

February 1986

£1.50

# STUDIO SOUND

AND BROADCAST ENGINEERING



## POWER AMPLIFIERS METERING

# A CRAFTSMAN'S TALE.

"You should have seen the design brief. **Challenging** was hardly the word for it. Soundcraft saw the potential for very tough, very high quality power amps. But they set us two very different objectives. We had to match modern digital standards – very fast transients, ultra-low noise, inaudible distortion – with tough compact construction and full protection, to work flawlessly over months of touring.

Bringing these together made

heavy duty power supply, produces the very fast, very high, transient response we call 'Pulse Power' – over 3000W in the SA2000.

And it's Pulse Power that **really** sets the SA range apart from conventional power amps.

## THE PROOF

We've gone to great lengths to ensure reliability.

We test each one for 96 to 120 hours continuously and put batch samples through heartbreaking abuse. They're built to last.

The real test, of course, is how they **sound**. Because however good the specs are, you'll only appreciate our achievement by listening to them.

And as you'll hear, we've beaten the brief – they're very special amplifiers."

For further details on the new Soundcraft SA Amplifier range, call Soundcraft's Sales Office, or your nearest dealer.

# Soundcraft



Soundcraft Electronics Ltd., Unit 2, Borehamwood Industrial Park, Rowley Lane, Borehamwood, Herts WD6 5PZ. Tel: 01-207 5050. Facsimile: 01-207 0194.  
 Soundcraft Electronics USA, 1517 20th St., Santa Monica, California 90404. Tel: (213) 453-4591. Facsimile: (213) 453 5634.  
 Soundcraft Japan, 4F Yoyogi Living, 12-21 Sendagaya 5, Shibuyaku, Tokyo 151. Tel: (03) 341 6201. Facsimile: (03) 341 5260.  
 Soundcraft Canada Inc., 1144 Hymus Blvd., Dorval, Quebec, Canada H9P 1J6. Tel: (514) 685 1610. Facsimile: (514) 685 2094.

headroom a major factor. To match the dynamics of much larger amplifiers (and make it harder to induce clipping), you need power capacities of **at least two and a half times** the RMS ratings.

A massive margin by anyone's standards.

We had to beat, in fact, the current state of the art in power amplifiers.

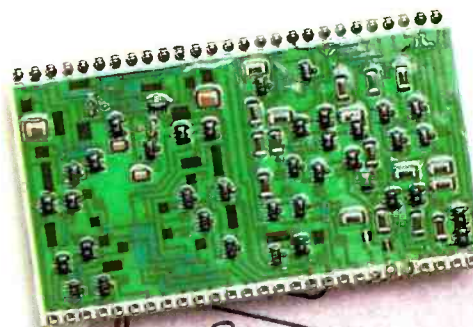
## NEW TECHNOLOGY

With an international team from Scandinavia, the UK and the US, we created a new standard from front to back.

The pre-driver is a true 'Class A' bipolar / mosfet synthesis, giving us true symmetry and a super-fast slew rate.

It's all on a unique laser-trimmed thick-film hybrid that's compact – and easily accessible. And in common with the whole circuit, only discrete components are used.

At the output, we created a revolutionary new 'feedforward' technique by combining both high power mosfet **and** bipolar devices. It's an efficient temperature stabilising system that, with our



## SPECIFICATIONS

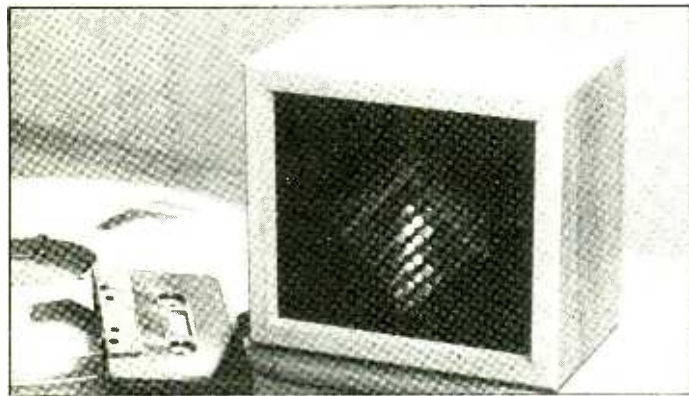
Model	Power (8Ω)	Pulse (10ms, 4Ω)	Units
All Amps 19 inch Rack Mount			
SA 150	100w/ch	450w/ch	1u
SA 600	160w/ch	700w/ch	2u
SA 1000	285w/ch	1400w/ch	3u
SA 2000	450w/ch	3000w/ch	4u
ALL	Noise: > 97dB(A)	Distortion: TIM: 11000000000	

# STUDIO SOUND

AND BROADCAST ENGINEERING

## REGULARS

- 5** **Editorial:** Find out why Keith Spencer-Allen feels it's often wrong to take the credit
- 30** **Diary:** Automated audio visual—Address changes—Agencies—People—Metering systems roundup—Lexicon R&D preview—SSL future console booklet—Tannoy and HHB apologies—Forthcoming events—Glyndebourne panned



- 40** **New products:** Camco LA601 and LA801—Sony TA-N7050 power amplifier—ASC SMPTE—StuDiomaster power amplifiers—MDB Window Recorder—Sony PCM 3324 control interface—Cipher digital timecode readers—By The Numbers 4-track—Studio Master studio software—JBL 5547/5549 equaliser systems—Bosendorfer computer piano system—Mitsubishi sub-woofer systems—3M 275 digital tape—Denon CD cleaner—NEI DAX2800 EQ/RTA

- 46** **Music page:** Jellinghaus Musik-Systeme—Chase Bit 01 expander—Steinberg Research distribution—Linn Electronics. By Mark Jenkins

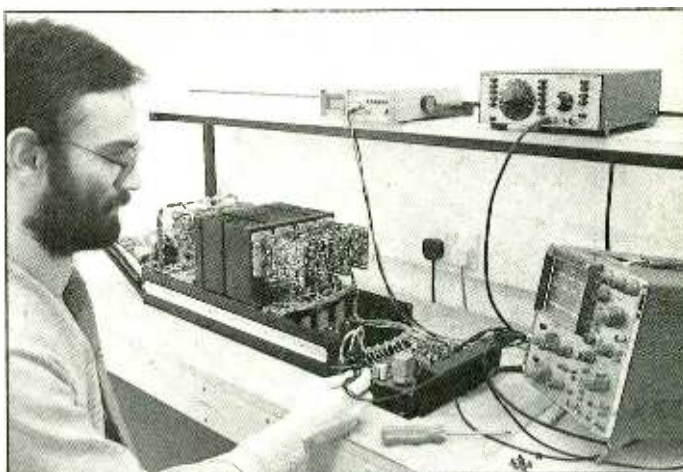
- 58** **Studiofile:** Sweet Silence, Copenhagen—Videasonics. London

- 74** **Business:** Better sound with picture. By Barry Fox

## REGULARS

- 78** **Letters:** Perreaux review—A classical approach—Standard for TV programme interchange—Live Aid stereo sound—Lightning and tapes—Noise or art?—Analogue DSP—CD tips—Spanner in the works

## FEATURES



- 50** **Developing the KEF KM1:** Ric Cecconi talks to Tim Leigh Smith on the development of this unusual loudspeaker

- 70** **Quad in America:** David Scheirman reports on modern quad sound systems for PA

## REVIEWS

- 82** **BGW 750D:** A pre-production version of BGW's latest model is evaluated by Hugh Ford

- 88** **Soundcraft SA1000:** Hugh Ford reviews one of a range of four power amplifiers

- 96** **Perreaux PMF 5150B:** The third of our technical amplifier reviews from Hugh Ford

### EDITORIAL

**Editor:**  
Keith Spencer-Allen  
**Assistant Editor:**  
Carl Anthony Snape  
**Production Editor:**  
Ann Horan  
**Production Assistant:**  
Beverley Hudec  
**Consultant:**  
Hugh Ford  
**US Commentator:**  
Martin Polon  
**Contributing Editor:**  
Richard Elen  
**Secretary:**  
Carrie Love

### ADVERTISEMENTS

**Advertisement Manager:**  
Kerr Duffy  
**Telephone Sales:**  
Adrian Tippin  
**Secretary:**  
Mandy Paul  
**Production Manager:**  
Jacky Thompson  
**Japan and Far East Agent:**  
Media Sales Japan Inc, Tamuracho  
Bldg 3 3 14, Shimbashi Minato-Ku  
Tokyo, Japan  
**US West Coast Agent:**  
Herb Schiff, 1317 Fifth Street,  
Suite 202, Santa Monica  
CA 90401 USA

**COMMERCIAL MANAGER**  
Phil Guy

**Cover:** Photography by Roger Phillips.



Editorial and advertising offices:  
LINK HOUSE, DINGWALL  
AVENUE, CROYDON CR9 2TA,  
GREAT BRITAIN  
Phone: 01-686 2599  
International: +44 1 686 2599  
Telex: 947709

© Link House Publications  
PLC 1986. All rights reserved.



A LINK HOUSE  
PUBLICATION

Publisher and consultant to  
APRS for Studio Sound's  
Producer's Guide to APRS  
Members 1984/85

February 1986 Number 2  
Volume 28 ISSN 0133-5944

■  
**A new standard  
in digital recorders**  
**A new standard in  
pro audio rental**  
■

*Mitsubishi X-850*

---

**MUSIC**  
**LAB HIRE**  
*leading the way*



76 EVERS HOLT STREET, LONDON, NW1 1BY. TEL: 01-387 9356. TELEX: 28159 MUSLAB G.

# EDITORIAL

# EDITORIAL

This month's comment from Keith Spencer-Allen

## 1 to 3—and a second chance

I am angry, very angry. In a strange way I feel I have been implicated in what really amounts to a con trick and I know it is happening in a similar way to many of you, as well. I will explain but I must begin at the beginning.

How do you mix? Of course you balance the tracks, add processing and make any adjustments needed to make the title sound the way the client and yourself, plus whoever is required to give approval, likes. The engineer, obviously, also has the responsibility of ensuring that the artistic elements of the mix are still in step with the technical requirements of the mastering medium while bearing in mind the limitations of the final medium that he is mixing for. This means that when mixing to analogue 2-track reel-to-reel, the experienced engineer will structure the mix for the best possible result within the restrictions of the analogue tape. Further he will make sure that (if for instance the final destination of the recording is vinyl disc) there are no problems for the cutting engineer by watching those aspects that might cause problems such as extremes of HF and LF energy, difficult peaks, all LF energy being in one channel, etc. Quite often this means there have to be some compromises made—and I have often had to make separate mixes for differing end uses. One mix might be for radio play, another for the album, another for the single (although this may also have been different artistically). So often, even with similar media, we were mixing separately for them all.

Today we have at least three major carriers for music—vinyl disc, compact cassette and compact disc and their capabilities are quite different. They are all important with the cassette outselling the vinyl in several territories—it happened in the UK in early '85—and the CD making itself felt as a market force. Three very different media.

With the wider acceptance of stereo as the norm and the gradual improvement in fidelity from all consumer audio products, there has been less perceived need for specific media mixes. I have been told that with greater mixing console facilities and more sophisticated outboard gear, the universal mix is possible and that a 'good mix travels' well. I have to disagree.

There are many reasons now why we should consider making separate mixes for the different end products but how would the record companies take to this suggestion? With very little enthusiasm I would imagine.

The alternative is perhaps then to mix for CD and 'doctor' the copies for other media. This may be OK if you have kept the stereo image placing suitable for vinyl and that no super extremes of response are present. This has to be seen as a compromise all round—neither making the most of any medium nor being the universally acceptable (sterile?) master for all.

I am firmly of the opinion that we should mix for the end medium as we used to. There is, however, a funny side to this with regard to back catalogue. The good engineer

provides mixed tapes to the cutting room which are virtually ready to cut. Mixes optimised for transfer to vinyl will perhaps not make the most of the possibilities of CD. However, the less dutiful engineer may have the last laugh as the unsuitable vinyl aspects might make the mix a more exciting CD prospect particularly if this engineer had been less diligent in watching his dynamic range. A case where it didn't pay to be proficient.

So what is the possibility of the record company contacting the producer or the engineer that produced the back catalogue item they are thinking of issuing on CD?—probably very low. At the recent HHB/Sony Broadcast/*Studio Sound* sponsored 'Digital Information Exchange' in London, record producers Rupert Hine and Pip Williams expressed the feeling that most producers would like to get involved in the re-issue on CD of their old material if the record companies would ask them. Not so much to remix, which is probably not for the best, but to be present at the transfer and optimise what is on the tapes.

But now to the real source of my anger. I have just seen a very low budget film soundtrack that I engineered more than a decade ago, turn up on CD. The film budget allowed a whole afternoon of recording time for 45 minutes of music which was then mixed to mono following the session. A few months later a record company acquired the rights and wanted a stereo version. Unfortunately, the multitrack was not available, the music producer and the film company didn't want to know and the man from the record company was very insistent. The answer was to synthesise from the mono master. This was done in a manner that I was far from happy about at the time but it gave the record company a demo version of the soundtrack that would help them plan the release while the search for the multitrack went on. Of course they released it as it was and it sounded rough on vinyl. Ten years later here it is on CD with my name credited as engineer.

Crediting the engineer of the mixdown intended for vinyl with the engineering for the CD mix is misleading and a great disservice to the engineer's name—particularly in this case! It somehow suggests to the purchaser of this dreadful sounding CD that I have given my approval or been involved with this project. May I suggest that record company sleeve note compilers add a statement to the credits about the engineer's role, ie original mixdown engineer and then CD transfer engineer, etc.

In this case I would like to have seen something like 'XXXX records admits that although we have listed this gentleman as engineer he really is not responsible for the sound quality of the CD which should never have been transferred in the first place. All complaints should be directed to the record company'. And then follow it up with the home phone number of the record company bosses. That would stop this pretty quick.

If you agree, let's push the record companies on the subject of separate mixes and assistance in the CD transfer process. It could save YOUR future embarrassment.

# STUDIO SOUND

AND BROADCAST ENGINEERING

STUDIO SOUND is published on the second Friday of the preceding month. The magazine is available

on a rigidly controlled requested basis only to qualified personnel (see back page for terms) or for an annual cost of £18.00 UK, \$40 US surface mail, \$75 US airmail. £24.50 overseas surface mail or £46.50 overseas airmail to non-qualifying readers or where more than two copies are required in a studio or small organisation. New subscription enquiries should be sent to the Croydon address on page 3. All other enquiries should

be made to **Studio Sound Subscriptions, Link House Magazines Ltd, Central House, 27 Park Street, Croydon CR0 1YD. Tel: 01-760 0054.**

US mailing agents: Postmaster please send address corrections to Studio Sound, c/o Expeditors of the Printed Word Ltd, 515 Madison Avenue, New York, NY 10022.

Total average net circulation of 13,981 per issue during 1984. UK: 5,735 Overseas: 8,246 (ABC audited)

Studio Sound and Broadcast Engineering incorporates Sound International and Beat Instrumental. Printed in England.

ABC

# Toys for the boys

■ Rent or buy the latest studio processors from Music Lab ■



■ **AMS DMX15-80S** 2 channel digital delay available with up to 32 secs at full bandwidth, full loop editing, VCA, external trigger, 9 memory locations, optional pitch change cards/de-gitch cards, plus optional DMX-K Interface allowing sampled sounds to be played under keyboard control.



■ **AMS RMX16** 9 program plus "soft prog." locations for previously issued programs, optional 99 memory remote control/bar code reader, optional delay memory extension (1600m/s).



■ **BEL BD320** Now with up to 32 seconds digital sampling, full bandwidth, external trigger, loop edit facility, VCA.



■ **YAMAHA REV 7** The amazing new programmable digital reverb from Yamaha, incorporating 30 innovative factory presets, 60 user memories, 20HZ - 12KHZ bandwidth, offers an unprecedented amount of operator control of essential parameters.



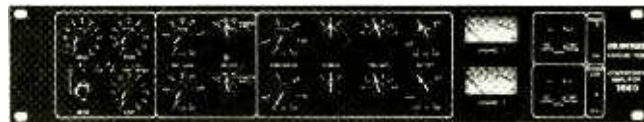
■ **DRAWMER T102** Two channel trigger interface provides variable length tone bursts and can create logic pulses for triggering outboard effects. Manual or auto reset allows single or continuous sequencing, selectable delay plus invert control.



■ **ROLAND SRV2000** Digital reverb with 16 Bit Linear D to A system gives smooth 30Hz to 10KHZ bandwidth, up to 99 seconds decay, contemporary or non-linear sounds can be created, 32 user memories.



■ **DRAWMER DL221** 2 channel, stereo linkable compressor/limiter, variable threshold, ratio, attack release, separate peak limiter, VU and gain reduction display.



■ **DRAWMER VACUUM TUBE 1960** Dual compressor limiter using vacuum tubes in conjunction with semi conductors. Soft-knee compression characteristics. Classic valve guitar sound, stereo linkable.



■ **DRAWMER DS201** 2 channel stereo linkable noise gate, frequency conscious keying with adjustable attack, hold and decay controls.



■ **BSS DPR 402** 2 channel compressor limiter, de-esser and peak limiter. All facilities available at once, stereo linkable.



■ **RANE PE15** Five band parametric, 1.5 to 0.03 octave bandwidth, 20db cut for notch filter capability, end bands switchable to shelving mode, individual by-pass, four octave sweep.



■ **ADA STD-1** Stereo tapped delay image processor, multivoice chorusing, true stereo flanging, holographic positioning, true stereo outputs, stereo outputs from mono source.



■ **RANE HC6** six stereo headphone amplifiers in a single rack space, individual volume controls. Up to six separate mixes available.



■ **LEXICON PCM60** 2 program (room/plate) digital reverb with suitable size and decay settings, and bass/treble cut off.



■ **LEXICON 224XL** The ultimate digital processor featuring all hyperthetical reverb programs plus many effects and split programs. LARC Remote/control, 60 stores.



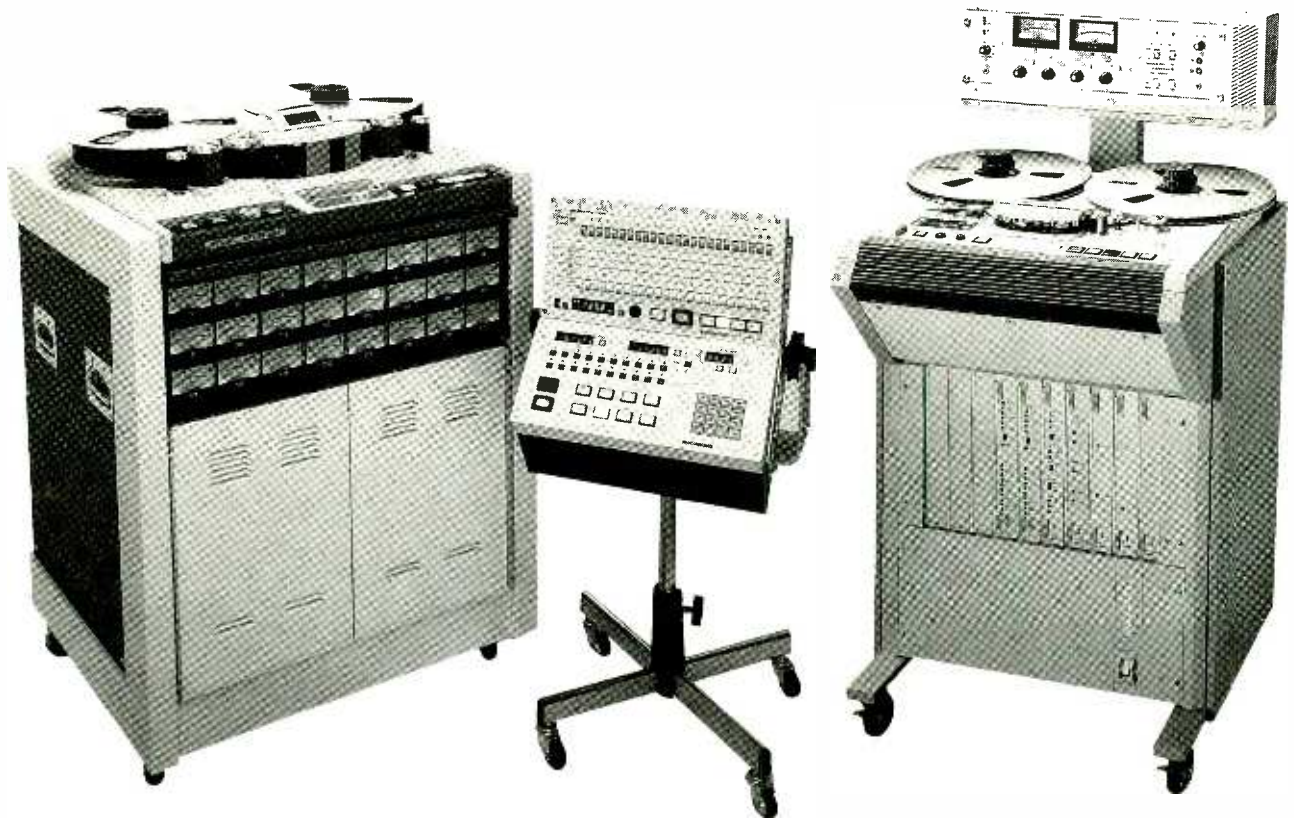
■ **APEX AURAL EXCITER TYPE B** Psychoacoustic processor, fast becoming standard studio tool.

**MUSIC LAB SALES** 01-388 5392

**MUSIC LAB HIRE** 01-387 9356

72-76 EVERS HOLT STREET, LONDON NW1 1BY, TELEX: 28159 MUSLAB G

# Otari Rentals



## THE OTARI MTR 90 24 TRACK AND MTR 12 2 TRACK

The MTR 90's track record for outstanding reliability and performance and more recently the MTR 12 master recorder have proven Otari's long term commitment to producing state of the art analogue tape machines.

Similarly, our reputation at Music Lab Hire demands we rent only the finest and most reliable recording studio products available. When it came to investing in tape machines, our commitment had to be Otari.

When you rent Otari from Music Lab, be it for 24 track, 48 track lock-up, Mastering or Video post production, our technicians arrive with the correct cable systems and a fully commissioned machine.

When synchronisation is required, a Q-lock system including all correct interfaces is available as well as the new Otari EC101 Chase Synchroniser.

At Music Lab we not only recommend Otari – Otari recommend us.

**MUSIC  
LAB HIRE**

**01-387 9356**

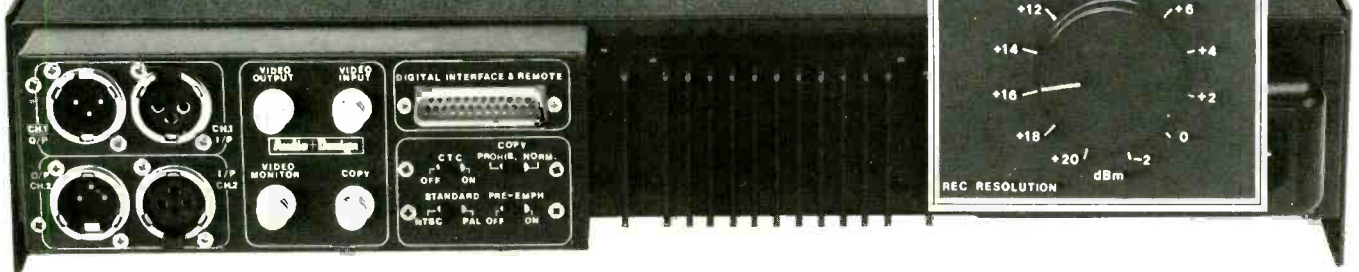
**24 HOUR STUDIO EQUIPMENT RENTAL**

76 EVERS HOLT STREET, LONDON NW1 1BY. TELEX: 28159 MUSLAB G

# Audio+Design

# Digital PCM 701 ES Professional

- Balanced XLR inputs/outputs (+ 22dBm)
- Precision unity gain input/output attenuator
- PAL/NTSC, Record Emphasis and Copy Prohibit Switchable
- Digital input/output interface
- Full 1610 send and return interface in rack-mount cradle
- CTC™ Time Correction
- Retrofit Service



Audio+Design's enhancement programme for Sony domestic digital processors, expands the scope of low-cost digital for the professional user.

The PRO-701 ES has a full professional analogue interface with improved cross-talk

performance. The digital interface provides a low-cost high quality A/D converter for use with computer hardware. When coupled with the A+D Add-mix™ Digital Fader the system provides inexpensive digital mixing for the first time.

A complete Sony 1610 interface is available as a plug-in option fitted in a rack-mount cradle that holds the PRO-701 ES. This interface not only offers 'send' facilities to 1610 from F1/701 format, but also digital 'return' from 1610 tapes to F1/701.

## Audio+Design

The Hit Sound in Audio Science

Audio Design Calrec Ltd.,  
P.O. Box 182,  
Reading, Berks.  
RG2 9BA England  
Tel: Reading (0734) 861088  
Telex: 848722 ADR UK

Audio Design Calrec Inc.,  
P.O. Box 786,  
Bremerton,  
WA98310, USA  
Tel: (206) 275 5009  
Telex: 152426 ADR USA

# Sound sense

The famous 4104 STC developed ribbon microphone, now distributed by Seasim Controls Ltd. This robust broadcast quality microphone is ideally suited for outside broadcasting where there is a high level of background noise, it has an excellent record for reliability and is used widely by broadcast networks.

Other microphones in the range include the superb 4038 studio ribbon microphones with a BBC specification making it an outstanding choice for the orchestral hall as well as the broadcast and recording studio. The 4021 pressure operated moving coil microphone for measurement standardisation & high quality studio work & the new 4160 which is a very reasonably priced Cardioid Dynamic Microphone

As reviewed in recent issue of Studio Sound and immediately available

Also available a full range of Keith Monks microphone stands.

Write for brochure for information on the complete range of microphones.



## Seasim Controls Limited

The Paddocks, Frith Lane,  
Mill Hill, London NW7 1PS  
Tel: 01-346 9271. Telex 21189 24 hour export service worldwide.



FRI	FRI	THURS	WED	TUES	SUN	SAT
8	7	6	5	4	3	2
15	14	13	12	11	10	9
22	21	20	19	18	17	16
29	28	27	26	25	24	23
6	5	4	3	2	1	30

This special clients calender will aid those studios who require goods yesterday. This way goods ordered on the 7th will arrive on the 6th. Everyone phones Fridays so we have included two per week, so our turnover is doubled and you have two chances of having enough tape to complete weekend sessions. No one phones Mondays so they are eliminated.

This revised studio clock should be adopted to aid out of London clients who phone in panic orders half an hour after the 4pm Securicor collection.



**STUDIO SPARES** ~ where all orders are processed within the hour and everythings `in stock` at last years prices!

16 Stucley Place, Hawley Crescent, Camden Town, London NW1 6NS  
 Telephone: 01-482 1692 lines open 24hrs a day  
 Trade counter opens: 8am - 12-30 - 1-30 - 5-30pm

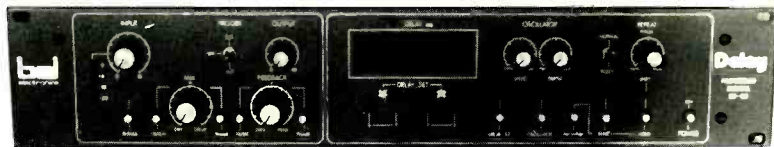
**VISA**

**ONE MINUTE CAMDEN TOWN STATION**

**ACCESS**

**STUDIO SPARES**

# 8 SECS



# SED

### Bel BD80 DELAY LINE/SAMPLER

4 TWO SECOND CARDS  
15kHz

# 24 SECS



# SED

### Bel BD240 DELAY LINE/SAMPLER

4 x SIX SECOND CARDS 18kHz

# 32 SECS



# SED

### Bel BD320 DELAY LINE/SAMPLER

4 EIGHT SECOND CARDS 15kHz

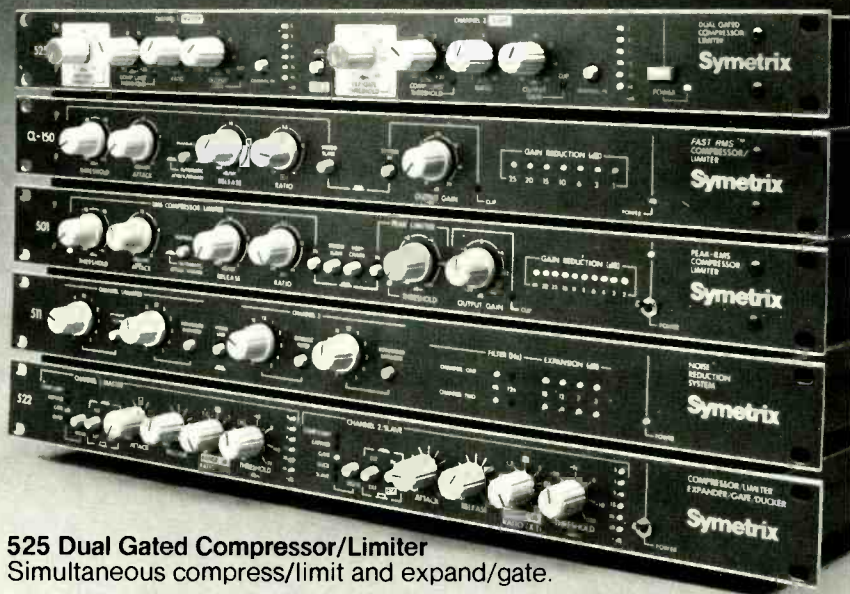
Audio Services • Carlsbro Sound Centre • Chromatix • Don Larking Audio Sales • ESS • Future Music • ITA • Jones & Crossland • GIG Sounds • HHB • JSG Music • KG Music • Michael Stevens & Partners • Movement Audio Visual • Music Labs • Raper & Wayman • Sackville Sound • Studio Spares • ShuttleSound • Sound Business • Turnkey • The Turnkey Shop

Studio Equipment Distribution

29 Guildford Street, Luton, Beds., LU1 2NQ

Tel: Luton (0582) 452495

# Dynamic Range Control at its best.



# Symetrix

SOUND TECHNOLOGY LTD  
6 Letchworth Business Centre  
Avenue One, Letchworth  
Herts SG6 2HR  
Telephone: 04626 75675

**525 Dual Gated Compressor/Limiter**  
Simultaneous compress/limit and expand/gate.

**CL150 Fast RMS™ Compressor/Limiter**  
A highly cost-effective single channel automatic gain controller.

**501 Peak-RMS Compressor/Limiter**  
Simultaneous peak and RMS detection. An indispensable tool for PA.

**522 Compressor/Limiter/Expander/Gate/Ducker**  
Versatile multi-function processing for studio, stage, or production.

**511 Noise Reduction System**  
Removes noise from any source, pre-recorded or live, mono or stereo.

Symetrix products are sold and supported world-wide. When you specify Symetrix you specify quality, performance, and reliability.

# Room Service?

HHB's reputation is founded on quality, value for money and service, as well as its commitment to the new technology of digital recording.

So, as digital multitrack has yet to become an affordable reality for most people, we have sought out a superb range of packages to fill the gap in analogue 24 track choice.

We feel these make sound economic sense in the 2" jungle.

The picture shows the superlative Total Audio Concepts 'Matchless' console - one of the large range from Amek/TAC - and the Sony/MCI JH2424, which has an established reputation for quality and

reliability, further enhanced by Sony since their acquisition of MCI. This package of console and recorder, complete with autolocator and audio remote, costs the same as some recorders alone, but makes no compromise on quality yet saves thousands of pounds.

Alternatively, for an even higher mixer specification, we can offer any of the other Amek/TAC consoles, such as the Angela or 2500 series, both of which are available with automation if required.

All these consoles feature the famous Amek EQ, thought by many to be the finest available, as well as the facilities that make Amek consoles world leaders.

In addition to the analogue Sony 24 track recorder, we can also offer their digital PCM 3324, as well as the top-line Studer range.

Of course a multitrack system does not start and finish with the mixer and recorder; we can also supply everything you need from digital mastering systems through signal processors and monitors to microphones and hardware.

We can also put you in touch with the country's top acoustic consultants, and gain access to the amazing Tecron TEF 10 audio analysis computer.

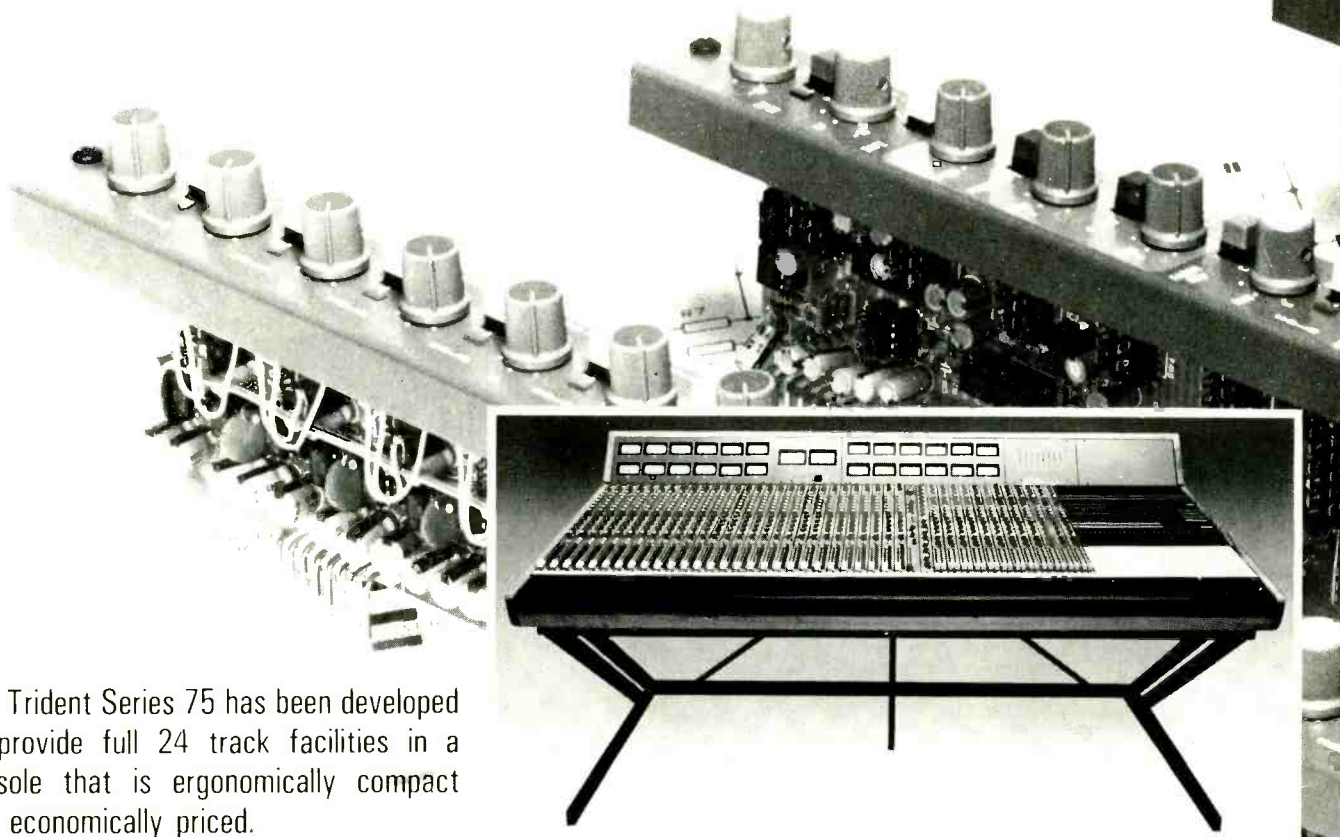
All this is naturally supported by HHB's established advice and back-up service.

