September 1983 £1

studio sound

AND BROADCAST ENGINEERING

Mixing Consoles

When you're used to the best there is...

You would choose Soundcraft too. That's what producer/songwriter Pete Bellotte told us.

And he certainly is used to the best. After recording in Westlake Studios, LA, and other top studios on both sides of the Atlantic, Pete Bellotte chose Soundcraft for his personal studio in Surrey, England.

"I needed the absolute freedom of a studio at home – but I also wanted the same high quality I was used to, so I could produce master tapes without additional overdubbing at a later stage.

"I had use Soundcraft consoles before in the States, and I was told by my engineers how good the 'sound' of Soundcraft desks really was. So the choice was simple.

"My only guidelines in selecting the equipment were space and quality. That's why I spent a fortune getting the accoustics just right, having Westlake monitors fitted by a team flown in from the States, a Lexicon reverb unit – and a Soundcraft 2400 console with the new Series 760 multitrack.

"Once you're used to the best there is, you'll never want to compromise. And that's why I chose Soundcraft."

Soundcraft

The Producer's choice

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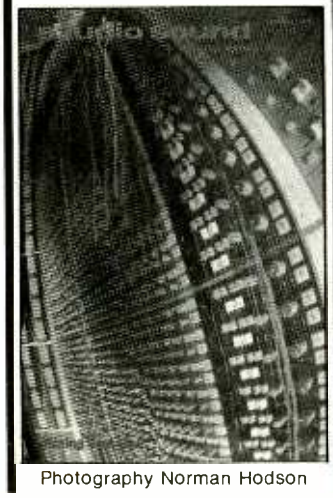
NUMBER 9

Cover: Solid State Logic console at Advision London



Photography Norman Hodson

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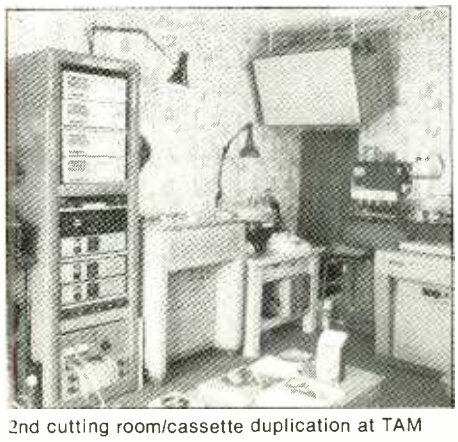
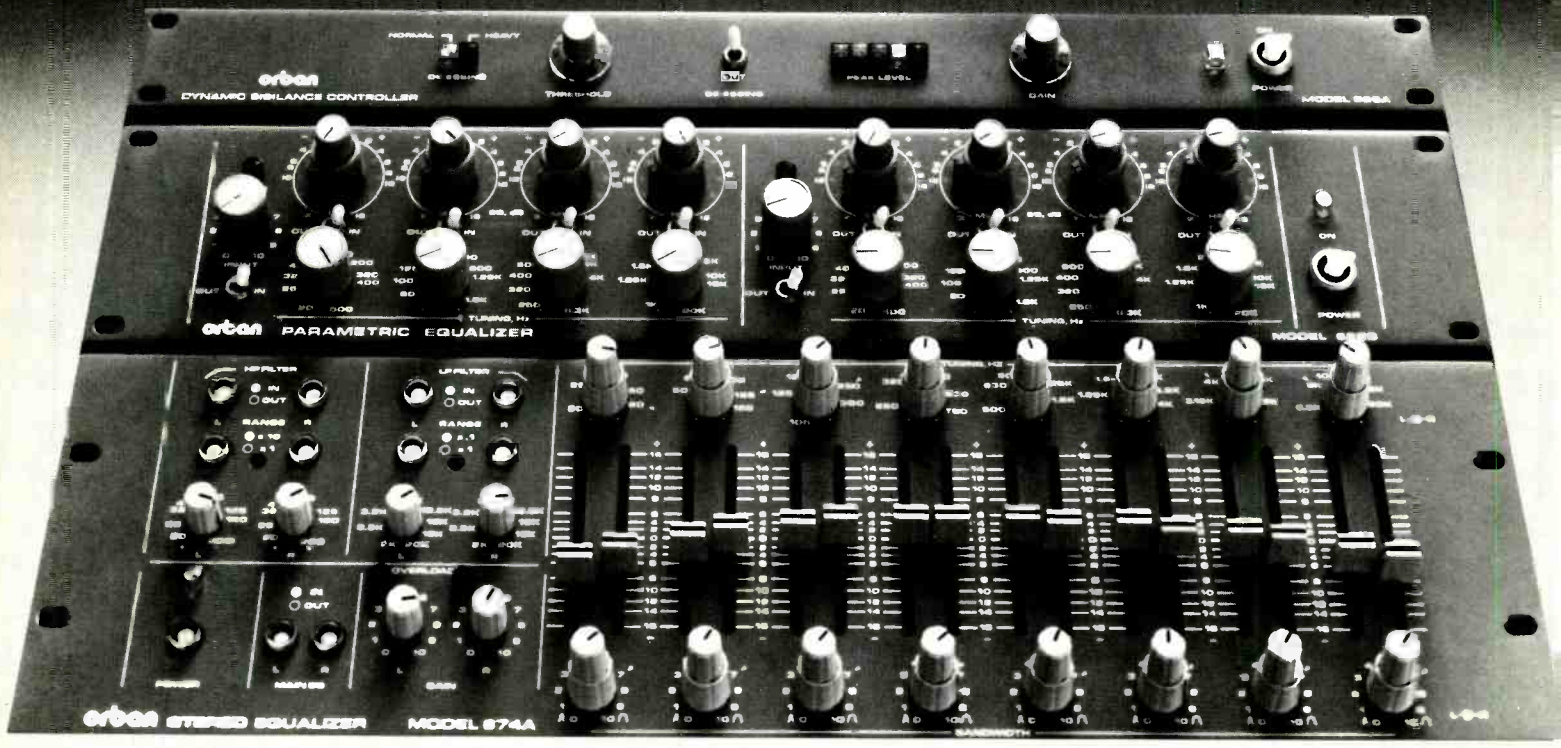


2nd cutting room/cassette duplication at TAM

New console from Hill Audio shown at APRS

Tools of the Trade

Signal Processors by **orban**



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AND BROADCAST ENGINEERING

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EDITORIAL

CD's Watergate

A lot of people noticed my comments in the May editorial on the subject of *Compact Disc* labelling, and the item from APRS published in July. In essence, we—and the APRS, for that matter—were and are worried about the lack of information on *CD*s as far as the origin of the recording is concerned. Barry Fox gives an excellent example of a cock-up on the Decca John Mayall *CD,* in which the label and the box have different information, in this month's *Business* column.

Now, Dr Benjamin Bernfeld of Harmonia Mundi Acustica GmbH in Freiburg, West Germany—an organisation responsible for some remarkable digital recordings, and not noted for Luddite tendencies—has sent us some rather interesting (not to mention disturbing) extracts from the PolyGram Group *Compact Disc Standard UGT-293/00*, dated 1983-02-01. This document, we presume, is used by PolyGram and its associated record companies in the production of label and inlay card copy for *CD* release. It contains some remarkable rules laid down for the guidance of, we imagine, label managers and their staff, and goes some way to explain why, at the London press launch for *Compact Disc,* PolyGram people were remarkably reticent about my comments on the labelling of recordings.

Section 3 of the 'Standard' defines the kind of descriptions you are obliged to give for different types of recording. The italics are Dr Bernfeld's:

"3.8 Digital Recording
If the Compact Disc has been recorded digitally, the term, 'Digital Recording' has to be mentioned." (Fair enough: presumably 'digital' means 'all stages of the recording process are digital', typically digital classical recordings straight to PCM *1610* stereo.)

Now for the good bits:
"On analogue recording it is *not allowed* to mention 'Analogue Recording' " (!?! Here speaks a Marketing Department! If it is really an analogue recording, you mustn't say so—it might hurt your sales. So if you can't call it analogue when it is, what do you say? Aha! What you say is covered next. . .)

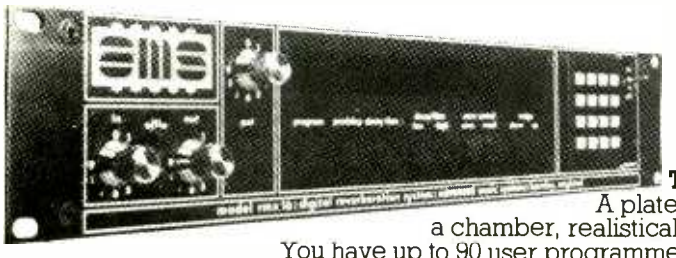
"3 9 Analogue Recording
If the Compact Disc has been recorded analogically" (good word, that: remember it to impress your friends. . .), "the term 'Digitally Mastered' must be used." (Well, well. So Decca presumably got their knuckles rapped for producing the only non-Nimbus *CD* which admits that its source is 'Digitally mastered from an original analogue recording', which is what it said on the box. For what it said on the *label,* you'll have to see Barry's column. This is a very nasty bit of deliberate misleading of the public. Please copy us in on your letters to the Advertising Standards Authority. The answer to the question 'When is an analogue recording actually digital?' is 'When it has been digitally mastered and released on a PolyGram label'. Of course, you and I know full well that *all CD*s are digitally mastered—they would have quite a lot of problems if they weren't. But Joe Public doesn't know this—yet—so we can mislead him. I would call that at least slightly unsound, ethically speaking. But then, I am not a record company. And there are other things too, when we come to the booklet or cover card. . .)

"5.10 *Only* the text 'Digitally Mastered' should be used. Translations in other languages (such as French) are not required." (Well, we know that the French are very protective of their beautiful tongue. But it seems a little unfair to discriminate against them. If I was working for PolyGram—something of which I have no conceivable chance, now—I would regard this as a bad marketing decision. After having gone to all the trouble of concealing the analogue nature of a large number of my recordings, I now tell the poor French consumer of their spurious digicality in incomprehensible—or might they say reprehensible?—English, so they may not know they've been fooled. If you want to tell 'untruths', surely you should tell them in at least three languages?)
"5.11 Digital Mastering: *only* the text 'Digitally Mastered' should be used" (Decca have their real problem here, I guess). "Translations in other languages (such as French) are not required." (PolyGram obviously have something against the country next door. Why didn't they say 'such as German or Dutch'?)

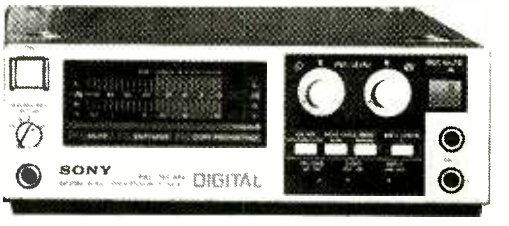
I will be most intrigued to see what the APRS have to say about all this. They obviously have some good ideas on the subject which are not unlike our own. Unfortunately, they are not very involved with record companies. APRS member studios could well carefully label their tapes 'Analogue recording' or whatever, when they go off to be mastered. But then, if a PolyGram company is involved, they will simply ignore the fact and plaster your lovely 30 in/s ½ in stereo master (copied on to *U-Matic* to be mastered for *CD)* with the words 'digitally mastered', and the poor consumer will merely hear the hiss and think that the PolyGram group record company concerned can't make *CD*s very well (the more observant consumer will simply think that the *factory* can't make *CD*s very well—in both cases, they get their just deserts). To the smaller independent labels, may I recommend a facility in Wales, which comes on-stream in a few month's time. . .?

Richard Elen

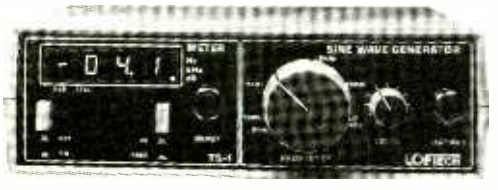
Turnkey's Summer Update



The Newest Reverb
A plate, a spring, slapback, a chamber, realistically created, digitally. You have up to 90 user programmed settings as well as the 9 preset, classic sounds. The AMS reverberator offers full 18kHz bandwidth and 90dB dynamics. We are the new South of England distributors. Arrange for a demonstration.



Audio by numbers, when your experience counts.
Stop just thinking about digital recording. We are SONY's newest professional audio dealer. And, by way of an opening offer, we'll let you evaluate the F1 digital audio processor in your studio for a week at no obligation. Call on us for full details.



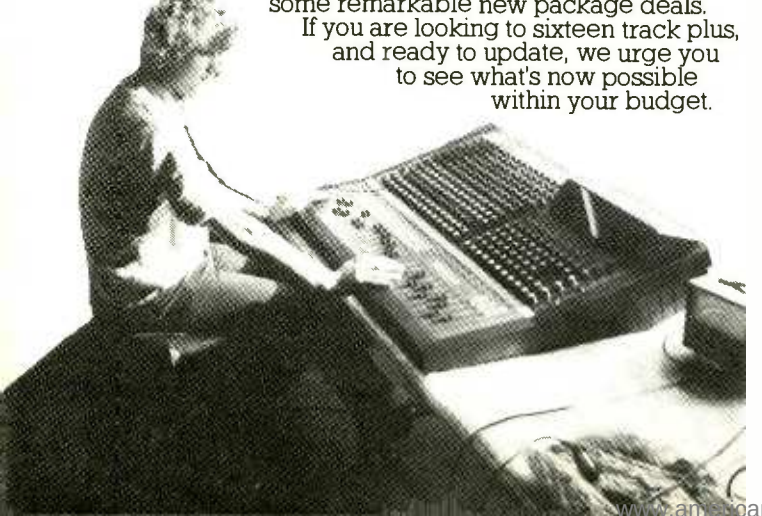
Go digital and save time. The LOFT TS1 includes oscillator, dB meter, and a true frequency counter in one, palm sized unit. It's designed to work fast with the minimum of controls. It's a laboratory instrument which provides accuracy equal to devices costing many times the price, only much, much faster.

Great new Fostex amps, but there's a catch
Specs are impeccable, and you cant blow them up. XLR connectors throughout. Priced per Watt, they're first in value.
The only restriction is that they are not designed for the trials of the road.
But then just because they're priced as if they fell of the back of the lorry, doesnt mean they have to.
Call for a copy of the full specifications of both the 300 and 600 Watt versions.

Webber Webber Webber

Every one a Master US made test tapes have one major drawback. Costly to produce in the first place, by the time they're through the hands of transatlantic dealers, they can be prohibitively expensive. Now an enterprising British engineer is mastering test tapes locally. On the finest tape, on precisely aligned machines. The range covers all speeds and formats. Now the affordable Webber tapes, direct from Turnkey.

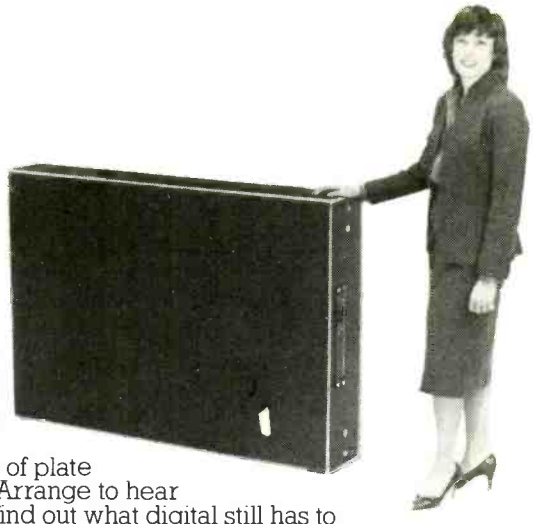
3000 Packages Ready. Exclusively ours. We've acquired the British rights to, and completed gruelling tests on, the Dynamix 3000 mixer. A distinctive new shape with many unique features, providing the basis of some remarkable new package deals.
If you are looking to sixteen track plus, and ready to update, we urge you to see what's now possible within your budget.



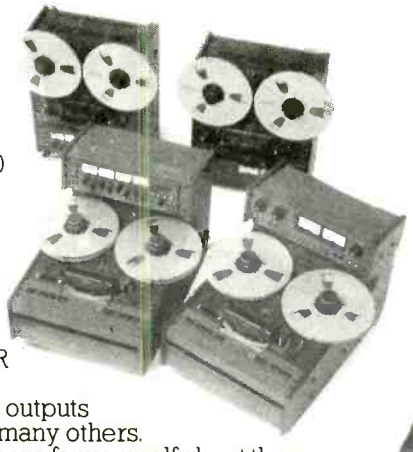
Updating the Speed of Sound.
The 50 Series are by far the toughest Tascams to date. Designed for demanding production applications. Built smarter and stronger, with a microprocessor to make SMPTE lock and editing faster. Examine the range and see how serious TASCAM is about the recording industry.

Beyer Price Crash
The most popular DT100 headphones are now at a truly outstandingly low price from Turnkey.
Ask no questions, just call us for the remarkable price

Monitor Mountain
We stock a wide range of studio speakers.
Begin the assault on your ears with your choice of the **Visonik** or **Auratone** micro monitors. There's also a powered version from **Fostex.** The **Tannoy** Stratfords are a good budget choice leading up to the classic sound of the Little Red monitor and of course the **JBL** range. The esoteric **Turnkey Two** monitors are top of our range. Hear and compare them all at Turnkey.

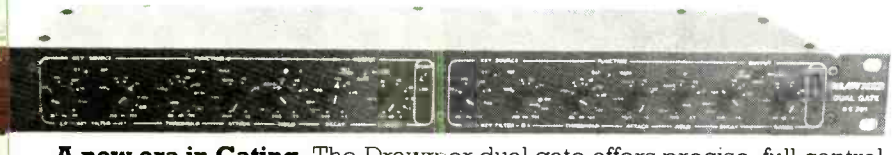


Superplate
Reverberating success of the Ecoplate II has resulted in a new compact version being introduced, at a fraction of the previous cost and size. The sound is bright and tight.
The classic sound of plate reverb that sells. Arrange to hear Ecoplate III, and find out what digital still has to match. You can listen and compare in our new demo room.



Budget Otari
In a land where performance is the major criteria for success, Otari's 5050 series two track is America's most popular mastering machine for the smaller studio.
Take a closer look and you discover features such as XLR inputs, standard reference balanced outputs direct capstan, and many others.
Call us and find out more for yourself about these new Otari's from Turnkey, the new source.

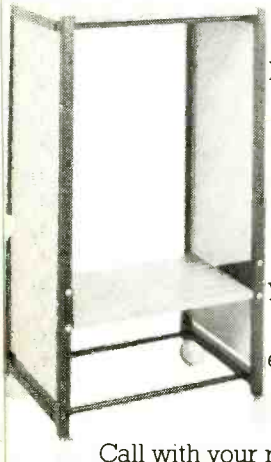
Instant Acoustics ?
Illsonic panels are acclaimed as the quickest and most effective way to control room response. They are sculpted from the most effective 'absorption' material ever produced. Installing a panel is like opening a window wherever you need to control reflections. Call us for a free copy of the latest Acoustics Cookbook.
It Works!



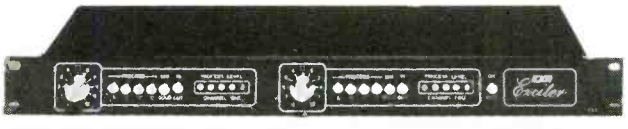
A new era in Gating. The Drawmer dual gate offers precise, full control over difficult signals. It allows sophisticated sidechain patching and a new range of techniques to be developed. Also ask about the compressor.

Controlled Microphone Omission
The 122 deck is Tascam rather than TEAC brand. There are no microphone inputs, and it's features are normally associated with open reel. Three heads, front panel bias, two speeds, LSI remote, Dolby B, HX and optional dbx. The first cassette deck that's specifically designed for studio applications.

A delay that's been worth the wait. Now MXR turn the tables on their foreign imitators by cutting prices and setting performance standards. The full range of time shift and warp effects, with the smoothness of control that's the hallmark of these American pioneers. It's the most delay for the money in recent memory.



STAK RAK
It's an ingenious British system of interlocking components that builds into your exact rack mounting requirements.
It's designed for fixed or mobile use with a full range of parts and accessories letting you construct a custom system of any height quickly and very economically.
Shelves, side panels and castors are usually in stock.
Call with your requirements or for an illustrated brochure and design specs.



Excitement for Disbelievers
Two new psychoacoustic processors from EXR. Success in both broadcast and recording studios, has resulted in development of new specialist units to enhance sound using their patented process, yet offering a degree of control. If you work in mastering or production we urge you to hear how aural excitement can brighten and tighten stereo sound.

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BUDGET PACKAGES

Tascam 4 track systems

A variety of small systems for the cost conscious, from the M244 Portastudio, complete on its own; or the latest Tascam 34 4 channel reel-to-reel now available in a package with the new PEP 800 8 × 4 mixer. This mixer has the comprehensive facilities of larger mixers costing twice the price. Total Package Price **only £985.**

The world's smallest 8 track. Available also as a complete system, with the 350 Mixer. NEW LOW PRICES.

The New Sensation from Fostex – X-15 Tracker

A portable battery or mains operated 4 channel cassette recorder with built-in mixer. The musical note book you can use anywhere. Dolby noise reduction, treble and bass EQ, punch-in/out, and lots more for **only £260.**

Tascam 8 track systems

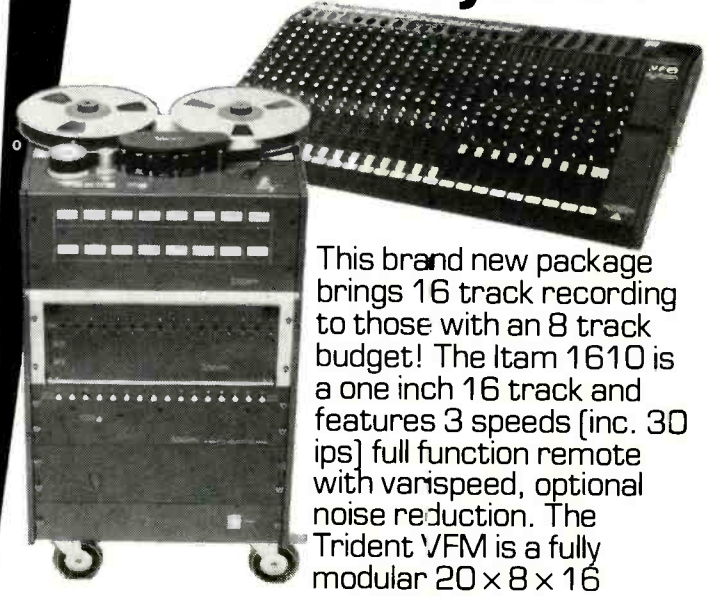
38 — the sensational new half inch 8 track has shattered price barriers. Yet performance is better than ever, with digital counter, lower noise electronics, and pitch control.

Special Offer

Only from ITA — the new Tascam 38, 8 track with Itam dB30 noise reduction. 8 channels of simultaneous NR giving 30dB improvement in sig/noise ratio.

£1750 Complete

ITAM/TRIDENT 16 track system



This brand new package brings 16 track recording to those with an 8 track budget! The Itam 1610 is a one inch 16 track and features 3 speeds (inc. 30 ips) full function remote with varispeed, optional noise reduction. The Trident VFM is a fully modular 20 × 8 × 16 console with 20 inputs and full 16 track monitoring. Special Offer (subject to stocks):

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STUDIO SYSTEMS

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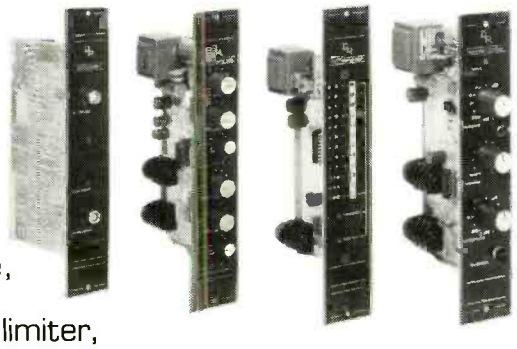
SPECIAL OFFERS

D & R signal processing



Any 4 of the following modules, complete with power supply and cabinet: parametric EQ, noise gate, compressor/ limiter, stereo limiter, compander, stereo disc amp, high-low pass filter.

Only £295

Alternatively, buy any 4 D & R modules at our normal professional price, and get a 19 inch rack FREE!

MULTITRACK MIXERS

ITAM Sigma

SIGMA — the new multitrack console that outclasses the competition — in price, features and performance. Facilities include: Full modular construction, full 16 track monitoring, 8 busses + stereo buss + 4 aux busses, programmable muting, autosolo, LED bargraph metering with switchable VU/PPM characteristics, PFL on groups and cue sends, comprehensive line-up oscillator, dedicated FX returns, 4-band EQ mid-bands sweepable, hi and lo pass filters, flexible talk-back system, electronically balanced mic. inputs with switchable phantom power, phase reverse and pad.

16-8-16: £3,960

With Audiofad faders: £4,360

Stand: £155

SECOND HAND EQUIPMENT

The following equipment has been taken in part exchange, and has been overhauled in our workshops.

MCI JH114 24TR	**£12,000**
STUDER A80 MKII 16TR	**£9,500**
TASCAM 80-8	**£1,150**
TASCAM 3440	**£400**
OTARI MX5050B 2TR	**£855**
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PENTAGON CASSETTE duplicator STEREO	**£625**

(Please phone for latest details)

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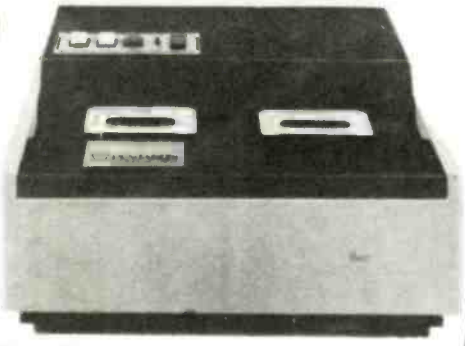
We have been installing and servicing duplicating equipment for 10 years, and have built up considerable expertise for small or large systems. Whether you need to copy 100 cassettes per week, or 50,000, we can give you the back-up you need.

PENTAGON



Small in-cassette copiers, mono or stereo. 16 times duplicating speed. Prices from around £500.

OTARI

Highest quality and reliability from the world's leading manufacturer. Cassette or reel master. DP4050C2 is expandable to max. of 11 slaves.

DP2700. An automatic loader for blank or recorded pancakes. Will wind any length precisely. One operator can run up to 3 machines. Reliable and attractively priced.

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Revox B77 Stereo	40	25	15
Otari MX5050B Stereo	60	40	20
Tascam 4-track	50	30	20
Tascam 38 8-track ½"	90	50	30
Otari Mk.III-8 8-track ½"	110	60	40
Itam 8-track 1"	150	80	50
Itam 16-track 1"	200	120	75
Otari MTR90 24-track 2"	600	400	150
MIXERS			
Teac Model 2A 6 x 4	20	10	—
Tascam Model 30 8 x 4	40	25	10
Fostex 350 8 x 4	35	20	10
Itam Stereo 8 8 x 2	45	25	15
Seck 10 x 4	25	15	10
Seck 16 x 8	75	40	25
Location 8 x 2 portable	60	40	20
Itam 14 x 4 8-track monitor	100	60	35
CASSETTE DUPLICATORS			
Otari DP4050C2 cassette master	150	80	40
Otari DP4050 OCF reel master	300	200	80
VARIOUS			
GBS Reverb	20	10	—
Quad 405 amp	20	10	—
DBX noise reduction 2-track	20	10	—
Dolby C N.R. 4-track	20	10	—
Fostex Digital Delay	20	10	—
Fostex Graphic EQ	20	10	—
Stereo compressor (various)	20	10	—
Roland Drumatix	20	10	—
Roland Space Echo	30	20	10
Roland Rhythm Composer TR808	50	30	—

Subject to our standard conditions of hire. Prices exc. VAT
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406 ½ 10½ NAB	15.50	14.50	7
406 1 inch NAB	25.45	24.25	5
406 2 inch 10½	52.90	49.50	2
407 7 inch (LP)	5.25	4.75	10
407 ¼ 10½ NAB	11.95	11.45	10
456 7 inch	5.65	5.25	10
456 ¼ 10½ HUB Bulk pack	—	7.20	10
456 ¼ 10½ NAB spool	10.46	9.90	10
456 ½ 10½ NAB	18.95	18.00	7
456 1 inch NAB	29.90	27.90	5
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OTARI 2 TRACKS

NEW MX5050B2II 2 track

Otari's latest compact 2 track features — microprocessor controlled transport, LED tape timer, active balanced input/output for better transient response, 3 tape speeds, ref. flux indicator. Now in stock.

NEW MTR12-2 2 track

An additional model in the MTR range— MTR12-2 2 track Master Recorder, featuring 12 inch spools for extra playing time. Available in 2 track ¼ inch, 2 track ½ inch and 4 track ½ inch formats.

THE MULTITRACK MASTERPIECE

OTARI MTR90-II

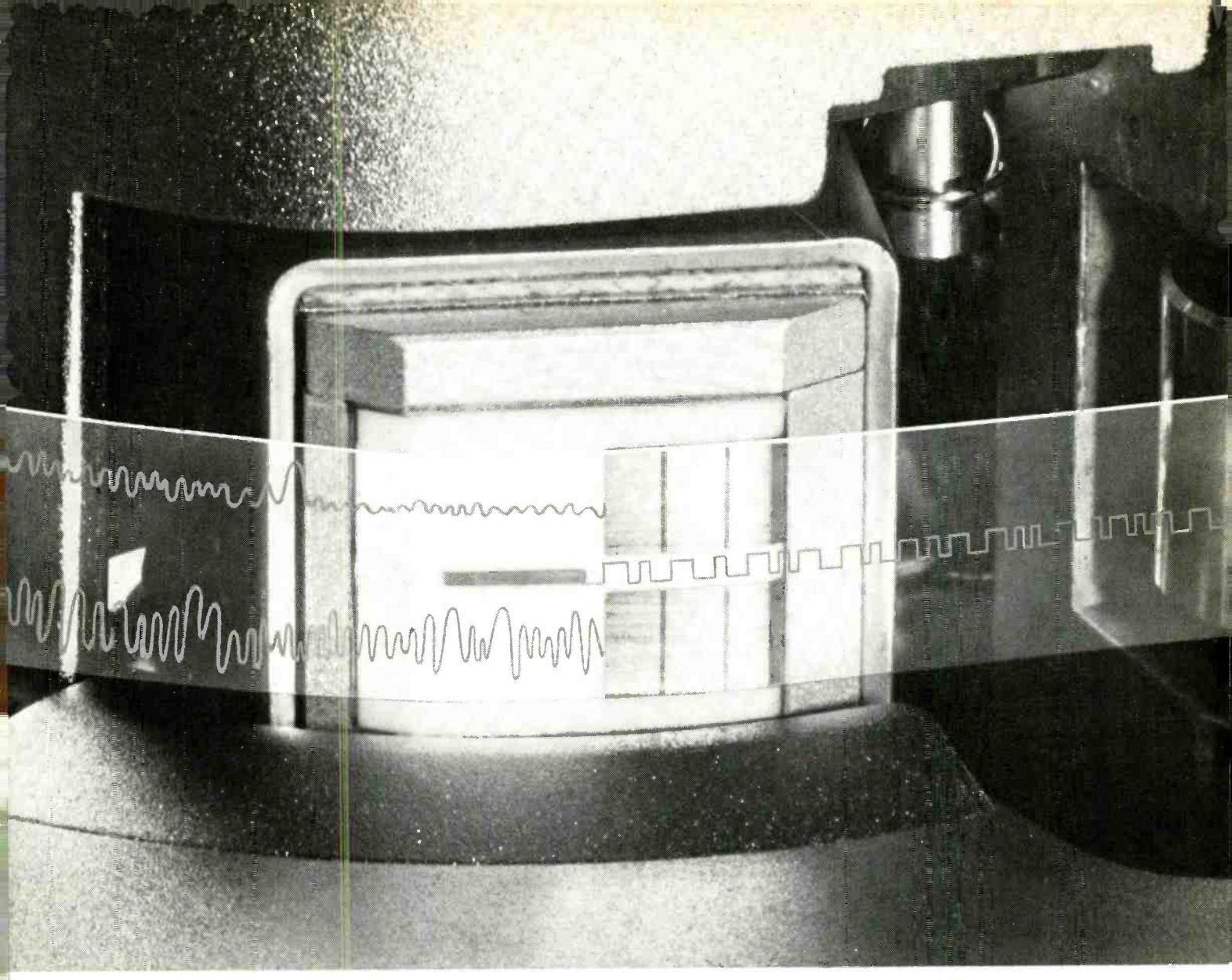
The new series MTR90 — the pinnacle of tape recorder technology. Now available in 8 track 1 inch, 16 or 24 track 2 inch versions. Optimal Tape Guidance System, with pinchroller-less PLL capstan, two ½HP DC reel motors, and integral tape guidance headblock assembly governed by Otari's proven microprocessor controlled servo system. Transformerless I/O, adjustable record phase compensation, spot erase, tilting deckplate for easy access, 14 inch reel capacity.

I.T.A. is pleased to add to its list of latest Otari users:-

BBC Radio—5 units of MTR90 are now in use at Cardiff, Manchester and Bristol.

Limehouse Productions—the new £10 million TV studios in Dockland will use two MTR90 24 tracks for Video applications.

New address: ITA, 1 Felgate Mews, Studland St. London W6 9JT. Tel: 01-748 9009. Telex: 21879



TOTAL SEPARATION AND PERFECT TIMING.

These are the innovative features that place the microprocessor-controlled Studer A810 way ahead in the science and art of analogue recording.

The A810 incorporates a specially-developed time code system, utilizing a new combination head arrangement to input SMPTE code data on a 0.35mm wide central track between the audio channels on a ¼" tape. Two 'combi-heads' are employed, on either side of the audio record and reproduce heads. One head contains the time code reproduce gap and the audio erase gap; the other has the time code erase gap and time code record gap. Because the heads are totally separate, audio/code crosstalk rejection is better than 90dB.

An integral digital delay automatically compensates for the problem of audio/code time offset – at all speeds. During recording and playback, this delay holds the time signal until it is in exact synchronization with the audio output. Tapes can be spliced in the normal way without fear of removing SMPTE data.

Not only does this novel A810 time code system eliminate the need for a multi-track recorder when synchronizing stereo audio programs with video tape recorders, but it is also ideal for a variety of other applications: film audio editing, TV – simulcast, broadcast automation systems, A/V system control, and slow-speed logging.

And the A810 offers a host of other advanced features including: fully-programmable functions; a revolutionary memory system for electronic alignment parameters and different tape formulations; quartz-referenced capstan speed control with +/– readout; and many other monitoring and control options.

Just write or 'phone for full technical details.

Studer A810. A quantum leap.

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F.W.O. Bauch Limited
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Telephone 01-953 0091, Telex 27502

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Available for use with a standard 47k-ohm cartridge, the EMT 948 is an integrated system ready to drop straight into a desk-top. The EMT 948 brings excellence within greater affordability.

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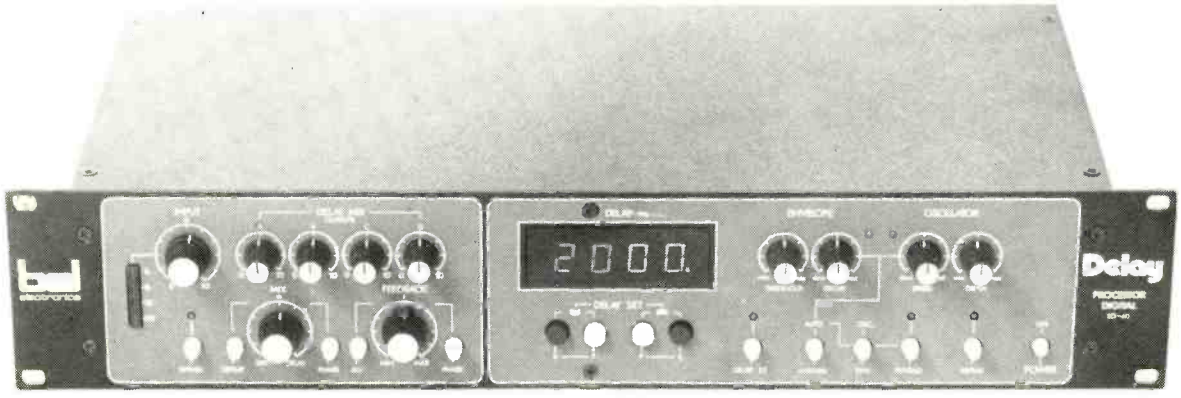
It's only limit is your imagination



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- 2 secs maximum delay @ 16kHz bandwidth
  4 secs maximum delay @ 8kHz bandwidth (x2 delay)
- 4 outputs with delay mix controls
- 3 operating & setting of delay modes
  Manual : via up/down keypad switches
  Oscillator : via speed/depth controls (depth greater than 10:1)
  Envelope : via threshold/decay controls
- Infinite (non-deteriorating) repeat switch – LED indicated
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- Output mix control with phase invert and dry defeat switches

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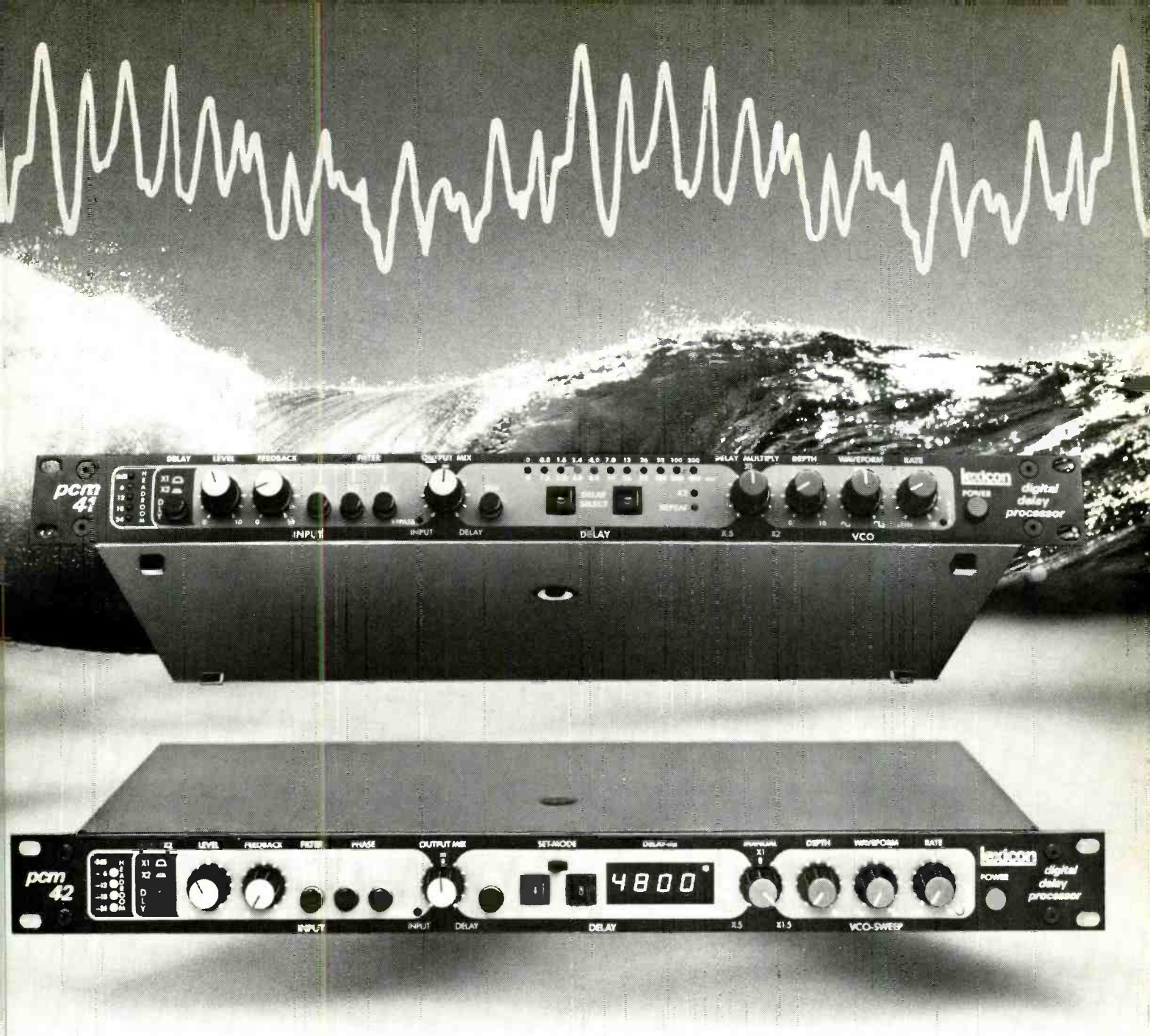

The Image Builders.

