just as *Easy Rider* produced a flood of bike films, *Bullitt* produced a flood of car chases and *Airport* unleashed a flood of awful disasters in inaccessible places, so any of the Dolby-encoded films could have had a deaf man with a big cigar and a list of box office returns proclaiming: 'What we want is more films with good sound'. But they didn't.

On the other hand, *Star Wars*, which soon after its release was showing in a hundred Dolby-equipped cinemas across the US, made box office history.

No one is pretending that *Star Wars* owes its success to Dolby-encoded sound, or that cinemas are nailing up 'featuring Dolby' signs. But the film does rely heavily on subtle surround-sound and music, and the

*A rebel ship moves in for the kill.*



message has got through that it is easier to achieve this with both optical and magnetic tracks if a noise reduction encoding system is used.

To recapitulate briefly, the original idea of encoding film sound tracks was not so much to reduce hiss, but extend the useful frequency range of an optical track. Traditionally, all high frequencies in an optical track are rolled off to reduce hiss, and brutal equalisation is used to provide artificial brightening at the top end. This in turn creates a risk of over-modulation. Use of the Dolby system enables more hf to be put on the track in the first place, with less equalisation. The idea of splitting the optical track into two halves, for separate left and right channel stereo information, dates back to Blumlein in the mid-thirties. But splitting the track degrades the signal-to-noise ratio by unacceptable amounts unless a noise reduction system is used. Also, the Dolby optical *sva* system (stereo variable area) uses circuitry on playback which routes all inphase, equal-amplitude information to a third bank of speakers at the centre of the screen. Thus all mono effects and dialogue come from there.

Oddly enough, dialogue and most effects sound much more natural if located at screen centre. Watch a film like *The Eagle has Landed* (non-Dolby, incidentally) for a clue to how unnatural it can sound when speech and effects are panned left and right across the screen to match movement. Apart from all other considerations, the speaker banks 'across the screen' are often mismatched in quality, so the timbre of a sound changes as it moves. The stereo capability really comes into its own when used to spread sound, especially music, across the screen.

Dolby Labs found early on that, although domestic or studio stereo setups using a pair of speakers can produce a solid centre image in space between the two speakers, the phantom image produced by just a pair of stereo speakers is inadequate for a cinema audience, most of whom are inevitably sitting away from the ideal stereo seat position—front centre in the stalls. Hence the third (centre) bank of speakers and derived centre channel. The next step was to use QS encoding to incorporate surround-sound information in the stereo track for routing to effects speakers around the cinema. But the number and type of effects speakers varies from cinema to cinema. Sometimes it's a bank of respectable monitors driven by a reasonable power amp—other times it's several dozen little 'toy' speakers dotted around the roof and driven by a domestic amp running hard into clipping. But whatever the system, a Dolby stereo track with encoded surround-sound

information puts voices and mono effects at the centre of the screen, spreads the remaining front sound across the screen, and puts selected effects above and behind the audience.

Cinema soundtracks can be magnetically recorded in either of two formats. Using 35 mm film, four tracks are used: three spread out over the cinema screen (left, right and centre) and one for auditorium effects. With 70 mm film, the format is 6-track, with five tracks spread out over the screen (extreme left, inner left, centre, inner right and extreme right) and again, one for the auditorium effects. Films have been made according to these formats for some 20 years now, but *A Star Is Born* was the first 70 mm film with six tracks all Dolby-encoded. The film was shown in this format in the West End of London, and it was originally hoped that the major provincial cinemas around the country would either follow suit using 6-track magnetic, or compromise with stereo optical formats. But it never really came to pass. Although, on the whole, the sound quality of *A Star Is Born* was good, and the music (a live multitrack recording by Phil Ramone) pleasantly clean, the dialogue was often unintelligible—thanks to an excessively wide dynamic range. Barbra Streisand, not only star but entrepreneur, was present at many of the dubbing sessions and had final word on some of the levels used. It seems likely that she fell into the trap of producing a 'director's mix'. Quite simply, if you know the dialogue backwards, as for instance is inevitable if you have acted in the film or followed it through all production stages, you risk mixing speech at a level which isn't intelligible for the general public who usually only ever see and hear a film once. In *A Star Is Born* it is quite often the case that loud music is followed or mixed with semi-whispered lines of dialogue that are almost totally lost to most of the audience.

Current plans are for *Star Wars* to open in London in Dolby 6-track sound this winter. Quite how many provincial cinemas will show it in that format, or the optical stereo surround equivalent, is uncertain. It is also uncertain how enthusiastic the British film critics, movie moguls and cinema-going public are for decent surround-sound. Dolby Labs still find any number of cinema managers, both in the UK and the US, who feel they are being cheated if, after spending money on installing a stereo or surround system, the sound doesn't bounce around the screen all the time. It's hard to explain to them that a surround-sound effect carries far more dramatic weight if it comes as a surprise, rather than heralded by an hour of surround-sound mush. All too often cinemas, noting that there is some dialogue and music bled through from the main tracks on to the surround-sound track, will try and make too much of it by cranking up the gain to the effects speakers far above the intended limit. Not only does this detract from the real dramatic effects when they finally come along, it also subjects the unfortunate audience to a welter of hiss and distortion. Sadly, some areas of the film industry still think of stereo as ping-pong, and surround-sound as mixed doubles. ■



# The Professional's Choice



## The Adaptable A77

The industry's workhorse. Over 400 versions ensure that an A77 is suited to your particular application. Make your choice from five tape speeds, three track configurations, Dolby noise reduction, varispeed, three enclosure styles, power amplifiers, remote controls, voice-operated auto-start, balanced input/output, NAB or IEC equalisations, built-in loudspeakers.... etc., etc. The standard echo and track-to-track facilities of the A77 are as well known as its proven track record over the past decade. The machine by which all others are judged.

## The Versatile A700

The deck that closes the gap between top ranking amateur tape recorders and full grown professional studio machines. Full logic control and motion sensing, 3 tape speeds, real-time counter, open head format, built-in mixer with balanced mic. inputs and RIAA pre-amplifier make the A700 a self-contained and versatile recording system.

## The Modular B77

Latest addition to the Revox range, the B77 with its logic control, self-sharpening tape cutter, easy access to heads, remote and varispeed controls and modern styling make it the natural choice of the semi-professional and the true Hi-Fi enthusiast.

Sole U.K. distributors, F.W.O. Bauch Limited, 49 Theobald Street,  
Boreham Wood, Hertfordshire WD6 4RZ.

# STUDER REVOX

# Microphone techniques for live recording

Johnny Rosen\*

\*FANTA PROFESSIONAL SERVICES

*Microphone technique is one of the most important aspects of modern multitrack recording. The proper use of close miking has made it possible to capture live recordings that sound as good as those carried out in a studio, while still retaining all the vitality and spontaneity of a live performance.*

**L**IVE RECORDING is much more complicated than studio recording. There are the inherent inconveniences of less than ideal acoustics, stage monitor speakers, scr light dimmer noise, and the matter of everyone playing at once. We specialise in mobile recording for the record and film industries, with clients ranging from symphony orchestras to loud English heavy-metal rock and roll to laid-back country music artists.

To ensure that we have the correct microphone for the right instrument or voice, we carry 80 microphones in our 12m mobile semi-trailer control room. Directional microphones are universally accepted in all phases of live recording and, consequently, we carry only cardioid or bi-directional types. These are used to feed our Sphere console which incorporates 32 inputs, 24 outputs and 32 monitor positions, with an octave equaliser on each input. The signal-to-noise ratio hovers at 80:1, and the headroom in any part of the system is at least 20 dB.

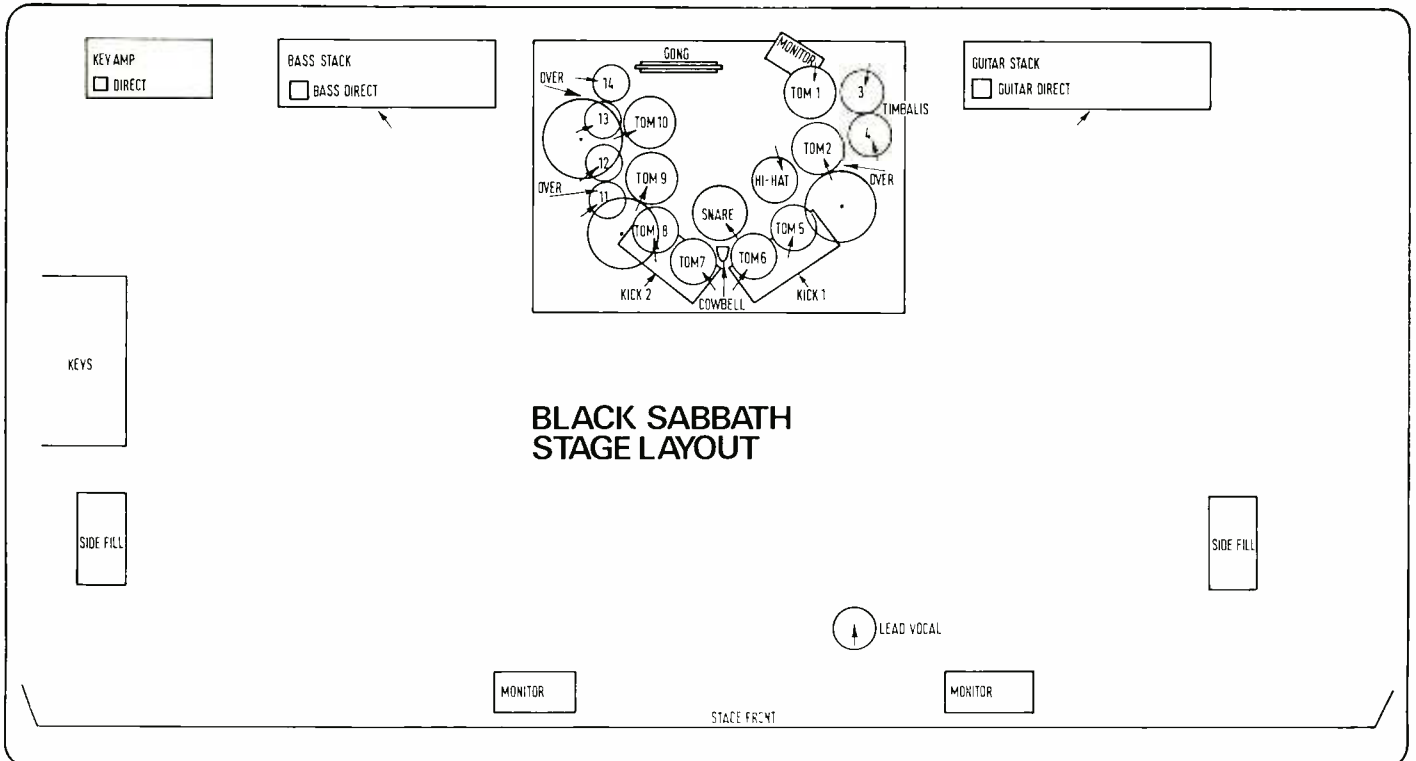
Choice and placement of each microphone is paramount in the success of a live recording, and probably the easiest way to indicate the problems involved is to summarise the techniques used in a

few actual recording dates.

## Black Sabbath live!

Black Sabbath is a loud, 3-instrument, 4-member group. In order to make the best possible recording of part of their recent American tour, we spent an evening with the group at a previous performance that was not being recorded—live recording has to capture the *feel* of the show as well as perfectly capturing the music. It was immediately obvious that microphones were going to be the critical factor. Black Sabbath performs at outrageously high levels, and the sound reinforcement company had installed a system that ensured the audience's satisfaction at staggering levels.

Ozzy, the singer in the group, usually has the microphone mounted on a regular straight stand, located slightly left and down near the foot of the stage. Unfortunately, there was a huge side-fill monitor about three metres away, so the problem was how to hear the voice without hearing the monitor. A Sennheiser MD-441 cardioid dynamic microphone, which has a small windscreen and an isolated capsule, fitted the bill. Handling the stand and





screaming into the microphone was just fine—it didn't overload or distort and was extremely directional. The signal-to-noise ratio of a microphone used for rock and roll vocals should be calculated in a different way to the manufacturer's specification. The sound you want to hear is the singer's voice; it equals the signal. Everything else is noise, which in this case consisted of the stage monitors, leakage from the drummer's cymbals, and leakage from the four double-cabinet, lead guitar amplifiers. The *MD-111* was a perfect choice—the effective ratio worked out to be about 30:1. That may not sound very impressive, but one has to remember that the average sound pressure level on the stage was about 110 dBA; fortunately Ozzy sang loudly and the microphone did not overload.

Tony played the guitar. An Electro-Voice *RE-15* microphone and a Sescom *SM-1A* di box were assigned to different tracks of the Ampex *MM 1200-24*. The amps were pushed so far beyond their limits that the level from the speakers stayed almost constant during any song—no need for limiters here! The *RE-15* was chosen because of its relatively good cardioid pattern and its similarity of recorded to original sound. And the guitar amp was so loud that leakage was not a problem. However, the di box provided a completely different type of sound, and was eventually the heart of the guitar sound for remixing.

Geezer's bass and the way he played it were unique. It was fed through a couple of effects pedals, several guitar amps and six bass cabinets. We chose to mic a rear-loaded, horn-style cabinet with two 38 cm speakers, and a Sescom di box followed the bass amp. The mic was placed at an angle slightly away from the drums, in order to take advantage of the directional characteristics of the *RE-15* microphone in preventing leakage from the drum kit.

The drums themselves presented the main challenge in miking Black Sabbath. Altogether it took 21 microphones to cover Bill's massive drum kit. Sennheiser *MD-421s* were chosen for the tom-tom mics because of their wide dynamic range and even response in the low mid-range. The overhead microphones were Studer *SKM-541* hypercardioid condenser models, which were used because of their extended high-frequency response and super-directional characteristics. Consequently, leakage from the bass stacks and lead amp stacks was negligible. A large gong behind the drummer had to be loose-miked, as it sometimes swung violently. Also the

sound radiates from the entire surface, so the microphone was placed over half a metre back from one edge of the gong.

Microphone placement around drums is extremely important, since phase cancellation between drum tracks can present complicated situations during the mixdown. The easiest method of placing the microphones is to direct them away from the snare drum for separation, and place the microphone diaphragm very close to the upper drum head. The obvious exception to this technique is the kick drum, which has an entirely different sound, and is also played differently. The final choice of placement of the drum microphones is very critical: solo the snare drum and each tom-tom microphone one at a time and listen for phase cancellations; then do the same thing comparing each microphone with the others. Subtle changes in the microphone positions will probably solve many phasing problems without sacrificing the tonal characteristics for each mic and drum combination. Once this has been accomplished, equalising to ones own requirements can take place.

Overhead microphone placement on a tightly-miked drum kit is different to the techniques used in a recording studio. Leakage from other instruments and stage monitors is a constant problem. So the Studer hypercardioid microphones usually help because of their extremely tight pattern and lack of overload problems. Finally check for phase cancellation problems again.

Drums consistently take more time to mic and present more problems to the recording engineer than any other instrument. The recorded sound is completely dependent on good drums and a good drummer—Black Sabbath is blessed with both.

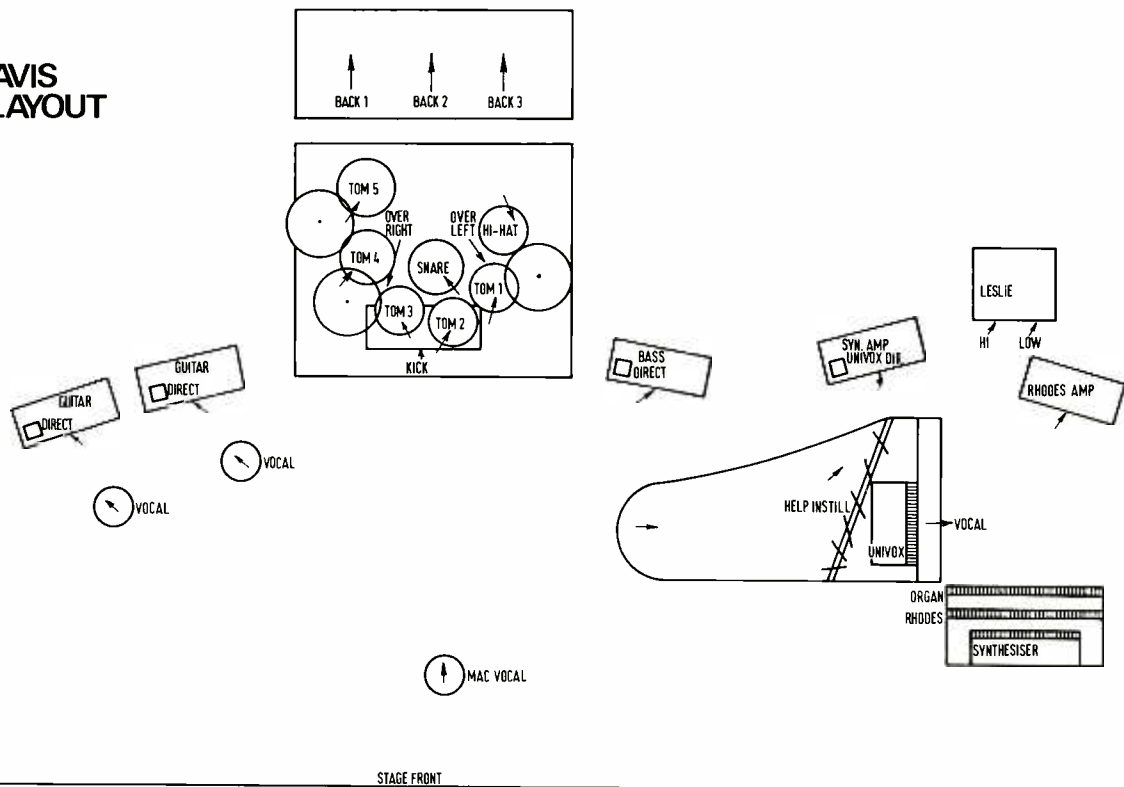
Black Sabbath uses an extra musician off-stage to play various keyboard instruments. All these were fed into a Yamaha mixer, and then out to the recording and pa equipment via a 600-ohm balanced output at line level (+4 dBm).

This was the microphone set-up for a loud rock and roll group and, including spares, consumed all 32 inputs of our mobile console.

### Country music

Recording country artists is noticeably different to rock and roll. Although the drums and guitar amps are dealt with in the same way, the piano and vocals are usually handled differently. For instance, the technique used to record the piano for a recent MacDavis

## MAC DAVIS STAGE LAYOUT



## MIC TECHNIQUES FOR LIVE RECORDING

performance was rather elaborate. Mac's music ranges from light country to heavy pop and the piano was therefore played in different ways; it needed to *sound* different for the wide musical variations in their show. The grand piano was miked with two types of device. The first was a Helpinstill piano pickup, which consists of six electromagnetic pickups placed over the strings. We also used a pair of *AKG 411* large-diaphragm condenser microphones: one directed towards the middle of the high strings, and one near the low end of the piano, away from the keyboard.

Each element of the Helpinstill pickup was sent directly to an input of the console; then equalised, panned and balanced into a smooth panoramic piano sound. The two *AKG* mics were placed onto two other tracks, giving the remix engineer many options in piano sounds.

Vocals on these 'lighter' acts have to be handled more carefully than with loud rock and roll. The lead singer (Mac) was backed up by a minimum of three female voices, and a maximum of six mixed voices. We chose *Shure SM57* microphones for all vocals except Mac's because they are designed for close-talking and have easily placed windscreens—popping is totally unacceptable. Keeping the singers close to the mic was very important since we didn't want to have the presence changing, nor any problems of leakage from the stage monitors. By keeping the monitors at low levels, we ensured that each singer would stay 'on mic' in order to hear themselves.

For Mac, who plays guitar as well as singing, we used a *Sennheiser MD 411*. This was chosen for several reasons: first of all it sounds great; secondly, it has a built-in shock-mount and windscreen; and lastly, its shape and size worked well for him.

### Nashville Symphony Orchestra

Mobile recording is not always of 'popular' music. A large portion of our microphone kit is devoted to the requirements of classical recording, and there are many techniques for miking a large symphony orchestra.

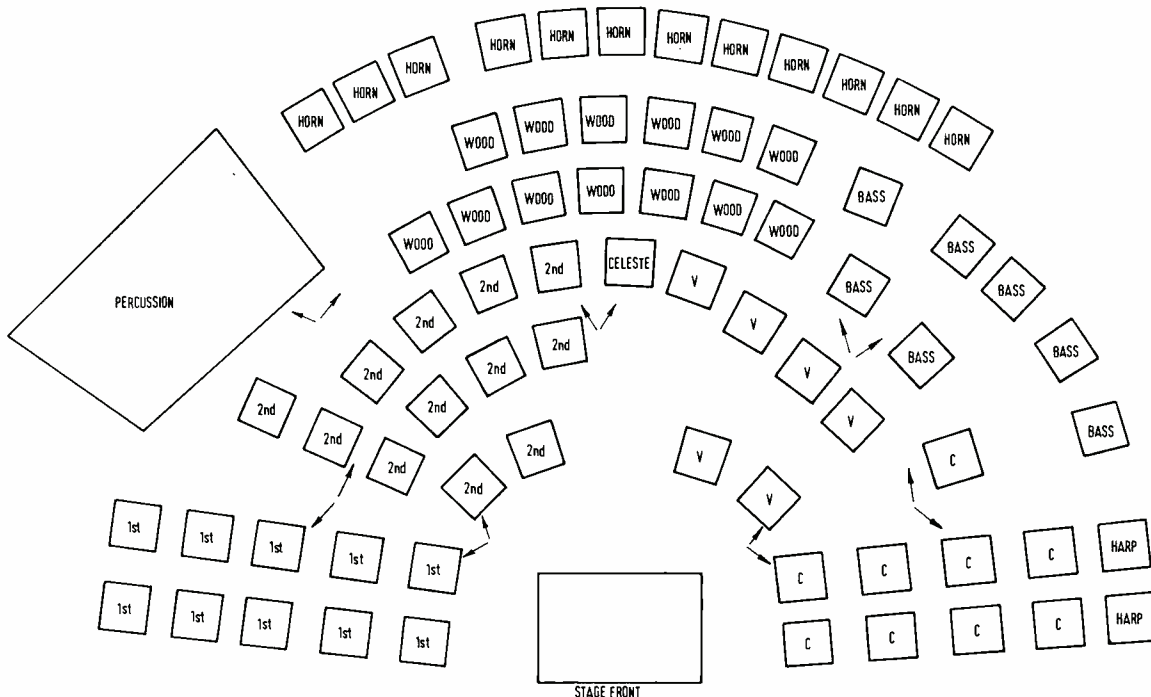
A good beginning for large symphony recording is placing a Studer coincident-pair microphone in the 'overall' position. Usually this is forward of the stage by three to six metres, and five metres over the stage level. But basically trial and error is the only true method of finding the correct position. In a new hall, we usually require two, 3-hour rehearsals with the entire orchestra in order to find the location of the 'overall' mic. This must be perfectly matched and placed, so we fabricated a long telescopic aluminium pole that we usually attach to the grid-work or ceiling of the auditorium—simply because a tall floor stand would interfere with the audience. The angle and position of this mic must be static under all conditions because any movement would affect the phase relationship of all the microphones.

However, most large orchestral or orchestra and choir pieces require some additional microphones to reinforce certain sections of the orchestra. The string instruments usually require the most attention. In order to have good separation of the sections (necessary for good remixes), cardioid microphones are used exclusively. Our normal method is to use Mole-Richardson lightweight stands to hold pairs of microphones. For instance, first and second strings would be miked with two stands placed in the aisle between the string sections. One of each pair is pointed towards the first strings, and the other towards the second strings. Then we move back in the section and do the same again, with the same procedure being used for the violas and celli. Studer *SKM 511s* form the basis of the microphone selection with *RCA DX77* ribbons used around the horns and tympani. These were selected after many conductors just plain liked the sound. *Shure SM57* microphones are used for the announcer and the conductor.

This article has briefly covered a few types of microphone layout but several thoughts run consistently through the logic. They are:

- 1) quality is the most important factor in good microphone technique;
- 2) separation must be considered in deciding upon microphone layout;
- 3) you can't own enough microphones.

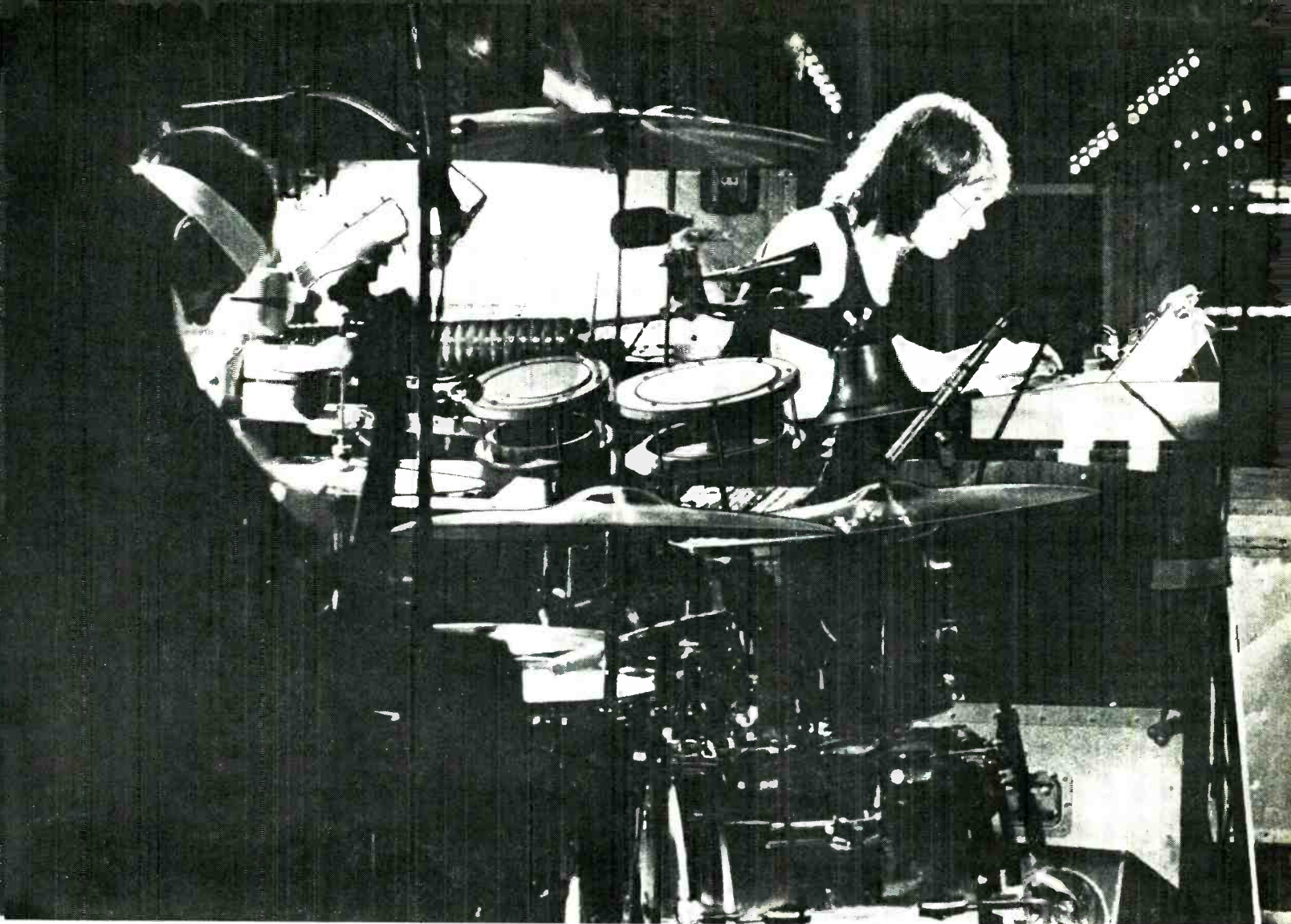
All of these factors contribute towards the ease of remixing and therefore a comprehensive microphone kit will meet all needs. ■



**NASHVILLE SYMPHONY  
STAGE LAYOUT**







# MANFRED MANN

and his Earthband

## "Achieving my Sound"

During my long experience I have used different sound equipment. Mick Williams, my sound-engineer, and I have found AKG products to be the most suitable for our purpose.