So if you're on the horns of the 24 track dilemma, why not try HHB's Room Service, and call Martin Westwood.



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

# SERIES 75



The Trident Series 75 has been developed to provide full 24 track facilities in a console that is ergonomically compact and economically priced.

Because of this, the Series 75 is equally suitable for use in a musician's home studio or a commercial multi-track facility.

The electronics design of the console allows no compromise. Trident have been manufacturing consoles that are used in world class studios for the past dozen or so years and enjoy a reputation for providing particularly warm and musical sounding equalisation. Series 75 carries on this tradition in characteristic style.

A feature of the console is its comprehensive, separate monitor section that provides monitor equalisation and the availability of up to 56 line inputs during mixdown, complete with equalisation, panning, aux sends and muting. A full 308 point bantam patchbay is also provided as standard.

Take a close look at the Series 75. We'll be surprised if you can find a console with a better reputation and more features at the same price.



Trident Audio Developments Ltd.  
Trident House, Rodd Industrial Estate  
Govett Avenue, Shepperton,  
Middx, TW17 8AQ.  
Telephone: (0932) 224665  
Telex: 8813928 TRIMIX G

Trident U.S.A. Inc.  
308 N. Stanley Avenue,  
Los Angeles 90036, U.S.A.  
Telephone: 213 - 933 7555  
Telex: (255) 510600019 TRIDENT U.S.A.

# More effects from HHB.

Introducing the amazing Yamaha REV 7 digital reverb + effects processor.



At last, a professional quality programmable digital reverb, with the sounds and features you want, at a price so low you won't believe it.

Here are a few of the REV 7's features:

- True or simulated stereo.
- 30 factory presets and up to 60 user stores
- Hall, Plate & Room reverb programs
- Reverb available with gating, reverse, flanging...
- Early reflection programs.
- L/R delay and stereo echo.
- Stereo phasing and flanging.
- MIDI interface.
- Remote control.
- 16 bit @ 31.25 kHz sampling giving 20-12kHz response.
- 3 band parametric EQ

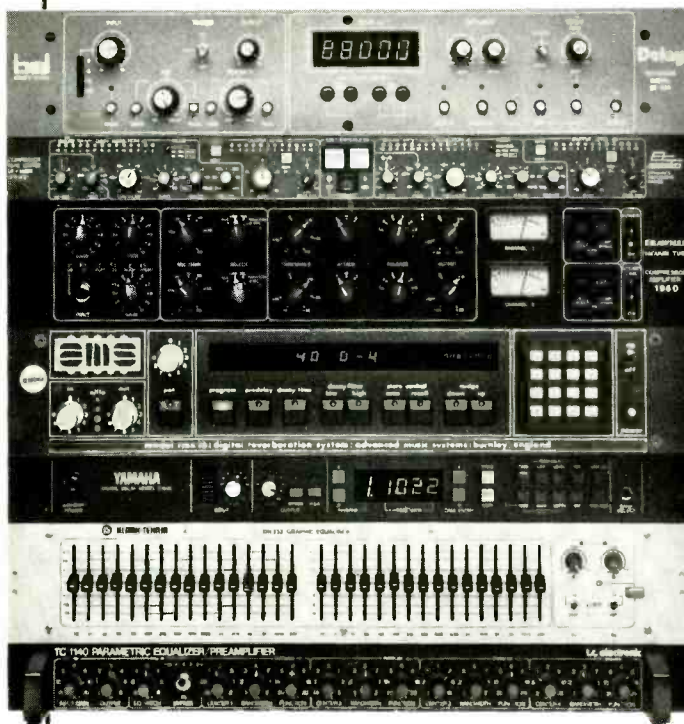
**£1040**

At £1040 the REV 7 must be the year's best buy; send now for colour brochure.



For the more demanding user, don't forget Yamaha's original REV 1 digital reverb with its full function remote control at £6595.

In addition to the REV 7, here are some more gadgets from HHB's effects collection:



The newest from the BEL stable, the BD320 gives all the functions of the popular BD80, but with up to 32 (yes 32) seconds of delay BD80 £695 (2 secs) + £200 per extra 2 secs. BD320 £1200 (8 secs) + £500 per extra 8 secs.

The BSS DPR402 is an all in one dynamics processor, providing compression, peak limiting, de-essing and expansion, all with frequency keying all in a lu package £615.

For that authentic 60's sound, DRAWMER's 1960 valve compressor/pre-amp is a must. "Soft knee" compression, microphone inputs, side chain operation etc £750. (Don't forget the DL221 @ £325, and DS201 @ £275.)

The AMS RMX16 shown here is the state-of-the-art in programmable reverb. We also try to keep the DMX 15-80 DDL/pitch transposer, but demand is high so order now. RMX16 £4680 DMX15-80 £POA.

The YAMAHA D1500 is a low-cost, high-value programmable DDL with MIDI interface; it gives up to 1 sec delay, with 16 user memories. Our price is so low that we don't dare print it! £POA

KLARK-TEKNIK's range of equalisers should need no introduction: they are simply the industry standard for graphics. We also stock other Klark-Teknik products, such as their excellent digital reverb and the DN60 analyser. DN332 (shown here) £525. DN360 £980. DN60 (analyser) £1650. DN780 reverb £3580.

TC ELECTRONICS TC2240/1140 are stereo/mono 4 band fully parametric equalisers offering 20dB of cut and boost. We think they are the best value and best sounding outboard EQ's around. TC2240 £330. TC1140 £195.

We also keep toys from Lexicon, Urei, Electrospace, dbx, Eventide and many more. Our demo room is ready for you to try before you buy, or take advantage of our mail order service for best prices and free delivery.

Access, Barclaycard/Visa, American Express, Finance arranged (All prices exclude VAT and are correct at time of going to press.)



HHB HIRE & SALES, UNIT F NEW CRESCENT WORKS, NICOLL ROAD, LONDON NW10 9AX  
TELEPHONE 01-961 3295 TELEX 923393

**YOU GET A FREE  
WITH EVERY**



# PAIR OF HANDS MASTER MIX



Remember the old days? That homely atmosphere you got in the control room as the musicians and their roadies gathered round the console to help you with faders on the final mix? That wonderful sense of achievement that greeted you as, finally, the drummer's roadie managed to bring the brass section in on cue after the hundredth attempt? What you needed was an extra pair of hands – and that was on sixteen-track.

Now, thank goodness, those days are passed. Now you have Master Mix, by Audio Kinetics. The independent console automation system. It's easily fitted to your automation-ready console, and to many others with the addition of the Master Mix VCA fader system. You'll hardly know it's there – until you need it. Master Mix doesn't interfere with your normal mixing process – it enhances it. It remembers your fader movements, your channel muting, your chores. No longer do you have to go over the same complex sequences time and again, because Master Mix remembers it the first time. Instead, you can concentrate on the music. Isn't that what you were trying to do in the first place?

And the free pair of hands? They're yours.

Audio Kinetics Ltd.  
Kinetic Centre, Theobald Street,  
Boreham Wood, Hertfordshire,  
WD6 4PJ England  
Tel: 01-953 8118 Telex 299951

Audio Kinetics Inc.,  
4721 Laurel Canyon Blvd.,  
Suite 209, N. Hollywood,  
California 91607, USA.  
Tel: (818)980 5717



**AUDIO KINETICS**

# APRS

# 86



## Olympia 2

Wednesday 25  
26  
27

JUNE 1986

**EXHIBITION OF PROFESSIONAL  
RECORDING EQUIPMENT**

APPLY NOW FOR EXHIBITION SPACE

23 Chestnut Avenue  
Chorleywood, Herts  
England WD3 4HA  
Tel: 0923 772907

# SOUND ENGINEER

## COURSE

*"The most practical way  
to learn the art of  
recording"*



11 Schools World-wide

### DIPLOMA

A RECOGNISED  
ONE YEAR DIPLOMA  
COURSE WITH PRACTICAL & THEORY INSTRUCTION IN OUR OWN MULTI-TRAK STUDIOS.

### THE LARGEST SCHOOL

AS THE LARGEST, WE OFFER AN INTERNATIONAL NETWORK OF FORMAL TRAINING SCHOOLS IN THE FIELD OF STUDIO, FILM, BROADCAST, SOUND.

### JOB PLACEMENT

THE SCHOOL IS ACTIVE IN ASSISTING SUCCESSFUL STUDENTS INTO JOBS IN THE INDUSTRY WITH THE HELP OF OUR LEADING MUSIC MAGAZINES.

★ WE GUARANTEE HANDS ON STUDIO TIME.

## School of Audio Engineering

LONDON SYDNEY MELBOURNE MUNICH

TEL: 01-608 2420

**IT'S MIDNIGHT,  
THE BAND'S IN A  
SESSION AND THE STUDIO'S  
DELAY LINE HAS DROPPED  
OUT.....**

**MUST REACH HILTON SOUND...**

**WITHIN 10 SECONDS HILTON  
SOUND'S NEW CCF EQUIPMENT  
IS AUTOMATICALLY TRIGGERED.**

**AT HOME, HILTON'S DUTY  
ENGINEER TURNS OFF  
THE VIDEO AND PICKS  
UP THE PHONE..**

**THE URGENT CALL IS  
INSTANTLY REROUTED...**

**'HILTON  
SOUND CAN  
I HELP YOU..'**

**30 MINUTES LATER A NEW UNIT  
IS POWERED UP IN POSITION AND  
WORKING. AND THE BAND PLAYS ON**

When you have a gear breakdown you can lose your temper, your clients and your reputation. Hilton Sound can save all these with just a 'phone call.

Anytime, anywhere - we'll be with you immediately, giving you expert service, advice, or the right replacement. There's nobody else who gives you the best in pro-audio gear.

The last thing you need is down time, so the first people you call should be us.

**AT HILTON SOUND WE'RE ONE CALL AWAY  
NIGHT OR DAY!**

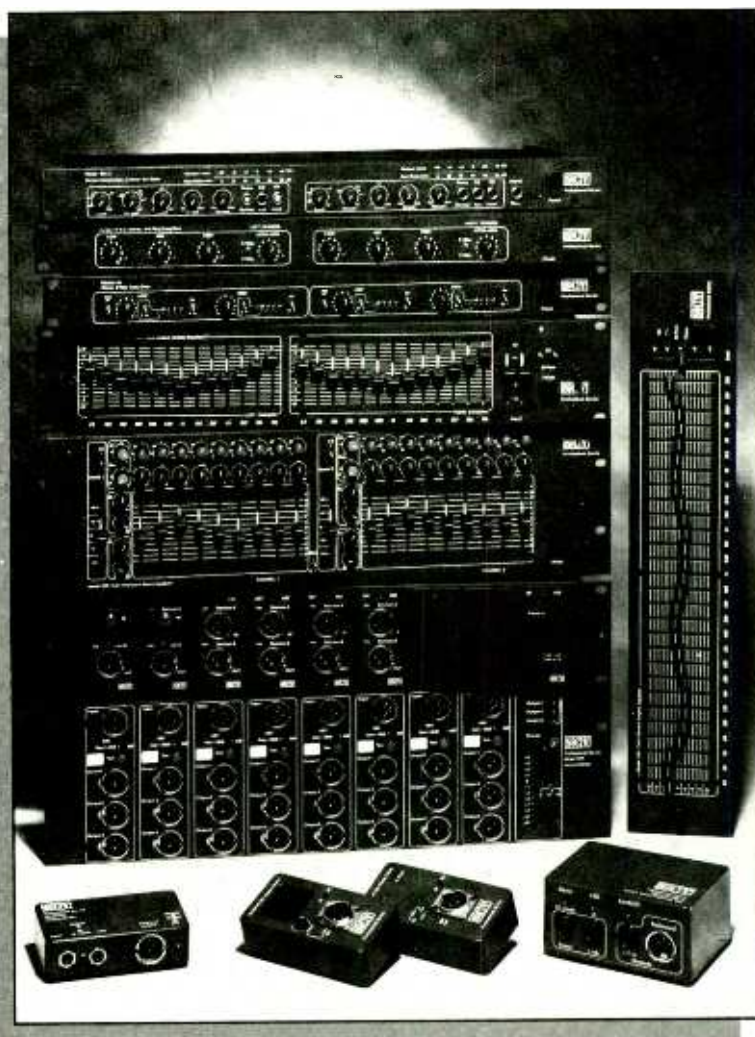
**01-708 0483**





# Our standards are even higher than yours

DIBOX II	Active direct box
DIP	Passive direct box
PC80	Phase checker system
SRL2	Dual compressor-limiter, de esser
RBS2	Stereo spring reverb
NGS2	Frequency selective noise gate
EQ 213	Dual 13 band, 2/3 octave EQ
EQ 128	28 band 1/3 octave graphic EQ
EQ 228	Dual 28 band 1/3 octave graphic EQ
RE 209	Stereo, parametric room EQ
M 222	Stereo, 2 way crossover
FA4-2	Stereo, 3-4 way crossover
UB 280 series	Universal buffer
824 series	Active mic splitter



## DISTRIBUTORS

### AUSTRALIA

AR audio engineering  
59 Bristol rd. Hurstville 2220,  
Sydney — Australia  
Tél. : (02) 57.12.36  
Contact : Anthony Russo

### BELGIUM

Inelco  
Avenue des Croix de Guerre, 94  
1120 Brussel  
Tél. : 32.02.216.0160  
Tlx : 22 090  
Contact : Luc Vandeneynde

### CANADA

SF Marketing  
312 Benjamin Hudon, St-Laurent  
Québec H4N1J4  
Tél. : 514.337.6113  
Tlx : 826 765  
Contact : Sol Fleising

### GERMANY

BFE  
An der ochsenwiese 6  
6500 Mainz/Gosenheim  
Tél. : 06131/463  
Tlx : 187 300  
Contact : Bodo Feldmann

### ISRAEL

Sontronics electronic equipment Ltd  
103 Nordau BLVD P.O.B.  
21511 Tel Aviv  
61214 Israël  
Tél. : 03.44.22.33  
Tlx : 361 579  
Contact : Sonny Shmueli

### ITALY

Audio equipement S.R.L.  
20052 Monza Mi  
Via C.Rota, 37  
Tél. : 039.836767  
Tlx : 323668  
Contact : Giuseppe Porro

### NORWAY

Nortek  
Nydalsveien 15,  
0483 Oslo 4.  
Tél. : (02) 23.15.90  
Contact : Truis Berger

### SOUTH AFRICA

Tru-Fi electronics  
4 a Chadwick avenue,  
Wynberg, Sandton  
P.O. Box 84444  
Tél. : (011) 796.71778  
Tlx : 4 28708SA  
Contact : Flemming Ravn

### SWEDEN

Tal & Ton Ab  
Kampegatan 16 S ; 41104  
Goteborg  
Tél. : 031803620  
Tlx : 27492  
Contact : Jan Setterberg



## PROFESSIONAL SERIES

USA SCV Inc.

414 North Spark St.  
91506 Burbank USA  
Tél. : 818.8437567  
Contact : Ron Fuller

FRANCE S.C.V. Audio

186 Allée des Érables  
ZI Paris Nord II BP 50056  
95947 Roissy C.D.G. Cedex  
Tél. : (1) 863.22.11 Tlx : 212802  
Contact : Richard Garrido

**HH**  
electronic

# SUPERIOR POWER AMPLIFIERS



At HH we know there is no substitute for quality. That's why when you buy an HH amplifier you automatically get a range of benefits and features not always available from our competitors. A point many of the most notable Studios, Installation and Broadcast Companies

have been quick to note and appreciate when installing our amplifiers – and amazingly it doesn't cost any extra!

HH design, manufacture and sell, thus cutting out one or more stages in the supply chain. The benefit – higher quality and additional features.



**M900**  
**400W + 400W**

The M900 has been designed for the installation or P.A. specialist who wants quality, reliability and limited features at a fiercely competitive price. Identical in performance and specification to the V800 it has the advantage of 'Lock Pot' Input Attenuators.

*The V800 features stepped input attenuators*



### Range of Connectors

Inputs: Jack and XLR together with XLR Link connectors

Outputs: Binding Posts and 4 × XLRs

### Rear Carrying Handles

Invaluable rear carrying handles help in transport and when installing in racks. Additionally they provide protection against accidental breakage of the binding posts.



Contact one of our distributors or HH direct for full details of our range of power amplifiers.

Scenic Sounds Equipment, Unit 2, 12 William Road, London NW1. Tel: 387 1262.

Canford Audio, Stargate Works, Ryton, Tyne & Wear NE40 3BR. Tel: 091 413 7171.

**H. H. ELECTRONICS LIMITED, 9 CLIFTON ROAD, HUNTINGDON, CAMBRIDGESHIRE PE18 7DW**  
**TELEPHONE: 0480 432227 TELEX: 32789 HH ELECC**

# When you're in the studio you want the best.

- ***Innovative products using the latest technologies***
- ***Sophisticated, versatile equipment to create originality***

At Electrospace Developments Limited, we have an international reputation amongst engineers for meeting all these criteria – and more.

And, you won't need a small army of technicians to get the best from our products.

Products like our New Gate and Strate Gate, unique Audio Gates which have a level of precision and control that needs to be seen – and heard – to be believed.

Like the Spanner, the industry's first digital panning system which gives infinitesimal adjustment and variation for both mono and stereo inputs.

And like the next generation of technological engineering which we are today developing into tomorrow's products.

Distributed in the UK by Britannia Row Equipment Limited, on 01-226 3377.

## **Electrospace**

ELECTROSPACE DEVELOPMENTS LIMITED THE SOUND OF QUALITY

**Main UK dealer, Professional Audio Limited,**

**Professional Audio House, 53 Corsica Street, London N5 1JT. Tel: 01-226 1226**

*Authorised dealers:* **Turnkey** – London, Tel: 01-202 4366/01-637 1701/0782 24257 **Don Larking Audio Sales** – Luton, Tel: 0582 450066

**Carlsbro Sound Centre** – Nottingham, Tel: 0602 581888

## A better vocal microphone



**The New SM87 by**

# **SHURE**

HW International  
3-5 Eden Grove London N7 8EQ Tel 01-607 2717



**POLY**

# **SAJE**

**AUDIO CONSOLES MADE IN FRANCE**

**AUXY**

**ULN**

**RACKY**

**ODYSSEY**

**MEMORY**

**OB**

**MOBILE**

**THEATRE/PA**

**STUDIO  
BROADCAST  
VIDEO**

**SOUND MIXING**

**ROUTIERS SANS FRONTIÈRES**

**SAJE**

3 RUE VERTE, 95100 - ARGENTEUIL (FRANCE)  
TELEPHONE: (1)39.61.15.62 TELEX: 699672F SAJE

# THE SECOND COMING

## FIRST TESTAMENT • CHAPTER 1 •

*From January 1st 1986 we can promise you a service second to none.*

*Having joined forces with Bill Kelsey we are now working together under new management to give you, quite simply, the best of everything.*

*This means that our complete catalogue will now be available from stock, together with the full range of RCF speakers.*

*For the best in quality and service, Court Acoustics has finally arrived.*

**COURT ACOUSTICS**

Court Acoustics Sales Ltd

29 Beethoven St., London W10 4LG. Tel 01-960-8178 Easylink No. 19018075 Telex 946240 CWEASY G Ref. 19018075

# NORTHERN AUDIO

## PROFESSIONAL STUDIO EQUIPMENT SECOND HAND PRODUCTS

1. MCI JH400 28/24/2 with fully wired patchbay and JH 50 automation, 4 yrs old	£16,500	8. Otari MTR 10 1/4" master recorder, mint	£3,900
2. MCI JH566C JH50 auto with every extra, 2 yrs	£75,000	9. Studer A810 1/4" master recorder	£4,000
3. Soundcraft TS24 32/24 ex-demo	£25,500	10. Soundcraft S20 1/2" master, as new	£3,250
4. TAC Matchless with full wiring loom in packing case	£8,450	11. Tascam 35/28 1/4", master, ex-demo	£650
5. Neve 8128 12 months old (phone for details)	£55,500	<b>ANCILLIARY EQUIPMENT</b>	
6. MCI JH500 56 in-line console with automation	£65,000	Fairlight Mk2 with pages 1-7, ages RMG and L	£15,500
7. Amek 2500 15/16/8/2 PA console, 2 yrs	£6,500	JBL 4435 monitors, 12 months old	£2,500
8. Neve 8108 48 channels, Necam 2, 4 yrs old	£105,000	JBL 4430 monitors, 18 months old	£2,000
9. Harrison MR3, 4 yrs old, 40/32 frame 32/32 fitted with 3 extra modules (automated)	£29,500	Tannoy little red monitors, new	£690
10. Neve 8108 56 channels, Necam 1, 4 yrs old	£125,000	Audio and Design vocal stresser	£700
11. AHB Syncon 'A' 28/24/2 with fully wired patchbay, 2 yrs old	£7,500	BEL Stereo noise reduction s/h	£120
12. Trident series 80B, 32/24/2, 2 yrs old	£16,500	<b>MICROPHONES</b>	
13. SSL 4000E 40 frame, 38 fitted	POA	Neumann U871 complete refurbish from Bauch	£395
<b>TOTAL RECALL READY</b>		Neumann U871 s/h	£350
1. Soundcraft 762, 24-track with standard remote	£11,500	AKG C451 with various capsules	£125
2. Soundcraft 762, 16-track machine, 30 imps only	£5,000	<b>STOP PRESS</b>	
3. MCI JH110 24-track machine, 4 yrs old	£13,250	1 Pair of Quad electro static speakers, new	£1,290
4. Otari MTR90 with autolocate, 6 months old	£25,500	E.M.T. Gold foil plate TS stereo	£2,250
5. Studer A800 Mk1A, 4 yrs old, good condition	£17,500	AMS 1580 DIG/DEL with two 408 milli sec cards	£2,650
6. Trident TRS 24, 3 yrs old, mint	£9,500	AMS 1580S with 1 x 4 08 card + 2 x 1.6 cards, first pitch change and deglitch, new	£4,680
7. Lyrec TRS 24 with ex 16-track headblock and remote 3500 hours, 2 yrs old	£13,250	1 Pair JBL 4401 s/h	£180

WE ARE CONSTANTLY ON THE LOOKOUT FOR USED EQUIPMENT. PLEASE GIVE US A RING.  
RING TONY BAYLEY ON 061-483 9563/4299 *anytime* or WRITE TO US AT:  
4 CHEVIOT ROAD, HAZEL GROVE, STOCKPORT, CHESHIRE SK7 5BH

Tel: 061-483 9563/4299

TELEX 666576 HTRNGS

**NEW!**

# The Aphex Aural Exciter® Type C

## The Best Way to Improve Your Sound System Just Got Better.



### And more affordable!

Like the famous Type B, the new Type C restores natural brightness, presence and detail to live and recorded sound... and does it more quietly and musically! Lyrics will have more intelligibility... guitars more bite... drums more kick. The overall mix will be cleaner, more natural and exciting.

The Type C is the best way to improve any sound system. It adds that *extra edge* that is impossible to add with any other

processor. Live sounds fill the room without all the problems of high frequency EQ. Multitrack tapes made on narrow format machines will sound like they were made on expensive studio recorders. Even cassette dupes will have an unmuffled, professional sound.

Hear the difference *only* a genuine Aural Exciter can make at your dealer today. Or write us for more information and the name of your nearest dealer.

# The Aphex Compellor.™

## Invisible Compression in Stereo or Mono.

The Aphex Compellor is the most acclaimed compressor/leveler/peak limiter ever made. With good reason... you simply can't hear it work. It doesn't add *any* color or other sonic effects. Best of all, the Compellor is easy to use. Set it once and it goes to work automatically... inaudibly controlling your dynamics.

Ask your professional sound dealer for a demonstration of the remarkable Aphex Compellor. Available in monaural and

stereo versions. Or write us for the name of your nearest dealer and more information on the full line of innovative Aphex products.



**Aphex Systems Limited**  
Sound Technology Ltd.  
6 Letchworth Business  
Centre, Avenue One,  
Letchworth, Herts SG6  
2HR

Aural Exciter and Compellor are registered trademarks of Aphex Systems Ltd., North Hollywood, CA  
© 1985 Aphex Systems Ltd.

**AUSTRALIA**  
East Coast Audio Sales,  
Melbourne

**AUSTRIA**  
AKG, Vienna

**BENELUX**  
Trans European Music,  
Ditbeek

**CANADA**  
AKG Acoustics,  
Scarborough

**DENMARK**  
SC Sound, Taastrup

**FINLAND**  
Nores Oy, Helsinki

**FRANCE**  
3M France  
Cergy Pontoise Cedex

**GERMANY**  
AKG, Munich

**GREECE**  
Omikron, Athens

**HONG KONG**  
Audio Consultants,  
Kowloon

**ITALY**  
M Casale Bauer, Bologna

**JAPAN**  
Matsuda Trading, Tokyo

**KOREA**  
Young Naksorisa, Seoul

**NEW ZEALAND**  
Maser Comm., Auckland

**SINGAPORE**  
Auvi Private Ltd.

**SPAIN**  
Neotecnica, Madrid

**SWEDEN**  
AB Betoma, Solna

**SOUTH AFRICA**  
Tru-Fi Electronics  
Wynberg, Sandton

**SWITZERLAND**  
Audio Systems  
PAS AG, Basle

**TAIWAN**  
Linfair Engineering, Taipei

WITH OVER 44 YEARS' EXPERIENCE IN THE DESIGN AND MANUFACTURE OF SEVERAL HUNDRED THOUSAND TRANSFORMERS WE CAN SUPPLY

## AUDIO FREQUENCY TRANSFORMERS OF EVERY TYPE

**YOU NAME IT! WE MAKE IT!  
OUR RANGE INCLUDES**

Microphone transformers (all types), Microphone Splitter/combiner transformers, Input and Output transformers, Direct Injection transformers for Guitars, Multi-Secondary output transformers, Bridging transformers, Line transformers, Line transformers to British Telecom Standard Isolating Test Specifications, Tapped impedance matching transformers, Gramophone pickup transformers, Audio Mixing Desk transformers (all types), Miniature transformers, Microminiature transformers for PCB mounting, Experimental transformers, Ultra low frequency transformers, Ultra linear and other transformers for Valve Amplifiers up to 500 watts, Inductive Loop transformers, Smoothing Chokes, Filter inductors, Amplifier to 100 volt line transformers (from a few watts up to 1000 watts), 100 volt line transformers to speakers, Speaker matching transformers (all powers), Column Loudspeaker transformers up to 300 watts or more.

We can design for RECORDING QUALITY, STUDIO QUALITY, HI-FI QUALITY OR P.A. QUALITY. OUR PRICES ARE HIGHLY COMPETITIVE AND WE SUPPLY LARGE OR SMALL QUANTITIES AND EVEN SINGLE TRANSFORMERS. Many standard types are in stock and normal dispatch times are short and sensible.

OUR CLIENTS COVER A LARGE NUMBER OF BROADCASTING AUTHORITIES, MIXING DESK MANUFACTURERS, RECORDING STUDIOS, HI-FI ENTHUSIASTS, BAND GROUPS AND PUBLIC ADDRESS FIRMS. Export is a speciality and we have overseas clients in the COMMONWEALTH, E.E.C., U.S.A., MIDDLE EAST. etc.

Send for our questionnaire which, when completed enables us to post quotation by return.

## SOWTER TRANSFORMERS

Manufacturers and Designers

E. A. SOWTER LTD. (Established 1941), Reg. No. England 303990

The Boat Yard, Cullingham Road, Ipswich IP1 2EG, Suffolk. P.O. Box 36, Ipswich IP1 2EL, England.

Phone: 0473 52794 & 0473 219390. Telex: 987703G

# PA-VS 01-540 2164

**7 DAYS A WEEK 24 HOUR EXPRESS  
STUDIO EQUIPMENT HIRE SERVICE**

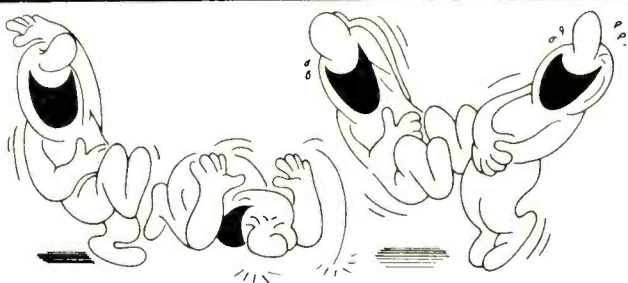
DIGITAL RECORDERS  
SYNCHRONISERS  
DRUM COMPUTERS  
KEYBOARDS

DIGITAL DELAY  
DIGITAL REVERB  
ANALOGUE EFFECTS  
VIDEO EQUIPMENT

### SALES AND TECHNICAL SERVICES

PA-VS offers a range of new and used studio equipment for sale at competitive prices plus a comprehensive studio and studio equipment design and installation service. Repairs and modifications carried out on most makes of equipment.

Palmer A-V Systems Ltd. 67 Mostyn Road, London SW19 3LL.



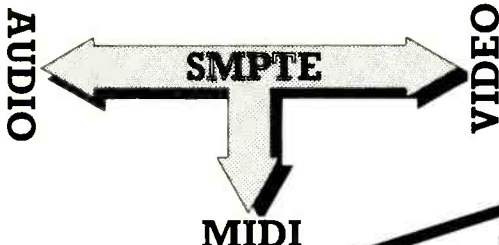
**YOU WANT IT WHEN??**

Essex Tape Supplies  
Manufacturers of High Class  
blank & pre-recorded cassettes



215 Moorfield  
Harlow, Essex  
CM18 7DL  
(0274) 414513

Main distributor for B.A.S.F.  
professional audio tape products



**TEL FOR FREE  
14 DAY TRIAL**

# SYNCHRONISING?

**THE ANSWER IS SMPL®**

- ★ Chase lock
- ★ 8 Point Autolocator
- ★ Automatic Punch In/Out
- ★ MIDI Sync/Autolocate
- ★ DF, NDF, 25F/S, 24F/S SMPTÉ Time Generator
- ★ 8 programmable EVENT gates
- ★ Transport remote controls
- ★ 24, 48, 96, Tick/Beat instrument etc.

Best of all, the SMPL System is for real - no "gotchas". Works with equipment from every major manufacturer from inexpensive Portable Studios to 2" transports even consumer quality VCR's.

**ALL THIS FOR LESS THAN £2,000!!!**

# AUDIO SERVICES

Studio House, High Lane, Stockport SK6 8AA

**06632 4244**

4 Wellington Road, St. Johns Wood, NW8. (opp. Lords Cricket Ground)

**01-586 3167**

**THE SYNCHRONOUS TECHNOLOGIES SMPL SYSTEM IS ON PERMANENT DEMONSTRATION IN BOTH SHOWROOMS**



# Drop-in, drop-out, trigger effects, remote control...

## QuPlay does it all automatically!

Drop everything and listen. Whether you're a recordist who plays a bit, or a player who records alone, you'll know you can't do both jobs at once. QuPlay changes all that.

### Free to play...and free to think

This brilliant new device will memorise drop-in points, trigger external devices and functions as a remote control. Leaving your hands and head free to get on with more creative things.

### Save time, stop mistakes

Just program QuPlay to carry out your instructions then you can concentrate on getting the performance right. The operation is quick and efficient and you won't run the risk of wiping or clipping a perfect take.

### Only a minute to master

We designed the QuPlay to help you. In operation, it's simplicity itself; after one demonstration you'll wonder why you tried to manage without it.

### Rugged and reliable

Housed in a tough steel box measuring just 17 x 11 x 15cms, QuPlay is still light enough to permit one-hand use. And with its long remote cable, it'll give you mobility between instruments and tape machine, control room and studio.

### Accurate even after 20 passes

If you DO need twenty takes at a drop-in (maybe you should be thinking of a new career) QuPlay will stay locked on cue.

### From MTR90 to Model A80

QuPlay is designed to interface with all the latest multi-tracks: Fostex B16 and Model A80, Otari MTR90, MTR12, MTR10, and MX70, Tascam 48, 58, MS16 and 388 Portastudio.

### Self-powered

Actually, strictly speaking, QuPlay draws its power from the tape machine it's plugged into. But what this means in practice is that it's never going to run out of batteries at the crucial moment.

### A silent partner

Its nerves are unshakeable, performing precise drop-ins after hours of operation. It doesn't get tired, irritable or angry however long you work.

### Affordable

At under £300, how much longer can you afford to be without a QuPlay? In fact, when studio time is being paid for by the hour, if it saves just one mistake it could well pay for itself.

### Want one?

Post the coupon or contact any of these stockists:

**America:** Europatech (213) 3924985. **Canada:** Gerr Audio Inc (416) 868 0528. **France:** Regiscene (1) 374 5836. **Italy:** Audio Links (2) 302 772009.