The PCM series of Lexicon digital delay systems has revolutionised the creation of dramatic sounds on stage with studio precision, enabling live performers and recording artists to explore new dimensions of musical expression.

Both systems expand the horizons for digital audio processing, drawing on the Lexicon technology which is the first choice of world-class recording studios and entertainers.

The compact, cost-effective PCM41 puts full professional quality within the reach of almost all entertainers and small studios. Effects include automatic double tracking, flanging, slap echo, infinite repeat, doppler pitch shift and many others. Virtually distortion free over the entire power bandwidth, the PCM41 is easy to understand and simple to operate. The only modest feature is its price!

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Lexicon PCM Series. The cornerstone for improved performance.

lexicon

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QUESTION:

Which range of studio monitors, apart from the new Tannoy SRM Series with SyncSource,™ provides a single point sound source for all monitoring applications?

ANSWER:

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Individually, they're amazing. Together, they're unbeatable.

Recording studios, radio and television production suites, video and A/V facilities and serious musician/composers have discovered that Valley People equipment improves productivity, offers ease of operation, requires little or no maintenance and provides excellent signal quality. Standing alone they offer unrivalled processing power and versatility: used together by the creative engineer/producer, they increase variety and control dramatically.

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The low impedance unit for transparent, distortion-free recording as well as on-the-air or live performances. Each of the four inputs is adjustable from 20dB to 60dB of gain.

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Provides maximum flexibility: the seven octave range on each of the three frequency bands gives a six octave overlap. Ideally suited to pre-conditioning of signals when used in-line with the Kepex II and Gain Brain II.

Kepex II Expander/Gate

Spectacular performance in noise gating, reduction and elimination is complemented by its creative value in 'loosening' drum effects, removing excess cymbal ring or performing electronic musical effects.

Gain Brain II

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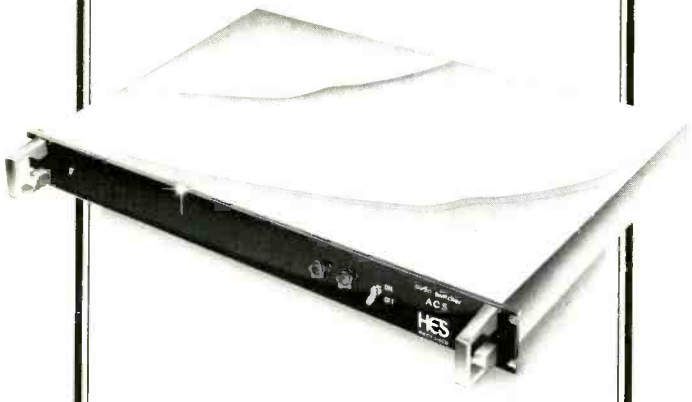

12 x 4 AUDIO CROSSPOINT SYSTEM

The ACS AUDIO CROSSPOINT SYSTEM is a 12 x 4 audio switcher built into a 1U x 19" case, designed for applications requiring only a limited number of crosspoints. It can be operated in mono or stereo configurations, and two units can be linked together to double the capacity. Each unit uses a dedicated micro-processor which can be controlled in a variety of ways, including simple push-button selection.

Technical specifications:

electronically balanced input
electronically balanced output (with transformer option)
max. output level ..... +22dBm into 300Ω
distortion ..... 0,1% at +20dBm
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Please contact Les Hamilton at:

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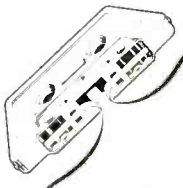

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The PEP service is expanding fast. In addition to our highly successful range of small cards and modules, we now offer complete mixing desks and auxilliary equipment ex stock.

EXAMPLES – Budget mixer 8 into 4 with 8 track monitor £250 + VAT; Budget mixer 10 into 4 with 8 track monitor and comprehensive EQ £475 + VAT; 12 into 4 de luxe console £1400 + VAT; Timetrack multi-tracker with echo and comprehensive facilities £350 +VAT. In-Line recording console 20 in 20 out £2900 + VAT, and there are lots, lots more.

Why not telephone or call in for more information.

SPECIFICATIONS FOR SMALL CARD—RANGE	MIC–1 MICROPHONE PREAMP	VEM–1 VIRTUAL EARTH MIXER	LHD1 600 OHM LINE DRIVER	LHD2 LINE DRIVER WITH GAIN	GPA–1 GENERAL PURPOSE AMP	MAG–1 RIAA PHONO PREAMP	MC4 MOVING COIL HEAD AMP	MBC–1 VU METER BUFFER
INPUT IMPEDANCE (OHMS)	100K UNBAL USE TRANSFORMER WITH 200 OHM MICS	LESS THAN 25 OHM	22K	22K	40K	47K	100	10K MIN
MAXIMUM RECOMMENDED SOURCE RESISTANCE	USE HI Z MIC OR MT 1 TRANSFORMER	USE 22K MIXING RESISTORS	10K	10K	10K	USE MOVING MAGNET CARTRIDGE	USE MOVING COIL CARTRIDGE	10K
OUTPUT IMPEDANCE	100 OHMS	100 OHMS	70 OHMS	70 OHMS	100 OHMS	100 OHMS	100 OHMS	3K6 TO SUIT VU
MAX O/P LEVEL (1KHZ)	6VRMS	6VRMS	5VRMS INTO 600 OHM	5VRMS INTO 600 OHM	6VRMS	6 5VRMS	5VRMS	3VRMS
GAIN	0 to 50dB SET BY EXT RES	0dB +0 2dB	0dB +0 2dB	+10dB +0 5dB	0 to 32dB SET BY EXT RES	+40dB AT 1KHZ	+30dB	0 to 10dB SET BY PRESET
POLARITY	NON INV	INV	NON INV	INV	NON INV	NON INV	NON INV	INV
FREQUENCY RESPONSE 20 KHz	0 5dB	0 5dB	0 5dB	0 5dB	0 5dB	RIAA CURVE +0 5dB	—0 5dB	0 5dB
REF 1 KHZ 20 Hz	0 5dB	0 2dB	0 5dB	0 2dB	0 5dB		0 2dB	0.5dB
TOTAL HARMONIC DISTORTION 3 Vrms	LESS THAN 005% at +20dB	LESS THAN 004%	LESS THAN 004% (600 OHM)	LESS THAN 008% (600 OHM)	LESS THAN 005%	LESS THAN 005%	LESS THAN 008%	LESS THAN 0.5%
1 KHz								
NOISE (REFERRED TO I/P)	125dBm USING MT 1	90 dBm	—110 dBm	95 dBm	105 dBm	—72dB REF 2m Vrms 1KHZ AT THE I P	—125 dBm	—90 dBm
POWER CONSUMPTION (+24V SUPPLY)	10mA	6mA	16mA	12mA	10mA	10mA	20mA	5mA
PHYS CAL DIMENSIONS L	115	70	80	130	85	130	160	50
W	75	75	75	75	75	75	75	75
m m H	18	15	18	18	15	18	25	15

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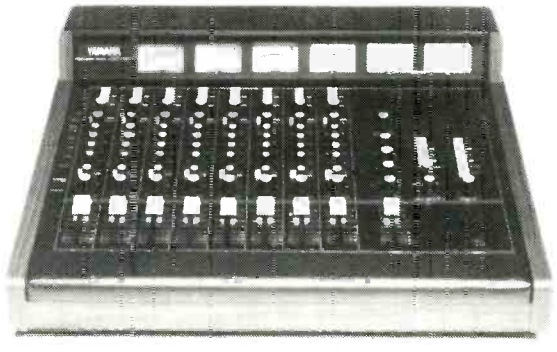
Yamaha Step Inside

With a reputation secured in high quality sound reinforcement equipment, Yamaha need no introduction to the professional recording industry. Now, with the new RM Series of recording mixers, Yamaha take another step inside the world of the professional recording studio.

The RM1608 has been built with eight and sixteen-track recording in mind, as well as being ideal for use in audio–visual, video and film production. Its 16 input channels feature, amongst other things, a 3-band parametric EQ enabling three overlapping frequency bands to be boosted or cut by 15dB; a 12dB per octave high pass filter switch; twin independent echo send controls, and a gain control giving variable sensitivity over a 40dB range to match virtually any mic/line signal.

The RM1608 also features an 8 Program mixing buss console, each buss switchable for Output A or B; a talkback module, and a built-in patch bay that puts the most often patched circuit points up front for easy access. Rear panel patching, and feature all possible applications including effects connections cater for balanced microphone inputs.

All this and more contribute to a professional interior that's matched with a plush exterior furnished with rosewood trim, smoked glass meter panel and padded arm rest. So inside or out, when you're talking Yamaha RM Mixers, you're talking quality.



Also available: Yamaha RM804

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Please send further details about Yamaha's RM1608 and RM804 Mixers.

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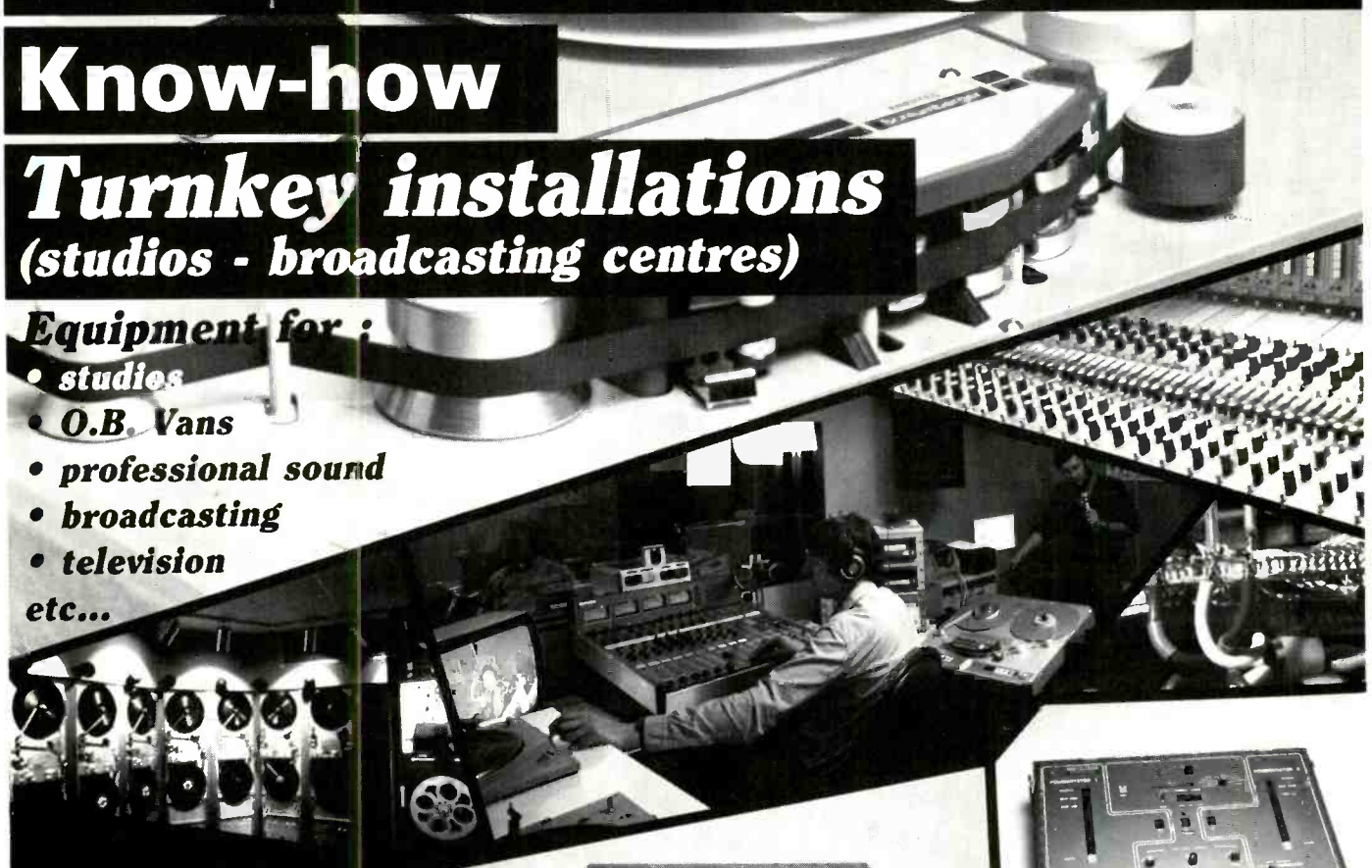

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natural Progression

Just grab it and go. THE LOCATION MIXER was designed to travel. If there's no AC at your location, no problem. You've got the battery pack right in the lockable cover. No need to bother with batteries or power supplies for your mics. THE LOCATION MIXER powers them all – 12-48V. phantom, and even T-power is provided.

You can set up everything from a single mono mix, to a stereo mix to an eight channel direct feed for your multitrack. You can even set up all three mix feeds at once!

You've got the flexibility to insert effects to individual channels. And you'll appreciate the convenience of the tape return to the monitor section.

An instant, easy way to check your tape, or the output of an outboard compressor.

With Mic/Line switches on all channels, audio and video sound people can monitor multitrack playbacks without patching – just press a button. Multitrack mixdown in the field? Absolutely. And with no compromise in quality because you feed line inputs directly – NOT padded down through the mic. preamp. You'll love the ability to edit electronically through the flexible Solo system and channel mute... it can be a great time saver.

Doing a live remote? THE LOCATION MIXER is perfect. All four mix busses (2 main, 2 AUX) drive a 600ohm line to 20dBm (with balanced Xfmr option) giving both mono/stereo and back up feeds at the same time. And the ability to solo pre or post fader with the channel on or off makes set-up and trouble shooting a bad cable or mic. easy.

What's in THE LOCATION MIXER for film people? Plenty! No more battery or power supply hassles for your T-power mics. Just flip a switch. And there's a low-cut filter ahead of the mic. transformer to keep wind and boom movement from saturating your tape. This filter is independent of the EQ section. The EQ itself has sweepable mid, detented pots for resetability and can be totally bypassed with the EQ in/out switch. Need a quick talk-back system for your boom man? Just use the pre fade Aux bus on an unused mic. input, and he can hear his mics, cues, and your closed-circuit directions – his own custom mix!

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The Trident TSR Professional Multitrack Machine speaks for itself.

Supplied with full Remote control and autolocator, this fully professional machine is available in 16 and 24 track versions,

both of which are considerably less expensive than the overseas competition.

Now available as an extremely attractive package with the new Trident Series 80B or Series 70 mixing consoles. These complete Trident packages are available only from Don Larking Audio Sales and they are just waiting for you to come and try them out in our studio at Luton.

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EELA AUDIO products designed for the future

S100 Series — Total flexibility
Pick a frame size to suit your exact needs. The S100 series uses 4-channel modules with either mono mic/line inputs or stereo high level inputs and can be configured from 4 into 2 up to 20 into 4. As with other EELA mixers features and options include: phantom power, B.S ppm's, fader switches, PFL, balanced ins and outs.

S191 Series
A 6 into 2 channel mixer to fit a standard 19" rack mount. Extremely suitable for video and film dubbing suites.

Features
Mic/line input selection.
Phantom powering.
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Built-in talkback mic.
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S200 Series Modular Mixing Consoles
This series consists of a wide range of modules which may be easily configured for a number of applications. The simplest a 4 into 1 mixer ideal for film dubbing. The most complex a 32 into 8 group broadcast/recording console.

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105mm audio facers; mono mic/line input module; stereo high level input module; VCA Compressor/limiter; telephone hybrid, tape remote, patch module.

S41 ENG Minimixer
A 4 into 1 portable mixer ideal for use with radio, TV and film crews. Including powerpack the S41 weighs only 5lb and has such features as: Mic/line inputs, phantom power, PFL, 1kHz oscillator, conductive plastic faders. It will run for 8 to 10 hours on it's 2 × 7 nicad cells. Dimensions 246 × 162 × 72mm.

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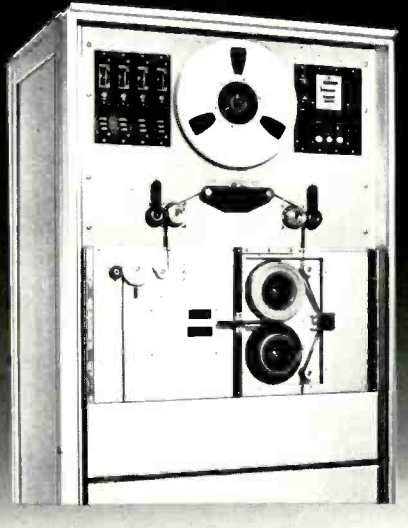

ASONA High-Speed Loop-Bin

The loop-bin/slave system employs neither compressed air nor vacuum. Completely self-contained, requires only one mains connection.

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ASONA is manufactured in West Germany by AUVIS ASONA KG, Stollbergstraße 7, D-8000 Munich 22 Tel.: (0)89-225057, Telex: 522084 AUVIS D

diary

Magnetic media symposium

Honolulu was the venue for the Symposium on Magnetic Media Manufacturing Methods for three days during May. This unique occasion was attended by 311 delegates from widespread locations such as India, Argentina and South Africa with most coming from the United States and Japan and many from Europe.

The symposium comprised 31 lectures the majority of which are documented in a 770 page hard bound book plus a 100 page supplement. Unfortunately these publications are not available to anyone who did not attend, but limited additional copies can be sold to delegates.

On the first day all delegates attended sessions in the large Molokai room at the Waikiki Sheraton. The first presentation was a useful tutorial on Basic Magnetics by Dr James Lemke of Eastman Technology Inc. This was followed by seven papers on Magnetic Materials covering such areas as plated coatings, sputtered coatings and evaporated films.

Much of the technology described does not apply directly to analogue audio recording as much emphasis was directed at vertical recording using perpendicularly oriented coatings which are eminently suitable for very high density digital recording.

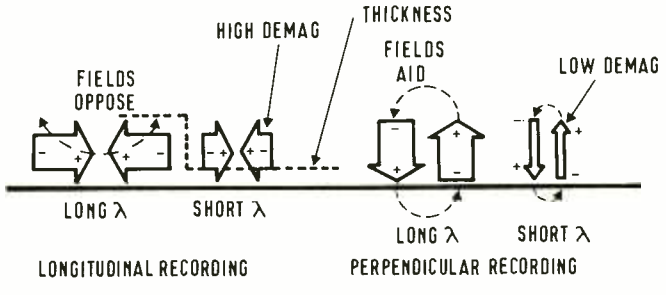
In conventional longitudinal recording a tape is made from acicular (needle-shaped) particles which are aligned during coating along the length of the tape (for audio tapes). As the recording head magnetises the tape in this direction the orientation process increases the available output by making the particles easier to magnetise.

Unfortunately at short wavelengths (high frequencies) the adjacent particles are magnetised north/south and south/north causing self demagnetisation which results in a loss at short wavelengths. In digital recording this leads to pattern sensitivity such that not only the output level but also the timing of the replayed waveform varies with the pattern of digits being recorded.

With perpendicular recording the vertically oriented particles do not exhibit demagnetisation characteristics at short wavelengths as the adjacent acicular bar magnets are aligned N-S and S-N as shown in **Fig 1**. The arrangement actually gives an output which increases with shortening wavelength.

When using perpendicular recording, conventional heads cannot be used and the design of suitable heads is at an early stage, however when using particulate recording media (as opposed to thin film media) perpendicular recording should achieve about three times the potential bit packing density of longitudinal recording. About 150,000 b/in may be anticipated for particulate media or 200,000 b/in for thin film media.

FIG.1
PERPENDICULAR .V. LONGITUDINAL RECORDING



In the field of magnetic materials much of the discussion related to magnetic coatings suitable for perpendicular recording. Variations of the currently used ferric and chrome oxides may be used but Mr Fujiwara of the Toshiba Recording Laboratory described a new barium ferrite medium which takes the form of hexagonal platelets of 0.08 μm diameter.

This medium has many advantages over metallic coatings as it does not corrode, has stable temperature characteristics of coercivity and magnetisation and furthermore can be coated using existing techniques as opposed to sputtering or evaporation.

Turning to coating methods Matsushita have for some time been producing their Angrom evaporated film microcassette tape. A version of this tape with a 0.1 μm coating is now under way for the new 8 mm videocassette system. Dr Sugaya of Matsushita presented data on this new product claiming a far better head life when compared with coated metal pigment tapes. Furthermore the evaporated tape gives negligible change in output with running times up to 100 hours resulting from the lack of shedding and an excellent still frame performance up to two hours.

With the exception of the Matsushita evaporated tape all current tapes are coated using a solvent system which is dried in a heated tunnel after coating. This results in large and relatively slow tape coaters.

Radiation curable coatings are used in other industries and there are interesting possibilities for coating magnetic materials as the process is fast and easy to control. The entire thickness of the coating can be 'cured' in milliseconds without the generation of any heat which could deform the polyester base film.

This coating method requires a radiation curable binder system to be coated using conventional methods. The coated web is then passed to an electron beam processor which irradiates the coating with high energy electrons effecting the almost instantaneous cure of the coating.

The electron beam irradiator works rather like a cathode ray tube where the screen is replaced by an electron transparent window and the normal 30 kV or so EHT is upped to between 150 kV and 300 kV. The electron beam may either scan the width of the coated web or special electron guns giving a curtain beam may be used.

This is but a brief note of the aspects of the symposium which related to the audio business. Progress in the magnetic recording industry is extremely rapid with the areal density (b/in^2) of digital recording increasing one hundredfold about every 10 years.

Hugh Ford

AEG partial name change

One of the companies that formed part of the AEG-Telefunken group has recently changed its name and is now a separate organisation. ANT Nachrichtentechnik GmbH, as it will now be known, manufactures a product line that includes *Telcom C4* noise reduction systems; *Telmos 800* sound reinforcement systems; sound mixing consoles for broadcast use; *V 600* series mic, line and distribution amplifiers, filters and faders; *Telkos* microprocessor controlled audio switching systems; wireless paging systems etc.

The full address is ANT Nachrichtentechnik GmbH, Fachbereich Elektroakustik, Lindener Strasse 15, D-3340 Wolfenbüttel, West Germany. Tel: (05331) 83-0. Telex: 95651.

Designer correction

In the Designers and Consultants service guide an unfortunate error crept into two entries during one of the final printing stages. The correct address for Perception Inc should be 1537 Cerro Gordo Street, Los Angeles, CA 90026, USA. Tel: (213) 660-9351 and that of Plan Audio, 27b Bell Street, Reigate, Surrey. Tel: 03727 41822. We apologise for any inconvenience that this may have caused.

People

● The professional audio products division of Sony Corporation of America has appointed two new sales managers. Michael Faulkner will cover the eastern region and Graeme Goodall, the southern region. Both will have responsibility for the complete professional products line including Sony digital, the MCI range, wireless mic systems, etc.

Datatronix changes marketing

Datatronix Inc, manufacturer of API consoles, has announced that the marketing of its audio and broadcast products will now be handled direct from its manufacturing facilities in the greater Washington, DC metropolitan area. Previously they used a system of distributors but the company feels that this move will improve the service offered. Two agents will however be retained; Studio Consultants in New York and Nissho Iwai in Tokyo. Other foreign agents are being sought at present.

Datatronix Inc, 2100 Reston Avenue, Reston, VA 22091. Tel: (703) 620-5300.

Agencies

● CTAB have announced a new distributor for the Milab range of microphones in the USA. They are Camera Mart Inc, 245 West 54th Street, New York, NY 10019. Tel: (212) 757-6977. Telex: 12078.

● Elliott Brothers, London have been approved as main agents for HH Electronic *MOSFET* and *TPA* amplifiers.

● The Gotham Export Corporation has opened a European sales office in Zurich, Switzerland. Gotham Europe AG will be responsible for the Swiss market and as a liaison and back-up service facility for all Gotham European marketing. The office will be managed by Franz Ammann. Further details from Gotham Export Corporation, 741 Washington Street, New York, NY 10014, USA. Tel: (212) 741-7411.

Addresses

● Selco Products Co, have changed their telephone number and their new details should be Selco Products Co, 7580 Stage Road, Buena Park, CA 90621, USA. Tel: (213) 921-0681. Selco distribute Sifam products and Sifam have asked us to point out that the Selco telephone number given in their advertisement in our August issue was incorrect and should have been the number listed above.

● The hire company, Paul Farrah Sound has moved to larger premises and their new address is Paul Farrah Sound, Unit 7, St Georges Industrial Estate, Richmond Road, Ham, Surrey. ■

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HHB

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

new products

Milab new models

Milab, the Swedish microphone company, have several new and changed models available. The *DC96B* is a condenser mic using the Milab large rectangular dual diaphragm capsule. A newly designed amplifier has brought a significant reduction in noise and an improvement in dynamic range. The price of the mic has been kept down by the offering of variable pattern and attenuator features as options. The mic design is physically slim and is finished in a non-reflective black.

The *LC25,* first made available as a line output mic, is now also available with a normal mic output level for conventional use. The problem with the line level version was that the input circuitry on some consoles prevented the full potential of the mic being realised, particularly at the HF end of the response. There was the further problem of trying to derive the 48 V phantom power from the line input which is not a facility offered by many desks. The mic level version is still transformerless and has a claimed response of less than 1% THD at an SPL of 130 dB across the frequency band of 30 Hz to 15 kHz. The line level version is now available to special order only.

Milab have also announced two live application mics. The *BM-73* replaces the *DC-73* and is designed for handheld use and has features such as an easily replaceable front grille in the event of damage. It is a condenser type with features including low handling noise, presence boost, and switchable proximity filter. The *P-14* is a low cost dynamic mic for road use with emphasis on handheld and vocal applications. As well as standard versions of the mic, Milab are also offering versions customised to requirements such as with different types of switch, balanced or unbalanced etc.

Creative Trade CTAB AB, Knutsgaten 6, S-26500 Astorp, Sweden.

UK: Audio Video Marketing Ltd, Unit 21, Royal Industrial Estate, Jarrow, Tyne & Wear, NE32 9XX. Tel: 0632 893092.

USA: Camera Mart Inc, 245 West 54th Street, New York, NY 10019. Tel: (212) 757 6977. Telex: 12078.

Cementation Muffelite DUO PLEXX

Milab DC96B

Sescom ADA-2

Sescom has introduced an 8-output distribution amplifier in a single unit, 19 in rack mount enclosure. The *ADA-2* has eight individual line amplifiers and front panel input selection between two buffered 15 kΩ transformer balanced bridging inputs. Also accessible from the front panel are gain adjustments for each of the line amplifiers. Output is 600 Ω transformer balanced with output level of +30 dBm. Other specifications include max input: +18 dBV; CMR: −87 dB at 1 kHz; gain: +30 to 0 dB; distortion at max rated output: 0.2% at 20 Hz, 0.04% at 50 Hz, 0.002% at 1 kHz; noise: 101 dB below rated output; bandwidth: 60 kHz at −3 dB; frequency response: ±1 dB 20 Hz to 20 kHz.

Sescom Inc, 1111 Las Vegas Boulevard North, Las Vegas, NV 89101, USA. Tel: (702) 384-0993.

High powered Hill

Hill Audio showed the first of three new additions to their range of power amplifiers at the recent APRS exhibition. Intended principally for live applications, the *DX 2000* is probably the biggest production amplifier currently available. The output power rating is quoted as in excess of 550 W RMS continuous per channel into 4 Ω over 20 kHz bandwidth or in a bridged mono mode, 2,000 W RMS continuous into 4 Ω.

For an amplifier of its power rating it is fairly compact with 19 in rack mount format and a height of 3U. Internal layout is such that each channel is either side of a centrally situated power supply. Each channel has a thermostatically controlled cooling fan that forces air through the channel electronics and expels it at the front panel. The amplifier doesn't have any replaceable fuses and there are no protection devices in the audio path of the power amp although there is sensing for serious overload, short-circuit, overload, component malfunction and overheating. This will trigger a protection relay that isolates the offending channel from the power supply and gives front panel indication of the problem. The relay may be reset by a front panel switch.

Each channel offers male and female *XLR*-type sockets and ¼ in jacks, all unbalanced with each channel having independent gain controls. Output connectors are four sets of 4 mm binding posts on ¾ in spacing.

Provisional specification: distortion < 0.003% THD 1 kHz at 500 W into 4 Ω; < 0.05% THD 20 kHz bandwidth within rated power; < 0.01% IMD SMPTE 60 Hz/7 kHz 4:1 0.1 W to 500 W into 4 Ω; frequency response ±0.1 dB, 20 Hz to 20 kHz; damping factor > 2,000, 20 Hz to 1 kHz and > 500, 1 kHz to 20 kHz; slew rate 20 V/μs and rise time 3 μs.

Hill Audio Ltd, Hollingbourne House, Hollingbourne, Maidstone, Kent. Tel: 062-780 555.

USA: Hill Audio Inc, 231 Marquis Court, Lilburn, GA 30247. Tel: (404) 932-3193. Telex 293 827 HLAD.

Visual talkback anyone?

Textlite UK have announced a development of their *MM300* moving message display unit known as the *MM300E.* It will display any one of up to 16 messages at the flick of a switch. These messages are specified by the user and then stored permanently in a plug-in *Text-module.* Each of the 16 messages can be up to 128 characters long or divisions of that with eight messages of 256 characters long, four of 512 etc. The unit can be remote controlled from another room; it is possible to change instantly between messages; interfacing to consoles for automatic operation is also possible. Textlite say that the 17 in long display is legible up to 60 ft. The display weighs less than 3 lbs and so can easily be fixed almost anywhere.

Textlite UK Ltd, Concord House, Concord, Washington, Tyne & Wear, UK. Tel: 0632 478585. Telex: 537227.

Sidelines

● There are a large number of products that don't immediately suggest themselves as studio items but can have very real applications in this sort of environment. One such item is *Croxtine,* an anti-static liquid used for treatment of carpets. Meech Static Eliminators recently treated a carpet in a major London studio where the carpets were causing people walking across them to become charged and then they discharged when touching the console etc, with the possibility of clicks being produced. Meech apparently were able to eliminate this problem by spraying *Croxtine* in a concentrated form onto the carpets which will then keep them static free for several months before needing retreatment. The treatment provides a conductive film which allows the charges to leak away as well, as preventing them from forming. For more minor applications, *Croxtine* is also available in aerosol cans.

Meech Static Eliminators Ltd, 146/150 Clapham Manor Street, London SW4 6DA. Tel: 01-622 4555.

● Cementation Muffelite have announced a lightweight, one piece isolator to help reduce structure-borne noise induced by electric cooling fans. Known as the *DUO-PLEXX,* it is designed for use with 3⅛ in and 4½ in tube axial cooling fans and is claimed to reduce noise levels from 3 to 16 dB, dependent on the type of fan, housing and cabinet structure. Made from light, high strength, impact-resistant plastic, it incorporates a diaphragm element and is operative over the temperature range −30 to +50°C as well as being flame retardent and a good electrical insulator.

Cementation Muffelite Ltd, Hersham Way, Walton-on-Thames, Surrey KT12 3PQ. Tel: Walton-on-Thames 24122.

36▶

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☐ **Please send me information on the MXR Drum Computer.**

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new products

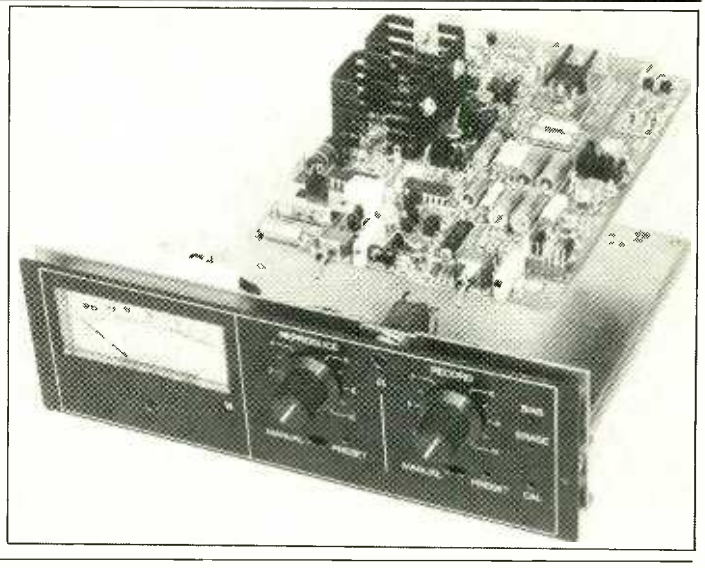
Strategic Sound ATR-100 replacement channels

Strategic Sound Inc have announced a new transformerless input/output board replacement for the Ampex *ATR-100* tape machine. They claim that by very closely matching a transistor pair with 0.1% resistors they have achieved a very low noise with maximum common mode rejection ratios.

The output uses *OP-37* precision op-amps in conjunction with VMOS and ring emitter transistors for minimum distortion. They further claim that by using only the best precision components they have eliminated the need for four internal DC offset and calibration adjustments.

Other features include transformerless coupling with correct absolute polarity, unbalanced line output capability without level change, class A output operation, balanced voltage supply shutdown and power on/off mute circuit. Improved specifications include variable input sensitivity of −10 to +40 dBm, input CMRR greater than 70 dB 10 Hz to 1 kHz, with input clip level of greater than 26 dB above operating level. Frequency response is ±0.1 dB 10 Hz to 20 kHz with a bandwidth at ±1 dB of 5 Hz to 100 kHz; output noise better than 90 dB below operating level A weighted; low distortion of less than 0.01% 10 Hz to 20 kHz at ±24 dBm with a 600 Ω load; and an input to output system slew rate better than 20 V/μs.

Strategic Sound Inc, PO Box 3148, Redwood City, CA 94064, USA.



New excitement from EXR

The EXR Corporation have announced a 'fourth generation' *Exciter* known as the *Model EXIV*. The design maintains all the desirable features of the *EXIII* but with several additions. One such is a completely new enhancement process that affects the bass and lower-mid frequencies when in the 'A' process mode.

New features include sweepable frequency centre point control, process noise gate with threshold and release controls, adjustable limiter to prevent HF splash, 0 dB and −20 dB switchable *XLR*-type inputs, and a peak level switch which gives narrow band enhancement in the L position or wide band in the H position. The *EXIV* is a single 19 in rack mount unit.

EXR have also announced a 'psychoacoustic footpedal' for use by musicians known as the EXR *Projector Model SPIII*. This contains many of the rack mount unit's features but in a very low price format.

EXR Corporation, 11523 Dexter-Pinckney Road, Pinckney, MI 48169, USA. Tel: (313) 878-9445.

UK: Turnkey, Brent View Road, London NW9 7EL. Tel: 01-202 4366. Telex: 25769.

Bel digital delay

Bel Electronics have a new addition to their established range of delay line/flangers in the form of the *BD-60* digital delay line. It offers up to 2 s of delay with 16 kHz bandwidth and in a x2 mode, up to 4 s with a 8 kHz bandwidth. The precise delay time is indicated on an LED display with control by up/down pushbutton switches. As well as the output at the maximum delay time set, there are three other outputs equally spaced at lesser delay times. The levels of these four outputs may be individually set on the front panel controls. It is further possible to add regeneration selected from either the main delay or the auxiliary delays.

As with other Bel delay units, there are facilities for the delay time to be manually set or either envelope following or controlled by the internal oscillator. Envelope settings include variable threshold and decay while the oscillator controls are depth and speed. There are phase invert switches feedback send and delay output, provision for external VCO control and an infinite hold mode.

Bel Electronics, 29 Guildford Street, Luton, Bedfordshire LU1 2NQ. Tel: 0582 452495. Telex: 825488.