This is why:

**For all vocals: AKG D 2000 E**

A rugged hardwearing microphone.  
Good integral popshield.

**For guitar stacks: AKG D 1200 E**

The switchable e.c. on this mike is very useful.

**For bass stacks: AKG D 202 E**

In addition to the direct inject the microphone on the bin gives the depth.

**For kick drum: AKG D 12**

This mike gives a good fat sound and takes plenty of stick.

**For lo floor tom, hi floor tom, rack tom and snare: AKG D 224 E**

The lack of the proximity-effect on these two-way cardioid microphones suit Chris Slade's drum tuning, giving a hard solid sound.

**For hi hat: AKG C 451 / CK 1**

This condenser microphone provides super clear definition of the super highs.

The A 51 swivel joint between the capsule and the preamplifier makes for easy positioning.

**For keyboards: AKG 100 K**

My Moog, the Hammond C 3, the Rhodes and the omni-string synth run through the new AKG 100 K keyboard mixer which is very flexible and has great e. q. for those instruments.



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AKG Equipment Ltd.

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# Survey: 2 and 4-track tape machines

Forthcoming surveys include multitrack tape machines (next month), equalisers (February), studio designers and consultants (March) and cartridge machines and turntables (April). Information for inclusion should reach the editorial offices (address p3) not later than six weeks before the issue publication date (preferably a lot earlier).

## ACCURATE SOUND

Accurate Sound Corporation, 114 5th Avenue, Redwood City, Ca 94063, USA.  
Phone: (415) 365 2843. Telex: 348327.

### MODEL 2600 TRANSPORT

**Tracks/speeds:** 1, 2 or 4 on 6.35 or 12.5 mm; 9.5/19 or 19/38 cm/s, or all three (higher and lower speeds on special order).

**Wow and flutter:** 0.08% rms at 38 cm/s.

**Features:** full logic control and motion sensing; capstan off until 'play' initiated; remote control option; 'constant torque and/or tension holdback and/or takeup'; MCI, Inovonics or ASCO electronics package available with selsync and meter options.

**Price:** \$1425 (less head assembly and electronics).

## AMPEX

Ampex Corporation, 401 Broadway, Redwood City, Ca 94063, USA  
Phone: (415) 367 4151.

**UK:** Ampex GB Limited, 72 Berkeley Avenue, Reading RG1 6HZ.

Phone: Reading (0734) 55341. Telex: 847611.

Agents in most countries.

### AG440C

**Tracks/speeds:** 1, 2 or 4 on 6.25 mm, or 4 on 12.5 mm; 9.5, 19, 38 and 76 cm/s, in any combination.  
**Frequency response:** ±2 dB, 50-20k Hz at 76 cm/s.

Ampex ATR100



**Noise:** 70 dB, ANSI-weighted, at 76 cm/s.

**Wow and flutter:** 0.04%, peak-weighted, at 76 cm/s.

**Features:** full logic control with motion sensing and interlock plus memory; dc servo capstan; remote control and varispeed option; full selsync; NAB/CCIR eq; available in portable, console and rack-mounting versions.

**Price:** from \$3.5k.

### ATR100

**Tracks/speeds:** 1 or 2 on 6.25 mm, or 4 on 12.5 mm; 9.5, 19, 38 and 76 cm/s, in any combination.

**Frequency response:** ±0.75 dB, 200-20k Hz at 76 cm/s; ±0.75 dB, 100-15k Hz at 38 cm/s.

**Noise:** 81 dB, ANSI-weighted, at 76 cm/s.

**Wow and flutter:** 0.03%, peak-weighted, at 38 and 76 cm/s.

**Features:** full logic control and motion sensing; closed-loop servo tape drive without pinch rollers; remote control, autocue and varispeed options; full selsync; digital tape timer; accessories for disc cutting preview; available in console, table top, portable and rack-mounting versions.

**Price:** from \$4.8k.

## FERROGRAPH

North East Audio Ltd, Simonside Works, Leam Lane, South Shields, Tyne and Wear NE34 9NX, UK.

Phone: South Shields (0632) 566321.

**US:** Hammond Industries Inc, 155 Michael Drive, Syosset, NY 11791.

Phone: (516) 364 1900. Telex: 961396.

See News item, p26.

### STUDIO 8

**Tracks/speeds:** 1 or 2 on 6.35 mm (or 3.8 mm to special order); 9.5/19 or 19/38 cm/s.

**Noise:** -62 dB, DIN-weighted, at 38 cm/s.

**Wow and flutter:** <0.06%, rms quasi-peak weighted, at 38 cm/s.

**Features:** full logic control with motion sensing; line-in/line-out plus headphone monitoring as standard; varispeed and remote control; mic inputs optional; built-in monitor speaker amps; variable (preset) spool speed; bin/dump or standard edit; led elapsed-time display; available in console, portable and rack-mounting versions.

**Price:** £2550 for portable and £2915 for console versions (both line-in/line-out). Also available as a quality control/tape stock check machine for 3.8 mm cassette duplicating tape, in either record/replay mono or bidirectional, replay-only stereo formats. Price: about £4k.

## LOGIC 7

**Tracks/speeds:** 2 (½ or ¼-track) on 6.35 mm; 9.5/19/38 cm/s.

**Frequency response:** ±2 dB, 30-20k Hz at 38 cm/s.

**Noise:** <60 dB, unweighted (ref: 2% distortion), at 38 cm/s.

**Wow and flutter:** 0.08% at 38 cm/s; 0.1% at 19 cm/s; quasi-peak.

**Features:** full logic interlock with motion sensing; remote controllable; optional 10W amplifier and integral loudspeaker and/or Dolby B.

**Price:** £560 for basic machine; amp/speaker £40; Dolby B £100.

## LEEVERS-RICH

319 Trinity Road, Wandsworth, London SW18 3SL, UK.

Phone: (01) 874 9054. Telex: 923455.

Agents in most countries.

### PROLINE 2000TC

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5/19 or 19/38 cm/s or 38/76 cm/s. (Four-track on 12.5 mm tape available shortly.)

**Frequency response:** ±2 dB, 30-18k Hz at 38 cm/s; ±2 dB, 30-16k Hz at 19 cm/s.

**Noise:** -60 dB for mono and -58 dB for stereo; both at 38 cm/s.

42 ▶

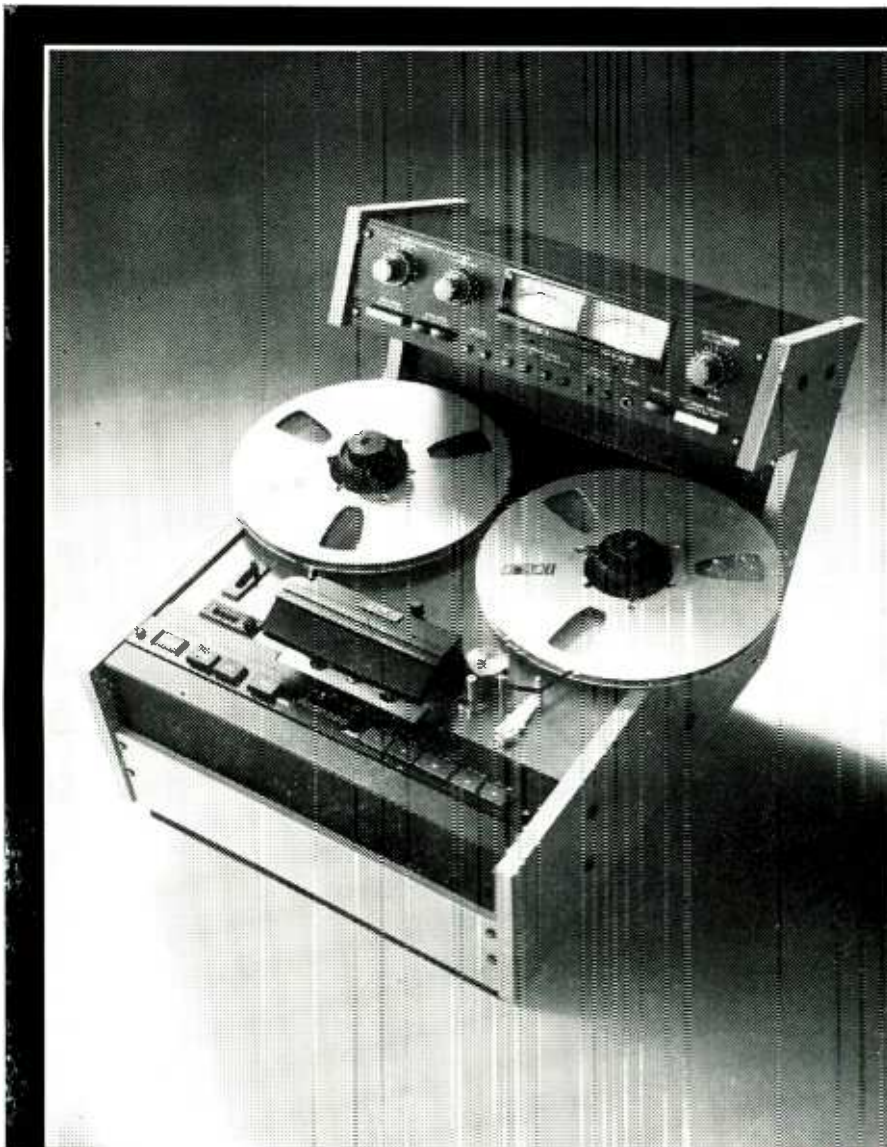


Ferrograph Studio 8



# OTARI

## The new $\frac{1}{4}$ -inch 2-track recorder with a finish. Otari MX5050 MK II-2 for uncompromising recordists.



**I**t's a new-generation studio recorder. Compact, full-fledged and thoroughly professional. Separate transport and electronics with complete accessibility. 65 dB S/N and greater-than-55 dB crosstalk. DC servo capstan motor for less than 0.05% wow/flutter, with  $\pm 7\%$  pitch control. +19 dBm headroom and 600 ohm +4 dBm output with XLR connectors. Motion sensing control logic. Front panel edit and cue. Stepless bias adjustability. Built-in test and cue oscillator. And there's more: it comes with an interface jack for dbx and Dolby, remote controllability and 4-track playback capability.

In other words, the MKII is the latest masterpiece of Otari's long successful tradition of quarter-inch professional recorders, each with proven reliability in over one thousand critical applications by discriminating broadcasters, studio recordists, a/v professionals and musicians. For the full story of the MKII-2, get in contact with your nearest Otari distributor.

Please send me details on  
**MX5050-MKII-2**

Name

Company

Address

SS

Japan: Otari Electric Co., Ltd., 4-29-18 Minami-Ogikubo, Sugiyama-ku, Tokyo 167, Japan U.K.: C.E. Hammond & Co., Ltd., 111 Chertsey Road, Byfleet, Surrey KT14 7LJ  
France: Reditec, 62-66, Rue Louis Ampère, Zone Industrielle des Chanoux, 93330 Neuilly-s-Marne West Germany: Peter Struven GmbH, 2 Hamburg 53, Bornheide 19  
Belgium: Trans European Music S.A., Koelwijverstraat 135, 1710 Dilbeek, Brussels Italy: Exh. bo Italiana S.R.L., 20052 Monza, Via F. Frisi, 22  
Switzerland: Audio Bauer AG, CH-8048 Zurich, Bernerstrasse Nord 18.2 Haus Atlan Australia: Klarion Enterprises Proprietary Ltd., Regent House, 63, Kingsway, South Melbourne, 3205

## SURVEY: TAPE MACHINES

**Wow and flutter:** <0.05%, peak-weighted, at 38 cm/s.

**Features:** full ttl logic interlock; twin dc servo controlled capstans with crystal reference; dc spooling motors with constant velocity, variable speed spooling; 15-80 cm/s varispeed; dump edit; constant tape tension in all modes, speeds and reel sizes; NAB/DIN (IEC) switched eq; led tape timer display; plug-in open face headblock and modular electronics; provision for external capstan drive; various control panel options for tv, radio and recording studios; remote control option.

**Price:** on application.

### PROLINE 1000/SC

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5/19 or 19/38 or 38/76 cm/s.

**Frequency response:** ±1 dB, 100-10k Hz at 19 and 38 cm/s.

**Noise:** -58 dB, overall unweighted, for stereo at 38 cm/s.

**Wow and flutter:** <0.05%, peak-weighted, at 38 cm/s.

**Features:** mains-locked capstan motor on 1000, or servo-controlled on 1000SC; motion sensing interlock; servo tape tension control; variable speed spooling; plug-in open face headblock; modular electronics; varispeed for 1000SC; NAB/DIN (IEC) switched eq; electronic adjustment of starting tensions and specially-designed air damping for optimum starting and spooling conditions; remote control option; available in console, transportable or rack-mount versions, or transport only.

**Price:** on application.

### E200

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5/19 or 19/38 cm/s.

**Frequency response:** ±2 dB, 40-18k Hz at 38 cm/s.

**Noise:** -60 dB, overall unweighted, for stereo at 38 cm/s.

**Wow and flutter:** <0.06%, peak unweighted, at 38 cm/s.

**Features:** 'logic semi-interlock'; modular tape transport and electronics; servo-controlled tape tension; plug-in headblock; NAB or DIN (IEC) eq on plug-in cards; remote control option; available in Lowline console, standard or rack-mount versions, or transport only.

**Price:** on application.

Leavers-Rich Proline 2000TC



### MCI

**MCI Inc, 4007 NE 6th Avenue, Fort Lauderdale, Florida 33304, USA.**

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

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

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

### JH-110A SERIES

**Tracks/speeds:** 1 or 2 on 6.35 mm or 4 on 12.5 mm; 9.5/19/38 cm/s or 19/38/76 cm/s.

**Frequency response:** ±2 dB, 50-20k Hz at 76 cm/s.

**Noise:** 67 dB, unweighted, at 76 cm/s.

**Wow and flutter:** <0.02%, DIN-weighted, at 76 cm/s.

**Features:** full logic interlock and motion sensing; servo-controlled dc spool motors; crystal-controlled dc capstan, externally controllable by dc voltage or frequency; variable speed rewind; remote control and autolocator options; digital clock and return-to-zero facility; tape velocity indicator; available in console or rack-mounting versions. *JH-110M* is a disc mastering deck for cutting rooms.

**Price:** on application.

### 3M

**3M Company, Building 224 BW, 3M Centre, Saint Paul, Minn 55101, USA.**

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

**UK: 3M UK Ltd, 3M House, Wigmore Street, London W1A 1ET.**

**Phone: (01) 486 5522. Telex: 28155.**

Agents in most countries.

### M79

**Tracks/speeds:** 2 on 6.35 mm or 4 on 12.5 mm; 19/38 cm/s or 38/76 cm/s.

**Frequency response:** +1, -2 dB, 50-15k Hz at 38 and 76 cm/s for reproduce and rec/repro.

**Noise:** 68 dB for normal replay and sync in 'stand-by' mode.

**Wow and flutter:** 0.06%, max rms, NAB-weighted, at 19 and 38 cm/s.

**Features:** dc servo capstan and spool motors; /sloop drive system; full logic control with motion sensing; 10-124 cm/s varispeed; sync facility; remote control, *Sonoplan* autolocator and remote Dolby switching as options.

**Price:** on application.

### NAGRA

**Kudelski SA, 1033 Cheseaux-sur-Lausanne, Switzerland.**

**Phone: (021) 912121. Telex: 24392.**

**UK: Hayden Laboratories Ltd, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW.**

**Phone: Gerrards Cross 88447. Telex: 849469.**

**US: Nagra Magnetic Recorders Inc, 19 West 44th Street, Room 715, New York, NY 10036.**

**Phone: (212) 661 8066.**

### IV-S

**Tracks/speeds:** 2 plus *Nagrasync* on 6.35 mm; 9.5, 19 and 38 cm/s.

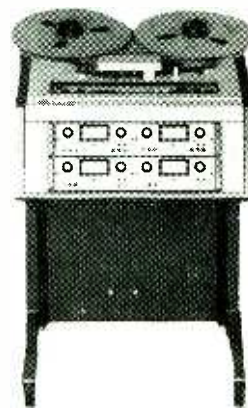
**Frequency response:** ±1 dB, 30-15k Hz at 19 cm/s; ±1 dB, 30-20k Hz at 38 cm/s.

**Noise:** 74 dB for *Nagramaster* or 71 dB for NAB or CCIR equalisation at 38 cm/s.

**Wow and flutter:** ±0.05%, DIN-weighted, at 38 cm/s.

**Features:** portable machine, mains or battery-powered; mic/line inputs; twin-needle peak reading meter, switchable to read sum and difference; built-in reference oscillator; NAB or CCIR switchable eq; line and headphone outputs; variety of options and accessories available, including large-reel adaptor, microphone pre-amplifiers, and Dolby noise reduction unit.

**Price:** SF7-8k dependent on options required.



### 4.2 LSP

**Tracks/speeds:** 1 plus *Neopilot* on 6.35 mm; 9.5, 19 and 38 cm/s.

**Frequency response:** ±1.5 dB, 30-15k Hz at 19 cm/s; ±1.5 dB, 30-20k Hz at 38 cm/s.

**Noise:** 73 dB for NAB or 72 dB for CCIR, A-weighted, at 19 cm/s.

**Wow and flutter:** ±0.05%, DIN-weighted, at 38 cm/s.

**Features:** similar to those for *IV-S*.

### E

**Tracks/speeds:** 1 on 6.35 mm; 9.5 cm/s.

**Frequency response:** ±2 dB, 50-15k Hz.

**Noise:** 62 dB 'weighted'.

**Wow and flutter:** ±0.1% to DIN 45507.

**Features:** low-cost mains or battery-powered portable derived from 4.2 transport; mic and line input; NAB or CCIR equalisation; includes circuit diagram and a selection of spare parts for field maintenance.

### SN

**Tracks/speeds:** 1 (with or without pilot-tone) on 3.81 mm; 4.75 and 9.5 cm/s.

**Frequency response:** ±2 dB, 80-15k Hz at 9.5 cm/s.

**Noise:** <60 dB, A-weighted.

**Wow and flutter:** ±0.1% to DIN 45507.

**Features:** miniature battery-powered portable; 10 Hz *Pilotone* system; mic and line inputs; variety of accessories available. Model *SNS* is a 1/3-track, 2.38 and 4.75 cm/s version.

### IS

**Tracks/speeds:** full-track (with or without pilot-tone) on 6.35 mm; 9.5 and 19 cm/s.

**Frequency response:** ±2 dB, 50-15k Hz at 19 cm/s.

**Noise:** <66 dB, ANSI-weighting, at 19 cm/s.

**Wow and flutter:** ±0.12%, DIN-weighted.

**Features:** battery or mains-powered portable; accepts only 127 mm reels; three servo-controlled motors; mic and line inputs; pushbutton control of record/play/wind modes.

### OTARI

**Otari Electric Co Ltd, 4-29-18 Minami Ogikubo, Siginami-Ku, Tokyo 167, Japan.**

**Phone: (03) 333 9631. Telex: 26604.**

**UK: C E Hammond & Co Ltd, 105/109 Oyster Lane, Byfleet, Surrey KT14 7LA.**

**Phone: Byfleet 51051. Telex: 26525.**

**US: Otari Corporation, 981 Industrial Road, San Carlos, Ca 94070.**

**Phone: (415) 593 1648. Telex: 3764890.**

### MX-5050-2 SERIES

**Tracks/speeds:** 1 or 2 on 6.35 mm tape; 9.5/19 or 19/38 cm/s.

**Frequency response:** ±3 dB, 30-25k Hz at 38 cm/s.

**Noise:** 68 dB, weighted, at 38 cm/s in stereo mode.

**Wow and flutter:** <0.05%, NAB-weighted, at 38 cm/s.





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STUDER REVOX CANADA LTD., Toronto, Phone (416) 423-2831, Telex 06-23310

STUDER FRANCE S. à r.l., Paris, Phone 533 58 58, Telex 24-744

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# SME

## SURVEY: TAPE MACHINES

**Features:** motion-sensing control logic; hysteresis synchronous or dc-servo capstan; 4-head option—erase,  $\frac{1}{2}$ -track record and replay, plus  $\frac{1}{2}$ -track replay; sync facility and remote control; NAB eq with EIA, CCIR and IEC options; available in cabinet, road-case and rack-mounting versions. *Model* version has the following additional features: separate transport and electronics module; dc servo capstan with varispeed; interface for dbx and Dolby.  
**Price:** £850 approx.

### MX-5050-QX

**Tracks/speeds:** 4 on 6.35 mm tape; 19/38 cm/s.  
**Frequency response:**  $\pm 2$  dB, 50-20k Hz at 38 cm/s.  
**Noise:** 65 dB, NAB-weighted, at 38 cm/s.  
**Wow and flutter:**  $< 0.05\%$ , NAB-weighted, at 38 cm/s.  
**Features:** motion-sensing control logic; dc servo capstan with varispeed; interface for dbx or Dolby; separate transport and electronics module; sync facility on all channels; plug-in head assembly; available in portable, console, or rack-mounting versions.  
**Price:** £1750.

### SCHLUMBERGER

Compteurs Schlumberger, 296 Avenue Napoleon-Bonaparte, 92500 Rueil-Malmaison, France.  
Phone: 977 9223. Telex: 692474.

### F400 SERIES

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5, 19 or 38 cm/s.  
**Noise:** 60 dB, CCIR-weighted, at 38 cm/s in stereo mode.  
**Wow and flutter:** 0.04% at 38 cm/s.  
**Features:** full logic control and motion sensing; servo-controlled capstan;  $-50, +100\%$  varispeed via external frequency; remote control with digital counter; built-in monitoring.  
**Price:** F35k for stereo version (ex-works).

### SCULLY

Audio/Electronics Division of Dictaphone Corporation, 475 Ellis Street, Mountain View, Ca 94043, USA.  
Phone: (415) 968 8389. Telex: 345524.  
UK: Lee Engineering, Napier House, Bridge Street Walton-on-Thames, Surrey KT12 1AP.  
Phone: Walton-on-Thames 43124.  
Telex: 928475.

### 280B SERIES

**Tracks/speeds:** 2 on 6.35 or 4 on 12.5 mm; 9.5, 19, 38 and 76 cm/s.  
**Frequency response:**  $\pm 2$  dB, 50-20k Hz at 76 cm/s.

**Noise:** 68 dB, NAB-weighted, for 4-track at 76 cm/s.  
**Wow and flutter:** 0.04% for dc-servo capstan, ANSI-weighting, at 76 cm/s.

**Features:** dc-servo or ac capstan; logic control and motion sensing;  $\pm 20\%$  varispeed; remote control and *Varisync* options; available in console or electronics plus transport versions; *284B Series* accepts 35.6 cm reels.  
**Price:** on application.

### MODEL 250

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5/19 or 19/38 cm/s.  
**Frequency response:**  $\pm 2$  dB, 50-18k Hz at 38 cm/s.  
**Noise:** 66 dB, NAB-weighted, for 2-track at 38 cm/s.  
**Wow and flutter:**  $\leq 0.06\%$ , ANSI-weighted, at 38 cm/s.  
**Features:** logic control and motion sensing; hysteresis synchronous capstan; remote control option; available in rack-mounting or portable versions. *Model 255* is a 9.5/19 cm/s, replay-only version for broadcast use.  
**Price:** on application.

### SONY

Sony Corporation, PO Box 10, Tokyo Airport, Tokyo, Japan.  
Phone: 488221.  
UK: Sony (UK) Ltd, 134 Regent Street, London W1R 6DJ.  
Phone: (01) 439 3874. Telex: 264149.  
US: Sony Corporation of America, 9 West 54th Street, New York, NY 10019.  
Phone: (212) 371 5800.  
Agents in most countries.

### TC766-2

**Tracks/speeds:** 2 on 6.35 mm; 19 and 38 cm/s.  
**Frequency response:**  $\pm 3$  dB, 30-22k Hz at 38 cm/s.  
**Noise:** 64 dB on FeCr tape.  
**Wow and flutter:** 0.018% wrms at 38 cm/s.  
**Features:** logic control; closed loop dual-capstan drive with ac-servo control; four heads including  $\frac{1}{2}$ -track playback; mic/line inputs; remote control option.  
**Price:** on application.