**Japan:** Matsuda Trading Co. (03) 295 4731. **New**

**Zealand:** Maser (9) 444 3583. **Spain:** Lexonsa (320) 34804. **Switzerland:** W.A. Gunther

(391) 3939. **Denmark:** S.C.Sounds. Aps

(2) 99 88 77. **Finland:** Audiotron (0)

5664 644. **Sweden:** Intersonic A.B.

(8) 744 5850. **Norway:** Lyd/Rommet

(2) 114 085. **Australia:** Syntec (2) 406

4700. **England:** S.A.S. (01) 625 4515,

I.T.A. (01) 748 9009.

### QuPlay...as versatile as you.

Works without using up valuable tracks or the risk of stretching your valuable master tape.

Does *not* need batteries or mains power.

Accepts programming by time-code driven devices.

Acts as conventional remote control.

Trigger external effects, bounce tracks, start 2-track tape machine automatically.

Allows multiple drop-in of a fixed length sound effect by shifting record window.

Control drop-ins via footswitch in recording area, or patch through on tie-lines from control room.

Provides unique pre-record rehearsal facility with arm/disarm buttons plus automatic mute is achieved with external trigger.

Program drop-in points, spot erase, track clear confidently without risk of accidental erasure.

# QuPlay

LTD

Tel: 01-482 4288 oor (0707) 44616, 24 hour answering service.  
Telex: 8951182 GECOMS G. Attn. QuPlay.  
U.K. distribution exclusively by QuPlay. Credit facilities available. Contact us for details.

Post today for free brochure  
and list of local stockists

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Private Studio  Commercial Studio  (Please tick)

Tape Model No. \_\_\_\_\_ Your Daytime Phone \_\_\_\_\_

**QuPlay Ltd., Unit 5, 43 Carol Street, London NW1**



## IT MAKES TAPE MORE FLEXIBLE

Otari Corporation  
 2 Davis Drive  
 Belmont, California 94002  
 Telephone: (415) 592-8311  
 Telefax: (415) 591-3377  
 Telex: 910-376-4890 OTARICORP BELMT

Otari Electric Co. Ltd.  
 4-29-18 Minami-Ogikubo,  
 Suginami-ku,  
 Tokyo 167  
 Telephone: (03) 333-9631  
 Telefax: (03) 331-5802  
 Telex: J26604 OTRDENKI

Otari Singapore Pte Ltd.  
 625 Aljunied Road,  
 07-05 Aljunied Ind.  
 Complex Singapore 1438  
 Telephone: 743-7711  
 Telefax: (743) 6430  
 Telex: RS36935 OTARI

Otari Electric Deutschland GmbH  
 Gielen Strasse 9,  
 4040 Neuss 1  
 Telephone: (02101) 274011  
 Telefax: (02101) 222478  
 Telex: 8517691 OTEL D

Otari Electric (UK) Limited  
 22 Church Street,  
 Slough,  
 SL1 1PT  
 Berkshire  
 Telephone: (0753) 822381  
 Telefax: (0753) 823707  
 Telex: 849453 OTARI G



Otari would like to draw your attention to a remarkable new recorder. The MX70.

The MX70's microprocessor-controlled tape transport, closed-loop tension control and real-time tape counters give you instant, accurate tape control. And that gives you more time to do a better job.

The MX70 is designed for ease of use with machine controllers and synchronisers, meeting a variety of standards, including SMPTE. This makes it as valuable in video

post-production and broadcast studios as it is in audio recording.

Features like these, and many others, make the MX70 one of the most flexible tools any growing studio could wish for.

But there's one area where Otari's MX70 really does offer the kind of flexibility that no other machine can match. In formats.

The MX70's option list lets you choose between 1" 8-track and 1" 16-track formats. Convert to 1/2" 8-track. Or even switch between all three options on the same machine.

But while the MX70 sets new standards for flexibility, the men at Otari have stuck rigidly to tradition.

They haven't budged an inch on quality.



**OTARI**®

For more information on the MX70 or other Otari products, contact  
 Industrial Tape Applications, 1 Felgate Mews, Studland Street, London W6 9JT. Telephone: 01-748 9009  
 Sterling Audio Systems Ltd., 1 Cantfield Place, London NW6 3BT. Telephone: 01-625 4515

# DIARY DIARY

Metering, people, events

## Agencies

● Studiomaster has been appointed the sole UK distributor for Primo microphones. Primo is a Japanese company based in West Germany which provides a complete range of semi-professional and professional dynamic, condenser and electret microphones both OEM and under the Primo label.

● T Miyaji previously with Otari for 15 years has formed a new company, Trico Systems Corporation. Essentially involved in import and export of electronic products, the company can also supply Otari cassette and video related products in addition to

peripheral duplicating equipment made by other manufacturers. Trico are based at Ichibancho Phoenix Bldg, 4F 15-20, Ichibancho, Chiyodaku, Tokyo 102, Japan. Tel: 03-239 4651/2, Telex: 33852

● Sony has appointed two new US pro-audio dealers. New York's Martin Audio Video Corporation will now handle the complete Sony digital audio range including the *PCM-3324* multitrack recorder and the *PCM-1630* and Westec Audio Video Ltd, also in New York, will handle a variety of products including consoles, microphones and the *APR-5000* series 2-track analogue tape machines.

## People

● QuPlay has appointed Kevin Walker as sales director. Walker formerly of Turnkey will be responsible for UK sales and distribution.

● Whiteley Electronics has announced the appointment of Ron Hampshire as chairman following the death of R A Douglas the former chairman.

## Automated audio visual

A recent agreement has been made between Soundout Laboratories Ltd and Celco Ltd to develop a computer interface between the Soundtracs *CM4400* audio console and the Celco series 2 lighting control desk. The subsequent 'handshaking' of these two products opens up interesting possibilities in automated audio visual

presentations.

Both manufacturers see applications within the AV industry, theatres, concerts, theme parks and Son et lumière where automation of both sound and lighting is feasible. Further details can be obtained from Cerebrum Lighting, Chiltern Drive, Surbiton, Surrey, UK or direct from the manufacturers.

## Address changes

● FM Acoustics USA has recently moved to PO Box 854, Benicia, CA 94510. The new telephone number is (707) 745-4444.

● HH Electronics Ltd has moved to larger premises and is now at 9 Clifton Road, off St Peter's Road, Huntingdon, Cambs PE17 7DW, UK. Tel: 0480 432227. Telex: 32789.

● QuPlay, previously in

Hertfordshire has moved to Unit 5, 43 Carol Street, London NW1. Tel: 01-482 4288. Telex: 8951182.

● Qusted Monitoring Systems Ltd are now located in larger premises due to increased production requirements. The new address is 59 Maltings Close, Bagleys Lane, London SW6 2BX. UK. Tel: 01-731 7434.

Whilst other areas of professional audio are constantly breaking new technological barriers, metering, by comparison is a relatively quiet backwater. In many ways this is to be expected: if metering systems and standards changed every year no one would have a fixed standard by which relative levels could be compared. Fortunately we do have such a standard—several in fact (!)—and although abused on a fairly regular basis, in order to cut costs or provide a more 'readable' movement for example, the basic VU and PPM meters get most engineers through 99% of their working life.

Over the years, however, the familiar yellow VU meter and the black PPM has given way to vertical arrays of multicoloured LEDs, gas plasma displays and in recent years the video display, but for most practical purposes they still have the familiar VU or PPM 'movement'. Some manufacturers have opted for a different route and have tried to combine the virtues of established meter systems without the vices. One such manufacturer is the California-based, Dorrough Electronics.

The Dorrough Program Level Meter is described by the

## Metering systems roundup

manufacturer as a loudness monitor. It looks unconventional and it is. The Dorrough meter has 40 LEDs arranged in a single scale. The lower reading half of the meter is scaled from -25 to +1 dB with green, yellow and three (indicating -1, 0 and +1 dB) red LEDs which seems conventional enough. Immediately on from the red LEDs however the scale reverts back to yellow (+2 to +11) then back to red at +12, +13 and +14. The lower scale is identified as the Normal Persistence Range and the higher scale as the Normal Peak Range. The whole object of the system being to allow the engineer to get the highest consistent level with the minimum of distortion. With both peak (higher scale) and average levels (lower scale) represented on a single continuous display all the engineer has to do is adjust the level until one or the other set of red LEDs is illuminated. In order to avoid any confusion the circuit is configured such that transient signals do not illuminate the average level red LEDs. According to the manufacturer maximum level settings are possible when using the meter

regardless of programme content.

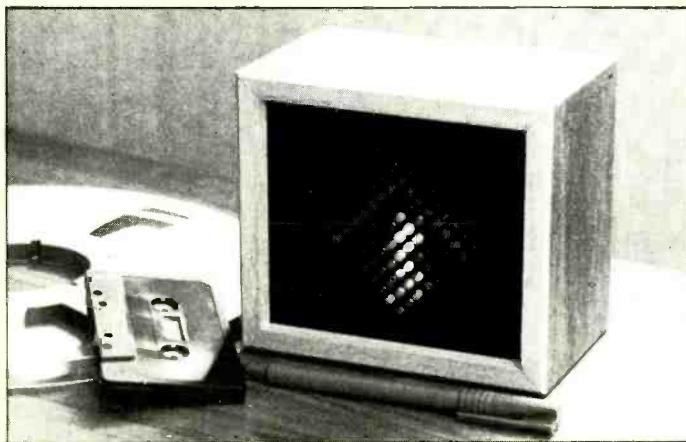
The Dorrough meter is available in a variety of options including vertical mounting (model *21-A*), dual meter (model *12-A*) and self contained in wooden case (model *40-A*).

Another company taking the unconventional route is the British manufacturer Tapetalk. *The Box*, as it is known, contains 100 LEDs arranged in the shape of a diamond and is designed to indicate stereo peak levels, balance, stereo width and phase. Essentially *The Box*

acts as an oscilloscope, correlation meter and individual channel meters all rolled into one. Two versions of the Realtime Soundstage Analyser are available: balanced (*RSA-1*) and unbalanced (*RSA-2*). Both have user definable scaling and the two level ranges can be altered remotely.

The increasing use of TV monitors in recording studios has encouraged the growth of TV-related metering systems. The Real World Technologies Group *UniVuer* system, although aimed at the video and television producer who needs to watch programme content on the screen, is a

The Box from Tapetalk



# Low-cost digital audio comes of age.

The Sony PCM series has now been available for several years. In this time recording and broadcast organisations, government, educational and industrial establishments, as well as individual users have all acknowledged the unique value of these units, and made them a new standard. It is the superlative quality of Sony PCM digital, coupled with extremely low cost that has brought about this professional acceptance of the range. This is borne out by the number of new ancillary products from other manufacturers, that have further increased the flexibility and versatility of the range. Examples of these products are the 'CLUE' logging and editing system from HHB, as well as various interfaces which allow digital communication with the PCM 1610.

Sony has acknowledged that this acceptance by professional users necessitates a change of

policy towards these products. Accordingly they have upgraded them from the domestic catalogue, and, realising the need for professional support and all that that entails, have appointed HHB as specialist dealers to represent them in the pro-audio market.

We are proud to announce this appointment, and happy to assure our customers of continued availability of the PCM range. The re-instatement of the PCM production line has been very largely due to pressure from end-users, who are after all the motivating force in the audio world. So if you are involved with audio recording and are still unfamiliar with Sony digital, then you owe it to yourself to call HHB - the No. 1 name in Digital Audio.

**SONY** FROM 

HHB HIRE & SALES, UNIT F, NEW CRESCENT WORKS, NICOLL ROAD, LONDON NW10 9AX. TELEPHONE: 01-961 3295. TELEX: 923393.



THE SONY PCMF1 AND PCM701ES DIGITAL AUDIO PROCESSORS.

# DIARY DIARY

Metering, Lexicon preview

Lexicon gave a preview of some of its R&D work to a selected audience during the New York AES Convention. This was not a product preview but an opportunity to see some of the ideas in development.

Project *RD-1* is a record, play, mix and edit development system based around a hard disk recording medium. The system comprised a work station/mixing console and a hardware rack that also contained the disk drive. Precise details of the work station/desk are of little real value as it is not a finished product but the operating systems are of particular interest. Briefly the controls included six channels with

## Lexicon R&D preview

faders, pan and mute buttons, tape transport-type disk controls, a small keyboard, a 6 in screen, a number of other switches and a rotary control for editing.

All the major functions of the *RD-1* were demonstrated including recording and mixing—the signals remaining in the digital domain after A/D conversion throughout the system. Maximum recording time of the system as shown was 120 minutes of 2-track although longer times would be simply (simply?) a question of adding more disks. Recording is not restricted to two tracks depending on how the system is configured. Mixing was demonstrated in

terms of level, mute and pan. Editing capability was particularly interesting with the ability to record tracks out of sync with each other and then move them in relative time until they aligned at the desired points. Editing between different takes and separate pieces of music was also demonstrated—the process being simple and straightforward.

Of particular interest was the menu-type screen displays that help in locating and referencing takes and different musical pieces, and also the editing wheel itself. In the shuttle mode, spinning the edit wheel allowed the user to move forwards or backwards

through the recording as if fast winding under variable speed control while hearing the recorded signal. For fine tuning of edit points there is the scrub mode that allows slow movement forwards or backwards through the track in exactly the same manner as analogue editing.

Several other points were touched on—such as interfaces to down load recordings to some other medium from the hard disk and future extensions of mixing abilities. It appears that Lexicon are putting a considerable effort into the development of this system. The first parts of this technology should become available towards the end of 1986 in whatever precise form the system develops.

fairly sophisticated device. It is available with either VU or PPM ballistics and has an adjustable flashing peak indicator and an adjustable silence sensing device, useful for broadcasters who have unwittingly gone 'off air'.

Horizontal and vertical bar size and position can be adjusted according to screen size or degree of prominence required and there are also features to vary the intensity and switch in or out a black border to improve legibility. For recording and/or maintenance a separate Mono/Stereo Coherency Evaluator (*MonSter*) is available. This can be used in conjunction with the *UniVUer* to provide on screen indication of the phase relationships between stereo channels.

Moving into the area of conventional metering, Sifam who manufacture moving-coil panel meters for practically every measurement application, has seen growing interest in their *Harmony* range of analogue/digital meters.

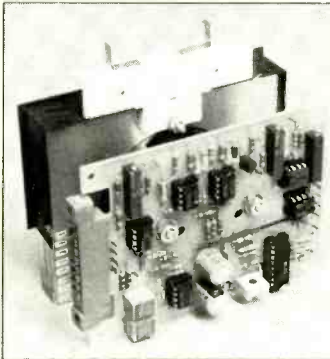
The *Harmony* system resembles a conventional LCD digital meter but it also contains a moving bar displayed beneath the digital reading which provides a reading similar to the conventional analogue display. It incorporates a microprocessor and can be programmed as a multi-range meter covering several different measurement functions or ranges. A

## Metering systems roundup

separate sector of the liquid crystal display can be used to 'flag' the specific range being measured at any specific time. The meter can also be programmed to act as a meter relay to initiate alarm or control functions at pre-settable high or low points, an interesting option for designers of outboard equipment.

As studios and peripheral equipment become more automated the concept of a programmable metering system could bring a whole new range of possibilities to equipment designers with automated switching of effects according to input or output levels. Perhaps the MIDI-compatible VU meter is not as crazy as it may first seem!

Even though the future may bring a whole host of new innovations there is still an ongoing need for conventional meters and conventional metering systems. Companies such as Ernest Turner and Modutec (who stock over 4,000 different types of meters)



Sifam Harmony (below) and the PPM7 from Surrey Electronics



continue to refine the basic unit with better illumination and more compact designs. Even the more specialist companies like Surrey Electronics are actively revising and improving their products with for example improvements to their economic *PPM 5A* BBC-approved PPM drive circuit and further development of the *PPM6* and *PPM7*.

Bach-Simpson can provide Bell and ANSI type VU meters with the conventional Type A scale or Type B (0 to 100% modulation on top, dB scale below). Ontario-based McCurdy (available through Seltech in the UK) produce an interesting extended range audio level meter, -50 to +10 dBm switchable -30 to +30 dBm. Rack-mounted the *SA 14023* is the basic version and the *SA 14023/5* PPM. RTW are of course well known and produce a variety of neon 'plasma' tube devices, both free standing and for use in equipment. In addition to their PPMs RTW produce an interesting phase meter, the *Correlator*.

Metering, particularly with the growth of digital recording and the pre-determined headroom limitations, still remains for the time being at least an essential and indispensable tool for the recording engineer. In the control room of the future however the VU meter as we know it could well be relegated to a museum piece in the studio foyer.



**IF YOU**  
**MISSED 1-50,**  
**MAYBE YOU'LL**  
**MAKE 51-100.**

ITA have now sold over 50 Otari MTR-90 multitracks. Proof that more studios come to ITA for their most important items of equipment. They also come to us for complete systems and after sales service that is second to none. So if you've missed out, contact us and make our next 50.

INDUSTRIAL TAPE APPLICATIONS  
PROFESSIONAL PRODUCTS DIVISION



1 Felgate Mews, Studland Street, London W6 9JT. Telephone: 01-748 9009. Telex: 21897.

# DIARY DIARY

People, places, events

## SSL future console booklet

Written by SSL, *The Future of Audio Console Design* is a 40-page booklet designed to promote a broader dialogue on the subject within the professional audio community. The special report covers the audio, computer and human engineering aspects of console design both analogue and digital. Detailed are the various issues console manufacturers are confronted with as they attempt to develop consoles beyond the standard analogue designs in use today.

In addition to a useful glossary the booklet provides a clear and concise guide to the numerous decisions and implications of various developments.

According to Doug Dickey, SSL's vice president for Design Communications, "In the course of producing the new *SL 5000 M* series, and in our discussions about SSL's future

direction, we discovered that many of the concepts and technologies we were exploring were quite unfamiliar to the average console user and studio executive. This is not a healthy situation. If the coming changes in studio technology are to be truly beneficial to the industry, then the people who will ultimately use this gear must be able to influence its development. To do that, we all need to speak the same language, and be aware of each other's goals and problems." The booklet should go a long way towards this end.

SSL are distributing the booklet to more than 150 schools and universities with audio education programmes around the world. Copies are available from SSL and their agents and will also be available from the SSL booth at all the major audio trade shows.

## Agencies

• Keith Monks (Audio) Ltd has appointed Mr J Groeneveld as the new professional sound distributor for Holland. Record cleaning machines will continue to be distributed by TES. Mr J Groeneveld, Gedluidstechniek Voorne, Regoutstraat 1, 3125 BH Schiedam, The Netherlands. Tel: 010 150550.

• Electrospace Developments has appointed the following exclusive overseas distributors. **Belgium:** ASE pvba, Koningin Astridlaan 238, B-2800 Mechelen. Tel: (015) 42 11 52. Tel: 24207. **Holland:** Audivice, PO Box 11, Kuinre 8374 ZN. Tel: 05271 727.

**Japan:** Continental Far East Ltd, Sasaki Building, 18-9 Roppongi 3-chome, Minato-ku, Tokyo 106. Tel: 03 583 8451. Telex: 22498. **South Africa:** Eltron Pty, 112 Polly Street, PO Box 23656, Johannesburg 12044. Tel: 011 293066. Telex: 8-9416. **Spain:** Red Led,

O'Donnell 56, 28007 Madrid. Tel: (1) 4094174. Telex: 46877.

**West Germany:** Soundstudio Consultancy Service GmbH, Weil der Stadter Strasse 55a, D-7253 Renningen 1. Tel: 07159 7222/8118. Telex: 7245208. **France:** Studio 38 Equipment, 6 bis, Avenue Charles de Gaulle, 78800 Houilles. Tel: 968 66 12. Telex: 210311 F 2071.

**Finland:** Studiotec Oy, Sininarhentie 5, Espoo 60 SF-02600. Tel: (0) 514 133. Telex: 125284.

UK and Eire sales and distribution continues to be handled by Britannia Row Ltd, 35 Britannia Row, London N1 8QH. Tel: 01-226 3377.

• FWO Bauch Ltd has been appointed UK distributor for Ross Video Ltd of Iroquois, Canada. The wide range of production and post-production video switchers will be offered as individual units or as part of a system.

## Four good reasons for choosing sound technology:

### Sound Technology Centres:

**London**  
Argents Keyboards 01-379 6690  
London Rock Shop 01-267 7851  
Michael Stevens & Partners 01 464 4157  
Music Village 01-598 9506  
Raper & Wayman 01-359 9342  
Stirling Audio Systems 01-625 4515

**Accrington**  
Avenue Parade 0254 36000

**Birmingham**  
Musical Exchanges 021-236 7544

**Brighton**  
Sackville Sound 0273 732745

**Bristol**  
Studio 34, 0272 733154

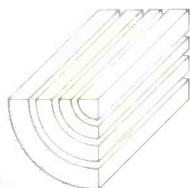
**Hampshire**  
Kingfisher Music 02514 21554

**Luton**  
Don Larking Audio 0582 450066

**Scotland**  
Sound Control 0383 733353

**Stockport**  
Audio Services 06632 4244

**Wakefield**  
KGM Studio Specialists  
0924 371766



sound  
technology

Sound Technology Limited,  
6 Letchworth Business Centre, Avenue One,  
Letchworth, Hertfordshire SG6 2HR.

Telephone: 0462 675675 Telex: 826967

### Aphex Aural Exciter Type 'C'

The best way to improve your sound system just got better! Latest version of this classic studio device. Restores natural brightness and clarity. Essential for all audio applications.

£299.00  
INC. V.A.T.

### Digitech 1900 Digital Delay

Studio quality unit with 1.9 sec delay at full 15kHz bandwidth. Full controls enabling rich flanging and chorusing effects as well as doubling and long echo. Stereo outs, repeat hold, S/N ratio -87dB.

£249.00  
INC. V.A.T.

### Bokse US-8 Universal Synchroniser

29 different time codes including MIDI, DIN and a wide range of clock rates. Synchronise up to 13 different time code based units simultaneously! Use the Bokse either as a master, or slave it to tape or other equipment. Compatible with all makes; past, present - and future?

£395.00  
INC. V.A.T.

### Symetrix 511 Noise Reduction

Dual channel dynamic noise filter/expander for universally compatible recording with elimination of unwanted hiss and noise, from any source without loss of frequency response.

£596.00  
INC. V.A.T.



# DIARY DIARY

People, places, events

## Tannoy apology

We have been asked by Tannoy Ltd to publish the following apology on their behalf.

"Tannoy Limited wishes to apologise to Titan International Productions limited for inadvertently using that company's registered

trade mark as the name of one of its products. Tannoy wishes to assure Titan International Productions Limited that it was a genuine accident which will not be repeated and hopes that this occurrence has not caused harm or embarrassment."

## ...and from HHB

HHB Hire & Sales have asked us to publish a disclaimer on their behalf stating that there is no connection whatsoever between the current advertisement for 24-track

packages from HHB and a company trading under the name of Room Service of 26 High Street, Hadlow, UK who are a studio design company.



## Forthcoming events

**Feb 18 to 20** Sound 86, Novotel, London, UK.

**March 4 to 7**, 80th AES, Congress Center, Montreux.

**March 10 to 14**, Fiarex Electronics Trade Fair, RAI, Amsterdam.

**March 17 to 21** IERE 6th International Conference on

Video, Audio and Data Recording, University of Sussex, Brighton, UK.

**April 13 to 16** NAB, Dallas, USA.

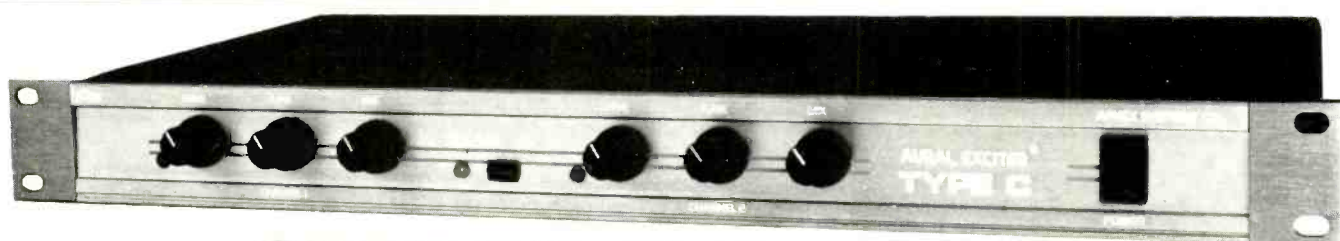
**May 13 to 15** ShowTech 86, Berlin, West Germany.

**June 25 to 27** APRS 86, Olympia 2, London, UK.

## Glyndebourne panned

Oliver Knussen's Fantasy Opera *Where The Wild Things Are* at Glyndebourne Festival Opera's 1985 Summer Season features six Wild Thing animated figures, five of which are some 12 ft high, and a soprano singing the part of a little boy, Max. The soprano's

voice is heard *au naturel* from the stage but the voices of the Wild Things are sung from the orchestral pit in amongst the London Sinfonietta, by five amplified proxy singers. Their voices zoom off by Ambisonic panpotting at appropriate moments into and around the



# DIARY DIARY

Practical ambisonics

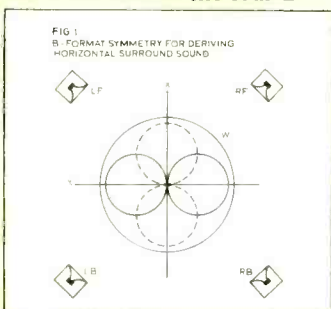
audience courtesy of an Audio+Design 8-input pan rotate unit. They are given horizontal surround sound via four Tannoy *Lynx* loudspeakers, two just off the floor either side of Glyndebourne's proscenium and the other two either side of the front of the balcony.

The London Sinfonietta perform contemporary music at concerts and frequently in such modern music, amplification is needed of one sort or another. This is usually in the hands of John Whiting and his team and so here he was set up in a box at the back of the stalls for the Wild Things and its companion on the double bill *Higglety Pigglety Pop* also based on children's books by Maurice Sendak.

## B-format

The A+D unit takes eight single mono inputs and provides a standard B-format output. The involvement of the B-format concept probably needs some explanation. B-format should be seen as an intermediate signal 'description' stage which is then further processed to provide a choice of output. This could be mono, stereo, horizontal surround sound stereo to a minimum of four loudspeakers, ie 6, 8, etc, or periphonic full sphere surround sound with a minimum of eight. The letters X, W, Y and Z are used for the full set of B-format signals. What they represent provides all the information necessary to describe the soundfield at a given point in space.

There is X—figure-of-eight, front to back, velocity; W—omni, pressure; Y—figure-of-eight, side-to-side, velocity; Z—figure-of-eight, up and down, velocity. **Table 1** shows the basic uses of the four B-



## Glyndebourne panned

format signals. Only X, W and Y are needed for further processing to the horizontal surround sound under discussion, the A+D pan rotate unit provides these and the additional processing is handled by a Minim *AD10* pro Ambisonic decoder.

## Audio+Design pan rotate unit

Each of the eight line level inputs has two controls. One is a very low friction, continuously rotatable 360° pot labelled at 15° intervals. This places the mono input signal anywhere in the 360° sound stage area by varying the relationship of the derived X and Y signals. The accuracy of positioning and smoothness of traversing is due as much as anything to the total symmetry of the B-format signals to the four loudspeaker feeds produced after decoding. See **Fig 1**.

The second input control is Diameter. At its centre position, one presumably has all W, as all speakers receive similar feeds giving a centre image, if you are at the central listening position. By

moving from a full anticlockwise normal position to a full clockwise position a 'through the middle' pan is possible. For example LF to RB, etc, depending on the position of the Rotate control.

Thus with these two controls per input any or all the eight inputs can be made mobile. In Wild Things John Whiting for example makes the five voices roam around before the initial stage entrance of the Wild Things, much aiding the effect of Max's puzzled look, wondering where the Wild Things were about to appear from. When the figures appear on stage their voices are stereophonically spread on the front pair of speakers.

The return from a Yamaha *R-1000* digital reverb unit was also fed via a channel of the A+D pan rotate equipment. This allowed the reverb to be 'whizzed' around or presented 'off set' to the source using it at the time.

During tests at Glyndebourne prior to performance the usual characteristic with Ambisonic reproduction of 'loudspeaker invisibility' was evident. Also the sound stage did not collapse to the nearest speaker should one's seat be so

situated. In fact, amazingly, even in the front row, the separation for sounds down the sides and rear meant that they were heard from these directions. Test measurements show in excess of 20 dB differential which is gratifyingly high.

The pan rotate unit has a separate 'all signals' Rotate control. The summed inputs can be fed through this or can bypass it. Similarly, external X, W, Y, B-format signals from, for example a second pan rotate unit, a Calrec *Soundfield* microphone or a tape can be mixed either pre or post the overall Rotate control. The unit exceeded expectations at what was thought to be a 'world premiere' for such sound treatment at public performances.

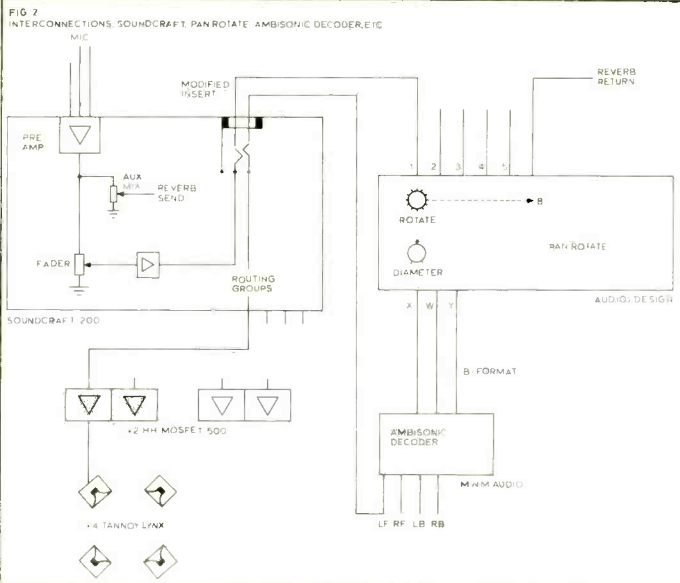
## Other aspects

As shown in **Fig 2**, central to the interconnections was a Soundcraft *200* desk. John had modified the first eight input channels to post fade insert, so the pan rotate inputs from the Wild Things' voices came from them with the Soundcraft acting as five separate pre-amps for the AKG *C451/CK22* combination used by the voices. The *CK22* capsules are omnidirectional and these are favoured as there is no proximity bass rise effect, no handling noise and no popping. Four of the Soundcraft insert returns are used to route the feeds for the pair of HH *MOSFET 500* which drive the Tannoy *Lynx* loudspeakers. Reverb sends are derived from an auxiliary mix.

The recently introduced Tannoy *Lynx* system is very suitable for the sort of sound projection needed in contemporary music. The requirement is for an integration of the amplified sound with that from the live instrumentation. It is not a case of amplifying everything in sight up to horrendous levels, merely a case of producing a balance both in level and tone. Having single dual concentric drivers they are also particularly suitable for an Ambisonic rig as they are point source. They can however be stacked in pairs vertically or bolted together as angled pairs. **Mike Skeet** □

TABLE 1 Basic uses (without frills) of B-format signals

	Mono	Stereo	Horizontal	Periphony
X Front-to-back			●	●
W Omni	●	●	●	●
Y Side-to-side		●	●	●
Z Up and down				●



# Mitsubishi X-850.

32 Channel Digital  
45 Tracks  
Cut-and-Splice Edit  
Fully Compatible  
RS-232/RS-422/Parallel Interface  
Sync to 9.6/8 kHz • 60/50/59.94 Hz  
Composite Video  
SMPTE/EBU Non-drop/Drop  
Varispeed



*For  
World-Class  
Studios.*

 **MITSUBISHI PRO AUDIO GROUP**

DIGITAL ENTERTAINMENT CORPORATION

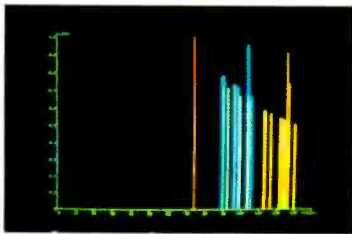
Headquarters: 225 Parkside Drive, San Fernando, CA 91340 • Phone (818) 898-2341 • Telex 311786

New York: Suite 1530, 555 W. 57th Street, New York, NY 10019 • Phone (212) 713-1600 • Telex 703547

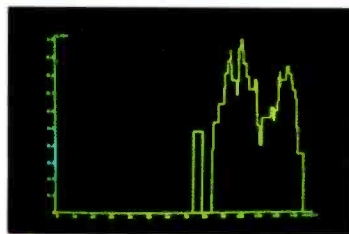
Nashville: 2200 Hillsboro Road, Nashville, TN 37212 • Phone (615) 298-6613

Canada: 363 Adelaide Street E., Toronto, ONT. M5A 1N3 • Phone (416) 865-1899

United Kingdom: 1 Fairway Drive, Greenford, MIDDX UB6 8PW • Phone (01) 578-0957 • Telex 923003



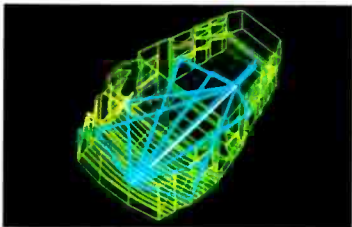
■ Early reflection graph



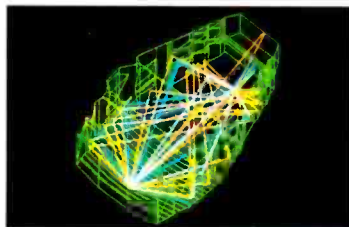
■ Perceived early reflection characteristics

### Early Reflection Simulation Example Based On a Specific Hall Design

■ Hall simulation (1st reflection)



■ Hall simulation (early reflection pattern)



# REV 7

The REV-7 is a highly professional, MIDI compatible, stereo programmable digital reverberation system. It is also an extraordinarily powerful studio effects unit.

Natural reverberation is the most complex of the 'time domain' effects to be replicate with true fidelity. It requires ultra-high speed circuitry capable of processing an immense amount of data very quickly. It also requires the implementation of very sophisticated software based on a thorough understanding of real-world acoustic responses. Thus, in the past, a top-quality digital reverberator has always been very expensive.

By designing their own purpose-built LSI (Large Scale Integration) micro-processors specifically to meet all these stringent requirements, Yamaha have achieved an astonishing cost breakthrough. So that, at the price, no other device even approaches this kind of quality, flexibility and simple musicality.