More Boundary Recording news

Two more manufacturers have shown versions of boundary recording mics but in these cases information on the units is still limited. Beyer Dynamic showed a unit known as the *MPC 50* at the Eindhoven AES for the first time and it easily wins the prize for the prettiest unit so far. It is made from wood (the version of the exhibition looked like Rosewood with a light varnish) in the form of a thick (approx 1 in) slab with angled edges. The transducer is positioned exactly in the centre just below the surface level of the wood. The mic can be powered by a 9 V battery or standard 12-48 V phantom power. Other information is a little hard to come by at present although we hope to carry more details soon.

The other manufacturer to enter this field is Schoeps with a fitting for their *Colette Series* in the form of a metal plate about 8 in square with the transducer sited about two-thirds of the way across a diagonal and almost flush mounted. A standard preamp fitting plugs into the plate from the opposite corner to the transducer. This attachment is known as the *BLM 3* and information on this unit is also in short supply although this will soon be rectified.

Surrey stabilizer

Surrey Electronics have announced new versions of their *Stabilizer 4* frequency shifters for howlround reduction. These units provide a frequency shift that is variable between 1 and 10 Hz. The already established mono version has been redesigned slightly. A stereo version is now also available where the frequency increase or decrease may be selected independently for those occasions where this may be preferable.

Surrey Electronics, The Forge, Lucks Green, Cranleigh, Surrey GU 6 7BG, UK. Tel: 0483 275997.

Klark-Teknik Series 300

Over the last year there have been a lot of new products coming out of Klark-Teknik and some of the familiar items have been replaced and slowly withdrawn. Although they make many products these days it is for their graphic equalisers that they are perhaps still best known and it is this area that they have now updated with a completely new range.

The *Series 300* comprises four separate units all using a Klark-Teknik proprietry microelectronic active filter circuit together with the application of thick film technology which they claim should increase reliability.

The *DN 300* is a ⅓-octave single channel graphic equaliser with 30 bands at ISO recommended frequency centres from 25 Hz to 20 kHz. Cut and boost is controlled by 45 mm oil-damped faders each with a range of ±12 dB and a centre detent position. It also incorporates adjustable high and low cut shelving filters with the high cut being selectable 6 or 12 dB and the low cut fixed at 12 dB. Other features include electronic input balancing as standard (output optional), a failsafe feature that automatically connects the inputs direct to the outputs in the event of a power supply failure, input level control and a bypass switch. Transformer balancing and a Perspex security cover are options.

The *DN 360* is similar to the *DN 300* but contains two channels with the same number of bands and the same centre frequencies. The faders are 30 mm types and it is possible to select the range of cut and boost to be ±6 dB or ±12 dB. Other features include input level control, a 30 Hz LF filter and an overload indicator. The basic series functions of electronic input balancing and automatic failsafe are standard.

The *DN 332* is a dual channel ⅓-octave graphic with 16 faders per channel—45 mm types as the channels are placed side by side rather than piggy back as with the *DN 360*. Each channel has independent input level controls and 30 Hz LF filters as well as the other *Series 300* features mentioned.

The final unit is the *DN 301*. This has all the features of the *DN 300* and the same number of channels, although each band has attenuating controls only of up to 15 dB for applications in sound contract installations primarily.

The old range has not disappeared completely. The latest version of the original *DN27*, the *DN27A* is still available and will continue to be for some time. It is interesting to note that the *DN 360* ⅓-octave 30-band 2-channel unit is the same size as the *DN27A* for over twice the facilities and also weighs nearly 5 lbs less.

Klark-Teknik Research Ltd, Coppice Trading Estate, Kidderminster, DY11 7HJ, UK. Tel: (0562) 741515. Telex: 339821.

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

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letters

Pirating

Dear Sir, In your article 'Cassette Machines for the Studio' (March issue) you touched upon an interesting point when you suggested giving cassettes, rather than masters, to the yet-to-pay customer.

Just a few weeks ago, we received a contract to re-record good quality cassettes made in the States for cutting on to disc—so perhaps a really good cassette recorder can be more expensive than at first thought.

And please do not forget that many pirate recordings are made on cassette machines, some under a mixing desk and some even in the audience!

Yours faithfully, Andrew von Gamm, Eifel-Audio, Am Markt 14, 5522 Speicher, West Germany.

VAT warning

Dear Sir, I am writing to draw your attention to a rather odd VAT anomaly we have just discovered. We have recently had a Swiss band recording in the studio. We assumed that in the normal way VAT would be reclaimable on this project on export. To our considerable surprise, we found out at the last minute that the part of the bill related to studio charges was classified by the VAT office as 'entertainment services', and therefore the VAT was not reclaimable on leaving the country.

We have made several phone calls seeking advice on this matter from the APRS, the Export Intelligence Service, Export Times *(apparently defunct), and finally I encountered at least a helpful attitude from the Swiss Desk at the Export Licensing Branch of the Department of Trade. Pending any further information from this source, it would appear that there is nothing to be done about this situation.*

I do not see this as being a very satisfactory way of encouraging export sales in our industry. Obviously this is rather a special case because the majority of foreign clients will either be paying through their British-based record company, or will be from EEC countries (where we are assuming VAT can be reclaimed).

However, we have now had two clients in this category this week and no doubt will be getting quite a few more in the near future since the clients are happy and hopefully will send their friends.

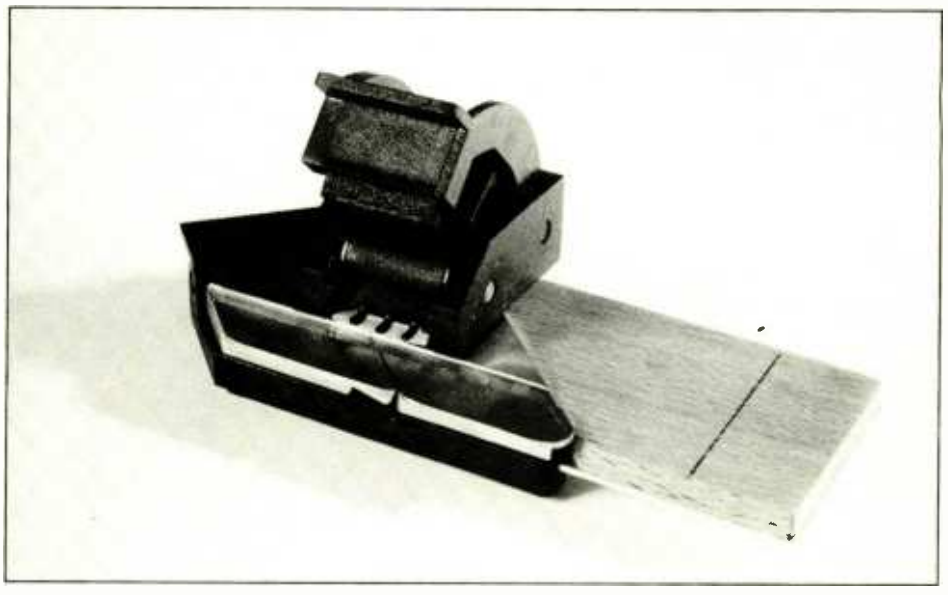
If anyone has any information on this problem area, we would be delighted to hear from them and would like to throw the matter open to general comment.

Yours faithfully, Moira Sheen, Phoenix Recording Studios, 4-5 Christopher Place, Chalton Street, London NW1 1JF.

CAT modification

Dear Sir, I thought the enclosed photograph and a brief explanation of the modification to this splicing system might be of interest to Studio Sound *readers, should you be able to find space to include them.*

In common with many other engineers, I find that using a chinagraph pencil on recording tape to mark edit points is not only a little on the clumsy side, but takes time and is undesirable to boot. For these reasons I prefer to use a particular point to the right of the replay head (in this instance, the right-most tape guide on my usual editing machine) marking this offset distance on the editing block. (I'll not belabour the point further, Grandmothers and egg-sucking and all that!) The 'CAT' splicer is too short to incorporate this reference mark so the modification shown was carried out using easily available materials.



Using 18 gauge aluminium cut to the shape of the base-plate, 6¼ × 2¼ in approx fixed to the top face of the base with adhesive, ensures a flat clean surface with sufficient clearance for the offcuts of tape and an extension to the base to support the piece of hardwood. This piece of wood is 4⅛ × 2¼ in approx with the left hand end cut to fit the 45° angle of the right hand tape cutter. If the thickness of this 'platform' is made to be 5/16 in the top face will lie level with the lowest point in the machined groove the tape rests in. The overall thickness of the 18 gauge 'ali' plus 5/16 in of wood being very close to this ideal height so as not to crease the tape when laid in position. All that is necessary now is to mark the reference point (equal to the offset distance of course) to the right of the cutter position to suit your machine(s). The hardwood surface can then be varnished and two stick-on feet (RS Components type 543-333) added to the underside of the extension aluminium piece will provide a level surface of the same height as the original padded base.

I have 'modded' two CATS this way, both functioning perfectly.

Yours faithfully, Mike McMillan, Mike Sounds (Reading), 98 Anderson Avenue, Earley, Reading, Berkshire RG6 1HB.

Death at Broadcasting House

Dear Sir, In his article about the film Death at Broadcasting House (Studio Sound, *July, page 102) Barry Fox has allowed his enthusiasm to over-ride his judgement; the film was unfortunately* not *shot in BH. It would have been extremely difficult to obtain sensible shots of the real rooms and studios without using a very wide-angle lens, quite apart from the impracticabilities of operating a bulky sound camera and lighting equipment in the building (not to mention tying up two floors for several weeks).*

In fact, the interiors are shot in the film studio, and are sets. They are quite convincing, although not entirely accurate. The 'Vaudeville Studio', Studio BA (sub-basement) is constructed reasonably like the actual studio, with a small stage complete with 'tabs', but the décor is not quite correct, and the audience chairs were in fact fixed tip-up type, not the movable ones seen in the film. Similarly the drama studios are correct in general principle though not in detail—for example, the doors to the studios have catches on them!

The 'dramatic control panel' looks accurate enough, and indeed the whole business of multiple studio drama is well illustrated. The reason why the Blattnerphone is not shown is presumably because there was only one, it was bolted to the floor, and the camera could not have been got into the same room with it!

Comparison of the film with the photos in the book Broadcasting House, *published by the BBC in 1932, will show up various discrepancies. (This book is fascinating—it has photos of most of the studios, the control room, and various technical areas and offices, and gives detailed maps of every floor. Imagine any broadcasting organisation publishing such a book now!—it is practically a saboteur's handbook).*

The novel on which the film was based, written by Val Gielgud (who plays the drama producer in the film in a manner which suggests that he—Gielgud—must have been impossible to work with) and 'Holt Marvell' (ie Eric Maschwitz), was published by Rich and Cowan in 1934; second-hand copies can still be seen occasionally, although prospective readers should be warned that it is rather stodgy going.

The film has already been shown on television —September 3rd, 1982, BBC 2; of course it departs from the novel in a number of ways, particularly the denouement. In the novel, the villain makes his way to the roof, engages in a shooting match with the detective, is shot in the wrist and falls to his death . . . 'a hundred and twelve feet sheer to the pavement below'. In the film he rushes into a small room and presumably flings himself across some terminals, as there is a flash and lots of smoke, all the lights flicker, and he is fatally electrocuted. This room (I was assured by an engineer who worked at BH in the 1930s) would have been unlikely to have caused such a fatal result. It contained the 50 V supply.

Yours faithfully, Roger Wilmut, freelance author, c/o Methuen London Ltd, 11 New Fetter Lane, London EC4. ■

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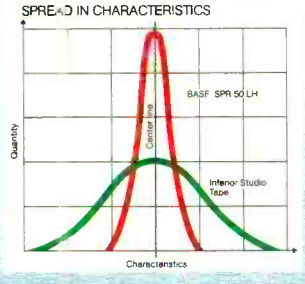

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Ambisonic mixing -an introduction

Richard Elen

The British-developed Ambisonic surround-sound system is not the only technique capable of producing a 'surround' effect in use today—modern developments in SQ technology have found application in the film and video fields. However, Ambisonics is capable of excellent results, although until recently there has been little available in the way of mixdown equipment to make mass-market multitrack-derived record releases possible, and this has restricted the appeal of the system (although there are currently over 150 albums recorded Ambisonically with the Calrec *Soundfield* microphone and similar systems) and this has held back the sale of decoders. All that is about to change, however: a new range of equipment designed by Dr Geoff Barton of the Ambisonic Technology Centre in Reading, and manufactured by Audio and Design Recording is about to be released. The prototypes of these devices have been installed in a studio at nearby Cruchfield Manor in Berkshire, making this the world's first Ambisonic recording facility with multitrack capabilities. Richard Elen often uses the studio and has been evaluating the equipment with the help of Geoff Barton, and offers some observations and techniques which should be useful in developing Ambisonic mixing for both the surround-sound and stereo environments.

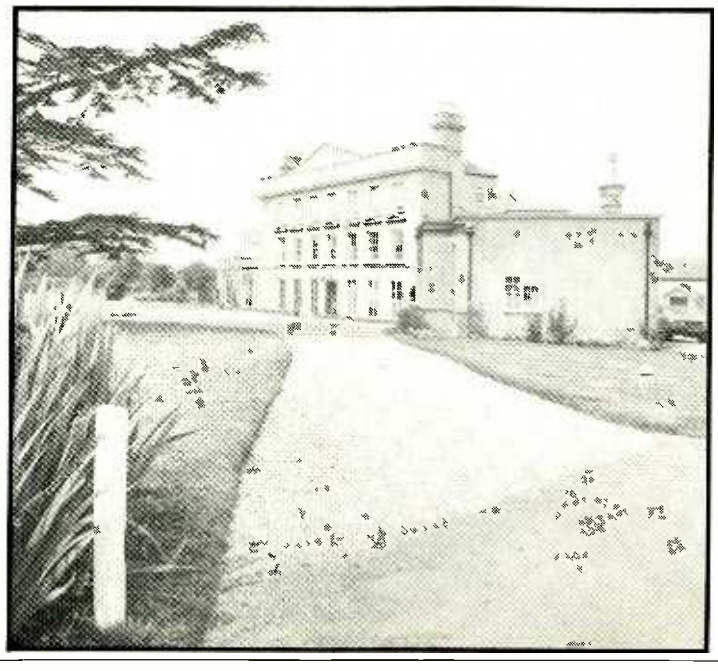
CRUCHFIELD Manor is situated on the A330 between Ascot and Maidenhead in Berkshire, a few miles from Bracknell, and is an impressive building once owned by the Cadburys. Adjacent to the Manor is a small building, once the blacksmith's forge for the stables next door, which the present owner, composer/arranger and musician Keith Mansfield, has converted into a 24-track studio which is jointly owned by him and top recording engineer John Timperley. Principal recording equipment consists of Soundcraft *2400* 24/24 console and 24-track recorder, and *B67* stereo machine.

Now that the equipment exists, to produce Ambisonic mixdowns from multitrack and the fact that the Ambisonic Technology Centre is 'down the road' (10 miles away in Reading) made Cruchfield an ideal location for experiments with the new prototypes.

The primary requirement for mixing multitrack material into Ambisonics is that the tracks on tape can be localised individually into their required positions in the soundfield image. This requires, quite simply, the Ambisonic analogue of the common panpot. The simplest way of achieving this is to build a unit based around a 360° potentiometer with a sine/cosine law, allowing one to localise a signal source within the soundfield and giving a B-Format output. B-Format is the standard format for Ambisonic signals: it consists of four signals in its complete form, these being labelled X, W, Y and Z, where W is effectively mono, X represents front-back, Y left-right and Z up-down. As we are only considering horizontal surround-sound (without height information as in full 'periphony') in this instance, we can dispense with the Z signal, although the circuitry is easily modified to cope with it. The present prototype 'pan-rotate' unit is a 1U rack-mount device with eight continuously-rotatable sin/cos panpots plus a 'rotate' control which can be used to rotate the entire soundfield continuously through 360°. The panpots can be switched to come before or after the rotate control and there are two external B-Format inputs—one pre-rotate and one post—which may be used to chain these or similar modules together. The rotate control may also be switched out altogether. The single B-Format output may be taken to a 4-track recorder, or to an encoder to produce a UHJ 2-channel-encoder master tape which can be cut to disc or broadcast in the usual way.

Unfortunately, sin/cos pots are very expensive, and in addition the pan-rotate unit requires individual mono inputs to be fed from the desk—this could make the console patchfield rather a mess—so other methods of localisation had to be found. One such is the 'converter' unit, which enables the console panpots to be used for localisation, thus freeing the pan-rotate unit for dynamic panning effects, or where a higher degree of localisation control is required. The production versions of the pan-rotate unit will be 2 U, high and will include a 'radius vector' control for each panpot. These controls are used with the panpots to determine the distance of the source from the centre of the image, so the angle can be set with the panpot and the apparent distance away can be adjusted with the radius vector control, which is a 270° pot with a switch at the end of the track, varying the distance from 'normal' (switch position), corresponding to the periphery of the field, through 'zero' (centre) to 'minus', thereby allowing panning across a diameter of the soundfield. The two controls can be used together, of course, to produce 'spiralling' effects between the periphery of the field and the centre.

Cruchfield Manor



Converter

The converter unit is another 1 U rack-mount device with no controls at all other than a power switch. Inside are two independent B-Format groups with separate ouputs, each group having five

inputs. These are designated LF, RF, RB, LB and ES and are designed to be fed from four console groups plus an echo send (post-fader). The echo send level supplies the W (mono) reference while the console group inputs provide level information which is 'converted', with the W signal, into B-Format. Thus any console panpot can be used as an Ambisonic localisation control merely by turning up the echo send level (which must be the same level as the main channel ouput at any fader position) and routing to two of the four groups.

The converter unit assumes two things: first, that you can pan between odd and even groups: and second, that the panpots have a 'constant power' characteristic. This latter gives you a signal level 3 dB down in the centre in stereo, and is quite a common panpot characteristic (more on this subject later). **Fig 1** shows the way in which the console panpots are used. If we assume that the four groups are 1, 2, 3 and 4, then selecting 1 and 2 allows panning across the front quadrant (LF to RF); selecting 2 and 3 pans across the right quadrant (RF to RB) and so on. The converter unit is thus ideally suited to the task of localising most of the channels in B-Format, especially those which do not need the dynamic effect capability of the pan-rotate unit. And the fact that there are two such B-Format groups, both entirely separate, adds to the flexibility of the unit.

Transcoder

There is a further unit which has localisation applications too, the Transcoder. This was one of the first Ambisonic units produced for mixing applications, and the original prototype which we used for mixes at the 1981 Cunard Hi-Fi show was based on the UHJ 2-channel encoder made by Calrec to accompany the *Soundfield* microphone. In essence, it takes four inputs which correspond to the four corners of a 'quad' setup (generally four groups again) and 'transcodes' them into a 2-channel UHJ-encoded signal. The unit offers two 'soundstages', front and rear, which may be varied in width between 0 and 180° at the front and 0 to 150° at the rear. Panning between the front two groups with the console panpots pans across the entire width of the front stage, and so on. The main drawbacks are that the unit cannot produce a B-Format output, and that it is impossible to localise a sound in certain places (ie at the sides between the extremes of the two soundstages). This rather limits its effectiveness in normal mixing applications: its primary use would be to transcode 4-channel 'quad' tapes into UHJ for Ambisonic release. It does, however, have application in basic mixing and is a useful place to bring back echo returns in a mix to be performed with the other units if the output is to be UHJ rather than B-Format.

Decoding and monitoring

Having covered the units used for Ambisonic localisation—all of which were designed to allow a conventional stereo multitrack desk to be used for Ambisonic mixdown—we now come to one of the vital parts of the system: decoding, and monitoring the result. A number of Ambisonic decoders are currently available from any one of half-a-dozen manufacturers, although you won't find many in the shops—yet. We used the top-of-the-range decoder from Minim, which is a tastefully-finished 1 U device with the minimum of controls, which may be rack-mounted with optional 'ears'. It has a screwdriver preset on the left to set up the decoder for the preferred speaker layout and is designed to drive four speakers arranged in any rectangular configuration between 2:1 in either direction—ie the ratio of the sides of the rectangle (with the speakers at the corners) can be anywhere up to the shorter sides being half the longer sides. This means that most listening rooms can be accommodated. A 'forward preference' control is also fitted which can be used to emphasise the front of the layout if desired. Pushbutton controls then select between B-Format decode, UHJ 2-channel decode and bypass. The latter function is accomplished by relays which also drop the unit into bypass—normal stereo on the front pair of speakers—when the power is removed. A further pushbutton compensates the signal if the speakers are more than 3 m away.

The speaker feeds were sent to a pair of HH *V-200* MOSFET amps driving four Keesonic *Cubs* mounted on mic stand bases, enabling their height to be adjusted easily. Keesonic kindly supplied two extra *Cubs* with threaded baseplates to fit standard mic stands. There is no disadvantage in using small speakers for Ambisonics, as long as they are not too directional, particularly at HF.

Setting up

The first part of the setup procedure was to position the speakers in sensible places. The easiest way of doing this is to find a practical rectangular layout in the control room, position the speakers to point at the listening position (which is rather less critical than for stereo, although careful pointing of the speakers is more necessary if the HF dispersion is limited) and then *measure* the sides of the rectangle and set the layout control on the decoder accordingly. It is misleading to try to adjust the layout control by ear, especially if you are new to the system. The speaker height should be adjusted to normal monitoring criteria, with the proviso that it is helpful not to have them too high, to avoid the image forming slightly disconcertingly over your head! But then again, the same is true with normal stereo monitoring. The decoder controls are then adjusted accordingly.

We checked the layout with a 2-channel UHJ 'walkround' test recorded with a prototype Ambisonic panpot in 1981. There is also a 'walkround' band on the current Hi-Fi Sound test record, made with a *Soundfield* mic. These tests simply consist of a voice calling out cardinal points around the sound field: North (centre front), East (centre right) and so on, plus the points in between. The cardinal points are in many ways more useful than the old-style 'quad' labels LF, RF, etc, as often the speakers will not be 90° apart, and unlike 'quad', there is no 'pulling' of the image into the speakers. Thus 'North West' might not be near a speaker at all, but it *will* be 45° left of centre front, if all is well. Minor compensations can then be made with the layout control if needed.

In our case, we derived the 2-channel send for the UHJ input of the decoder from the 'alternate control-room monitor' outputs of the Soundcraft *2400,* and here we had our first taste of a problem which kept on cropping up during the setup procedure. It is a problem that has nothing to do with Ambisonics—it is simply that Soundcraft, aiming for the US as well as the domestic market, have decided to wire their *XLR* connectors with pin 3 hot. All our gear, of course, right down to the HH power amps, is wired with pin 2 hot. This means that precisely nothing came out when we first tried the monitoring, and later the Transcoder. A few minutes work with the soldering iron perverted a few *XLR* leads to phase-reverse mode but the whole exercise was a pain. Having sorted it out, we were left with an Ambisonic monitoring system which could be switched out without disconnecting anything. As John Timperley uses the Keesonics as secondary monitoring anyway, this was an essential consideration—indeed one that was designed into the whole 'Ambisonic Mastering System'—one should be able to use the studio setup for ordinary stereo with the minimum of effort and complexity.

We next decided to set up the Transcoder. This has *XLRs* in and out, including the B-Format input which uses a 5-pin *XLR* wired to an agreed standard. All the Ambisonic units to date are unbalanced, and here again we were expecting conflicts with the *XLR* pinouts—and got them. Luckily the ADR Transcoder has links on the PCB to allow for curious *XLR* wiring 'standards'—as will production units of the other devices—you simply remove the top cover and re-plug the links. Through all our experiments, this *XLR* perversity was our only problem. It took

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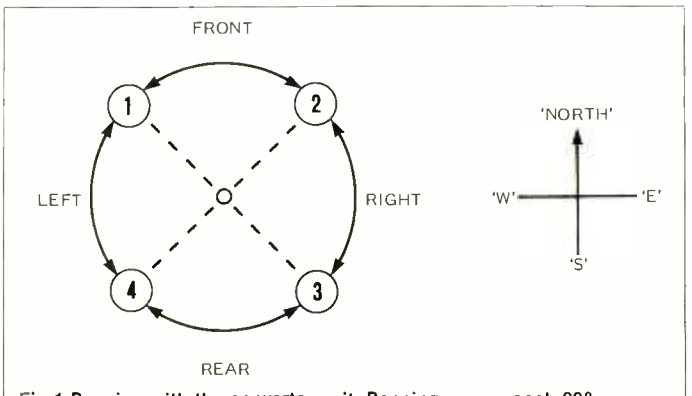
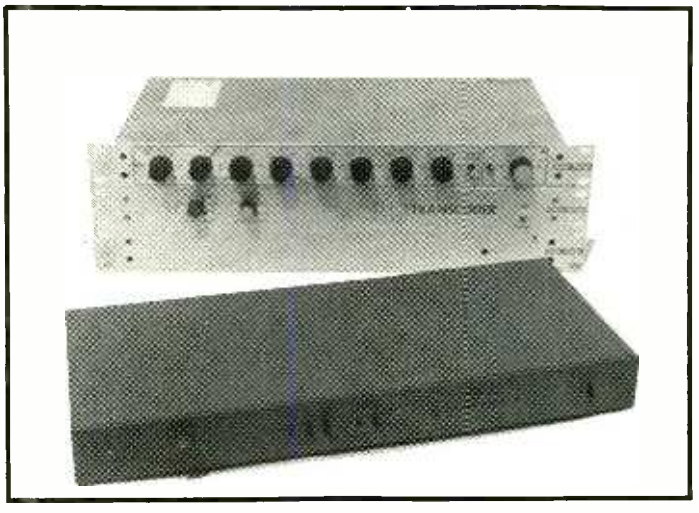


Fig 1 Panning with the converter unit. Panning across each 90° quadrant is achieved by routing to two of the numbered groups (one odd, one even). Note that while panning across left or right quadrants, panpot and signal move in opposite directions

Ambisonic Transcoder and AD12 Decoder



Ambisonics

several minutes to sort it out every time it occurred.

The Transcoder was provided with *XLR*-to-Bantam leads which enabled us to patch it into the comprehensive patchfield on the *2400,* for test purposes deriving the inputs from group insert sends 1 to 4, thus bypassing the group faders to ensure the same levels from each group. The 2-channel UHJ output was patched into the mix buss insert returns, to enable the main mix fader to be used to control the overall level of the UHJ-encoded signal to tape. An experimental mix was performed, which immediately indicated that the ADR production Transcoder was more accurate and flexible than the original prototype we had used back in 1981.

A couple of weeks later we tackled the interfacing of the converter and pan-rotate units, having used the intervening period to order up bantam to ¼ in jack leads from Future Film Developments. These were brought down together with some 5-pin *XLR* leads to interconnect the various B-Format outputs and inputs. We used a speech signal from the radio as a source, patched into a console channel for testing (speech is very useful for checking localisation as it contains a narrow range of frequencies; we also *expect* a voice to be coming from a particular direction). The post-fade line out from the channel was routed into the pan-rotate unit's number 1 panpot, with the rotate control switched out, the B-Format output from the unit being patched directly into the B-Format input of the decoder for test monitoring purposes.

We were immediately struck by the accuracy of localisation offered by the pan-rotate controls, and by the fact that localisation in B-Format is somewhat superior to that achieved via 2-channel UHJ. The controls proved easy to use, and the ability to send a sound right round the room with one control was fascinating, although some engineers might find 360° rotation on one 360° pot a little coarse compared with the conventional panpot, which offers approximately 60° localisation with a 270° control. This soon becomes natural, however, and the highly-accurate one-to-one correspondence of knob position to sound position is very satisfying. We then experimented with the rotate control, using it to rotate an entire soundfield derived from several panned channels through 360°. Rotating the entire soundfield is quite remarkably disconcerting, although this isn't something one would normally want to do. Rotating certain elements within the soundfield is more subtle and useful.

It is amazingly easy to spot localisation faults caused by incorrect wiring. The first B-Format lead had a fault in it: the Y signal line had come adrift in one of the plugs. This caused a rotated signal to move from back to front rather than round the circle, and was easy to spot as an error condition. The fact that there was no localisation to left or right immediately pointed to the Y signal being missing, which was found to be the case. This having been rectified, we next tackled the converter unit.

We expected problems with the converter unit, as it is designed to take an auxiliary postfade cue send as its W source, which must be the same level as the feed to the groups. In addition, the unit is designed to work with constant-power panpots, as stated earlier. Soundcraft consoles do not use constant-power panpots. They use instead a compromise between constant-voltage (6 dB down at the centre in stereo, which gives a good, wide image) and constant-power (3 dB down at centre, giving good stereo/mono compatibility). This results in a law which gives about 4.2 dB down at the centre in stereo. It is quite easy to modify these panpots to constant-power; you simply add resistors across the existing ones in the wiper of each gang of the pot, the added resistors being of the same value (3.3 kΩ) as the existing ones. However, I did not relish the thought of persuading John that it was a good idea to add dozens of extra resistors all over his console! So we decided to try it without console modification to see what happened. Neither did we measure the aux output to determine at what level we obtained the same level as from the main output. We just plugged in.

Setting a panpot to hard right, we patched the first group of the converter lines into group insert sends on groups 5 to 8, and derived the ES line from the Aux 1 output on the patchfield, turning the Aux 1 send on the channel to full and the Aux 1 master level control to 0. Routing the channel to groups 5 and 6 (to give panning across the front quadrant) we faded up the channel fader, again using speech as a test signal. A non-localised sound emerged which couldn't be said to have been situated anywhere. Turning up the Aux 1 master level, however, caused the sound to start 'gathering itself together' at the North-East edge of the sound field.

With the Aux send level at 6 (on a scale to 0 to 10), the signal was accurately localised in the N-E corner, exactly as it should have been with the desk panpot in the far right position. This position, incidentally, was nowhere near the speaker: we had a rectangular layout slightly wider than it was long, and the sound in this instance was at an accurate 45° to the listening position, rather to the left of the RF speaker and a good few feet beyond it! We had already noted with the pan-rotate box that the sound field extended some way beyond the limits of the speaker layout. Turning the Aux pot beyond 6 and towards 10 tended to drag the localisation into the room and towards centre-front. Rotating this control up and down produced a well-defined point (setting 6) at which the sound was accurately localised in the desired position. On checking this later, we found that indeed, this position corresponded to zero level with respect to the main output.

Then came the bigger test, which was to evaluate the law of the desk panpot operating Ambisonically via the converter box. Panning from right to left, we perceived a very smooth panning law, with the pot covering the front quadrant with a great deal of accuracy, and no discernible changes in level across the quadrant. Thus we did not have to modify the console: neither should mods be needed on consoles which have this kind of panning law compromise, which includes a good number of consoles currently available. Some consoles with constant-voltage panpots have a 'compatibility' button which switches the panning law to constant-power, and these present no problems either if the 'compat' button is pressed. We do not yet know what the effect would be of using a constant-voltage panpot through the converter, but we would expect a non-linearity of the panning law and slight changes of level across the quadrant, plus changes in the precision and quality of localisation. As it was, however, the Soundcraft panpots exhibited a very smooth localisation action which was comparable to that experienced in normal stereo. Panning across the other quadrants was equally impressive, one disconcerting (and unavoidable, unless you can pan between *any* pair of groups) factor being that panning over the side quadrants, the panpot is moving in the *opposite direction* to the sound! Familiarity with this slight idiosyncracy comes pretty rapidly, though.

Mix configuration

Having ascertained that all the units were operating correctly, we set up the console for a mixdown. This was done in the normal way, but with the Ambisonic units set up as shown in **Fig 2.** Thus the 'A' group of the converter box was fed into the post-rotate input of the pan-rotate unit, deriving its feeds from console groups 5 through 8 and Aux 1; the B group of the converter was patched into the pre-rotate B-Format input of the pan-rotate unit, with its signals derived from console groups 9 through 12 and Aux 2 (although this was not used in fact). The eight pan-rotate inputs were patched direct into channel line outputs as and when required later in the mix, and the B-Format output of the pan-rotate unit was fed into the B-Format input of the Transcoder—this simply encodes it into 2-channel UHJ.

The fact that our Soundcraft only had 24 input channels led us to some rather unusual wiring when it came to echo returns. We wanted to use the converter box for primary localisation, the pan-rotate unit for dynamic panning and rotate effects, and the Transcoder to return two reverb units—a MicMix spring system and an EMT *Gold Foil*—to the UHJ master output, spreading the EMT over the front stage and MicMix across the rear, fed from Aux 5 and 6 respectively. Normally we would have patched the echo returns into the monitor panel inputs, which return to the mix buss and whose faders can be 'swapped' with the group faders (which are full-length as opposed to the monitor faders, which are small). However, in this configuration, the mix buss was to carry the 2-channel UHJ-encoded master signal, rather than straight stereo, so we couldn't return to there! Instead, we patched

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the first four group outputs into the Transcoder, returning the reverb units into the group insert returns on those groups. This enabled us to use the large group faders to control the echo return levels. We could adjust the spread of the reverb returns in the sound field with the width controls on the Transcoder (which affect only the signals applied to the four transcode inputs, and not the B-Format input which is merely being encoded and mixed at unity gain with the UHJ from the transcode inputs to provide the main output from the unit). This enabled us to spread the EMT across up to 180° at the front and the MicMix across up to 150° at the rear. We had previously discovered, in our 1981 experiments—the first Ambisonic mixes derived from 24-track—that two reverb returns spread across front and rear stages like this is very effective: while only mono sends from the channels are used, you can send echo from a given channel and have it return either in the same sector as the source or in the opposite sector, just as it is sometimes useful in stereo to have a signal on the left with its echo on the right, for example.

The UHJ 2-channel mix output from the Transcoder was then patched into the mix buss insert return to allow the master fader to be used as before, and the mix was sent to the stereo master recorder in the usual way. This had the added advantage—as the decoder was patched out of the alternate monitor outputs—of allowing easy replay of encoded tapes, just by pressing the stereo replay buttons; plus the capability to select bypass on the decoder to check stereo and mono compatibility as well as being able to switch in the main monitors instead—with a single button—and hear the UHJ signal in 'stereo' or 'mono' on the main system. This proved to be very useful, and again fulfilled one of the design goals of the system, that of ensuring that the system could be returned to normal stereo use with as little replugging as possible—in this case, it was simply a matter of pressing either bypass on the decoder, or the speaker select button on the board, to return to stereo monitoring.

Mixing techniques

The Ambisonic boxes were placed on a table next to the console, where the 24-track remote is positioned, for easy access to the controls. This is shortly to be replaced by a rack cabinet which will enable all the Ambisonic boxes plus the extra monitoring amps to be neatly installed, and still leave room on top for the 24-track remote at a reasonable height!

Almost immediately a number of mixing techniques were evolved to make best use of the system. One of the great strengths of Ambisonics is that there is a very high degree of compatibility between UHJ, stereo and mono. Indeed, we feel that the compatibility in these respects exceeds that of stereo. When an Ambisonic signal is 'collapsed' into stereo—simply by replaying a 2-channel UHJ signal into two monitors with no decoder, for example—the 'rear' images are simply projected on to the front, so that they are perceived at the same distance to the side of the stereo sound-stage as they are in surround. Thus a sound positioned, say, 'South-South-West' in surround will end up half-left in stereo. Also, a signal rotating continuously round the field in surround will simply pan from left to right and back again in stereo.

Additionally, a UHJ signal replayed in stereo has a number of interesting characteristics. First, as Ambisonics uses phase and level to localise a source, rather than simply level as we are used to with conventional stereo panpots, the image is much less dependent—either in stereo or surround—of listener position, very much like a coincident-pair recording (indeed, Ambisonics is very much like a 'three-dimensional coincident pair', and this is exactly what the *Soundfield* mic is). This means that you can wander about in the listening environment without losing the image. It also means that producer and engineer, for example, will hear the same thing. In stereo, as well as surround, the image is more stable, and sources can be more 'tightly' localised. For some reason yet to be properly explained, the width of a UHJ recording played in stereo on loudspeakers is wider than the speakers, and stereo effects can be produced which go round the room without having the benefit of an Ambisonic decode system! On headphones the effect is even more pronounced: instead of the usual 'line between the ears' of conventional panpotted stereo, some kind of 'brain-decoding' produces the illusion of a sound field, albeit less deep (front to back) than Ambisonic speaker-decode.