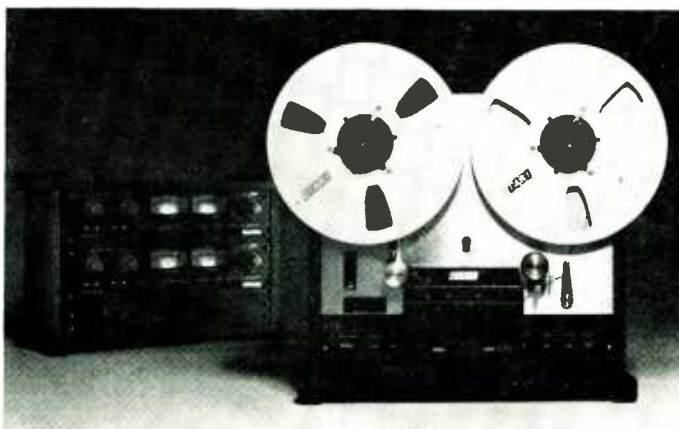
### TC880-2

**Tracks/speeds:** 2 on 6.35 mm; 19 and 38 cm/s.  
**Frequency response:**  $\pm 3$  dB, 25-35k Hz at 38 cm/s.  
**Noise:** 65 dB on FeCr tape.  
**Wow and flutter:** 0.02% wrms at 38 cm/s.  
**Features:** similar to *TC766-2*, plus 'optical monitoring' with switchable vu, ppm or peak hold; calibrated input and output controls; varispeed.  
**Price:** on application.

### TC510-2

See review p70.  
**Tracks/speeds:** 2 on 6.35 mm; 9.5 and 19 cm/s.

46 ▶



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**Allen and Heath/Brenell Limited, Pembroke House, Campsbourne Road,  
Hornsey, London, N.8. Tel: 01-340 3291 Telex: 267727 BATGRP G**

## SURVEY: TAPE MACHINES

**Frequency response:**  $\pm 3$  dB, 30-20k Hz at 19cm/s  
**Noise:** 64 dB on FeCr tape.  
**Wow and flutter:** 0.05% wrms at 19 cm/s.  
**Features:** battery or mains-powered portable; mic/line inputs; stop, record and playback on 3-position 'click-stop' switch; varispeed.  
**Price:** £420.

### SOUNDSTREAM

Soundstream Inc, 375 Chipeta Way, Salt Lake City, Utah 84108, USA.  
**Phone:** (801) 583 5711.

### DIGITAL RECORDING SYSTEM

**Tracks/speeds:** 2 or 4 on 12.5 mm; 76 cm/s.  
**Frequency response:**  $\pm 1.5$  dB, dc to 17 kHz.  
**Noise:**  $-85$  dB, unweighted, 'typical'.  
**Wow and flutter:** 'none' (the timebase of the reconstructed audio is re-established with the precision of a crystal).  
**Features:** each channel is recorded serially and independently in a 16-bit digital form; noise reduction 'unnecessary'; 90 dB dynamic range; print-through 'eliminated'; no generation loss while copying; im distortion better than  $-80$  dB; crosstalk better than  $-85$  dB; digital editing of recorded material without splicing.  
**Price:** on application.

### STELLAVOX

Stellavox, 2068 Hauterive/NE, Switzerland.  
**Phone:** (038) 334233. Telex: 35380.  
**UK:** John Page Ltd, 169 Oldfield Lane, Greenford, Middlesex UB6 8DW.  
**Phone:** (01) 578 0372. Telex: 24224 (Reference 568).

### SM8/SQ8

**Tracks/speeds:** 2 (SM8) or 4 (SQ8) on 6.35 mm; 19

and 38 cm/s.

**Frequency response:**  $\pm 2$  dB, 20-28k Hz at 38 cm/s.  
**Noise:**  $\leq 70$  dB (SM8) or  $\leq 66$  dB (SQ8), A-weighted, at 38 cm/s.  
**Wow and flutter:**  $\pm 0.04\%$ , DIN-weighted, 'typical'.  
**Features:** battery or mains-powered portable; built-in loudspeaker; twin ppm or vu metering; single transport control; mic/line inputs.  
**Price:** on application.

### SP8

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5, 19 and 38 cm/s.  
**Frequency response:**  $\pm 2$  dB, 30-18k Hz in stereo mode.  
**Noise:**  $\leq 65$  dB, A-weighted, at 19 cm/s in stereo mode.  
**Wow and flutter:**  $\pm 0.07\%$ , DIN-weighted at 19 cm/s.  
**Features:** similar to SM8 with 50/60 Hz pilot generator and cue track playback amp or synchroniser; EBU time code recording option also available.  
**Price:** on application.

### TD88 TRANSPORT

**Tracks/speeds:** 1 (with or without Neopilot) or 2 (with or without Synchrotone) on 6.35 mm, 2 or 4 on 12.5 mm, and Perfoltape for 16 mm magnetic tape; 4.75, 9.5, 19, 38 and 76 cm/s, plus 24 and 25 fps.  
**Features:** battery or mains-powered semiportable transport without electronics; logic control and motion sensing; interchangeable head blocks; remote control and varispeed options; electronic counter; available in free-standing or rack-mounting versions.  
**Price:** on application.

### STEPHENS

Stephens Electronics Inc, 3513 Pacific Avenue, Burbank, Ca 91505, USA  
**Phone:** (213) 842 5116.

The company manufactures a capstanless machine, available in 4, 8, 16, 24, 32 and 40-track formats. Full specification will be included in the January survey of multitrack machines.

### STUDER/REVOX

Willi Studer, Althardstrasse 150, CH-8105 Regensdorf, Zurich, Switzerland.  
**Phone:** (01) 840 2960. Telex: 58489.  
**UK:** FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ.  
**Phone:** (01) 953 0091. Telex: 27502.  
**US:** Studer Revox America Inc, 1819 Broadway, Nashville, Tenn 37203.  
**Phone:** (615) 329 9576. Telex: 554453.  
 Agents in most countries.

### B62

**Tracks/speeds:** 1 or 2 on 6.35 mm; 19 and 38 cm/s.  
**Frequency response:**  $\pm 1$  dB, 60-12k Hz at 19 cm/s;  $\pm 1$  dB, 60-15k Hz at 38 cm/s.  
**Noise:** 62 dB, NAB-weighted, at 38 cm/s in stereo format.  
**Wow and flutter:**  $\leq 0.05\%$ , weighted, at 38 cm/s.  
**Features:** logic control and motion sensing; electronic tape tension control; pilot tone available; mono/stereo switching; varispeed and remote control options; vu meter panel; portable, console or chassis version available.  
**Price:** on application.

### B67

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5/19/38 or 19/38/76 cm/s.  
**Frequency response:**  $\pm 1$  dB, 60-15k Hz at 38 cm/s.  
**Noise:** 62 dB, NAB-weighted, at 38 cm/s in stereo format.  
**Wow and flutter:**  $\leq 0.06\%$ , weighted, at 38 cm/s.  
**Feature:** full logic control with tape tension and motion sensing; remote control, varispeed and 'fader-start' options; NAB or CCIR eq on plug-in cards; sync facility; vu meter panel; digital tape timer; tape dumping (motor off); console, portable or rack-mounting versions available.  
**Price:** on application.

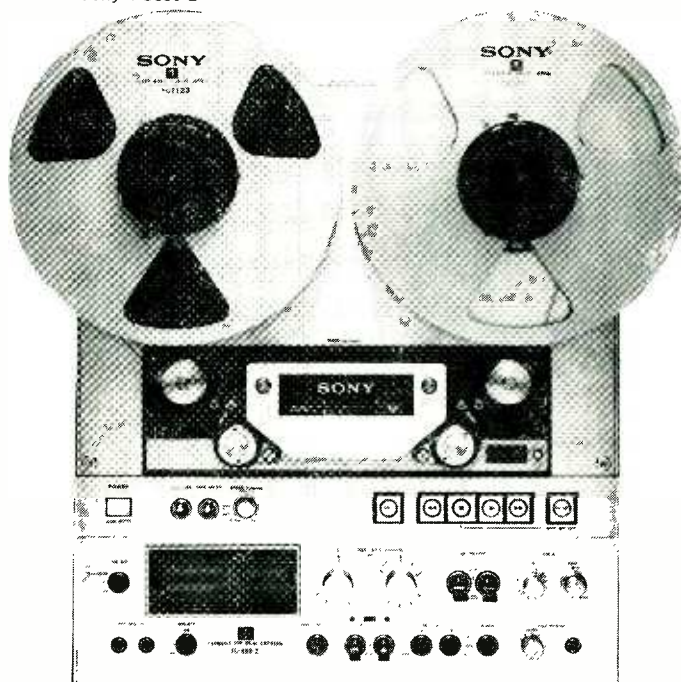
### A80/RC

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5/19 or 19/38 or 38/76 cm/s.  
**Frequency response:**  $\pm 1$  dB, 60-15k Hz at 38 cm/s.  
**Noise:** 62 dB, NAB-weighted, at 38 cm/s in stereo format.  
**Wow and flutter:**  $\leq 0.04\%$ , weighed, at 38 cm/s.  
**Features:** full logic control with motion sensing;

Two-track model from Scully 280B Series



Sony TC880-2







**Success breeds  
success.**

## **48 machines on their way to AIR (All India Radio) are tangible evidence of the popularity of the Proline 1000SC.**

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.

This wide popularity has led to increased volume production, which means that the Proline 1000SC is not only technically interesting but from the economy point of view it is very interesting indeed.



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## SURVEY: TAPE MACHINES

remote control and varispeed options; NAB or CCIR eq on plug-in cards; variable spooling in edit mode; electronic tape timer plus 'zero locator'; chassis or console mounting versions available.  
**Price:** on application.

### A80/VII MkII

Basically similar to A80/RC plus pre-wiring for autolocator and comprehensive remote control unit. Special version with pre-listen facilities available for cutting rooms.

### A77

**Tracks/speeds:** 1 or 2 ( $\frac{1}{2}$  or  $\frac{1}{4}$ -track) on 6.35 mm; 9.5/19 or 19/38 cm/s.

**Frequency response:**  $\pm 1.5$  dB, 50-15k Hz at 19 cm/s in stereo format.

**Noise:** <66 dB, A-weighted, at 19 cm/s.

**Wow and flutter:**  $\leq \pm 0.08\%$ , DIN-weighted, at 19 cm/s.

**Features:** relay logic control; servo capstan; Dolby B optional; IEC/NAB equalisation; mic and line mixing onto one track; varispeed and remote control units as option; available in wooden or metal case with or without amplifiers and/or loudspeakers.

**Price:** on application.

### A700

**Tracks/speeds:** 2 ( $\frac{1}{2}$  or  $\frac{1}{4}$ -track) on 6.35 mm; 9.5, 19 and 38 cm/s.

**Frequency response:**  $\pm 1.5$  dB, 50-18k Hz at 38 cm/s.

**Noise:** 65 dB, A-weighted, at 38 cm/s.

**Wow and flutter:**  $\leq 0.06\%$ , DIN-weighted, at 38 cm/s.

**Features:** full logic control with motion sensing; crystal-controlled capstan; four mic inputs plus mixing; slide sync; varispeed and remote control as options; available in portable and rack mounting versions.

**Price:** on application.

### B77

See review p64.

**Tracks/speeds:** 2 ( $\frac{1}{2}$  or  $\frac{1}{4}$ -track) on 6.35 mm; 9.5 and 19 cm/s (other speeds available in near future).

**Frequency response:** +2, -3 dB, 30-20k Hz at 19 cm/s.

**Noise:** 66 dB, A-weighted, at 19 cm/s.

**Wow and flutter:** <0.08% at 19 cm/s.

**Features:** logic control and motion sensing; slide sync, varispeed and remote control option.

**Price:** £550 approx.

## TANDBERG

Tandbergs Radiofabrikk A/S, PO Box 9, Korsvoll, Oslo 8, Norway.

**Phone:** (02) 232080. **Telex:** 16441.

**UK:** Tandberg (UK) Ltd, Farnell House, 81 Kirstall Road, Leeds LS3 1HR.

**Phone:** Leeds (0532) 35111. **Telex:** 557611.

**US:** Tandberg of America Inc, Labriola Court, Armonk, NY 10504.

**Phone:** (212) 892 7010.

### 10X

**Tracks/speeds:** 2 ( $\frac{1}{2}$  or  $\frac{1}{4}$ -track) on 6.35 mm; 9.5, 19 and 38 cm/s.

**Frequency response:** 30-26k Hz at 19 cm/s; 30-30k Hz at 38 cm/s; to DIN 45511.

**Noise:** 67 dB (IEC A-curve) or 58 dB (IEC lin rms).

**Wow and flutter:** 0.07%, DIN-weighted, at 38 cm/s.

**Features:** built-in 4/2 mixer; servo-controlled tape tension and speed regulation; full logic control; Cross-Field record head; mic and line inputs; 'peak-reading' meters; varispeed and remote control options; cabinet or rack mounting.

**Price:** £700 approx.

## TEAC

TEAC Corporation, 3-7-3 Naka-cho, Musashino, Tokyo 180, Japan.

**Phone:** (0422) 531111. **Telex:** 2282551.

**UK:** Teledyne Acoustic Research, High Street, Houghton Regis, Dunstable, Beds LU5 5QJ.

**Phone:** Dunstable (0582) 603151. **Telex:** 825467.

**US:** TEAC Corporation of America, 7733 Telegraph Road, Montebello, Ca 90640.

**Phone:** (213) 726 0303. **Telex:** 677014.

### A-7300RX

**Tracks/speeds:** 2 on 6.35 mm; 19 and 38 cm/s.

**Frequency response:**  $\pm 3$  dB, 30-28k Hz at 38 cm/s.

**Noise:** 100 dB with dbx, 65 dB without (overall).

**Wow and flutter:** 0.04%, NAB-weighted, at 38 cm/s.

**Below:** Stellavox TD88 transport.

**Right:** TEAC A-7300-2T without dbx.

**Features:** full logic control and motion sensing; dc servo-controlled capstan; mic/line inputs; integral dbx noise reduction; separate electronics and transport; memory linked to elapsed time indicator; tape/source switching plus tape direct output;  $\pm 5\%$  varispeed; available without dbx as model A-7300-2T.  
**Price:** £1330.

### A-3340S

**Tracks/speeds:** 4 on 6.35 mm; 9.5/19 or 19/38 cm/s.

**Frequency range:** 25-24k Hz at 38 cm/s.

**Noise:** 55 dB (overall).

**Wow and flutter:** 0.04%, NAB-weighted, at 38 cm/s.

**Features:** logic control and motion sensing; hysteresis synchronous capstan; simul-sync on all tracks; remote control plus sound-on-sound/echo unit and mixdown panel options.

**Price:** £740.

## TECHNICS

Matsushita Electric Trading Co Ltd, PO Box 288, Osaka Central, Japan.

**Phone:** Osaka 2045111.

**UK:** Technics, 107-109 Whitby Road, Slough, Bucks SL1 3DR.

**Phone:** Slough 27516.

**US:** Technics by Panasonic, One Panasonic Way, Secaucus, NJ 07094.

### RS 1500US

**Tracks/speeds:** 2 on 6.35 mm; 9.5, 19 and 38 cm/s.

**Frequency response:**  $\pm 3$  dB, 30-30k Hz at 38 cm/s.

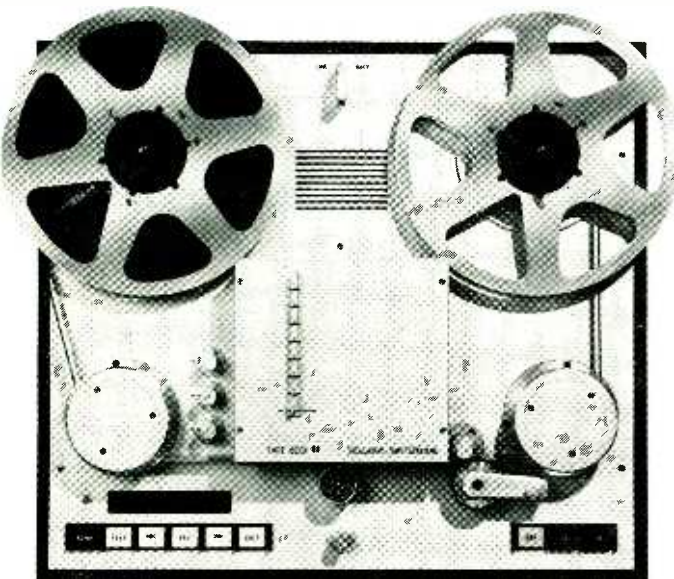
**Noise:** 60 dB, NAB-weighted, at 38 cm/s.

**Wow and flutter:** 0.018% wrms at 38 cm/s.

**Features:** full logic control and motion sensing; isolated loop tape path; dc servo-controlled capstan; four heads including  $\frac{1}{4}$ -track playback; mic/line inputs; 3-way bias and eq selection; remote control and battery adaptor (24V dc) options; available in rack-mounting or free-standing versions.

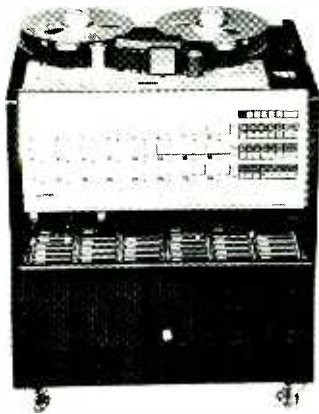
**Price:** £600 approx.

50 ►





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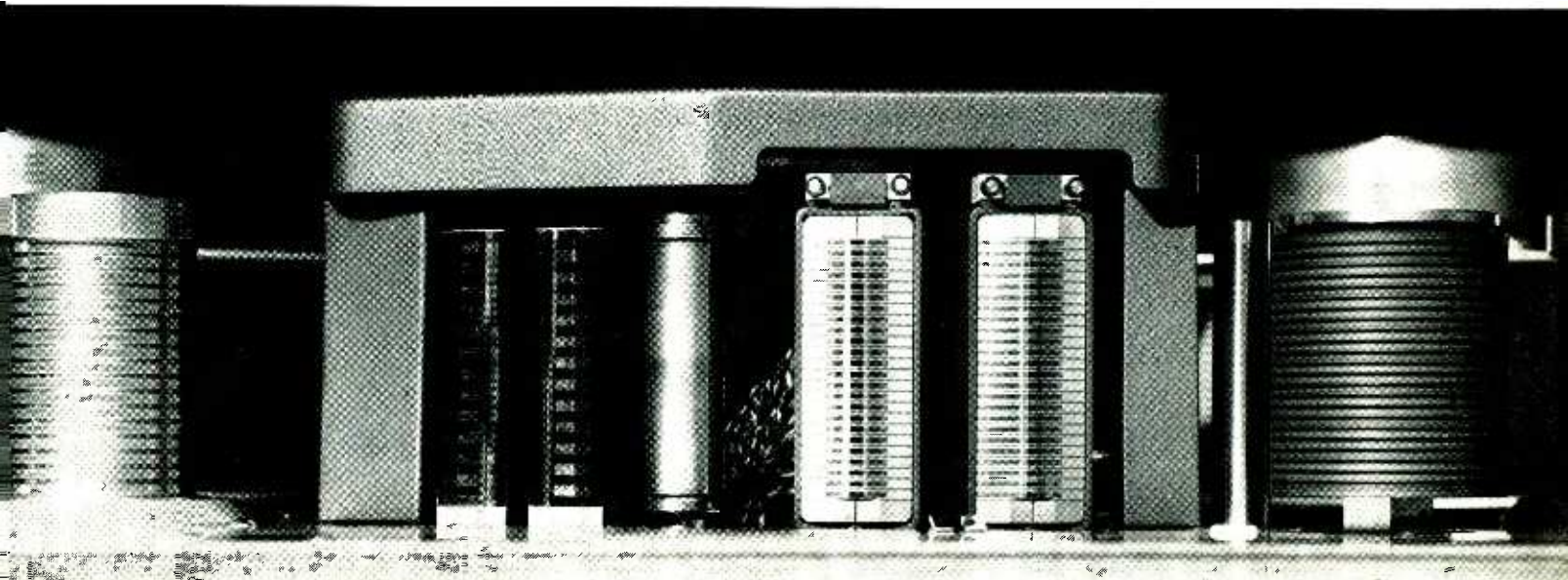
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**Phone: 862460. Telex: 733233.**

**UK:** Hayden Laboratories Ltd, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW.

**Phone:** Gerrards Cross 88447. **Telex:** 849469.

**US:** Gotham Audio Corporation, 741 Washington Street, New York, NY 10014.

**Phone:** (212) 741 7411. **Telex:** 236779.

Agents in most countries.

### M15A

**Tracks/speeds:** 1 or 2 (with or without pilot tone or time code) on 6.35 mm, or 4 on 12.5 mm; 19 and 38 cm/s.

**Frequency response:**  $\pm 1$  dB 60-10k Hz at 19 cm/s;  $\pm 1$  dB 60-16k Hz at 38 cm/s.

**Noise:** 65 dB, A-weighted, at 19 and 38 cm/s in stereo mode.

**Wow and flutter:**  $\leq \pm 0.04\%$ , DIN-weighted, at 38 cm/s.

**Features:** full logic control and motion sensing; timed record and bias switching for 'click-free-gapless drop-ins'; interchangeable head blocks and modular electronics; comprehensive autolocator with nine locations;  $\pm 50\%$  varispeed; available in portable or console versions, or as a chassis unit.

**Price:** £3.6k full-track £3.9k 2-track; £5.3k 4-track.

### TELEX

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

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

**UK:** Avcom Systems Ltd, Newton Works, Stanlake Mews, Stanlake Villas, London W12 7HS.

**Phone:** (01) 749 2201. **Telex:** 897749.

### 1400 SERIES

**Tracks/speeds:** 1 or 2 on 6.35 mm; 9.5, 19 and 38 cm/s.

**Frequency response:**  $\pm 2$  dB, 35-22k Hz at 38 cm/s.

**Noise:** 60 dB, NAB-weighted, at all speeds.

**Wow and flutter:** 0.12%, DIN-weighted, at 38 cm/s.

**Features:** dc servo capstan; motion sensing and

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**Price:** from £1150.

### UHER

**Uher Werke Munchen, Barmseestrasse 11, D-8000 Munich 17, West Germany.**

**Phone: 78721. Telex: 0522932.**

**UK:** Uher Ltd, 28 Spencer Street, St Albans, Herts AL3 5EG.

**Phone:** St Albans 30236.

### SG630

**Tracks/speeds:** 2 ( $\frac{1}{2}$  or  $\frac{1}{4}$ -track) on 6.35 mm; 4.7, 9.5 and 19 cm/s.

**Frequency range:** 20-25k Hz at 19 cm/s, 'overall'.

**Noise:**  $\leq 65$  dB, DIN-weighted, at 19 cm/s.

**Wow and flutter:**  $\leq 0.05\%$ , DIN-weighted, at 19 cm/s.

**Features:** full logic control and motion sensing; 4-motor *Omega Drive* without pinch roller; interchangeable heads; mic/line inputs; remote control option.

**Price:** £589.

### 4000/4200/4400IC

**Tracks/speeds:**  $\frac{1}{2}$ -track mono (4000IC),  $\frac{1}{2}$ -track stereo (4200IC) and  $\frac{1}{4}$ -track stereo (4400IC) on 6.35 mm; 2.4, 4.75, 9.5 and 19 cm/s.

**Frequency response:** 30-20k Hz at 19 cm/s to DIN 45500.

**Noise:** 64 dB (4000/4200IC) and 62 dB (4400IC), DIN-weighted.

**Wow and flutter:**  $< 0.2\%$  at 19 cm/s to DIN 45507.

**Features:** battery or mains powered portables; built-in monitor loudspeakers; mic/line inputs.

**Price:** £290-348.

### 1200 SYNCHRO

**Tracks/speeds:** 1 plus *Neopilot* on 6.35 mm tape; 19 cm/s.

**Frequency response:**  $\pm 1$  dB, 60-12.5k Hz.

**Noise:** 62 dB, DIN-weighted.

**Wow and flutter:**  $< 0.15\%$ , to DIN 45507.

**Features:** connects to W352 unit, comprising a pilot-frequency amplifier, resolver and running-time moderator for frame-synchronisation.

**Price:** on application.

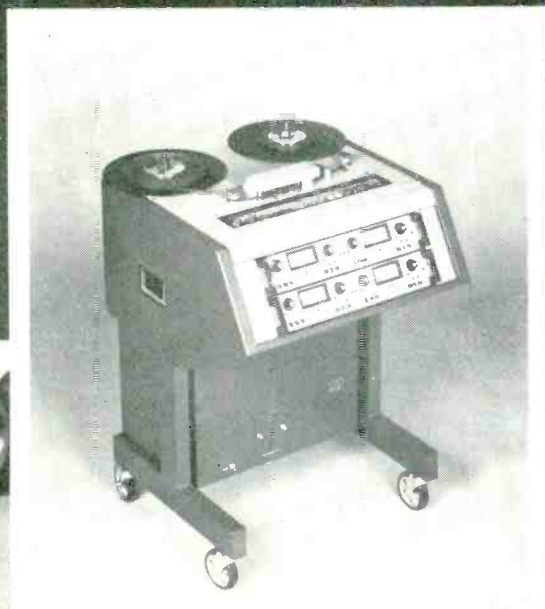


Technics  
RS 1500 US  
with isolated  
loop tape path



# BUILT TO TILT

The latest MCI JH-110 recorder has a new feature—a desk that tilts forward to allow a variety of work modes. This variable profile (which ensures effortless editing) is made possible by a gas-spring tilting mechanism. To complement this, a tape counter displaying minutes and seconds in real time can be combined with the JH-36 "Return to Zero" (CUE-UP) function. For precise electronic editing there are new bias and erase timing generators eliminating clicks, gaps and overlaps for all three speeds. Scissors and markers can also be supplied. The recorder can handle 14-inch reels. It is capable of handling mono and stereo configurations on quarter-inch tape as well as eight channels on one-inch tape.



The MCI logo, consisting of the letters 'MCI' in a bold, stylized font inside a rectangular border.

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London NW1 3EX.  
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# work

## Music Centre

The advent of the Music Centre in 1971 was an event of considerable magnitude, and rightly so. Amid the welter of converted country houses, grand basement dungeons and chic revamped warehouses that were being pressed into service as recording studios, it stood out as something radically different. Here for the first time, was a complete recording facility under one purpose-built roof, with four studios ranging in capacity from 10 to 125 musicians, full video and magnetic film transfer facilities, a disc-cutting room, and even a *bijou* bar and restaurant. The idea was great, but somehow the reality never quite lived up to it, and the Music Centre was quietly trundling towards oblivion like some sleeping giant, while other smaller establishments have taken all the laurels.

The wind of change has been blowing through downtown Wembley of late though, and for the past couple of years the Centre has been through a radical re-equipping program to bring it as close to the state-of-the-art as anyone's likely to get. Music Centre's beginnings can be traced back to the acquisition of Kingsway studios by cinema producer, Jacques De Lane Lea, in the mid-Sixties. The previous owners were Bensons, the advertising agency, who'd used the studio

to produce advertising jingles and voice-overs. As De Lane Lea Studios, and under the guidance of Dave Siddle, it rapidly became one of the bigger rock studios in London, recording such luminaries as the Stones, the Animals and Jimi Hendrix.