With 16-bit linear quantisation, a sampling rate of 31.25kHz, a 12kHz bandwidth, a dynamic range of between 78dB and 84dB (depending on effect selected) and 3-band sweepable equalisation, the REV-7 creates astoundingly accurate simulations of a variety of acoustic environments based on exhaustive real-world research. And on top of that,

Yamaha engineers have also built in the capabilities of virtually every other time-domain processor you can think of.

Within its memory banks are stored 30 factory preset effects which range from natural-sounding halls of various sizes through chorusing, delays, stereo repeats, flanging, phasing, flanged reverb, gated reverb, reverse gate and more. All these effects can be edited to a fine degree and there are another 60 user-memories in which to store your own creations.

Here are some of the adjustable parameters for a reverb effect:

**1st Reflection** (0.1 to 100ms after direct sound, 0 to 100% level) - the time delay between the direct sound and the first reflection.

**Initial Delay** (0.1 to 100ms) - the delay between the direct sound and the onset of reverberation.

**Reverberation Time** (0 to 10 secs) - adjustable over three frequency bands.

**Diffusion** (0 to 10) - the shape and proportion of a room will determine how spacious, or conversely how directional, its reverberant field is, irrespective of its overall reverb time. With this adjustment then, you are able to actually adjust the apparent shape of the room and definition of the sound source.

# REVERBERATION PLUS..!



## REV1

Alternatively, if you need the last word in quality, control, programmability and user-friendliness, the REV-1 is the ultimate studio machine for reverb and effects. Offering instant 'one-touch' access to memories and fine control of effect parameters, the REV-1 also provides variable display graphics to aid swift and subtle adjustment, keeping you fully informed at all times.

Programmes can include up to 40 early reflections and 99 secs reverb time (individually adjustable for 4 frequency bands). The full-function remote features a large graphic display of all parameters, and actually includes 9 RAM programme memories allowing you to carry your own REV-1 effects wherever your work takes you. There is also an RS-232 interface port for use with a PC as part of a computerised system.

No amount of words can fully describe the effects of either the REV-7 or REV-1 - you'll want to hear them for yourself. If you're not sure quite where to go for your hands-on demo, please contact Yamaha's Pro Audio Specialist, Alan Martin, on (0908) 71771. He'll give you the low-down on their new UK Stockist line-up and price guidelines for REV-1.

/// ALL OUR ENGINEERS AGREE THAT THE REV-7 AND REV-1 ARE EXCELLENT AND ARE IN CONSTANT USE. ///

**CHRIS DUNN**  
BATTERY STUDIOS

/// REV-7 AND REV-1 ARE FIRST CLASS WITH A VERY HIGH GRADE OF CONSTRUCTION, VERY RELIABLE AND EASY TO USE. MY PERSONAL PREFERENCE IS THE REV-1 BUT BOTH FULFIL THEIR PURPOSE ADMIRABLY. ///

**JOHN TYMMS**  
AUDIO RENTS

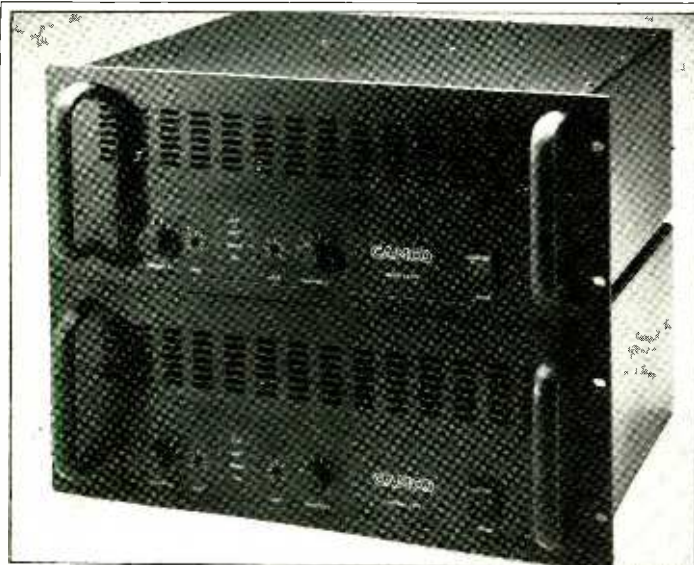
 **YAMAHA**  
PRO - AUDIO PRODUCTS

● MOUNT AVENUE, BLETCHLEY, MILTON KEYNES, BUCKS, MK1 1JE  
☎ (0908) 640202 24hr Ansaphone (0908) 649222

# NEW PRODUCTS

# NEW PRODUCTS

Equipment, modifications, options, software



## Camco LA601 and LA801

Two power amps have been added to the Camco range: the *LA601* and *LA801* featuring built in power limiter adjustable from 40 W to full power, clip limiter, two print connectors per channel to connect prints for active operation and other EQs

eliminating the requirement for external crossovers, EQs and compressor/limiters.

The *LA601* gives 2x450 W and the *LA801* 2x700 W. **Camco Audiotechnik, Brücher Weg 38, D-5910 Kreuztal 9, West Germany. Tel: 02732 21060.**



## Sony TA-N7050 power amplifier

Sony's professional audio division has announced its first power amplifier. The dual channel *TA-N7050* has a maximum output of 45 WRMS/channel into 8 Ω or 70 WRMS/channel into 4 Ω. The *TA-N7050* has been designed for critical monitoring in audio productions and Sony engineers made tonal accuracy their primary target. Frequency response is ±0.1 dB from 20 Hz to 20 kHz, harmonic distortion less than 0.1% and the S/N is rated at 114 dB.

The amplifier can be used in the bridged mode thus providing 150 WRMS into an 8 Ω load. Short circuit

protection is provided and the front panel provides indication of overload, signal presence and clipping. The amplifier measures 19 1/8 x 3 1/2 x 17 3/4 in and weighs 27 lb 9 oz.

**Sony Corp, PO Box 10, Tokyo Airport, 149, Japan. Tel: 03 448-2111. Telex: 22262/24666.**

**UK: Sony Broadcast Ltd, City Wall House, Basing View, Basingstoke, Hants RG21 2LA. Tel: 0256 55011. Telex: 858424.**

**USA: Sony Corporation of America, Professional Audio Products Division, 9 W 57th Street, New York, NY 10019. Tel: (212) 371-5800. Telex: 424595.**

## ASC SMPTE

Audio Systems Components have produced an SMPTE centre-track timecode kit to fit new, or retro-fit existing, *Revox PR99 MkII* and *Otari MX5050* series 1/4 in 2-track machines. By adding a fourth, offset head, the software controlled system ties in to the machine's own logic to automatically recognise speed and direction, pickup tachometer pulses and then identify and self configure to any of the internationally recognised timecode standards.

User facilities are timecode ready/record LED (flashing/steady) and LED

showing software locked to off-tape or incoming code.

Timecode input/output to either machine is by standard *XLR*-type connector, external synchroniser connections being standard on the *Otari* series machines and provided for by additional *D* range multiway in the *PR99 MkII* kit.

Recording and replaying of timecode on/off tape is via a *Woelke* composite erase/record/replay head with custom mount.

**Audio Systems Components Ltd, 4a King Street, Mortimer, Reading RG7 3RS, UK. Tel: (0734) 333100.**



## Studiomaster power amplifiers

Studiomaster has introduced three new amplifiers to their range. The 3U high *Mosfet 2000* complements the existing *500* and *1000* models and contains four discrete amplifiers providing 450 W/channel into 4 Ω. Bridging the channels into two pairs provides at least 1000 W/channel into 4 Ω. The *2000* can operate in input-linked mono, stereo or bridged format. The power bandwidth is 5 Hz to 200 kHz with THD being typically 0.006% in bridged mode and 0.003% in the 4-channel mode. Each amplifier is provided with its own gain control and four 2-colour LED meters provide individual monitoring facilities.

Also new are two 'budget' amplifiers, the *Stellar FET 2* delivering 200 W/channel and the 400 W (into 4 Ω) *Stellar FET 4*. Both are 3U high and the amplifiers are cooled with a large slow running fan for quiet performance. THD is quoted at less than 0.006% with both amplifiers being fully protected against thermal overload, direct current offset and short circuit.

**Studiomaster, Home Farm, Northall, Nr Dunstable, Bedfordshire, UK. Tel: 0525 221331.**

**USA: International Music Corporation, 1316 East Lancaster Street, PO Box 2344, Fort Worth, TX 76113. Tel: (817) 336-5114.**

# Some People Actually Enjoy Sitting at Their Desk for Twelve Hours a Day.



Of course, their desk is an SL 4000 E Series — a classic example of responsive technology and engineering know-how. Mixers tell us it allows them to perform their craft with extraordinary freedom and precision. Producers say it serves their work in ways no other console can.

There is something about this console that goes beyond the clarity of sound, the agility of its software, the scope of its possibilities. Something that can't be shown in pictures, diagrams or words.

When you sit behind an SSL, there is recognition. It's more than knowing that this is the best. It's a discovery that someone actually understands the procedures and the pressures of your job. And that they've developed innumerable ways to make it easier, faster and better.

We'll be happy to send you our 40 page brochure on the SL 4000 E, or to arrange an audition. But a word of warning. Once you sit down at *this* desk, you may want to stay longer than you had planned.

## Solid State Logic

Oxford • New York • Los Angeles • Hong Kong

Oxford, England OX7 2PQ • (099 389) 8282  
200 West 57th Street • New York, New York 10019 • (212) 315-1111  
6255 Sunset Boulevard • Los Angeles, California 90028 • (213) 463-4444  
22 Austin Avenue, Tsim Sha Tsui • Kowloon, Hong Kong • (03) 721-2162

# NEW PRODUCTS

# NEW PRODUCTS

Specification of the

**FF ISA**

input signal amplifier

The first of a series

Separate microphone and line level inputs, each with stepped sensitivity switch.

•  
Mic - line changeover switch.

•  
H.F. lift and cut with 5 switched turnover frequencies.

•  
High Pass Filter: 5 frequencies.

•  
Low Pass Filter: 5 frequencies.

•  
Mid band lift and cut with continuously variable frequency and bandwidth.

•  
L.F. lift and cut with 5 turnover frequencies

•  
E.Q. in/out.

•  
Phase invert.

•  
Transformers in and out give total floating freedom.

•  
Input and output balance greatly exceeds that of lines likely to be used.

•  
Frequency response falls away smoothly without out-of-band resonances, to way outside audio limits.

•  
Immaculate square wave performance (with controls flat).

•  
L.F. distortion traditionally associated with transformers is around 80 dB down at 20Hz.

•  
High order harmonics are not generated in any condition of use.

**"It sparkles"**

Fully screened enclosed module.

Front panel 8 1/4" x 1 3/4".

Uses Amphenol 18 way 133 in-line rear connector and fits ISEP frame system.

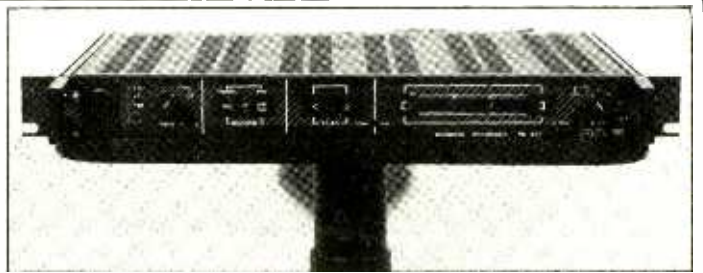
Racks cases and P.S.U.'s available for outboard mounting.

Power requirements:

24vDC regulated or ±15v regulated (specify).

Customizing possible to interface with certain consoles.

*If you've had your ear to the ground lately you will probably have heard about this.*



## MDB Window Recorder

The *MDB Window Recorder* is a digital sampling device offering 12 s full bandwidth sampling with three triggering modes and the ability to overdub samples without degradation.

The window is an LED bar display for visual editing of the sample memory. Having located start and stop points the sample may be triggered from a separate audio input; MIDI and CV/Gate inputs

allow the sample to be transposed up or down one octave from a keyboard or sequencer.

Future plans include disk drive and ×4 memory expansion option bringing the total sample time up to 48 s. **Giant Music, 30A CH-2503 Biel-Bienne, Switzerland. Tel: 41 32 22 52 95.**

**UK: Syco Systems Ltd, Conduit Place, London W2. Tel: 01-724 2451.**

## Sony PCM 3324 control interface

Sony have introduced a new device known as the *IF-3310* to extend the flexibility of the *3324* digital multitrack and the *RM-3310* remote controller. The *IF-3310* allows users to operate the *3324* from a mixing console by converting the consoles commands into a form that is understood by the *RM-3310* remote unit. Tape transport controls from a mixing console using the *SRIF-1* communication standard as well as Rec Ready commands for all 24 channels in the *SRIF-4* standard are translated for the *RM-3310*. The unit further allows

connection of up to three *PCM 3324/RM 3310s* for a 72-channel digital recording system allowing transport and Rec Ready functions for all the channels to be controlled from the mixing console.

**Sony Corp, PO Box 10, Tokyo Airport 149, Japan. Tel: 03 448-2111.**

**UK: Sony Broadcast Ltd, City Wall House, Basing View, Basingstoke, Hants RG21 2CA. Tel: 0256 55011.**

**USA: Sony Corp of America, Professional Products Division, 9W 57th Street, New York, NY 10019. Tel: (212) 371-5800.**

## Cipher digital timecode readers

Four models of timecode reader from Cipher decode 30-frame SMPTE and 25-frame EBU code formats. The *735L* and *735CD* feature 8-digit front panel display selectable for time or user data and error bypass to eliminate false readings. The *CD* is a coincidence detector with eight controlled outputs giving coincidence detection on time or user data. The *735V* incorporates video display for time or user data and the *710A* incorporates an 8-digit

front panel display selectable for time or user data, it will decode and output time and user data simultaneously, and internal video character inserter will display time, user, or both on a single or two separate lines.

**Cipher Digital, 150 Huntington Avenue, Suite NK-3, Boston, MA 02115, USA. Tel: (617) 267-1148.**

**UK: Future Film Developments, PO Box 3DG, 114 Wardour Street, London W1A 3DG. Tel: 01-434 3344.**

**FF**

**Foundation First**

Electro-Acoustic design engineers

P.O. Box 38

Newmarket Suffolk CB8 7EG.

Tel: (0638) 730696



# The one man band

WIFE, SEVEN  
KIDS AND A  
NON-STANDARD  
DIGITAL MULTI-  
TRACK TO  
SUPPORT!

Being a one man band isn't all it's cracked up to be. In the hard bitten world of professional recording, maintaining your independence doesn't have to mean going it alone. As long as you're using the Sony system you'll soon become part of the orchestra.

It's all a question of standards. And Sony has already set the standard format for digital multi-track recording.

Find out more about the PCM-3324 system and come in from the cold.

## Sony Pro-Audio

**SONY**  
Broadcast

**Sony Broadcast Ltd.**

Belgrave House  
Basing View, Basingstoke  
Hampshire RG21 2LA  
United Kingdom

Telephone (0256) 550 11  
International +44 256 550 11  
Telex 85 84 24  
Fax G2/G3 (0256) 474585

# NEW PRODUCTS

# NEW PRODUCTS

Equipment, modifications, options, software

## By The Numbers 4-track

The *Colossus* 4-channel digital recorder from By The Numbers is a compact processor which works with any professional or consumer video format with 16-bit resolution and bandwidth in excess of 25 kHz. The proprietary code developed by Louis Dorren for the system makes no use of data reduction.

Future possibilities include a multitrack recorder with 16-bit resolution and at least 20 kHz bandwidth and will use a

video format for archival programme storage and a high density hard disk interface to facilitate overdubbing and insertion. It is anticipated that the user cost will be roughly equivalent to professional analogue recording with the same track capacity.

Further information is available from John Eargle Associates, Tel: (213) 876-3416. **By The Numbers, PO Box 8359, Incline Village, Nevada 89450, USA. Tel: (702) 831-4459.**

## Studio Master studio software

Florida based Studio Master has developed an interesting studio management system based on the Macintosh 512k computer which, according to the manufacturers, can be used to add total recall to any mixing console with the addition of a special interface. The basic management system will provide track sheets, calculate session times, create invoices, print tape labels and maintain tape logs. By using the mouse and on-screen prompts typing is kept to a minimum.

With the Studio Console Interface engineers can log console settings and with the Patch and Peripherals options

can note signal paths and outboard gear in use for any particular recording.

Basic specifications include 16 inputs, maximum level +28 dBV, impedance 20 kΩ balanced; a total of 1016 readings are available for each channel which includes a maximum of 500 log and 500 linear frequency readings and 16 level positions. Connections are via 30-pin Tuchel and Amphenol DIN connectors. Power requirements are 110 V (220 V to special order).

**Studio Master, 229 Sunny Isles Blvd, PO Drawer P, North Miami Beach, FL 33160, USA. Tel: (305) 945-9774.**



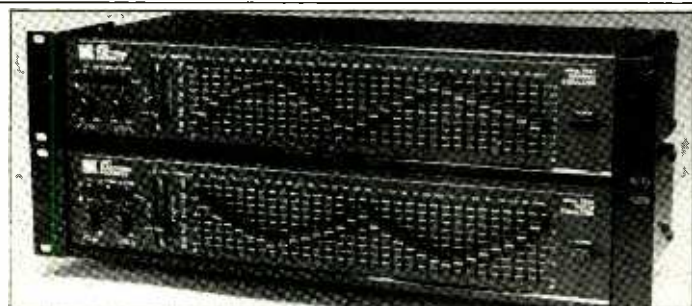
## Bosendorfer computer piano system

A computer-based piano record/play system has been announced resulting from a combined project of Wayne Stahnke (a Californian computer designer/audio engineer); the R&D facilities of piano manufacturer Kimball International Inc and Bosendorfer pianos of Vienna. The Bosendorfer 290 SE is built into the 9½ ft Bosendorfer *Imperial Grand*. The system operates by scanning the keyboard 800 times/s as the piano is being played, digitally coding all piano functions and then recording them on to audio tape. The tape playback activates the piano to reproduce the performance

with every note and nuance with which it was originally performed: this performance can also be loaded into a computer and edited before playback.

There are numerous applications of such a system such as unlimited experimentation with mic positions with the concert hall and studio; freedom from concern with separation as the piano can be re-recorded optimally at a later date, etc. The system is currently in use at the Massachusetts Institute of Technology.

**Kimball International, 1600 Royal Street, PO Box 460, Jasper, IN 47546, USA. Tel: (812) 482-1600.**



## JBL 5547/5549 equaliser systems

The 5547 graphic equaliser and 5549 room equaliser are designed for professional studio and sound reinforcement use. Both units feature front panel input and output level controls facilitate adjustment of the signal level through the equaliser, allowing system response to achieve optimal headroom and signal to noise ratio.

The 5547 has 30 ½-octave

bands centred between 25 Hz to 20 kHz with 12 dB boost or cut available at each centre frequency. The 5549 provides corrective room EQ and a 0 to 15 dB cut only range.

**JBL Professional, 8500 Balboa Boulevard, Northridge, CA 91329, USA. Tel: (818) 893-8411.**

**UK: Harman (Audio) UK, Mill Street, Slough SL2 5DD. Tel: (0753) 76911.**

## Mitsubishi sub-woofer systems

Mitsubishi Pro Audio Group recently introduced a new range of high power sub-woofer speaker systems. There are two models available: the *PW-0821* and the *PW-1600*. The *PW-0821* contains one 90 cm (31.5 in) sub-woofer mounted in a ported high strength cabinet with a resonance of 12 Hz and a claimed power handling capacity of up to 2000 W. The *PW-1600* contains one 160 cm (63 in) sub-woofer with a cabinet resonance of 8 Hz and a claimed max power of 3000 W.

The cases for the sub-woofers are manufactured from a

lightweight rigid aluminium honeycomb material developed by the Space Electronics division of Mitsubishi Electric. These systems are intended for high power sound reinforcement use where reducing the number of sub-woofer systems would be an advantage. They are also fully waterproofed.

**UK: Mitsubishi Pro Audio, 1 Fairway Drive, Long Drive, Greenford, Middx UB6 8PW. Tel: 01-578 0957.**

**USA: Mitsubishi Pro Audio Group, 225 Parkside Drive, San Fernando, CA 91340. Tel: (818) 898-2341.**

# NEW PRODUCTS

# NEW PRODUCTS

Equipment, modifications, options, software

## 3M 275 digital tape

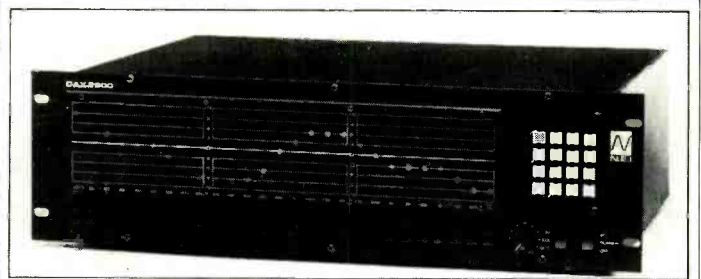
3M have launched a new digital audio mastering tape known as 275. It is recommended for all stationary head high density recording applications. 3M say tape inspection by a proprietary laser scanning system in the virtually eliminates coated in errors and consequent error loss resulting in a claimed superior dropout performance. Additionally 275 uses a double binder system that is claimed to improve the dependability

of operation for multiple pass applications.

275 is designed to be a direct replacement for Scotch 265 and will be available in 1/4, 1/2 and 1 in widths with lengths suitable for all fixed head machines.

**3M Magnetic Products Division, 3M Centre, St Paul, MN 55133-3600. Tel: (612) 736-9567.**

**UK: 3M UK Ltd, PO Box 1, Bracknell, Berks RG12 1JU. Tel: 0344 26726.**



## NEI DAX2800 EQ RTA

Neptune Electronics have introduced a unit which is a combination of 1/3-octave real-time analyser and a digitally controlled 1/3-octave graphic EQ. An onboard computer controls the storage of gain settings on each of 28 ISO centred filtering bands which can be instantly recalled from 16 memory locations.

Specific EQ is recalled by push button and a digitally controlled RTA can display the spectrum of an audio source on the 28-band LED matrix to

locate room acoustic anomalies. The unit will perform computer-controlled automatic equalisation, EQ a system to any memory setting and has the facility of instantaneous automatic EQ and RTA curve averaging of up to eight curves. The DAX2800 also acts as master computer to download prescribed room EQ curves into the DAX EQ POD. **NEI, 934 NE 25th Avenue, Portland, OR 97232, USA. Tel: (503) 232-4445.** □

## Denon CD cleaner

According to Japanese recording and manufacturing company Denon although you may not hear a CD mistrack, every bit of extra work the error correction system does will worsen the sound quality. Fingerprints can cause clicking or mistracking and even a tiny spec of dirt can

cover 60 tracks, so Denon has introduced has AMC 12 CD cleaner.

The cleaning kit comes with its own CD holder, special wiping pad and cleaning fluid and is claimed to remove even greasy fingerprints without scratching.

# High Spec - Low Cost



At less than £1600 the remarkable Fostex Synchroniser is well worth a closer look!  
Test drive or hire one now - ring (01)-267 9395



**HIRE MULTITRACK**  
PROFESSIONAL AUDIO & VIDEO EQUIPMENT  
Multitrack Hire Ltd 66 Rochester Place London NW1

# MUSIC PAGE

# MUSIC PAGE

Mark Jenkins on synthesis for the studio

## Jellinghaus Musik-Systeme

JMS have recently announced a re-packaged release of their *12-Channel Studio*, *Sequence Chainer* and *Score Writer* programs for the Commodore 64 computer.

The programs are now available on EPROMs in a perspex-clad circuit board fitting between the computer and the JMS MIDI interface. Loading is now virtually instantaneous and files can be easily transferred from one program to another.

The *12-Channel Studio* has one record and 11 playback channels which can operate on any MIDI channel. Each track can be looped, played, transposed and erased individually. Finished sections can be chained together into songs and prepared for printing. This can be on up to six staves, with any pair of staves available for a piano score on bass, treble or alto clefs.

Full control is available over line spacing, bar length and other layout parameters and printout can be on any compatible dot matrix or Centronics printer.

UK: Rosetti/JMS, 138-142 Old Street, London EC1V 9BL. Tel: 01-253 7294.

## Chase Bit 01 expander

The *Bit 01* is based on the *Bit 1* MIDI synthesiser. It offers 6-voice polyphonic playing (3-voice in dual mode, 2x3 voices in split mode) with velocity response for volume, filter setting, pulse width, attack time and LFO speed.

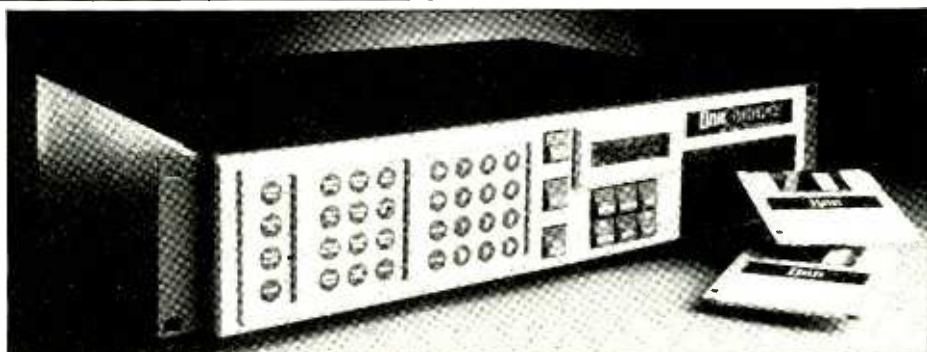
In a 19 in format, the *Bit 01* is self-editing using a keypad and four LED displays. There are 75 fully programmable memories plus 24 split/dual memories which record two patches and (in split mode) a keyboard split point.

Stereo outputs, MIDI and tape dump are provided. Powerful filters and a wide selection of effects allow the *Bit 01* to produce many 'digital' sounds reminiscent of the Yamaha *DX7*, but it is also capable of providing the entire repertoire of analogue synthesiser effects.

UK: Chase Musicians, 58 Oldham St., Manchester M4 1LE. Tel: 061-236 6794/5.

## Steinberg Research distribution

The Oxford Synthesiser Company recently announced their appointment as UK distributors of the Steinberg Research range of MIDI software products for the Commodore 64 and Apple computers.



LinnSequencer 32-track MIDI keyboard recorder

The range includes a 16-track real-time/step-time polyphonic sequencer; a *Scorewriter/Music Editor* capable of editing the sequencer's files, transcribing and printing complex music in standard notation; a *Sound Editor* for the Yamaha *DX7/TX7* including 160 new sounds on disk; a *Sound Editor* for the Casio *CZ* synths including 128 new sounds on disk; a *Sound Editor* for the Korg *DW-6000* with access to 576 sounds at once and guitar and piano tutorial packages.

There are also two MIDI interfaces; a simple interface with one MIDI In and two MIDI Outs with an optional synchroniser to drum machines and tape; and a deluxe MIDI interface including tape and drum machine sync with additional MIDI routings.

All the software is on disk and runs on the Commodore 64/SX64/Commodore 128; the *Sequencer*, *Score Writer* and *DX7 Editor* also run on the Apple II and IIe computers using the deluxe interface. UK: OSC, 5 Gladstone Court, Gladstone Road, Headington, Oxford OX3 8LN. Tel: 08675 5277.

## Linn Electronics

Linn Electronics have announced a reduction in price for the *LinnDrum* digital drum machine and a new product, the *Linn Sequencer*.

The price of the *LinnDrum* falls by almost 30%, as does its alternative *Sound Library*. Improvements in production techniques at the American plant are quoted as the reason for the cuts.

The *Linn Sequencer* is a 32-track MIDI keyboard recorder in a 19 in rack-mounting format which shares many of the facilities of the well-established Linn 9000's recorder section. It operates as a MIDI multitrack recorder with Play, Stop, Record, Fast Forward, Rewind and Locate controls (also available from a remote control unit) and can record 1,000 sequencers containing 32 simultaneous polyphonic tracks. A 3.5 in disk drive stores 110,000 notes per disk, and full auto-correction of any notes entered is available.

The *Linn Sequencer* has optional SMPTE (24, 25 or 30 frames/s and drop frame) and all MIDI parameters including velocity, after touch, program change, modulation, sustain and pitch bend are handled. Spot erase, bar copying, song creation from sections up to 999 bars long, footswitch control of Erase, Repeat, Play/Stop and Locate, Tap Tempo and variable programmable time signature are all available.

Linn Electronics Inc, 18720 Oxnard Street, Tarzana, CA 91356, USA. Tel: (818) 708-8131.

UK: Syco Systems, 20 Conduit Place, London W2. Tel: 01-724 2451. □

## Rycote

### Wind JAMMER

A completely new concept of cover.

The new WindJAMMER improves the performance of any Windshield by at least 6 dB.

Now you can record in conditions previously considered impossible.



Rycote Microphone Windshields, New Mills, Slad Road, Stroud, Gloucester GL5 1RN, England. Tel. 04536 79338

# WHO NEEDS.....



## JUST ANOTHER AMPLIFIER ?

*If you want that rare combination of a superb performance, high reliability and extreme solid construction: **YOU DO !!***

**The SA 900C & 500C:** not "just amplifiers", they feature ultra fast, high voltage, full complementary output devices and the use of top-quality components all-over. They combine with very carefully designed circuitry to guarantee a superb performance and outstanding electronic stability.

**The application of individual power-supply modules** with high power, high efficiency custom designed toroidal transformers, reduces crosstalk and power-dumping to the almost immeasurable levels, necessary to accommodate the high dynamics of digital sound sources. It also creates the possibility for ideal wiring to further decrease crosstalk and harmonic distortion.

**Electronically balanced inputs** can be switched in and out and allow for bridged-mode operation. Long life 41-step potentiometers are

used as input level controls. To prevent earth-loops a ground-lift switch is also provided for each channel.

**An opto-coupler operated protection** works very efficiently against switching peaks, heavy overload, DC and short-circuit on output, whilst temperature sensors protect the amplifier against overheating. LEDs indicate clipping, signal present, overload/short circuit and overheating.

**The power and driver-transistors** are mounted on two heat sinks with "Sil-Pads" for superior long-life heat transmission. A two-speed, thermally controlled ultra low-noise fan is built-in for optimal cooling.

**Specially designed aluminium profiles** make the amplifier very solid and truly **Road** and **Roady-proof** for many years.

The SA 450C is a single channel, 100V line version of the SA 900C.



stage accompany

**Stage Accompany.....you need it!**

For more information contact: **Holland:** Stage Accompany, Anodeweg 4, 1627 LJ Hoorn, tel:(0)2290-12542, telex37989 Stage nl  
**Austria:** Kühnl & Wurzer, Waldeggstraße 68, 4020 Linz, tel. (0)732-688125 **Belgium:** Stage Accompany, Hendriklei 50, 2020 Antwerpen, tel. (0)3-2160352 **France:** Caw Sonoss, 3 Rue Vieille, 59160 Lomme, tel. (0)20-925091 **Germany:** Stage Accompany, Marienburger Straße 29, 4460 Nordhorn, tel: (0)59211-6196 **Hong Kong:** Studer Revox (far east) ltd, 25<sup>th</sup> floor Arion commercial centre, 2-12 Queens Road West, Hong Kong, tel: 5-412050 **Italy:** Kennel snc, 324 Corso Unione Sovietica, 10135 Torino, tel. (0)11-612148 **Japan:** Sakata engineering co ltd, 2-6-8 Ohjima Koto-Ku, Tokyo, tel: (0)3-682-8411 **Switzerland:** Stage Accompany, Spiseeggstraße 30, 9030 St. Josefien, tel: (0)71-281696 **United Kingdom:** S.E.D., 27 Guildfordstreet, Luton LU1 2NO, Beds, tel: (0)582-452495



**...and some people start a session  
without a Klark Teknik Reverb.**

To find out how much potential you'd have at your fingertips with a DN780 Digital Reverberator/Processor contact your local representative or Peter Tongue at Klark Teknik., Klark Industrial Park, Walter Nash Road, Kidderminster DY11 7HJ. U.K. Telephone (0562) 741515. Telex 339821 or David Solari, Autograph Sales Ltd., on (01) 267 6677.

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



**KLARK TEKNIK**

# DEVELOPING THE KMI

**Ric Ceconi relates to Tim Leigh Smith how a manufacturer, already well known in the hi-fi world, came to produce a loudspeaker for the BBC that could cope with rock and roll**

**S**ome four years ago Laurie Fincham, technical director of KEF Electronics, gave a talk on aspects of loudspeaker design to BBC Radio sound balancers. His listeners included Mike Robinson and Ted de Bono members of Group 2—the pop music and light entertainment balancers. At the time they were using the BBC LS5/8 monitor which they liked for quality but for quantity they preferred some of the stoked up speaker systems used in the commercial studios. Could KEF come up with a monitor that combined quality and quantity?

KEF built its reputation in the domestic hi-fi speaker market but has been involved in the manufacture of various BBC designs over the years, so it was agreed that the company would take up this challenge. Laurie Fincham started work on the project with Enrico 'Ric' Ceconi, the engineer who was to see it through to its successful conclusion. Ric was later joined by Dave Smith who had worked for JBL in the USA before coming to KEF. Together they worked out the final details of the design and constructed the first production models.

This was KEF's first venture into designing a professional monitor from the ground up—broadcasters usually insist on free-standing monitors—and the target was 123 dB SPL. It is probably significant that both Laurie and Ric are bass players. Laurie Fincham played the double-bass in jazz bands, Ric Ceconi played double-bass in the orchestra at university and electric bass in rock bands.

Ric's early experiences with loudspeakers were less than satisfactory: "As soon as I started playing bass guitar I started breaking loudspeakers. When you're out there as a user, the first spec you see is the power handling. I used to think that if a loudspeaker was rated at 100 W you should be able to use it with a 100 W amplifier and that was it—no problem. I think a lot of people don't realise that a loudspeaker has a mechanical movement rating and a thermal rating on the voice coil. It's perfectly reasonable, when you know how a loudspeaker works, that you can't expect it to move too far and you can't expect it to cope with too much heat."