All this means that stereo-mono compatibility is built into the Ambisonic system: indeed it is more compatible and more flexible than ordinary panpotted stereo. And those exciting effects will cut on an

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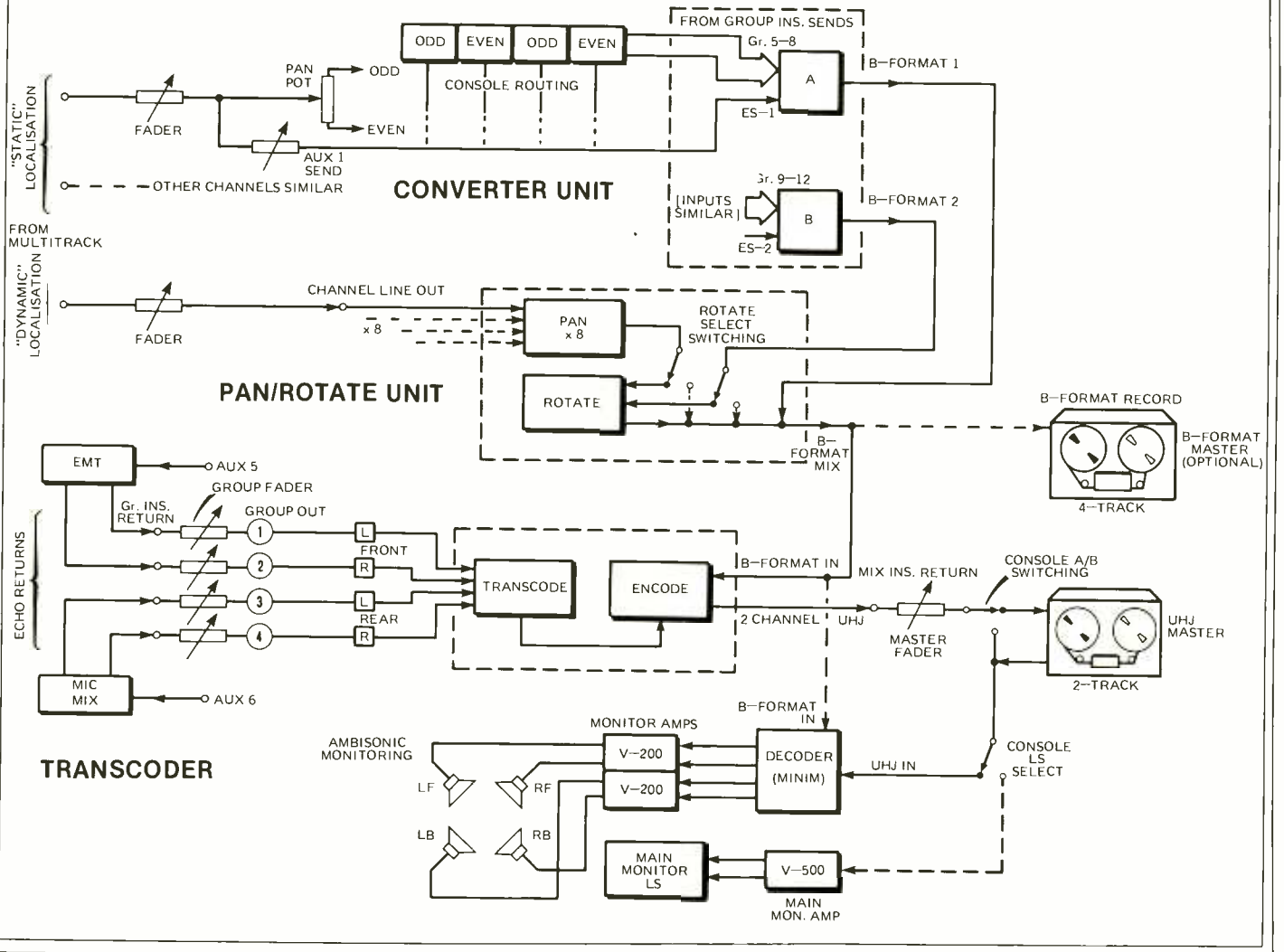
Fig 2 Mix configuration with Soundcraft 2400 and ADR Ambisonic units



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Ambisonics

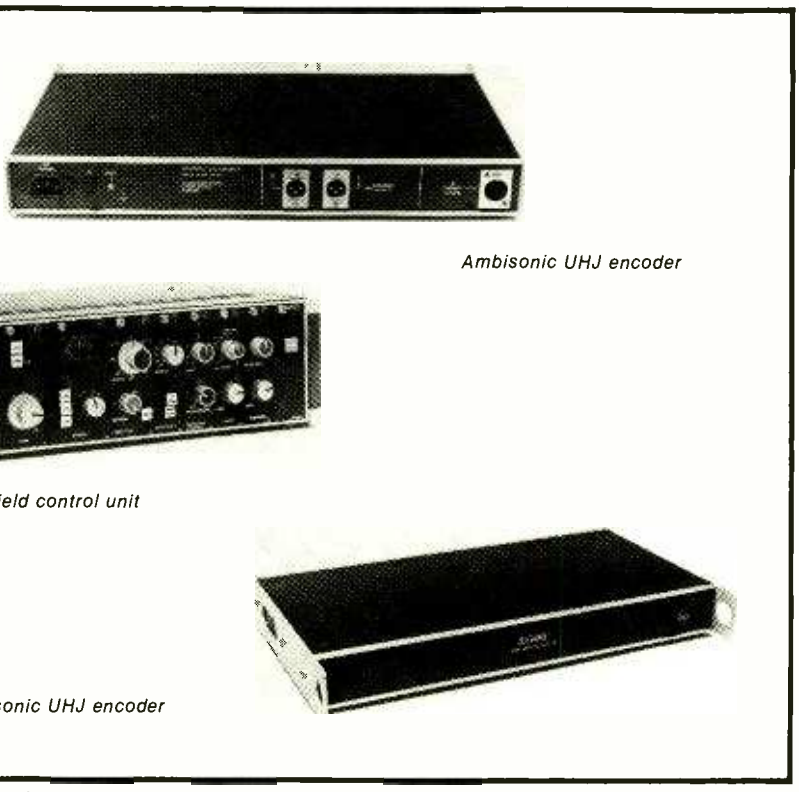
analogue disc with no trouble, too, unless they are really loud and bassy which means situation normal as compared with conventional stereo.

As much Ambisonic material will be played back on conventional stereo systems (they may even be mixed specifically for stereo applications!) initially, this compatibility must be borne in mind. There are no technical problems with compatibility, as has been discussed above; but there are also creative considerations if the mix is to sound good in stereo. For example, newcomers to Ambisonics may find it very tempting to localise sources in places where you could never go in stereo—round the back and sides. It must be remembered that in stereo, these will be 'collapsed' on to the front, and careful positioning is necessary (and easily practicable) to avoid cluttering of the stereo image. Impressive sounds which spread right across the soundstage from East to West sound very good Ambisonically, and you may like to put several stereo signals across from E to W—but in stereo they will all be split left and right (albeit somewhat beyond the speakers). Impressive front-back stereo splits will end up in mono when replayed conventionally, and this should also be borne in mind. This means that care should be taken in what signals get positioned where. Use the all-round positioning that Ambisonics offers by all means, but bear in mind what the relationships will be in stereo. Just as you choose what to locate near or far from centre in stereo, choose in similar manner when mixing with Ambisonics. Here the ability to check stereo easily (or mono) at the push of a button proves itself.

We found rapidly that the best approach when balancing for Ambisonic/stereo compatibility was to localise sounds in decode mode first via the locator unit, later choosing which channels were to go to the pan-rotate unit, checking them in stereo on the small speakers (which will give a better image) as and when needed, and then switch to the main monitors to get sounds and EQ (because, in stereo, little speakers *are* little again) and to obtain the right *stereo* balance. You will find, as we did, that a mix balanced in this way—that sounds great in stereo—will also sound excellent through the decoder in surround. Consider especially—if your are using dual reverb systems like we were—the relationship between a source and its reverberation in surround. Here reverbs like the Quantec and the Lexicon—which have four outputs and two inputs—really come into their own. The Quantec especially, with the capability to add early reflections to the first two channels (these should be wrapped across the front stage of the Transcoder) is exceptionally effective, and the Lexicon can of course be split to offer two stereo-out/mono-in systems with differing characteristics.

Of course, on some material, all the sources will sound best localised around the front of the sound field, with only reverb/ambience at the rear—this is obviously no problem. While rock music sounds impressive coming from all points of the compass, multitrack-derived orchestral material would sound a bit unusual performed in this way, with the listener in the middle of the orchestra! On such material, it is useful to have recorded a set of ambience tracks in B-Format on the multitrack from a *Soundfield* mic if you have one, although a stereo pair or two could be routed via the Transcoder if desired, along with the reverberation returns. If you have effects returns with routing, or spare channels for them, it is best to allocate four groups to the Transcoder inputs and route the returns and effects to them, bearing in mind that you can position returns with the ordinary panpots anywhere between the extremes of the two soundstages available with the Transcoder. They can also be routed via the coverter box groups in a more flexible way, and if channels are available with normal routing for effects and reverb returns, localising them in this way may prove more useful. The idea of the soundstages on the Transcoder does, however, give a useful impression with returns from reverberation devices, although of course it cannot be used if a B-Format master is required.

Generally speaking, it is preferable to mix Ambisonically to B-Format, and store the master on 4-track tape. It can then be encoded later through an encoder or via the B-Format Transcoder input for conventional 2-channel purposes, and 2-channel UHJ is the current conventional 'release format' for Ambisonic recordings whether for FM broadcast, conventional analogue record release, or *Compact Disc*. However, B-Format can later be encoded into other forms for transmission, for example '2½' or 3-channel UHJ, which can be transmitted via FM radio by using phase-quadrature modulation for the third channel (which may be bandwidth-limited, hence the '2½') as has been demonstrated by the IBA. Such a system is now permitted by the FCC in the USA. Equally, B-Format can be used to derive future formats for *Compact Disc*—provision is made in the system for various types of extra information including 4-channel release, and subcoding could be used to switch a decoder automatically when a suitable record is played. Thus 2-channel UHJ is fine for now, but B-Format will have applications in the future. In addition, one obvious application for Ambisonics will be in the audio-visual market: here it will be quite possible to use B-Format audio tapes on-site, played back via a decoder in the viewing area. Four channels of tape facilitate three channels of B-Format (assuming horizontal-surround only—hence no Z channel) plus one track for slide sync or even timecode.



Ambisonic UHJ encoder

Soundfield control unit

Ambisonic UHJ encoder

Summary

Ambisonic mixdown involves no techniques which are either difficult or time-consuming to learn. The existing units, which will be available shortly, are not expensive compared with modern outboard gear and add an impressive extra dimension in stereo, let alone surround-sound, to even an averagely-equipped studio. With more console facilities, as available on many modern boards, even more flexibility is possible. VCA grouping, for example, would enable the various B-Format group levels to be adjusted easily with a single fader—for example, the two B-Format groups in the converter box could then be balanced independently and used for subgrouping, as could the group of signals feeding the Transcoder if it is in use. As it stands, all the Ambisonic units mix at unity gain, and thus need external control for group balancing. Of course, VCA groups can also be used normally, and this may be a preferable alternative, controlling the individual groups of faders on the console irrespective of which Ambisonic device they are feeding.

While care needs to be taken in the setting up of the equipment, especially the decoder/monitoring section, this requires no more concern than usual in such areas. The system has the big advantage that returning to stereo is remarkably easy, whether during the course of an Ambisonic mix, or after the session when conventional stereo needs to be restored. All those who have heard or experimented with the system to date—including experienced musicians, engineers and producers—have commented on the remarkable compatibility of Ambisonics with stereo and mono, and the flexibility and ease of use of the system. ■

NB: Arrangements can be made for demonstrations of the Ambisonic Mastering System: those who would like such demonstrations should contact the Ambisonic Technology Centre at Reading on (0734) 597083. Many of the articles published on Ambisonics recently in *Studio Sound* and *Broadcast Sound* have been reprinted as a booklet, available on request from the Ambisonic Technology Centre, 16 North Street, Reading, Berkshire RG1 7DA.

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studiofile

Starr Recording, Philadelphia

"I like the idea of a Mom and Pop studio," says David Starobin, owner, engineer, chief cook and bottle washer of Starr Recording in Philadelphia. He's not engaged in wistful nostalgia over some lost golden age, however—for five years Starr Recording was a family business, owned and operated by Starobin, his brother Danny, and his father.

Starr occupies a spacious ground-floor suite at the bottom of one of three condominium towers on exclusive Society Hill, in historic downtown Philadelphia. But despite the attractive and convenient location, running Starr was a tough battle from the beginning. The previous occupants, Society Hill Sound, "were clouded in mystery," says Starobin. "There were a lot of horror stories about the place—cheap techniques, sloppy engineers. The reputation worked against us." The Starobins did an impressive amount of work upgrading the facility, not with all new equipment, but by "elimating 50-foot cable runs that should have been 12 feet, re-doing all the grounding, spending $12,000 modifying the console, that sort of thing." A 3M 24-track tape machine was brought in (and the transformers removed) to replace the old 16-track, along with a new Studer 2-track, and the peripherals rack was expanded considerably.

John Storyk was called in to rebuild the control room ("It was terrible, and it couldn't be corrected just with EQ") and the Starobins made two later modifications. The main room, a healthy 34×27×13½ feet with two iso booths, was left pretty much alone—Starobin considers its size and live properties a unique feature in the Philadelphia recording scene, which includes about five other 24-track houses.

All of the improvements, however, didn't help Starr escape the recording-industry doldrums of the late '70s/early '80s, and in 1981 Danny Starobin—"He had grown tired of it and wanted to move on to other things," says David—and his father, were ready to sell the place. "They put ads in the trades, and were showing people around the place. One day I heard my dad offer a very, very cheap price to someone, and that's when I decided to do something. I had spent five years working real hard here, and I wasn't about to lose all that."

So David bought the studio himself, even though his father did not like the idea: "He didn't want his son to be in a money-losing venture for the rest of his life," says David. In September, 1981, in a last-ditch effort to turn the studio around, he tried a treacherous tack. First, he lowered the price of studio time from about $100 per hour to a measly 50 bucks. Then he developed a 3,500-name mailing list, from former clients, record companies, the Musicians' Union, students, and engineers and producers all over the map that he culled from Billboard's directories and other sources. He sent them all a letter, which he admits he designed to look like "a pitch for life insurance," which proclaimed in big letters: Starr is Closing, and it's *not fair!* For two legal-size pages, Starobin extolled the virtues of the studio and literally pleaded for business.

"I justified it in two ways," he says. "First, anyone can go across the river to New Jersey or up to New York and book 24-track time in a decent place for $35. Second, we'd been losing money for five years, and so I figured it was time to make some." In the letter, he wrote: "I really didn't want this aspect of the industry to go the way of the bargain bin, but I've got no choice. It'll either save our ass or be our swan song!"

The tactic worked. Within a few months, the room was booked solid, and in the spring of 1982, Starobin was able to raise the rate to $60. By that summer, the studio was finally breaking even, and was looking forward to its first month in black ink. (In the fall, the rate went up to $65, and will probably be $75 by the time you read this.)

Over the years, Starobin, who comes from a musical background, has carefully assembled some excellent equipment, and he feels that this contributed strongly in bringing clients in, along with the attractive price. Among his 70 microphones, for example, are two Telefunken *251*s, two Neumann *M49*s, two *U67*s, two *U47* tubes and a *U47fet*, two AKG *C28*s and plenty of other Neumanns, Sennheisers, RCAs, Shures, *PZM*s and Beyers. The MCI *JH-416* console, since its modification, runs quieter than factory specs, Starobin claims. There are 11 tube limiters including *LA-2*s, *175*s, and four rare RCA *BA-6A*s.

He is just as proud of his keyboard collection, which includes an excellently maintained and oft-praised Yamaha *C3* conservatory grand, a Wurlitzer ivory piano, a *B3*, a Clavinet, and electric pianos and synthesisers from Rhodes, RMI, ARP and EMS. The studio boasts a set of Tama drums, which figured prominently in an ad campaign for that company, as well as in a series of instructional tapes that Billy Cobham recorded here. Starobin has maintained a close relationship with Hoshino, Tama's American distributor, who also handle Ibanez. Thus he has found himself posing for ads for Tama mic stands, and has quite a bit of equipment from Hoshino, including the stands and Ibanez mics and outboard equipment. He is particularly pleased with his Ibanez *AD-204* guitar multi-effects unit. "It's great," he says, "because the instrumentalist can use that, so we don't need to tie up our Eventide *Harmonizer* for flanging. It's so versatile, sometimes clients end up playing with it for half an hour."

In the control room are Altec *Big Reds* with UREI crossovers, JBL *L100*s and Auratones all powered by an array of Crown and McIntosh amps. Reverb is supplied by EMT and AKG units, and there are various signal benders from Lexicon, Eventide, dbx, UREI, Valley People and Inovonics. There is also a rack of four Technics cassette decks. "I bought them the day after Christmas," says Starobin, "which is the greatest day of the year for bargains. At the end of a session, when everybody in the band wants copies of the rough and I'm too tired to stand up, I just pop in the cassettes and run 'em off. Some studios charge a lot for copies and make money off them, but I don't like to do that."

Although Starr Recording has yet to produce the platinum record that conventional wisdom says it must in order to stay in business, it has had a wide variety of clients pass through. "People ask me what kind of music we do here, and I can't answer them," says Starobin. There have been rock bands, gospel groups, 100-voice choirs, string orchestras, advertising agencies with clients like McDonald's, tracks for radio, film and television, including the Children's Television Workshop's *Sesame Street* and *3-2-1 Contact!*, and even an aerobic exercise record. Recently, CBS/WMOT Records artist Major Harris produced an entire album here.

"Eventually," David Starobin hopes, "people will be in here because it's Starr Recording, not just because of the rates." He's not at all sorry that he took the steps he has: "I think the other studios are angry as hell," he laughs, "but I've gotten no direct feedback from them. I encourage clients to check out the other places around town, and sometimes they come back and tell me they heard that our console was under water or something. I don't mind," he grins. "That's the nature of competition."

Paul D Lehrman

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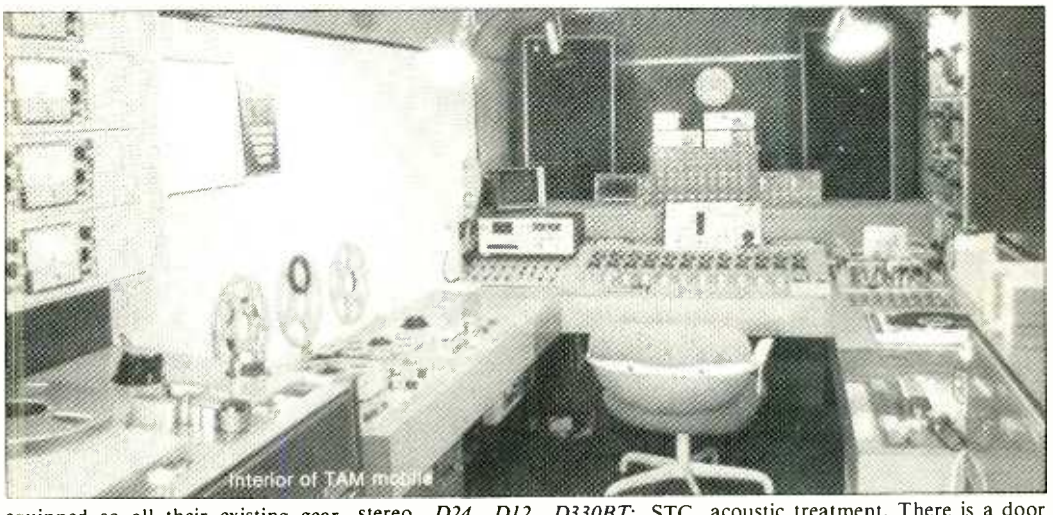
TAM Studio, North London


Interior of TAM mobile

TAM Studio is set in suburban Finchley in a quiet residential road, within walking distance of the famed Finchley Central underground station. Walking up an incline between two of the houses you find yourself in one end of a nursery garden. This is the home of TAM.

Tony Batchelor is an old-style audio pioneer and certainly someone who does not believe in taking the easiest way out of a situation. Together with his wife Myrtle (hence TAM—Tony And Myrtle) they run a disc cutting suite, an 8-track mobile and real-time cassette duplication facility. The operation has evolved to its present state by a mixture of chance, design and hard work. The mixture of facilities is best explained by the history of Tony himself.

Tony used to work for STC in a variety of positions rising to audio products development manager in 22 years of service. In 1972 he decided that now was the time to make a break or it would be too late. This point has to be viewed in parallel with a hobby that was turning into a business. A classically trained pianist, he had always been interested in sound and met his wife when they both volunteered to organise a PA for Coronation celebrations in 1953. Together they ran a small facility and were always being called upon for local occasions. One such job was the regular PA for a number of pubs that featured live jazz in the early '60s. Often they would be asked to record the set by the band and so they geared up to enable the recording of a feed from the PA mixer. The equipment for this varied but was based around a Ficord portable tape machine, a Vortexion *WVB5* mono tape machine running at 7½ in/s, a home made 4/1 valve mixer, three STC ribbon mics and a Reslo dynamic. All monitoring was done off tape. In the years up to 1966 many famous jazz names were recorded this way. The next important occasion was in 1970 when their son was playing trumpet in a school production of Noyes Fludde and they were approached to record the concert. This was completed successfully and they were asked to arrange for records to be cut from it. This led them to investigate that area of record production. Against this background, they decided to set up TAM and Tony left STC.

They set up a service offering complete package deals for school choirs and similar. In 1973 they met two engineers who were assembling a mobile studio equipped with 3M 16-track and when it was completed TAM would sub-contract the mobile and use De Lane Lea at Wembley for their disc cutting work. In 1976 they were able to purchase the mobile without the equipment.

The mobile had then to be equipped so all their existing gear was quickly moved in. At this point it included a Philips *PRO Stereo* tape machine, two Vortexion tape machines, one of which was modified for stereo and used as a back-up with the other for echo use, a Grampian *Ambiphonic* reverb, 'Brahms' speakers and mics from AKG, Beyer and STC. A 12/2 modular mixer using ICs and a pair of amplifiers were designed and built by Tony. The mobile itself is a Thompson Touring Caravan and is normally towed by a Land Rover.

The mobile today is equipped with a 3M *Series 400* 8-track which used to belong to Apple Studios, an early Ampex *AG440* with a sync panel, and two Philips *PRO Stereo* machines. These Philips machines are rather useful for editing as with the tape laced, the brakes release when the spools are moved. Also they have a slightly wider track width that Tony reckons gives an extra 2 dB signal to noise.

The original 12/2 desk is still operative although it has since been modified to 4-output. Additional mixing facilities are provided by nine channels of Neve mic/line amps with outputs for 8-track use on a separate panel. This system allows separate stereo and 8-track recordings to be made and a further eight channels of Neve sends/monitors allows rough stereo mixes to be made for monitoring use. Tony has a policy of always monitoring off tape just in case the equipment has become disturbed in transit.

Other equipment includes Tannoy *Cheviot* monitors with HPDs, Dolby *301* unit, Bel noise reduction for the 8-track, Goldring turntable with SME/Shure combination, Teac *A-108* cassette machine for logging, a pair of Neve limiter/compressors, stereo spring reverb and a Great British Spring, the latter cunningly mounted at the rear of the mobile in such a way that you can jump up and down and not create any noise—the only problem is the door slamming says Tony. The mic complement includes AKG *C33* stereo, *D24*, *D12*, *D330BT*; STC *4033*; Beyer *101*, *201*; and some very obscure types such as a Krundaal 'D12-type' and an Italian made mic that looks like something STC would have made and is apparently excellent for string bass.

The trailer itself is exceptionally spacious with dimensions of 22× 7 ft. Because it is a trailer, a lot more of the internal room is usable. The decor is basic but functional with the interior surfaces being pegboard with insulation materials between the board and the trailer fabric. With half of the holes covered, spectrum analysis of the room showed that the response was flat enough not to need EQ on the monitors.

All round the wall of the mobile is a shelf at a practical height to provide plenty of working space. The monitors are mounted on a shelf at the front of the mobile over the cable locker with a video monitor mounted between them. The console faces forward and the entrance to the trailer is at the rear.

Disc cutting is the service that TAM is probably best known for. It was about 1977 that they were looking to diversify. Areas looked at included high speed cassette duplication and disc cutting and the latter won. Near their house was a double garage and part of this was turned into a cutting room and a complete cutting system was bought second hand but the deal fell through at the very last minute and they needed a replacement in a hurry. Through Trad they found a suitable unit in Paris. The details and the problems of transporting this equipment are covered in *Studio Sound* (March 1979) as well as transporting it to Watford Town Hall for some direct to disc sessions for Crystal Clear (*Studio Sound*, February 1979). Since then they have actually repeated this operation for another lathe. For a while the lathe was actually used in the mobile although a permanent home was preferable.

The main cutting room is 12× 16 ft and needed a minimum of acoustic treatment. There is a door at the rear which can be opened in summer to allow daylight in with the room dimensions being retained by the use of an inner glass door. The room is checked very regularly to ensure that the response does not drift.

The lathe is a Scully and is in immaculate condition. Additional equipment includes a Westrex *3D* head, Westrex valve cutting amps, Scully pitch and depth control system, Ortofon treble limiter *STL631* and a custom designed scrolling and pre/post expansion unit. Coming from France the control panel has been modified for French users and so Tony has had to familiarise himself with marche, arrêt, avance, graveur and décro. This lathe is also the only one in the UK that is equipped with a reverse lead screw enabling cutting from the centre outwards.

The monitors are Telefunken units that were apparently built to order only and this pair came from the cutting room at Apple Studios. They are powered by valve amplifiers that are situated within the cabinet and Tony describes the bottom of the cabinet as being full of 'large bottles'. The drive units comprise two 12 in bass units and a very large number of mid range/tweeter units that plug in and are arranged in arcs within the cabinet. Tony describes them as being very good in the HF, giving a dispersed response wherever you are standing and this he feels is very important for cutting. The bass end is not so good however, and they have to be adjusted with Astronix graphics.

The control desk is built like a tank as are the associated outboard equipments and finished in EMI green. It has four channels and takes its feed from a disc cutting version of the Telefunken *M10*. There is provision for EQ on the preview channels and echo sends. All switches are stud type and this enables accurate records to be kept of the settings for future use. The faders are quadrant type and are

52 ▶

also used for master outputs and echo returns. There is a ± offset switching facility so that the maximum position of the faders reads zero on the meters.

The EQ is a separate passive unit to one side of the desk and provides 2-channels, in three bands with four frequencies in each band. All the knobs are hand-sized and allow control of amplitude ±10 dB in very precise steps as well as Q and shelving, all with stud switches. It is also possible to gang the channels so that moving one channel will physically move the controls on the other. Truly a magnificent piece of engineering.

Other control equipment includes Dolby *301s* and Philips valve limiters. Metering includes a phase meter and a very large light galvanometer permanently across the cutting head.

The lack of more sophisticated outboard equipment in the room is explained by Tony's philosophy of preferring to cut flat. He believes that the producer should do the work and not the cutting engineer who has enough other problems to watch.

The other half of the old double garage used to be the office but now houses the real time tape duplication facilities. There is a bank of 12 machines, four Teac *CX-310*, four Nakamichi *BX1/BX2* and four Yamaha *TC-800GL*, arranged in banks of four so that various smaller sized runs can be made simultaneously. Noise reduction in the form of dbx *155*, Bel *BC3* and Dolby *B* and *C*, internal and separate are available. They have found that the internal Dolby calibrations on the Teac machines are to a very close tolerance anyway. Every three months the machines are pulled out of the rack in rotation to ensure that 0 VU is still 0 VU.

Feed machines for the duplication are a Telefunken *M10* for 15/7½ in/s tapes and an Akai *GX-4000D* for low speed use. Monitoring is on Cadac speakers—again from Apple, biamped with Audix amps. Using the internal adjustments it has been possible to flatten the response within the room without using EQ.

Also in this room are another pair of lathes. In one corner sits a pre-war Neumann lathe to which has been added a vacuum turntable, an ex-Decca cutting amplifier modified to fit a Westrex head. This lathe is used largely for checking heads and experiments such as automatic pitch control using the office Sinclair *Spectrum* accounts computer. The other lathe forms part of a disc cutting system that TAM have pioneered—to the best of their knowledge—cutting from cassette. They find that there is a lot of demand for good quality cuts from cassette. Other cutting rooms, Tony found, were tending to cut at fixed pitch only and with a lot of limiting with the client receiving flat low level cuts. To try to improve this situation they developed a delay system for the audio so that a preview feed for the lathe can be generated. The only manufacturer who gave any help in trying to sort this out was DeltaLab in conjunction with Scenic Sounds Equipment. They managed to sync the internal clocks of a pair of *DL-3 DDL* with memory extension to achieve the delay which is more than enough for cassette work. The lathe part of this system is a Neumann *VMM Special*, one of the first built in the '60s for stereo use. The depth control had to be added as previously it had been used for mono only. It uses an Ortofon *DSS661* head and moding of the Ortofon cutting amps was required for them to accept it.

The cassette end of the system is a BIC *T3*, at first sight an odd choice but it has some useful features such as a closed loop capstan, full azimuth adjustment, and a fade in from pause facility.

It would not be presumptive to believe that in all his work with disc cutting systems and modifying second hand equipment, Tony has become recognised as an authority on many aspects of the equipment. He actually acts as a consultant to Ortofon in certain matters. TAM have recently announced that after many requests they will be setting themselves up as disc cutting equipment dealers and services will include installation of full systems with monitors.

They will also be building replica Neumann valve disc cutting amplifiers with original valve types or their nearest equivalent as well as having transformers specially would, all to meet a rather surprising demand.

The new area they are looking at now is digital recording. Tony has been a member of the APRS digital committee and they did some early experiments with a prototype Sony *1600* unit at Watford Town Hall. They have recently recorded at the Purcell Rooms using the Sony *PCM F1* unit, and the resulting piano recording may well become the first *PCM-F1* mastered recording in the UK. Subsequently the *F1* has been installed in the mobile and is used in conjunction with a Sony industrial *U-matic* with shifted head cross points (as described in the article Inside the PCM F1, *Studio Sound*, March 1983) so recordings are compatible with those of the BVU type.

Tony has been experimenting with cutting from digital and the assembly of albums by copy editing and this apparently presents no problems with the use of the *PCM-F1* auto muting feature as long as there are clean break points. ■

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Eden

the birth of a studio

Pippa Lewis

EDEN Studios is inconspicuously tucked away in a quiet corner of Chiswick, its peaceful courtyard access belying the fact that daily, famous names such as Shakin' Stevens, Nick Lowe, The Jets, Dave Edmunds, and Phil Everly, to name but a few, may be doing a session there. It is one of the top independent studios in the country, and is fully equipped with the most up-to-date equipment.

The studio, measuring some 32×23 ft, is at ground level and situated at the back of a spacious courtyard with ample parking room. Reception and the lounge area are adjacent to the studio/control room in this part of the building; offices, tape copying suite and workshop are to be found tucked away in other parts of the extensive premises.

In the studio attention is drawn immediately to the unusual and very modern-looking acoustic ceiling, made up of geometric panels cleverly concealing the air conditioning outlets. Each section of the angled walls carries a large flat box from floor to ceiling, each containing three frequencies of bass absorption. The discreet brown and cream colour scheme gives the studio a warm and comfortable feeling; although it is now into its seventh year it still feels fresh and modern. Polished parquet flooring at one end provides a live area on an otherwise carpeted floor.

Eye contact is maintained between sound engineer and artists via windows from the control room on to both studio and a floating isolation booth, with the SSL angled at 90° to the studio to reduce the 'goldfish' effect. Instruments include a Yamaha grand and a Fender Rhodes. Mics are by Neumann, AKG, STC, Electro-Voice, Beyer, Calrec, Shure and Crown (PZM). Equipment in the control room besides the SSL desk with *Total Recall* includes Studer *A800 MkII* and Ampex *MM-1200* 24-track (with 24-24 copying, 46-track, and 16-track heads available); 2-track Studer *A-80*, Dolby *M24* and *361*s for noise reduction and JBL *4350* monitors with Crown and Quad amps. A large selection of outboard equipment is provided, including Lexicon and EMT digital reverb and stereo plate; AMS digital reverb with delay line and flangers; Eventide *Harmonizers* and flangers; ADR *Panscan*; etc...the list goes on.

The tape copying suite, upstairs at the other end of the courtyard, includes *A80* and *B67* 2-track machines, Dolby *361*s, cassette machines, Klark Teknik graphics and Tannoy *Super Red* monitors. Shag pile carpeting covers one wall for sound treatment.

The lounge area which has been doubled in size this year contains television and video (120 cassettes), and a video games machine. Kitchen facilities and a shower are also available. The surrounding area is well supplied with restaurants, pubs and fast-food shops (and even a genuine 'greasy spoon'!). The huge games room has darts and snooker. There is a sun-trapping patio to relax on when any sun appears.

Eden's three directors, Piers Ford-Crush, Mike Gardner and Philip Love have achieved success by sticking together through thick and thin for the last 15 years. They faced many problems over the years including compulsory council purchase of their first studio when they had just about got it together, and subsequent difficulties in finding and financing new premises. Piers takes up the history of the studio.

"We actually started off in Mike's bedroom in Wimbledon, before we got our premises in Kingston," he recalls, "and then just together to write and record songs in our spare time. At the time Mike and I were working at the BBC, Mike then introduced me to Philip who had also written some songs, one of which had been recorded by Gerry and the Pacemakers on an album. That was pretty exciting in 1965. As Mike had some recording equipment we decided to get together and write and record some demos. We converted Mike's bedroom into a studio, people heard about it, and started coming there to record their demos. At the time there were only a few studios like RG Jones, Tony Pike, Studio Republic, and a few other independent studios. Demos in those days had to be transferred from tape to direct cut acetate disc—it was long before cassettes. We got quite a good reaction to our demos—people were impressed with the quality, and thought they were done in 'real' studios. We were using Reslo ribbon mics and a mixer which Mike had made. Groups kept coming along there to record and we began to think we had something to offer.

"The crunch came when Mike's parents very inconsiderately decided to move to Reigate! We thought if we could get premises and convert them into a studio we could hopefully pay the rent by doing demos and in the meantime would carry on writing songs and doing our own thing. We spent the best part of a year looking for premises which ended when we found a place in Kingston which had actually been a Congregational Church meeting hall. It was just a room in the middle of a very odd-shaped building which had a supermarket downstairs, a flat around one side and backed on to the Congregational Church. It was about 20×16 ft with skylights and really lent itself well to conversion. It had another couple of rooms as well, and the rent was nominal.

"Whilst sorting out the base for the studios here, we made our first capital purchase—a Presto disc cutter with the original 78 RPM turntable! We had to borrow the money from our parents to buy it—it cost about £275. This was a good price, which we only achieved because Phil and Mike, while having a private discussion in the studio in Bracknell about the cost of it, realised that the owner had switched on an intercom and was evesdropping—an early ex-

Patio area

ample of bugging! They pretended to bemoan the high price saying how much we wanted it but it was just too dear and we'd have to give it a miss. Suddenly the owner came back in and knocked a huge chunk off! It looked like a heap of old junk but had all the right bits."

Piers, Mike and Phil did the conversion from church hall to studio themselves, with the aid of a lot of friends. Rockwool, chicken wire and fibre board made up the acoustics; because of the wool dust they had to work with polythene bags over their heads. Equipment at the time consisted of two Revoxes (one with selsync), some mics and stands, Grampian spring echo, and the pièce de résistance, Mike's home-made fully transistorised mixer, 30-channel (16 out/24 monitoring) with rotary knobs. "The disc cutter was soon going and we got a contract with a publisher to produce acetates for his overseas companies, a good bread and butter line," recalls Piers.

It soon became clear that they were actually in business, and their clients expected a service. "Things escalated very quickly," says Piers, "and the continual effort to improve the studio took up more time than songwriting. To finance it we borrowed a few hundred pounds from parents, who also acted as guarantors, and spent most of the money on the second Revox. Philip had done some accountancy training so had a good idea about figures and book-keeping and went to see his own bank manager in Wimbledon, with reasonable cashflow figures. I think he was impressed that we were being realistic and that we weren't thinking in terms of making a fortune overnight but talking about a small business dealing in small sums of money that would pay its way—he gave us an overdraft of £400."

The studio gradually built up steady business. Mike, Phil and Piers were there on their days and nights off from their main jobs. Many clients from those days subsequently had big hits including Peter Skellern and John Kongos. From demos it was only a short step to making masters, and one of their first was with a band called Conclusion Is. It was arranged by Harry Stoneham and got quite a few plays in its first week of release and then disappeared! "This small success kept us going, We never drew any money out and had amassed a bit of capital by the time we left Kingston.

"We finally ended up with a 4-track Ampex and were charging £7.50 an hour in 1972, which in those days was good value."

On the move

Kingston Council had been wanting to develop the corner of Eden and Union Street, where the studio was situated, and were threatening compulsory purchase. Ultimately, not being able to find suitable alternative premises in the time allocated, the compulsory purchase came to a compensation claim. It was fortunate that Philip had produced some tracks which they decided to take a chance on by going to Midem; the chance proved a lucky break for them, because a small American record company was really impressed, and paid a substantial advance for an album to be produced. The contract signed with him was duly presented to Kingston Council; it was pointed out that they couldn't fulfil the contract without a studio. Kingston Council accepted this, and after long negotiations Eden got substantial compensation agreed. After that they had to decide whether to pack up altogether and get on with their own careers or do the thing properly.

"By this time a 16-track studio was the norm," recalls Piers. "I actually went to Companies House and went through studios' accounts to see if any of them were making any money. The figures seemed impressive. Studios like Air, Apple, Advision and Olympic were around by then, but there still weren't a lot—probably less than half the number there are now. There were very few independents, run as we were, by a small team. In the end we decided to carry on. We looked over the whole of West London; we wanted to be closer to the West End than Kingston. Some of the places we rejected have since become studios, and one hears of problems they are having that we foresaw, trouble with neighbours, structure-borne noise, and so on."

Studio area showing roof construction

Mike found their present premises. They consisted of a yard and a big building at the back of the yard which had once been a laundry, but was then being used for making big fuel tanks. "It was in a terrible mess; the roof was in a state, drains were blocked up and the yard was occupied by an enormous oil tank. It really had zero going for it, but the area for the studio was big without pillars or RSJ's holding the roof up. Mike convinced us that if we used our imagination we could begin to see possibilities. We did. The premium for the lease exactly used up all our savings from the previous six years. We put this down at a stage when we had no idea how much conversion was all going to cost. All we knew was that we had the premises and a bit of experience of running the business.

"It was now time to plan the new studio. We visited all the acoustic experts then practising and of all those Ken Shearer was the one we felt we could work with. One or two of them were rather offhand, perhaps sensing a cost-conscious approach rather than the blank cheque method of acoustic treatment where sound is absorbed by empty bank accounts.

"Ken visited the site with architects Graham Anthony and Peter Wadley and drew up a scheme. At first we treated this as a sketch plan to form a basis for discussion, then after asking various silly questions we realised just how Ken had carefully balanced all our requirements and selected the exact dimensions to create manageable acoustics. The final building plan was sent to a quantity surveyor. His estimates came back at exactly twice what we thought we could afford. We talked to the architect again and some builders decided that with a few changes we could get pretty near our figure. Now, whenever anybody tells me they're planning a studio—and I know three people who have built major studios—I warn them its going to cost twice what they think and take twice as long. It was an ongoing nightmare and occasionally a farce.

"The date for leaving Kingston arrived. Mike was quite well on with building a new desk, which was exactly sized to fit into the old control room at Kingston. The problem facing us now was how would we get it out of the roof space where it was being built at Kingston? The legs had to be removable, which meant lots of extra wiring and plugs. We managed it in the end with the aid of specialist removers and it was moved to a portable hut in the yard at the new premises for Mike to carry on working on it. He and a friend of ours, Chris Glass, put a fantastic amount of work into it—what started off as a 4-track desk, gradually expanded to a 16-track. They worked away during the 3-day week with cardboard over the win-

SSL in control room

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dows on our 'off' days so no-one would know we were using electricity—two soldering irons!