After a move to larger premises, the idea of grouping together all recording functions under one roof was mooted, and this eventually came to fruition with the opening of the Wembley complex. The project was troubled almost from the start, as studio administrator Richard Goldblatt recalls: 'I think we possibly jumped the gun a bit in trying to do everything at once. You name the problem, we started off with it.'

The firm whose tape machines had been specified went bankrupt and the studios had to be equipped with another make, suitably reworked by De Lane Lea's own technical staff. The desks were of an advanced design, but they weren't sufficiently developed to be reliable. And even the acoustics were somewhat suspect. Things took a turn for the better some years later, when De Lane Lea merged with CTS to become the Music Centre proper.

Richard Goldblatt remembers the personnel changes: 'When CTS left Bayswater, John Richards and

Dick Loosey, their two best engineers, came here. John Richards especially, is one of the best engineers around. He's worked with everybody from Andy Williams to Frank Sinatra and Tony Bennett; they all come to him to record. And all the film work followed him from CTS to here'.

Another refugee from Bayswater was Peter Harris, current technical director of the Music Centre and the man mainly responsible for uprating the studio equipment to its present high standard. He didn't accept the equipment *in situ* as being of a sufficient standard, and insisted on a complete refit as a condition of his coming. This is what's been happening over the past couple of years, with one studio being taken out of service at a time; leaving the other three in use and so causing the minimum of disruption.

Currently all four studios are equipped with Neve consoles. The 26-in/24-out desk in Studio 2 was the first one to be installed. 'It's basically a standard S equipped for quad mixing with some joysticks, and it was originally built for Studio 1 when we had to get a good desk in fast', explained Goldblatt.

Studio 1—at 23.4×14.7m the largest of the four—is equipped with a custom-built 30-in/24-out console, with facilities for mixing to magnetic film at the same time as multitrack recording. To complement this feature, there are full projection facilities and a *Cinema-scope* screen in the studio. Studio 4's 16-track desk is something of a hybrid. 'It was originally a small Neve 12-channel/4-out desk, but it's been completely rebuilt by our maintenance department as a 20-channel-in/16-out/16-monitored unit.' The newest developments are in studio 3, but more of this later.

To a large extent, ancillary equipment in all four studios is interchangeable. The main playback units are all Studers; the Centre has a total of three 24-track, one 16-track, two 8-track, four *ASO* stereos, six *B62* stereos and one *B62* mono. In addition, there are a pair of Ampex decks left over from the early days, which were fitted with Studer heads and electronics by the maintenance department. They've been christened 'Stupexes' by the staff. All are mounted on heavy-duty castors, and can be moved anywhere in the building. 'Sometimes we might get a session where someone might want to run a 24-to-24 setup. If we've got a free machine we can simply wheel it into the studio and use it.'

Studio interchangeability doesn't end there either: 'All the studios are connected by ring ties; we've

got 20 permanent lines which run round the whole building. Then we have what we call a pink box which is a sort of giant patchboard that we can use to connect any two rooms together directly. That's mainly used for film and telecine work so that we can have, say, one studio connected with film sound and another with telecine, and not have them interacting with one another. Soundwise we can get anything to anywhere, even the disc-cutting room; so if we wanted to do a live recording straight to disc, we'd have no problems.'

All four studios are equipped with Dolby systems: *MX* or *M16s*, with individual manually switched *360s* for mono and stereo work. In addition, the three 24-track studios have built-in *Kepex* and *ADMs*, with a 'floating' mobile *Kepex* that can be used as needed. Other ancillaries include a Lexicon digital delay and an Eventide *Instant Flanger*, plus 'odds and sods in the way of phasing boxes.' Each studio also has at least two Urei limiters *in situ*.

Undoubtedly the most advanced of the studios is number 3, which has recently emerged from a long and comprehensive rebuild. If all goes well, it should serve as the pattern for the other studios at sometime in the future. The acoustics and working environment in the other control rooms are fine — if somewhat bleak and utilitarian. As Richard puts it, 'they're not anything lavish — they're working men's studios if you like — but Studio 3 is a totally different world to the others.' Interior design was handled by Ken Shearer, who worked on the Pink Floyd's studio, and throughout the job he collaborated closely with Peter Harris and the rest of the staff.

The somewhat unorthodox polygonal monitors were built to Peter's special design, using Tannoy *HPD* speakers, which are also fitted in the cutting room. At present the rest of the monitors use Tannoy *Reds*, but they will gradually be phased out and replaced with new enclosures in the near future. As a studio policy, the Music Centre doesn't use gung-ho high-powered monitoring: 'I mean, to sit in front of a couple of 300W speakers at full power; it's sheer madness. You've got a career ahead of you that's going to last quite a few years, so you don't want to ruin your ears. The highest output amplifiers we've been using so far are Crown *150s*, and we've just bought a pair of *300s* for Studio three. But even they're not going to be driven hard; we're simply using them because we have such large speakers to

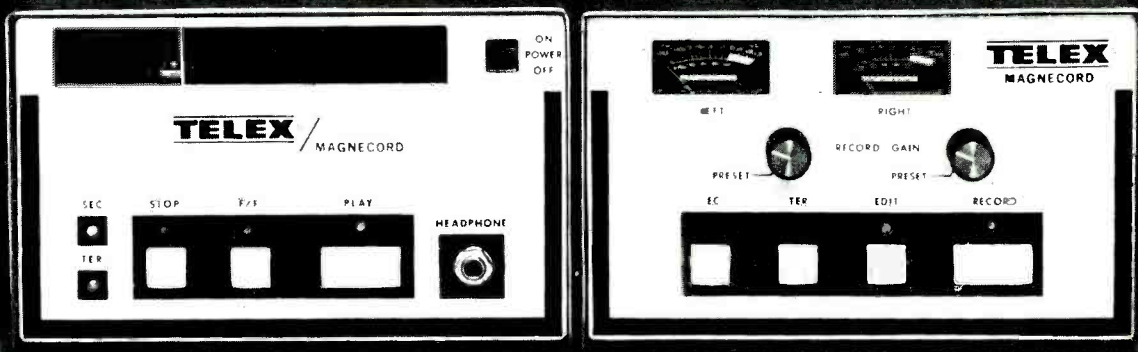
Studio 3 at the Music Centre

Photo: Antoine Raffoul





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## RTW

Radio - Technische Werkstätten GmbH,  
Neusser Str. 397-399  
D-5000 Köln 60,  
W. Germany.  
Tel: (02 21) 76 40 35.  
Telex: 8885 217

## Pieter Bollen Gelvidstechniek B.V.

Hastelweg 6,  
Eindhoven,  
Nederland.  
Tel: 040 51 27 77.  
Telex: 59281 Bolle N L.

## WORK

drive. Nobody here uses a lot of level, unless an outside engineer comes in and wants it. But it's never come to the point where we've needed any more power than we have already.'

The console in Studio 3 is, naturally, a custom Neve unit. 'We had it built to our own specifications with special foldback and echo sends. We use four auxiliary sends instead of the usual echo and foldback sends. Each one of these has an individual level control, so you can have four different levels coming off each channel, rather than the usual setup.'

The desk is equipped with *NECAM*, and Richard Goldblatt is full of praise for its operational characteristics: 'There isn't anything in automatic mixing to touch it, because it works in real time. You can see everything happening on the mixer itself as the faders move; it's not just happening on some voltage-controlled fader, where you need an indicator to tell you what's going on.'

'The original installations had a simple servo/motor-operated fader. Then Neve introduced a clutch

into the system for faster responses, and we've just re-equipped the whole desk with the new clutch-controlled version. In fact they're constantly uprating it anyway; they've just installed a new and more comprehensive computer program, for instance.'

Besides the obvious advantages of being able to see exactly what's happening as it occurs, Richard also rates the rapid reaction time of the system as being an important reason for choosing *NECAM*: 'Yes, it's instantly responsive. Some of the American systems seem slightly sluggish; they move a fraction behind the operator all the time. Also with a lot of the other systems you store the information — all the information — on the tape, so that if a section of tape drops out, you've lost the corresponding section of information. With the IBM floppy discs which we use, data can quickly be deleted, relocated or even transferred over to an entirely new disc.'

Another advantage with *NECAM* is ease of installation: 'It doesn't interfere with the main desk. All Neve do is pull out the old faders and replace them with new servo-driven faders. Then you simply hook up the computer, and you're away. That means what we could feasibly do next is install a set of

*NECAM* faders in Studio 2, without initially going to all the expense of buying a new computer.'

Instruments available in house consist of a Fender *Rhodes* stereo electric piano, an electric harpsicord, an upright jangle piano and Steinway, Yamaha and Bosendorfer grand pianos. Also, the Music Centre is one of the few studios in this country to have *Aphex*, a new sound enhancement system from the States which promises great things in future. 'Aphex adds what the manufacturers call a psycho-acoustic encoding on the tape. I read about it and phoned Curt Knoppel, who developed the system. He very kindly obliged by sending one over for us to use on some sessions we were doing at the time. Since then, Britannia Row, the Floyd's recording organisation, have taken over the agency in this country, but ours came directly from the States.'

'IBC's cutting room borrowed it for a session with Lol Creme, but we've now got it permanently. Brian Bennett's been using it on a lot of his sessions here; I've used it on a new album which I've been engineering for Raymond Froggatt, and Paul McCartney's even been working on stage using *Aphex*.'

You can't go out and buy an *Aphex* machine as such; it's charged

on the basis of the time used on a particular recording, with the equipment remaining the property of Aphex Systems.

The range of work undertaken by the Music Centre in a year is enormous. Everyone from Paul McCartney to James Last has passed through, and with such a cosmopolitan and diverse clientele, it's obvious that engineers tend to specialise in different musical styles. Richard doesn't see this as a problem though: 'We've got six engineers and seven tape operators, and they all do their own bit. A lot of them don't work with groups, and stick to orchestra and film work, which is highly specialised in its own right.'

For the future, the next major project is the building of a permanent link with the adjacent Empire Pool, which is being increasingly used for rock concerts. 'We're running landlines from here to the space where there used to be a wave-making machine for the swimming pool. We're going to run ducts with about 40 lines, with additional video lines as well, so that we can record concerts live via the line system, and patch it into any one of the studios. So we could even become the biggest 'mobile' in existence!'

**Dave Hamill**

## Marquee remix

It is by now fairly common knowledge that one of the oldest established studios in London has opened a brand new remix suite on their premises. The Marquee's remix suite opened for business at the beginning of January, and has been heavily booked ever since. The idea was to build a totally up to date mixing system, not only to complement the recently updated studio, but to provide a first class mixing environment for any multi-track reduction from any studio. This idea also increases client turnover, as the suite is separated from the original control room thus making the whole complex, multifunctional.

The room is an Eastlake design, as is evident from the well known wood panelling / built-in speaker formula which is something of a trademark. The desk is a 36-in/22-out MCI *JH-542*, at present hooked up to a 24-track MCI tape machine with the usual autolocate facilities mounted on the desk. The room itself is not enormous, but as remix sessions do not usually involve a whole band, the 10 square metres area available is sufficient for the average client. The layout is compact and con-

ventional, the tape machines being mounted in a line beneath the loud speakers, and the rack-mounted units being positioned on the opposite wall, within easy reach of the engineer.

Even now, after several months work, the room has that clean unlined in smell about it, but no doubt it will not take long before things start getting clogged up with fag ash and spilt Coke! The whole complex radiates energy and efficiency—a lot of which, one suspects, emanates from the studio manager Simon White.

The equipment is what one would expect from a studio of this calibre—the usual compressors and noise gates are there in force, along with a generous sprinkling of graphic and parametric equalisers. There are three console-mounted MCI 6.35 mm machines for mastering (or delays) and the multi-track machine is the new narrow MCI with interchangeable head blocks. The remix suite also has four EMT plates and a ddl. The mixing console is the latest from the MCI stable and is ready wired for conversion to 32-track, but no one knows as yet when that fateful day will arrive. All channels are vca controlled, and are linked up

ready to accept the MCI computer mix system when it becomes available.

As it is, the desk can utilise its vca facility for subgrouping down to eight master faders, which dictates the level of any number of remix channels, while still retaining their relative levels, pan positions etc. Thus, the whole drumkit or string section can be regulated by one master vc fader. In effect this means that a 24-track mix—even without the computer—can be as

simple as an 8-track mix. I was impressed by the way in which MCI have been able to develop such a co-ordinated system. It's very rare for a company to produce both mixing desks and tape machines—it's even rarer for a company to produce both to the same very high standard. I also know from my own experience that this is dependable equipment despite its sophisticated specification. Obviously and inevitably things do

56 ▶





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A dilemma Nagra were suffering for some time, was how to produce a self-contained Professional Tape Recorder which incorporated all the qualities of their highly acclaimed Nagra 4.2, but could be marketed in the lower price range. Almost anyone can manufacture a cheaper version of a successful product but Nagra were determined not to sacrifice standards for economy. Well, we are happy to announce they have achieved the perfect solution with the new Nagra E.

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### TECHNICAL DATA

Dimensions: 13.8 x 9.3 x 4 in (351 x 336 x 104 mm)  
Weight: 12.6 lbs (5.75 kg) with tape and batteries  
Wow and flutter:  $\pm 0.1\%$

Reels: 7 in cover open, 5 in cover closed.

Loudspeaker: 1.0W both switchable Tape/Direct  
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Frequency response recorded at  $-20$  dB: 30—15,000 Hz  $\pm 2$  dB

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SS12/NAG

## WORK

go wrong, but since both the consoles and tape machines are modular in the accurate sense of the word, most major breakdowns can be easily overcome if sufficient spares are carried by the distributor or even the studio. A further indication of this company's understanding of the practical use of studio equipment is the inclusion in their multitrack tape machines of a led 'state-of-the-machine' indicator panel. As an instant trouble shooter, this device is so far in a class of its own.

'Eastlake have the reputation of being able to guarantee a very high standard, if they accept a particular commission. Their technology depends simply on applying tried and trusted techniques, rather than ultra-modern mass-produced ideas being squeezed into a particularly shaped room. The system would seem to be primarily tailoring the acoustics to give the correct sound behind the desk—and then, rounding off the edges with monitor eq. The sound in the Marquee's room seems pretty good at most points, but the more directional top end is tailored for someone sitting behind the mixer'.

I talked for some time with Geoff Calver who was able to tell me a great deal about the studio from a practical point of view. . . .

'Eastlake had the problem of working in a very restricted space, and to a very fast deadline. They actually completed the project from start to finish in three weeks, which allowed us to open for business on January 1st. Three weeks from bare walls to a working situation is incredible.'

'The work was all done during the 'run-up' to Christmas, allowing us the time immediately after to do our own sound checks and to familiarise ourselves with the system. Most of the things to be sorted out were with the mixer, which is designed to work with the MCI computer system—although we don't have it yet. As soon as it is available, we'll stick it in.

'The desk is the usual MCI layout, each module covering both channel and output group. The vc faders are a very useful tool, each one providing a vc output which can control any number of remix channels. As an engineer I never entirely trust the machine—on this desk it's very easy to bypass all the clever bits and use it in a totally straight-forward way.'

Geoff's comments reminded me of

my own 'introduction' to automated mixing systems. I was told about a certain major London studio, who asked an equally major manufacturer to devise an automated switching system in the new desks they had ordered. The end result of several months frenzied activity in the design department was the spectacle of producer, engineer and rock band sitting behind a very large console, watching in amazed and bemused silence, while machines around them dropped in and out of record, or into rewind at will. Little lights flashed on and off on the desk and Dolby units began to light up like Blackpool illuminations.

However, from little acorns, slightly larger acorns grow (I think) and studio machinery these days seems to be slightly more reliable than the demon infested heap previously mentioned. At this point it is sorely tempting to launch into my pet discourse on the studio equipment spiral, but I won't. I asked Geoff what his thoughts on this topic were, and if he thought the general public in the form of record buying teenagers really cared too much about the sophistication of the techniques involved—in comparison with the infinitely more primitive methods used in the early days of Hendrix and

Cream, for instance.

'I think the general public—even the kids, have been educated to expect a higher standard of recording—to complement the high standard of their hi-fi systems. We don't rush out and buy something just to keep up with the Joneses. If we really need a specific piece of equipment we look at the market very carefully. And we've tried to make it a policy to be as independent from the main studio as possible—all we ever borrow is the occasional mic for our little o/d room, next to the Reduction Suite. Eastlake have put in a mirror on the opposite wall to compensate for the window between the two. We have tie lines to the main studio, but they're only used for copying really.'

The Marquee's remix suite has yet to develop its own character both as a working environment and as a 'name' in the industry—but I think it will not be long before they gain a reputation for providing a clean, trouble-free mix in very comfortable surroundings. They are not cheap at £44 an hour (exc. VAT) but for the professional who puts quality above fiscal consideration it would seem to have a lot going for it.

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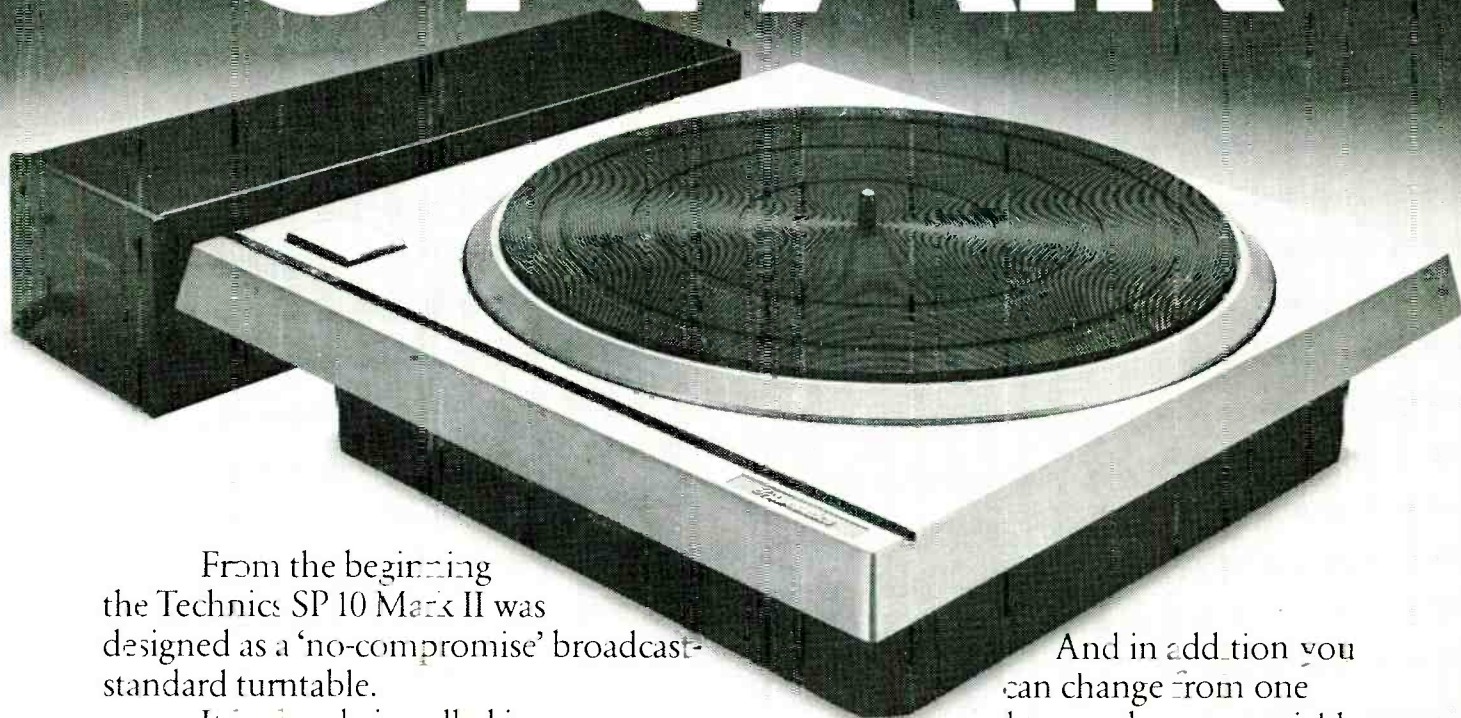
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**The SP 10 Mark II Quartz-controlled Direct Drive Turntable.**



# reviews



## TEAC Tascam Series 80-8 tape machine

Hugh Ford

### MANUFACTURER'S SPECIFICATION

**Tape width:** 12.5 mm.  
**Format:** 8-track, 8-channel.  
**Reel size:** 267 mm maximum, NAB hub only.  
**Tape speed:** 38 cm/s.  
**Line input:** -10 dB (0.3V); impedance greater than 20k ohm, unbalanced.  
**Line output:** -10 dB (0.3V); load impedance greater than 10k ohm, unbalanced.  
**Record level calibration:** 0 vu referenced to 3 dB above 185 nWb/m tape flux, adjustable.  
**Speed accuracy:** +0.5% deviation from 38 cm/s.  
**Wow and flutter:** 0.04% rms NAB-weighted; ±0.06% ANSI-weighted. (Measured with flutter test tape.)  
**Starting time:** <500 mS.  
**Fast wind time:** 120s for 730 m of tape.  
**Overall frequency response:** ±3 dB, 40-18k Hz.  
**Signal-to-noise:** 65 dB weighted; 60 dB un-weighted. (Referenced to 3% thd level, 10 dB above 0 vu, at 400 Hz.)  
**Distortion:** 1% at 400 Hz, 0 vu.  
**Total harmonic distortion:** 3% at 10dB above 0 vu, overall.  
**Crosstalk:** >45 dB at 400 Hz.  
**Erase:** >65 dB at 1 kHz, +10 vu reference.  
**Power:** 117V, 60 Hz, 200W. (Also 240V, 50 Hz version.)  
**Dimensions (whd):** 445 x 533 x 305 mm.  
**Weight:** 35 kg.  
**Manufacturer:** Teac Corporation, 3-7-3 Naka-Cho, Musashino, Tokyo, Japan.  
**UK Agent:** Teledyne Acoustic Research, High Street, Houghton Regis, Dunstable, Bedfordshire.

58 STUDIO SOUND, DECEMBER 1977

THE TEAC *Tascam Series 80-8* is an 8-track machine that uses 12.5 mm wide tape in what is naturally a very narrow track format (similar to the common domestic 6.35 mm stereophonic format). The tape transport has three motors: two reel motors to which are attached NAB hubs, and a belt-drive capstan motor. As is to be expected, the machine cannot use other types of spool, but this only makes sense where 12.5 mm tape is used and the maximum spool diameter is limited to 267 mm. Tape tension at the pay-off and take-up spools is controlled by the motor torque, while the tape motion start and stop uses electro-magnetically-operated band brakes, with sprung damping arms being fitted to prevent tape loops.

From the pay-off spool the tape is passed to the tension arm and then to a high-inertia damping roller. From here it passes to a head block that houses the 8-track erase, record and replay heads mounted reasonably well onto a heavy plate. Fixed tape guides are fitted at the entrance and exit of the headblock, with a further fixed guide between the erase and record heads and a scrape flutter roller between the record and replay heads; this of course being the ideal place for a roller. From the headblock the tape passes the large diameter belt-drive capstan and its solenoid-operated pinch roller, and thence to the take-up spool via the tension arm.

Threading the tape was found to be completely straightforward, there being only one obstruction in the form of a replay headshield that hinged out of the tape path for threading. So far as control of the tape motion is concerned, the performance in the normal forward modes was good except for a tendency to throw loops on starting, but this was taken up by the tension arms without trouble.

In the fast wind modes the tape tension was rather low and the winding fast, with the result that even BASF *SPR50* back-coated tape did not give a good wind. But this is common disease of many tape transports in the lower price range. As is good practice, particularly in view of the use of metal heads, tape lifter pins remove the tape from the heads in the fast modes, a cue latch being fitted for listening to recordings in such modes.

Tape motion is controlled by the usual two 'fast wind' buttons, a 'forward' button and a large 'stop' button. They work via a solid-state logic control system that provides all the necessary interlocks, and which may also be remotely by means of a rear-panel connector. A useful feature, but not ideal, is the provision of a digital tape position counter with a 'memory' facility, which stops the tape at zero counter indication when it is switched into operation.

In addition to the motion controls already mentioned there is a 'pause' button which

functions in both the record and replay modes. Thus the machine can be set ready in the record and pause condition, and then put in motion at any desired time by simply pressing the 'play' button.

The record function is individually selected for each track by a series of eight pushbutton switches, each of which has its own red led indicator to show that a particular track has been selected. These lamps and the lamp associated with the record master button flash when the tape is stationary, but are steady in the recording mode with tape motion—a very good feature. In order to be able to drop-in on particular tracks there is no record interlock with the play button, but this is essential if the machine is to be flexible in operation; it only requires a little extra care in use.

The remaining front-panel controls and facilities include record-level potentiometers; vu meters and peak-level red led indicators for each track; and three interlocking pushbuttons for controlling the source of the machine's eight outputs. These can be fed either from the inputs or permanently from tape. Alternately, the 'normal' mode automatically switches the outputs between the input and the record head in the sync mode, in accordance with the record/replay status of the individual tracks.

At the rear of the machine there are phono sockets for the eight inputs and fixed-level outputs, all of which are high-level, unbalanced connections; the fixed mains power lead; the remote-control socket; and, behind a removable panel, a printed circuit connector for the optional *type DX-8* dbx unit, which automatically selects its functions in sympathy with the machine.

Within the machine the signal electronics comprise eight record/replay amplifier boards. These are located behind a hinged panel that supports the vus and record-level controls, such that the controls on the amplifier boards are readily accessible; in addition the machine is provided with an extender board for servicing the amplifiers. These are very clearly laid-out on good-quality pcbs that plug into a mother board at the rear of the machine. The remainder of the electronics, which consist of the control logic and power supplies, are supported on two further pcbs within the machine. Access to these boards for servicing is rather awkward.

In terms of general finish, the machine is made to a good semi-professional standard without any unnecessary trim. It was felt, however, that the strength of the rear covers could well be better for portable use, since they are very likely to be damaged. Internally the wiring was tidy and all necessary identifications had been applied to components, including the multitude of fuses.

As is to be expected of a machine in this price range, the standard of metalwork is not all that substantial. But here again it can be said fairly that the standard of construction is to a good semi-professional quality and, other than noise from the solenoids on starting and stopping, the machine was very quiet in operation.