Like many other bass players, Ric started to build his own speakers by trial and error, before studying electronics at

university and going on to post-graduate studies in acoustics. Thus equipped he joined KEF in 1975. Any remnants of the black box syndrome were quickly dispersed as he came to grips with drive units. "My first week here they sent me into the factory and I had to build some bass units and a batch of 10 tweeters. I probably got a 10% pass rate, but you've got to know how they're stuck together and what the vulnerable areas are."

The BBC did not provide a detailed specification for the new loudspeaker. It was simply agreed that it had to be loud but still sound as good as existing monitors. As Ric Ceconi says, what was required was really a very powerful hi-fi speaker.

"KEF have always made hi-fi loudspeakers, so it was just a question of grouping together enough components to get the level. You just have to make it bigger and stronger, handling more power and playing louder, without compromising any of the things you already know about that give you a good sound. If we wanted more level out of the tweeter, for instance, we could probably make it lighter but that would remove some of the damping and the frequency response would suffer. So we'd pile on the magnet rather than taking away damping from the material."

"It was a challenge to do it, technically, so it was intellectually stimulating. We realised that a loudspeaker that big was going to be pretty expensive and we weren't going to make a fortune on it. But we knew that we would be able to use some of ideas later on in other products, so we would get the money back that way. The research would be a sort of investment in the future."

The highly directional nature of higher frequencies meant that a single tweeter was essential for a clear stereo image. The 50 mm (2 in) unit would have to be considerably beefed up, so Ric took off on a magnetic 'flight of fancy'.

"With low frequency units you can't keep piling on the magnets to get more output because it gives you more damping at the lower frequency end, which gives you *less* output. With a tweeter you're only using it at the higher frequency end of its range so you have this wonderful bonus: the more magnet you put on, the more output you get for the same electrical input. So the obvious thing is to keep piling on the magnet."

"When I first came here, as a sort of loudspeaker novice, and started to play about with magnets, everybody told me that it was the law of diminishing returns. Once you got above a flux density of about 1.5 tesla (15,000 gauss) you were really flogging a dead horse: you couldn't get any more output and the magnets would be difficult to make. I wanted to see how far you could go with that, so I played about with various magnet designs and looked at special materials for the pole pieces. I got in all these fancy materials, but I just wasn't getting anywhere."

"I wanted to double the flux density on the original tweeter to get myself 6 dB more output. I tried bigger magnets but the way you're supposed to use ferrites, if you want more flux density, is to keep making the thing bigger in diameter and then concentrate the flux down with the pole pieces. With a tweeter you really don't want a very big magnet because it means that the units are going to be

Ric Ceconi tests the amplifier





further apart, which is a problem acoustically when you're trying to integrate them at crossover. I just had to do it the wrong way.

"I ended up stacking magnets. I took two of the magnet rings we use on the bass speakers and stacked them together. That way with just simple brute force, I was able to get the flux density, the target I'd set myself. It took a lot of playing about with prototype magnets, measuring fluxes, looking at leakages and calculating the flux density in various parts of the magnet to work out what was happening—because you can't see anything with magnets, it's terribly frustrating. I'd calculate what was happening and then nudge it a step at a time the way I wanted it to go.

"That's how we ended up with a tweeter which has a massive magnet, and yet is still manageable on a baffle. I wasn't just aiming for the moon because I knew that there were some units with a flux density of 2 tesla made by other people. I might have got away with a slightly smaller magnet by using much more expensive pole pieces but it's not really cost effective. A lump of ferrite is much cheaper than, say, Permandur where you'd be paying something like £10 (approx \$14) for just a pole piece."

The massive magnet acts as a useful

heat sink for the tweeter and the magnet gap is filled with Ferrofluid which conducts the heat from the coil to the magnet.

"We've always wanted to use Ferrofluid because it seemed like a good idea. We were worried about it attacking adhesives so we had to do a fair amount of 'life testing' to make sure things weren't going to fall apart after a while. Also it's a bit messy, it gets everywhere. It's difficult to re-use a structure once it's got Ferrofluid in it. You can't get it out—you can't demagnetise it because then it sprays the stuff everywhere."

The first heavyweight tweeters were installed in the prototype system and soon showed up a weak link.

"We got a lot of failures due to the lead out wires breaking. The winding of the voice coil was simply unpeeled, pulled back to a stationary part of the unit and terminated there. We were still playing about with the crossover frequencies, so we were probably asking the tweeter to move further than we eventually settled on but we got metal fatigue and copper wires broke. We use beryllium copper braid on our woofers, and it's very flexible. I had a bit of a job to find some that was thin enough to use on a tweeter—you can't use massive hawsers on there. Eventually I came up

with it and we haven't had any breakages since."

Two midrange units are positioned one above and one below the tweeter. These are heavy duty versions of the KEF B110 110 mm (nominally 4 in) unit which does service as a bass/midrange driver in some of the smaller hi-fi speakers. The midrange/tweeter box is internally divided into acoustically separate enclosures to ensure that there is no interference between units.

Most of the energy in any sort of music has to be handled by the midrange units operating from 200 Hz upwards, so a major consideration was protecting them from the heat generated in the voice coils. This involved wet winding the voice coils, filling the magnet gap with Ferrofluid, and attaching a large heat sink to the back of the magnets. The wet wound coils can cope with temperatures up to about 300°C (572°F) while the maximum working temperature of the Ferrofluid is only about 100°C (212°F), so there appears to be an element of 'belt and braces' about this approach but it has advantages.

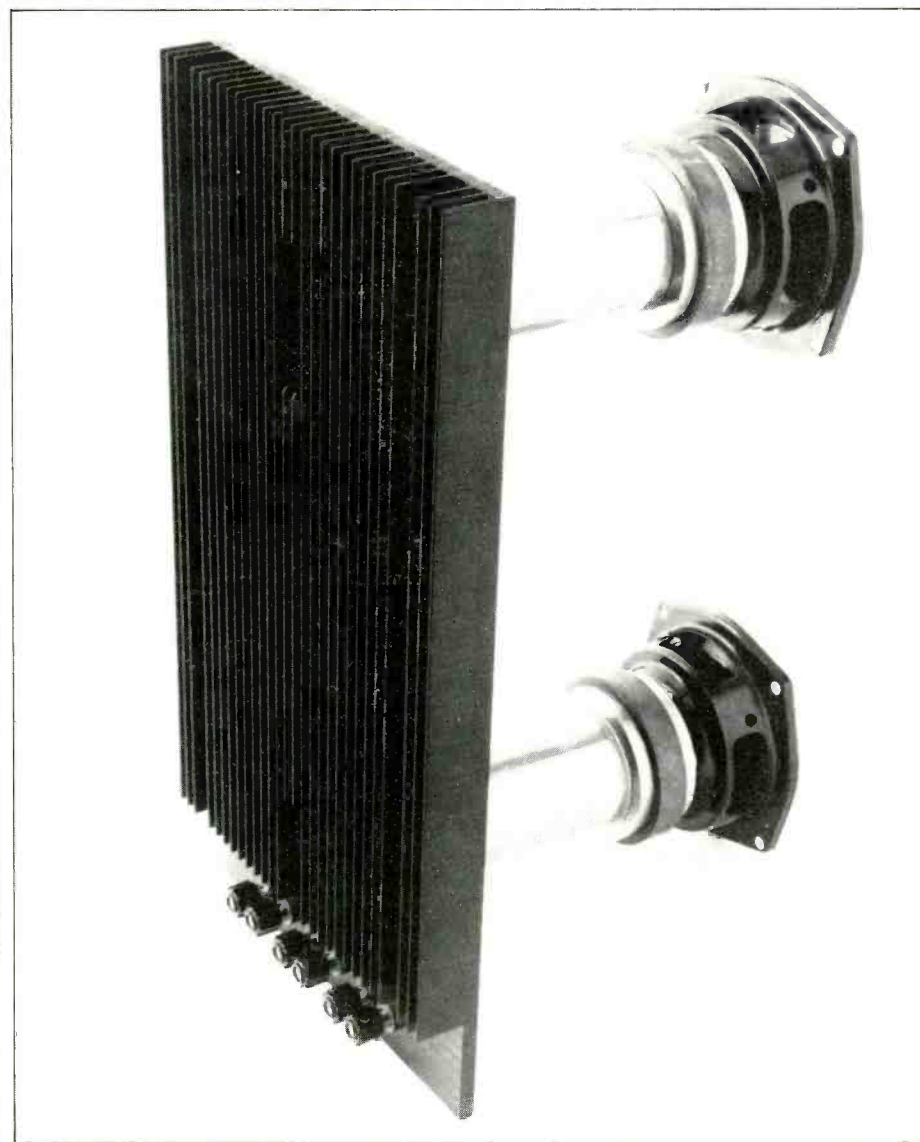
Ric Cecconi explains all: "The wet winding process uses a wire, which has a high temperature coating, passed through an epoxy adhesive just prior to winding on the former. The coil is wound wet, covered in epoxy which is then baked so that it totally encapsulates the coil, bonding it to itself and the former. With typical modern adhesives this gives you coils which are probably good up to 300°C before the adhesive fails.

"The dry winding process, which is easier, quicker and cheaper, uses wire with a self-bonding coating on it which, when you heat it up, fuses and gives you a bond between each turn and its neighbour and the coil to the former. It probably gives you coils which are only good up to 100°C. Now that shouldn't really be a problem with speakers that are limited to 100°C because of the Ferrofluid but you do get some softening of the adhesive before it fails—it's not just that it bakes and then starts to fail. That softening point is not terribly well defined, it can vary, and where you've got things vibrating a soft glue is just as bad as one that's failed—in other words it's no good at all. Wet winding is more expensive and messy but if you're after reliability you've just got to do it.

"The Ferrofluid cooling limits the maximum temperature to 100°C whereas the maximum allowable temperature of a wet wound voice coil is probably 300°C. At first sight it would seem that we have limited the maximum output by restricting ourselves to a 100°C voice coil temperature but the fascinating thing is that voice coil cooling is improved such that 100°C with a Ferrofluid unit and 300°C with a non-Ferrofluid unit are both reached with the same input voltage. When the voice coil's at a higher temperature, however, it is high resistance so it isn't taking the current it should. If you're running the voice coil much cooler it can take more current so you can get more output that way and you haven't lost anything.

"What you have gained is that everything runs cooler and you don't get so much thermal compression, because if you hit the speaker with a high current

6500 cm<sup>2</sup> heat sink and two 64 mm diameter metal bars to cool the two mid-range units



# DEVELOPING THE KM1

it doesn't heat up as much. When you have a speaker which has no Ferrofluid operating at high levels, as you increase the input signal, the output doesn't go up proportionally because the voice coil temperature is increasing, its resistance is increasing, and therefore it's not taking as much current as you expect for a given voltage. If you limit the maximum temperature to 100°C, because of the Ferrofluid, then it is more linear with no drop in maximum output."

A 64 mm (2½ in) diameter metal rod takes the heat from the magnet on each of the midrange units to a 6500 cm<sup>2</sup> (7 ft<sup>2</sup>) heat sink at the rear of the midrange/tweeter box. The result of all this heat dissipation is a claimed thermal compression effect of less than 0.5 dB over the full range of frequencies and levels.

After some 18 months of successful use at the BBC's rock music studios, MV 4 and 5, in West London's Maida Vale, the prototype speakers were replaced by early production models. Almost immediately there were problems with the cones on the midrange units becoming cracked. Ric has never worked out why this did not show up on the prototypes which had the same type of Bextrene cones. Possibly they had been treated with more respect than 'the real thing'. It was quite a puzzle to find out what the trouble was anyway.

"We thought at first it might be that the cones were moving too far but it didn't seem to be related to just movement. We did 'life tests' where we altered the amount of movement and the amount of cracking didn't really correlate with that. It seemed that once you exceeded a certain acceleration on the cone, and you did that more than a certain number of times, you got cracking.

"Looking in vibration handbooks we found it is a well documented phenomenon: you exceed a certain stress level and after some number of stress reversals, the material fatigues. If you never exceed this threshold level, then you never get cracking—it doesn't matter how many stress reversals you do. But once you get past this threshold level, you start to get cracking with a number of stress reversals which is inversely proportional to the stress level. The higher the level, the fewer the number of stress reversals you need to get to the cracking stage.

"I'm not a mechanical engineer so I only have a cursory knowledge of it, but we read about the phenomenon and we verified it experimentally with the Bextrene cones. It's a bit like a pathology lab—you get back the dead bodies, and you dissect them to find out what's gone wrong. Then you wonder what could have caused that and you try to reproduce the conditions here. Once you have done that you can then set about finding a new material, or taking steps to ensure it doesn't ever happen again."

Now you know why Bextrene cones



The complete KM1

work perfectly in many applications but the *KM1* midrange units have polypropylene cones. Polypropylene is very difficult to stick so samples of various glues had to be obtained and tested to find something suitable.

"We didn't use polypropylene for a long time because people were having trouble sticking it. Now that some reasonable adhesives have come through, that actually seem to stick the stuff, we are using it ourselves. We are very cautious about using new things that might affect the reliability of the unit, because if the thing breaks down it's no use at all. It doesn't matter how beautifully smooth the frequency response was when we started, if it doesn't last more than a week or so it's hopeless."

In its earliest form the *KM1* was called the *HS1*. Along with the tweeter and midrange units, this had two *B300 12* in (300 mm) woofers mounted back to back so that they fired out of the sides of the cabinet. The lack of directional information in the bass made this arrangement perfectly acceptable. It also allowed the bass drivers to be joined rigidly, magnet to magnet, which greatly reduced the vibration of the units. Rubber anti-vibration mounts took up most of the remaining vibration so that there was virtually no transmission to the cabinet.

Unfortunately the control room of Maida Vale 4 is one of those rooms where you get lovely bass over by the door but not quite so much when you sit at the desk. The *HS1* just couldn't pump enough air to overcome this problem and so it was retired. More recently KEF produced its *104/2* speaker which, as predicted, made good use of this research, including the idea of a vibration cancelling tie-bar between two bass drivers.

The next venture was into the labyrinth of reflex systems. "We found that the reflex system wasn't really giving us very good value for money. We

had the same units but we had to have a bigger magnet for that particular box size, which meant it was more expensive but we didn't get any more level out of it.

"We got some very good results with the port. We'd got a lot of turbulence, so I had the idea—which came from messing around with cars and carburetors really—that if you're going to make air go into somewhere, you flare it so you have a smoother transition. So where the ports came out they suddenly doubled in area. It really cut the turbulence down quite a lot but it was expensive and elaborate to do.

"At higher frequencies the box is like its own little room and you get standing waves in there. OK, it's damped but if you damp it too much the port doesn't work because you get port losses, and then you're throwing away all the advantages of the reflex cabinet. If you don't have all the damping, then at certain frequencies you're almost bound to get some high frequency rubbish coming back through the port. So we didn't seem to be getting much for a lot of effort and we abandoned the reflex design completely."

The third version and then a fourth version followed becoming the current *KM1*. A central steel frame holds the midrange/tweeter box with the amplifier unit beneath, each mounted on telescopic slides for ease of servicing. Two separate boxes, each containing two 12 in drivers mounted on anti-vibration bushes, are bolted onto each side of the central frame. One of the striking things about the appearance of the *KM1* is the way the bass driver 'wings' are swept back at an angle of about 30°. This is not done for dramatic effect.

"I'd built up a system with just the centre section, the midrange and tweeter, which does everything down to 200 Hz. Then I made up some rather large 'wings', because I knew we had to have a big box to take four 12 in speakers. First of all I started off with a flat box, and got horrendous interference dips—I'm



— NEW STANDARDS —  
IN TAPE ENGINEERING

Teac has been the name behind many of the milestones in the development of tape transports. You will find it on the world's leading data recorders, on NASA's shuttle video recorders, on military equipment and of course on the finest musicians' sound recording machines.

Now you will find Teac's TASCAM brand on a new breed of professional-standard multitrack sound recorder/reproducers, built to satisfy the most sensitive ears and engineered to cope with the most punishing workloads, even on video lock-up.

The new ATR-60 range includes 2, 4 and 8 track machines with 1/4 inch, 1/2 inch, 15 ips and 30 ips formats, while the 1 inch 16 track MS-16 is technically without rival.



By employing more efficient construction techniques, Tascam are now setting new standards in value: from around £3,400 for a 2-track with centre track time code to around £7,000 for the 16 track MS-16.

**TASCAM**  
TEAC Professional Division

Find out more about the new standards — contact:  
Harman UK, Mill Street, Slough, Berks SL2 5DD.  
Telephone: (0753) 76911

# DEVELOPING THE KMI

talking about 10 dB—huge anomalies in the frequency response. The tweeter and the midrange units did not like seeing a big flat baffle.

"We took the wings off to pretend we had a small hi-fi box and the response was OK. It was something you could equalise. So somewhere in between we thought we'd have something usable. In fact it turned out that just simply by angling the wings back by 30° we got a shape that was very amenable to equalisation. The centre units seemed to like that acoustic load better than a small box or a big baffle. They produced a smoother response on axis with no great anomalies off axis."

The bass units have wet wound coils to withstand high temperatures and they have sufficient thermal mass to dissipate heat without the aid of Ferrofluid. Like the midrange units, each bass driver is in a completely separate enclosure to prevent mutual interference.

In theory you can put multiple drivers in a common enclosure. But you find that at high levels you can get strange instabilities because of the non-linearity of the drivers. They can actually start moving out of phase, despite the fact that they're being driven in phase. Once they are really moving very far, the coil is probably at least half out of the gap so the magnetic field is non-linear.

"When the voice coil moves out of the gap it goes into an area of lower magnetic field so the restoring force, when it comes back, isn't as much as the force which took it out. Eventually you find that the cone floats outwards or inwards, depending on which direction it started off with. It's a well known phenomenon with high level drivers. People get round it by having stiffer spiders or using smaller boxes.

"If you buy a loudspeaker for use with a bass guitar, you'll probably find that the manufacturer recommends that you use a small box. And you'll find that the speaker has a very high resonance, maybe 70 or 80 Hz, because it has a very stiff spider. Those are measures to counteract this float effect. We found that simply by having a moderately stiff spider, having separate enclosures, and driving with separate amplifiers we could minimise that effect."

The spider in a modern loudspeaker is almost the sole suspension for the coil and the cone, now that soft materials such as PVC are used as an acoustic load termination at the outer edges of the cone. Long periods of pouring power into the bass hole of Maida Vale 4 proved to be too much for the standard bass speaker spiders of the prototypes. The cloth they were made of was fine in domestic hi-fi applications but a bit brittle for hard rock. Samples were obtained from suppliers in the search for a more supple cloth with the required springiness to support the cone.

"You just have to get samples and try them all out, so it's a question of sloggling through more life tests. Having speakers going up and down for hours on



Assembling the speaker

end, and going to look at them periodically with a strobe to check what's happening. I suppose it's 'suck it and see' really. It doesn't sound terribly technical does it but the only way of doing it is to try them out and see which ones last the longest.

"It's not been a total success because in getting a cloth that wasn't quite so brittle we got rid of the cracking problems but after about a year's heavy use the cloth becomes 'tired' and loses its springiness. You just have to change the drivers at that stage. You've got rid of a catastrophic problem but you have a longer term wear problem. It's like the speaker coming in for its 6000 mile (9656 km) service.

The eight power amplifiers are made by Quad and provides 200 W for each of the four woofers, 250 W for each of the two midrange units, and a pair of amplifiers connected in bridge mode deliver 400 W, up to 160 V peak to peak, to the single tweeter. The Quad units are arranged as a pair of twin channel amps side by side which are back to back with a similar pair so that the heat sinks form a sort of chimney up the middle of the *KMI*. Air passes up through the amplifier heat sinks, between the two bass cabinets, past the midrange heat sink on the back of the central section, and out through a perforated panel on the top.

"We didn't want to use fans. The thing about fans for amplifiers is that they come in after you've had a heavy passage that's heated everything up. Then it goes quiet and by that time the heat sink temperature's crept up so the fan comes on. If it had come on a bit earlier you wouldn't have noticed it. I'm sure it wouldn't take too much thought to come up with a circuit that only let the fans come on when the music was playing loudly. I'm not into amplifier design so someone else can nick that idea."

The input circuitry was designed by consultant Peter Baxandall and includes a fully floating 20 k $\Omega$  input as required by the BBC for 600  $\Omega$  line bridging. His

novel circuit achieves very low distortion and excellent low frequency performance while still using a transformer with its high input offset tolerance. The circuit, with slight modifications, can pass 1 Hz squarewaves! If some people are emotionally or ideologically opposed to transformers the circuit will even work without one. As well as designing an input circuit with very high common mode rejection, PJB suggested a modification for the Quad power amps to accept a 2 V input so that the active crossover filters could be run at higher level. This gave the system a signal to noise ratio in excess of 105 dB.

Ric Cecconi designed the active crossover circuitry which includes a touch of EQ to match the speakers to the box. There is also the option of a plug-in card to extend the bass response if required. This facility was yet another reason for abandoning the reflex system.

"The advantage of a closed box loudspeaker system, if you put a fair amount of lining in, which we do, is that it has the characteristics of a simple second order highpass system. It's very amenable to equalisation. If you know what the response of the system is, you can construct an electronic inverse of it to cancel out that characteristic. With a reflex system you're fixed from the moment you decide the tuning frequency. You can never boost below that because at frequencies below the box tuning frequency the driver and the port are working against each other. You'd have to redesign the whole system.

"The response of the basic units in this closed box system has a corner frequency of about 40 Hz and a Q around 0.9. You can cancel that electronically and have the speaker flat to 20 Hz or flat to DC if you want. You just change a few components on the circuit board and you have the characteristics of your dreams—as long as you're sensible and don't expect more air moving capability and as long as you don't expect the speakers to reproduce large levels of DC."

In fact the *KMI* can look after itself pretty well. An amber 'overload' LED on the front of the unit comes on if the amplifiers are being driven into clipping. If the level is not reduced before the drivers begin to heat up, an automatic thermal overload circuit lights a red 'protection' LED and then, cuts the signal level by 40 dB.

The protection circuits model the thermal characteristics of the tweeter and midrange units. They sense the audio signal from the appropriate power amp and deliver a DC control voltage which is proportional to the temperature of the voice coil receiving that signal. If the control voltage exceeds a certain threshold, then the 40 dB attenuators are brought in to protect the system.

*KMI* speakers, in one form or another, have been working at Maida Vale for some 3½ years and seem to have satisfied the BBC. This is no mean feat as it means satisfying the various sound balancers from Group 2 who use them; the Maida Vale maintenance engineers who look after them; and Studio Capital Projects Department who paid for them; not to mention the architects; the safety inspector; and David Stripp, Engineering Division's loudspeaker guru. □

# dbx

The future is modular...



902 De-essing or full load band ducking, auto threshold sensing  
903 Stereo strappable Overeasy™ compressor limiter  
904 Fully adjustable gate  
905 Parametric EQ with infinite notch on each band

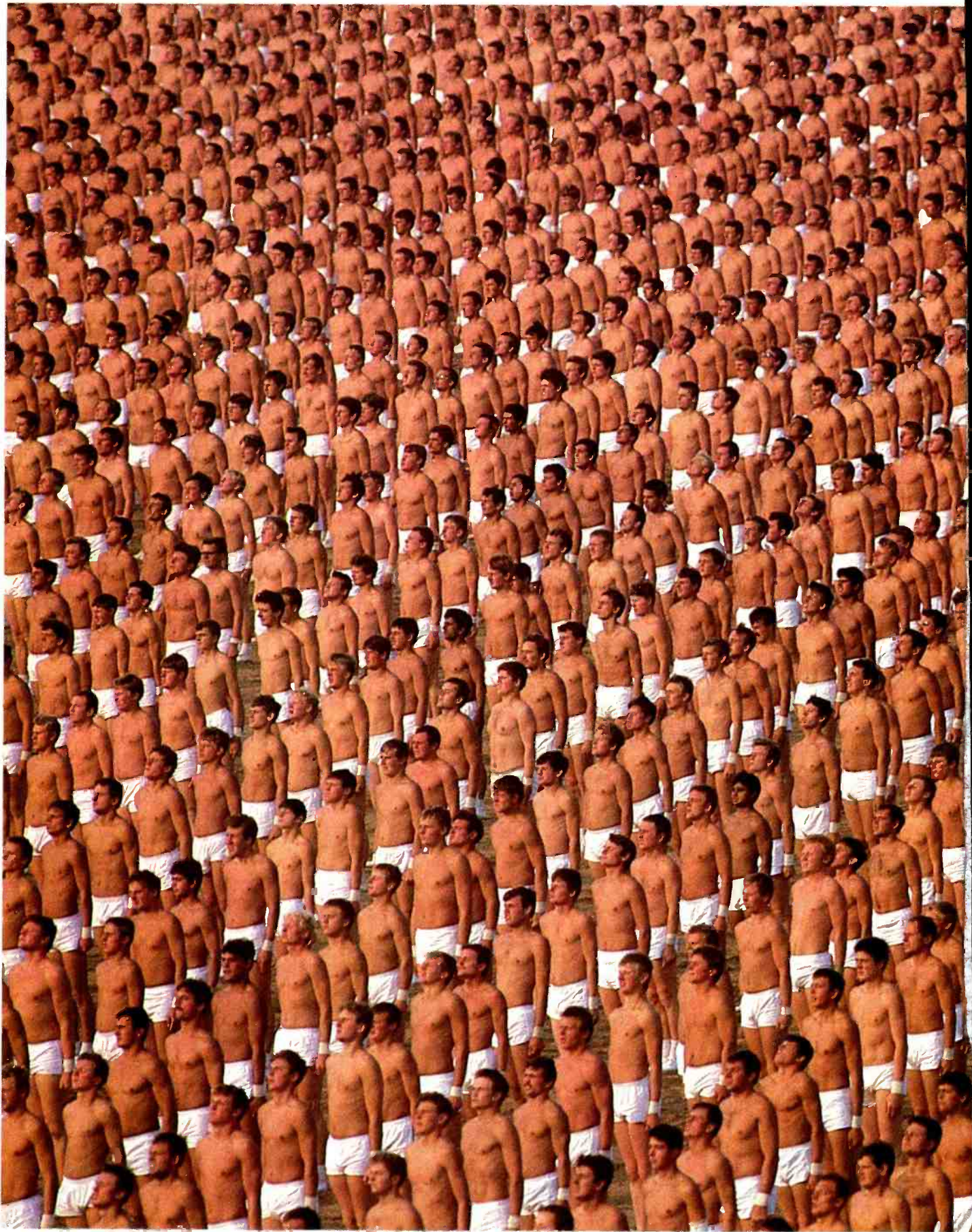
911 Type I noise reduction encode/decode 1 channel  
912 Type II noise reduction encode/decode 2 channel  
941A Type II noise reduction 2 channel encoder  
942A Type II noise reduction 2 channel decoder  
F900 9 slot frame, modular power supply

9?? The future is modular!!

**dbx** PO Box 100C, 71 Chapel Street, Newton, Mass. 02195 USA.

Austria KAIN GES MBI & COMPANY Salzburg, Vienna · Australia KLARION ENTERPRISES PTY LTD South Melbourne · Belgium TRANS EUROPEAN MUSIC SA Dilbeek · Denmark SLT Kopenhagen · Finland STUDIOTEC KY Espoo · France S.C.V. AUDIO Paris · Great Britain SCENIC SOUNDS EQUIPMENT LTD London · Greece ANTALEX O.E. Athens · Hong Kong STÜDER REVOX LTD · Indonesia P.T. KIRANA YUDHA TEKNIK Jakarta · Italy SCIENTEL AUDIO SRL Modena · Japan BSR LIMITED Tokyo · The Netherlands SPECIAL AUDIO PRODUCTS B.V. Amsterdam · New Zealand VICOMM SYSTEMS LIMITED Auckland · Norway LYDROMMET Oslo · Singapore LINGTEC PTE LTD · South Africa PRO SOUND Johannesburg · Spain AUDIO PROFESSIONAL SA Barcelona · Sweden TAL & TON ELEKTRONIK AB Gothenburg · Switzerland AUDIO BAUER AG Zurich · Taiwan YANG'S AUDIO VISUAL LABS Taipei · Turkey OMER TRADE EXPORT AND REPRESENTATION Ankara · West Germany AUDIO VERTRIEB

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



*Sycu. The madding crowd. Far from it*



Gyco

20 CONDUIT PLACE, LONDON W2 TEL 01-724 2451  
TELEX 22278 SYCO G, FAX 01-262 6081

# STUDIO FILE

# STUDIO FILE

Located in a large though somewhat unassuming house in downtown Copenhagen, Sweet Silence largely represents what the Danish music industry is all about. Since its beginnings in 1976 when it opened up as the first 24-track facility in the country it has been put to work virtually 24 hrs/day, 365 days/year. A bold claim certainly but one which is backed up by the booking sheets which adorn several walls in the studios' offices and corridors.

The driving force behind this impressive record is Freddy Hansson, a name to be conjured with in studios all over the world during the '70s before he grew tired of the nomadic lifestyle and determined to settle in his native Denmark. He was also tired of using different studios and equipment all the time, and therefore wanted to establish his own. A brief involvement with Rosenberg studio saw Freddy very much involved with the development of the prototype Lyrec 24-track tape recorder—the design of the remote among other things being attributable to him. When the machine was finished and working perfectly Freddy moved with it into Sweet Silence.

The choice of console similarly reflects a bit of history, as Freddy had been working at Trident London with Roy Thomas Baker and had become acquainted with the guys building the Trident A series console. They had started to build one for a French studio who ultimately could not come up with the money, and so it winged its way to Denmark instead. And there it remains to this day. Freddy: "It is very nice sounding although some of the facilities are a bit old fashioned but the sound makes up for that. It is geared up for quad because that was the fashion then, briefly, and that's why we have four speakers in the control room—it's good for listening but only for fun. The console has two sets of everything and lots of auxiliary sends which is a good advantage.

"The sound of the Trident is so good because it is discrete, no iCs. I don't want to get an SSL and I don't need to. It is

## Sweet Silence, Copenhagen

the input (musicians) and the output (engineer)—that's what makes it, not the desk. And there is more challenge in a desk like that. If you haven't got enough hands then, OK, you can get the SSL.

"It is also very simple to set up between sessions, which is important when the studio is working 24 hours/day. And as far as maintenance—it has never had anything wrong with it. It has been really reliable."

Freddy is certainly a man who knows his own mind. On the subject of the studio's design, he explained why he didn't bring in a firm to do it: "I didn't want Tom Hidley or any of those people with their walls not pointing at each other and all that stuff. I didn't want traps in the wall—you should bring those things in; things change; you should be able to do any sound you like. We put in absorbers behind the wooden slats in the walls, and fibreglass and plywood and all that sort of thing but in some places there is just black tissue paper to give the impression of depth and dimension."

The rooms obviously work, their popularity bears testament to that fact. The main studio is very large—approximately 35×30 ft with various acoustic treatments around the room. Under the Steinway *D-series* concert grand is a marble floor, the rest is carpeted. Most of the wall surfaces are covered in light wood slats as Freddy

described, with various treatments behind them. The control room window wall is covered in stone with wood above it and the uneven ceiling is also of light wood. The room is broken up with a series of white posts and lit by a series of yellow spotlights suspended from the ceiling. The wooden panelling along one wall opens up to reveal windows which will soon command a view down to the nearby beach as the industrial area surrounding the studio is being cleared.

In addition to the Steinway ("Nice for intros and Oscar Peterson-type recording, it is too heavy for rock—anyway, I don't want people banging away on the Steinway.") there is a Kawai grand which is "better for rock and roll", and an upright honky tonk.

In spite of Freddy's aversion to trapping, he does concede that there is a small amount down the middle of the studio to separate the live and dead areas. But the versatility is a factor he is determined to hold on to: "Sounds change all the time and we change with them."

At the back of the room are windows into two isolation rooms—one live and one for drums—which also have a window between them so that all round communication is complete. The walls are treated in a mixture of stone and wooden slats with wooden ceilings. The floor of the live room is red tiles.

Behind these is a large store

room. "It's about 12×14 m and is very raw, very ambient. It's great for drums and guitars, very nice. We're planning to open it up—take the ceiling down and move the walls out. There is another 4 m above the ceiling and about 9 m behind the back wall. Most studios haven't got a room like this and all the bands that come here love it."

The 8×7 m control room was not only full of its own equipment but also several musicians and their keyboards, however, the bits that showed were fairly standard fare. The window wall is covered in stone and the rest of the room with cork tiles. The back wall has been opened up with windows to bring some natural light into the room looking onto a roof garden/terrace. The control room window is in three sections, the monitors are above with a matching pair suspended from the ceiling at the back of the room—all JBL 4333s. Other monitors available include JBL 4411, Visonik David 9000, Auratones and Yamaha NS10M plus the facility to bring in your own should these not suffice.

Tape machines at the time of writing were a Lyrec TR532 24-track and Otari MTR90-II 24-track with pitch control and autolocate. These are synchronised with *Q Lock*. They were, however, awaiting the arrival of the newest Lyrec models which have been redesigned with a new tape transport and amps.

"If they survive three months' studio testing then they will stay. If you are used to the Lyrec remote then the Otari is very different. Lyrec servicing is the best available in Denmark because they are here. You can't say the same for Studer or Otari. Service and backup is always the reason for what you buy."