"Finance was a problem again—but it was to be nine months after moving to these premises before compensation with Kingston Council was finally settled. This was in 1973, the time of the first oil crisis and the 3-day week—a bad time for anybody setting up a new business. We had found a backer who was interested in putting money into the business; and just as we were about to set off again for Midem, with artist's impressions in hand, and builders on site, we heard that his money had been frozen in a 'fringe' bank! We were out on a limb again, but decided to go to Midem anyway and phone the architects from there to explain the situation! We asked them to complete the work they had started with the few thousand we had, without going any further."

It was quite a few months before they did have the money to pay anybody. "I think that the fact that we were honest from the start went in our favour," Piers reflects. "People were very fair and gave us credit. After Midem I spent any time, when not working at the BBC, going through *Yellow Pages* phoning financial institutions. We discovered that our mistake was in wanting to borrow only about £20,000. If we'd wanted £20,000,000 they would have been interested!

"One day I called a merchant bank, asked for their Investment Department and went into my standard spiel for about the 50th time, but the reaction was different. 'How old are the directors?' was the first question. 'Around 28,' I replied. 'Well, that's the right age—we'll come and see you.' Two energetic young guys turned up, asked all the right questions, looked at the books, the premises, were very friendly and things never looked back. Why can't more bankers take this approach?"

The merchant bank bought a quarter share in the company and made available a sizable loan, which Eden's own bank matched.

"A major factor in getting the money was the fact that we could show five years of business experience, albeit handling small sums, but the books balanced, the business had developed and we'd made a profit. As well as this we had sensible cashflow projections for the future. By the time we finished our written presentation even we were impressed!

"Ken Shearer's work provided the basis for everything—with duff acoustics you're beaten from the start," says Piers. "We are eternally grateful to him. It was before the days of Eastlake and off-the-peg finishes; the architects designed the acoustic wall units—'Stonehenge' blocks which contain several resonant absorbers in each one, to satisfy Ken's acoustic specification. The ceiling is unique—like an inverted geometric landscape. It is so unusual that a photo of the studio was printed in Music Week upside-down!

"Anybody planning to have a studio built for them should beware. It is specialised work and very few builders have any experience of acoustics. Only by being on site at 8 o'clock one morning did I manage to stop the builders putting wooden bracing struts between the two frames of the window between the control room and studio! Obviously these have to be isolated to stop sound transmission. Minutes later they would have been covered up with Rockwool and for years we would have been wondering why we had such poor separation between the studio and control room! We also discovered that it is traditional practice in the building trade to measure the diagonals of a room and if they are equal they assume that the room is built square. When we explained the geometrical flaw in this thinking the builders were amazed; they had never heard of a rhombus. Unfortunately we couldn't afford a site foreman to co-ordinate all the trades and supervise the fine detail.

"The main advantages of the premises at Beaumont Road was that we had sufficient clear space to build studio, control room and separation booth inside the existing structure without having to incorporate any of the old building. This has been a problem with a lot of conversions where existing floors or roofs have had to be used. We are also lucky in that we have no adjoining walls with any private premises and that it was a single storey building so we have never had any problems with neighbours and structure-borne noise.

"As time went on sure enough costs kept rising. Finally, when the estimates came in for fitting the acoustic treatment and finishes for the control room and studio it brought the final cost very neatly up to the figure originally quoted by the quantity surveyor. Of all the trades and professions that we used in the building the only one I was left with any respect for was quantity surveying."

The studio was finally completed in 1975, and by that time Mike and Philip were working there full-time. Piers joined them after the first year. They went again to Midem now with photos instead of artist's impressions. In those days a new studio was a novelty and they got a lot of interest. "Studios were lacking in atmosphere then, they were rather stuffy and utilitarian. Nobody thought of the artists having to work in there. We built ours with artists in mind—if they liked coming here they would come back again. We remembered how people had liked the atmosphere at the demo studio and we realised how important it had been. Equipment consisted of Mike's 28/16 desk, 16-track Ampex, 2-track Leevers-Rich, Dolbys and an EMT reverb plate—not much else. In those days there wasn't much outboard gear around. We did get a steady flow of bookings from the start, but no big names. Most of our clients were independent producers and fairly small production companies although we did some work for major record companies. Out of the blue one day we got a booking from the Bay City Rollers—the street was full of screaming girls and we felt the millenium had arrived. It helped a lot, our name was on a good-selling album. We went along for quite a few years after that doing very good business, fully booked, paying off debts without producing any monster hits.

"Our first successful record was by Brotherhood of Man which was a big hit in Europe. We also did an album with Graham Parker and The Rumour called *Howling Wind* which was well received in the States. Another good early contact was Dave Robinson of Stiff Records which led eventually to us doing lots of work for Stiff and also people like Elvis Costello, Nick Lowe, Dave Edmunds. They were very loyal over many years and made lots of successful records here. This put us on the map and from then on we had more work than we could always fit in. We were offered a lot of big name acts that we would like to have done but couldn't because we were fully booked."

Re-equipping

In 1980, everything still going well, Eden decided to revamp their studio, starting with the multitrack. Choosing the Studer *A800 Mk II* was fairly easy but deciding on a console proved more difficult.

"It was almost as agonising as finding new premises," says Piers, "we had to think of the impact it would have on our clients, many of whom loved the old desk and didn't want to change. Our opinion was that we could have got many more years use out of it, but we are in a competitive business; other studios were replacing equipment and it was obvious that it was going to become harder to get good business. We looked at a great number of desks. We were very spoilt because Mike's desk had features on it in terms of echo routing and cuts that you couldn't get on current boards. We didn't want to spend a lot of money and have fewer facilities. We had built up an excellent reputation and couldn't let that go downhill.

"In the end we went for Solid State Logic, nearly the most expensive. We had rejected it originally as too expensive and gimmicky but after looking round the market and having a play with it we changed our minds. We did our sums and decided tha if we were going to keep an edge in a declining business we would

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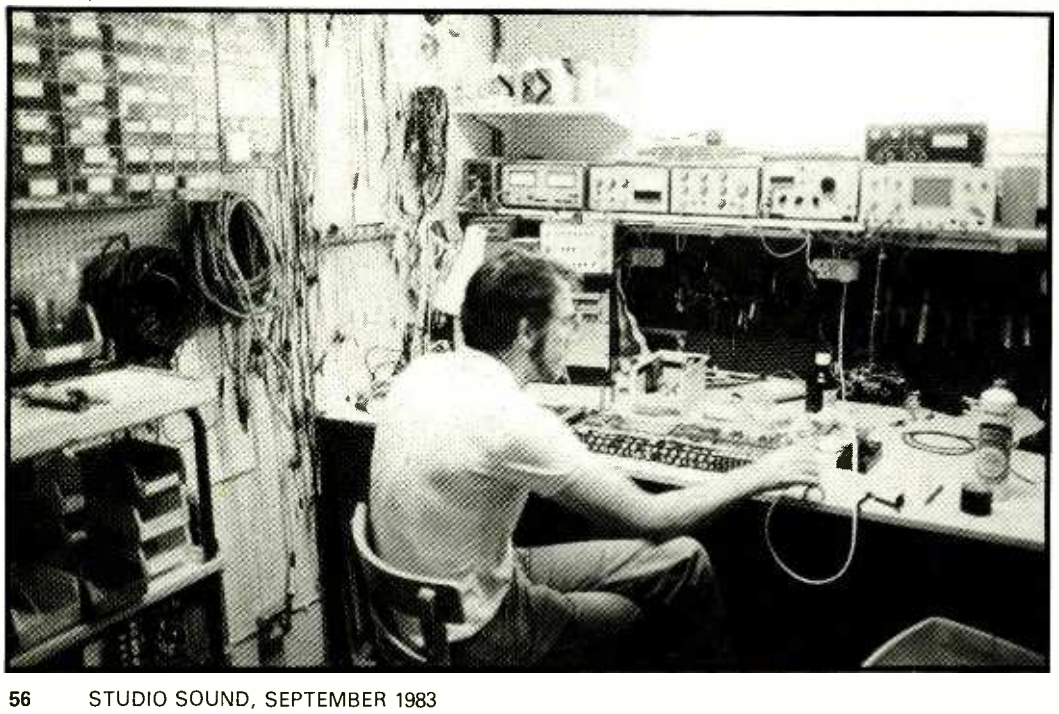
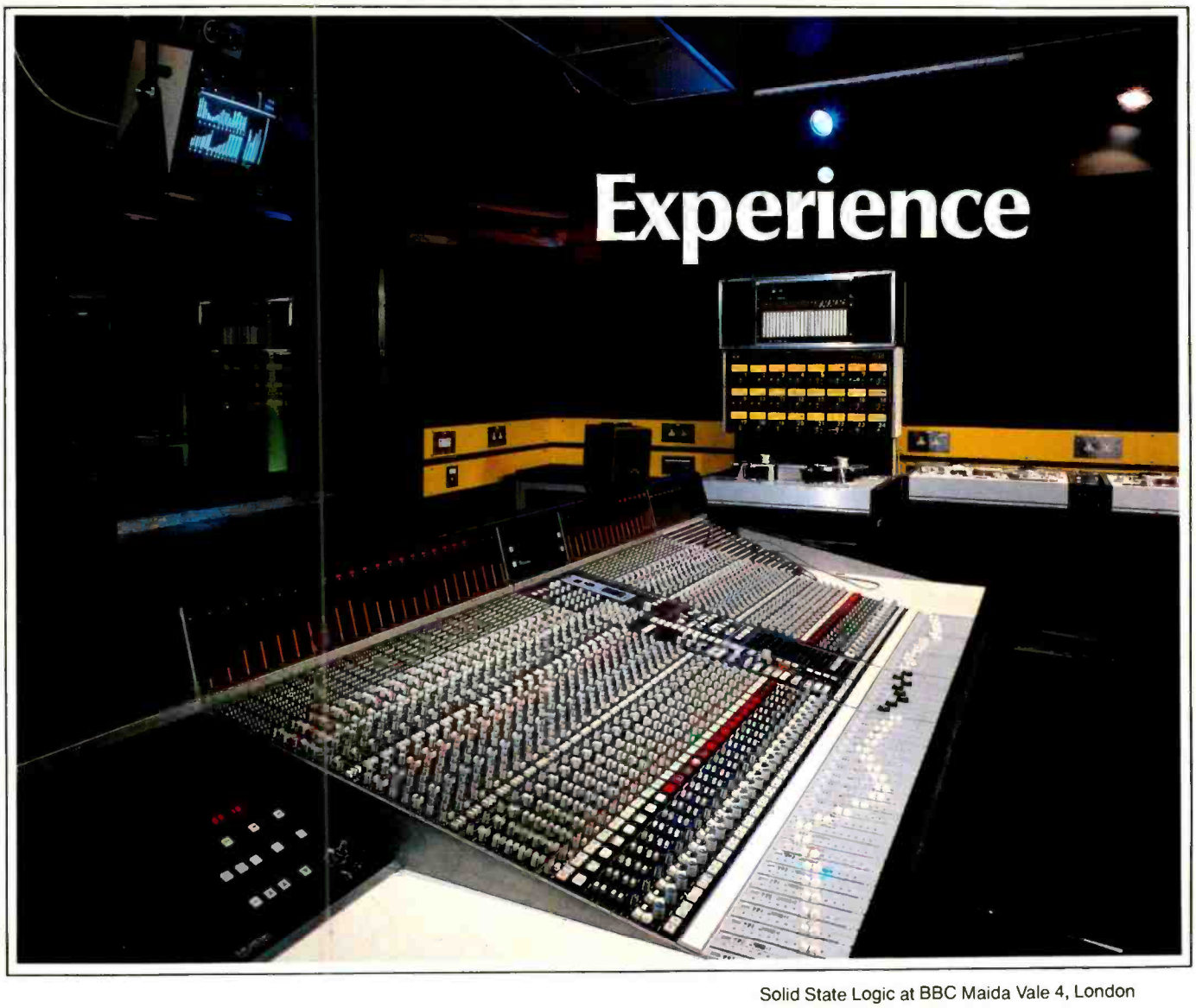
Workshop





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Eden

have to get the desk that in our estimation gave us the best facilities and was the best desk on the market. We had to be prepared for customer resistance; maybe they wouldn't pay extra money because they didn't want the extra facilities; maybe they would feel some magic would be lost because of the old board. In the end we needn't have worried—they fell in love with it. People always ask if we have had any problems with the desk, but they have been tiny (the faults I mean!). Obviously anything of such complexity has to have its shakedown period which fortunately in our case was limited to a number of ICs going down over the first month. Since then it has been wonderfully reliable. Any faults that may occur are usually such that they don't affect the session and can be covered by redundancy within the desk.

"Because of studio commitments we only had a week for installation. The desk was delivered on a Monday and the first session was on the following Saturday, which wasn't a desirable state of affairs, but people were desperate for time and it did cause a bit of nail-biting and some irritating minor faults; but SSL really backed us up with cars racing to and from Stonesfield—they're very nice people to deal with it. It has definitely been worth it for us.

"The *Total Recall* facility has been an absolute boon to us because we only have one studio. You can do a lot of back-to-back recording of ongoing projects and it gives people total confidence that they can come back to the board as they left it. This would not happen if the tape op just produced pieces of paper or a polaroid photograph. We've had sessions running for a week with one in the daytime and another one at night; every evening the desk was reset. Another great attraction is that when people want to remix they can go back and reset the desk in 40 min to exactly as they left it in every way. You can make small adjustments and remix in a few hours rather than a whole day. SSL desks are going into lots of studios now and we're proud to have been the first independent commercial studio to install one.

"Studios can never feel complacent about equipment. In the end only the best will do and it's usually the most expensive. We're always looking at new outboard gear, mics and speakers. We've auditioned different monitors four times in the last year—it takes a full day and a lot of lifting—and in the end we still prefer our JBL *4350*s. Last year we built some massive concrete plinths for the control room monitors which has given us tighter bass reproduction. Also we put parquet floors down in a third of the studio, something we wouldn't have needed in the 'high-separation' days.

"New equipment has to be judged closely for cost effectiveness. Some outboard gear really doesn't earn its keep and its appeal may be short-lived but clients expect to see current items in the racks. This is another reason for charging sensible studio rates. Studios that try to keep a low rate find they're caught in a 'poverty trap' of not attracting good business and not making enough profit to move up the market. It's a delicate balance. The fact that we buy the best equipment is all part and parcel of how we see ourselves in relation to the music business. Record sales are down and record companies want value for money; if they are going into new projects they want to find the best they can. I hope everybody will recognise that you can only get consistently good results from producers and artists in a studio with the best and most professional acoustics and equipment. Otherwise you are taking a chance. There's nothing like re-recording or endless remixing to kill the magic of a record. We do good business putting a sparkle back into economically-recorded multitracks.

We do all our mixes at 30 in/s on ½ in tape. I don't think, sound quality is the main ingredient of a successful record but a well run, well equipped studio can make a 'major contribution' as they say.

"It is quite interesting to note how recording has changed in the years since we started. When we started we were doing 30-piece orchestras with strings and brass quite regularly for some companies; most records had a big string section, or brass, and we did lots of those line-ups. It was great experience for everybody. Also everybody wanted a great degree of separation in those days. There was a great cult for building drum booths and screening everybody off, solo artist playing the piano and singing which created separation problems; gradually that has all changed—we've only done one string session in the last 15 months. There is still some brass work being done. Sessions have got smaller and have even gone away from loud guitars—the staple sound of pop for 25 years—although we have done a lot of rock'n'roll-type records. The unfortunate thing for engineers is that we started off with big sessions and lots of natural instruments; gradually this has gone down to drums and bass and most overdubs come from synthesisers and keyboards. People get very little experience of miking up natural instruments and using their ears about mic placing in the way that we had to do only seven years ago. We had to think and plan out how to lay out the studio. Miking up a drum kit is about the last practice of the art. When rockabilly came in engineers were phoning each other asking how to mic a double bass.

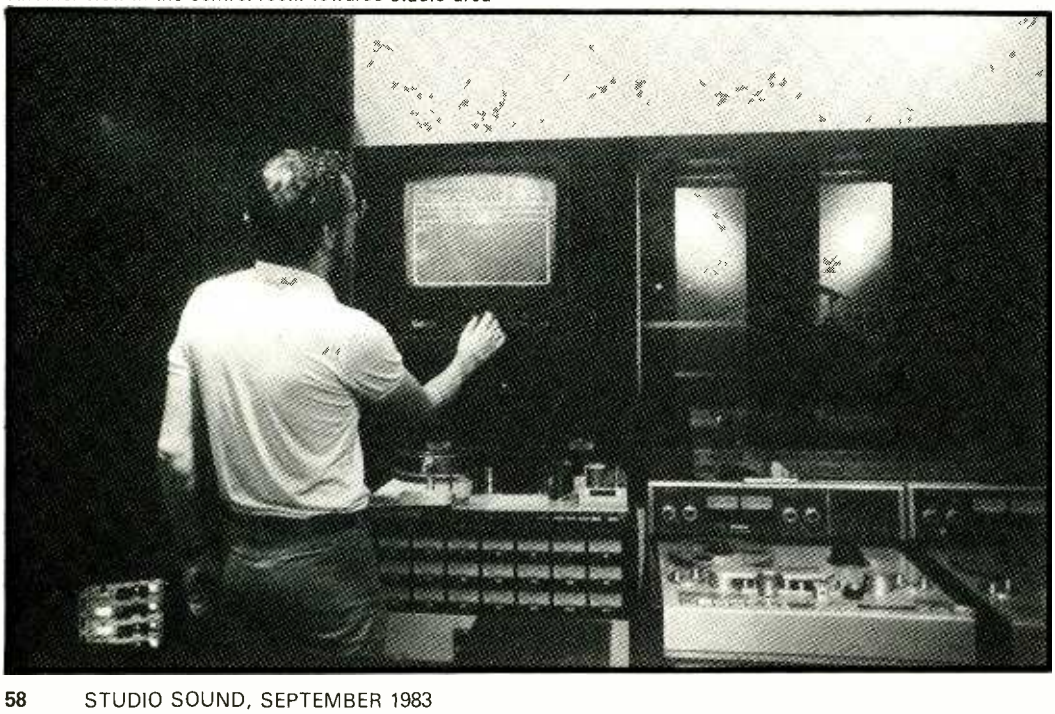
"I was disappointed to hear a quote made by a girl singer in the popular press recently—possibly it was misquoted—that the music business was 'full of people trying to rip artists off,' and listing among these management, record companies and studios. This is unfortunate because studios must be the least 'ripping-off' element in the whole of the music business. All we can do is charge a sensible rate to get a reasonable return on what is an enormous investment in capital and hope that people like us enough to keep coming back. You can't rip people off by providing the best service. You can't put pressure on them. If they don't want to pay for what you are offering they won't come. Our own rate reasonably reflects the cost of gear we have here and the fact that people will get something good for their money. After all it is not just providing the studio and the equipment, people need to be looked after while they are in the studio, everything from hiring musical instruments to taking phone messages or even occasionally doing some shopping for them when they're stuck in the studio for days on end.

"It is unfortunate at the moment that there is so little upward movement for young people coming into the business. I know from the enormous numbers of letters we get that it is an area which holds a fascination for people but there is so little movement now it doesn't present great career prospects. There is a danger that somebody with only average ability may find his career has become static, although he's only in his early 20s. Unfortunately until you do the job you can't know if you really have a gift for making records. You have to take advantage of any chance to work your way up from assistant to engineer, and from engineer to producer or into studio management. It is a crowded profession but hopefully talent will out. So very few people have that perfect combination of electronic understanding, musical ability and personality.

"The luckiest thing of all is that the three of us have been able to get on with each other and stick together for 15 years. Being a small team has made it easy to take decisions although we each have a different approach to any problem, but knowing each other so well we find it possible to sit down and hammer out a decision. Usually if we agree about it, it will be the right decision. It is rather like a marriage. We have also been very fortunate with the people we have had working with us over the years. Roger Bechirian started here as an assistant and is now a successful freelance producer. Neill King and Philip Vinall are our engineers and Irene Kelly assists. Freelance producer and engineer Rod Houison also does a lot of work for us. Sue Brookes looks after the office and bookings."

The road to lasting success is not a straight one but Eden seem to have travelled it without succumbing to the setbacks. ■

Another view in the control room towards studio area



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AUDITRONICS (USA)
Auditronics Inc, 3750 Old Getwell Road, Memphis, TN 38118. Tel: (901) 362-1350. Telex: 533356.

Ranges of multitrack consoles.

AUDIX (UK)
Audix Ltd, Station Road, Wenden, Saffron Walden, Essex CB11 4LG. Tel: 0799 40888. Telex: 817444.

Broadcast orientated console with multitrack capability.

BEL (UK)
UK: 29, Guildford Street, Luton, Beds LU1 2NQ. Tel: 0582 452495. Telex: 825488.

Multitrack modular console.

BIAMP (USA)
Biamp Systems Inc, 9600 SW Barnes Road, Portland, OR 97225. Tel: (503) 297-1555.

Multitrack consoles.

CADAC (UK)
Clive Green & Co Ltd, Britannia House, Leagreave Road, Luton, Bedfordshire LU3 1RJ. Tel: 0582 411513. Telex: 826138.

Custom built in-line multitrack consoles.

CALREC (UK)
Calrec Audio Ltd, Hangingroyd Lane, Hebden Bridge, Yorkshire HX7 7DD. Tel: 0422 842159. Telex: 51311.
USA: Audio & Design Recording Inc, PO Box 786, Bremerton, WA 98310. Tel: (206) 275-5009. Telex: 152426.

Broadcast orientated consoles with multitrack applications.

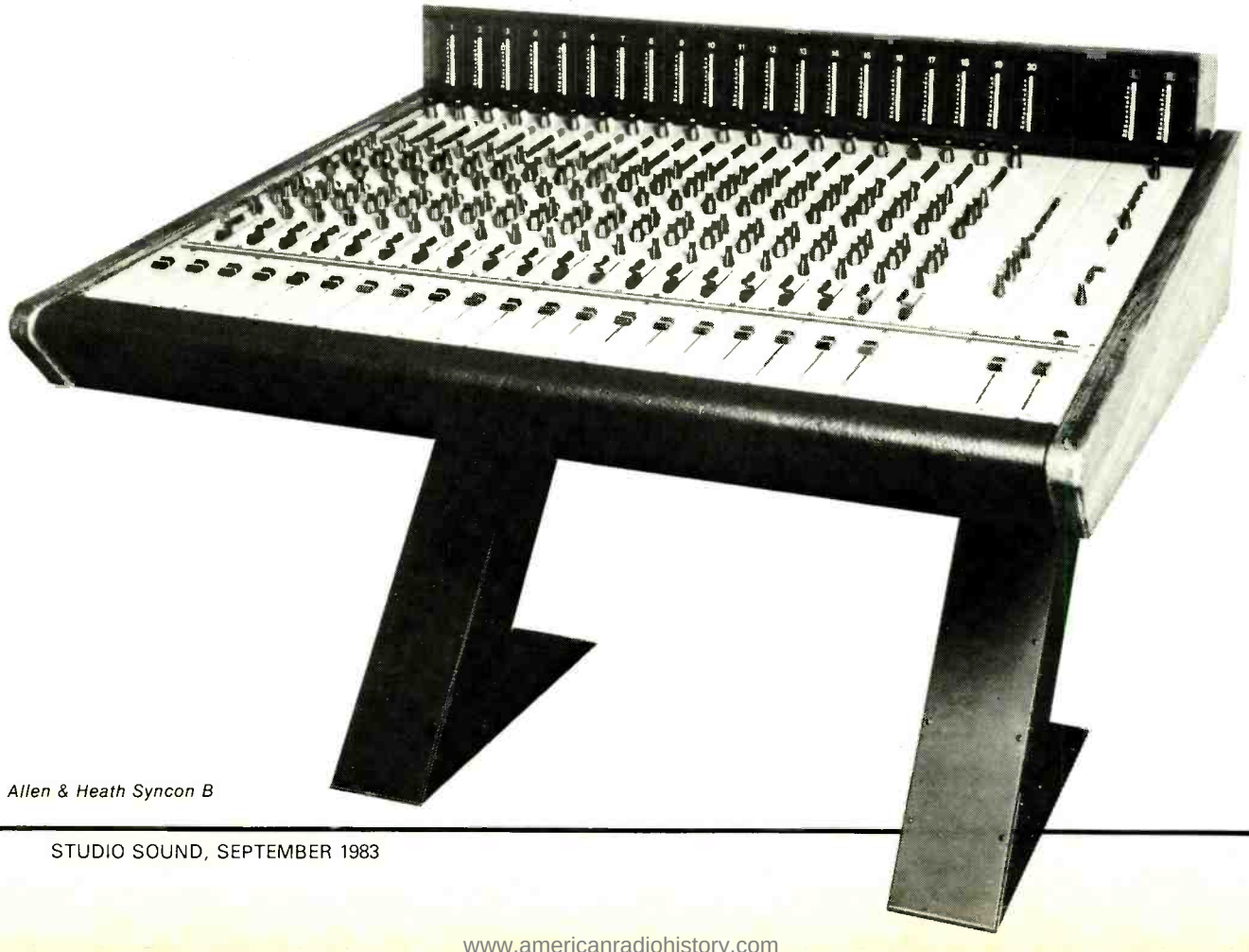
CHILTON (UK)
Magnetic Tapes Ltd, Chilton Works, Garden Road, Richmond, Surrey TW9 4NS. Tel: 01-876 7957. Telex: 912881.
Canada: Radio Service Inc, 2500 Bates Road, Montreal H3S 1A6.

Smaller multitrack consoles.

D & R (Netherlands)
D & R Electronica BV, Chassestraat 26, 1057 JE Amsterdam. Tel: (020) 183556.
UK: DSN Marketing Ltd, Westmorland Road, London NW9 9RJ. Tel: 01-204 7246. Telex: 8954243.

Wide range of small and large multitrack consoles.

DDA (UK)
DDA Ltd, Unit 7B, Worton Hall Trading Estate, Worton Road, Isleworth, Middlesex TW7 6ER. Tel: 01-847 0363.
North America: Heinl Electronics Inc, 16 Mary



Allen & Heath Syncon B

Street, Unit 1, Aurora, Ontario, Canada L4G 3W8. Tel: (416) 727-1951.

Compact multitrack consoles.

DYNACORD (West Germany)
Dynacord Electronic GmbH, Sienmensstrasse 41-43, D-8440 Strubing. Tel 09421 3101.
USA: Dynacord Electronics, PO Box 26038, Philadelphia, PA 19128. Tel: (215) 482-4992.

Small multitrack consoles.

EELA AUDIO (Netherlands)
Pieter Bollen Geluidstechniek BV, Hondsruglaan 83a, NL-5628 DB, Eindhoven. Tel: 040 424455. Telex: 59281.
UK: Audio & Design Marketing, North Street, Reading, Berks, RG1 4DA. Tel: 0734 53411. Telex: 848722.
USA: Audio & Design Recording Inc, PC Box 786, Bremerton, WA 98310. Tel: (206) 275-5009. Telex: 152426.

Range of multitrack consoles for range of applications.

ELEKTROIMPEX/BEAG (Hungary)
Electroimpex, PO Box 296. H-1392 Budapest. Telex: 225771.

Multitrack console.

ENERTEC (France)
Enertec SA, 1 Rue Nieuport, 78140 Velizy-Villacoublay, France. Tel: 946.96.50. Telex: 697430.

Wide range of modules for assembly into multitrack consoles and standard small units.

FAIRCHILD (USA)
Fairchild Sound Equipment Corp, 75 Austin Blvd, Commack, Long Island, NY 11725. Tel: (516) 543-5200.

Small portable multitrack consoles.

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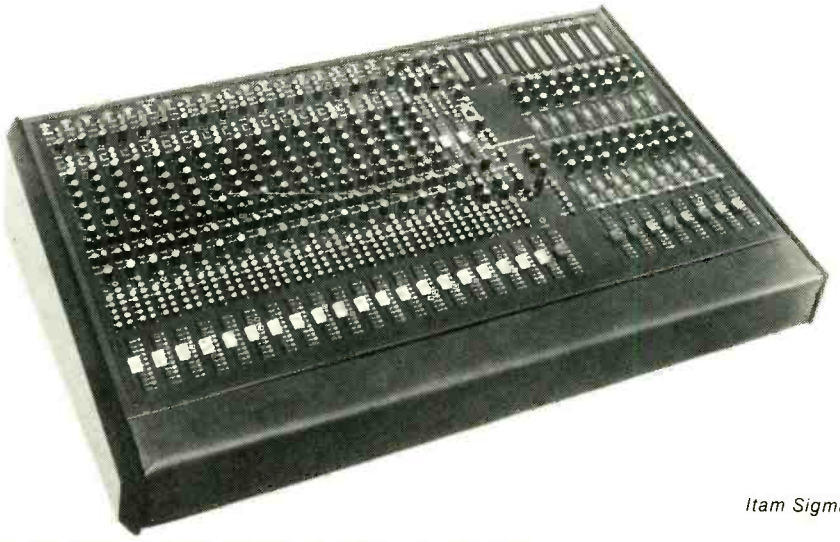
Amek M2500

product reference

Multitrack mixing consoles



Itam Sigma

FORMULA SOUND (UK)
Formula Sound Ltd, 3 Waterloo Road, Stockport, Cheshire. Tel: 061 4803781.

Custom built multitrack consoles.

FOSTEX (Japan)
USA: Fostex Corporation of America, 15431 Blackburn Avenue, Norwalk, CA 90650. Tel: (213) 921-1112.
UK: Bandive Ltd, Brent View Road, London NW9 7EL. Tel: 01-202 4366.

Compact multitrack mixer.

HARRISON (USA)
Harrison Systems Inc, PO Box 22964, Nashville, TN 37202. Tel: (615) 834-1184. Telex: 555133.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Tel: 01-953 0091. Telex: 27502.

Wide range of multitrack consoles for recording and VPP use.

HELIOS CUSTOM AUDIO (UK)
Richard Swettenham Associates, 53 Westbury Avenue, London N22 6BS. Tel: 01-448 2582.
USA: Helios Custom Audio, 13266 Beaver Sylmar, CA 91342. Tel: (213) 362-2328.

Custom designed multitrack consoles.

HILL (UK)
Hill Audio Ltd, Hollingbourne House, Hollingbourne, Kent. Tel: 062780 555.
USA: Hill Audio Inc, 231 Marquis Court, Lilburn, GA 30247. Tel: (404) 923-3193. Telex: 293827.

Range of multitrack consoles.

ITAM (UK)
Industrial Tape Applications, 1-7 Harewood Avenue, Marylebone Road, London NW1 6LE. Tel: 01-724 2497. Telex: 21879.

Multitrack console.

INTERFACE (USA)
Interface Electronics Inc, 3810 Westheimer, Houston, TX 77026. Tel: (713) 626-1190.

Range of multitrack consoles.

INTERNATIONAL CONSOLES (USA)
Sun Valley Audio/International Consoles Corp, PO Box 388, Sun Valley, ID 83353. Tel: (801) 377-9044.
UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Tel: 01-580 4314. Telex: 28668.

Range of modules for assembly into multitrack consoles.

KAJAANI (Finland)
Kajaani OY Electronics, Nuaskatu 11, SF-87400 Kajaani. Tel: (86) 37.311. Telex: 33148.

Small and large in-line multitrack consoles.

MCI/SONY (USA)
MCI (a Division of Sony Corp of America), 1400 W Commercial Blvd, Fort Lauderdale, FL 33309. Tel: (305) 491-0825. Telex: 514362.
UK: Sony Broadcast Ltd, City Wall House, Basing View, Basingstoke, Hants RG21 2LA. Tel: 0256 55011. Telex: 858424.

Several ranges of multitrack consoles.

MIDAS (UK)
Midas Audio Systems Ltd, 54-56 Stanhope Street, London NW1 3EX. Tel: 01-388 7060.
Canada: Gerr Electro-Acoustics Ltd, 363 Adelaide Street East, Toronto, Ontario M5A 1N3. Tel: (416) 868-0528. Telex: 06524385.

Expandable multifunction consoles.

M-JAY (UK)
M-Jay Electronics Ltd, Albion Mills, Church Street, Morley, Leeds LS27 8LY. Tel: 0532 524956.

Range of multitrack consoles.

NEOTEK (USA)
Neotek, PO Box 11127, Chicago, IL 60611. Tel: (312) 929-6699.

Several ranges of multitrack consoles.

NEPTUNE (USA)
Neptune Electronics Inc, 934 NE 25th Avenue, Portland, OR 97232. Tel (503) 232-4445.
UK: Court Acoustics (Sales) Ltd, 10-16 Mercer Street, London WC2. Tel: 01-240 3648.

Small multitrack console.

NEUMANN (West Germany)
Georg Neumann GmbH, Charlottenstrasse 3, D-1000, Berlin 61. Tel: 030 251-4091. Telex: 184595.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Tel: 01-953 0091. Telex 27502.
USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014. Tel: (212) 741-7411. Telex: 129269.

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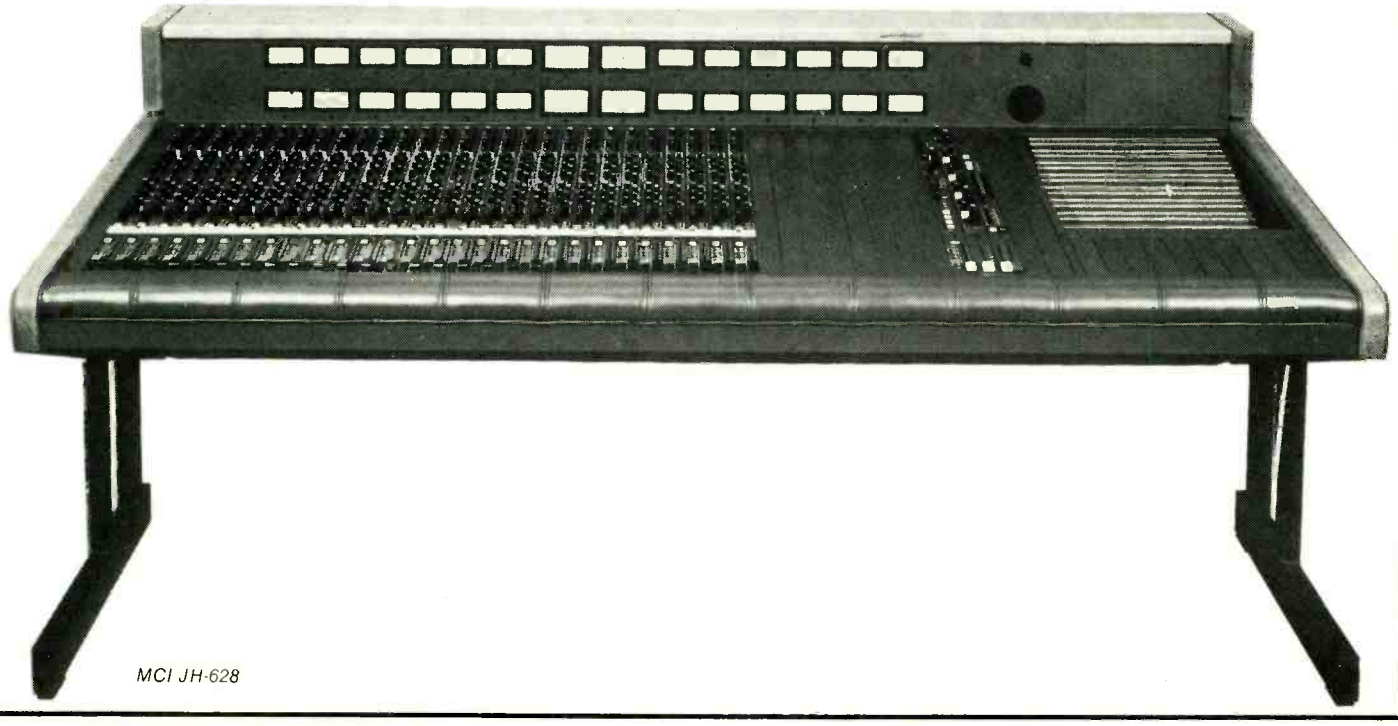
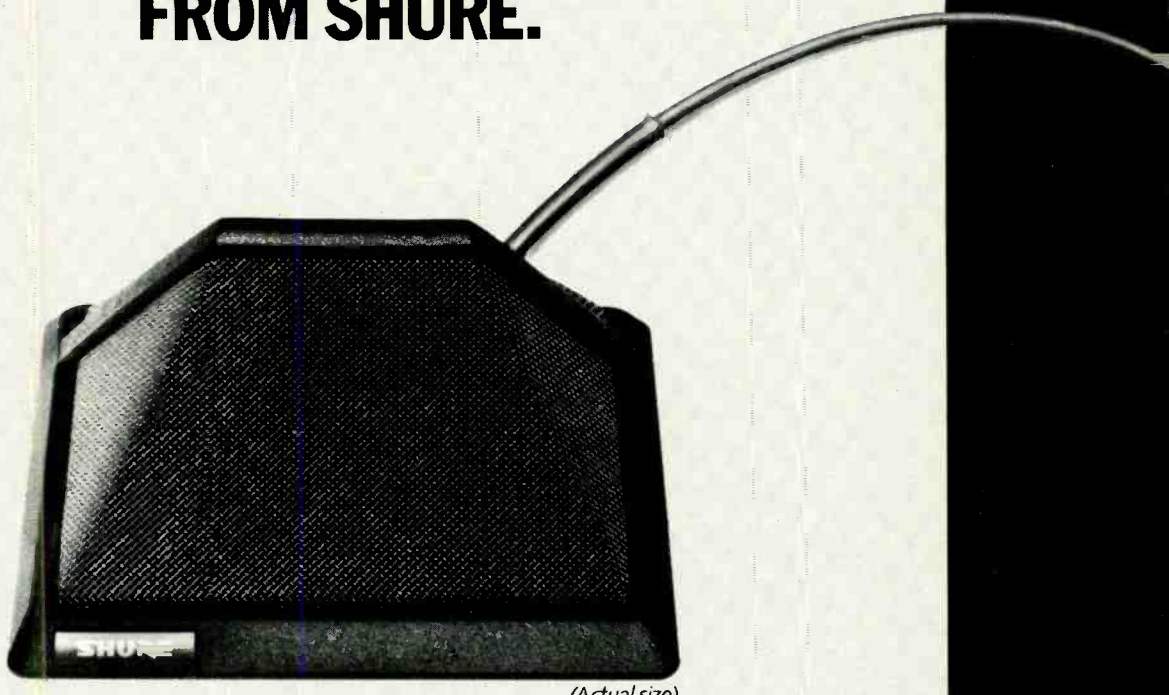


MCI JH-628

THE WORLD'S FIRST AND ONLY AUTOMATIC MICROPHONE SYSTEM – FROM SHURE.