### Replay performance

Initial investigations were aimed at the replay frequency response against the IEC 35  $\mu$ s standard for 38 cm/s operation; in lieu of a 12.5 mm calibration tape a flux loop was used

60 ▶



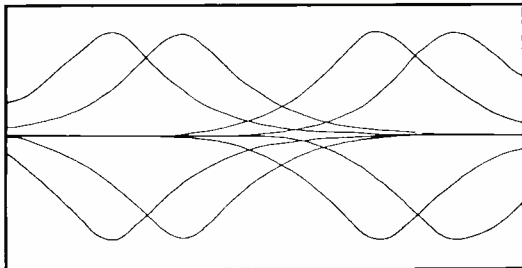
# 8 features to consider if choosing a mixer

## 1. What are the input select facilities?

Nothing is more annoying than having to change plugs during a session. Signals should be connected permanently to the console and selected by a front panel switch. TASCAM consoles switch up to 20 sources into 8 input channels.

## 2. What type of equaliser is used?

The classic, commonly used baxandall circuit, originally designed for Hi-Fi applications has limitations for professional applications. The 'shelving' effect at the limits of the frequency range tends to bring in unwanted rumble and noise. Peaking equalisers as found in TASCAM consoles control specific frequency bands only.

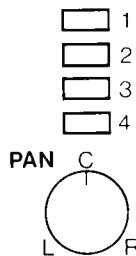


## 3. How much overload headroom?

Under steady tone conditions most consoles perform well. The real test lies in active operation when peaks of up to 20dB can cause severe distortion. Ample overload headroom is maintained throughout TASCAM system design.

## 4. How is the channel routing done?

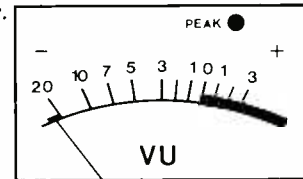
TASCAM's logic pan routing system enables outputs to be accessed independently or the pan control comes into operation when more than one assign button is pressed. This eliminates the crosstalk and versatility limitations of directly switching the outputs of a pan pot.



## 5. How effective is the metering?

Other than your ears the meters are your only indication of the signal the mixer is putting out. Arguments between PPM's and VU's are lengthy and inaccurate instruments make matters worse.

TASCAM consoles combine the best of both worlds and feature a VU scale with a peak reading LED.



## 6. How is the power supply arranged?

Perhaps an understated feature but nevertheless a well-designed power supply is necessary. Single rail power units can introduce intermodulation distortion when, for example a headphone amplifier is powered by the same supply as the microphone amplifiers. TASCAM consoles contain up to 4 regulated supplies for stable operation.

## 7. Will it grow with my needs?

As you work with your equipment you will want to add extra channels, effects and facilities. TASCAM consoles offer convenient connection points for, cascading, expansion and insertion points for connecting external processors.

## 8. How well is it made?

Mechanics are just as important as electronics—the paint and printing durability, the longevity of the faders and switches, etc. TASCAM products are built to the same exacting standards as all TEAC's professional equipment for the past 25 years.

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### TEAC TASCAM 80-8

to check the replay frequency response of several channels. With respect to 1 kHz the replay frequency response was found to be within  $\pm 1.5$  dB of the theoretical curve from 40 Hz to 10 kHz, above which the replay response boosted by about another 1.5 dB at 20 kHz. As the use of a flux loop does not take into account head/tape separation losses etc, this extra boost would appear to be desirable. There is, therefore, no cause for complaint about the replay equalisation in either the monitor or sync modes, which gave virtually identical results. In practice there are equalisation controls on the record/replay amplifier boards for both the monitor and the sync modes. Thus minor corrections can be made to the replay equalisation.

Not allowing for fringing effects, a full-track recording of a 1 kHz tone at the reference fluxivity of 320 nWb/m gave an output from the machine of 0.3V rms in either the monitor or the sync modes. Level adjustment potentiometers are provided on the record/replay amplifier boards for adjusting these levels by between  $\pm 8$  and  $\pm 10$  dB.

Machine replay noise was found to be good, with the following reference fluxivity (320 nWb/m) to noise ratios being measures with the machine alone, and with machine-erased *SPR50LH* standard-play tape:

	Reference fluxivity to noise (average of channels)
<b>Machine only—no tape</b>	
Unweighted rms 20-20k Hz	50.0 dB
A-weighted rms	65.5 dB
CCIR-weighted rms, ref 1 kHz	59.5 dB
CCIR-weighted quasi-peak, ref 1 kHz	55.0 dB
<b>Machine-erased tape (SPR50LH)</b>	
Unweighted rms 20-20k Hz	48.5 dB
A-weighted rms	57.0 dB
CCIR-weighted rms, ref 1 kHz	48.5 dB
CCIR-weighted quasi-peak, ref 1 kHz	44.0 dB

It will be noted that the unweighted noise is almost the same with or without tape. This is

because the 50 Hz hum level in the outputs was above tape noise; it is felt that the manufacturer should improve this situation.

A final aspect of the replay amplifier's performance is the maximum tape fluxivity that can be replayed without excessive distortion. This was found to be 25 dB above the reference fluxivity of 320 nWb/m, which certainly gives a more than adequate margin for all current or likely future tape types.

### Record/replay performance

While the above table gives the noise performance in the record/replay mode, the overall available dynamic range depends upon the maximum output level of the tape in use, and the drive capability of the machine's record amplifiers. In the case of the *80-8* the record amplifiers were found to give an enormous margin on current tape types, while with *SPR50LH* tape the actual 3% third harmonic distortion point was found to occur at 9 dB above the reference fluxivity of 320 nWb/m.

Biasing *SPR50LH* tape for 3 dB over drop at 10 kHz, the best overall frequency response which could be obtained is shown in fig. 1. Although the response is well within the manufacturer's specification, it exhibits an excessive high-frequency boost. This is in spite of the record amplifier being fitted with a high-frequency equaliser control and a peaking control, both of which had a drastically small range. According to the UK agents these controls are fitted to equalise the machine for the recommended Ampex *456* tape, but to my way of thinking they should be able to equalise the record amplifier for any current tape makes and types.

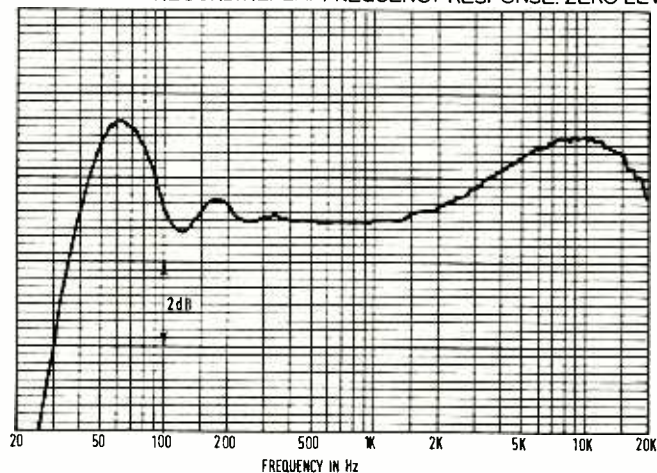
Distortion when recording a 1 kHz tone at the reference fluxivity of 320 nWb/m was found to be similar on all channels checked, being 0.8% third harmonic for *SPR50LH* tape biased to the 3 dB over drop point at 10 kHz—a respectable performance.

### Level indicators

As has already been mentioned, the machine is fitted with a vu meter and a red led peak indicator for each channel. Alignment of the zero vu points was found to be 9 dB below the

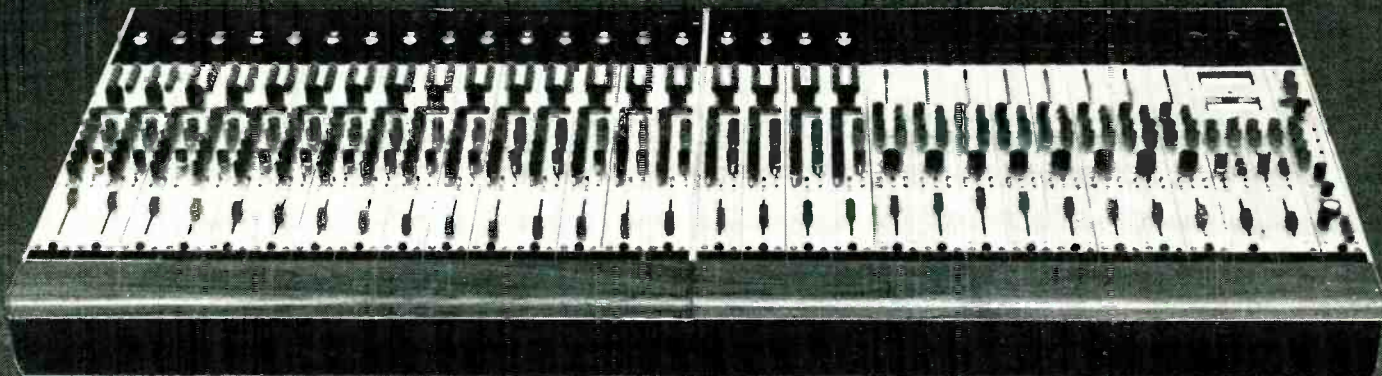
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FIG.1 TEAC TASCAM 80-8 RECORD/REPLAY FREQUENCY RESPONSE. ZERO LEVEL: -20dB.





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## TEAC TASCAM 80-8

maximum output level for 3% third harmonic distortion, which is correct for the genuine vu-standard instruments. A check of the meters showed that they were, in fact, rather faster than the standard instrument, rising to zero vu in 200 ms with a similar fall time. It is felt, however, that the pre-set calibration can well be justified. The peak-indicating leds were found to be quite fast in action and illuminated at the 3% distortion point from tape. They are probably more useful on programme material than the vu meters, which have their place when calibrating the machine.

### Inputs and outputs

The minimum input sensitivity for recording the reference fluxivity was found to be about 200 mV, with the range being adjustable by the front-panel potentiometers to accept any input level. Sensibly the input impedance remained high for any input sensitivity setting, varying from 29k ohm at maximum sensitivity to 32k ohm at minimum input sensitivity.

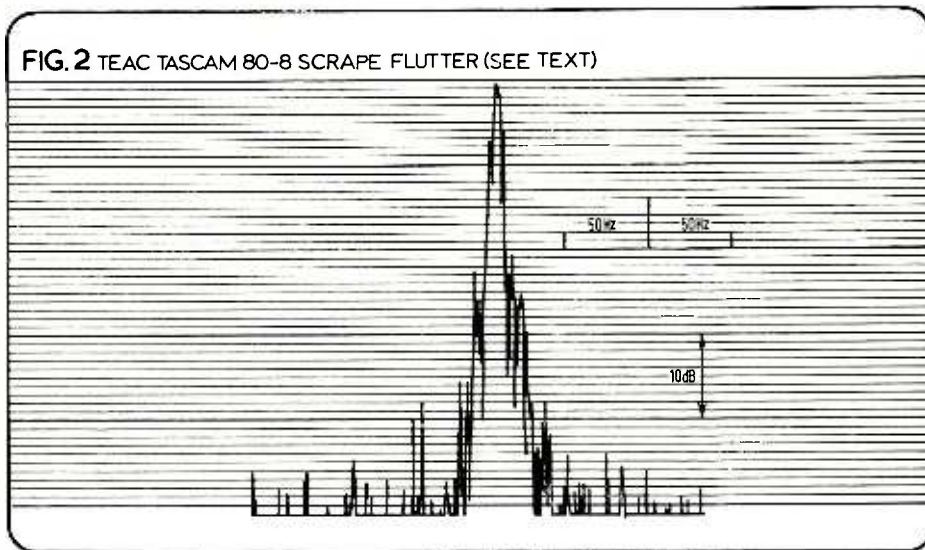
The output level is fixed by an internal potentiometer to 300 mV when replaying a recording at the reference fluxivity of 320 nWb/m. It is possible to reset this level over a fairly wide range, with the maximum output capability being limited to +18 dB, ref 0.775V unloaded. However, the output impedance is on the high side at a measured 660 ohm, but this can be readily reduced by a simple modification.

### Other matters

Checking the wow and flutter to the IEC (DIN) weighted quasi-peak measurement showed that the performance was consistent throughout a reel of tape at 0.5%, which is reasonable for this class of machine. Drift in speed from one end of a reel to the other was measured as 0.3%, with the beginning of the reel being the faster end.

The scrape flutter performance is depicted in fig. 2, which is a 3.15 Hz bandwidth spectrum analysis of a recorded and replayed 10 kHz tone. The performance of this machine is good

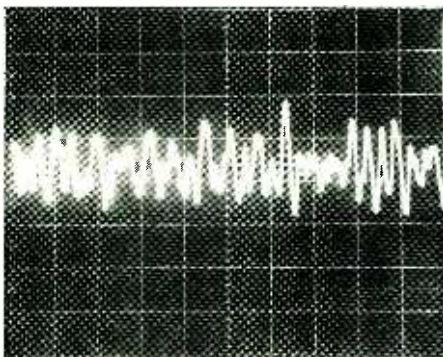
FIG. 2 TEAC TASCAM 80-8 SCRAPE FLUTTER (SEE TEXT)



by many standards, thanks to the sensible positioning of the flutter roller on the head-block.

Similarly the phase jitter between the outer tracks, as shown in fig. 3, is to a good standard for a 12.5 mm machine, with the peak phase

FIG. 3 Phase jitter at 38 cm/s. Horizontal scale: 1s/division. Vertical scale: 10°/division.



jitter of the recorded 10 kHz tone being in the order of  $\pm 15^\circ$ .

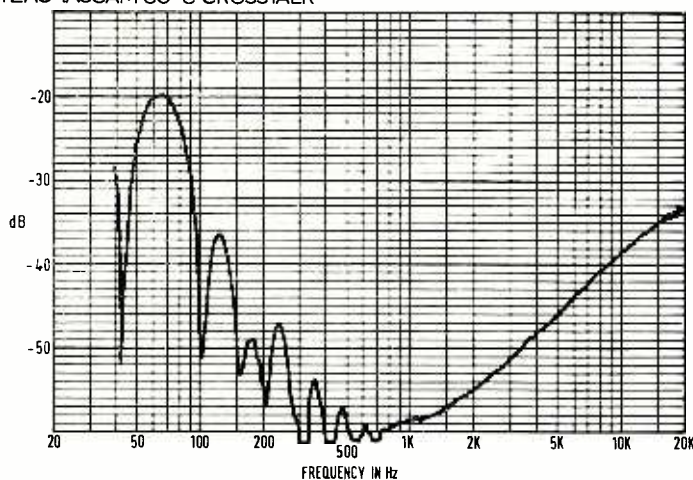
The worst-case crosstalk between tracks is shown in fig. 4, which represents the crosstalk when recording on both adjacent tracks—a condition which, of course, should be avoided in practical recording. As expected the low-frequency performance is poor, due to the narrow guard bands between tracks and the added secondary gap effects of the heads. In other areas, however, the crosstalk is surprisingly good.

The final matter to be investigated was the erasing capability of the machine. The result was that a 1 kHz tone on *SPR50LH* tape was erased by 83 dB; so there is no complaint in this area.

### Summary

For its low price as an 8-track machine, the *Tascam 80-8* has many very good features. The only really restrictive shortcoming is that the record amplifiers cannot be equalised for many tape types. Obviously, the use of the 8-track format on 12.5 mm tape restricts the machine's capabilities in comparison with more expensive machines using 25 mm tape, but one has to weigh this against the difference in cost. As with any machine noise reduction can be used, and clearly it will overcome some of the disadvantages of the narrow-track format. It is not surprising, therefore, that TEAC offer the type *DX-8* dbx noise reduction accessory specifically to match the *Tascam* machine.

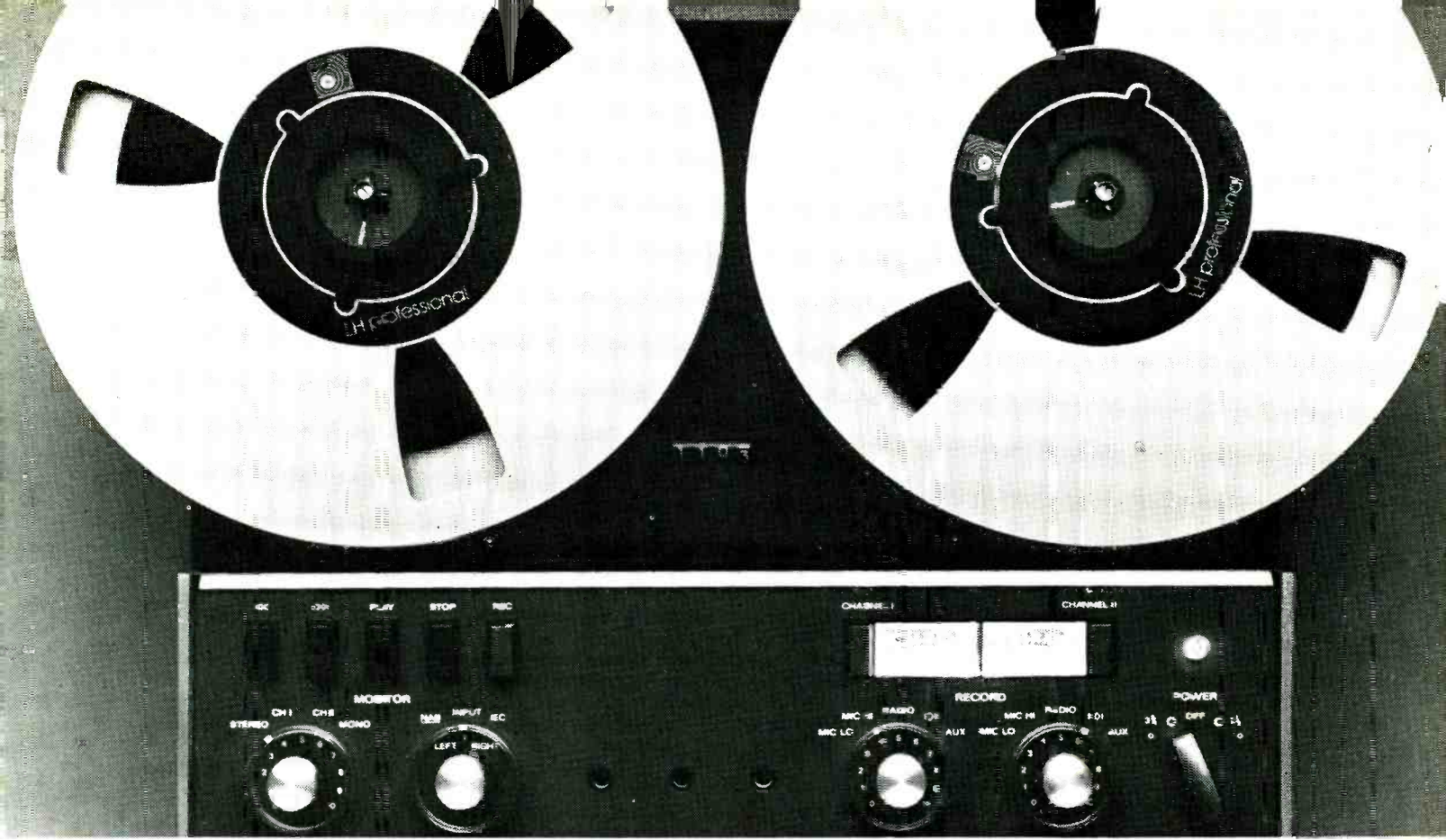
FIG. 4 TEAC TASCAM 80-8 CROSSTALK



*In response to Hugh Ford's comments about the small range of equalisation control on the record amplifiers, Tascam in Japan has replied as follows:*

*'Ampex 456, Maxell UD50 and Scotch 206 are recommended for use with this machine. The adjustment range of the equalisation circuit was limited at the design stage to prevent user misadjustment. There is no problem in extending the range of adjustment: replace C25 (330 pf) to 470 pF, and C26 (3.3 nF) to 6.8 nF, on each of the eight record/replay pcs.'*





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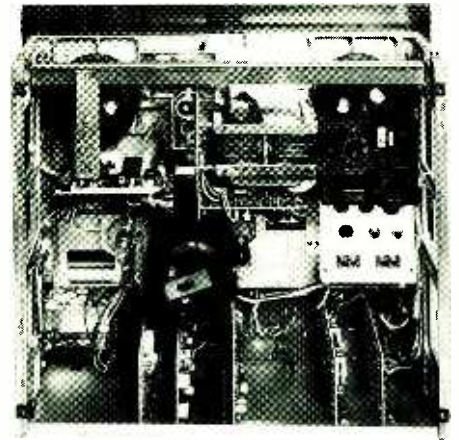






## Revox B77 tape machine

Hugh Ford



THE REVOX *B77* machine is, in effect, an updated version of the well-known and respected *A77*, and as such the basic layout and design are identical. The spools are driven directly by individual ac motors which are run at constant torque, there being a switch for altering the tensions for large or small spools. Spool hold-down is by cine-type hubs, with the capability of using either the Revox 267 mm diameter cine-centred spools or NAB-type spools with the aid of an adaptor.

From the pay-off spool the tape passes a spring-loaded damping arm, a fixed cylindrical guide and then a tape presence detector, which is an improved version of the earlier incandescent lamp and photocell arrangement. The  $\frac{1}{2}$ -track erase, record and playback heads follow this detector. It is perhaps surprising that no scrap flutter roller is fitted at all, and that no roller guides are used. From the replay head the tape passes to a small-diameter guide and then to the capstan and pinch roller, which are of the original Revox design. These are followed by the final guide and the take-up spool.

All these tape transport components are mounted on a relatively heavy-duty alloy casting, onto which the remaining components are mounted by means of an alloy framework and conventional sheet metal work. The result is that those components which require critical alignment are solidly mounted (including the heads, which have a very good azimuth adjustment) and that weight is saved in the overall construction where really solid mounting is not needed. Overall, the standard of construction is very good, and there is ready access for servicing and the replacement of any major components.

While the signal electronics occupy only five printed circuit boards that plug into a mother board, the electronics associated with the power supplies and tape transport control occupy a further three boards which are mounted onto the tape transport—however, these are also readily removed for servicing. In the review sample of the machine no individual components on the boards were identified; neither were the fuses identified by their values. But it is assumed that this will be corrected in the production versions of the machine.

Control of the tape transport functions is effected by the usual collection of pressbuttons for play, record, stop and fast wind, plus a pause button that stops the tape in any mode

### MANUFACTURER'S SPECIFICATION

**Transport:** three motors—two ac reel motors, one ac capstan motor, with electronic regulation.

**Tape speed:** 9.5 and 19 cm/s with electronic switching; speed accuracy  $\pm 0.2\%$ ; 6.5 to 28 cm/s external speed variation.

**Wow and flutter:**  $< 0.1\%$  at 9.5 cm/s;  $< 0.08\%$  at 19 cm/s (to DIN 45507).

**Drift:** maximum 0.2%.

**Spool diameter:** up to 26.5 cm; minimum hub diameter 6 cm; tape tension switchable for small hubs.

**Rewind time:** about 135s for 1.1 km of tape.

**Tape control:** functions are controlled by integrated logic with a tape movement detector; electronic motor control (without brushes); all functions can be remote controlled.

**Equalisation (NAB):** 90/3180  $\mu$ s at 9.5 cm/s; 50/3180  $\mu$ s at 19 cm/s.

**Frequency response:** +2, -3 dB 30-16k Hz, and  $\pm 1.5$  dB 50-10k Hz at 9.5 cm/s; +2 -3 dB 30-20k Hz, and  $\pm 1.5$  dB 50-15k Hz at 19 cm/s. (Record/replay measured at -20 dB vu.)

**Maximum level:** 514 nWb/m, corresponding to +6 dB vu.

**Level indicators:** vu meters to the ASA standard, with led indicators for peak levels.

**Total harmonic distortion:** at 0 dB vu and 257 nWb/m  $< 1\%$  at 9.5 cm/s and  $< 0.6\%$  at 19 cm/s; at +6 dB vu and 514 nWb/m  $< 3\%$  at 9.5 cm/s and  $< 2\%$  at 19 cm/s.

**Signal-to-noise ratio:**  $\frac{1}{2}$ -track  $> 63$  dB at 9.5 cm/s and  $> 69$  dB at 19 cm/s;  $\frac{1}{4}$ -track  $> 59$  dB at 9.5 cm/s and  $> 62$  dB at 19 cm/s. (ASA A-weighting.)

**Crosstalk:** stereo  $> 45$  dB; mono  $> 60$  dB (at 1 kHz).

**Erase:**  $> 75$  dB at 19 cm/s.

**Inputs per channel:** three; MIC, 0.15mV/2.2k ohm for microphones of 50-600 ohm or 2.7 mV/220k ohm for high-impedance mics; RADIO, 2.8 mV/33k ohm; AUX, 40 mV/1M ohm. (Overload capability of all inputs is 40 dB (1:100).)

**Outputs per channel:** three; 'output', 1.55V, internal resistance 390 ohm with adjustable attenuation of 26 dB; 'radio', 1.55V, internal resistance 4.7k ohm; 'phones', max 5.6V, internal resistance 220 ohms, short circuit without risk, for headphones of 200-600 ohm impedance. (Level 6 dB vu, 514 nWb/m.)

**Connections:** remote control mechanism; speed variation; slide projector control.

**Power Requirements:** switchable between 100 and 240V, 50-60 Hz without switching; maximum consumption 80W.

**Weight:** about 17 kg.

**Dimensions** (h x w x d without spools): 414 x 452 x 207 mm.

**Price:** £550 approx.

**Manufacturer:** Willi Studer, CH-8105, Regensdorf, Zurich, Switzerland.

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

while it remains depressed. However, the control logic in the Revox *B77* is by means of solid state logic which includes an lsi microcircuit and conventional logic. The result is that the original relays have gone and only the pinch roller solenoid remains in the way of electro-mechanical components.

Overall control of the tape was found to be very good in the normal forward modes at either 19 cm/s or 9.5 cm/s, but I feel that the fast wind modes are too fast with resulting 'leafing' of the tape. In addition, when stopping from the fast modes the tape tension was too low, but this could be the result of the band-type spool brakes requiring adjustment.

Tape lifters are fitted to remove the tape from the heads in the fast modes, but can be defeated by a slide control for editing. A new feature is the fitting of a splicing block and tape cutter on the transport cover. Although a tape position indicator is fitted, this is not in the form of a timer and consequently is of limited use.

Turning now to the electronics, the review machine was a stereo  $\frac{1}{2}$ -track model (to the European stereo track dimensions). However, the record electronics can be used in the mono mode since each channel has a record on/off toggle switch. In addition to this switch, the record electronics are fed from an input source selector switch for each channel, with the provision for high or low-impedance microphone inputs from a front-panel jack; a high-level auxiliary input from rear phono sockets; and a 'radio' DIN input. A further switch position allows copying from one track to the other. The record level is controlled by a potentiometer for each channel, and is monitored by genuine vu meters and red led peak level indicators within the meter cases.