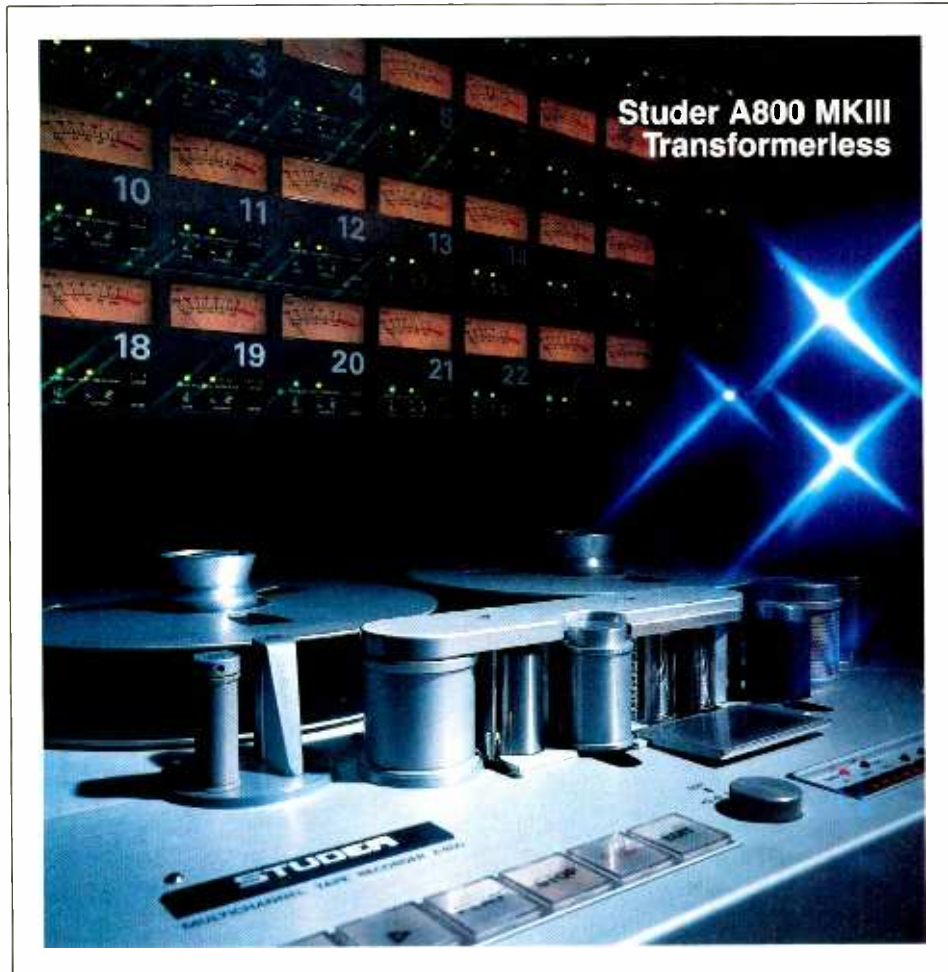
The ¼ in machines are two Studer A80s, two Revox PR99s and one A77. There is also a Lyrec TR55 ½ in and they were expecting delivery of a Studer A820 digital ½ in recorder. Cassette decks are by Alpine—five AL-90s and there is a Revox B710. Dolby is available—24-track A/M16H and two A/361s. Two Sansui SR636 turntables are also available and a Sony PCM 701-ES modified with RTW

One of the two isolation rooms





# First we proved it. Then we improved it.



Over the past four years we've installed over 500 Studer A800 multi-track recorders in studios all around the world. We've proven this machine on all counts—reliability, sonic performance, production versatility, and total client satisfaction. No other recorder has earned such widespread admiration among recording professionals.

And now, with the introduction of the A800 MKIII, we've improved on the proven standard. We've removed all transformers from the record and reproduce paths. We've added interfaces for Solid State Logic and

Neve/Necam automation, and for all SMPTE/EBU synchronizing and editing systems. We've also updated the software for the microprocessor controls to meet the most demanding industry requirements.

Improving the A800 was not an easy assignment, but at Studer the pursuit of perfection has become an ingrained habit. Discover the difference yourself.

**STUDER**  
INTERNATIONAL AG  
CH-8105 Regensdorf Telephone (01) 840 29 60

## **F.W.O. Bauch Limited**

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

# STUDIO FILE

# STUDIO FILE

8803 digital interface.

The other rooms in the building house tape store, kitchen, shower, meeting/rest room, offices, editing/copy room and games room. "Ritchie Blackmore made us get a football table—he paid for it too. He's great—I've never seen anyone beat him. It was worn out within two years."

The edit/copy room has Studer and Lyrec machines, JBL 4411 monitors and Dolbys. "We are the only place in Copenhagen that still has Dolby. You sometimes need them for copying someone else's tape. We haven't used them in the main room for five years except when a foreign group comes in and wants it specifically." There is also TV and video here: "There is not much on Danish television so you need to have video—the bands can watch their dirty movies then."

In addition to the studios there is a mobile which is housed in a Mercedes bus and contains two Lyrec 24-track machines, a Trident 32/24 *Trimix*, JBL 4411 and Yamaha NS10 monitors with Yamaha P2200 amps. Outboard equipment is four UREI 1176 limiters, Eventide H910 *Harmonizer*, four *Kepex* noise gates, two *Gain Brains*, two Klark-Teknik DN11 equalisers and an AMS 15-80S digital delay. There is a Revox PR99 ¼ in and two Alpine AL90 cassettes. All the equipment is very mobile too and anything extra may be temporarily stolen from the studio and vice versa.

Freddy's partner Flemming

## Sweet Silence continued

Rasmussen built and runs the mobile which is involved in quite a bit of work for television, live work for all the major record companies and location recording. "Flemming is very good, very quick. He works with the mobile most and there are always two engineers on it. You need at least two people."

For a full run down on the equipment see separate listing. Freddy did, however, give special mention to the fact that they have a lot of old valve microphones. "All those old microphones are very popular again and very hard to get hold of. When they designed the transistor and IC

they forgot about the sound of the tubes; now everyone is remembering. We have even built a lot of DI boxes with tubes in them."

Maintenance is one of Freddy's roles. He manages to get two or three months a year actual recording fitted into his busy schedule which also includes administration of the business. He is aided in this by a computer which handles every aspect including, studio bookings, accounts, track sheets, daily work sheets, materials and stock. Everything is accounted for and in this way a client knows exactly where his money has gone and there is

no room for error. "The computer can tell the client exactly what materials, hours and extras like food they have had and this way it is fair. If you don't keep proper records it is the client who loses out in the end."

In his workshop he not only works on the day to day maintenance but also developing equipment for use in the studio. "Things don't often break down but if they do, then I will get a phone call at perhaps 5 o'clock in the morning to say that the session has finished and I will come in. It is not the console and the machine that breaks, it is just that the more equipment you get the more wiring you need, the more cables, the more patchbays and so it goes on."

Although there is room to accommodate up to six people on site, this is avoided where possible because with the studio operating round the clock there would be people wandering around who had nothing to do with the session in progress and this is a situation Freddy prefers to avoid. Copenhagen doesn't, anyway, exactly lack hotels.

Sweet Silence is run on a staff of 10 including six engineers: Freddy, his partner Flemming Rasmussen, Jasper Bo Nielsen, Flemming Hansson (Freddy's son), Finn Lyngemark and Jan Kiberg.

There are big plans afoot. The floor above all this is destined for conversion into a control room and overdub room and, possibly living areas. The existing studio is going to have more live

Control room with Trident console



## Outboard equipment

Lexicon 224XL reverb  
EMT 140 S plate  
EMT 250 and 251 digital reverbs  
AMS RMX16 digital reverb  
UREI 1176LN Compressor/limiters (8)  
UREI LA-4 (2)  
Teletronix LA-2 (2)  
dbx 160 and 160X  
B&B CX-1 (6)  
Aphex Compellor  
Orsa Major MSP-126 stereo processor  
Ortofon STL 732  
Kepex noise gates (7)  
Gain Brains (3)  
Drawmer 201S Dual Gate (2)  
Klark-Teknik DN22 (2)  
Klark-Teknik DN27 (2)  
Klark-Teknik DN30 (2)  
B&B EQF2 (2)  
Pultec EQP1 (4)  
Scamp rack  
AMS DMX 2580S and DMX 1580S  
Eventide H910 (2)  
Eventide Flanger  
Eventide Phaser

Lexicon DDL92  
Roland 555  
Aphex 602B (2)  
Aphex II Aural Exciter  
MXR Auto Flanger (2)  
Court spectrum analyser  
Countryman phase shifter  
Korg SDD3000  
Boss DE200  
SRC SMPTE reading clock with input module and new 84 software.

## Microphones

Bruel and Kjaer 4006  
Neumann U47, U89, U87, KM84  
Shure SM7, SM33, SM56, SM57, SM58  
AKG Tube, D12, D224, D2000, C33, C414, C535  
Crown PZM  
Sennheiser MD421 and MD441

## Headphones

AKG, Fostex, Sennheiser and Beyer

## Musical instruments

Steinway D-series concert grand  
Kawai piano  
Fender Rhodes 88  
Yamaha DX7  
ARP Solina  
Linn 9000 digital drum synth  
Syndrums  
Leslie 147  
Music Man bass guitar  
Music Man lead guitar  
Gretsch drumkit  
LP congas  
Fender super reverb with JBL speakers  
Music Man 2×12 in amp  
Music Man bass amp 65  
Marshall 4×12 in guitar amp  
Music Man 1×15 in bass amp  
Acoustic pedal organ  
Rototoms  
LP timbales  
Boss and MXR effects pedals.

"And we don't charge extra for anything. Stupid us." Freddy Hansson, Sweet Silence

# STUDIO FILE

# STUDIO FILE

surfaces with traps to control it. The acoustics will possibly be made more variable by the utilisation of moveable stone walls, the aim being to enable the engineer to create a special acoustic environment for whatever he wants to record. The existing windows which will overlook the sea are going to become a permanent feature, covered over with curtains controlled from the control room.

"I'm looking forward to getting the windows. The control room and studio environment today should be just like a living-room. People should feel like they are at home. They don't want to sit in black holes any more. Three years ago we brightened up the control room by putting the window in the back wall and the daylight made such a difference."

It is not very easy to define Freddy's recipe for success. To

## Sweet Silence continued



The studio features a Steinway grand

all appearances he seems to just stick his head down and get on with it, and if you don't like it there are plenty of other places to go. The studio does not, for example have any kind of brochure and they never advertise. They just are.

"What do you need brochures for? You can come and look at the studio and if you feel fine, OK, you stay, if not go. The only brochure you need is your name on as many records as possible.

"Money is the only

competition we have. If record companies are trying to find somewhere cheaper that's up to them. You don't need to advertise because your recordings are the only thing that recommends you, not advertisements. I don't believe there should be competition between studios. It's no good having people working in your studio if they don't like being there is it? I also don't think it is right to make your prices cheaper to try to get more work. If you do a good job there is work enough."

And he would appear to be right as, since the very early days with Cat Stevens, Dr Hook, Rainbow and even an unreleased album with Ringo Starr, Sweet Silence continues from strength to strength.

**Janet Angus**  
Sweet Silence Studios ApS,  
85 Strandlodsvej, DK-2300  
Copenhagen S, Denmark.  
Tel: (01) 59 12 00.

## PPX AMPLIFIERS

# CITRONIC

**A SIGN  
OF  
QUALITY**



Technically superior and totally dependable high quality power amplifiers.

**PPX, better performance.**

# STUDIO FILE

# STUDIO FILE

When Dennis Weinreich was a successful freelance producer/engineer he decided that he didn't ever want to own a recording studio. "Too much trouble. I think it's difficult to make money in the recording studio business, because any time you get any money in the bank there's always another piece of equipment that you want to buy. So it's a bad investment and it's a lot of hard work. The only people who should own recording studios are people who love owning recording studios. People who want to go into business should open up McDonald's hamburger stands or something." So how come he's the owner and operator of Videasonics?

Dennis came to Britain from America some 14 years ago and worked as an engineer with Scorpio Sound at Euston Tower, which is also the home of London's Capital Radio. He spent some time with Scorpio and began to get into production. Then his wife, Li, made a request which was to affect his future. She is an experienced film editor who very wisely diversified into video editing. In the mid '70s Li was working on a video production which required rather more complex work on the sound than a video editing suite could offer—the sort of thing that a film editor would take to a dubbing mixer. At the time video audio post production was little more than an idea. Very few people had suitable facilities. Dennis had done some film and video work in Los Angeles—perhaps he could help.

They managed to do the job at Scorpio with the aid of a 'play speed only' timecode synchroniser. This early type of synchroniser simply controlled the capstan speed on the slave to keep it locked to the master—if the master went into fast wind the slave could not follow but had to be manually relocated. Despite, or possibly because of, this sort of problem, the idea took root for an audio post production facility built and operated by people from the recording industry.

The cash benefits of producing the odd million-selling album, and involvement in a hire

## Videasonics, London



Studio One

business, had enabled Dennis Weinreich to buy various bits of studio gear. By the beginning of the '80s he owned a 36-channel console, at least one 24-track machine and a large collection of microphones. "We basically had a recording studio without a building." So he decided to get the finance to set up his own business. He took his proposal to several banks and soon had the necessary backing. Then things slowed down.

Various premises around the West End of London were looked at, then came news of a recording studio in Camden Town which had gone out of business. It had some of the latest equipment and it was all leased. The owners of the lease suggested that Dennis might like to buy it at a very favourable price. The package included a Harrison 3624 console, Studer A80 MkIII, two B67, amps, monitors, various mics, stands and a piano. The question was: how soon would all this have to be removed from the studio and where could it be stored? The landlord suggested that the equipment could remain in the studio on a short-term lease until suitable premises were found. So although he felt it too far from the centre of activities in the West End, Dennis ended up running his

first recording studio in Camden Town.

Meanwhile Li had been doing some video editing at Research Recordings which was beginning to establish itself in its building in Hawley Crescent, Camden Town, and almost directly opposite was TVam, preparing to go on the air with ITV's first breakfast programme at 6am on February 1st, 1983. So in March 1983 Dennis Weinreich and Mike Bradley, Videasonics technical manager, set up a temporary control room on the top floor of the new building.

Just a couple of days after they had completed the temporary installation someone rang up in urgent need of audio post production, including voiceover narration, on a video for British Telecom.

"We didn't even have a voiceover booth but I said, 'Come on in and we'll see if we can sort you out'. A couple of days later we got another panic phone call—a guy had a special going out on Channel Four and there were some problems with the mix could we sort it out? A couple of days later the phone rings again and somebody else has got a problem—and then again, and then again, and then again. Within two months we were up to a staff of eight running 24 hours a day out of one room which was

supposed to be a test bed."

During the summer TVam sent a scouting party over the road to investigate the video and audio facilities. It turned out that they had no staff available to cover audio post production in the afternoons and evenings—would Videasonics be prepared to handle dubbing for TVam from 2pm until midnight on a day to day basis? Dennis Weinreich was a bit stunned.

"We figured our biggest job was going to be convincing people to use audio post production. Just the opposite—the phone was actually ringing off the hook and then in the middle of it all this very attractive situation arises with TVam. Of course that turned into seven days a week for TVam—but it was always, 'Can you do Monday, Tuesday, Wednesday, Thursday, Friday of next week for us?' and then on Thursday, 'Can you do Saturday and Sunday for us?'—and that went on for six or eight months."

The infant Videasonics was kept on its toes by TVam's head of sound, Denis Stevenson, who always insisted on the very highest possible quality. All this work was a great start for the company but it did delay the building of the permanent facility for about a year. So a voiceover booth was added to the top floor control room and it was not until December 1984 that this 'temporary' set up was retired, by which time it had handled some fairly prestigious productions.

Dennis thought of Andy Munro or Sean Davies to do the design. In the event the lot fell on Andy Munro. Dennis asked him to take a few chances since this was not simply a recording studio and he wanted to be adventurous.

"I think we're the only studio in Britain with a 180° control room window for instance. I wanted all areas of the studio and control room to be visible to each other all the time. Of course the only way to achieve that is by having the window as big as possible. That left Andy with some problems and he overcame them. We're real happy with the acoustics in the studio and the control room."

Studio One is 72 m<sup>2</sup> and is sort of wrapped round the

► If you're naming names, where do you start?

At venues with permanent installations like Carnegie Hall and Grand Ole Opry, a high-tech studio like the NOMIS complex, or Rinaldo's futuristic discotheque in Peterborough?

With Ella Fitzgerald's cool jazz, or Iron Maiden raising hell around the globe?

The Turbosound TMS Series is so versatile, you're rather spoiled for choice.

Those people use our system for reasons so compelling it's only fair you should hear about them.

Many of today's PA systems originated over a decade ago. We developed the TMS Series because we wanted to bring live sound into the eighties.

Our designers, then, work on two maxims.

One, that nothing is more important in speaker design than the sound your ears hear.

Two, that rules are there to be broken.

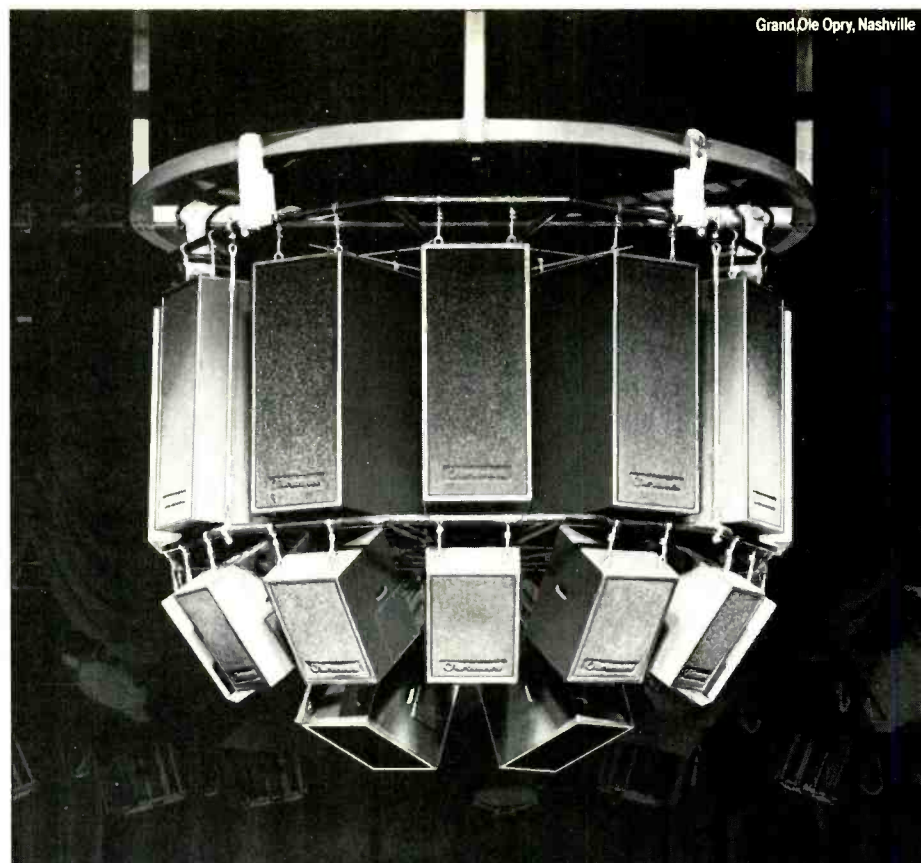
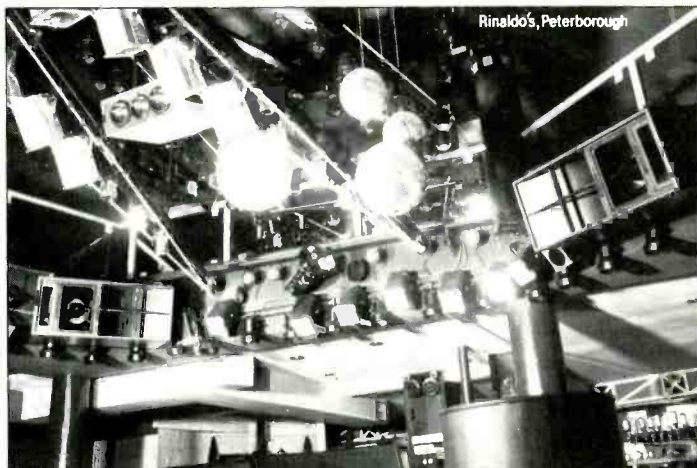
So they invented two unique loading techniques, so innovative as to be the first in years to receive worldwide Principle Patents:

They refused to see cone design as a fait accompli and regarded 'the woodwork' as an integral science – and made quality and efficiency partners instead of enemies.

Never, in fact, have speakers been so completely designed from top to bottom. That's why nothing else can equal our power and quality in such small enclosures.

According to tradition it shouldn't really work. But then, tradition has never been our strong point.

We've defied the argument that an enclosure has to be bigger to be louder and to achieve better bass response.



## From Nashville to Peterborough, from Ella Fitzgerald to Iron Maiden, Turbosound's the choice.

The 250Hz – 4kHz vocal range is covered, seamlessly, without a crossover point, and each section is dynamically balanced for strong imaging.

And because the enclosures are naturally correct, we don't need to use compensating electronics (we're surprised how many people compare our designs with others that use a mass of electronics to synthesise reality).

With distortion so low it's virtually hi-fi (in enclosures capable of producing upto 141dB maximum SPL), you'll

understand why the TMS Series is increasingly regarded as the elite of professional sound systems.

Other benefits are more prosaic.

Compactness radically improves handling and installation capabilities; it obstructs sightlines less and saves money on trucks, crew and maintenance. And it's easy to create an ideal 'point source' array.

We can talk all day about why we sound better than anyone else, but you'll have to hear a Turbosound system to appreciate the real difference.

Like the clients we've mentioned, listen to a Turbosound system in concert, or pick up the phone and call your distributor to arrange an audition.

It's the most natural sound you've heard; whatever your audience, and whatever your music.

\*The TurboBass™ and TurboMid™ devices are covered worldwide by Principle Patents (and not simple design patents). The concepts embodied in their design are, therefore, entirely unique. (See brochures for further information).

**Turbosound**  
A member of the Turbosound Group of Companies London New York

Turbosound Sales Ltd 202-208 New North Road, London N1 7BL Tel: (01) 226-0099 Telex 265612  
Turbosound, Inc. 611 Broadway #841, New York, New York 10012 Tel: (212) 460-9940 Telex 230199

**Worldwide distributors:** Australia: Creative Audio Pty Ltd Melbourne (03) 354-3987 Austria: Audiosales Moedling (2236) 888145 Canada: Belisle Acoustique Inc Quebec (514) 691-2584  
China: Wo Kee Engineering Ltd Hong Kong (5) 2490735 Denmark: Per Meistrup Productions Kallund (02) 151300 France: Regiscene Paris (01) 374-5836 Greece: Alpha Sound Athens (01) 363-8317  
Holland: Ampco Holland bv Utrecht (03) 433134 Hong Kong: Tom Lee Piano Co Ltd Hong Kong (3) 722-1098 Indonesia: Atlas Sound (Pte) Ltd Jakarta (01) 85123 Israel: Barkai Ltd Ramat-Gan (03) 735178/732044  
Italy: Audio Link Parma (0521) 772009 Milan (02) 285-0334 Japan: Matsuda Trading Co Tokyo (03) 295-4731 Korea: Bando Pro-Audio Inc Seoul (02) 546-5491/5  
Malaysia: Atlas Hi-Fi Sdn Bhd Kuala Lumpur (03) 432104/432077 Norway: Nordtek Equipment a/s Oslo (02) 231590 Singapore: Atlas Sound (Pte) Ltd Singapore 220-4484 Spain: Lexon s.a. Barcelona (03) 203-4804  
Sweden: Inter Musica a.b. Skovde (500) 85260 Switzerland: Studio M + M Schonenwerd (64) 415722 Thailand: Bangkok Cine-Graphic Center Bangkok (2) 314-3570 UK: Turbosound Sales Ltd London (01) 226-0099  
USA: Turbosound Inc New York (212) 460-9940 West Germany: Adam Hall GmbH Usingen (6081) 16031

# STUDIO FILE

# STUDIO FILE

180° window at the front of the 50 m<sup>2</sup> control room. Collecting valve (tube) mics is one of Dennis' hobbies so there are numbers of AKG *C12*, *C24*, *C28*, and *Tube*; Neumann *U47*, *49*, and *67*; and Telefunken *251* around. The studio can manage up to 35 musicians if they're on friendly terms but for some sessions only one corner is used for a voiceover or sound effects. The control room window bay is largely occupied by an automated MCI *556C* 56-channel desk. Above the window are two UREI *813* monitors powered by Crown *Delta Omega* amps, and a Sony *Profeel 27* in video monitor. Nearfield monitoring is by Yamaha *NS10* monitors. The rear half of the control room is a raised platform so that production folk can see the action. At the front of this area, immediately behind the sound balancer's chair, is a large flat topped desk with talkback facilities where producers can spread out their paperwork or performers can set up their synths. This huge mass in the middle of the room could have screwed up the monitoring—another of the challenges Andy Munro had to overcome. In fact the design worked so well that the equalisers bought to trim the monitoring were not required at all.

The front face of the central desk holds a vast range of outboard gear within easy reach of the engineer. This includes a couple of Fairchild-*670* valve (tube) compressors, two dbx *165* comp/lim, two UREI *1176* limiters, an MXR dual-channel limiter, a rack of Valley People gear with eight *Kepex* and six *Kepex II* noise gate/expanders, five *Gain Brain* and two *Gain Brain II* compressors. EQ and effects are provided by a pair of Klark-Teknik *DN27* 27-band graphics, Orban *621* 2-channel parametric, UREI *565 Little Dipper* filter set, AMS *DMX 15-80S* stereo DDL with extended memory, Bel *BF20* stereo flanger, two Delta Lab *DL 4* delays, ElectroSpace Developments *Spanner* stereo panner, Eventide *H910 Harmonizer*, three MXR flangers, two MXR phasers, and two Yamaha *D1500* digital delays.

The range of reverberation

## Videosonics continued

should suit most tastes: AMS *RMX 16* and two Yamaha *R1000* which are actually in Studio Two but accessible to Studio One; EMT *140* valve stereo plate, EMT *245* digital reverb, and Lexicon *224X* installed in the central machine room with remote control. All this familiar audio gear is supplemented by a Sony *VO-5850* U-matic as video master with a btx *Softouch* timecode system controlling up to three slaves.

Around the back of the control room are a mixed bunch of tape machines. One MCI *JH-110B* 2-track handling ¼ in and ½ in tape, one MCI *JH-110B* ½ in 4-track (the standard for stereo mixdown plus timecode in the American market), one Studer *A810* ¼ in 2-track plus centre-track timecode (which is becoming the European standard) and one Studer *B67* ¼ in stereo with Nagra stereo pilotone head. A Sony *PCM-F1/SL-F1* 2-track digital system is available and is often used for recording sound effects to order. A Sonifex *MicroHS* cart machine and a LAD instant start gram unit are also used for music or effects playback.

One or two multitrack machines can be accommodated at the back of the control room but they usually keep themselves to themselves in the central machine room. The patch bays in the central machine room allow any combination of tape machines and synchronisers with the two main consoles. There are two Otari *MTR-90 MkII* 24-tracks and one MCI *JH-24* 24-track with all the necessary Dolbys. What happened to the original Studer *A80* multitrack? It proved to be a bit 'soggy' for full time use with the btx synchronisers and it was limited to 10½ in reels whereas VT machines can run up to three hours on one reel. What was wanted was a machine that liked the synchroniser better and took 14 in reels. Andy Munro, with Turnkey at the time, suggested the Otari *MTR-90*. Dennis wasn't sure but Andy persuaded him to try one.

"It literally came in through the front door, we put it into

service and it never left the building."

The central machine room houses a broadcast quality Sony *BVH-1100PS 1* in C-format VT machine with *BVT-2000P* timebase corrector which can be used as video master for an additional £70 (\$95) per hour—the usual sort of rate charged by video facilities for a 1 in VTR. Apart from that the basic rates include all the outboard equipment and two 24-track machines. With experienced music balancers like Peter Hoskins and Dennis on the team it is no surprise that Studio One does a number of straight music sessions in addition to music to picture for film or television.

Charges for Studio Two include the video facilities. It was designed as a straight forward audio post production suite with a 35 m<sup>2</sup> control room and a 8 m<sup>2</sup> voiceover booth which has various sound effects surfaces (gravel, etc) in Foley pits under the floor. The Harrison *3624* automated 32-channel console, Studer *A68* power amps and UREI *813* monitors from the temporary control room were installed in Studio Two and proved very successful there too. There are thoughts of updating to one of the very latest Harrison desks.

Not being a music studio there is a smaller range of outboard gear but items do tend to get shared between the two control rooms as required. Resident equipment includes the AMS *RMX 16* and two Yamaha *R1000*, Delta Lab *DL 4* DDL, Drawmer dual gates and dual companders, Eventide *H949 Harmonizer*, two Klark-Teknik *DN27* graphic EQ, two UREI *LA-4* comp/lim and UREI *1176* limiter. The video side is provided by a Sony *VO-5800* U-matic with a *Profeel 27* in video monitor and a btx *Softouch* synchroniser system. One of the two Otari *MTR-90* is normally allocated to Studio Two. The control room has a Studer *A810* 2-track with centre timecode and an MCI *JH-110B* 2-track. There is also a Sonifex *MicroHS* cart machine and a Technics quick start gram unit.

For the benefit of those who want to have a look and a think before embarking on audio post production there is a pre-dubbing preparation room, also known as Studio Three. This is a 12 m<sup>2</sup> control room with a Neve *Melbourn 12/2* desk, Studer *A68* amps and Tannoy monitors, Sony *VO-5030* PAL/SECAM/NTSC U-matic and video monitor, a collection of tape machines including: Ampex *AG 440* 2-track, MCI *JH-110B-3-TC* 2-track with centre timecode, Studer *B67* 2-track, *B67* ¼ in full-track with Nagra mono pilotone system, and Sonifex cart machine.

A multitrack machine can be accessed by Studio Three for track-laying. There are collections of library music and the Sound Ideas effects library from Canada as well as Videosonics' own effects. A new development here is a Convergence *224* video editor modified by the makers to control two U-matics with Sony *PCM-701* digital audio processors and a third U-matic providing pictures with timecode. This will enable digital audio tracklaying for video using two U-matics as A and B roll tapes. Not only high quality but probably more cost effective than multitrack.

The story of how Videosonics came to be set up seems to involve a number of lucky breaks. Dennis Weinreich is philosophical about this.

"We have been outrageously lucky. We came into business and got to buy a defunct studio's worth of equipment that was only a year or two old for effectively a fraction of its cost. What a head start that gave us. On top of that we ended up with a whole studio. Then we moved into this building, slapped up a cardboard control room and all of a sudden business was crazy.

"We keep thinking the bubble's going to burst. I find that everything in the studio business, probably everything in life, is cyclical. We're in an up cycle at the moment but you just don't know what's going to happen." □

Tim Leigh Smith

Videosonics, 13 Hawley Crescent, London NW1 8NP, UK. Tel: 01-482 2855.

*Just when you thought the future  
couldn't shock you any more.*

Introducing the Lexicon PCM 70, our extraordinary new digital effects processor with dynamic MIDI. Designed, creatively speaking, to thrust you into the future.

To begin with, the PCM 70 gives you access to the same astonishing Lexicon digital effects used by the world's top artists and studios. With complete, variable parameter control, and registers that let you create and store your own programs.

Now, about dynamic MIDI. With this pioneering Lexicon development, you can vary any PCM 70 parameter through a MIDI keyboard while you're actually playing. Just imagine being able to vary the wet-dry mix, for example, through finger pressure on the keys. Or by your choice of other controls, like the modulation wheel. Or even by a computer.

There's more. The Lexicon PCM 70 digital effects processor is also a full-fledged digital reverb, with a complete selection of Lexicon reverb programs. And the price? Shockingly reasonable.



You'll want our detailed PCM 70 brochure. At your Lexicon dealer, or contact us. Lexicon Inc., 60 Turner Street, Waltham, MA 02154, USA. (617) 891-6790. Telex: 923468. Lexicon International, P.O. Box 122, 8105 Regensdorf, Switzerland. Telex: 59222.

Come to the future.

**lexicon**



SCENIC SOUNDS EQUIPMENT LIMITED  
Unit 2, 12 William Road, London NW1 3EN.  
Tel: 01-387 1262, 01-734 2812  
Telex: 27939 SCENIC G



AUDIO EXPORT,  
Badstr 14, 7100 Heilbronn,  
Germany,  
Tel: 07131 82275

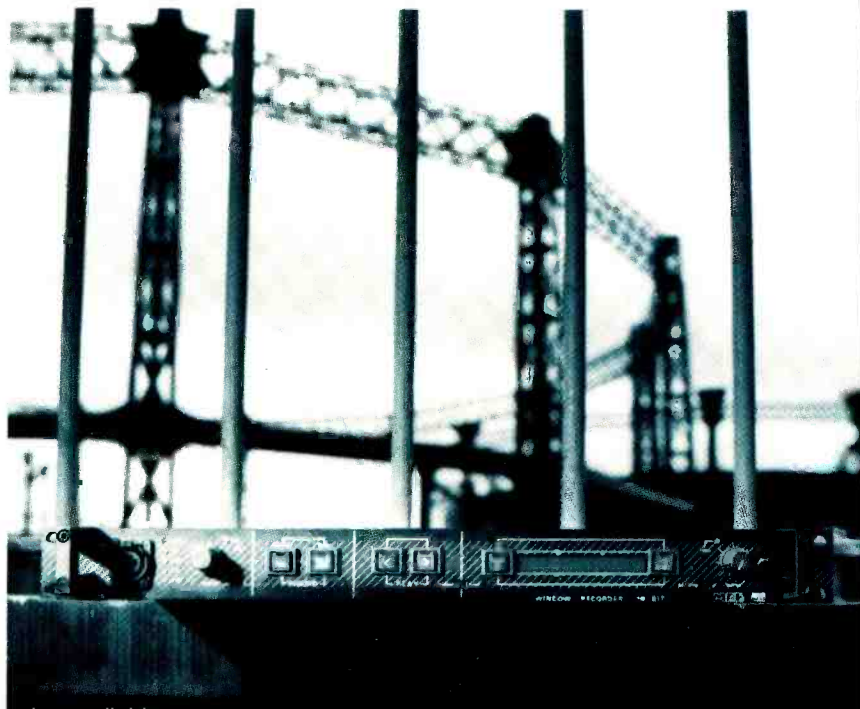
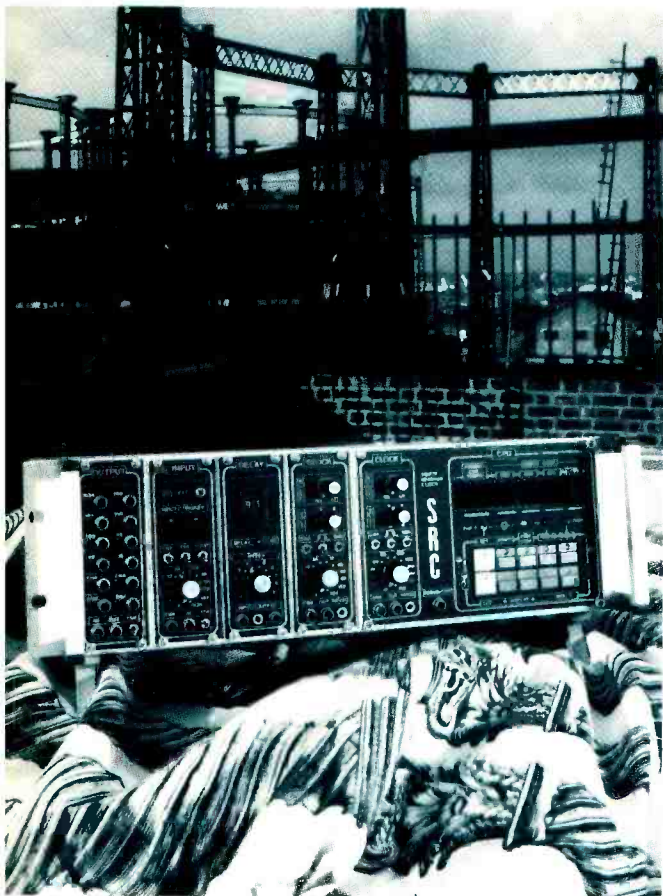
**A**t Syco, we've got time for music. And control of time is one of the most important considerations in modern music recording. We've chosen three devices each of which deals with a different aspect of time. All leaders in their field, the Quantec Room Simulator, MDB Window Recorder and Friend Chip SRC.