(Actual size)

Whenever someone has something to say in public, it's often the microphone system that makes or breaks their speech.

Clicks. Pops. Crackles. Background noises and missed syllables. Just a handful of the hazzards that can turn a speaker's finest hour into a fiasco.

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At the heart of the AMS are angle-sensitive microphones. Speak into any one of them within its own 120° 'window of acceptance' and it turns on; change the surrounding audio conditions and it compensates. Quickly. Quietly. Automatically.

The rear panel of every AMS mixer features logic terminals that not only give unprecedented flexibility but also eliminate many of the usual adjustments and controls.

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The new Shure Automatic Microphone System. It makes speeches not mistakes.

IT'S SO SMART IT CAN 'MAKE' SPEECHES

SHURE

You simply can't make it any clearer.

For more information write to: HW International, Dept SS, 3-5 Eden Grove, London N7 8EQ. Tel: 01-607 2717

product reference

Multitrack mixing consoles

Range of modules for assembly into range of multitrack consoles.

NEVE (UK)
Neve Electronics International Ltd, Cambridge House, Melbourn, Royston SG8 6AU. Tel: 0763 60776. Telex: 81381.
USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, CT 06801. Tel: (203) 744-6230. Telex: 969638.

Wide range of multitrack consoles.

PARTRIDGE (UK)
Partridge Electronics Ltd, 56 Fleet Road, Benfleet, Essex SS7 5JN.

Range of small multitrack mixers.

PLUS 30 (France)
Plus 30, 37 Rue des Annelets, F-75019, Paris. Tel: (1) 202.21.02.

Multitrack console system.

PROGRESSIVE (UK)
Progressive Electronic Products Ltd, 83 Leonard Street, London EC2A 4RB. Tel: 01-729 5411.

Range of modules for assembly into multitrack consoles as well as small multitrack assembled units.

PROTECH (USA)
ProTech Audio Corp, Flowerfield Building 1, St James, NY 11780. Tel: (516) 584-5855.

Range of modules for assembly into multitrack consoles.

PYE (UK)
Pye TVT Ltd, PO Box 41, Coldhams Lane, Cambridge CB1 3JU. Tel: 0223 245115. Telex: 81103.
USA: Central Dynamics Corp, 331 W Northwest Highway, Palatine, IL 60067. Tel: (312) 991-4720.

Portable console.

QUAD/EIGHT (USA)
Quad/Eight Electronics, 11929 Vose Street, North Hollywood, CA 91605. Tel: (213) 764-1516. Telex: 662446.

Range of multitrack recording consoles and series of modules for assembly into a variety of formats.

QUANTUM (USA)
Quantum Audio Labs Inc, 1909 Riverside Drive, Glendale, CA 91201. Tel: (213) 841-0970.

Range of compact multitrack consoles.

RAC (UK)
Rugby Automation Consultants, 220 Alwyn Road, Rugby, Warwicks CB22 7RA. Tel: 0788 810367.

Custom manufacture of small consoles.

RAINDIRK (UK)
Raindirk Ltd, 33A Bridge Street, Downham Market, Norfolk. Tel: 03663 82165. Telex: 817737.

Wide range of consoles for recording, video post production and film work. Also custom design.

REBIS (UK)
Rebis Audio, Kinver Street, Stourbridge, West Midlands DY8 6A. Tel: 0384 71865.

Custom design and standard models.

REDDINGTON (UK)
Reddington Electronics, Reddings, Kirkby on Bain, Woodhall Spa, Lincs. Tel: 0526 52950.

Custom multitrack console design.

RSD (UK)
Recording Studio Design, Faircharm Trading Estate, Chaul End Lane, Leag, Luton, Beds. Tel: 0525 570621. Telex: 825612.
USA: Studiomaster Inc, 1365C Dynamics, Anaheim, CA 92806. Tel: (714) 528-4930. Telex: 678407.

Small multitrack consoles.

RSD (Canada)
Richmond Sound Design Ltd, 1234 W 6th Avenue, Vancouver, British Columbia V6H 1A5. Tel: (604) 734-1217. Telex: 0454667.
USA: Listec Television Equipment Corp, 30 Cain Drive, Plainview, NY 11803. Tel: (516) 694-8963. Telex: 640470.

Consoles for small multitrack use.

SAIT (Belgium)
Sait Electronics SA, 66 Chaussee de Ruisbroek, B-1190 Bruxelles. Tel: 02-376.20.30. Telex: 61130.
UK: Sait Electronics UK, Wireless House, 31 River Road, Barking, Essex IG11 0BX. Tel: 01-594 5642. Telex: 897576.
USA: Sait Inc, 33 Rector Street, New York, NY 10006. Tel: (212) 422-6690. Telex: 222411.

Wide range of consoles and custom design.

SAJE (France)
SAJE, 3 rue verte, 95100 Argenteuil. Tel: 961.15.62.

A wide range of multitrack consoles with recording broadcasting and PA applications.

SECK (UK)
Bandive Ltd, Brent View Road, London NW9 7EL. Tel: 01-202 4366.

Range of compact multitrack consoles.

SIEMENS (West Germany)
Siemens AG, D-7500 Karsruhe 21. Tel: 0721 595-2428. Telex: 782851.
UK: Siemens Ltd, Siemens House, Windmill Road, Sunbury-on-Thames, Middlesex TW16 7HS. Tel: 09327 85691. Telex: 8951091.

Wide range of modular multitrack consoles.

SOLID STATE LOGIC (UK)
Solid State Logic Ltd, Stonesfield, Oxford. Tel: 099389 8282. Telex: 837400.
USA. Musicworks International 2352 Wisconsin Avenue NW, Washington, DC 20007. Tel: (202) 342-1501. Telex: 23440519.

Large multitrack audio and VAPP consoles.

SOLIDYNE (Argentina)
Solidyne Srl, Tres de Febrero 3254, 1429 Buenos Aires, Tel: 701-8622.
USA: Intectra, 2349 Charlston Road, Mountain View, CA 94043. Tel: (415) 967-8818. Telex: 345545.

Rebis Omega

Range of multitrack consoles.

SONETEC (France)
Sonetec, 21 Avenue do Fort, F-92120 Montrouge. Tel: 654.07.07. Telex: 202347.

Range of modular multitrack consoles.

SONIFEX (UK)
Sonifex Sound Equipment, 15 College Street, Irthlingborough, Wellingborough, Northants NN9 5TU. Tel: 0933 650700.

Small multitrack console.

SONOSAX (Switzerland)
Sanosax, Route d'Yverdon 27, CH-1028 Preverenges/Lausanne. Tel: 021. 71 13 13.

Compact multitrack console system.

SOUNDCRAFT (UK)
Soundcraft Electronics Ltd, 5 Great Sutton Street, London EC1V 0BX. Tel: 01-251 3831. Telex: 21198.
USA: Soundcraft Electronics USA, 1517 20th Street, Santa Monica, CA 90404. Tel: (213) 453-4591. Telex: 664923.

Range of multitrack consoles for audio and VAPP.

SOUNDTRACS (UK)
Soundout Laboratories Ltd, 91 Ewell Road, Surbiton, Surrey KT6 6AH. Tel: 01-399 3392. Telex: 8951073.
USA: Soundtracs Inc, 262a Eastern Parkway, Farmingdale, NY 11735. Tel: (516) 249-3669.

Compact multitrack consoles.

SOUND WORKSHOP (USA)
Sound Workshop Professional Audio Products Inc, 1324 Motor Parkway, Hauppauge, NY 11787. Tel: (516) 582 6210.

Several ranges of multitrack consoles.

Neve 8128

SPECTRA SONICS (USA)
Spectra Sonics, 770 Wall Avenue, Ogden, UT 844041. Tel: (801) 392-7531.
UK: (modules and components) Sun Recording Services, 34-36 Crown Street, Reading, Berkshire. Tel: 0734 595647.

Custom consoles.

STAR SOUND DYNAMIX (UK)
UK: MTR Ltd, Ford House, 58 Cross Road, Bushey, Herts, WD1 4DQ. Tel: 0923 34050. Telex: 025859.

Range of compact multitrack consoles.

STRAND SOUND (UK)
Rank Strand Sound, PO Box 51, Great West Road, Brentford, Middlesex TW8 9HR. Tel: 01-568 9222. Telex: 27976.
North America: Strand Century Ltd, 6334 Viscount Road, Malton, Ontario, Canada.

Compact multitrack consoles.

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product reference

Multitrack mixing consoles

STUDER (Switzerland)
Studer International AG, CH-5430 Wettingen. Tel: 056-2687 35. Telex: 53682.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Tel: 01-953 0091. Telex: 27502.
USA: Studer Revox America Inc, 1425 Elm Hill Pike, Nashville, TN 37210. Tel: (615) 254-5651. Telex: 554453.

Several ranges of multitrack consoles.

TAB (West Germany)
Tonographie Apparatebau V Willisen GmbH Co, PO Box 130534, Kleine Klotzbahn 27, D-5600 Wuppertal 1. Tel : 0202 447452. Telex: 8591742.

Multitrack consoles.

TANGENT (USA)
Tangent Systems Inc, 2810 South 24th Street, Phoenix, AZ 85034. Tel: (602) 267-0653.

Multitrack consoles.

TEAC/TASCAM (Japan)
UK: Harman (Audio) UK Ltd, Mill Street, Slough, SL2 5DD. Tel: 0753 76911. Telex: 849069.
USA: Teac Corporation of America 7733 Telegraph Road, Montebello, CA 90640. Tel: (213) 726-0303. Telex: 677014.

Compact multitrack consoles.

TECHNICAL PROJECTS (UK)
Technical Projects, Rampart House, 63 Victoria Street, Windsor, Berks SL4 1EH. Tel: 07535 58154. Telex: 849988.

Custom multitrack consoles.

TECNICOBEL (France)
Tecnicobel, 8 rue de la Croix-Matre, BP26, F-91122 Palaiseau Cedex. Tel: (1) 920.80.39. Telex: 692543.

Modular multitrack consoles.

TOA (Japan)
UK: Toa Electric Co Ltd, PO Box 82, Castle Street, Ongar, Essex. Tel: 0277 364333. Telex: 995554.
USA: Toa Electronics Inc, 1023 Grandview Drive, San Francisco, CA 94080. Tel: (415) 588-2583. Telex: 331332.

Range of consoles with multitrack application.

TORE SEEM (Norway)
Tore Seem A/S, PO Box 10, N-1344 Haslum. Tel: 02.53.39.75. Telex: 19121.

Broadcast orientated multitrack consoles.

TOTAL AUDIO CONCEPTS (UK)
Total Audio Concepts Ltd, Islington Mill, James Street, Salford M3 5HW. Tel: 061 8346747. Telex: 668127.

Compact multitrack consoles.

TRACKTECH (UK)
Tracktech, 159 Park Road, Kingston-upon-Thames, Surrey, KT2 6BX. Tel: 01-549 9130. Telex: 889294.

Multitrack consoles.

TRIDENT (UK)
Trident Audio Developments Ltd, Shepperton Studio Centre, Studios Road, Shepperton, Middlesex TW17 0QD. Tel: 09328 60241. Telex: 8813982.
USA: Trident (USA) Inc 652 Glenbrook Road, Stamford, CT 06906. Tel: (023) 357-8337. Telex: 643678.

Ranges of multitrack consoles.

TWEED (UK)
Tweed Audio Electronics, Pinnaclehill Industrial Estate, Kelso, Roxburghshire, Scotland TD5 8DW. Tel: 0573 2377. Telex: 727633.
USA: Tweed Audio (USA) Inc, 12 Ilex Drive. Newbury Park, CA 91320. Tel: (805) 499-4764. Telex: 652337.

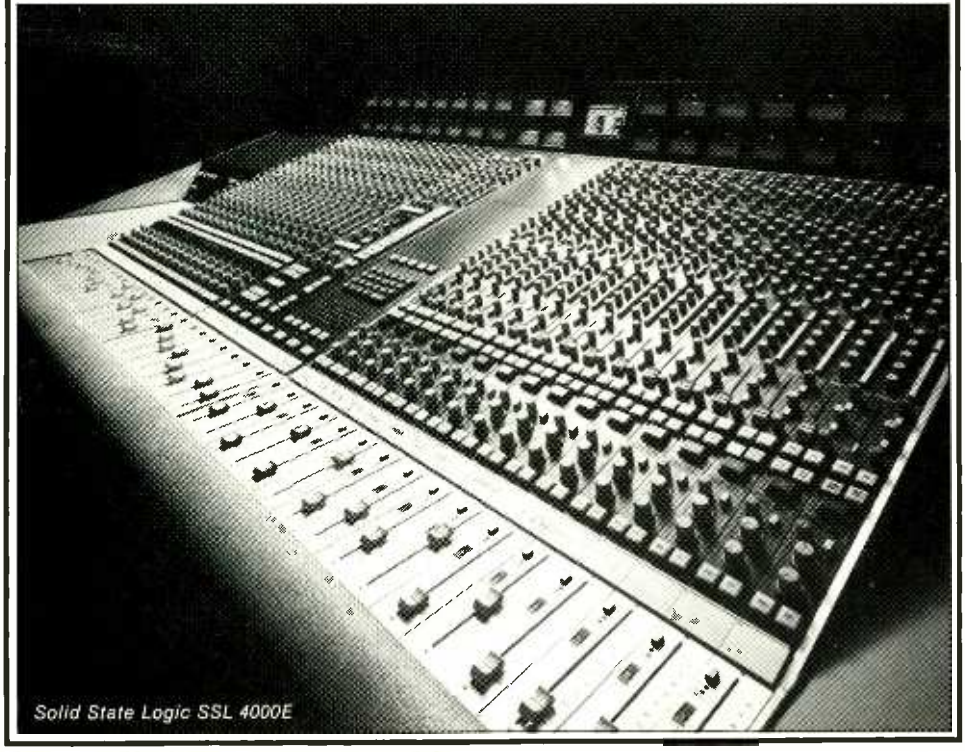
Broadcast orientated multitrack consoles, and custom design.

WARD-BECK (Canada)
Ward-Beck Systems Ltd, 841 Progress Avenue, Scarborough, Ontario M1H 2X4. Tel: (416) 438-6550. Telex: 06525399.
USA: Ward-Beck Systems Inc, 6900 E Camelback Road, Suite 1010, Scottsdale, AZ 85251.

Broadcast orientated consoles with multitrack application.

YAMAHA (Japan)
USA: Yamaha International Corp, PO Box 6600, Buena Park, CA 90620. Tel: (714) 522-9105.
UK: Yamaha Musical Instruments, Mount Avenue, Bletchley, Milton Keynes, Bucks. Tel: 0908 71771.

PA orientated consoles with multitrack applications. ■



Solid State Logic SSL 4000E

THE NEW OTARI MTR-90 SERIES II

...thoroughly recommended,"

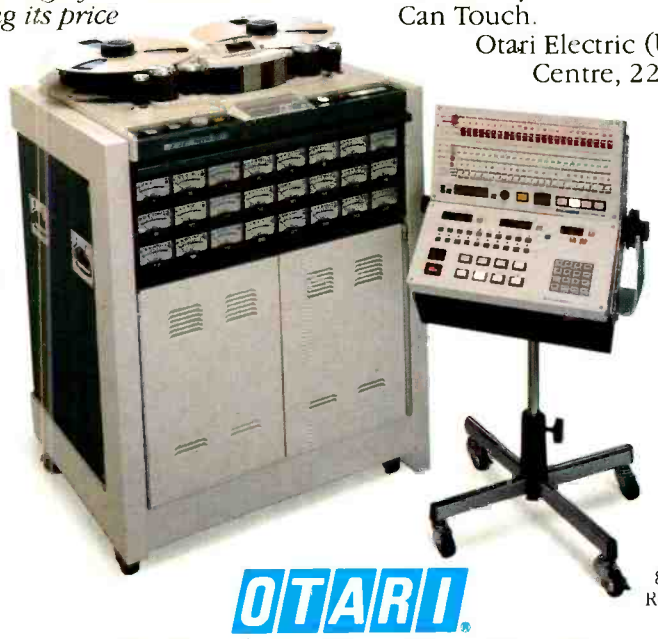
Hugh Ford, Studio Sound, November 1982

"The Otari MTR-90 Series II is a very well-built machine with the tape transport having many of the features of the premier recorders of European manufacture..."

"Both the remote control and autolocator are highly practical with excellent layouts. Full and foolproof interlocking is provided for all functions with clear displays of the machine's status."

"This machine is to be thoroughly recommended, particularly when comparing its price with the competition."

We have refined the features and extended the performance and capabilities of the new, second generation MTR-90 by working closely with recording and film/video post-production engineers who demand the extra measure of technology and commitment. The Series II Mastering Multichannel machines are the logical result; microprocessor-controlled recorders specifically designed to easily interface with any SMPTE-based video editing system, machine controller or synchronizer.



The complete text of Hugh Ford's review, plus a comprehensive technical brochure and price details are available now. Further, should you desire your own "hands-on" review of the MTR-90, ring us directly at 0753-38261 and ask for Mick Boggis.

From our hands to yours, the new MTR-90 Series II recorders are engineered like no other tape machine in the world, with quality you can hear and feel—with affordability that makes Otari the Technology You Can Touch.

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Telex: 849453 OTARI G
In Germany: Otari Electric, Deutschland GmbH, Gielen Strasse 9, 4040 Neuss 1 F.R. Germany, Tel: 02101-274011
Telex: 41 8517691 OTEL D
Authorised Dealers:
ITA 1-7 Harewood Avenue, Marylebone Road, London NW1 6 LE
Tel: 01-724 2497/8 & 01-724 3768
Telex: 21879
TURNKEY
Brent View Road, London NW9 7EL
Tel: 01-202 4366 Telex: 25769

8, 16 & 24 channel versions available with Remote Session Controller & Autolocator.

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Otari Corporation, Belmont, California (415) 592-8311 Telex: 910-376-4890. Otari Electric Co., Ltd., Tokyo, Japan (03) 333-9631 Telex: OTRDENKI J26604. Otari Singapore Pte., Ltd., 294-5370 Telex: RS 36935. Otari Electric Deutschland GmbH, Neuss, F.R. Germany 02101-274011 Telex: 41 8517691 OTEL D.

The alphaSyntauri digital synthesiser

Paul D Lehrman

Modern computer-based sound synthesis is generally an expensive business, and often only highly successful musicians and large studios have been able to afford it. But now there is a cheaper way—and you can do the accounts on the computer when you've finished composing. Paul D Lehrman describes the Alpha Syntauri music system which interfaces with the *Apple II* micro.

UPROAR from the Musicians' Union over last year's Barry Manilow concert at the Royal Albert Hall notwithstanding, it's going to be a while before computer synthesis replaces live musicians altogether. But computers are becoming an integral part of the music business, and it's definitely to the advantage of composers, arrangers, engineers, producers, studio managers and now performers, who want to stay ahead of the game to get comfortable with the new technology. Besides their 'traditional' (if you consider two or three years long enough to establish a tradition) uses in the studio, like accounts management, cataloguing, automated mixing and of course digital recording, computers are now becoming involved in the actual *creation* of the music.

The biggest drawback to getting involved with computerised synthesis is the price: $40,000 and up for a fully-equipped super-machine like a Fairlight *CMI,* a *McLeyvier,* or a *Synclavier.* The good news is that a goodly number of their capabilities are now available in a machine about one-tenth the cost.

Syntauri Corporation of Los Altos, California, has for the past couple of years been making a sophisticated system for digital music synthesis that uses an Apple computer as a storage and manipulation device. Known as the AlphaSyntauri Computer Music System, it is both a versatile performance instrument and a powerful recording tool. Perhaps most exciting, using an option known as *Composer's Assistant,* the AlphaSyntauri performs a composer's age-old dream: it can take input from a keyboard and print it out in musical notation. By itself, the Alpha (as its friends call it) costs about $1,800, and various very useful options add about $900. Add up the cost of an Apple, a monitor, a couple of disk drives and a dot-matrix graphics printer, and the whole system is less than $6,000.

The Alpha comes with either a 4-octave or, for a bit more, a velocity-sensitive 5-octave Pratt & Reed piano-type keyboard that plugs directly into one of the slots inside the Apple. A pair of music-synthesiser cards made by Mountain Computer take up two more slots, and of course the package includes several diskettes of software to run the whole thing.

The Mountain cards are what make the sounds; they contain 16 logical oscillators (actually one oscillator with 16 addressable control lines that are switched at about 32 kHz) that takes instructions from the computer to generate analogue wave forms. The analogue output appears at a pair of female RCA jacks wired to one of the cards, at a level high enough to drive a pair of headphones comfortably. (Mountain Computer also makes its own software for driving the cards; these diskettes come with the Alpha package, but are not used.) The manipulation and storage of notes and waveforms is done entirely in the digital domain, and the Apple's limited memory, abetted by standard 5¼ in floppy disks, is more than sufficient for the job. Unlike digital recording systems, there is no memory-hungry A/D conversion going on; there is only D/A conversion at the output stage.

The software comes in several parts. The basic synthesis software, known as *AlphaPlus,* allows for 10 'instruments' to be loaded into memory at a time, which can then be played on the piano keyboard. (The system comes with 'presets', on floppy disk, of 120 different instruments.) The choice of which instrument is 'live' is handled by the number keys (0 to 9) on the computer keyboard. An 'ensemble' feature allows several instruments to be played simultaneously.

Every instrument contains two voices, known as 'primary' and 'percussion' (the two voices appear at different audio outputs, giving the system a semblance of stereo) each of which has its own waveform and envelope control.

The *AlphaPlus* system includes several powerful methods of waveform control. Built into the software are algorithms for generating standard waves, like sine, sawtooth, triangle, and square, as well as a multitude of more complex forms. Using a program called *Quickwave,* the user can call up any waveform and adjust the relative amplitude of its first 16 harmonics, and then store the result for performance or for further modification. Using a somewhat slower programe called simply *Wave,* any four waveforms (standard or custom) and their harmonics can be layered on top of each other to create a new waveform, while the video screen displays a picture of the combined result. A third program, called *Draw Wave,* lets you physically draw the desired waveformes on the monitor screen in several ways using an optional pair of game paddles. This can be useful if you have a favourite waveform that you would like to reproduce and an oscilloscope to analyse it on. There are also programs for generating, with incredible precision, various types of pulse waves, and for simulating (better than any synthesiser I have come across before) the sound-generating and manipulating capabilities of a Hammond *B-3.* There's even a program for analysing the harmonic content of any pre-existing waveform.

The envelope parameters for the two voices that make up each instrument—attack, decay, sustain, and release—are displayed on the computer monitor screen as combinations of two letters and a number, usually from 1 to 255. For example, 'PR' is the attack rate of the percussion voice. Typing 'PR:255' on the computer keyboard gives that voice an immediate, strong attack, while typing 'PR:40' gives it a delayed, gradual entrance.

Other parameters that can be adjusted at this stage include setting the pitch of the instrument (adjustable in quarter-tones over a range of better than eight octaves); adjusting (or turning off) the velocity-sensing capabilities of the piano keyboard; enabling repeated attacks from one keyboard stroke; or accessing several special-effects programs such as amplitude modulation (tremolo), pitch bend, or 'timbre sweep.' The latter runs each played note through any or all of the various waveforms currently in memory, at a rate adjustable with the game paddles. In addition, the primary and percussion voices can be offset in pitch relative to each other in increments of 1/16 of a semitone, which can give a 'chorus' effect or even give each note two distinct pitches up to a major 10th (ie, 255 sixteenths of a semitone) apart. Vibrato (frequency modulation) can be added, using any waveform already in the machine (although a sinewave is most practical) and setting the depth and speed either from the computer keyboard or with the game paddles.

Furthermore, the entire system can be set up to detune A-440 to anywhere between 400 and 800 Hz, and if you want to get some seriously strange sounds, the keyboard can be instructed to divide each octave into anywhere from one to 32 notes.

The software allows the waveforms, envelopes, and instruments to be stored and manipulated in every conceivable way. Using the envelope and primary waves of a supplied instrument called 'Pipe Organ,' and plugging in a sinewave for the percussion voice while offsetting the two voices by an octave plus 3/16 of a semitone (ie, 195) gives a very respectable steel drum. (That was discovered purely by accident.) Within each bank of 10 instruments, waveforms and envelopes can easily be mixed and matched, and other forms can be brought in from other presets (as many as 20 banks can be stored on a single diskette) with a few keystrokes. You can also split the keyboard into as many as eight separate instruments.

While in the 'live' mode, two foot pedals come into play: one is used for sustain (if the envelope parameters of the voice are set up for it) while the other triggers portamento between played notes. Also while in the live mode, the computer's video screen displays a matrix of flashing bars that show which notes are being played. Each note has its own colour, which is of absolutely no practical use but is lots of fun to watch.

But using the AlphaSyntauri as a live-performance instrument is only a small part of the story. The system's recording program, known as *Metatrak,* allows a performance to be recorded, played back, and even looped (a feature which, for some strange reason, the system's designers have chosen to call 'echo'). For example, a 16-bar bass pattern, either monophonic or polyphonic, can be played on the keyboard, entered into the computer and saved on a diskette, and can be then played back, over and over in perfect time, while another line—melody, chords, or whatever—can be played on top of it. The second line can use the same instrument or a different one.

Changing the instrument playing either line takes only a couple of keystrokes—the software is only storing keyboard information (pitch, duration, and if you choose, velocity of the stroke), not real sounds.

In fact, up to 16 separate polyphonic tracks, each with its own instrument (actually, with only 10 instruments in memory, there will be *some* doubling) can be recorded and overdubbed in perfect synchronisation—all of the previously recorded voices are in 'play' mode while each new voice is laid down. The relative volume of each voice is adjustable, so that you can 'mix' while you are recording. The system even goes multitrack tape recording one better; if you like, you can add notes to a previously recorded track *without erasing* what's already there.

There is a slight problem when you get to really complex pieces: because the Mountain Computer synthesiser cards contain only 16 oscillators, two of which are used for each instrument, only eight notes can actually be sounded at one time. The software, however, allows for simultaneous recording of well over 100 notes, so during playback a clever feature silences the least-prominent instruments when there are more than eight. Even though you can't hear them, those notes are stored and can be recovered by playing each track individually.

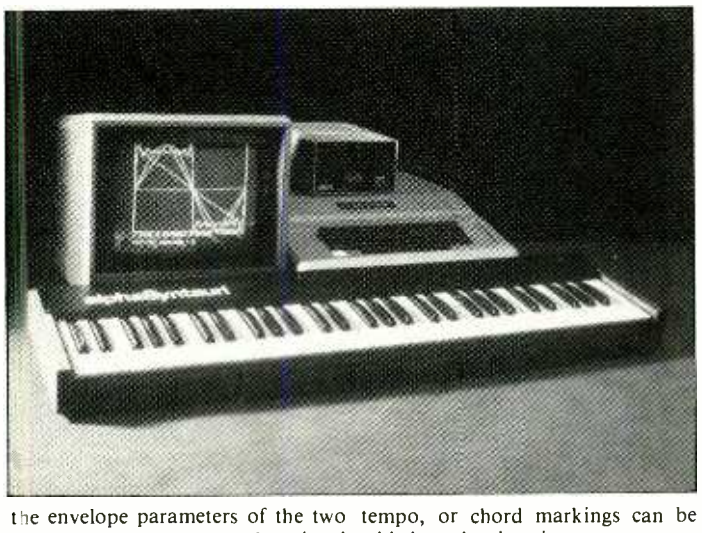
An adjustable metronome, which clicks through the Apple's built-in speaker (it doesn't show up at the audio outputs, but does remain in memory as long as necessary) helps keep everything together, and each track has very fast (no relays here!) punch-in/punch-out editing capability. There are no provisions for fast-forwarding in record or playback to get to a desired edit point quickly, as well as instant 'return-to-zero'. The system lets you change the speed of the music when starting record or playback and also allows for tempo changes within the body of a piece, which can then be stored and incorporated into the final mix.

For dumping individual tracks or groups from a *Metatrak* recording on to a multitrack analogue machine (one way of recovering dense orchestrations), there is a 'sync-to-tape' feature. This is accomplished by the computer writing a data word called a 'synchro-start pulse' on to the tape, which is outputted at the Apple's cassette-interface jack. When the tape is played back for subsequent passes, the machine recognises the word and locks up to it. (A word of warning here: Apple-compatible computers like the Franklin *ACE 1000* that lack a cassette interface cannot use this feature without modification.)

In addition, the AlphaSyntauri has provisions for interfacing with certain Roland, Linn, or Oberheim drum machines. This feature is particularly useful, as the manual admits, in that percussion sounds are not among the easiest to produce on the Alpha. The metronome pulse can show up at the computer's cassette output, and with the proper cable can serve as a trigger pulse for the drum machine. The drum machine is programmed in the usual way, but takes its downbeats from the Alpha.

If all this seems a little much, take heart. The designers have made the system very fast and easy to get going on: even a computer neophyte can be up and running in a few minutes, and anyone with multitrack recording experience can be comfortable with the *Metatrak* program in an afternoon. Of the 120 preset instruments that come with the system, quite a few are junk, but a sufficient number of them are worthwhile enough to occupy even a professional synthesist for quite a while.

But really getting *into* the system and making it work all its wonders takes time. If you're the knob-twiddling type used to Moog or ARP synthesisers, the plug-in-a-number approach will seem slow and clumsy for a while. For instance, there is no dynamic filtering—'swoop,' if you will—built into the Alpha. To achieve the same effect, you set one voice to how you want the sound to start, and the other to how you would like it to end, and then adjust



the envelope parameters of the two for a smooth, properly timed transition. But it's really not as hard as it sounds, and after a time, the amount and precision of control you have over the waveform and envelope generators, turn out to be useful indeed.

For example, the first day I got the system, I recorded two Bach fugues (one voice at a time) and orchestrated them so that each voice sounded on an organ with its own set of stops; in real life, this would have demanded five hands on a five-manual instrument. The next day I fooled around with some of the orchestral-instrument presets provided by the company and tried to make them sound more like the real things. Using these, I re-orchestrated the Bach, and also recorded a movement from a Mendelssohn symphony. Going back to the Bach the following week, I did an orchestration for a woodwind quintet (using modifications of a new set of instruments the company sent me) and another one for crickets, birds, and frogs, using a preset entitled 'Nature'.

By the end of the first month, I had done a couple of pop tunes I wrote some years ago (and at the time blew hundreds of dollars in an 8-track studio making demo tapes of), and an electronic improvisation. This last took me a half hour; the same thing during my student days in a traditional electronic-music lab, would have taken me a month.

As if all this weren't enough, there's the *Composer's Assistant* music-notation software. This latest addition to the AlphaSyntauri repertoire is not quite as fast or as elegant as I always dreamt it should be, but it will certainly do for now. It starts with a pre-recorded note file, stored using the *Metatrak* program. First it analyses the file, and then the screen asks you to define some parameters: tempo (if you record using the metronome and remember the setting, this becomes much easier) key signature, time signature, and resolution of the smallest note or rest: eighth, triplet-eighth, or sixteenth.

The computer then analyses and displays each bar on the video screen, where text like dynamic, tempo, or chord markings can be added, and prints it out on paper, using any one of a number of popular printers. Any one or all of the recorded tracks can be printed out, the music can be transposed, and the program can be told to shift the note attacks slightly to compensate for inaccuracies in keyboard technique.

Although the printout from *Composer's Assistant* is eminently readable (and usable for copyrighting purposes), it is not publishing quality. It will not 'beam' eighth or sixteenth notes; instead each note gets its own flag. If two notes pitched a second apart are played simultaneously, it will not shift the printed position of one of them; instead it will simply print them on top of each other. Ties are indicated by straight (not curved) dotted lines, and stems all point in the same direction: up. There are only three available time signatures: 4/4, 3/4, and 'free time'. This is less of a disadvantage than it might seem, in that in the 'free time' mode faint dotted vertical lines are drawn in at quarter-note intervals, allowing you to sketch in the bar lines easily after the score is printed out. Finally, the program only allows you to access about 1,000 notes for printing at a time, so if the piece you want to notate is longer (or denser) than that, you have to break it up into smaller chunks. But even with these drawbacks, *Composer's Assistant* is a terrific aid.

Of course, there are other problems with the Alpha that are unavoidable in a machine whose price tag is so reasonable. For one thing, it is fairly slow, especially in responding to instructions from the *computer* keyboard—although the piano-keyboard response is, as it must be, instantaneous. This is because different parts of the software are written in different languages: the real-time music instructions are written in assembler language, which is very fast, while the storage and design programs are in BASIC, which is a bit slower. This is unfortunately necessary if the system is to use the Apple computer as efficiently as possible. Another restriction is the size of the note files that the *Metatrak* program can record—about 3,000 notes, fewer if you are using the velocity-sensing feature—although a new hardware and software option, *MetaExtender,* with 20,000-note capacity, should be available by the time you read this.

Mixes in the *Metatrak* mode are static: the volume levels of each track cannot be changed within the body of a piece, so gradual changes and fades, while not impossible, are very tricky. The frequency response of the Mountain cards cuts off at about 16 kHz. By itself, this is no real problem, except that the software, with its huge pitch range, frequently generates harmonics well above that limit. Instead of just disappearing, these often send the oscillators into aliasing.

But probably the most important feature of its more expensive brethren that is missing from the AlphaSyntauri is that it cannot record *real* sounds and manipulate them. To accomplish this requires specialised hardware and software which the company considers 'feasible', but has yet to develop.

Being totally software-based it is easy to add features: the company updates the software constantly, and the new versions are made available to system owners at reasonable cost. When improvements are made, you can implement them into your system as fast as you can load a diskette into your drive (and read the new section of the operator's manual) and a strong effort is made to ensure that all new software is compatible with previous versions, so that your carefully constructed note files will not become obsolete. As long as there are Apple Computers, there will be AlphaSyntauri synthesisers. They'll just keep getting better. ■

business

Digitally mastered

If someone else doesn't complain to the Advertising Standards Authority about *Compact Disc* marking, then I'm going to. It's downright misleading for a record company to describe a *Compact Disc* sourced from an analogue tape as 'digitally mastered'. How else could a digital *Compact Disc* be mastered, other than digitally? First prize for cheek goes to Decca for its re-issue of a 1966 blues recording made by Eric Clapton and John Mayall. Although the paper sleeve note has the decency to acknowledge its analogue source, the disc itself is clearly labelled 'An original digital recording'. Before I complain to the ASA will someone in PolyGram please tell me what digital recording system they think Decca was using in 1966, when the rest of the industry was still breaking new ground with 4-track analogue. By the way, although this *CD* has been slagged off for its poor audio quality, to my ears it's nothing more or less than a clean replica of what a 1966 recording of a rock band sounds like, fuzz and all. This kind of material sounds better with a bit of analogue masking. The distortion is just too much when you strip it bare with a *CD* transfer.

Anti-digital

Some sections of the hi-fi press are currently mounting an anti-digital campaign that verges on hysteria. *Compact Discs* they will tell you, sounds terrible, and does awful things to the music and listener alike. The 44.1 kHz, 16-bit technology is, according to them, the provisional wing of the analogue protection society, nowhere near adequate as an audio standard for the future. They may be right. But why didn't they sound their warnings two or three years ago, when the standard was still being discussed, rather than now when it's fixed?

Inevitably, some people reading all this anti digital venom have started to put two and two together to make five. A very senior executive in the classical division of a British record company, was so worried about it all that the complained to his technical staff about distortion from his Tannoy *Lancaster* loudspeakers. "I am sure it has been caused by listening to *Compact Disc*," he told them.

The engineers took the speakers off to the lab and came back next day with a paper bag. "This seems to be the problem," they told the executive. The bag was full of jelly babies, plastic spoons and ballpoint pen caps. The executive's young son had been pushing them through a small hole in the speaker grill. Not surprisingly the cones started rattling. Doubtless we shall now read that high frequency distortion in digital audio upsets young children so much that they are compelled by an unseen force to try to damp it with jelly babies.

CD portability

Compact Disc has really arrived; the BBC has now had a player stolen. It was left unattended in a studio and promptly disappeared without trace. Now producers who want to use *Compact Disc* in their programmes, have to have a player sent over specially from the engineers and promise never to let it out of their sight.

All the BBC players are standard Sony domestic units. Recently I found out by practical experience that these players aren't as tolerant of faulty discs as the Philips or Marantz units. What's more, not all Sony players behave in the same way. Discs with blemishes bad enough to cause 'groove locking' on a Sony may play straight through on a Philips or Marantz, with quite tolerable sound quality. A small blemish, invisible to the naked eye, can be more trouble to the player than a large spot blemish that is clearly visible. This is because the key factor is the length of the blemish, not the width.

The Sony domestic player has a switch on the rear which puts anti-shock circuitry on or off. With anti-shock on, the player is better able to cope with what one Sony instruction book quaintly calls 'a hostile environment', a rickety table or springy floor, for instance. The servo loop is tightened and the laser just keeps on tracking. Akio Morita, boss of Sony, tried running his home player round the room on top of a vacuum cleaner. Then, with a battery power pack and voltage converter, he drove it in a car down a bumpy road. With anti-shock on, the Sony player will also cope with some blemishes that defeat it in the off position. But the player copes with surface faults better with the anti-shock circuit off because the laser doesn't focus on them so smartly. And a blemished disc may refuse to play on one Sony player, but track reasonably well on another, regardless of switch position. For broadcasters there's the added confusion that when a Sony player refuses to track a disc, it rejects it and you may then not be able to play anything past the blemish.