A/B monitoring on the meters and also by the headphone monitor amplifier is done by means of a 'tape/input' toggle switch. The two parallel stereo headphone jacks have their output level controlled by a coaxial pair of potentiometers for the left and right channels.

The normal signal outputs from the machine consist of a pair of high-level phono sockets and a 5-pin DIN 'radio' input/output socket, the actual level being variable by means of two rear-panel preset potentiometers. In addition to these rear-panel connectors there are sockets for full remote control of all transport functions



and varispeed. There is also an optional 'slide sync' facility which can be fitted for use with automatic slide projectors.

The remaining rear-panel features include the mains-voltage selector which covers a wide range of input voltages; a properly identified mains power fuse; and a mains input connector—one of those annoying 2-pin devices which could well be altered to an IEC connector.

Generally, the machine was easy to use and well laid out, but when threading the tape it was easy to miss out the tension arm near the feed spool—not that this provoked any major disaster. A further small cause for complaint was that the toggle switches on the front panel were prone to damage because they protrude excessively and are made of a fragile plastic.

As has been mentioned, the transport of the tape was good except in the fast wind modes; but the control logic could not be fooled and always gave proper protection to the tape. It was irritating, however, that the pause function only worked while the 'pause' button was depressed—I like to be able to lock a machine into the pause mode.

#### Replay performance

The replay equalisation of the Revox B77 machine is fixed to the NAB standards of 50  $\mu$ s and 3180  $\mu$ s at 19 cm/s, or 90  $\mu$ s and 3180  $\mu$ s at 9.5 cm/s tape speed. Using the standard BASF calibration tape 19H and making corrections for low-frequency fringing, the performance at 19 cm/s was within +0, -1.0 dB (ignoring errors in the calibration tape). But at the speed of 9.5 cm/s there was too much high-frequency boost, leading to an apparent error of +3.0 dB at 16 kHz when using the BASF calibration tape 9.5. As no preset control is fitted for adjusting the replay equalisation this error had to be lived with.

On the noise front the machine's performance was excellent, with the following reference fluxivity-to-noise ratios being measured using *Scotch 207* tape where appropriate (see p66).

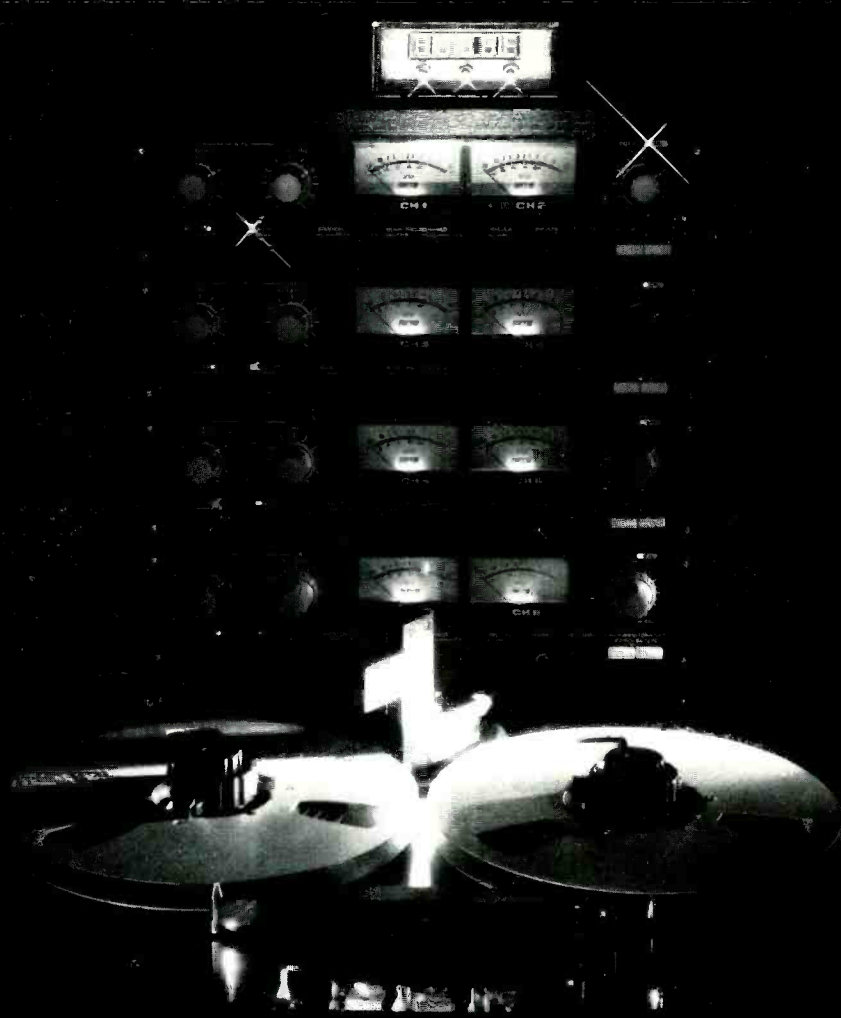
Because the noise performance of both channels was identical within 0.1 dB, the table only quotes a single channel. It can be seen that the machine has a very good noise margin on low-noise tapes, such as the *Scotch 207* used.

Mains hum in the output was also at a low level, and no other spurious noise sources were significant. The review machine was aligned such that the reference fluxivity of 320 nWb/m gave a maximum output level of +2.2 dBm. However, the maximum fluxivity that the replay pre-amplifier could handle was found to be 15 dB above the reference fluxivity, thus providing a very adequate margin for replaying future tape types that may have the capability of recording high levels.

#### Record/replay performance

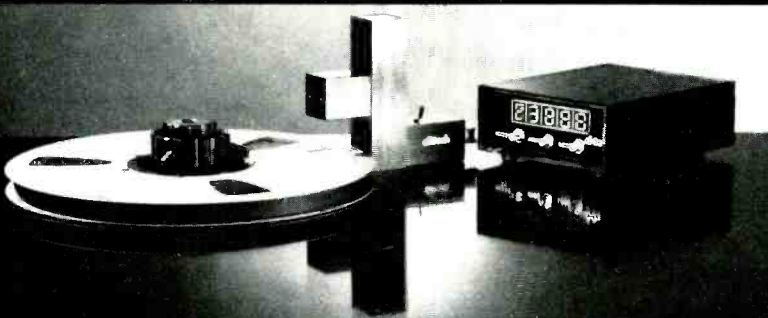
The record/replay performance of the machine was examined using *Scotch 207* tape, the machine being aligned at the factory for this type of tape. Both the adjustment of high-frequency bias and record pre-emphasis were found to have a wide range without being excessively critical. Alignment was very straightforward with the controls for bias and

66 ►



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## REVOX B77

equalisation being clearly identified and easily accessible.

When correctly aligned the overall frequency response was exceedingly flat, as can be seen from **fig. 1** (19 cm/s) and **fig. 2** (9.5 cm/s). In both cases the performance was far better than the manufacturer's specification would suggest.

Using the *Scotch 207* tape the maximum replay level for 3% third harmonic distortion was found to be +7 dB, reference 320 nWb/m at 1 kHz for the tape speed of 19 cm/s; or +5.5 dB above 250 nWb/m at 315 Hz for the tape speed of 9.5 cm/s, the performance being tape limited in both instances. Third harmonic distortion at the preceding fluxivities was found to be 0.65% at 1 kHz for the tape speed of 19 cm/s, or 1.2% at 315 Hz for the tape speed of 9.5 cm/s, both cases representing a good performance. Similarly, the maximum drive capability of the record amplifier was more than adequate, with the onset of severe distortion occurring 19 dB above the drive required to record the reference fluxivity of 320 nWb/m on *Scotch 207* tape.

Investigations into the noise performance of the input sections of the record amplifiers showed that, when using the high-level inputs, the noise was adequately below the noise associated with the replay amplifier. The noise associated with the high-sensitivity microphone input, when loaded with 200 ohm, was very close to the theoretical minimum noise—a considerable improvement on some other earlier Revox machines.

### Level meters

The twin illuminated vu meters were found to be genuine volume-unit meters that complied to the ASA standard—an unusual feature for which Revox are to be congratulated. Similarly the meters were correctly aligned such that there was an adequate margin between the zero vu indication and the 3% distortion point from tape at 19 cm/s. But this margin became rather small at 9.5 cm/s, where Revox have probably used the 5% distortion point for meter alignment.

For those who, like myself, do not like vu meters, the machine has a red led indicator within each vu meter for showing when the peak record level has been reached. This too was correctly aligned and reasonably visible on rapid peaks, but it is felt that a peak-hold circuit associated with the leds would have been an advantage.

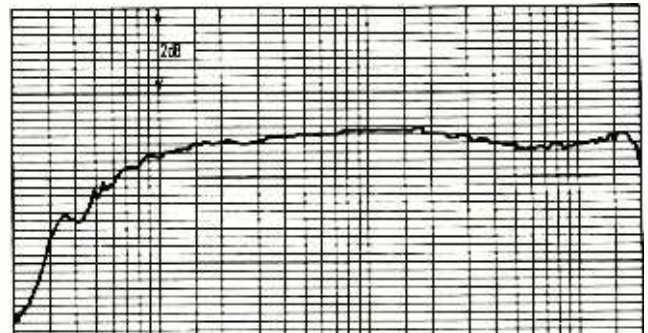
### Inputs and outputs

Both the phono-socket line output and the DIN 'radio' output offered the same output voltage of up to +2.2 dB (ref 0.775V) for a recording at a reference fluxivity of 320 nWb/m. The main difference between the outputs is that the line output has a source impedance of 350 ohm, and the 'radio' output a source impedance of 5k ohm. In both cases the output level could be controlled by individual preset potentiometers—one for each channel.

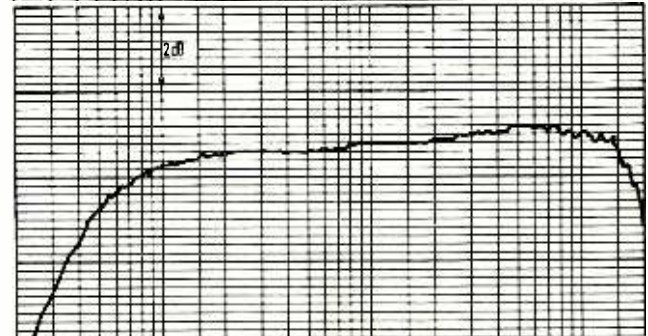
The output level at the two headphone sockets is altered by a coaxial front-panel level control. A maximum level of 2.9V is available for a recording at the reference fluxivity, at an associated source impedance

## REVOX B77 TAPE MACHINE

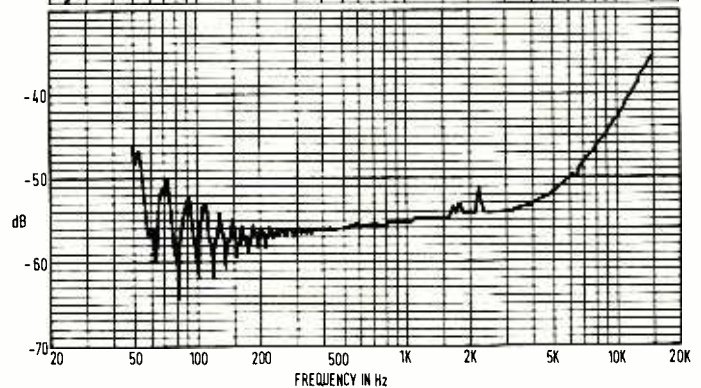
**FIG. 1**  
RECORD/REPLAY  
FREQUENCY  
RESPONSE  
AT 19cm/s.  
ZERO LEVEL: -25dB



**FIG. 2**  
RECORD/REPLAY  
FREQUENCY  
RESPONSE  
AT 9.5cm/s  
ZERO LEVEL: -25dB

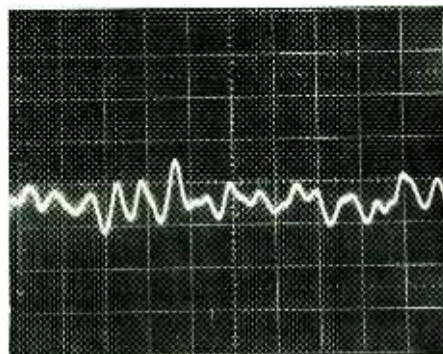


**FIG. 3**  
CROSSTALK  
AT 19cm/s



	A-weighted rms	CCIR-weighted (ref 1 kHz) rms	quasi-peak
<b>19 cm/s reference 320 nWb/m</b>			
Machine only without tape	70.1 dB	64.3 dB	59.5 dB
Record/replay	59.2 dB	61.0 dB	56.4 dB
<b>9.5 cm/s reference 250 nWb/m</b>			
Machine only without tape	67.6 dB	62.8 dB	58.2 dB
Record/replay	59.3 dB	50.9 dB	45.9 dB

**FIG. 4** Phase jitter at 19 cm/s. Horizontal scale: 0.5s/division. Vertical scale: 10°/division.



of 199 ohm—a performance suitable for most types of headphones.

On the input end, the line input had a sensitivity of 230 mV for recording the reference fluxivity of 320 nWb/m at 19 cm/s on *Scotch 207* tape. This is associated with an input impedance of 926k ohm and a maximum input level capability of 4.6V, which is on the low side for some applications, particularly in the professional field.

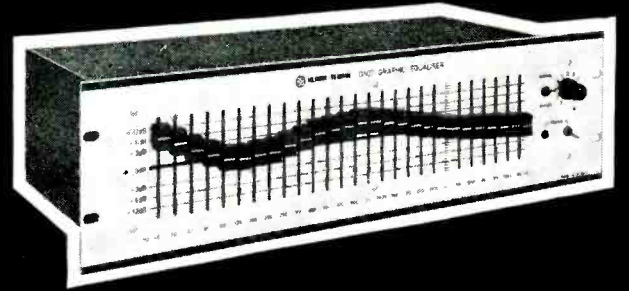
The 'radio' connector and the high-level microphone inputs were identical in sensitivity and overload capability, with a 1.8 mV sensitivity and 340 mV maximum input capability (the associated input impedances





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being 21k and 180k ohm respectively). The final input for the low-impedance microphones was found to have a 90  $\mu$ V sensitivity associated with a maximum input capability of 17 mV, and a well chosen input impedance of 2.1k ohm, which is ideal for 200 ohm microphones.

### Other matters

Checking the wow and flutter to the IEC (DIN) quasi-peak weighted method showed that the machine offered a good performance at both tape speeds, the wow and flutter at 19 cm/s remaining constant at 0.03% throughout a full NAB reel of tape.

At the tape speed of 9.5 cm/s the wow and flutter remained at 0.05% throughout most of the reel, but deteriorated to 0.07% at the end. This is a good performance and better than the manufacturer's specification. Similarly, the speed stability throughout a reel was excellent, with a recorded speed drift of only 0.07% from beginning to end of a NAB reel of 207 tape at 19 cm/s.

Checking the erasure capability of the erase system showed that a recorded 1 kHz tone at 19 cm/s was erased by at least 85 dB with 207 tape. While there are more difficult tapes from this point of view, it is felt that there is no cause for concern in this area.

Crosstalk between the two channels in the record/replay mode is shown in fig. 3, which demonstrates a remarkably good performance at long wavelengths with minimal head pole-piece secondary gap effects. Similarly, the phase jitter between tracks is unusually good, as can

be seen from fig. 4. This shows the jitter associated with a recording of a 10 kHz tone at 19 cm/s, the peak-to-peak jitter being in the order of only 10°.

Earlier in this review it was noted that the Revox B77 was not fitted with a flutter roller. The effects of this omission are shown in fig. 5, a spectrum analysis of a 10 kHz recorded and replayed tone. From this figure it can be seen that several troublesome sidebands are generated, the worst being close to the 10 kHz tone and only 15 dB down. While many machines are worse in this respect, it really does seem to be a serious omission to ignore the possible use of a flutter roller, which could well cure this shortcoming at little expense.

### Summary

This new Revox B77 has several important improvements in comparison with earlier models. Clearly in most respects it is a very good semi-professional machine, being far better built than many machines in this performance/price bracket.

For some reason all machines in this class are designed to wind tape far too quickly, with consequent poor winding, and here the Revox is no exception. However, it is far better built than many machines, using a casting for the main transport components instead of 'bent tin', and thus should be far more reliable.

In the electronics department it is a very good machine in all respects, and the facilities for full remote control and good control logic are likely to be extremely valuable for many applications.

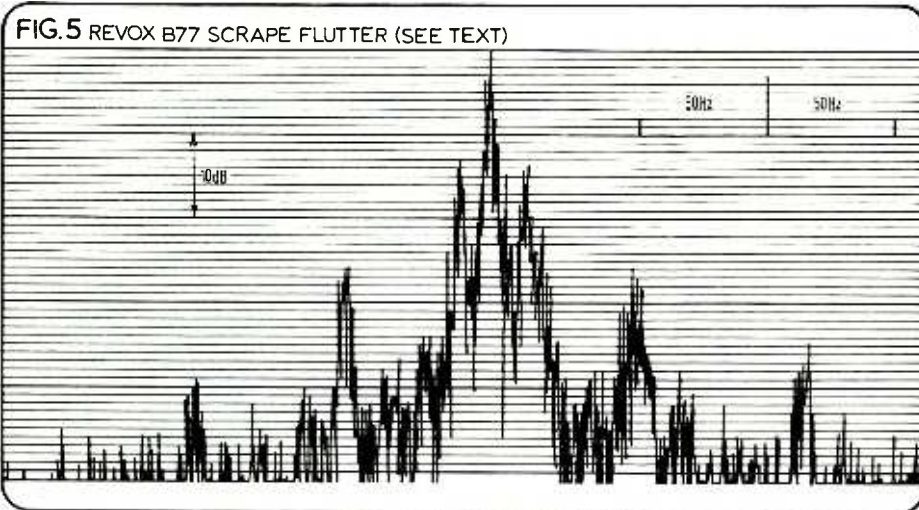
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## agony

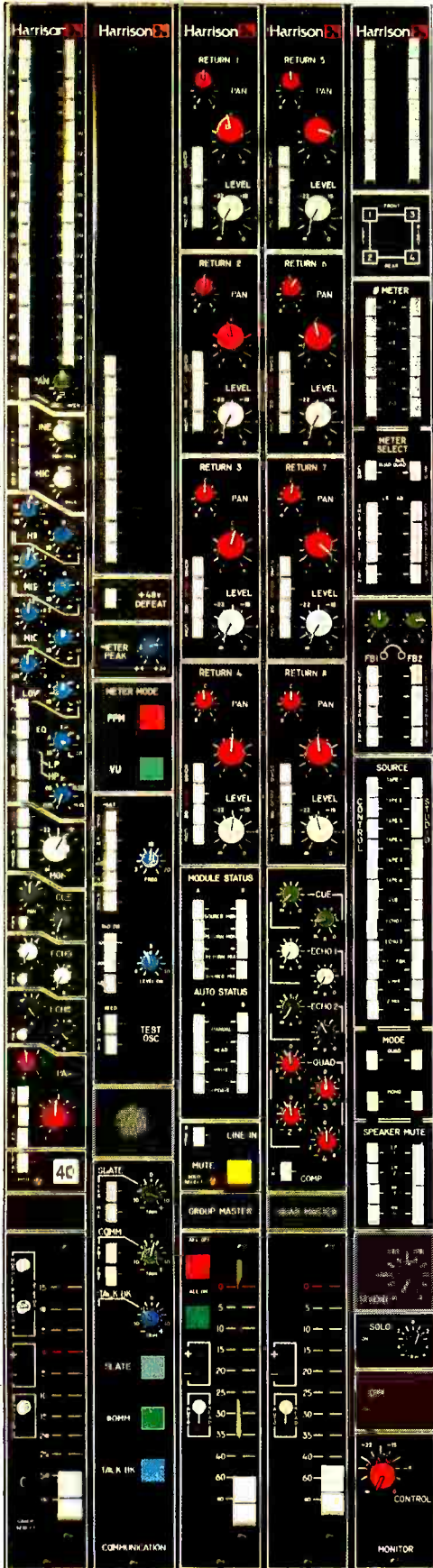
The King's College Christmas Rumble, and how it was cured: Beeb engineers setting up for a Yuletide broadcast some years ago found their AKG C24s rumbling during the performance in a way they had not rumbled during rehearsal. After a long scratching of Corporate heads, the problem was traced to an 8 km/h updraft caused by the candles. A similar problem is experienced above steaming Promenaders at the Royal Albert Hall; hence the windshields on the ambience microphones in the central area. These are a story in themselves . . . apparently back-to-back omnis are being used in lieu of dummy head microphones, the head being synthesised by a glassfibre disc of some 18 cm in diameter.



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# Sony TC510-2 portable tape machine

Hugh Ford and Peter Sharp

## MANUFACTURER'S SPECIFICATION

**Tape speed:** 19 and 9.5 cm/s.  
**Fast winding time:** approx 120s for 275m of tape.  
**Spool size:** up to 13-cm diameter.  
**Track system:** 2-track stereo.  
**Heads:** record, playback and erase.  
**Motor:** one dc servo-controlled motor.  
**Bias frequency:** 160 kHz.  
**Equalisation:** JIS standard.  
**Signal-to-noise ratio:** 60 dB (DIN) 64 dB (NAB) with Sony Ferri-Chrome tape  
**Total harmonic distortion:** 0.8%.  
**Speaker size:** 44 x 94 mm.  
**Power output:** 500 mW.  
**Frequency response (to DIN):** 30-27k Hz at 19 cm/s and 30-18k Hz at 9.5 cm/s with Sony FeCr tape; 30-20k Hz at 19 cm/s and 30-13k Hz at 9.5 cm/s with 'regular' tape.  
**Frequency response (to NAB):** 20-32k Hz at 19 cm/s and 20-23k Hz at 9.5 cm/s with Sony FeCr tape;  $\pm 3$  dB, 30-27k Hz at 19 cm/s.  
**Wow and flutter:**  $\pm 0.08\%$  at 19 cm/s;  $\pm 0.12\%$  at

9.5 cm/s; DIN-weighted.

**Inputs:** two microphone inputs, sensitivity 0.2 mV for low-impedance microphones; two line inputs, sensitivity 60 mV, input impedance 100k ohm

**Outputs:** two line outputs, output level 435 mV at load impedance of 100k ohm (suitable load impedance more than 10k ohms); headphone output suitable for load impedance of 8 ohm.

**Power requirements:** ac 220 or 240V, 50/60 Hz with Sony power adaptor; dc 12V, eight batteries, size D; rechargeable battery pack; 12V car or boat battery with Sony adaptor.

**Battery life:** continuous recording time approx two hours with normal batteries, approx 5.5 hours with alkaline batteries.

**Dimensions (whd):** 333 x 136 x 296 mm, including projecting parts and controls.

**Weight:** 6.8 kg with batteries.

**Price:** £420.

**Manufacturer:** Sony Corporation, Tokyo, Japan.

**UK Agent:** Sony (UK) Ltd, 134 Regent Street, London W1R 6DJ.



## Technical Review

THE SONY TC510-2 is a 3-head stereo machine with a choice of two tape speeds by selector switch. It is clearly intended to compete with machines such as a Uher, where the cost and complexity of a Nagra cannot be justified.

Power is derived from a slide-in battery pack that holds eight size D (HP2 or similar) batteries or rechargeable cells. Alternately, the complete pack can be removed and a mains-powered unit slid in its place. This arrangement makes changing batteries a very quick and foolproof task if a spare battery pack is carried. The specified battery life of two hours continuous use with ordinary batteries is adequate for many applications.

Turning to the tape transport itself, the maximum possible spool size is 127 mm diameter with or without the removable transparent lid in place. The spools are locked onto their hubs with threaded clamps similar to those fitted to a Nagra. While threading the machine is a very simple operation, it can be done incorrectly by forgetting to pass the tape around a roller guide. For this reason it is felt that the correct tape path should be indicated on the top surface of the tape transport. Once

the tape is threaded the spools lock in position when the machine is stopped, so there is no chance of the tape becoming loose and unthreading itself when the machine is being transported.

From the pay-off spool the tape passes a roller tension arm that controls the pay-off tension, and then to a large diameter roller guide preceding the ferrite erase, record and replay heads. A flutter roller is located between the erase and record heads. Tape guidance over the heads is controlled by a fixed guide at the entrance and exit from the substantial headblock, which has very sound head location and azimuth adjustment. From the headblock the tape passes to the capstan and pinch roller, and then to the take-up spool via a roller which controls the take-up tension.

As is good practice the headblock, capstan/pinch roller assembly and tape guides are mounted on a very substantial alloy plate, such that rough use of the machine should not disturb the tape guidance about the heads. The construction of the remainder of the machine's case is quite substantial, and the overall design is such that there are few projections that might be prone to damage in

transport.

In addition to the tape transport itself, the top surface of the machine has a record mode selector button for each track, and also four knurled knobs. Two of these select bias and equalisation for different tape types, including Sony FeCr tape. The remaining two knobs control the tape speed: one is a speed selector for 19 or 9.5 cm/s nominal speed, and the other functions as a variable speed control in the replay mode. The varispeed only works when the knob is pulled out, thus leaving the machine at its correct fixed speed when the knob is depressed.

A recess on the right of the machine is occupied by a stereo headphone jack socket and a monitoring level potentiometer, which controls the level at the headphone jack and the internal loudspeaker. Slide switches allow the latter to monitor either the left or the right channel or the sum channel, and also switch the loudspeaker in or out of circuit in the record mode.

To the left of the machine there is a second recess that contains the two microphone jack sockets and phono connectors for the line outputs/inputs. In addition there is a switch for inserting a highpass filter in the microphone pre-amplifier, and also an external 12V power connector.

The relatively large number of controls on the front of the machine are clearly identified and sensibly designed for easy access, while also being protected against accidental damage. Record or replay is selected by means of a rotary lever that is turned one way for replay, or depressed and turned the other way for record (this being interlocked with the record select buttons on the tape transport). Just depressing the lever allows levels to be set without tape motion. Adjacent to this control there are two red indicator lamps, one for each channel, which are illuminated when the record mode has been selected. In all modes except record and replay the tape is lifted clear of the heads by tape lifter pins.

The rewind and fast-forward tape motion, which are very rapid, selected by a toggle lever. This was found to be rather awkward in its action and uncomfortable and stiff to operate. In addition to these motion controls, a locking-type pause button is provided that works in both the record and replay modes—a function which I like to have.

Adjacent to the pause button there is a tape position indicator in the usual form of a resettable digital indicator, as opposed to a timer. Beneath this are the vu meters for level setting, both of which may be illuminated for a few seconds at a time by depressing a push-button switch. A further pushbutton allows one meter to function as a battery check meter in the replay or record modes.