In situations where realistic acoustic environments are required, the Quantec Room Simulator has earned itself an enviable reputation. Now in widespread use in radio, film and music recording the QRS is standard equipment in many studio installations. Five room sizes, ranging from 10 cubic metres to 10 million cubic metres allow the creation of acoustics ranging from a cardboard box to a cathedral. The ergonomic front panel makes the tailoring of each room simple and fast. 64 memories provide ample storage for the your most-used settings. Two special functions originated by Quantec are the 'freeze' and 'enhance' modes. In freeze mode reverberation may be trapped indefinitely and added to allowing aural 'backdrops' to be created with ease. Enhance mode generates natural acoustics with no perceptible decay. And with its ability to reproduce over 10000 reflections per second, it has one of the densest and most natural sounds available. The Quantec Room Simulator has set new standards in acoustic simulation, providing the user with a aural palette unsurpassed in realism.

The MDB Window Recorder is a 16 bit sampling device of compact disc quality – its audio specification of 96dB dynamic range and 20kHz bandwidth makes it one of the highest quality sampling devices available today. Available in a variety of memory configurations the Window Recorder can record up to 48 secs of audio at full bandwidth. The captured sound may be looped, reversed, overdubbed digitally, edited to an accuracy of 22 microseconds and spliced on to

new samples. Six editing speeds facilitate the tailoring of the sound, which may be triggered by a variety of sources – audio, gate or MIDI. The sound may be played from a MIDI keyboard, making the Window Recorder a creative musical instrument as well as a short term storage device for the studio.

The Friend Chip SRC needs little introduction. Now an industry standard, it was responsible for allowing the world of musical







*instruments to benefit from the advantages of an intelligent time code – SMPTE. Prior to the introduction of the SRC, countless hours were lost attempting to synchronise drum machines and sequencers from different manufacturers. When overdubbing with these instruments, tracks had to be run from the top to ensure that everything was in perfect sync. There was no easy way of pulling tracks forward to make them feel more on top of the beat. Start/stop buttons had to be reset for each pass. Its introduction brought considerable savings in both time and money. Now, the new options for the SRC make it even more invaluable – new software, input module and MIDI system clock. The new software provides SMPTE in four standards, and 32 programmable cue points with 8 tempo changes per sequence – this data may be saved on the relevant multitrack. The input module allows you to synchronise to an existing click on tape or even a drum track and is equipped to cope with drop-outs and missing drum beats.*

*The Quantec Room  
Simulator, MDB Window Recorder  
and Friend Chip SRC. All saving time.*

*Syco*

They're all exclusive to Stirling.

We are UK agents for Sanken microphones, Westlake monitors and the remarkable new Lynx synchroniser.

You'll find them alongside Otari, Soundcraft, AMS, Drawmer and many more.

However, exclusive doesn't mean elusive, because that's not our way. We'll help you pinpoint the best hardware – at the best prices.

And if you're on our mailing list, we'll keep you abreast of the studio world's latest developments.

# EXCLUSIVE.

**SANKEN'S** remarkable CU-41 titanium diaphragm double condenser mike gives digital and CD quality a new edge.

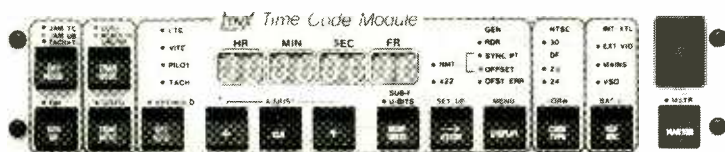
Its frequency response is ruler-straight to 20kHz. Yet at 134dB of SPL, its distortion is inaudible.

The CMS-6 Stereo Condenser mike is exceptional too, with a flat 240° polar response.

Have a listen to the best microphones in the world.

**LYNX.** The stunning new Lynx synchroniser, the talk of the New York A.E.S. show, combines wide band SMPTE reader, multi-standard SMPTE generator, audio/video synchroniser and an SMPTE RS422 external editor port.

Besides working with up to 32 machines at once, Lynx's integral software means recalibrating for different machines is simply a matter of selecting a new memory setting.



In either standalone or audio/video interface form, the Lynx is set to become a studio 'standard'.

**WESTLAKE** monitor systems are second to none.

We've the complete range, from the BBSM-4 to the reference-standard BBSM-12. Our service includes assistance with placing and installation.

**OTARI:** The MX-70 is the first professional 16-track 1" 30ips machine. We can supply it as an exclusive system with the Soundcraft I600.

Also from Otari come the MTR-12 and MTR-20 mastering machines and the acclaimed MTR-90 Series II.



**SOUNDCRAFT.** Another exclusive is the Stirling Soundcraft System, matching the I600 console with the recently updated 760 Series III multitrack. And we've the TS24 in-line console and the 2400 split mastering console.



**STUDIO ACCESSORIES.** Nothing but the best – AKG, AMS, Aphex, BSS, Drawmer, Neumann,

Publison, Quad, Revox, Sennheiser, Tannoy and Yamaha.

**BACK-UP.** Your investment here includes help with financial planning, and service (ask Technical Support Manager Rod Thear). We're always contactable through our Swiss Cottage office for consultation.

It's not only the major manufacturers who endorse our formula but our very satisfied clients too – familiar names like Abbey Road, Workhouse, Good Earth and Advision around London, through to Palladium Studios in Edinburgh.

The reason? Because we don't just sell studio systems, but help people buy them.

Call Andrew Stirling or Garry Robson for details.

And find out more about a service that is exclusive – to us.

 **Stirling**  
AUDIO SYSTEMS LTD

1 Canfield Place London NW6 3BT ☎ 01-625 4515  
Telex 946240 CWEASY G Ref No 190 14280

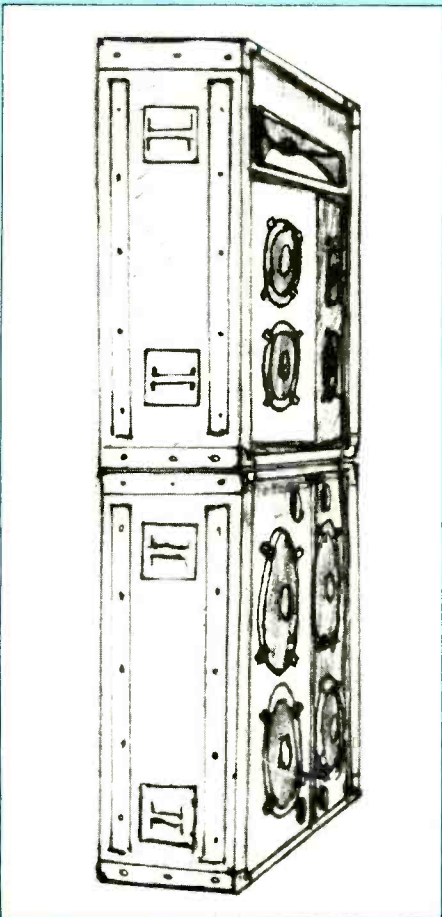
UNIQUE SOLUTIONS FOR UNIQUE STUDIOS



**A**pril 4, 1985: Los Angeles Forum—it has been well over a decade since popular British acts such as The Who and Pink Floyd attempted to use quadrophonic sound systems to present their music to American audiences in large concert venues (up to 20,000 seats). In the early 1970s hired American touring sound systems consisted primarily of bulky folded horn W-bins and assorted piles of rather loosely packaged components. It was difficult enough at that time to pull off successfully an entire string of one-nighters in large arenas with a stereo (twin stack) system. With as many as 800 km between the various performance sites, the additional rear stacks required for quad shows made such tours a potential logistical nightmare.

Sound reinforcement systems have changed since that time. Many professional touring rigs are well packaged, consciously engineered systems which offer matched components, sufficient amplifier headroom and quick set ups and tear-downs. Loudspeaker systems offered by Maryland Sound Industries/Northwest Sound give sound designers a variety of options when assembling a system for arena touring. During the first of what is to be many future joint effort ventures of international scope by Britannia Row and MSI/Northwest, the recent Roger Waters' tour of the United States allowed British sound mixers John Newsham and Andy Jackson (front of house) and Robin Fox and Peter

Fig 1: MSI/Northwest's 2-box modular 3-way system. High pack—four JBL 2202 12 in, one TAD 4001 2in. Low pack—four JBL 2225 15 in



# QUAD IN AMERICA

## David Scheirman reports on a modern quad sound system on tour with Roger Waters

McDowell (stage monitors) a first hand look at some of the latest gear available for arena touring.

### Loudspeaker system

"It is not economically feasible to ship an entire sound system over to the US for a tour," explained house mix engineer John Newsham. "It is also not necessary. There are some very good systems in the States today. This is the first time that I have used an MSI/Northwest system, and it is probably one of the best sounding I have heard anywhere in the world."

Two identically sized cabinets, known as high packs and low packs, make up the MSI/Northwest two-box system. The

low pack houses four JBL 2225 15 in loudspeakers in a ported, densely packed direct radiating cabinet. Each high pack is loaded with four JBL 2202 12 in loudspeakers and a single TAD 4001 2 in compression driver loaded onto a Northwest radial horn. Each 12 in mid bass speaker is given its own partitioned chamber shown in Fig 1.

A hanging array of 21 such boxes was provided for each side (18 low and 24 high), arranged in vertical columns of three boxes of a similar type. An additional six high packs and four low packs were installed at audience level. For supplementary low end reinforcement, eight Northwest Sound Bass Augmentation boxes (comprising of 6 TAD 1601 15 in speakers in an infinite

Fig 2: The main hanging loudspeaker arrays were supplemented by floor-mounted bass-augmentation cabinets

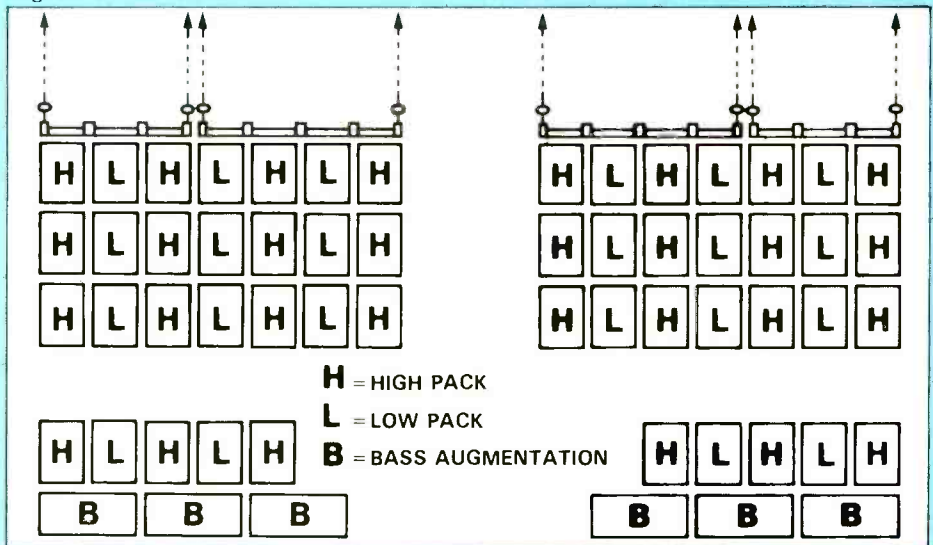


Fig 3: Northwest Sound's bass-augmentation cabinet houses six 15 in loudspeakers in a deep infinite-baffle enclosure



baffle cabinet) were provided (Figs 2 and 3). The total resultant loudspeaker complement for the main left and right forward arrays included 136 15 in speakers, 120 12 in speakers and 30 2 in drivers.

For visual support of the *Pros and Cons of Hitch-Hiking* concept, a projection screen totalling nearly 27 m in length was carried from city to city. When taken apart at load-out, the two halves of the screen support assembly reached within a ½ in of the rear doors of the semi trailers. Five such trucks were used for equipment haulage.

"An interesting thing occurred due to the projection screen," noted Maryland Sound Technician John White, one of five MSI/Northwest employees assigned to the tour (eight union stage hands were available as well at each venue). "Due to sightlines, we had to fly the sound system higher than usual. It was approximately 10½ m (35 ft) from the floor to the bottom cabinet of the hanging arrays.

Fig 5: The 'quad squad' use chain-motor hoists to hang the special effect side and rear clusters in large arenas

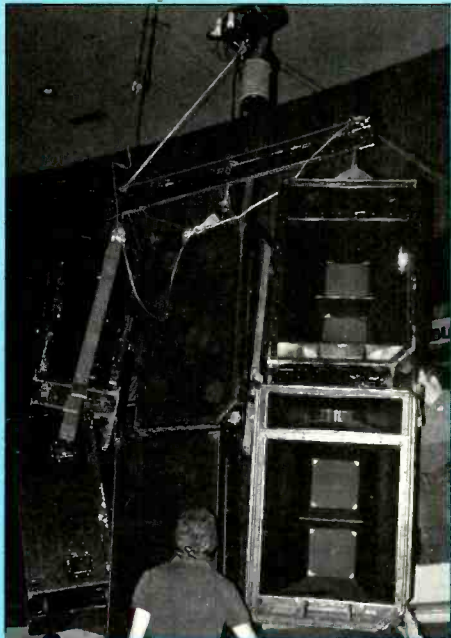


Fig 6: Special platforms are built where it is impossible to fly side stacks



"That is somewhat higher up in the air than the arrays would normally be flown. It took more cable, but all of the audio personnel involved felt that it gave us an extraordinarily smooth sounding show. As one walked across the face of the system from the rear of the halls, the 'hot spots' seemed to be minimised."

Amplification for the loudspeaker section included SAE *P-500* and *P-250* stereo power amps for the bass and mid bass power bands respectively, with modified Crest *5001* amps for the high frequencies. Offering up to 1,150 W/channel into 4 Ω, the *P-500* gives the MSI/Northwest systems more horsepower than competitive systems. In the low frequency power band, each watt is responsible for moving less than ½ sq in of paper cone area... a distinct advantage. "Many of the commercial amplifiers available on the market use different means to arrive at their rated power handling specifications," advised Northwest Sound's Chris Strahm, head of Design Engineering. "It took us many months of doing our own testing to find the right power combination. In assembling a complex concert sound system, you certainly cannot afford to trust some of the published material from the amplifier manufacturers."

Once 'ruggedised', individually calibrated and certified, the power amps are installed in 50 in tall road cases with

sturdy welded aluminium frames. As with all of the company's cases, exterior dimensions were selected with a tightly packed truck in mind. A total of 12 amp racks powered the main flying system providing in excess of 100 kW. (Fig 4)

## Quad squad

Separate rear left, right and centre loudspeaker arrays were suspended in each performance hall to enhance the show's audio with source directed special effects. These were affectionately dubbed as the 'quad squad' by the rest of the production crew. A separate group of MSI/Northwest technicians was responsible for getting these quad stacks up and on the air each day (Fig 5).

Each of three separate loudspeaker locations held four Northwest Sound 2-way boxes (with two TAD *1601* 15 in speakers and a Northwest model *340* radial horn with TAD *4001* driver) and two *Bass Augmentation* cabinets. These arrays were flown whenever possible, although the roof structure of the Los Angeles Forum required them to be stacked on the sides. (Fig 6)

"We are setting the system up on this tour in what we call a 'diamond quad' configuration," explained sound mixer John Newsham. "There are actually five sound sources, not four... it gives us a better ability to create apparent spatial

Fig 4: The six amplifier racks powering the house right array

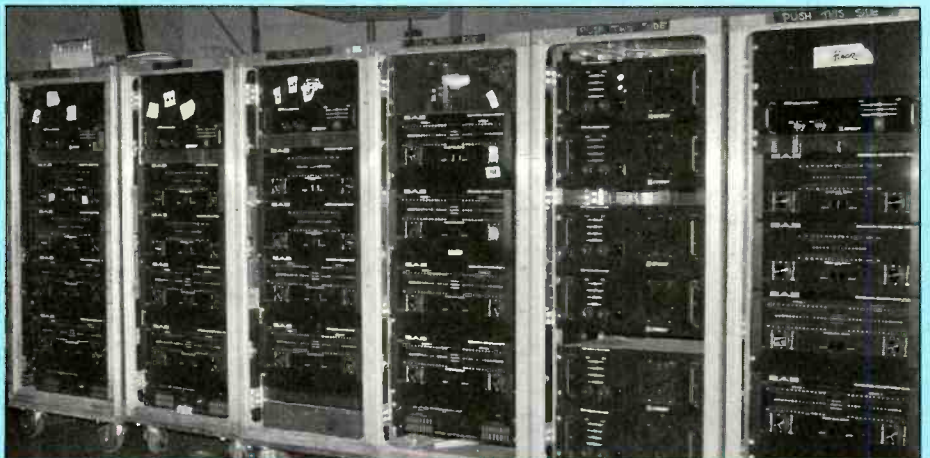
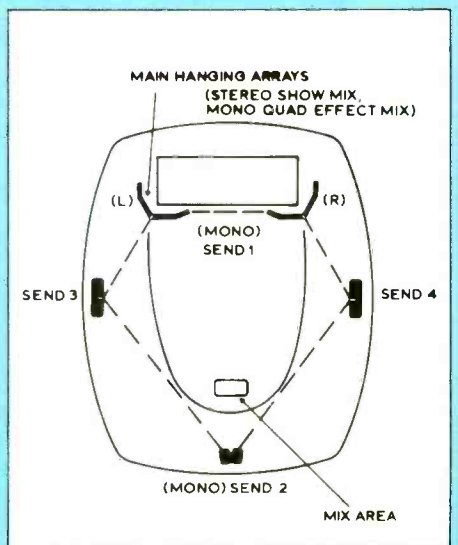


Fig 7: Diamond Quad concept—five loudspeaker arrays distribute four audio mix signals for effects. The main arrays carry a stereo show mix



## QUAD IN AMERICA

imaging in large venues. The rear and side stacks are used for occasional effects. The front left and right stacks of course, carry the primary show mix." (Fig 7)

### Front of house

Andy Jackson and John Newsham cooperatively devised the show mix on Midas consoles shipped to the US by Britannia Row. A host of signal processing devices that defied enumeration was available to the pair including a full rack of Drawmer noise gates for channel-insertion on keyboard and drum inputs, dbx 900 series compressors and gates and digital effects units from Eventide, Lexicon and AMS. A custom drive rack was supplied by MSI/Northwest that included the company's own time correcting crossover/line driver.

To handle the quad signal locating, the original Pink Floyd quad desk was retrieved from a European purchaser and rented for this tour. This special 8x4 Midas project from the early 1970s allowed the audience to 'hear' a Lear jet circling the arena before crashing into the stage (*Wish You Were Here*) and to listen to jingling coins and cash registers fill the room (*Money*). (Fig 8)

"What we're doing here is attempting to recreate the sounds of old favourite Floyd tunes, as well as Roger's new album, in a live setting," noted mixer Andy Jackson. "We have a film soundtrack with different effects on it, as well as master dupes from some of the old tunes. Live shows are becoming more like theatrical events. When you go to see a concert film in a theatre, you are sometimes surrounded with sound by means of the rear speakers. We're doing the same thing here, but for 20,000 people instead of 200."

A Soundcraft *SCM381-8* 8-track machine and an Otari *MTR-90* 24-track were handled by Britannia Row's tape operator Eric Barnes. Tape machine outputs were brought into the Pink Floyd quad desk.

Three separate projection units displayed images on the huge backdrop screen. Mike King operated the film soundtrack synchronisers. King, of Zuccarelli Labs Ltd, was also there to supervise the use of Hugo Zuccarelli's

holophonics process. "We did a live broadcast from Radio City Music Hall in New York using the process," King stated. "Also, selected effects for playback during the show were recorded using holophonics. This marks perhaps the first live concert use of the process in the United States."

### Stage monitors

"Whose monitors are these? We've never had sound like this before!" enthused Roger Waters over the microphone on an empty arena during the first day of pre tour production rehearsals. Midas consoles operated by Robin Fox and Peter McDowell were supplied by Britannia Row, but the audio signal path that attracted Waters' attention is the result of several intensive years of research and development by Northwest Sound's Christ Strahm, a 28 year old electrical engineer who built his first home made discrete 16-channel mixer when he was 12.

"When you start using legitimate engineering theory to design concert sound reinforcement systems, the results are dramatic" stressed Chris. "This monitor system is flat within 3 dB from 80 Hz to 16 kHz, before you even touch any external equalization devices. The main systems go lower, of course, down to 30 or 40 Hz depending on the system."

Strahm has designed a modular drive rack with 17 spaces (each 1 in wide) that replaces EQ units, time compensating delay units and electronic crossovers. A 16-channel analogue-multiplexer allows each module to be assigned to any of eight output mixers. When two racks are used in tandem, a total of 16 mixes become instantly available. "The processing crossover is set at 1 kHz, and provides electro-acoustic correction, filters and time alignment. There is also an RMS compressor limiter circuit offering a gain 'window' from -40 to +10 dB. The ratio is user-variable from 1:1 to 10:1," explained Strahm. A selector switch allows the modules to be used with either the company's 2x12 wedges or 2x15s.

The 2x12 wedges supplied to the Roger Waters' tour pack a pair of JBL 2202 loudspeakers and JBL 2445 compression driver mounted on a Northwest 340A horn. The sturdily braced boxes are finished in gel-coated glass fibre (Fig 9). Additionally, Waters received his own headphone mix that featured taped

orchestral passages from the 24-track machine and click track.

Monitor amplifier racks house four sets of SAE *P-50* stereo units and modified Crest 3501-s amps. "We figure that this system saves you at least two or three 4 ft tall racks of gear," claimed Chris Strahm. "An entire monitor system for eight bi-amped mixes consists of only two racks: processing and amps, and the 1/3-octave equalisers, which are Yamaha *Q-1027*s. Some of the guys don't even use the EQ rack due to the advanced processing."

### International co-operation

In 1973, Britannia Road Productions took a complete sound reinforcement system around the world for Pink Floyd in an effort to achieve consistent concert sound. A chartered aircraft was stuffed with amps, speakers and cables as well as people and band gear.

In 1985 such efforts are no longer necessary. They are also not economically practical. "Bryan Grant of Britrow needed a packaged system to meet this tour's specifications," stated Will Parry of MSI/Northwest's East Coast US office. "Since we base electronics and loudspeaker systems in Britain as well as North America and Asia, we were able to custom-build a touring system for this show without the terrifically high cost and problem associated with shipping everything to each continent. We will be doing more joint effort international projects together."

The Roger Waters tour (British mixing consoles and front end, American speaker system and crew) was successfully completed in April, 1985. MSI/Northwest and Britannia Row were due to collaborate once again for Rick Springfield's European tour in May 1985 (British crew and electronics, American sound mixing and speaker systems). Such international co-operation will apparently benefit artists, audiences and sound companies alike. The only losers would appear to be air cargo firms, and I have never known them to be particularly interested in high quality live audio anyway! □

Fig 8: Original Pink Floyd quad desk retrieved from a purchaser in Europe for the tour

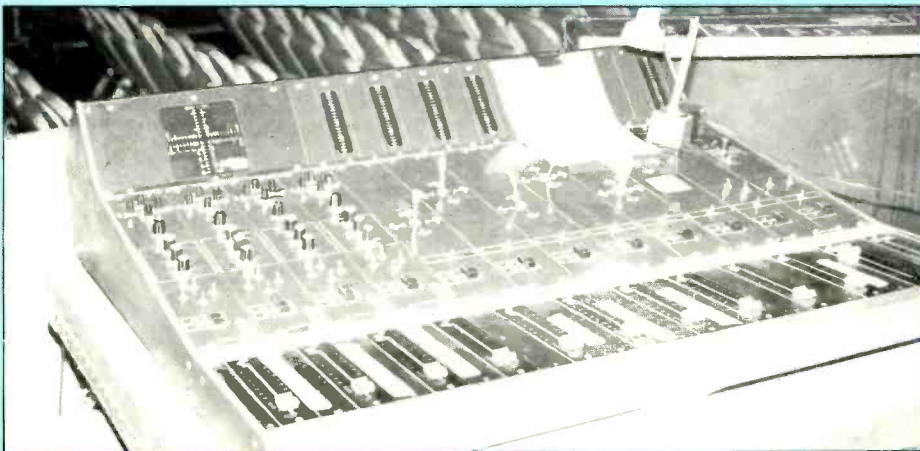


Fig 9: The 2x12 monitor wedges





# AT PROFESSIONAL AUDIO WE GIVE YOU MORE THAN JUST THE TIME OF DAY.

Professional Audio is a new company, staffed by experts with years of industry experience who are dedicated to helping you achieve the very best sounds that money can buy. The end result is a company that offers a complete service to professional audio experts – staffed and run by acknowledged experts in the industry.

Already in just a few short months, our growing reputation has enabled us to secure dealerships from leading industry names including Electrospace, Westlake Audio, FM Acoustics, Marshall Electronics, SCV, Renkus-Heinz, NKA and JVC.

Call Richard Kelley or Simon Browne and experience a very special kind of service and expertise. **01-226 1 226**

**Professional Audio Ltd.**, Professional Audio House,  
53 Corsica Street, London N5 1JT.



**YOU CAN COUNT ON US**

**PROFESSIONAL  
AUDIO LTD**

# BUSINESS BUSINESS



Barry Fox investigates the facts behind the industry news

Recently I was involved in a seminar set up by the BKSTS on the subject 'Better Sound with Picture'. A surprising number of people gave up their Sunday, either to talk or listen. Some interesting straws in the wind sailed by. Stray facts, you might call them. Here are a few worth passing on.

In 1979 Philips tried to sell a TV set with hi-fi sound. It was mono only but worked like a dream. I know, I was one of the few dozen people in the UK who bought one. The BBC and Philips had complaints from the public about the noise of hum and air conditioning broadcast from the studios.

Now every TV company sells a stereo set, most with sound inferior to the old Philips. There aren't yet any UK stereo broadcasts, of course, except simulcasts. DBS will change all that. The C-MAC system has eight channels of sound; this was worked out to suit the Nordic countries. The latest trick is to use half bandwidth channels, of 7 kHz, to carry speech. This will let one country broadcast a football match with stereo ambient sound and a string of different language commentaries which can be mixed in with the stereo. Not everyone likes C-MAC. The Germans and French have opted for a variant, D2 MAC, which carries the digital data in bursts of half the normal rate (20.25 Mbit/s). This means that the signal will go down a limited bandwidth cable network but the number of sound channels is halved.

ITT in Freiburg is running neck and neck with Philips-Mullard to produce MAC chip sets. Mullard has designed a package which will handle C-MAC or the simpler D2-MAC. The fear is that ITT's set for France and Germany will handle only D2 and not be upward compatible with C-MAC. The ITT chips will have two stereo decoders on a single silicon slice to make the mix of half bandwidth commentary and stereo ambience possible. It looks like a clever way to plug the defect of D2 but no-one will benefit if Britain and the Continent end up with incompatible chip sets and services.

The other possibility for stereo is of course with terrestrial TV. In the US the Zenith-dbx system with a pilot tone is used: the BBC tried to build a PAL I version of this system but wasn't happy with the results. In Japan they use the FM-FM multiplex system: the EBU tested it but found it susceptible to multipath interference. Multipath also rules out sound-in-sync; dancing dots are likely to appear on the picture. In Germany they use the two-carrier FM approach but this was mainly a ploy to try to keep out Japanese receivers by patenting the two-carrier system as novel. It isn't. The patents are unlikely to hold water and the system is plagued by birdy interference.

The BBC opted for two carriers, like Germany but digital modulation of the

## Better sound with picture

extra carrier. Demonstrations of stereo decoded off air from a second carrier transmitted from Crystal Palace with BBC 2, showed that a 704 kbit/s data stream can provide excellent quality without affecting normal reception of the mono sound on the first carrier. So the BBC technique is essentially a 3-channel system.

Hong Kong is now experimenting with the BBC's system. Hong Kong has a special need for dual language—Chinese/English—broadcasts and it also suffers badly from multipath effects because of the rocky terrain and high buildings. I remember a British Forces Broadcasting engineer telling me how they used to bounce OB signals off the Mandarin Hotel, using it like a massive radio mirror, to get round corners.

The easiest way to get stereo at the moment is of course to buy or hire stereo videotapes (or discs). Alistair Knox of Rank Video Services stepped in at the last minute at the BKSTS seminar to replace someone from Sony who dropped out. Rank have been duplicating in stereo for years. First there were linear tracks without noise reduction. Then VHS adopted Dolby and Beta opted for BNR, an awful system which helped kill

## In 1979 Philips tried to sell a TV with hi-fi sound. It was mono only but worked like a dream.

Beta. It compounded the whole range and breathed like a dragon. Knox first referred to BNR politely as "curious" and later, more frankly as "quite unpleasant".

The Beta and VHS FM hi-fi systems followed and Knox gave some interesting explanations why 2:1 compansion is needed to achieve the claimed 80 dB dynamic range. The head switching creates a nasty background noise which must be pushed down below the normal listening threshold. Even so there is still a roughness on pure sounds. The new 8 mm format has PCM sound which achieves remarkably good results from just 8 bit coding, after both analogue and digital compression. The current weak link is at the professional end; 1 in VTR, especially fifth or sixth generation copies as supplied to duplicators, cannot match the quality available from the domestic release formats. The only real hope is for the duplicators to work with digital

soundtracks, sync-locked to the picture tape. Incidentally, despite recent improvements in optical sound, TV stations use sep mag for 16 mm, and even throw away the optical track and call for a magnetic track on some 35 mm prints, for instance of *Dallas*.

Good sound costs money. It costs around £10,000 to convert a cinema to Dolby SVA. The cinema keeps 60% of its gate money and needs to sell a lot more seats to cover the £10,000 investment. Producers pay Dolby Labs a flat fee of £2,000 per film (\$5,000 in the USA) to use the SVA stereo system. Dubbing rooms get all the electronic toys free.

The next step will be contact print duplication. A mirror image master is sandwiched with blank tape and blitzed with heat or—more usually—a magnetic field. The image then prints through. At first it looked as if two-layer, depth multiplex FM hi-fi video recordings would not transfer. Now Sony and Matsushita reckon they have cracked the problem. The next hurdle is making contact printing work for 8 mm. The contact process is only 30% efficient. The mirror master must have a coercivity of around 2000 Oe for VHS tape which has a coercivity of around 650 Oe. The blank tape for 8 mm has a coercivity of at least 1000 Oe, which means a master of 3000 Oe. At these coercivities the masters can't be re-used because once recorded they can't be erased.

Significantly only one speaker at the BKSTS seminar spoke against improving sound with TV and cinema pictures. Tom Hawkins began in the BBC in 1951 and worked mainly in a clerical capacity. In 1957 he moved to Rediffusion as a cost estimator. After a freelance spell he moved to Yorkshire TV as head of film. In 1970 he became head of film at ATV and is now senior location manager for technical facilities at TVS. At an afternoon session of the seminar under the flag "Can we afford it?" Hawkins said it in one word: "No."

"Stereo," he said, "won't increase revenue. The only way to upgrade, is when there is a need to replace defunct equipment. We are chasing pie in the sky."

As an engineer who works at the BBC, using 21 year old equipment, put it, "I suppose that's what a cost estimator would say." As another speaker pointed out, financially film and TV would be better off without any sound at all. Jack Warner destroyed the economics of film industry by introducing talkies. Before that you could sell any film round the world to any country without any language barrier.

Fortunately the film industry, and probably also the TV stations, now have no choice but to continue improving sound, whether their accountants like it or not. Audiences are now so used to hi-fi in the home, and the sound of digital CD, that they won't accept anything less.



# 0-C60 in 110 seconds.

When it comes to performance, at any price, the new TracSystems CD201 cassette to cassette duplicator leaves the others standing.

Not only does it copy a standard C60 in less than 2 minutes – it also features dynamically controlled rewind (manual or automatic) that'll take a C60 back to the start in less than 35 seconds.

It's quick off the mark every time, with crystal referenced, servo controlled motors and a head block mechanism that's been tested to 1,000,000 insertions. So every copy is a faithful reproduction, from the first note to the last.

And if it's production line economy you need, just add any number of slave units to the CD201 master, without any fear of audio degradation.

Phone us today, and we'll show you a faster, more economical way to produce perfect copies, time after time.