All this of course explains why Sony is developing broadcast players. They are too bulky to be stolen and, hopefully, won't suffer from the vagaries of the domestic units. Expect more and more interest from Sony in broadcast *Compact Disc* technology. I've recently noticed patents issuing to the company on broadcast *Compact Disc* technology. For instance there's a buffer memory system which enables a disc jockey to cue up to split second accuracy. A packet of digits is stored in memory to fill in any gaps in the data stream which are created as the player is switched in. As I said, *Compact Disc* has arrived.

Holophonics

But has holophonics arrived? The 45 RPM, 12 in single of holophonic sound effects promised from CBS was originally scheduled for release in Britain early in May at a shop price of around £3. But CBS then admitted that release had been delayed until early June. Then they told enquiring callers that release had been delayed until late June or early July. By the time you read this, it should finally be in the shops. Why the delay? By early June CBS had tried seven times to cut the Sony PCM master tape on to disc. The dynamic range of the sound effects was just too wide.

Almost certainly much of the popular enthusiasm for holophonics has been generated by people who have heard Zuccarelli's tapes played direct from a digital source over headphones. They have been hearing binaural stereo with a dynamic range of 80 or 90 dB. But as soon as you try to put this on to analogue disc, you have to limit and compress drastically or end up with background noise and overload distortion. This all detracts from the binaural effect. But try explaining this to someone who has never heard dummy head stereo, and thinks dynamic range means loud.

On May 30th, *The Times*, the newspaper that supposedly helps you to be better informed, described holophonics as 'the latest breakthrough in surround sound'. But, *The Times* went on to report that 'those who have heard Zuccarelli's trials...were impressed by the illusion'. Does this mean that the man from *The Times* was reporting a 'breakthrough in surround sound' that he hasn't actually heard? Mind you in the same article he also reported that 'of the six tracks on a *Compact Disc*, only two are being used', and that 'nowadays no studio could survive without a 48-track console'. With such a penetrating misunderstanding of the audio business, it is probably marginally better that he concentrates on writing about what other people think.

CBS finally released the Zuccarelli record at the beginning of July and celebrated the event with a press conference. Although I'd been phoning CBS regularly since May, asking for updates on the Zuccarelli cut, I didn't hear about the press conference until afterwards. "It slipped our mind," said CBS. As anyone who has dealt with the CBS press office will well know, that rings true. A hi-fi journalist, who had been phoning CBS even more often than I, also never heard about the press conference until afterwards.

But CBS did rally round with copies of the record. The sleeve note, written by Zuccarelli himself, and the press release, which quotes Zuccarelli, are far more interesting than the recording. For instance, the sleeve note baldly advises the listener that if sounds are heard from the rear, rather than the front: 'something has gone wrong with your equipment, or your headphones or your ears'. There's no mention of the fact that many people can't get a frontal image from binaural stereo!

Zuccarelli also says that he is "...currently speaking to a number of companies who would like to develop holophonic loudspeakers and headphones" and "...we shall be pleased to offer our experience in the field of holophony by issuing a holophonic guarantee certificate for all the products which we shall be marketing under our registered trademark of Zuccarelli Labs Ltd".

So there you have it, anyone who can't get a frontal image from the CBS sound effects record is a potential customer for equipment licensed to carry the Zuccarelli trademark. But what if there's still no frontal image? Will there be Zuccarelli ear drops to improve hearing?

When I met Hugo Zuccarelli and Mike King, they were both at great pains to say that they had not sought publicity for what they call holophonics. I was especially interested, therefore, when a familiar voice piped up from the audience at a public demonstration of Dolby cinema sound staged at the National Film Theatre recently. "What about new techniques, such as holophonics?" asked the voice from the audience, without identifying himself as Hugo Zuccarelli, inventor of what he calls holophonics.

The next day a friend of mine saw Zuccarelli's record in his local W H Smith, at £2.99, in the *humour* section rack alongside a *Fawlty Towers* LP. ■

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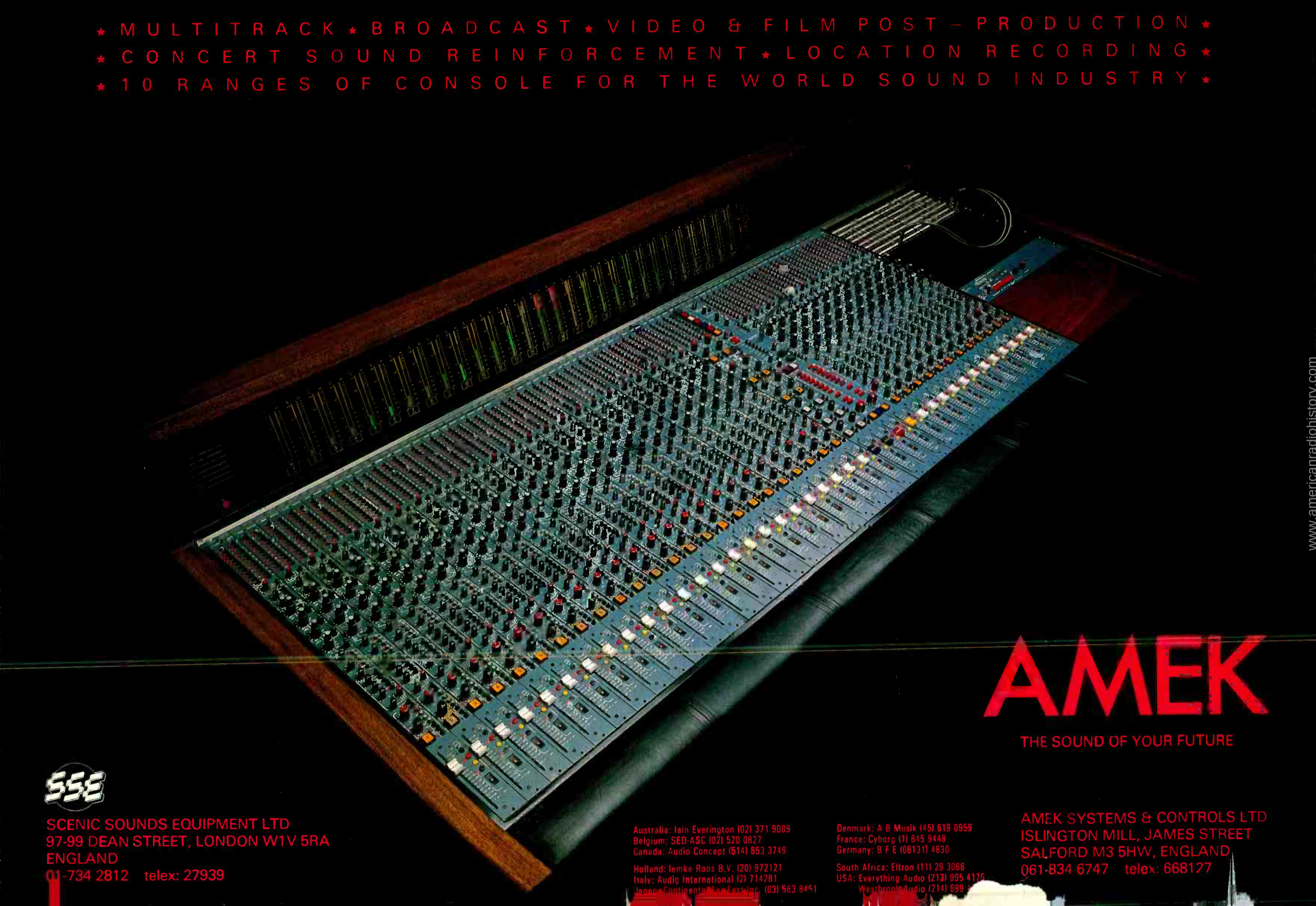

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This article discusses the potential role of industrial psychologists in the field of sound engineering. A recent *Studio Sound* editorial said that to the vast majority of the British recording industry, the concept of training is somewhat incomprehensible and unnecessary but there are developments that suggest our tried and trusted methods of producing engineers may be quite unsuited in many ways for the recording industry of the future. The author goes further and suggests that such practices are unacceptable now.

Industrial psychology

and its future in sound engineering?

Gerard Paul Hodgkinson

Industrial psychology has been defined as 'fitting the man to the job' and 'fitting the job to the man'. The former incorporates vocational guidance, personnel selection and occupational training and development, whereas the latter comprises the development of methods of work, equipment design and layout and the arrangement of working conditions and rewards. In summary, the role of the industrial psychologist is one of reducing problems at the interface between people and the jobs they perform.

This enterprise is gaining added importance as industries develop ever more complex and sophisticated equipment placing additional demands on their operators. In the field of sound engineering this is particularly true of mixing consoles. Consequently, the increased operating demands placed on the sound engineer by these devices must be matched with his abilities, capacities and limitations, if man and machine are to function at an optimal level of performance. Here industrial psychology has much to offer.

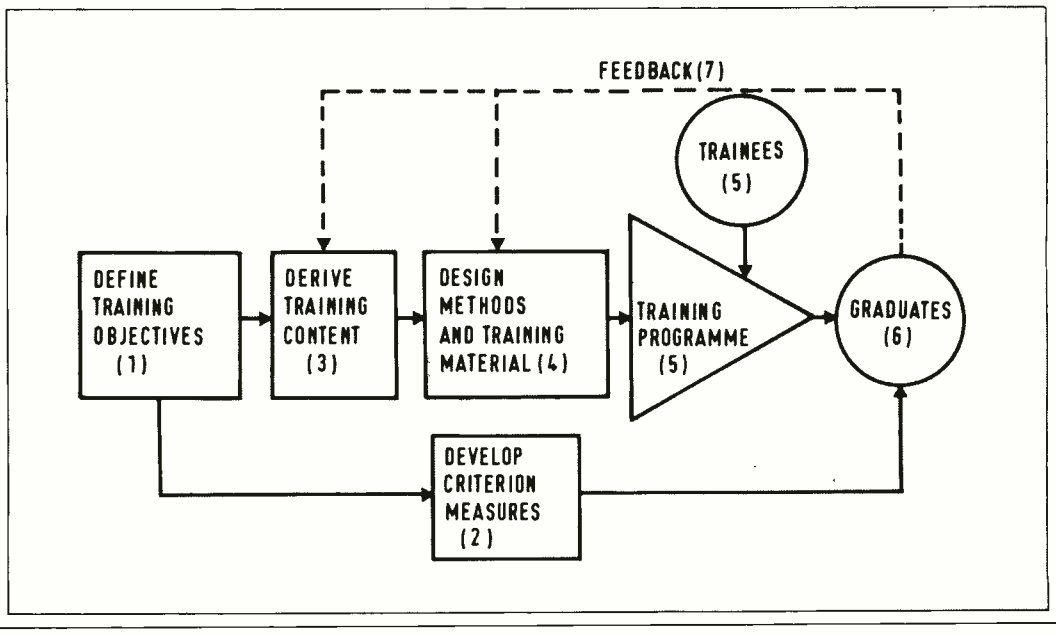
Training

Psychologists are making considerable contributions in the field of training[1]. Establishing an adequate training programme is by no means a simple procedure as **Fig 1** shows. Such a flow diagram is characteristic of the systems approach, helping us to represent the process at work and how its parts interact.

Firstly, the objectives of a particular training programme must be defined (1). From this it is then possible to develop criterion tests (2), ie measures indicative of the extent to which people have attained these objectives, after training. An interesting point here is that, ideally, if the people 'fail' such tests then it is not they that have failed but the system. A third stage is to specify what should go into training for these objectives to be met (3). The next stage involves actually devising training methods and equipment in order to present information to the trainees (4). The trainees and material come together in the training programme (5) and the trainees emerge as graduates of this programme (6) (not necessarily, of course, as university graduates). They are then judged against the criterion measures, any discrepancies causing modifications to be made in appropriate components by virtue of the feedback loops (7). For example, if one test item was repeatedly failed then a new method of presenting it may be needed. Alternatively, the information presented may be inadequate and thus the training content may need changing (mod 3).

The industrial psychologist, with his knowledge of human performance, is able to make significant contributions at each of the stages outlined in the above diagram. For example, analytic procedures have been devised in order to ensure that the content of a training scheme closely follows its objectives[3]. Yet all too often training courses have evolved in a subjective and unsystematic manner. The situation is even worse in the field of sound engineering where the majority of

Fig 1: Ideal training system (after Eckstrand[2])



engineers receive no formal training. Skills are handed down by way of tradition. This gives rise to the possibility that many unskilled behaviour patterns or habits may unwittingly change hands along the way.

The psychologist, however, is able to devise 'training regimes' under which the trainee receives instruction in a manner conducive to optimal learning.

Selection

The design and evaluation of recruitment schemes is one of the oldest and best known areas of industrial pyschology. Because of widespread differences between individuals in terms of the characteristics they possess, some are better able than others to perform a given job. Personnel selection is the process of choosing from among the applicants those who are the most likely to succeed at the job by virtue of the fact that they possess the required abilities, aptitudes and other characteristics necessary for adequate performance.

A whole range of abilities are required if a trainee is to become a successful sound engineer. But precisely what abilities and to what extent a person must possess them is impossible to determine *a priori*. First, a detailed analysis of the job and its component tasks must be undertaken. This will give rise to a more precise description of the abilities required in order to perform the job successfully. Only then can an adequate selection scheme be devised.

The psychologist, with his knowledge of test construction and evaluation is able to formulate procedures that will enable companies to identify from the applicants those individuals who possess the necessary traits and abilities required by the job.

No amount of training will compensate for a basic lack of aptitude. A properly developed and tested selection scheme may reduce the personnel turnover rate by as much as 80% or more.

Ergonomics

We turn now to the other side of industrial pyschology, namely, that of fitting the job to the man. Whilst the necessity of an ergonomic approach to the development of mixing consoles has been well documented in *Studio Sound*[4], designers continue to stress electronic considerations as the major criterion of system effectiveness. For example, even Steve Dove's epic series on console design devoted little more than a handful of paragraphs to the significance of human factors. As far as we are aware, there have been no studies published to date pertaining to the ergonomic evaluation of sound mixing consoles. Certainly, none of the main ergonomics journals (*Ergonomics, Applied Ergonomics* and *Human Factors*) contain any reference to these devices.

It is of major importance that such research takes place and to this end the author is currently engaged in an investigation in the Department of Psychology at the University of Hull[5].

The project stresses the development and application of general ergonomic principles to mixing console design. Many desks currently on the market are badly designed in terms of human factors. This is poor because the level of performance for a given task is determined neither by the characteristics of the machine alone nor by the isolated features of the operator. Rather, it is from their combined functioning as a 'man-machine system' that the quality of performance is derived[6].

Fig 2 depicts the sound engineer as a component of a 'man-machine system'.

In essence the system comprises an operator who acts as sensor, information processor and controller placed between the controls and displays of the mixing console. The displays constitute the link from machine to man. A display consists of anything that conveys information to the operator about the state of the machine. Thus the position of the console control knobs, the VU meters and the sound coming from the studio monitors or PA system each act as a display to the sound engineer.

Having processed the information furnished by the displays the engineer must formulate some form of response which he then communicates back via the controls of the mixing console. In this way the engineer functions as part of a closed-loop system.

In terms of mixing performance, this means that no matter how well developed a console may be from an electronics point of view, unless due consideration is given to human factors, the system will continue to function at a sub-optimal level. Not only should the controls be designed and laid out in accordance with anthropometric data (ie data pertaining to the dimensions of the human body) but the coding of controls and the legibility of displays are of equal importance. What, for example, is the earthly use of colour coding knobs on PA desks, when so often the operator performs under conditions of extremely low illumination? In any case the assignment of colours to specific functions varies widely between different types of desk.

Clearly a more effective coding must be developed.

There is a wide range of meter displays currently available on the market (eg analogue, bargraph and LEDs) but which type best informs the operator of the state of the system?

Such questions cannot be readily answered by reference to ergonomics handbooks alone. Many of these matters must be addressed empirically by means of experimental studies. It is here that the industrial psychologist is of particular value since he has received a thorough training in research methods. The author is currently in the process of devising a simulation of the task of mixing console operation, in order to ensure the precise control of variables whilst addressing these and related questions.

Following the initial laboratory trials under highly controlled conditions, field trials must take place 'on the job' in order to ensure the laboratory results are valid.

Conclusion

By now it should be apparent that the industry could benefit greatly from the services of industrial psychologists at a time when higher standards of skill are required from the sound engineer in the face of increased demands placed on him by the new generation of equipment he will soon be expected to operate.

The industry will have to develop improved selection and training procedures and devote much greater attention to ergonomic considerations in the design of equipment if its objective of increased standards, or indeed the maintenance of present standards, is to be realised. However, this can only be accomplished if the industry provides the funding necessary to conduct badly needed research in each of the areas outlined here. ■

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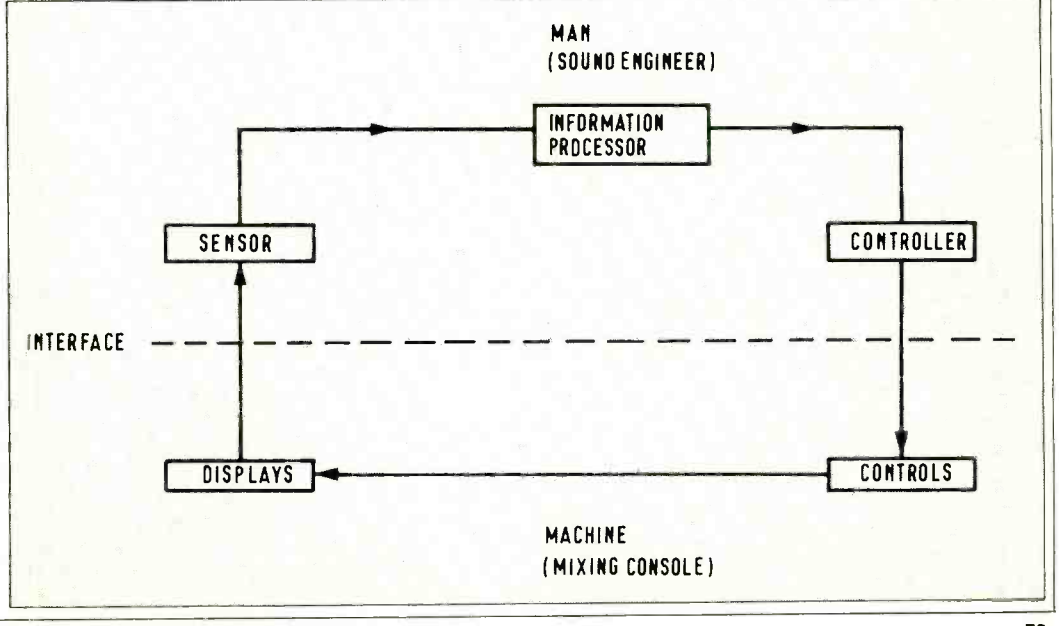
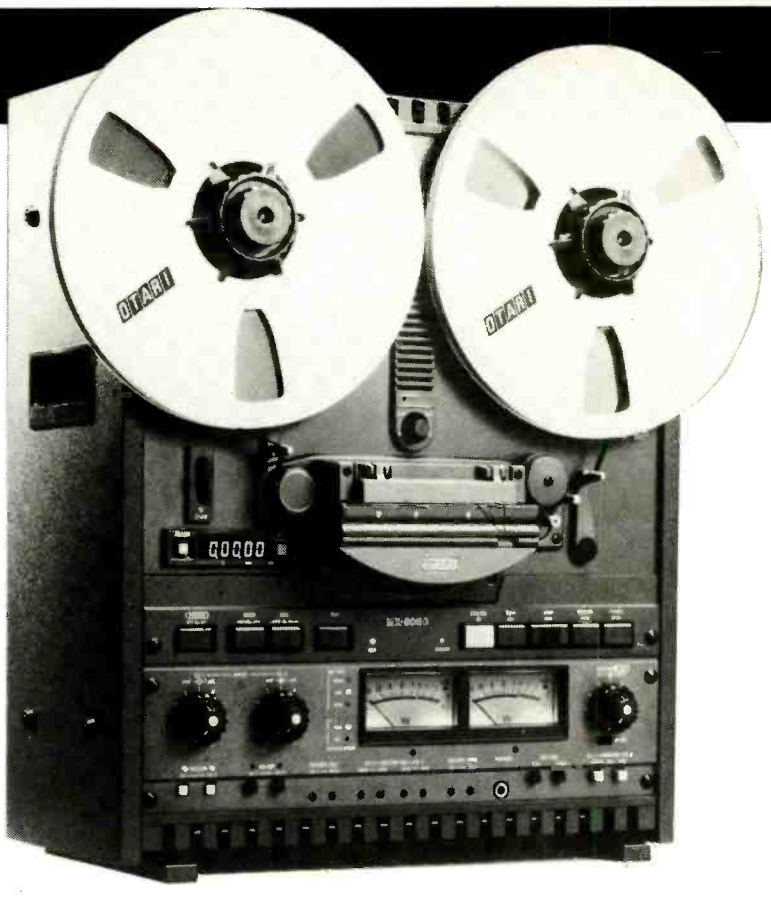
Fig 2: The man-machine model applied to the task of mixing console operation



Otari MX5050B2



THE *MX5050B2* is one of the latest additions to the *MX5050* series of tape machines from Otari. It is basically a 2-track on ¼ in machine although there are options that offer different head configurations such as full-track mono, DIN version stereo ½-track and ¼-track stereo. The machine falls loosely into the category of transportable-type recorders being equipped with substantial inset handles on the side panels, but permanent installation is also a possibility.

Designed for vertical and horizontal operation the *MX5050B2* has plastic strip feet on the underside and four round rubber feet on the back. Used in either postion there is still plenty of room for ventilation through the underside vents and there is plenty of clearance in horizontal operation for *XLR*-type connectors placed in the rear sockets of the machine.

All input/output sockets are positioned at the rear of the machine with the front panels containing all the standard access controls for the electronics on a panel the width of the cabinet under the transport controls which are in turn below the transport deck themselves. The machine is finished in a practical dark grey and black with white inscriptions, the deck and electronics panels have a satin-type finish and the side panels are textured.

Transport

The transport system is of a fairly standard design using three motors; two 6-pole induction motors for the reels and a direct drive DC servo motor for the capstan drive. The machine will run at tape speeds of 3¾, 7½ and 15 in/s although only the higher or lower two speeds can be operative at any one time. Conversion between the two sets of speeds is done by an internal switch and although I didn't attempt this, it would appear to be fairly simple. I was mainly concerned with the use of the machine for mastering and copying and so it was left to run at 7½/15 in/s.

The deck will handle up to 10½ in NAB reels which will hang over the top and sides of the machine by about 2¼ in. The reel clamps provided are excellent and fitting an NAB spool simply involves positioning the reel over the clamp in the right position and then lifting the outer ring of the clamp and then giving a small twist leaving the spool very firmly held. Also supplied with the machine were two plastic shims for spool height adjustment when using plastic or metal reels. Under the NAB spool clamps, the platter centre will take standard cine centre spools.

The tape path is fairly straightforward with the tape leaving the feed spool passing on the inside of a tape tension arm, around a roller with a hard rubberised covering and into the headblock. On leaving the headblock the tape passes between the capstan and the pinchwheel, inside a fixed guide, around the tape tension/transport shut-off swinging arm and on to the take-up spool. Tacho pulses for the tape position indicator are derived from the movement of the roller before the headblock. The purpose of the fixed guide after the capstan appears to be to hold the tape between the capstan and the pinchwheel (ie not touching either) when tape is loaded but the transport is at rest. In the play mode it increases the amount of tape that is actually in contact with the pinchwheel.

In the headblock lies the first of a number of useful features on this machine. The cover is hinged from the rear and when raised reveals four heads. Being a ½-track stereo machine there are the standard erase, record and play heads but with the addition of a 4-track, 2-channel head situated between the erase and record heads for the replay of 2-track recordings made on a ¼ in 4-track machine. This will be most useful in any environment where you may handle a mix of formats. Selection of replay heads is operative by a slide switch situated at the rear of the headblock under the hinged cover. Although this switch is clearly marked for function, there is perhaps a case for some front panel indication of the selected head for replay.

There are three fixed guides within the headblock and these form the major part of the fixing of the headblock to the chassis. All the heads are mounted from under the headblock top plate and have full adjustment facilities for azimuth, etc, available on hex nuts with very easy access. There are two tape lifters positioned inside the two heads on either side of the headblock. These keep the tape clear of the heads in the fast wind and stop modes. A locking lever to the left of the headblock will prevent the lifters from pulling the tape off the heads when required such as when editing. The wires from the heads mount on a single PCB which in turn mounts into an edge connector. The two replay heads are well screened however there are no head shields. In all the time I was using the machine there was no problem from this lack.

From the practical user point of view the headblock design, and even the whole transport is very convenient. With a little practice there is no problem in lacing the tape with one hand should you ever have anything better to do with the other. The lack of head shield of course makes editing, or at least the marking of edit points on the tape, much easier. Cleaning is also a very easy operation and the complete design shows a lot of thought.

Mounted on top of the hinged headblock cover is a metal splicing block. This is of the convex groove type which holds the tape pushed into the groove. It provides 90° and 45° cutting angles. Along the top side of the block are three arrows and these indicate the head position under the headblock with the 90° cutting angle aligning with the ½-track replay head. My first reaction to these marks was, however, that they were referring to the actual positions of the heads with relation to the tape in the splicing block although this is not the case. I have a preference for working in front of the heads rather than on the headblock above them when editing. I think this is rather better practice with regard to tape safety although this is of course a matter of personal choice. The integral block would be useful for those times when you have to record

remotely and realise that you need to edit but have left the editing block back at the studio—not the best of times to try and learn to edit with scissors again.

To the left of the headblock is the tape timer giving an elapsed time reading up to a maximum figure of 9 hr 59 min 59 s in a very readable ½ in digital display. The reset button to the right of the display returns the reading to zero and the memory button to the right will stop the transport when the display reads zero in the rewind mode. The display is 'intelligent' in that when travelling away from and below the zero point, the display starts to increase in time but with a minus prefix.

The tape transport controls are large push-button types with a positive action and a travel of about ⅛ in. From the left hand side, the power on/off button comes first with the only power on indication being the illumination of VU meters and the two yellow LEDs that will be covered later. Next to this comes the speed switch and the reel size tension switch. The edit button which follows, removes the power from the take-up reel and is used when dumping tape after editing. Indication of this mode is given by the illumination of a green LED. All the switches mentioned so far have side guards to them and this obviously reduces the chances of knocking them. To the other side of this panel are the straight transport controls for play, rewind, forward wind, stop and record. All the controls have full logic and the transport is very stable with very little chance of actually making the transport throw a loop. Removing the mains power in fast wind or play brings the tape gently to rest with the lifters remaining out.

There is a varispeed control situated just above the headblock. This control will give a range of ±7% of the selected speed on a rotary pot. The mode is engaged by pulling out the knob which illuminates a nearby red LED. The varispeed can be used in both record and replay modes so a little care should be taken in some circumstances—masters recorded at 16⅛ in/s are not a popular commodity. The only criticism I have is the fact that when the varispeed is engaged, it is useful to know what the normal speed is so that it becomes easier to move up or down in speed from that point—either an indent in the pot travel or some form of marking on the knob cap and surround. The *MX5050B2* unfortunately has none of these and there is no way of judging the speed selected on the control. This also makes repetition of varispeed settings difficult.

Entering the record mode is by pressing the record button as or after play has been selected. The record mode can be entered even without the record ready position being selected. This means that drop-ins can be made with just one button—the record ready. Although a useful feature, I cannot think that it will be very often used on a 2-track machine although it certainly would on a multitrack. Before the record mode is selected, selection of the record ready button causes the record LED positioned near the record button, to flash. When the record mode is entered, the illumination is continuous.

Electronics

The electronics control panel is below the transport controls. To the left hand side are two large dual concentric input level controls, one each for left and right channels with the centre knob being for the mic input level and the outer for line input level. Below the left hand channel control is a pair of orange latching pushbuttons and these are the record ready switches for each channel. The record mode can be entered without these being selected but no actual recording takes place until one or both of these are selected (see previous paragraph). When engaged, a red LED above the switch illuminates as does the record LED in a flashing mode as previously described.

To the right of these buttons is another pair in black, labelled 'Sep-Rep' with green indicator LEDs. Selecting one of these, switches the monitor on that channel to the record head to allow sync monitoring should you wish to record on the other channel in sync. As you can see this is a proper 2-track recorder.

Metering is with a pair of good sized VU meters which are well illuminated and easy to read. Within the meter housing is a peak reading LED that fires when the standard level is exceeded by 9 dB. In this case standard level is 185 nWb/m at 700 Hz and so a reading of 9 dB over this will be 520 nWb/m. The firing point may be adjusted.

To the right of the meters is another dual concentric knob for output level. The left channel is the outer control and the right, the

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inner. Just below this knob is a semi-recessed slide switch that enables selection of the SRL, standard reference level and this deactivates the output level control knobs. In the SRL position, the output level is determined by the position of the record level switch on the back panel which I will come to later. Indication is provided by a red LED. As the switch is recessed there is little chance of entering this mode by accident.

Below this are a pair of yellow latching pushbuttons for monitor source select—line in or line out. With the output controls in the normal mode (not SRL) it took a little getting used to to find the levels set with the output controls were the ones displayed upon the meters rather the meters being independent and reading a set-off tape level. To the left of these switches are another pair of switches that select 1 kHz and 10 kHz from the internal test oscillator. These tones are automatically fed to the line input when the switch is selected.

There then follows a stereo headphone jack, and alignment controls with holes in the front panel allowing screwdriver adjustment of presets for record bias, high and low record EQ and record level.

The only items not covered on the front panel so far are the LEDs for the rear panel selectors.

Rear panel

The rear panel contains the usual rear panel fittings in this case being IEC mains lead socket, grounding post, a multiway socket for connection of the remote control box, *XLR*-type sockets for line input and line output both being balanced, a separate mic input *XLR* socket also balanced and below these, four slide switches. From the left, we begin with the 2-position output level switch which will set the previously mentioned SRL output to either the +4 dBm or −10 dBm levels. Next to this is an equalisation switch to select NAB or IEC operation. The selected EQ is displayed on the front panel by a pair of LEDs.

The third switch is for record level selection and it offers three positions low, medium and high being referenced to 185, 250 and 320 nWb/m respectively. The handbook gives further details about relative dB levels and corresponding test tape reference levels as well as which tapes are more suited for the different levels. The selected position is also displayed on the front panel LEDs. The final switch is the mic input attenuator. This is a 3-position switch giving 0 dB attenuation on the −70 dBm minimum input sensitivity, 20 dB attenuation and an off position with mic input shorted to ground.

Remote control

The supplied remote control *CR-705A* is not standard but an optional extra. It is connected to the rear of the tape machine by a captive multiway cable of approximately 14 ft. It is housed in a black box with brushed aluminium top panel and ends. It has four feet underneath and enough bulk to prevent it sliding around under the weight of the cable. Functions are fairly standard with record, play, stop, rewind, forward wind with a red LED over the record button.

In use

It is difficult to know how much to expect from a tape machine in the price range of the Otari *MX5050B2*. Using Ampex alignment tapes and the NAB equalisation setting, I was able to achieve a very flat frequency response from 50 Hz to 15 kHz within ±1 dB at 15 in/s which I consider to be pretty good for a machine of this price range. The alignment also held despite being moved around and the occasional tweak was sufficient to hold it in over the space of a month.

The record electronics are quiet and the overall performance of the electronics with Ampex *456* was quite satisfactory. Operation at 7½ in/s was also good although I only use this for copying and this it did quite well enough for any application.

The transport is reliable and dependable—there was no trouble over the six weeks that I had the machine. It was very quick to start and 'almost instantaneous' in reaching correct speed at all reel positions. There were two minor points that were a little annoying—the transport is a little clanky although this is not unusual for a machine in this price range. By this I mean that when pushing play, the noise of the capstan and pinchwheel engaging meant that it would be difficult to record in that same room if instant starts were required—the noise of the start would be recorded. The second point is that on the test machine the capstan made a slight acoustic hum when powered up and this would also make the recording within the close proximity of the machine difficult. These of course are only problems if you should have to use the machine within these close conditions and also tend to be present in other machines of equally well known brands to greater and lesser degrees.

The counter accuracy is very good with discrepancies of only about 2 s over a complete reel in the play mode. If you give the machine a very hard time, ie fast wind, reverse direction to full speed and then play, etc, over a complete 10½ in reel, then returning to the same counter position revealed an error in tape position of about 4 in—who could ask for more? Fast wind was quite fast enough with the speed appearing to reach a maximum and then stabilise at that speed. This gives a fast wind time of 105 s with Ampex *456* for a 10½ in reel. With this tape and a selection of others, the wind quality could only be described as average but this is a common problem with machines in this price range.

Conclusions

As I began the last section by saying, it is very hard to make judgements about tape machines in this price bracket as there must be some compromises somewhere in the machine at that price. It really has to be judged as to whether any shortcomings on the machine in comparison to fully fledged studio machines, will be to the great detriment of the application and quality of recordings made on it. In the case of the *MX5050B2* I have used this tape machine as I would any other and have not made any allowances in operation. I have listed all the problems I found and I tend to think that when they are cross referenced to the price of the machine there is very little to justifiably criticise.

The *MX5050B2* has many very good features—the second replay head, the switchable levels, the mic attenuation facility, the easy access to alignment controls, the easy tape threading and editing, the sensible design throughout and the overall 'good feel,' etc. In short a recommendable machine at a good price that will find useful applications in a whole host of areas.

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Soundcraft 2400 multitrack console

Richard Elen

The Soundcraft *2400* console and *SCM-762* 24-track tape machine are available as a package, providing the studio owner with an economical method of entering the 24-track recording market. The package is proving very popular, and Richard Elen's evaluation of the *2400* is based on several months' use of such a system. In common with all our User Reports, this article concentrates on operational matters and does not attempt to include objective measurements: it is intended as a guide to people looking for this kind of console, and should be considered along with technical information supplied by the manufacturer and technical reviews where available. The Soundcraft multitrack machine has been reviewed by Hugh Ford previously, in the January 1982 issue of *Studio Sound*. The console under evaluation in this article is that installed at Nuptown Studios, Cruchfield Manor, Berkshire. The system has been in use for about a year.

THE Soundcraft 24-track package is designed to offer a cost-effective upgrade or entry to 24-track recording, and is aimed at the budget-conscious smaller studio. The *2400* console is available in a number of forms, with or without automation and with different metering options—the model under evaluation is based on a 28-input frame with 24-track monitoring and analogue VU metering with +8 dB LED peak indication on all tracks plus stereo mix buss. The Cruchfield unit is fitted with 24 out of the possible 28 input modules.

Console

The *2400* is a fully-modular recording console of the split-group ('European') type in which the group faders and monitors are separated from the main (input) channels. Notable features of the console include three solo modes (PFL, AFL and 'Solo-in-place') two of which are available on the monitors as well as the main channels, basic EQ on the monitor channels, and the ability to utilise the monitor panel as an extra 24 line-level inputs feeding the mix buss during mixdown. The *2400* is based around three main types of module: input; monitor; and master. The stereo mix buss is independent of the track busses and normally feeds the monitor speakers as well as the stereo mastering machines. This means that at any point in the recording process a monitor mix can be dumped on tape without replugging or reconfiguring the console. A semi-programmable dual mute system is fitted which enables two groups of user-selectable main channels to be muted by pressing one of two master mute buttons. A comprehensive patchbay is incorporated in the right-hand side of the console and allows access to most points in the console audio path with the exception of the mic amps. Insert points are provided in the main channels, the groups and the stereo mix buss.

Input channel

Fig 1 shows the layout of the standard input module. The majority of functions are actuated by white engraved pushbuttons which are quite closely packed in the routing section but are still easy to locate. Due to cost considerations, few of these buttons have LED indicators.

The input to the channel is derived either from a mic amp or from a line input (normalled to the 24-track returns) and is selected by means of a pushbutton marked 'LI'. Above this is the mic amp control section. At the top is a phantom power pushbutton which supplies 48 V standard to the *XLR* mic input socket. Below this is a 30 dB pad button which operates only on the mic input. After this is a gain control, consisting of a 41-detent pot (a type used extensively on this board) which gives a positive and repeatable control setting of the input gain between −70 and −30 dB sensitivity. The detent system is very useful in defining a specific control position, but the detents do not always correspond exactly to the marked calibrations—however, the knobs are of the collet type and are thus easily readjusted if this is the case. The combination of mic gain and pad gives a useful 70 dB range of control which means that not only can the mic input accept high levels from a mic or DI box; it can also accept most line-level inputs, such as synthesisers, directly into the *XLR* mic socket. This capability is utilised at Cruchfield by means of a tie-line panel of *XLRs* on the floor of the control room under the desk input panel (which is on the rear underside of the console). Lines come in here both from the studio and from a dozen or so lines terminating in *XLR* and ¼ in jack sockets on panels on the rear wall of the studio, where two shelves carry a large number of synthesisers. These can thus be plugged into the console directly via *XLR* patchcords between the tie-line box and the console inputs. We have yet to suffer any problems of excessive level which cannot be handled by the mic amp gain structure controls.

Under the mic gain control is a line trim pot calibrated from −10 through 0 to +20 dB, controlling the line input gain, this input appearing on the patchfield, and normalled to the 24-track returns for mixing. Beneath the mic/line switch is a phase button which acts on both mic and line inputs—a useful feature.

Beneath the input section is a highpass filter—again with 41-position detented potentiometer—actuated by a pushbutton. The knob cap is orange for easy identification, and the HPF has a 12 dB/octave characteristic variable between 50 and 800 Hz. There have been few occasions where I have wished for an LPF here in addition, and the HPF is very effective for removing hum components in nasty guitar amps, and tidying up bass drums (in conjunction with EQ) when no amount of mic technique, tuning or damping appears to do the trick.