The record level from either line or microphone is controlled by a coaxial potentiometer with a rather unusual form of knob; it was not easy to adjust the gain of both channels simultaneously without introducing severe left/right balance defects.

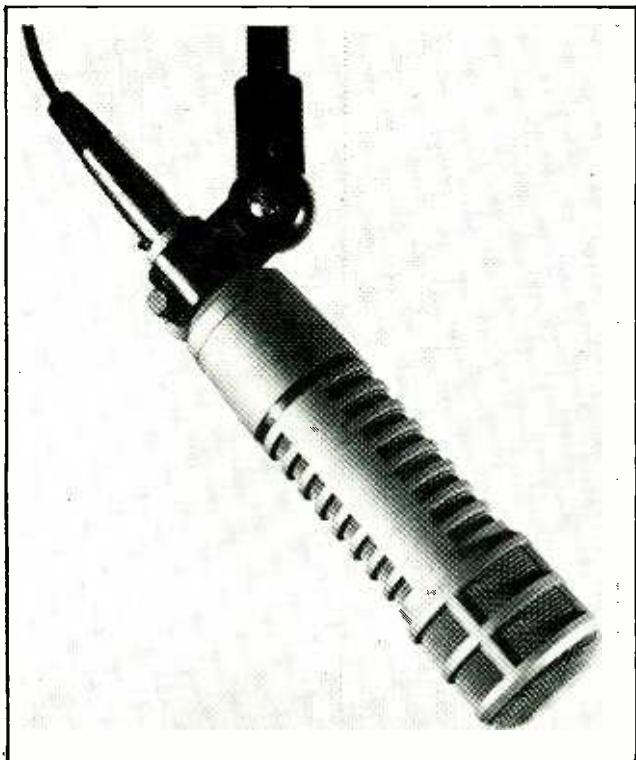
The remaining functions consist of four toggle switches that select line or microphone inputs; insert a 20 dB attenuator in the microphone pre-amplifier; insert a limiter into the record chain; and select pre or post-tape monitoring.

72 ►



# Electro-Voice

## MODEL RE20 DYNAMIC CARDIOID



### DESCRIPTION AND APPLICATIONS

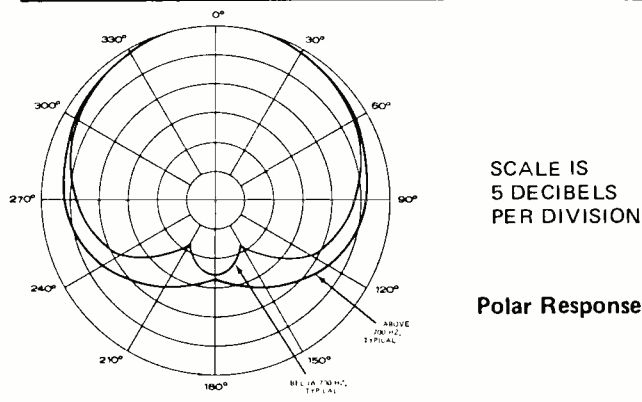
The Electro-Voice Model RE20 is a professional quality dynamic cardioid microphone created especially for recording, broadcast, and sound reinforcement applications requiring essentially flat response over a very wide frequency range. The wide frequency response, coupled with excellent transient response, makes the RE20 easily comparable to the finest condenser cardioid microphones. Unlike standard condenser cardioid microphones, however, the RE20 is virtually free of bass-boosting "proximity effect" when used close, because in design it is a Continuously Variable-D<sup>®</sup> microphone. An easily operated "bass tilt down" switch corrects spectrum balance for use in long-reach situations, or other applications where bass attenuation is needed.

A true cardioid microphone, the RE20 offers greatest rejection at 180° off axis — directly to the rear of the microphone. Directional control is so effective that the frequency response is nearly independent of angular location of sound source, creating virtually no off-axis coloration yet providing greatest possible rejection of unwanted sounds.

An integral blast and wind filter covers each acoustic opening on the RE20. At recording sessions and on stage, singers can "close talk" the microphone, singing with their lips almost touching the grille screen with no worry of "p-pops" or excessive sibilance. Part of the filter also shock mounts the internal microphone element, reducing the transfer of vibrations from external sources.

Using the mechanical nesting concept of design — the internal transducer parts are nested one within another — the RE20 is able to withstand all rigors of professional use. The diaphragm, made of Electro-Voice Acoustalloy™ is not affected by extremes of temperature and humidity. Further protection is provided by the extremely rugged exterior steel casing.

The RE20 is supplied wired for 150 ohms impedance. Fifty- and 250-ohm impedances are available through a simple wiring change.



### SPECIFICATIONS

Element:	Dynamic
Frequency Response:	45–18,000 Hz
Polar Pattern:	Cardioid
Impedance:	50, 150, and 250 ohms changed by solder connection
Output Level:	–57 dB (0 dB = 1 mw/10 dyne/cm <sup>2</sup> )
EIA Sensitivity Rating:	–150 dB (150 ohm output)
Diaphragm:	Electro-Voice Acoustalloy™
Case Material:	Steel
Dimensions:	8-17/32" (216.7mm) l., 2-9/64" (54.4mm) widest diameter, 1-15/16" (49.2mm) body diameter
Finish:	Fawn beige micomatte
Net Weight:	1 lb., 10 oz. (737g) without cable
Cable:	15' (4.6m), 2-conductor shielded, rubber-jacketed, brown broadcast-type cable, supplied with Switchcraft A3F connector on microphone end.
Accessories Furnished:	87213 Stand Adapter
Optional Accessories:	Model 309 shock mounted stand adapter for use with floor stand or recording boom.



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SSA

## SONY TC510-2

From the above it can be seen that the machine has many sensible facilities but, as can only be expected of a machine at this reasonable price, the standard of construction is not like that of a machine costing several times its price.

Mechanically the machine is well above the

common domestic standard, and the overall finish gave a good impression. However, the electronics department is based on domestic-quality pcbs, and while access for servicing was good the wiring was rather untidy.

### Replay performance

The replay chain equalisation is fixed to the NAB standards of 3180  $\mu$ s and 50  $\mu$ s for the tape

speed of 19 cm/s, or 3180  $\mu$ s and 90  $\mu$ s for 9.5 cm/s. Checking the replay frequency response with BASF calibration tapes 19H and 9.5 showed that the original setting at both tape speeds gave a 2.5 dB drop at 18 kHz. But this is generally within calibration-tape limits, and the machine has preset potentiometers for correcting the high-frequency response.

From the points of view of replay frequency response and of output level for a given tape fluxivity both channels are identical, with the replay amplifier being compensated in gain for the selected tape type. The output level for 320 nWb/m tape fluxivity at either tape speed was -3 dBV for 'normal' tape, 2.5 dB less for 'special' tape and a further 3 dB less for 'ferri-chrome'.

Replay chain saturation occurred at 14.5 dB above 320 nWb/m tape fluxivity, thus giving a very adequate margin for replaying any current tape types and allowing for future high-output tapes.

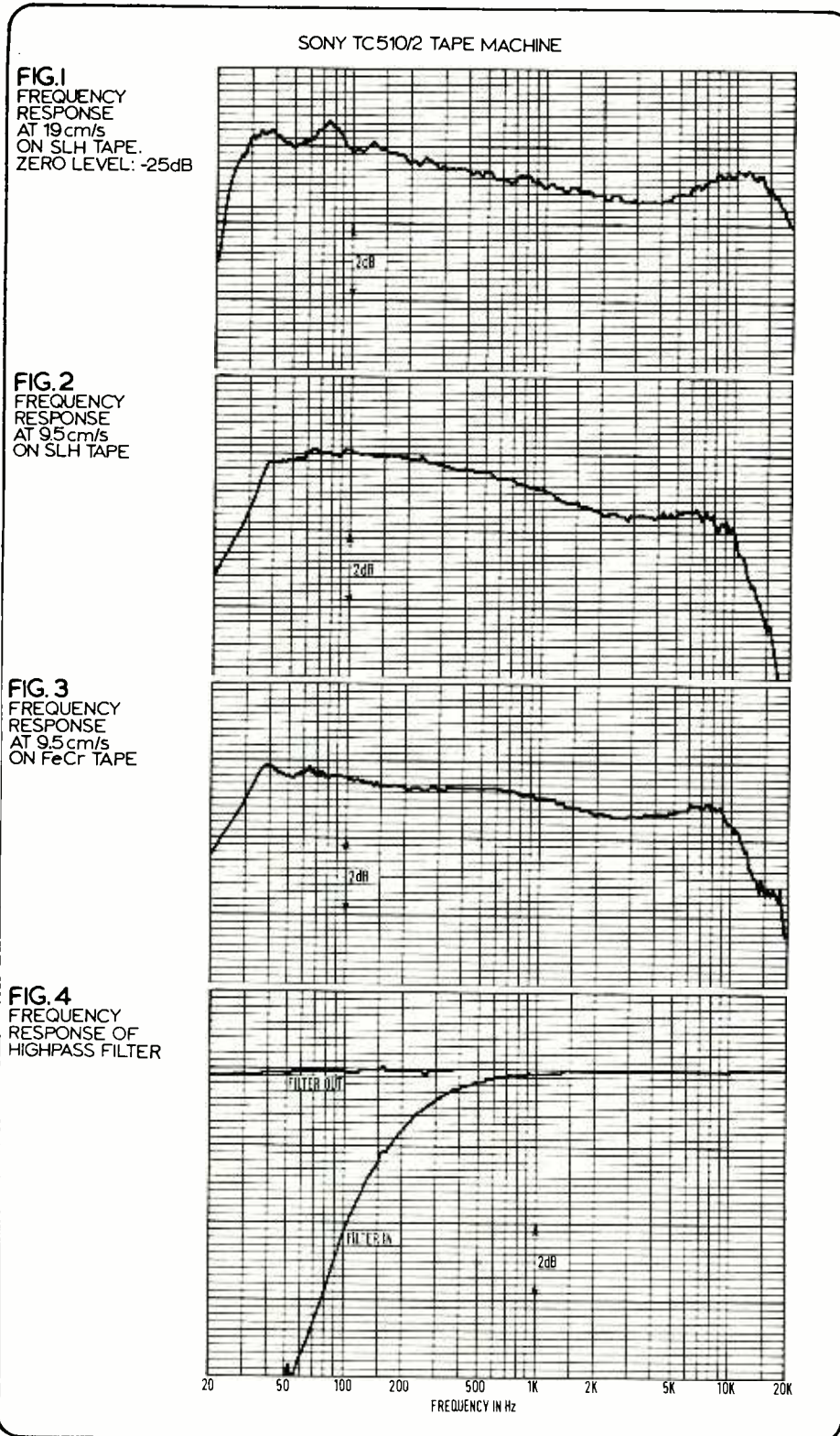
The noise performance of the replay amplifier was also excellent, with the amplifier having a considerable noise margin on Sony SLH ferri-chrome tape samples used for evaluation of the machine. Because both channels were found to have identical noise performance, the following table relates to both channels:

19 cm/s noise performance relative to 320 nWb/m		
SLH setting	Machine only	Machine erased tape
Band-limited 20-20k Hz rms	66.5 dB	55.2 dB
A-weighted rms	76.5 dB	58.0 dB
CCIR-weighted, ref 1 kHz rms	70.5 dB	51.5 dB
CCIR-weighted, ref 1 kHz quasi-peak	66.3 dB	46.8 dB
<b>Ferri-Chrome setting</b>		
Band-limited 20-20k Hz rms	66.6 dB	57.3 dB
A-weighted rms	75.7 dB	60.1 dB
CCIR-weighted, ref 1 kHz rms	68.7 dB	51.7 dB
CCIR-weighted, ref 1 kHz quasi-peak	64.7 dB	47.1 dB
<b>9.5 cm/s noise performance relative to 250 nWb/m</b>		
<b>SLH setting</b>		
Band-limited 20-20k Hz rms	63.5 dB	53.6 dB
A-weighted rms	71.6 dB	56.8 dB
CCIR-weighted, ref 1 kHz rms	68.1 dB	49.4 dB
CCIR-weighted, ref 1 kHz quasi-peak	61.6 dB	44.9 dB
<b>Ferri-Chrome setting</b>		
Band-limited 20-20k Hz rms	62.7 dB	55.5 dB
A-weighted rms	70.5 dB	58.0 dB
CCIR-weighted, ref 1 kHz rms	64.5 dB	49.5 dB
CCIR-weighted, ref 1 kHz quasi-peak	60.3 dB	44.5 dB

The above figures show a reasonable advantage for ferri-chrome tape over Sony low-noise tape, with the machine having a very substantial noise advantage over both tape types.

### Record/replay performance

The available dynamic range can be determined by relating the above noise figures to





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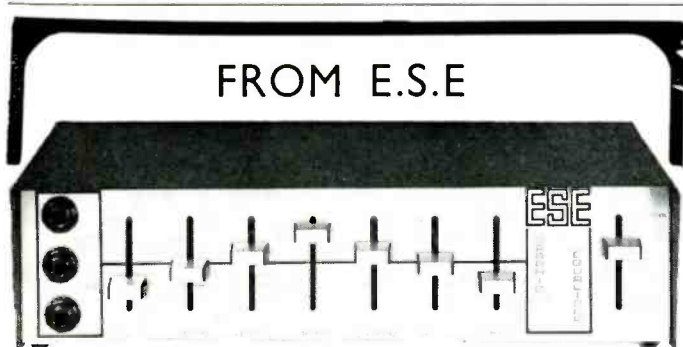
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## SONY TC510-2

the maximum output level available from a particular tape type. Thus the 3% third harmonic distortion point via tape was measured at 1 kHz at the tape speed of 19 cm/s, or 315 Hz at the lower tape speed of 9.5 cm/s:

	Sony SLH tape	Sony ferri-chrome tape
Maximum output level at 19 cm/s	+7.5 dB	+ 9.7 dB
Maximum output level at 9.5 cm/s	+8.9 dB	+10.8 dB

Again there is an advantage in the use of Sony ferri-chrome tape, and the combination of the higher available output and the lower noise make this an attractive proposition.

So far as overall record/replay frequency response is concerned, the choice of tape made little difference within the audio band at the higher tape speed. A typical performance is shown in fig. 1. At the lower tape speed of 9.5 cm/s, however, the ferri-chrome tape offered an advantage at high frequencies, as shown by a comparison between fig. 2 with ferric tape and fig. 3 with the ferri-chrome tape. It must be noted, of course, that the overall frequency response was always very flat at both speeds.

Checking the ballistics of the two record level meters showed that they indeed performed to the vu meter standard. Furthermore, the margin between zero vu and the tape's maximum output level has been set correctly. The before/after tape levels were also correctly aligned.

### Inputs and outputs

The input sensitivity of the microphone input for a recording at the tape fluxivity of 320 nWb/m at 1 kHz was found to be 400  $\mu$ V or 4 mV, depending upon the microphone attenuator setting. While the overload margin of this input was excellent at 150 mV/1.5V, it is felt that the sensitivity is on the low side. Fig. 4 shows that the frequency response of the microphone input is flat, with the option of a sensible highpass filter with its -3 dB point at 120 Hz. However, the equivalent input noise was high at -120 dBm with the input shunted by 200 ohm, and this may be associated with a very

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high input impedance.

It was also found that the line input, which has a sensitivity of 120 mV and infinite overload capability, was noisy. This was clearly connected with the stupid idea of making the input impedance 100k ohm by means of a series resistor. On a similar tack, the line output impedance was high at 4k ohm because of a series resistor, but the output level, which was fixed in relation to recorded tape flux, was sensible in the region of 500 mV for a recorded fluxivity of 320 nWb/m (depending upon the tape type for which the machine was set).

### Other matters

The basic IEC-weighted (DIN) wow and flutter was found to be constant at  $\pm 0.08\%$  throughout a reel of tape at 19 cm/s. It was equally

respectable at 9.5 cm/s with readings of 0.11% at the beginning and end of a reel, reducing to 0.08% at the middle. However, the scrape flutter was very poor as is shown in fig. 5, which is a 3.15 kHz bandwidth spectrum analysis of a 10 kHz recorded tone. As can be seen, multiple flutter sidebands are present and the audible effect of the flutter roller was poor. On the other hand the phase jitter between tracks was found to be minimal, as is shown in fig. 6. It is thought that the good phase jitter and poor scrape flutter may be associated with the use of fixed tape guides on the headblock.

As a final point, the erasing capability of the machine was checked with a 1 kHz recorded tone at a tape speed of 19 cm/s using ferri-chrome tape. The result was that the tone was erased by a respectable 80 dB.

### Conclusions

Unfortunately, time did not allow much practical use of this machine, but without doubt it is in many ways a very attractive proposition for reporting work. It is, however, on the heavy side and rather more bulky than its likely competition. From a technical point of view most of the performance parameters are excellent. But the poor scrape flutter, while being much better than many machines that use pressure pads on the heads, is rather a let-down. This shortcoming is not of real consequence for interview work, and it is this application where the machine is probably of most interest from a professional point of view.

**Hugh Ford**  
76 ▶

FIG. 6 Phase jitter at 19 cm/s. Horizontal scale: 1s/division. Vertical scale:  $10^{-7}$ /division.

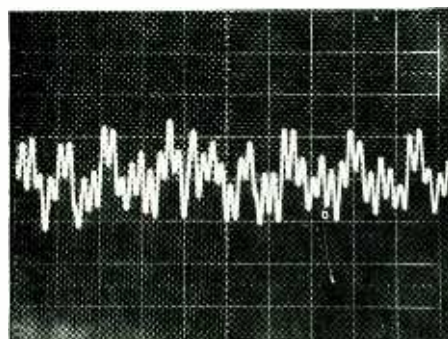
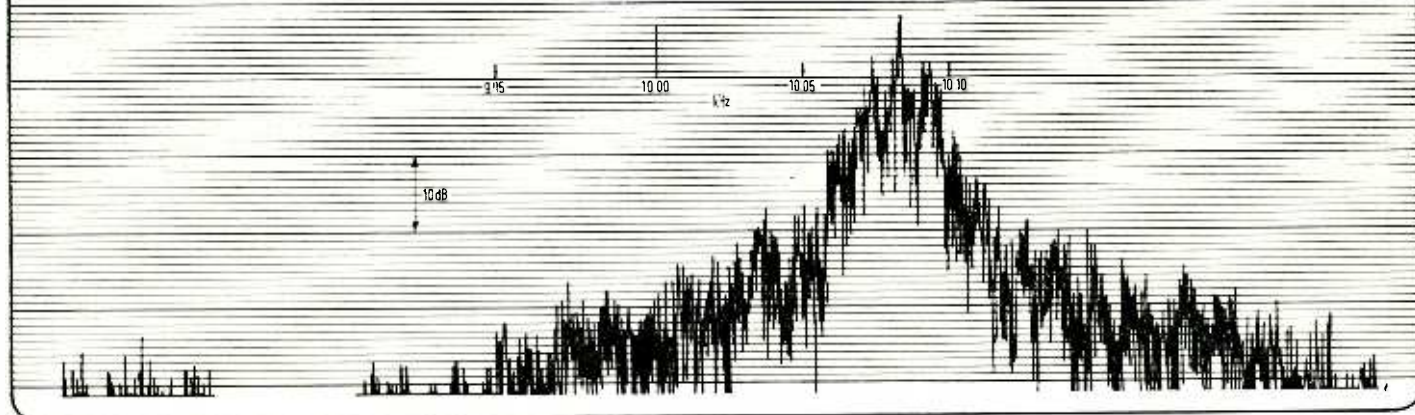


FIG. 5 SONY TC510/2 SCRAPE FLUTTER AT 19 cm/s (SEE TEXT)

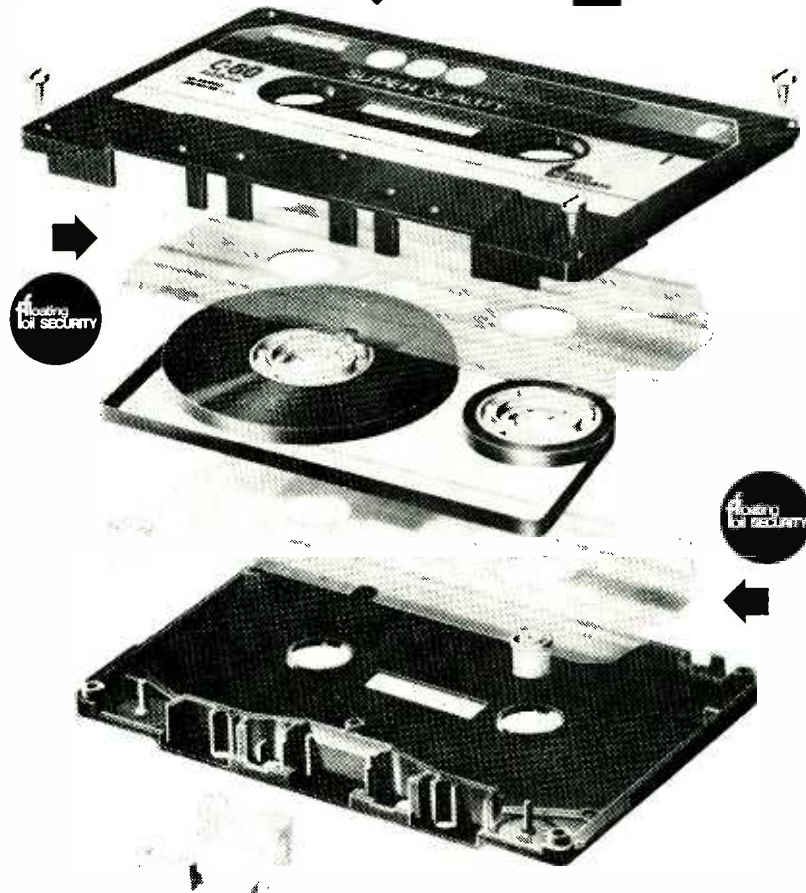






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## SONY TC510-2

### OPERATIONAL ASSESSMENT

I SPENT virtually my first two years in radio working with Sony cassette machines. I still have my much-loved, much-battered Sony *TC100A*, which looks almost prehistoric when compared with today's breed of professional machines. So when I was asked to 'test drive' one of Sony's new portable reel-to-reel machines I jumped at the chance.

Let me say from the start that no machine ever elicited such response from the London newsroom of Independent Radio News. A steady stream of reporters and producers spent much time poring over the *TC510-2*, and all agreed it was, at first glance, a fairly impressive machine. Unlike the solid, almost boring appearance of the Uher *4200IC* and the stark, functional and rather expensive Nagra *E*, the Sony gives an air of Japanese technology at its best.

So down to specifics. Along with most semi-professional portable stereo machines, the *TC510-2* certainly isn't cheap. It retails for about £420 plus VAT, which puts it roughly in the same range as the £350 stereo Uher *4200IC*; but well below the £1100 you would need for the cheapest Nagra, their new model *E* (see October '77 issue, p60).

The Sony design team have clearly taken a Nagra stereo machine as their model. The machines are basically the same size, have roughly the same form of instrument panel, and both carry that distinctive hinged plastic lid.

But that is where the similarities come to an abrupt end. Firstly, the *TC510-2* is a brute to carry. It weighs a hefty 6.8 kg with eight *HP2* (D-size) batteries. Sony claim just over five hours continuous recording time with the optional rechargeable battery pack, and approximately two hours with standard batteries. I can't vouch for either of those figures, but if you monitor during recording this will severely reduce battery life.

Incidentally, three cheers for the positioning of the batteries. All eight batteries fit into a 30 cm magazine that slides neatly into the side of the machine; none of this screwing open the back of the case with a coin while juggling a dozen or half-a-dozen batteries, as with Nagra and Uher models.

But it is a heavy machine and I found the balance slightly awkward while carrying it on the shoulder.

All portable tape machines are vulnerable to damage, especially if used on news reporting assignments. I would guess that Sony have not designed the *TC510-2* solely for that purpose, but even so I feel they should have taken far more care in the protection of what is a sizable investment.

The machine comes without any form of carrying case. A simple black nylon shoulder strap attaches to the body of the machine, and leaves it terribly exposed to injury. The *TC510-2* is enclosed in a black metal case but its rear base, which is taken up by the battery magazine, is made of plastic. You would only need to set the machine down carelessly to end up with a cracked battery case.

And this criticism can be repeated endlessly on careful examination of the machine. It

looks great, but just doesn't seem to have the mechanical stamina of a Uher. The instrument panel, which appears well laid out at first glance, is finicky and awkward to operate. The recording level controls are a curious dual-knob, which can be easily jarred and is difficult to adjust.

The series of four switches along the top of the machine are (from the left): a mic attenuation switch, which enables you to record close to the source (a Concorde take-off, for example) without overloading; a line/mic switch; a limiter switch for recording programmes that contain high-level bursts; and source/tape select switch. All fairly standard facilities for a machine of this price, but the switches themselves are fragile and poorly protected.

Look at the front of the machine and you cannot miss the orange 'pause' button. Hurray, said I, remembering the difficulties I had lining up material on the Nagra without such a control. But for professional work the button is almost useless; it's simply too slow.

Also I was very unhappy about the microphone sockets. I took the machine out to cover a very bad road accident—a tanker lorry had ploughed into the side of a school bus—and the police officer in charge of the operation was giving a roadside briefing. It was one of those situations where you are in the pack of reporters, all jostling for the best position for you and your microphone.

Unlike virtually any other machine I have seen, the *TC510-2* uses 6.35 mm plugs for the microphone input. I was only using one mic, but when I looked down to check my recording level the plug had been nudged out. I was able to shove it back seconds before the briefing began. Why not design the machine with mic inputs on *XLR* sockets? The Nagra *E*, for example, is fitted with these and you could literally swing the machine around your head with the mic lead. Perhaps a rather extreme test of a connector, but at least you're assured of no more lost interviews because of dodgy plugs.

For line feeding you face another problem. Two outputs are provided: one via phono sockets for connection to an external amplifier; and the other designed for headphone monitoring. I shudder to think of the limited level available at the latter if you are using it to feed material across international telephone lines. The output is quoted as 500 mW, which should be just sufficient.

But the Sony *TC510-2* is not all bad news. Despite some of the badly designed functions, a tape machine is used to record sound—I had no complaints from IRN about the quality of the tapes I recorded with the machine.

Just a note about editing on the machine. The head layout makes tape marking particularly easy, and there is plenty of space on the deck plate to mount a small editing block.

So, in summary, a good-looking reel-to-reel machine with fairly impressive specifications. I only wish Sony had spent a little time on making the machine more robust with a much greater degree of mechanical stamina. For my money I'm afraid I would go for a less-refined but hard-wearing Uher.