This brings us to the main equaliser section, which has four areas of control, in the form of HF, two mids and LF. A pushbutton selects 8 or 16 kHz at the HF end, with ±15 dB of control available on a centre-detent pot. There are times where I have found the 8 kHz setting too low and the 16 kHz too high, and I have wished that the HF end offered 10 kHz instead of 8, but this is a very minor consideration. The 16 kHz capability, on the other hand, is a great idea and especially good for vocals. The range of control is good; 15 dB is enough for anybody, and I have never used all 15 dB at once, in either direction, but despite this wide range, the control is very smooth and subtle nuances of HF EQ are

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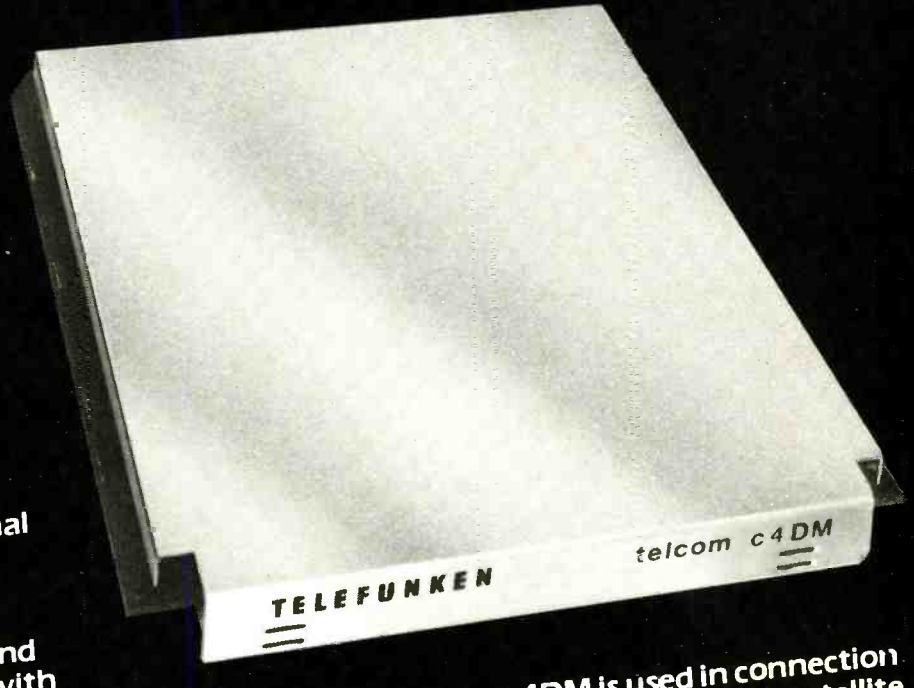

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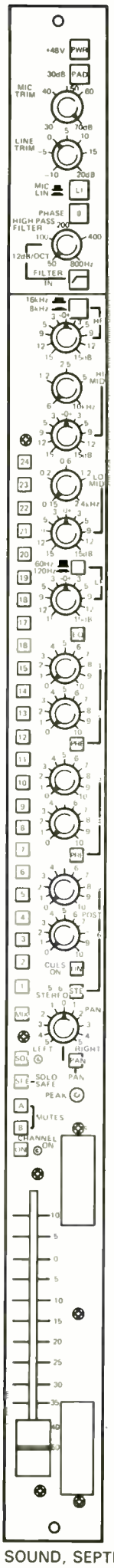
FIG. 1



reviews

well possible. The sound of this section is very clean and crisp in the positive direction, with no noticeable side-effects, and has a predictable effect in cut mode. It has a shelving characteristic as one would expect.

The mid controls are in the form of a 41-detent frequency pot and a centre-detent amplitude control, the former with orange cap and the latter with black for easy recognition, a useful feature of all the EQ sections on the desk. Similarly, input level controls are red-capped and aux sends are blue or green. The two mid EQ sections have the same characteristics—15 dB boost or cut over a range of frequencies—the high-mid offering 600 Hz to 10 kHz and the low-mid giving 150 Hz to 2.4 kHz. The Q of these sections is apparently 1.5, giving a useful bell-curve characteristic which is fine for normal applications. I tend to belong to the 'get the input sounding right rather than EQ it' school of sound manipulation, so I tend not to use the full capabilities of this equaliser: however, when I need them, they are there and do their job very well. The mid EQ sections are again very smooth in action and sound and the centre-detent amplitude controls make zeroing the desk after a session very easy.

The LF section is switchable between 60 Hz and 120 Hz—a useful combination. Again, a centre-detent ±15 dB control is fitted, with shelving characteristic. The bass end of the EQ is enhanced by using it in conjunction with the HPF—perhaps they should have been mounted together ergonomically speaking, but this would play havoc with neat PCB layouts! The combination gives a great deal of flexibility.

The EQ section is rounded off with an EQ in/out pushbutton. The equaliser contributes a great deal to the overall 'sound' of the console. With all amplitude controls set to zero, there is no difference whatever in the position of the EQ in/out switch: the EQ itself, however, imparts a specific sound to the console. This is not a bad thing at all, but it does mean that the *2400* has a specific sound which you will either like or not. It does not, perhaps, have the smooth 'warmth' of a Harrison EQ section, but it lends a tight, commercial sound to the board which is very appropriate for modern music. Indeed, the terms 'tight', 'clean', and 'punchy' rather sum up the sound of the *2400*—this can be no bad thing. But there is no doubt that the *2400* is capable of very smooth, pleasant sounds when it is required to manifest them.

Next we find the cue sends. There are six of them, numbered, surprisingly enough, 1 to 6, and grouped in colour-coded pairs. Both pairs 1 and 2, and 3 and 4, may be switched from post-fader to prefade with 'pre' buttons. 5 and 6 are always postfade, but may be placed post-panpot (for stereo cans or effects) by pressing an STE (stereo) button. All six sends may be activated (or turned off) with a 'Cues On button'. This all represents a very flexible aux send capability. The level controls are all 41-detent pots again, and are calibrated 1 to 10. They feed aux master level knobs on the Master Module, and on that module there are also useful alternative headphone source selection buttons.

The routing matrix consists of 24 group/track routing pushbuttons in line down the side of the module, plus a 'mix' button which routes the signal to the stereo mix/monitor buss. Any number of these buttons can be on simultaneously. In addition, a centre-detent panpot may be brought into action by pressing a 'pan' button. This enables left/right panning across the mix buss as you would expect, plus panning between odd and even groups, with a 'compromise' law midway between constant power (3 dB down at centre) and constant voltage (6 dB down) which gives good stereo width plus good stereo/mono compatability.

Confronted with all these pushbuttons brings to light one minor problem with the *2400*: although one can appreciate the cost-effectiveness of leaving all these buttons without LED or other indicators, it is unfortunately rather too easy to leave a button pressed without noticing. Often the results of this are non-destructive and easily noticed—for example track 15's meter waving in time with the snare drum when recording basic tracks—but on other occasions it could result in inadvertent mixing of unwanted signals on to a wanted one. Obviously, standard-size 'Schadow'-style self-indicating buttons would take up too much room on this module (Trident use them on the *Series 80* and thus avoid this problem) but I wonder if there are more compact self-indicating switches which would fit the space without costing as much as LEDs next to every routing button. I would like to see indication on the mic/line switch, HPF in/out, EQ in/out, routing and pan buttons to avoid potential embarrassment. Perhaps Soundcraft should look into this. A cheaper solution might be to colour the sides of the existing buttons in a bright, contrasting colour to indicate when they are not pressed. Any thoughts, O Soundcraft?

Next to the pan button is a solo button and below it, one marked SFE and 'solo safe'. These control the highly-flexbile solo/PFL/AFL setup

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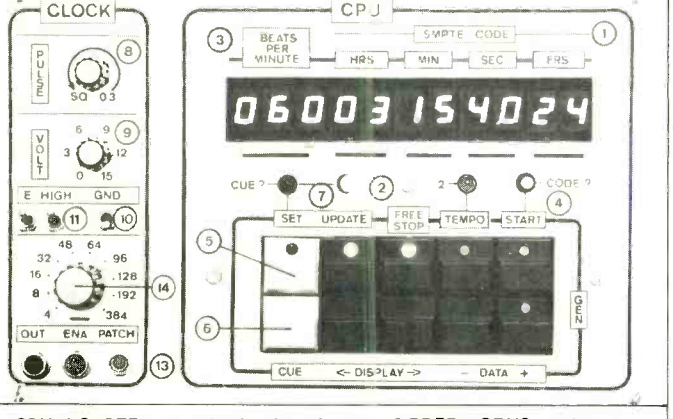

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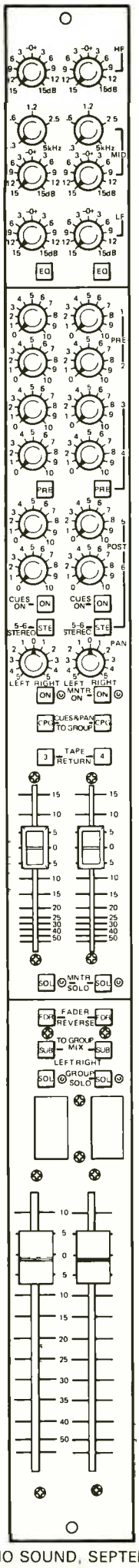
FIG. 2



reviews

on the *2400,* and they are used with two buttons on the Master Module, mono/stereo and SIP ('solo-in-place'). Pressing the mono button moves the solo monitoring point from stereo solo/AFL to PFL. Neither affect the signals passing through the desk—you just hear the signal. The manual points out, however, that '. . . the signal heard will not necessarily be at the same level as in the mix'—this generally seems to mean 'very loud' but that is due to my nasty habit of allowing the master fader to creep down during overdubs. The SIP button brings in the third mode, which as it suggests, mutes all other channels when the solo button on the channel is pressed. This *does* interrupt your stereo output, and the manual rightly describes it as a 'potentially dangerous mode'. However, the channel 'solo safe' button will ensure that channels with this button pressed are not muted by solo-in-place. As a result, you can listen 'in place' to a sound from a channel, and keep the echo returns there as well, if you 'solo safe' them. This is a very useful function and a welcome bell and/or whistle on an otherwise no-nonsense board.

Just above the fader are three buttons, 'A', 'B' and 'Channel On'. The last is obvious and, lo and behold, it has a little green LED to tell you its status. This is really necessary here, as solo or programmable muting modes may well contradict the button position. The A and B buttons are used in conjunction with Master Mute A and B buttons on the master module. When one is pressed on a number of channels, they will be muted—and the 'on' LED will go out—when the appropriate Master Mute button is pressed. These are invaluable for bringing in the brass section at the right time, losing that nasty clang on the drum tracks at the end of the number, or dropping out everything except the rhythm section in that middle bit where all the Simmons fills with multiple repeats and loud echoed handclaps are—and bringing everything back in again afterwards, with no unpleasant bending (or roadies all over the desk). The master mutes are in the middle of the board, too, so producers don't get to fiddle with them (watch they don't press A or B on a channel instead of solo, though). Two such programmable muting systems are just the right number—enough without being too complicated to remember which is which—and are the next best things to VCA groups when you don't have any.

Also in this area is a peak LED. When I first played with this console, I thought that these—and the +8 dB LEDs on the meters—were a bit unnecessary. They aren't! In fact, both are very useful. If you are used to PPMs but are OK with VUs, the meter LEDs can be treated just like you would a peak-reading meter: they are very reliable. The channel peak LED indicates a level 4 dB below clipping at the post-EQ, pre-fader point in the audio path. It stays on long enough to catch anything which might indicate a problem with the gain structure after heavy EQ, or whatever, and is almost as good as a meter at that point. It is also quite large and obvious. These peak LEDs do, however, have a slight 'hysteresis' effect: if one comes on and you turn the input gain down until it goes out, you can then turn it up again before it comes on. The final point where the light doesn't quite come on will be below the initial level, but above the level you first turned it down to. This may be due to the circuitry used to hold the LED on after a brief peak, and is soon come to terms with.

Finally we come to the audio fader: a conductive plastic, long-throw type offering both a high level of attenuation at infinity and a good scale-expansion in the working area (it says in the manual) and it does just that. It is as good as any you will find on other consoles and is almost certainly identical!

Group/monitor module

This module is shown in **Fig 2.** Each group/monitor module handles two tracks and offers a wide degree of flexibility. At the top is a simple, but effective 3-band equaliser, again with orange and black-coded knob caps and EQ button, and offers ±15 dB at 12 kHz; ±15 dB at 300 Hz through 5 kHz; and ±15 dB at 60 Hz. This is particularly useful when the monitor channels (via 'monitor in' sockets on the patchbay) are used as extra line inputs during mixdown. As this particular console has only 24 out of a possible 28 input channels fitted, this facility is invaluable. Then there are six sends, (the same six as on the input channels, of course), this time 1 and 2 being permanently prefade and 3 and 4 switchable pre/post, 5 and 6 are always postfade but may be switched into stereo as before. A 'Cues on' button is also fitted.

The monitor section itself allows the monitoring of either group outputs or tape returns. A pan button is permanently in-circuit: below this is a 'monitor on' button which does just that. Then there is a rather interesting button called 'CPG' (cues and pan to group). This removes the pan and aux send controls from the monitor path. Odd numbered monitors route to

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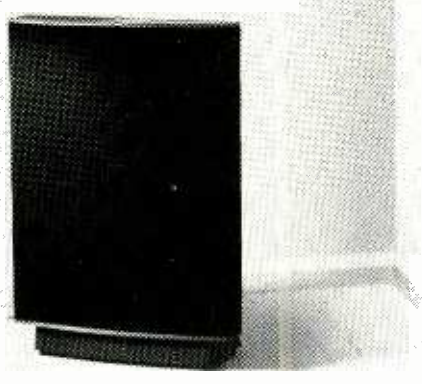

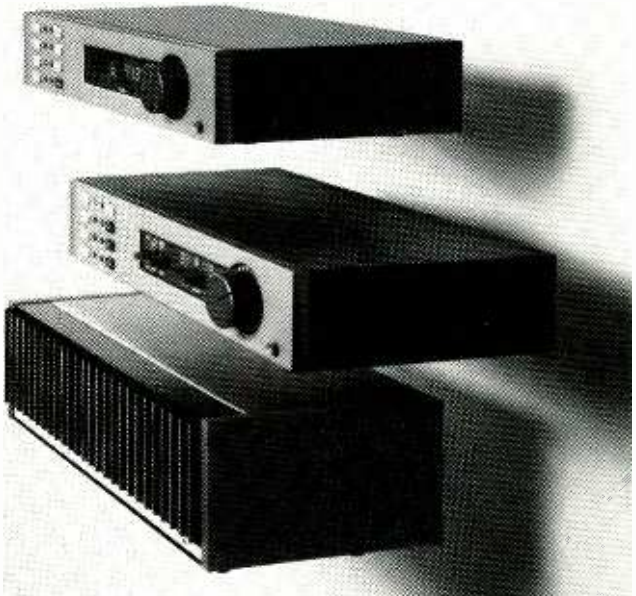

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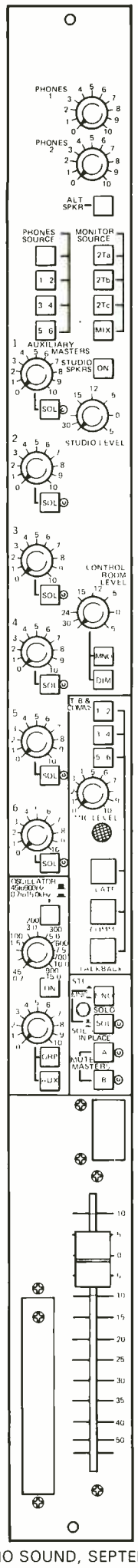
FIG. 3



reviews

the left of the mix and even ones to the right. When the 'SUB' button is pressed, the group signal is routed direct to the stereo mix, in addition to its patchbay destination. Odd groups go left and even ones right in the stereo mix. When both CPG and SUB are pressed, however, the pan controls enable the groups to be panned across the stereo. This is a neat way of enabling subgrouping on a mix. It is a very useful function indeed. It uses none of the precious input channels for returning the groups.

The 'Tape Return' button enables listening off tape or from the group (down or up respectively) during overdubs and the like. When a tape track is in 'ready' on many machines (including the Soundcraft) the input signal is routed back through the machine in all modes but play; thus this button must be used in the 'up' (group listen) position if you wish to rehearse something prior to recording it. When recording, of course, the button can be in either position as the tape machine passes line in through on record. I am continually forgetting this and wondering why I can't hear anything coming in to the track on replay: I hope other engineers are equally thick and that I am not alone. (Nothing to do with Soundcraft that—just addled brain!)

The monitor solo button acts in much the same way as on the input channels: there is no SIP function, though, and if the SIP master button is down, the monitor solo doesn't do anything.

Fader Reverse is a really useful function. The monitor faders are halfway up the board and are of the short-throw, carbon variety. They work fine, and are quite smooth, but it is often nice to have the big, conductive plastic group faders on the monitor mix. This button swaps the little monitor with the big, red-knobbed group faders (which are in the normal place) and enables you to use the little faders as groups. This suits me fine, and my usual first activity in the studio is to press all the 'FDR' buttons and send tone to the groups, lining up the little faders so that all the track meters read zero. They then stay there untouched except on the rare occasions when I have a complex balance to record and I need a lot of throw on the group fader(s) when I will reverse them again. Most of the time, though, I don't even move the group faders and use them as unity-gain mixes. If I'm recording timecode or *MC-4 Microcomposer/LinnDrum* data on track 24 (ie as far out of the way as possible) I usually patch the code into group insert return and adjust it with the small fader so as to go through as little console as possible.

The Group Solo button is similar to the monitor solo, except that it picks up pre or post the group fader, and when SUB or SUB and CPG modes are selected, the solo is in the correct stereo position.

Master Module

This module **(Fig 3)** contains all the master level controls for Aux sends, headphones, monitoring...you name it, plus comms facilities and the like and a lineup oscillator.

At the top are two headphone control knobs which allow control of either two mono or one stereo headphone drives from the desk according to the headphone source selector panel. Sources are selected on pushbuttons: the top, blank one sends from the mix buss, while the others select the three pairs of aux sends. Next to these buttons are the monitor source selection pushbuttons which allow monitoring of either one of three stereo machines (good!) or the mix buss. The buttons interlock so that you can't listen to several at once—just as well, really.

Above this section is a button which selects secondary monitors: this is also invaluable. Down the left of the module are the six aux master pots, each of which has a solo button and adjacent red LED indicator. In mono mode, these will be heard on the monitors in the centre; in stereo, odd numbers go left and evens, right. A useful means of checking the headphone or effects sends.

Below the monitor source selection buttons is the studio playback level control and switching. This is independent of the talkback lines and has an on/off button. Its source is that selected on the monitor source selection panel.

Halfway down the module on the right is the master control room monitor level control, with associated 20 dB 'dim' and mono check buttons. The mix buss metering is derived from the input to the volume control here, and thus any signal that is heard on the monitors is also metered on the main mix buss VUs: whether that source is a tape machine, the mix, or a solo selection (the latter over-riding the monitor source selection). Thus aux send levels, for instance, can be metered easily.

Beneath this, comprehensive comms facilities are marked off for easy location. Three buttons select talkback to Aux 1-2, 3-4 and 5-6 and may be combined if desired. A mic level control with adjacent flush-mounted electret insert provides engineers with chatting facilities. Beneath this are three buttons: Slate; Communication; and Talkback. Slate routes talkback signal plus a 30 Hz tone to all the groups, and dims the monitors when pressed. Comm sends the TB signal to the Aux sends selected and dims the monitors, while Talkback sends the TB signal to the studio playback speakers (independent of their level control) and also dims the monitors.

The lineup oscillator, bottom left, has two ranges selected by pushbutton and covering 45 to 900 Hz and 700 Hz to 15 kHz. It may be routed to groups and/or aux sends and has a level control (41-position pot again) and on/off button. It is very stable and exceptionally useful for lining up all parts of the system.

The solo and muting buttons are also comprehensive and have been partially described previously. A comparitively large bulb indicates that something, somewhere, is soloed, and adjacent are the mono/stereo solo and SIP buttons already covered. Here also are the A and B muting system masters.

At the bottom of the channel is a standard high-quality stereo fader which controls the mix buss level.

Summary

This console is exceptionally flexible, cost-effective and it sounds very good indeed. Noise and headroom characteristics are excellent and the *2400* is well suited to a wide range of recording activities. The ability to use the monitors as extra inputs to the mix buss is an important and useful feature. The separate PSU is quiet and introduces no untoward sounds either acoustic or electrical, and is well-shielded to avoid pickup. At Cruchfield, the monitor amp is just above it and no pickup problems occur. While one might wish for more clear indication of the status of some of the pushbuttons on the *2400,* it is likely that such modifications would increase the cost of the board out of all proportion to their usefulness. Overall, a very impressive console which is a pleasure to use. ■

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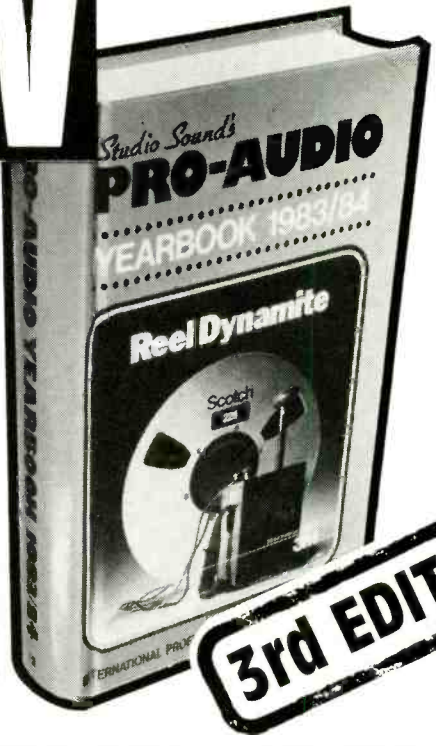

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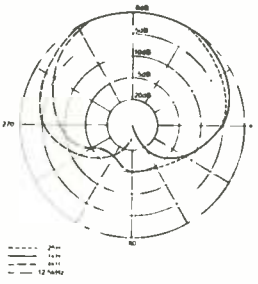

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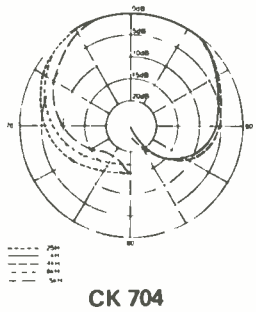

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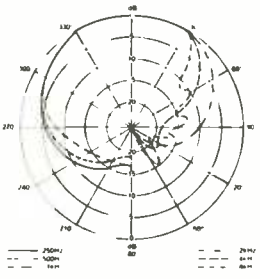

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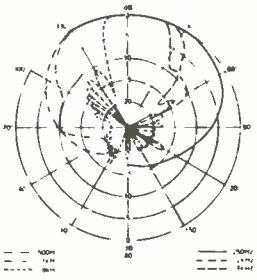

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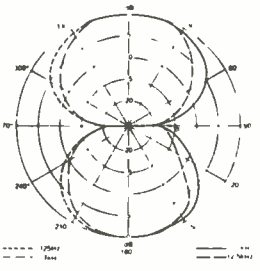

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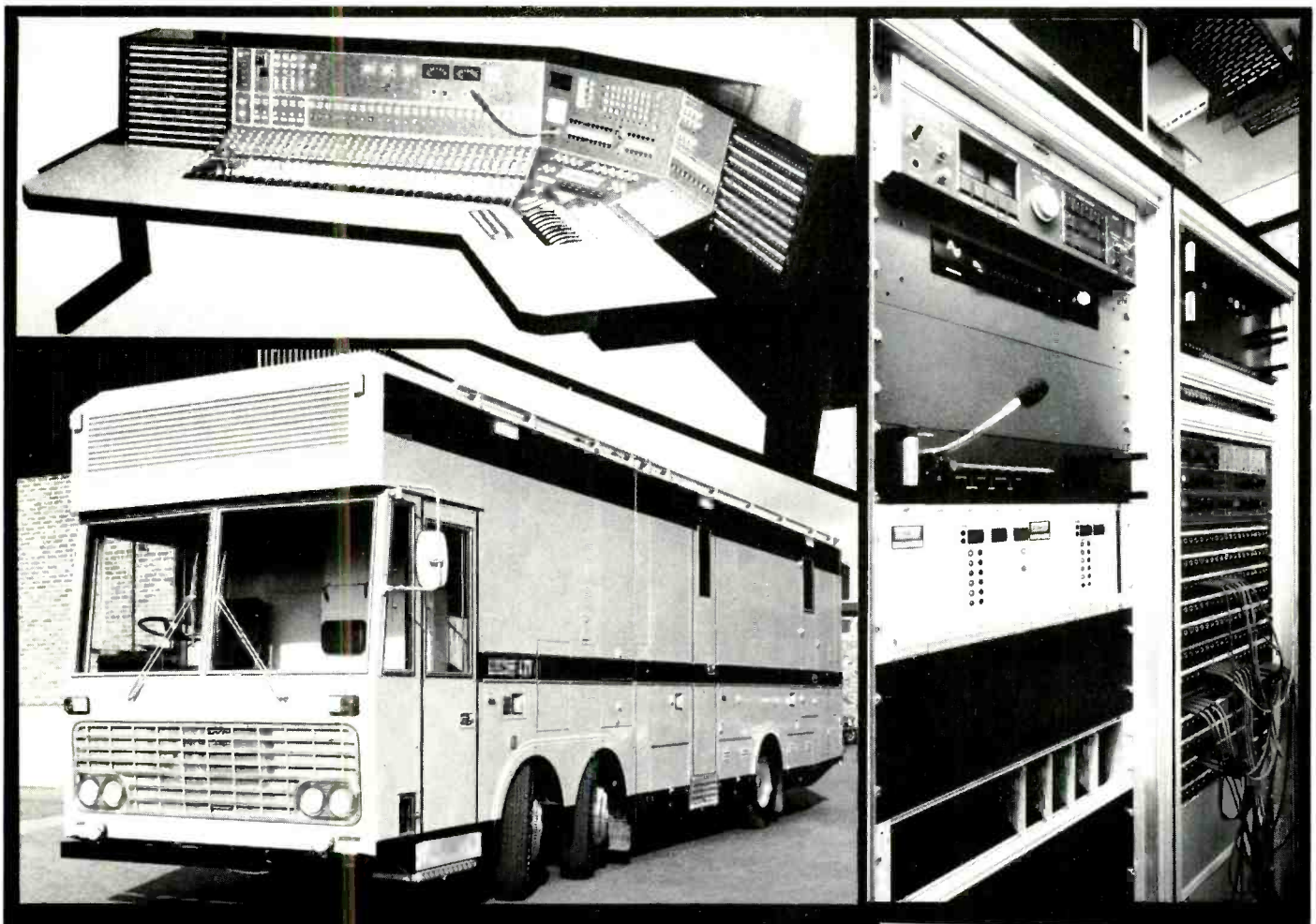

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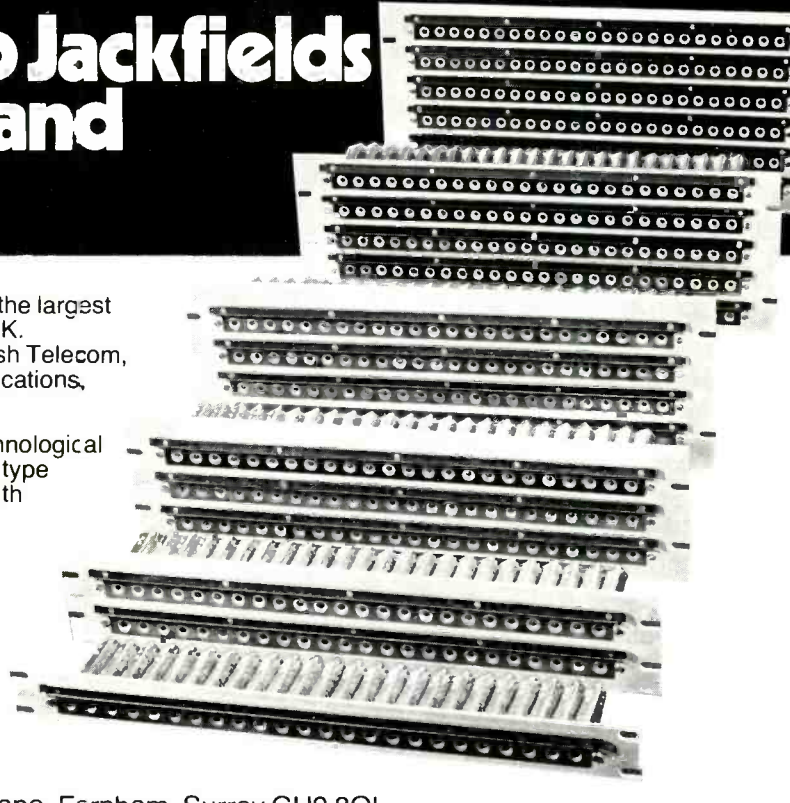

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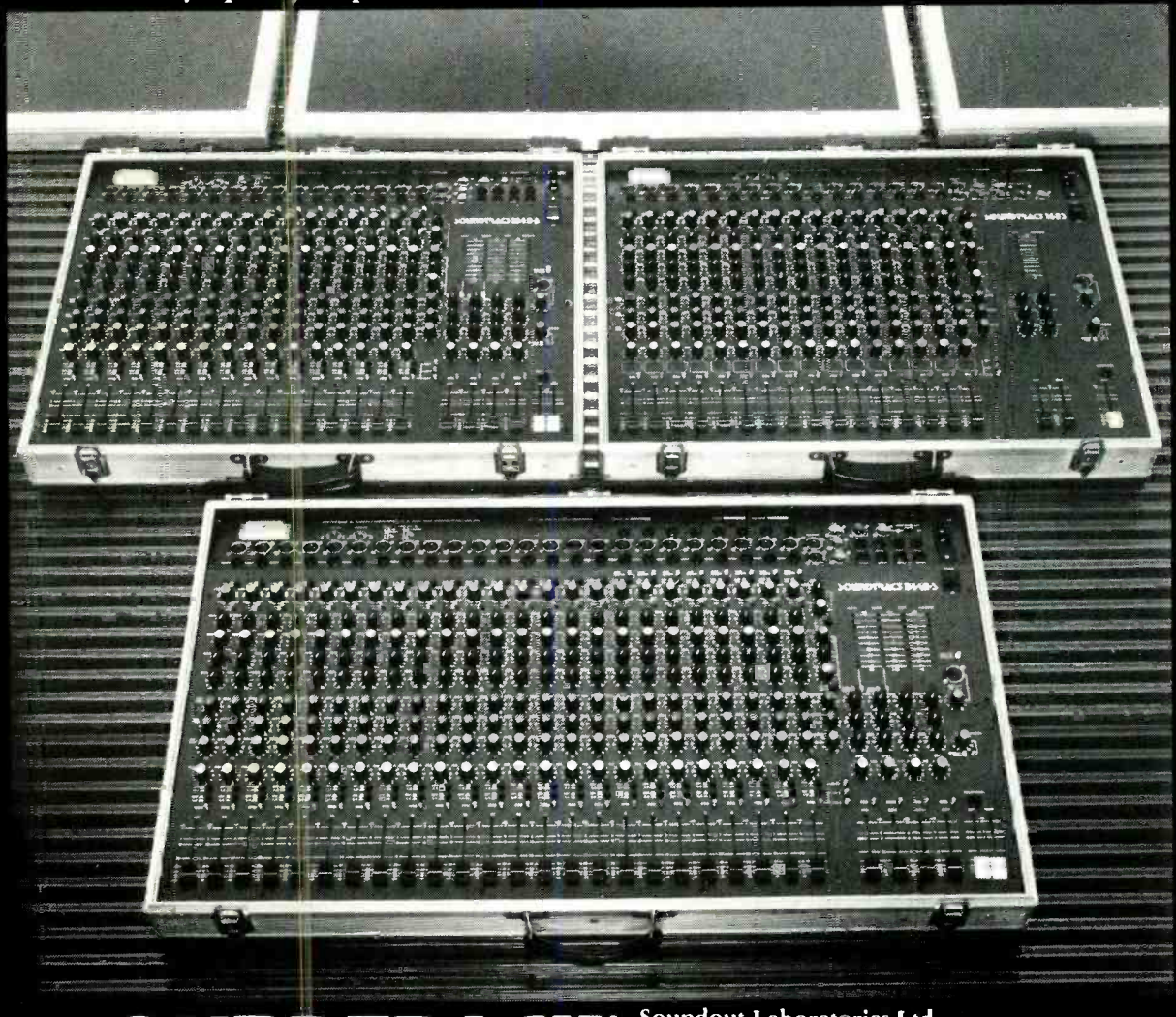

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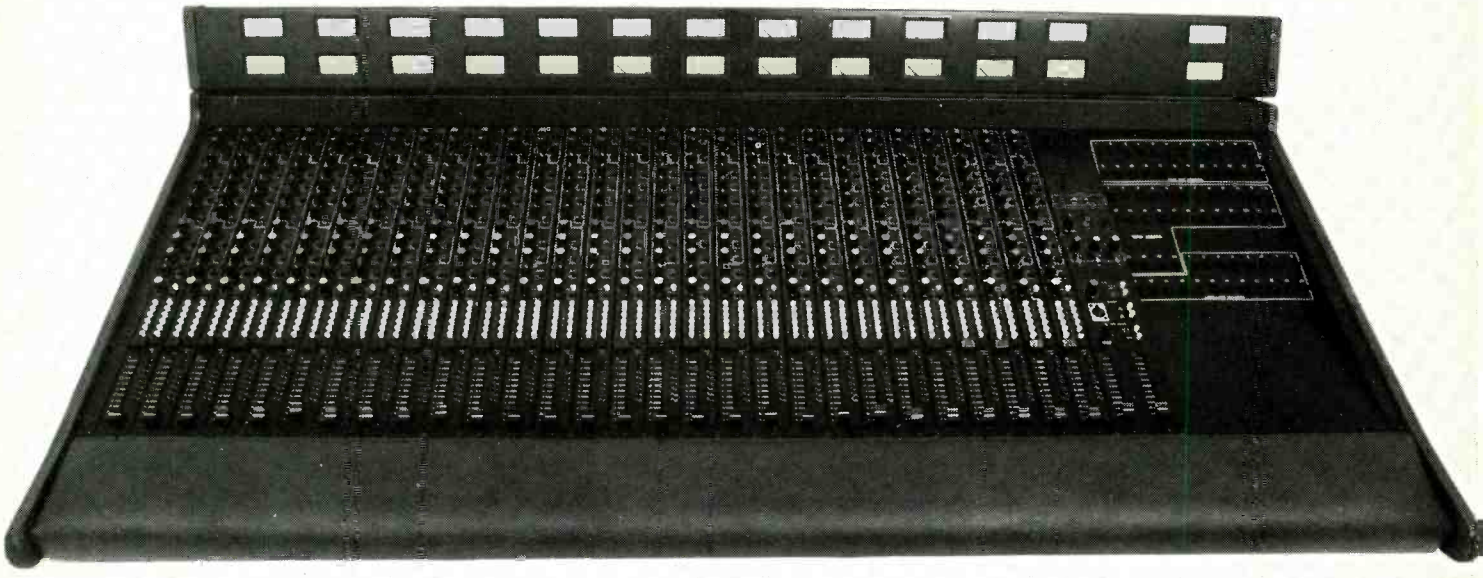

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Germany — TTS Electronic, Dammühlenweg 4, 6270 Idstein. Tel: (06126) 2014
Italy — Startek, Via Del Lapidari 8, 4029 Bologna. Tel: (3951) 321063
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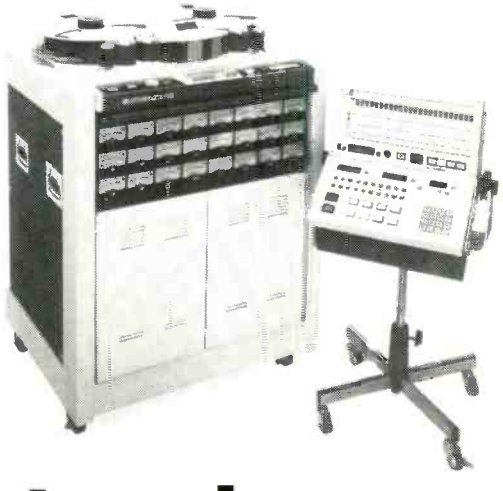

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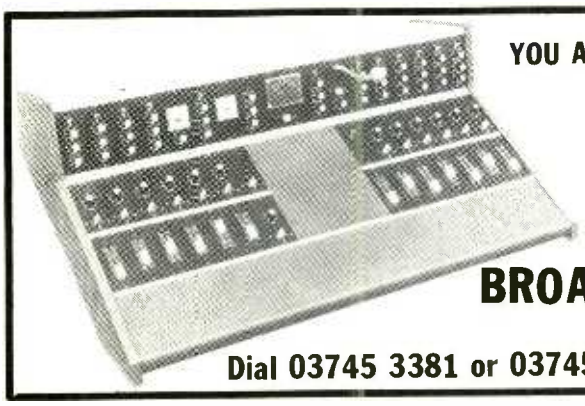

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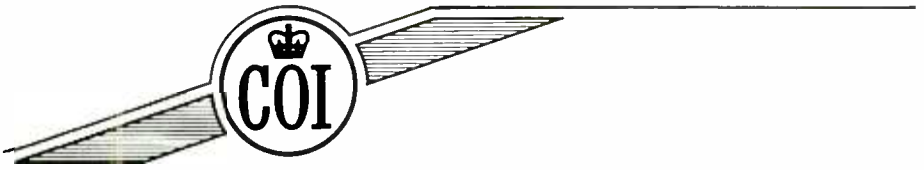

Sound Recordist

The Central Office of Information requires a Sound Recordist in its Visual Media and Radio Group at Hercules Road, London, SE1.

The successful candidate will join a busy group of sound engineers, servicing programme and news output. The Division produces programmes and news items for transmission by radio stations overseas and in the United Kingdom.

He/she must have multi-track and video experience for A.V. production and will be expected to edit tapes and to operate circuit transmission equipment to overseas radio stations. The ability to work quickly and accurately under pressure is essential. Some late night and weekend working is involved.

The post is graded Assistant Information Officer. Starting salary will be within the range of £5796 to £9328 according to age, experience and qualifications. Please send a postcard for an application form to Central Office of Information, Atlantic House, Room 159, Holborn Viaduct, London EC1 2PD, quoting competition number 103/NC/83. Closing date for returned completed application form is 2 September 1983.

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