Peter Sharp

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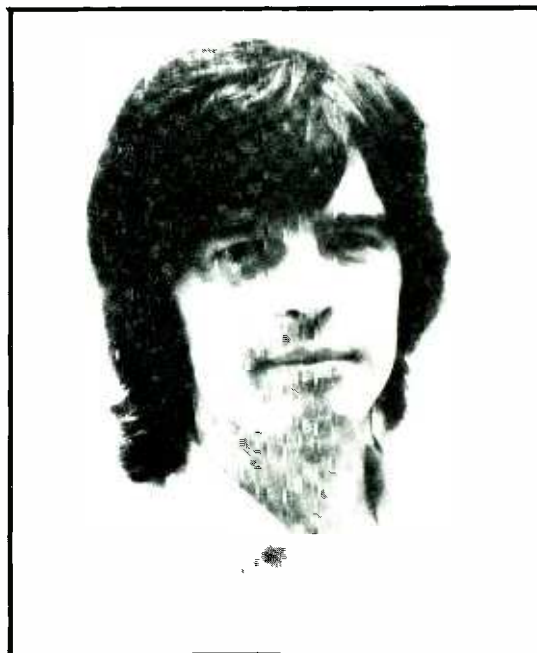
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# Index

to

# Volume 19

## AGONY

the one about the . . . Bassoon shop	48/2
Bootleg record shop	51/10
Disappearing carts	20/4
King's College Rumble	68/12
Local dignitary	51/10
Neurotic journalist	41/8
Pakistani percussionist	88/11
Pig's head	48/2
Pink Floyd live	113/6
Talking gravestone	94/11
Understanding judge	72/8

## AUTHORS

<b>Augspurger, George</b>	
Monitor equalisation	26/2
<b>Beville, Mike</b>	
Compressors and limiters: uses and abuses	28/10
<b>Bloomfield, Keith</b>	
Discotechnology	116/6
<b>Bransbury, Robin</b>	
The Cadac approach to automated mixing	32/3
<b>Carter, Ray</b>	
AES 55th Convention, a report	36/1
AES 56th Convention, a report	44/5
If pigs could fly . . .	104/6
<b>Condron, Nik</b>	
EMS <i>Vocoder</i>	96/7
Eventide <i>FL201 Instant Flanger</i>	90/7
Roland <i>System 700</i> synthesiser	84/7
<b>Dearden, Dave</b>	
Interconnection	32/4
Tape machine maintenance	36/2
<b>Dibble, Ken</b>	
Design considerations for a pa speaker system	38/5
<b>Edwards, Peter</b>	
Television film sound on location	52/9
<b>Everett, Kenny</b>	
Technics <i>SP10 Mk II</i> turntable assessment	66/9
<b>Fellgett, Peter</b>	
The echo of fashion	56/1
<b>Ford, Hugh</b>	
AKG <i>C414EB</i> condenser microphone	88/11
Allen & Heath <i>Feed Forward Limiter</i>	70/10
Altec <i>9440A</i> power amplifier	74/3
Amber <i>4400</i> multipurpose audio test set	58/2
Bruel & Kjaer <i>Psophometer</i>	64/2
Calrec <i>CM2050C/CM2051C</i> microphones	68/5
Cambridge microphone	70/5
Denon <i>EM 2000</i> professional echo machine	58/4

Dunlap-Clarke <i>Dreadnaught 1000</i> power amplifier	80/3
EMS <i>Vocoder</i>	96/7
EMT <i>250</i> electronic reverberation unit	52/4
Eventide <i>FL201 Instant Flanger</i>	90/7
Ferroglyph <i>ARA 1</i> audio response analyser	76/5
Itam <i>Compliment</i> compressor-limiter	66/10
Kudelski Nagra <i>E</i> portable tape machine	72/9
Magnetic tapes	64/8
Micron <i>101</i> radio microphone system	96/11
Neumann <i>U47fet</i> condenser microphone	92/11
Peerless <i>MBC 540</i> microphone	74/5
Quad/Eight <i>RV10</i> reverberation unit	62/4
Radford distortion measuring set	54/2
Radford low-distortion oscillator	50/2
Rebis <i>RA301</i> compressor-limiter	62/10
Reference levels	42/1
Revox <i>B77</i> tape machine	64/12
Roland <i>System 700</i> synthesiser	84/7
Sennheiser <i>MKH 415/MKH 435</i> microphones	74/5
Sennheiser <i>Type K2</i> microphone system	90/11
Shure <i>SM59</i> dynamic microphone	94/11
Sony <i>TC510-2</i> portable tape machine	58/12
Studer <i>A68</i> stereo power amplifier	68/32
TEAC <i>Tascam Series 80-8</i> tape machine	70/12
Technics <i>SP10 Mk II</i> turntable	66/9
White <i>140</i> sound analyser	76/1
<b>Gilbert, Charles</b>	
The News	64/6
<b>Harries, Dave</b>	
The economics of multitrack recording	30/1
<b>Harris Melvin</b>	
When dogs could sing	56/6
The electric revolution	68/6
<b>Hawker, Pat</b>	
Sound at NAB 1977	76/7
<b>Hodge, Dave</b>	
Making commercials	32/12
<b>Hodgson, Brian</b>	
Studio synthesis	44/7
<b>Hope, Adrian</b>	
If pigs could fly . . .	104/6
<b>Isom, Warren Rex</b>	
Centenary Perspectives	5/6
<b>Lambert, Mel</b>	
AES 56th Convention, a report	44/5
APRS Exhibition 1977, a report	40/9
<b>Lane, Basil</b>	
The thin brown line	72/6
<b>Laurence, Paul</b>	
George Martin—the formative years	8/60
<b>Mills, Dick</b>	

Pieces of eight	22/4
<b>Ord-Hume, Arthur</b>	
2000 years of recording music	52/6
<b>Ogden, Frank</b>	
APRS Exhibition 1977, a report	40/9
If pigs could fly . . .	104/6
<b>Palmer, Tony</b>	
Centenary Perspectives	5/6
<b>Pascall, Jeremy</b>	
Rock 'n' roll rules—OK?	88/6
<b>Peckham, George</b>	
Compressor-limiter—a cutter's best friend	50/10
<b>Preston, Brian</b>	
A coincident microphone technique	34/11
<b>Rosen, Johnny</b>	
Microphone techniques for live recording	36/12
<b>Riley, J Fred</b>	
Tower of Power	40/8
<b>Sharp, Peter</b>	
And now here with the details . . .	46/9
Kudelski Nagra <i>E</i> operational assessment	60/10
<b>Skene, Gordon</b>	
AES 57th Convention, a report	62/7
<b>Slaughter, Keith</b>	
Multitrack recording consoles—a review	66/1
<b>Smith, Peter</b>	
Multitrack on the road	34/9
<b>Steiner, Nyle A</b>	
Control devices for electronic synthesisers	60/7
<b>Tryggvason, Trygg</b>	
A question of coincidence	48/3

## BUSINESS

Damn clever those Asians	50/9
Hey man, turn it down	50/9
Phasync out?	48/10
+10 dBm candle power?	50/9
Riding the laser beam	60/11
Popcorn, ices . . . Dolby?	34/12
Trial and error	48/10
We will dupe them on the beaches	60/11
What's on ILR tonite?	48/10

## EXHIBITIONS

AES 55th Convention, a report	36/1
AES 56th Convention, a preview	38/3



AES 56th Convention, a report	44/5	BBC fm receiver design	26/12	Libra theatre consoles	24/12
AES 57th Convention, a preview	30/5	B&K catalogue	38/7	Maison Rouge	24/12
AES 57th Convention, a report	62/7	Berlin radio and tv exhibition	24/8	Maldwyn Bowden pa leaflet	26/11
AES 58th Convention, a preview	48/11	BGW 250C power amplifier	30/11	Marquee	30/3
APRS Exhibition 1977, a preview	50/7	Blumlein plaque	32/9	MCI at Marquee	30/3
APRS Exhibition 1977, a report	40/9	Bose (UK) address change	28/12	newsletter	20/10, 26/12
Sound at NAB 1977	76/7	Broadcast Electronics address change	30/11	for Yugoslavia	18/4
		cart system	38/7	McInnes (France) address change	20/5
		FM601 limiter	18/4	MICMIX Master Room	26/1
		Burwen PMB8 headphones	32/11	Time Warp	26/1
		Cadac A505 compressor-limiter	38/7	Midem 77	20/2, 18/4
		CARE at Pye	22/5	Midnight Audio/A&D deal	36/7
		(Holland)	20/8	oscillator	22/2
		V-Cat module	26/1, 28/9	turntable	20/4
		Calrec for BBC	34/7	voltmeter	22/2
		sound field microphone	30/11, 26/12	Milan Music Fair	24/8
		/Westend deal	24/8	Mixer survey omission	20/2
		Canary 10/2 portable mixer	28/3	MJS 401 test set	36/7
		Cetec broadcast console leaflet	26/10	Molinar expansion	36/7
		Circuit 77 exhibition	26/10	Keith Monks cable drums	26/1, 22/8
		CISCO 1977	32/9	MXR digital delay	36/7
		College for the recording arts	26/1, 22/10	NAB 77	28/3
		Colorado Nashville Inc	27/1	Nagra E portable tape machine	20/5
		Court Acoustics agents	38/7	National Listening Library	20/8
		Craighall	26/3	National wow & flutter meter	20/5
		Dana function generator	16/4	NEAL acquire Ferrograph	26/12
		Dataton modules	16/4	Neutric XLR connectors	20/8
		Delay unit survey omission	20/8	Neve for Anglia Television	34/7
		Dolby Cat 98 filter	16/4	for Bell	34/7
		Philip Drake talkback system	36/7	for Citreon	34/7
		Eagle microphones	20/10	for Hawaii	22/2
		pa equipment	26/10	for Jacques Loussier	34/7
		Eastlake/Finnlevy	22/5	for Kuwait	34/7
		/Marquee	30/3	director	18/4
		/Pye	22/5	NECAM at AIR	30/3
		EECO tape synchroniser	26/10, 24/12	NECAM for Capitol	32/9
		Electroconductive materials	28/12	for ORF	34/7
		Electro-Voice EV1776 microphone	30/11	for Polyvox	34/7
		/REW deal	20/10	for Ramport	34/7
		Sentry V speaker	20/10	for Sydney	34/7
		EMI in Canada	30/9	from Thames Television	34/7
		watermarking cassettes	18/4	for Yorkshire Television	34/7
		EMO di box	30/11	new factory	26/12
		EMS address change	34/7	Noriyuki SNM-3 minimixer	22/10
		Equipment surveys 1978	32/11	Nortronic 719 acoustic analyser	22/10
		Farnell FG3 function generator	32/9	/Gracey deal	38/7
		FBTRC award	30/9	Orban/Parasound 622 equaliser	40/7
		Fidelipac high-output carts	24/12	Ortofon/Scully deal	38/1
		Finnlevy, Finland	22/5	Partridge address change	30/3
		FRAP for ELP tour	24/10	PDG power amps	24/5, 22/8
		Future Film address change	32/11	Pearl/Cara deal	26/11
		Gelf Electronics mixers	22/2	Penny & Giles faders	20/2
		GenRad audio meter	26/1	Philips LDC35 consoles	24/10
		Griffin aperiodic loudspeaker	32/9	MFB speaker	28/3
		Harris MSP-100 broadcast limiter	30/9	Phonogram address change	38/7
		stereo am	24/12	Polytechnic of North London	26/10
		Harrison for Jack Clement	22/8	Professional Tape Marketing	16/4
		survey omission	20/2	Pye studio two, London	22/5
		IABM	22/5	Quad/Eight CPR-16 reverb	20/4
		IBA 4-channel demonstration	22/10	Quantum QM-128 desk	24/2
		head of information	25/12	QM-168 desk	26/11
		technical review	26/10	Royal Television Society meetings	28/12
		IBC 1978	24/10	RCA broadcast leaflet	28/3
		IEA 78	28/12	Revox A77 varispeed	26/11
		ILR expansion plans	26/12	B77 tape machine	28/9
		Indigo 24-track	34/7	price cuts	20/5, 26/11
		Industrial furniture	27/1	Rockwell voice-cleaner unit	26/11
		Industrial Research digital delay	26/10	Rogers survey omission	32/9
		survey omission	20/8	Roland 700 synthesiser	16/4
		ITA/SCAMP deal	20/5	SAE equaliser	22/8
		Ivie analyser accessory	20/10	5000 impulse noise reducer	30/9
		in UK	24/12	SCAMP for Radio Clyde	28/11
		Malcolm Jackson	20/5, 40/7	Scenic Sounds address change	36/7
		Kajaani ob mixer	28/9	Sennheiser ir headphones	24/5
		KLT Triamp 530	18/8	September Sound 16-track	24/10
		KONK apology	20/4	Sescom/MacInnes deal	38/7
		Langley Metal racks	28/12	Shure 50AC acoustic coupler	26/11
		Leader test gear	22/2	pa speakers	30/11
		Leak for Radio France	22/8	SM59 microphone	30/9
		Leavers-Rich 2000TC tape machine	24/8	Sondor mag film recorder	28/12
		for All India Radio	30/12	Sonifex QFX-500 cart	20/2
		Lentek monitor loudspeaker	26/12	Sound 80 24-track	40/7
		Lexicon Delta-T delay unit	20/5	Soundcraftsmen TG2209-600 equaliser	18/8
		price cuts	22/2, 26/10		

## INDEX TO VOLUME 19

Speck console leaflet	22/8
Spectra Sonics 1100 mixer	20/8
Sphere Eclipse consoles	18/8
Roger Squire name change	28/11
Stellavox SP8 portable machine	18/8
Stolen property	29/4
STRAMP Echo-7000 effects unit	32/11
Studer A68 amplifier	27/1
A80/RC tape machine	2/22
169 portable mixer	26/3
in Switzerland	22/2
Studio Electronics modules	20/2
Sun Recording di box	20/8
Syn-Aud-Con seminars	38/7
Tannoy address change	20/2
—the benevolent giant	28/11
Tape duplicating facilities	28/12
TEAC a-v distributors	36/7
multitrack booklet	28/12
Technics SH-9090 equaliser	22/5
Telefunken M15A multitrack	18/8
Trendsetter award	24/10
Trident address change	26/3
CB9109 test set	22/8
equaliser	28/1
UREI LA-4 compressor-limiter	34/7
200 response plotter	28/3
Video Tradex 77	33/11
Vitavox T-shirts	32/9
Wandel & Goltermann test set	30/11
PM-10 meter	20/8
Wayne Kerr catalogue	28/12
Westrex optical recording system	24/12
White 150 acoustic analyser	34/7
WMS 900-A delay unit/flanger	30/12

### REVIEWS

AKG C414EB condenser microphone

88/11

Allen & Heath Feed Forward Limiter	70/10
Altec 9440A power amplifier	74/3
Amber 4400 multipurpose audio test set	58/2
Bruel & Kjaer Psophometer	64/2
Calrec CM2050C/CM2051C microphones	68/5
Cambridge microphone	70/5
Denon EM 2000 professional echo machine	58/4
Dunlap-Clarke Dreadnaught 1000 power amplifier	80/3
EMS Vocoder	96/7
EMT 250 electronic reverberation unit	52/4
Eventide FL201 Instant Flanger	90/7
Ferroglyph ARA 1 audio response analyser	76/5
Itam Compliment compressor-limiter	66/10
Kudelski Nagra E operational assessment	60/10
Kudelski Nagra E portable tape machine	72/9
Magnetic tapes	64/8
Micron 101 radio microphone system	96/11
Neumann U47jet condenser microphone	92/11
Peerless MBC540 microphone	74/5
Quad/Eight RV10 reverberation unit	62/4
Radford distortion measuring set	54/2
Radford low-distortion oscillator	50/2
Rebis RA301 compressor-limiter	62/10
Revox B77 tape machine	64/12
Roland System 700 synthesiser	84/7
Sennheiser MKH 415/MKH 435 microphones	74/5
Sennheiser Type K2 microphone system	90/11
Shure SM59 dynamic microphone	94/11
Sony TC510-2 portable tape machine	70/12
Studer A68 stereo power amplifier	68/3
TEAC Tascam Series 80-8 tape machine	58/12
Technics SP10 Mk II turntable	66/9
White 140 sound analyser	76/1

### SURVEYS

Compressors and limiters

34/10

Disc cutting equipment

32/8

Microphones and ancillary equipment	64/11
Microphones: Who uses what	42/11
Monitor loudspeakers	48/5
Multitrack recording consoles	46/1
Power amplifiers	50/3
Reverberation and delay units	26/4
Special effects units	80/7
Synthesisers	66/7
Tape duplicating equipment	42/8
Tape machines (2 and 4-track)	40/12
Test discs and test tapes	40/2
Test equipment	30/2

### WORK

Ambisonics	58/10
Arrow	60/8
Beacon Radio mobile	62/9
Berwick Street	64/1
Chappell's	64/5
Chorus Line	44/2
Enigma Records	80/11
Indigo	58/8
Ivan Berg	54/10
Ken Scott	40/4
Konk Studios	42/2
KQED, San Francisco	42/4
Lansdowne	58/9
Marquee remix suite	54/12
Music Centre	52/12
Pink Floyd studio	64/3
Quadrangle	46/4
Radio Clyde revisited	52/10
Redwood Recording	62/5
Ron Geesin revisited	46/2
Sound 77 Exhibition	44/4
Sun Studio	62/3
Sunny Switzerland	54/8
Sutton Sound mobile	58/9
TEAC/Tascam mobile	44/4
Thames Valley Broadcasting	62/3



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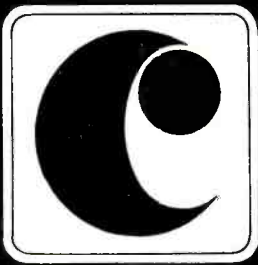
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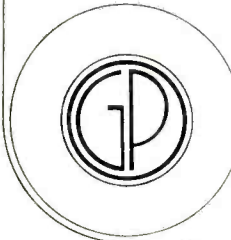


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Both the successful applicants will be involved in the operation of the television studio facilities and the maintenance of equipment.

Candidates for the more senior of the two positions must have a City and Guilds Telecommunications Certificate, or HNC or equivalent, or broadcast engineering training. Experience in studio operations, particularly vision control, videotape and lighting, is an additional requirement. Starting salary is £4767 including London weighting and pay supplements.

Applicants for the less senior post should have the City and Guilds Telecommunications Intermediate Certificate, or ONC, or broadcast engineering training. They should also have had some studio experience and should be capable of the operation and maintenance, under supervision, of camera, videotape, sound and lighting equipment. Starting salary is age-pointed from £3489 at age 21 to £4462 at age 28 and over, including London weighting and pay supplements.

Some of the training activity takes place in institutions overseas and there may be occasional opportunities for travel. Annual leave for both posts is 22 days and there is a non-contributory pension scheme.

For further details and an application form to be returned by 28 November, telephone 01-499 8011 extension 3041 or write to Staff Recruitment Department, The British Council, 65 Davies Street, London W1Y 2AA quoting reference G/14. M



## SITUATIONS VACANT

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### Metropolitan Police Office

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## INDEX TO DISPLAY ADVERTISERS

<b>A</b>		<b>G</b>		<b>P</b>	
Acoustical Manufacturing Co. Ltd.	.. 8	Gelf Electronics Ltd.	.. .. 18	Page, John Ltd.	.. .. 56
AKG Equipment Ltd.	.. .. 39	Grahams Professional Ltd.	.. .. 82	Peavey Electronics (UK) Ltd.	.. .. 18
Alice (Stancoil) Ltd.	.. .. 15	Granet Communications Ltd.	.. .. 60	Philips Electrical Ltd.	.. .. 75
Allen & Heath Brenell Ltd.	.. .. 14	<b>H</b>		<b>R</b>	
Audio & Design Recording Ltd	.. 76, 77	Hammond, C. E. & Co. Ltd.	.. .. 17	Radford Hi-Fi Ltd.	.. .. 30, 56
Audio Systems International	.. 68, 69	Hayden Laboratories Ltd.	.. 49, 55, 81	Raindirk Ltd.	.. .. 30
Audix	.. .. 80	H.H.B. PA Hire & Sales	.. .. 16	R.E.W.	.. .. 19
Avcom Systems Ltd.	.. .. 53	H. H. Electronic Ltd.	.. .. 31	Revox	.. .. 35
<b>B</b>		<b>I</b>		RTW, GMBH	.. .. 10, 18
BASF (UK) Ltd.	.. .. 63	Ind Tape Applications	.. .. 7, 9, 11, 13	<b>S</b>	
Bauch, F. W. O. Ltd.	.. .. 25, 35, 43	Ivie Electronics Inc.	.. .. 5	Scenic Sounds Equipment	.. 5, 15, 29
Bosendorfer Pianos Ltd.	.. .. 16	<b>K</b>		Sheffield Sound Centre	.. .. 82
Brenell Ltd.	.. .. 45	Klark-Teknik Ltd	.. .. 67	Shure Electronics Ltd.	.. .. 21
<b>C</b>		<b>L</b>		SME Ltd.	.. .. 44
CADAC (London) Ltd.	.. .. 2	Leevers-Rich Equipment Ltd.	.. .. 47	Sound Communication (publishers) Ltd.	83
Calrec Audio Ltd.	.. .. 82	Lennard Developments Ltd.	.. .. 82	Sound Recording Plant	.. .. 6
<b>D</b>		<b>M</b>		Squires, Roger, Ltd.	.. .. 22
D'arblay Sound Studio	.. .. 27	Macinnes Laboratories Ltd.	.. .. 12	Studio Equipment Services	.. .. 83
<b>E</b>		Magnetic Tapes Ltd.	.. .. 6	Surrey Electronics	.. .. 74
Electro-Voice Ltd.	.. .. 71	MCI Professional Recording Equipment Ltd.	.. .. 51	<b>T</b>	
El-Tech	.. .. 65	Midas Ltd.	.. .. 88	Teledyne Acoustic Research	.. .. 59
E.S. Electronics Ltd.	.. .. 73	Music Laboratory, The	.. .. 20	Trad Sales & Service	.. .. 10
<b>F</b>		Mustang Communications	.. .. 6	Trident Audio Developments Ltd.	.. .. 61
Feldon Audio Ltd.	.. .. 23	<b>N</b>		Turner Electronic Ind. Ltd.	.. .. 10
Fraser Peacock Associates Ltd.	.. .. 73	National Panasonic, Technics	.. .. 57	<b>W</b>	
Future Film Developments Ltd.	.. .. 50	Natural Sound Systems Ltd.	.. .. 87	Wilmot Breeden Electronics Ltd...	.. 4
		<b>O</b>		<b>Y</b>	
		Otari Corporation	.. .. 41	Yorke, James, Ltd...	.. .. 73



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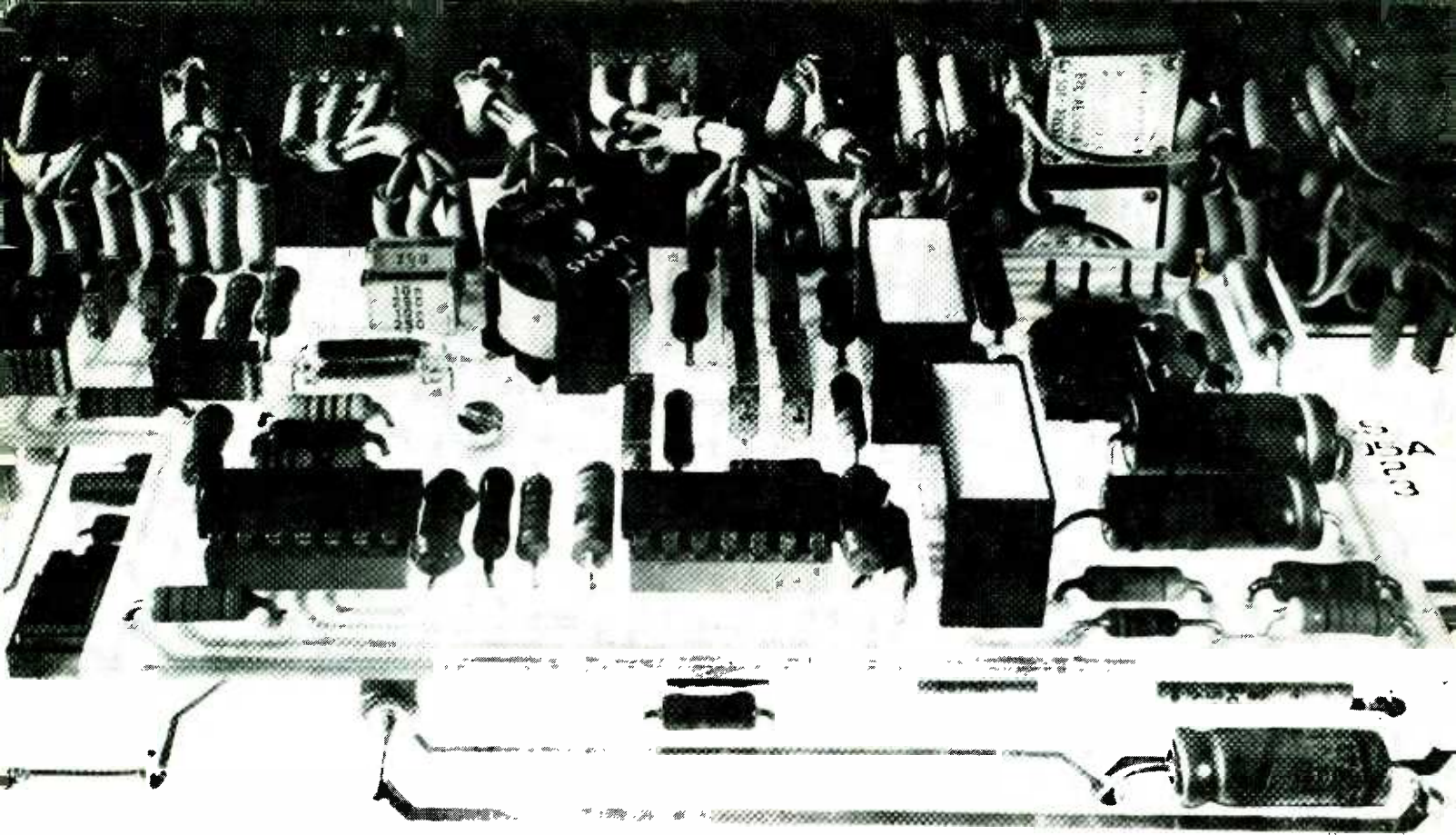
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