## TracSystems

27 Little Russell Street London WC1A 2HN England  
Telephone: 01-405 4075 & 01-405 7030  
Telex: 21120 (MONREF G) REF 1199



### TracSystems CD201

POWER ON

SIDE A  
-20 -10 -7 -5 -3 -1 0 +1 +2 +3  
SIDE B  
-20 -10 -7 -5 -3 -1 0 +1 +2 +3

STOP RECORD AUTO MAN REWIND

CD201 MASTER

STOP BIAS FE CR SIDE A B REWIND

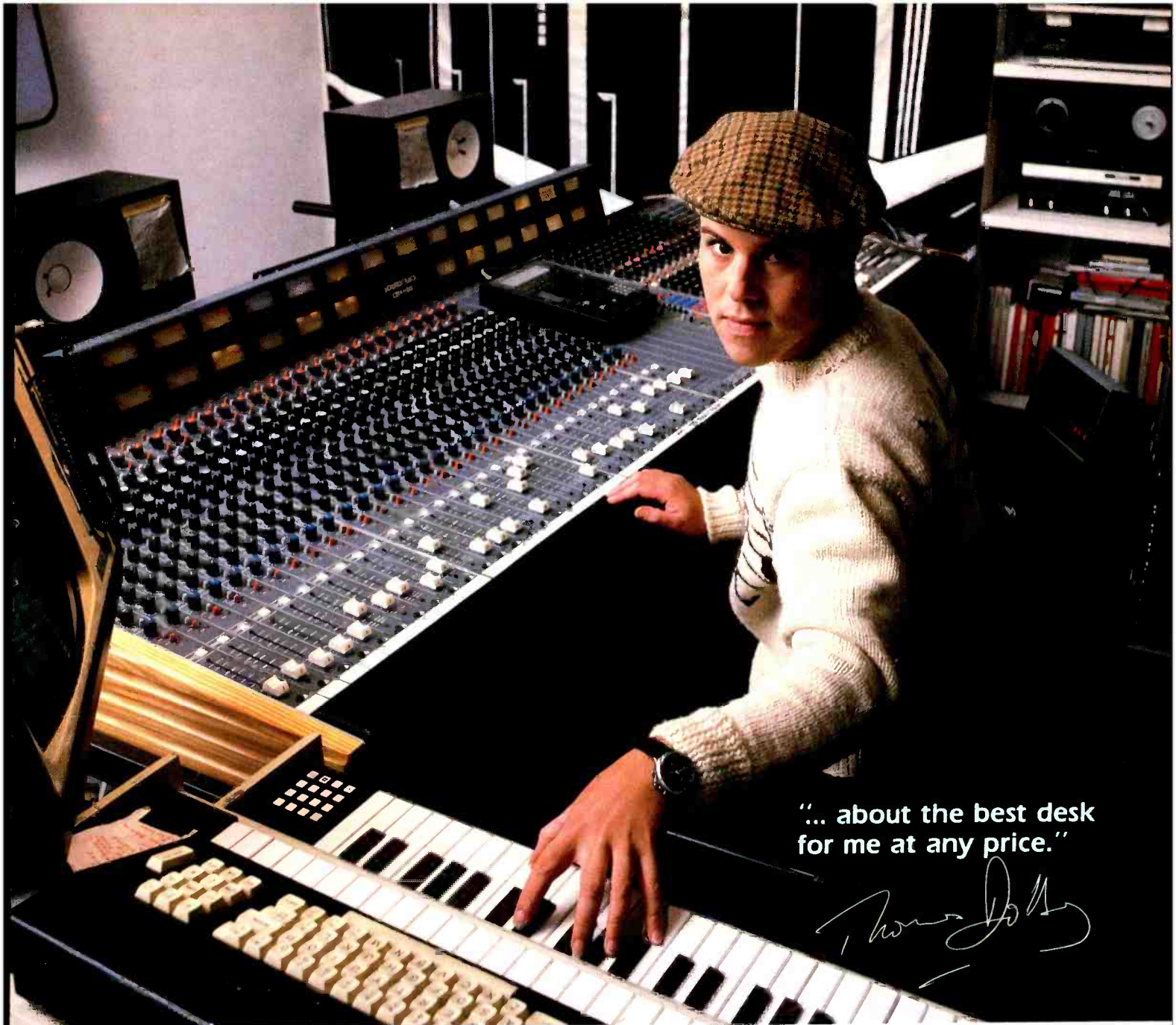
CD201 SLAVE

# DON SELLS SOUND!

Luton: 29 Guildford Street, Luton, Beds.  
Telephone: Luton (0582) 450066  
Telex: 825488 DONLARG

Stoke-on-Trent: Stafford House,  
Clough Street, Hanley, Stoke-on-Trent.  
Telephone: Stoke-on-Trent (0782) 24257

Don Larking  
audio sales



"... about the best desk for me at any price."

"I put my studio together to suit my particular needs for songwriting, sequencing, and film scoring. I took a look at all the mixing desks around, but most of the facilities I needed were only available on ridiculously expensive desks. So when I heard about the Soundtracs CM4400, I never imagined it would turn out to be about the best desk for me at any price. So I bought one and I'm delighted.

Now I'm up-dating it with the CMS2 package which will automate the digital routing and muting against SMPTE timecode — positive proof of the company's commitment to continual software development at a reasonable price. I'm impressed — definitely affordable quality."

**Thomas Dolby**

**THE CM4400 BY**



**affordable quality**

**Soundout Laboratories Limited**

**91 Ewell Road, Surbiton, Surrey KT6 6AH**

**Tel: 01-399 3392 Telex: 8951073/SNDOUT/G**

The CM4400 features:  
 Internal computer allowing 30 different mixes to be pre-programmed.  
 Pre-programmed triggerable routing patches.  
 RS 232 Interface for personal computer to display routing.  
 Up-dateable software.  
 The CM4400 is always up-to-date.



U.K. Distributor

**Don Larking**  
**audio sales**

Luton: 29 Guildford Street, Luton, Beds  
 Telephone: Luton (0582) 450066  
 Telex 825488 DONLAR

**America** Soundtracs Inc., 745 One Hundred and Ninth Street, Arlington, Texas 76011. Tel: (817) 460 5519. **MCI Intertek Inc.**, 745 One Hundred and Ninth Street, Arlington, Texas. 76011. Tel: (817) 640 6447. **Australia** Klarion Pty Limited, 16 Suakin Street, Pymble, N.S.W. 2073. Tel: 2 449 5666. Tlx: AA71289. **Austria** Audiosales, Postfach 168, A-2340 Modling. Tel: 2236 8881 45. Tlx: 79456 **AUDIO A**. **Belgium** Prom Audio, Av. de Stalingradlaan 63, 1000 Brussels. Tel: 02 231 7840. **Canada** Omnimedia Corporation Ltd., 9653 Côte de Liesse, Dorval, Quebec H9P 1A3. Tel: 514 636 9971. **Denmark** Kinovox AS, Industrivej 9, 3540 Lyngby. Tel: 02 187617. **Finland** MS Audiotron, Box 28, SF00421 Helsinki. Tel: 90 5664644. **France** Phase Acoustic, 163-165 Bd Boisson, 13004 Marseilles. Tel: 91 4987 28. **Germany** Amptown, Hamburg. Tel: 040 6460040. **Hong Kong** Session Musik, Walldorf. Tel: 06 2272876. **Sound & Drumland**, Berlin. Tel: 030 8827911. **Musik Shop**, Munich. Tel: 089 341111. **Der Musikladen**, Nurnberg. Tel: 0911 445454. **Greece** Sound Centre, 22 Tossitsa Street, P.O. Box 148, Athens. **Hong Kong** Ace (International) Co., 1/11, Wing Ming Ind. Centre, 15 Cheung Yue Street, Cheungshawan, Kowloon, Hong Kong. Tel: 3-7452343. Tlx: 40442 **ACECO**. **HK** **Indonesia** P.T. Kirana Yudha Teknik, P.O. Box 71, JWG — Jakarta. Tel: 487235. Tlx: 48120 **HASKO IA**. **Israel** Barkai Ltd., P.O. Box 2263, Ramat Gan, Israel. Tel: 03-735178/732044. **Italy** Linear Italiana S.p.A., 20125 Milano, Via Arbe, 50. Tel: 02-6884741. **Japan** Trichord Corporation, Bunsei Building No. 3 1Fl 8-8, 5 Chome Toranomon, Minato-Ku, Tokyo, Japan. Tel: 3 433 2941. Tlx: 2524324 **CMOSL J**. **Korea** Young Nak So Ri Sa Co., 182 Jangsa-dong, Jongru-ku, Seoul. Tel: 267 9697. Tlx: K22756 **YNTRADE**. **Netherlands** Pieter Bollen geluidstechniek bv/PAC, Hondsruglaan 83 A 5628 DB Eindhoven. Tel: 040-424455. **Norway** Siv Ing Benum A/S, Boks 2493, Skovveien 22, Solli, Oslo 2. Tel: 2442255. Tlx: 77681 **BENJUM NI**. **Portugal** Amperei Electronica Industrial LDA, Av. Fontes Pereira, De Melo, 47, 4°, D 1000 Lisboa. Tel: 532227/532698. **Singapore** Lingtec Pte. Ltd., 246 MacPherson Road 07-04, Betime Building, Singapore 1334. Tel: 07-471951/07-471952. **Spain** Telco Electronics SA, Gravina 27, 28004 Madrid. Tel: 231 7840-2210187. **Sweden** Septon Electronic A.B., Box 4048, S-42104 Vastra Frolunda. Tel: 31299400. **Switzerland** Studio M & M, Villa Tannheim, Ch5012 Schoenewerd. Tel: 64 4149 69. **United Kingdom** Don Larking Audio Sales Ltd., 29 Guildford Street, Luton, Beds. Tel: 0582 450066.

# LETTERS

# LETTERS

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

## Perreaux review

Dear Sir, I read with interest Hugh Ford's review of the Perreaux 5150B (see page 96, this issue).

I feel that the review was a fair assessment of the unit and that his comments concerning the safety aspects are fair comment. As already stated the 5150B is capable of a continuous current output of 30 A which means substantial connectors are required for the output terminals, thereby excluding shielded terminations such as XLRs. Perreaux have chosen to use large conventional terminals as most of the 5150Bs sold are for studio use (the 5150B is now widely used by recording studios throughout the USA) where they are rack-mounted by competent engineers.

However, as the 5150B will also find a home with hi-fi enthusiasts in the UK it is our intention to supply the 5150B with special covers over the terminals together with a cable restraint, thereby protecting the output terminals from accidental contact.

Yours faithfully, Allan Coleman,  
Managing Director, DW Labs Ltd, PO  
Box 43, Dunstable, Beds LU6 2NZ,  
UK.

## A classical approach

Dear Sir, 'The analogy I draw is taking a photograph with a camera. People can take a picture of a beautiful view and not notice the telegraph wires going right across the middle until they get home and have the film processed. It's the same thing. And that is why all these Soundfield and single stereo microphones simply can't work. This phenomena is something which these people just seem to miss. They don't give a natural sound because they don't take these things into consideration.'

(A Classical Approach: an interview with Brian and Ralph Couzens of Chandos Studio Sound, September 1985.)

Well! This is very interesting. Apparently the classic landscape photographers, such as Edward Weston and Ansel Adams, got it all wrong. What they should have done was photograph the scene from a number of different perspectives, superimpose the negatives, and create an entirely new image. OK, so Man Ray produced some great photos but let's not call them natural.

Spurious analogies aside, there are techniques of coincident pair recording just as of multi-miking. Having chosen your venue, you arrange the musicians and the mic (or pair) to achieve the desired perspective, trying not to include the furnace, the pigeons, and the passing lorries. Sometimes it's difficult but it can be done. The Couzens are free to create their own masterpieces as they hear them

but they shouldn't belittle the art of the photographer, whether visual or (amb)isonic.

'The thing is to get the natural sound and the performance—that is what's lacking in records today—they sound manufactured. . .'

Precisely.

Yours faithfully, John Whiting,  
October Sound, 24 Old Gloucester  
Street, London WC1, UK.

## Standard for TV stereo programme interchange

Dear Sir, Martin Polon issues a timely warning in his article on page 28 of the September issue. It is essential that all needless differences between the standards used by broadcasters, in all countries, particularly those which face each other across the Atlantic Ocean, should be eliminated, at birth if possible.

As I strongly suspect Martin well knows, the international 'same table', at which the EBU, SMPTE, AES, and NAB inter alia should sit, already exists in the form of CCIR Study Group 11. It is significant that the relevant CCIR Report 964 reproduces an EBU text and appears (even in the interim 'MOD 1' version) not to have had the benefit of significant input from North America. If this is so, and the situation is not changed after the next meeting of Study Group 11 in Geneva in October 1985, and this results in different standards being used in Europe and North America, broadcasters and others, will be faced with yet another unnecessary and avoidable problem.

Perhaps the best reference on this subject is Genesis 11, vv 1-9.  
Yours faithfully, J M Woodgate, J M  
Woodgate and Associates, 3  
Bramfield Road East, Rayleigh, Essex  
SS6 8RG, UK.

## Live Aid stereo sound

Dear Sir, I would just like to add a few points to the excellent articles covering Live Aid, and to put the record straight.

The stereo sound from Philadelphia did not come via an additional satellite as stated but on the same path as the vision. This was achieved by using the Wegener system, whereby two or more very high-quality audio signals may be sent with the vision signal. The system uses an FM subcarrier for each audio and these are situated at the top end of the pass-band of the vision signal. The audio is subjected to very precise companding, that results in a frequency response essentially flat to 15 kHz, and a signal-to-noise ratio of around 90 dB! The Wegener equipment on this occasion was situated at the BT

Tower in London, so obviously the signal-to-noise ratio was modified a little from this by the stereo pairs to and from the Tower. The Wembley signal (stereo sound and vision) was fed to Visnews, where the vision was converted to 525 NTSC, the audio delayed to match the vision delay through the converter, (as is normal practice) and passed to the BT Tower for encoding to the Wegener system then on to Goonhilly Earth Station for transmission to the US. A mono mix was also made at Visnews, that went on the normal satellite sound channel, as a backup for the States. As far as I know it wasn't needed.

The feed from Philadelphia came in on BrightStar, which is Visnews' 24-hour satellite link with the US. The stereo decoded Wegener feed was picked up from the Tower by the BBC and also fed to Visnews for monitoring. There was also a mono feed from Philadelphia, on the normal satellite sound channel again, that was fed to the BBC as a backup.

The problem with buzz on the audio soon after taking Philadelphia, was caused by too-high a vision level from there, causing over-deviation of the satellite that then clipped the level of the Wegener subcarrier so much that the decoder couldn't handle it. The loss of vision from Philadelphia was caused by the shut-down of the generator feeding the portable satellite up-link dishes.

Another feed from ABC Philadelphia, was brought in to London, appropriately called by some, the World Feed. This was ABC's main output that was fed to the Indian Ocean satellite path, so that the Far East, Africa, etc, could take it. When this feed took Wembley, the sound and vision delay around the whole loop was about 1.4 s! The pictures looked remarkably good after such a long trip.

It is appropriate that the most up-to-date technology was used on Live Aid, such as the portable dishes. It is not much short of driving up to a gig, pointing the dish at a satellite and the whole world sees it!

Yours faithfully, Chris Payne,  
Visnews Master Control, Visnews  
Ltd, Broadcast Facilities Dept,  
Cumberland Avenue, Park Royal,  
London, NW10 7EH, UK.

## Spanner in the works

Dear Sir, With regards to the ElectroSpace SP2 review, June 1985 issue, could you please relay to your reviewer Ian Gilby the fact that a Leslie speaker cabinet produces frequency modulation of the program material and not primarily amplitude modulation.

Yours faithfully, Robin Cross,  
Electro-Acoustics Group, British  
Telecom Research Labs, Martlesham  
Heath, Suffolk, UK.

# The orchestra

FELDON AUDIO HIRE



WDR



WISSELOORD STUDIOS

IRCAM



HARTMANN DIGITAL

FONTICELLA

MOS



Digital Services

THE TOWN HOUSE

Studio 54 Budde KG



SARIN

Advision

STUDIO PHILIPPE SARDE

If every musician in an orchestra were to play a different tune, you can imagine just what a disaster an opening night could be . . . The same goes for multi-track recording systems. If you don't make the right choice you could end up being a one man band.

Currently there are more PCM-3324s in operation than players in the average symphony orchestra. And you'd be surprised at how many people have already taken advantage of its incredible sound recording quality.

So, whether it's the Royal Philharmonic or Phil Collins, contact Sony about the PCM-3324.

Stop fighting the system and start using it.

## Sony Pro-Audio



**Sony Broadcast Ltd.**  
Belgrave House  
Basing View, Basingstoke  
Hampshire RG21 2LA  
United Kingdom  
Telephone (0256) 55 0 11  
International + 44 256 55 0 11  
Telex 85 84 24  
Fax G2/G3 (0256) 474565

# LETTERS

# LETTERS

## Analogue DSP

Dear Sir, Neve's DSP console, recently handed over to the BBC, is far from being 'fully digital' as reported in *Diary* December 1985. There is at least as much analogue hardware in the racks as digital! This analogue circuitry has been engineered to very high standards indeed and incorporates many innovative and advanced features to achieve very high performance. I don't know why Neve has not publicised this but I suspect it is due to the industry's current love affair with the word 'digital'.

I have nothing against digital processing where it can be effectively applied but I am against hype which stands in the way of progress<sup>1</sup> speaking of which, I suspect that the main reason Alice has remained in the analogue domain<sup>2</sup> is that resources would not stretch to digital development. Neve's DSP project consumed well over 40 man years of design effort alone, 10 of which were on the analogue side (equivalent to half of Alice's total design experience on one project!). Who else but Neve and the BBC (not forgetting CTS) could lead the world?

It is worth mentioning that it is possible to design a transformerless microphone amplifier that really does have all the advantages of a transformer type with none of their very real disadvantages, despite Alice's comments. Of course, it is quite expensive and you will only find it in the Neve DSP consoles. No other microphone amplifiers of any type even come close.

**Yours faithfully, Keith Armstrong,  
CEng, 18 High Street, Meldreth,  
Royston, Herts SG8 6JU, UK.**

1. 'Digital Misconceptions', Keith Armstrong, *Studio Sound*, Jan 1984 pp 62-64.
2. 'Development of a digitally controlled mixing console', Ted Fletcher and Steve Dove of Alice, *Studio Sound*, Dec 1985 pp 64-70.

## CD tips

Dear Sir, While re-reading Richard Elen's article in the October 1984 issue of *Studio Sound* entitled 'CD Mastering—how it happened' I noticed his comment that his CD-player didn't indicate the presence of pre-emphasis.

Perhaps the solution has since become apparent but just in case:

My Philips CD200 has a number of read relays on the D/A and Audio board. There is a doubled relay within a single coil, which is the output mute at power-up. Then there are two separate relays which, by the way, always switch together. These determine the state of the de-emphasis in the audio output amplifiers/buffers. Since they run on 5 V, an ordinary LED-lamp in series with a 390 Ω resistor connected across the coil of either of these relays will tell you all you need to know. Further checks with the

Denon test CD will show that Lamp On=pre-emphasis and Lamp Off=linear: QED.

Of course I checked all my discs out of curiosity.

Generally, Japanese discs have PE and European discs do not. There are odd exceptions though. Dire Straits' *Alchemy* has PE while the others don't. Aqualung and Tubular Bells have it. My Japanese A&M discs by Supertramp and Joe Jackson have no PE. Dark Side of the Moon has PE and definitely sounds quieter than, eg Bluesbreakers.

I hope this has been a useful tip.

Further I wish to point out some recent CD mastering cock-ups.

The Deepest Purple CD has clearly been mastered from tapes intended for the 50 min and vinyl version, so guess what? No bass when compared to the original records from which the tracks were lifted. Then Cream's *Disraeli Gears* starts too early. Listen to it and you'll see what I mean.

One positive point! Polydor seems to have reacted to a year-old published letter of mine in *Hi-Fi News & Record Review* about playing times of CDs. The CD re-issue of Level 42's *Pursuit of Accidents* has 12 in remixes tagged on the end giving 58 min total. Bravo!

**Yours faithfully, Bas Mollenkramer,  
Albert Cuyplaan 15, 3764 TN Soest,  
The Netherlands.**

## Lightning and tapes

Dear Sir, I read with interest the account of damage caused by lightning to a tape archive belonging to a friend of Hugh Ford's in your August issue.

Having worked in the area of EMP (electromagnetic pulse) and EMI (electromagnetic interference) some possible solutions come to mind. I believe that the heart of the issue lies in the cost of protection versus the value of the stored reels of magnetic tape. On the basis of cost-is-no-object, one might resort to storing such valuable master tape reels in mu-metal shielded cabinets where the outermost cabinet layer is of a ferrous metal such as steel, with an intermediate layer of copper and an additional innermost layer of steel. Such cabinets would have to be constructed to provide no openings where RF energy or magnetic fields could penetrate the cabinet's interior.

On a more practical basis, Mr Ford's friend would probably do quite well in purchasing a number of standard storage cabinets typically made for industrial and office use. These cabinets are not overly expensive, are made of steel, have internal adjustable shelves and locking doors and will typically provide a good measure of protection from stray magnetic and electric fields which would induce partial

or whole erasure of recorded tapes. The main objective in the use of a wholly enclosed metal cabinet is to create a Faraday shield; all electric and magnetic energy being safely shunted on the exterior surfaces of the cabinet only. The permeability of steel cabinets would most likely prevent any damage to audio tape.

A direct lightning stroke typically generates an initial pulsed current value of between 10 to 200 kA in a rise time varying from 5 to 200 μs. The corresponding EMF of such a stroke may exceed 100 MV. The oscillatory nature of lightning discharges may range in frequency up to about 10 MHz. With such an immense amount of electrical and magnetic energy, assuring that no damage would be done to magnetic tapes stored in the direct path of lightning will be extremely difficult, if not impossible. However, the use of full enclosed steel storage cabinets can only serve to reduce the chances of further damage.

**Yours faithfully, William C Wysock,  
President, Professional Sound  
Systems, 2527 Treelane Avenue,  
Monrovia, CA 91016, USA.**

## Noise or art?

Dear Sir, Malcolm Chisholm's letter in the November issue highlighted his own experiences of high monitoring levels and although one cannot question his conclusions, there are certainly some shaky theories propounded.

Any complex musical signal, whether Western or otherwise, will be hard to distinguish from noise when viewed on an oscilloscope, whilst it is also difficult to define the point at which one perceives a signal to constitute music or noise.

It would be too simplistic to assume that because the notes of the Western diatonic scale are based roughly upon the harmonic series, that any 'permissible' Western chord will not 'strain' the ear, because of the implied consonance of the signal. Some factors which must be borne in mind are:

- relative phases of the different components of the music, which will affect the directions of forces incident on the ear at any moment;
- the fact that most Western instruments operate on the equal tempered scale, where only very few intervals are exact harmonic multiples;
- that many percussion instruments, which provide some of the highest energy transients, are almost pure noise.

I fully agree that there is no simple formula for assessing levels of damage to the ears due to sound but it is a mistake to apply reasoning which has no 'sound' basis.

**Yours faithfully, Francis Rumsey,  
Lecturer in Acoustics and Recording,  
University of Surrey. □**

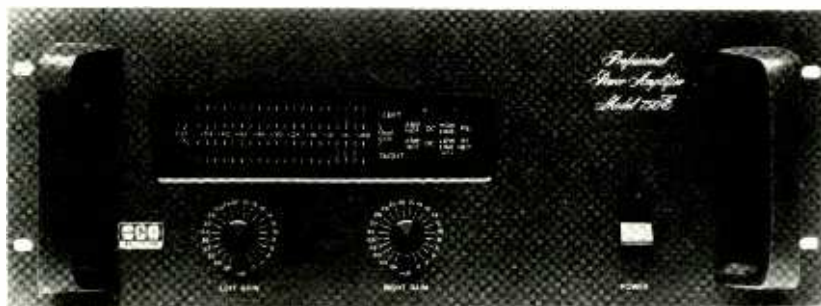
**NEXT TIME  
YOU HEAR  
A VOICE FROM  
THE GODS,  
IT'LL PROBABLY  
BE US.**

**RAMSA**

**Pro-Sound by Panasonic**

# REVIEW REVIEW

Technical power amplifier reviews by Hugh Ford



## BGW 750D

**T**he amplifier reviewed here is a pre-production version of BGW's latest product incorporating a number of new ideas. Basically the unit is a high power stereo amplifier and with the power rating of 250 W into 8 Ω or 450 W into 4 Ω is suitable for many applications.

The main case is steel with a thick alloy plate attached to form the front panel which is dark brown anodised. A U-shaped steel section finished in dark brown paint forms the top cover and the sides. All external features are clearly identified in gold lettering.

Designed for rack-mounting, the front panel includes four slots for the mounting screws and has substantial carrying handles which also afford some protection to the front panel controls. These comprise a magnetic circuit breaker for on/off switching and primary amplifier protection plus two stepped gain controls.

The gain controls have 2 dB steps from maximum gain to -30 dB with the steps increasing down to the infinity setting. Above the gain control in the review model an annunciator panel contains a number of features. It is understood from the manufacturer that the annunciator panel will be optional and that there will be a model without these features.

Firstly there are two output level meters in the form of bright horizontal LED bar displays having 3 dB increments from full output to -60 dB—an unusually large range. The 0 dB sectors are red, the following three sectors yellow and the remainder green giving a very clear indication of the current power output.

Also included in the annunciator panel are 10 further LED indicators. Immediately to the right of the metering are 'True Clip' indicators for each channel followed by warning indicators for overheat shutdown and DC protection shutdown for each channel. The remaining four indicators give warning of high or low mains input voltage—a novel idea, power transformer overheating and finally there is a power

imbalance indicator which is illuminated if there is a significant difference between the positive and negative power rails.

At the rear of the amplifier the power input is via a fixed lead with the audio inputs being paralleled at XLR-3 plugs and sockets plus twin ¼ in jack sockets for each channel—an ideal arrangement for sound reinforcement applications. As standard the inputs are unbalanced with options of either internal balancing transformers or a stereo active balanced input module. In both balanced cases

### MANUFACTURER'S SPECIFICATION

#### FTC power output:

250 W minimum sine wave continuous average power per channel with both channels driving 8 Ω loads. The maximum total harmonic distortion at any level from 1 W to 250 W and at any frequency from 20 Hz to 20 kHz is 0.03%.

400 W minimum sine wave continuous average power per channel with both channels driving 4 Ω loads. The maximum total harmonic distortion at any level from 1 W to 400 W and at any frequency from 20 Hz to 20 kHz is 0.06%.

800 W minimum sine wave continuous average power into an 8 Ω load driven in bridge connected monaural operation. The maximum total harmonic distortion at any level from 2 W to 800 W and at any frequency from 20 Hz to 20 kHz is 0.06%.

All measurements assume 120 VAC or equivalent supplied to the power cord.

**IHF dynamic power output:** 350 W/channel with both channels driving 8 Ω loads.

600 W/channel with both channels driving 4 Ω loads. 850 W/channel with both channels driving 2 Ω loads. 1200 W into an 8 Ω load driven in bridge connected monaural operation. 1700 W into a 4 Ω load driven in bridge connected monaural operation.

**Hum and noise:** 113 dB below 250 W/8 Ω 20 Hz to 20 kHz-unweighted. 115 dB minimum below 250 W/8 Ω A-weighted.

**Input sensitivity:** 1.42 VRMS for rated 8 Ω output.

**Voltage gain:** ×31.6 or 30.0 dB.

**Input impedance:** 15 kΩ.

**Load capability:** drives any load of 2 Ω or greater in dual channel mode or 4 Ω or greater in single channel operation.

**Damping factor:** 500:1 RE:8 Ω below 500 Hz.

**Power requirements:** 1500 W for rated 4 Ω power. 100, 110, 120, 200, 220 or 240 VAC: 50 Hz to 60 Hz.

**Dimensions:** (whd) 19×7×12 in (including handles).

**Weight:** 50 lb (net), 55 lb (shipping).

**Manufacturer:** BGW Systems, 13130 South Yukon Avenue, Hawthorne, CA 90250, USA.  
UK: Court Acoustics, 35/39 Britannia Row, London N1 8QH.

there are internal links for phase reversal.

The outputs are at sensibly sized terminals/banana sockets on the standard ¾ in spacing with a recessed slide switch allowing stereo or bridged operation. There is no indication of the configuration on the front panel and I would like to see this added in production versions.

The remaining rear panel functions are two further recessed slide switches, one for disconnecting the audio ground from the chassis and the other for switching the cooling fan at the centre of the rear panel to slow or off during normal operation. In the case of either heatsink overheating the fan always switches on in its fast mode. As the fan switch is connected directly to the incoming mains power its design should be changed as the clearance between the terminals connected to the power and the metallic body of the switch is insufficient to meet UK safety standards.

The fan, which is not fitted with an air filter, sucks air into the rear of the amplifier and passes it over the output device heatsinks before ejecting it through vents in the sides. There are no other holes in the amplifier's case so debris cannot fall into the amplifier. Two types of cooling fan are available, a so-called quiet 50 CFM fan or a high speed 90 CFM fan with a further option being a dual 18 dB crossover module about which I have no information.

Within the chassis a large toroidal power transformer is partially enclosed by a screen in the base of the unit. Included in the transformer is a 120°C thermostat for transformer protection, this disconnects the transformer but allows the fan and the warning indicator to continue in operation in the case of shutdown.

The remainder of the base of the amplifier is occupied by the 25 A rectifier and the smoothing capacitors which are firmly secured by a large metal clamp.

To the rear all the audio input connectors are soldered directly to a small printed circuit board which is fitted with two octal valveholder type sockets for the optional input transformers. Similarly, a PCB behind the annunciator panel supports the indicators and metering LEDs and their associated drive electronics.

The two amplifier channels are mounted on large finned heatsinks which drop on to rails in the top of the case and are each secured by four machine screws. The 10 special flat output devices for each channel are bolted on to the heatsinks and soldered to a printed circuit board each of which contains a complete audio channel.

A single 11-pin octal valveholder style socket provides all the connections except the two connections to the heatsink thermostat which are push connectors. It



# Music Works Chose

# AMEK

... twice.



*Music Works*

Music Works, Music Studios, 23 Benwell Road, London N7. Tel: 01-607 9495

# AMEK

Head Office and Factory  
AMEK SYSTEMS AND CONTROLS LTD  
Islington Mill, James Street  
Salford M3 5HW, England  
tel: 061 834 6747  
telex: 668127

In the USA  
AMEK CONSOLES INC.  
10815 Burbank Blvd.  
North Hollywood, CA 91601  
tel: 818 508 9788  
telex: 662526



# REVIEW REVIEW

is therefore extremely simple to change amplifier modules in the event of a fault. Furthermore, the circuit boards have first class access and have clear component identifications.

The instruction manual includes full circuits and circuit descriptions in addition to component listings and other operational information.

Interconnections to other parts of the amplifier are either via pin connections or push connectors with the wiring being rather untidy in this pre-production unit. As there is a large number of pin connections to the front panel printed circuit board it would be easy to incorrectly connect them during servicing and I would have preferred these connections to be in the form of a plug and socket, maybe of the removable pin type.

As previously stated the primary amplifier protection is by a magnetic circuit breaker in the power input. Loudspeaker protection is offered by a turn on delay which is entirely electronic, there being no relays in the amplifier outputs or elsewhere. Like the thermal protection this delay shuts down the driver current source.

DC protection is provided by sensing DC at the output terminals and should significant DC occur a thyristor crowbar circuit shorts the output and operates the short circuit protection. The latter senses the current in all the emitter resistors of the 10 complementary output devices and reduces drive if any single device carries more than 1 A over a given period whilst allowing peak currents of 10 A per output device.

At initial switch on it was found that the mains input high and the power supply imbalance indicators remained illuminated. Whilst the latter appeared

to be associated with component tolerances the former at first sight appears to be a design fault in the 240 V version of the amplifier.

Whilst pursuing this fault it was found, fortunately not the painful way, that 240 VAC was present at uninsulated terminations and on tracks on the front panel printed circuit board.

These problems were raised with the manufacturer who has found that the power supply indicator is too sensitive and is modifying this. Pin connections to the front panel board are being replaced with a Molex connector and they are looking into the performance of the input line monitoring which should show line low at 105/210 V and line high at 125/250 V.

## Inputs and outputs

The unbalanced audio inputs had an impedance that varied slightly with the gain setting being a maximum of 21.3 k $\Omega$  at minimum gain or a minimum of 14.6 k $\Omega$  at maximum gain with the capacitive loading being around 400 pF.

As the attenuators are across the input there is no limitation on the maximum input level with the input for delivering the rated output of 250 W into 8  $\Omega$  being 1.406 V or 1.412 V—a channel balance to within 0.04 dB. The switched input attenuators were within 1 dB of their nominal attenuation at any setting with the balance between the channels being very accurate (to within 0.26 dB) for any attenuator setting right down to -60 dB.

At the audio outputs the modulus of the impedance for a constant 10 mA input current is shown in Fig 1 with the impedance of 0.03  $\Omega$  below 1 kHz offering a damping factor of 267 reference 8  $\Omega$ .

DC offset at the outputs varied little

with temperature with the worst case measured being only 3.5 mV.

## Power output and distortion

Using the normal precautions of a stabilised 240 VAC 50 Hz supply together with precision non-inductive load resistors and a very accurate digital voltmeter the power output capability for the onset of rapidly increasing harmonic distortion was evaluated.

Table 1 shows the performance at 1 kHz for single and both channels driving 4  $\Omega$  and 8  $\Omega$  loads and for single channels driving 2  $\Omega$  loads as may be presented by some nominally 4  $\Omega$  loudspeakers at certain frequencies. These figures are well above the rated output and show a very satisfactory capability of driving any realistic loads. Also of interest is the peak power capability which was checked by applying 10 ms bursts of 1 kHz tone every 100 ms with the results given in Table 2. These figures show that the amplifier voltage limits when driving 8  $\Omega$  loads and current limits at around 65 A peak under these particular burst conditions.

Individual second and third harmonic distortion when driving the rated outputs of 250 W into 8  $\Omega$  or 400 W into 4  $\Omega$  was below 0.01% from 20 Hz to 20 kHz with the exception of one channel into 4  $\Omega$  where the second harmonic rose above 5 kHz to 0.03% at 20 kHz.

At 1 W there was little difference in distortion into 8 or 4  $\Omega$  but there was a difference between channels and this is shown in Fig 2 where the principal difference is above 1 kHz.

Total harmonic distortion and noise was measured at the rated output and at

TABLE 1

Load	Single channels		Both channels	
	Left	Right	Left	Right
8 $\Omega$	318 W	313 W	275 W	277 W
4 $\Omega$	532 W	530 W	436 W	427 W
2 $\Omega$	770 W	810 W	—	—

TABLE 2

Load	Single channel burst power	
	Left	Right
8 $\Omega$	324 W	315 W
4 $\Omega$	613 W	580 W
2 $\Omega$	1056 W	1056 W

FIG 1  
BGW 750D OUTPUT IMPEDANCE

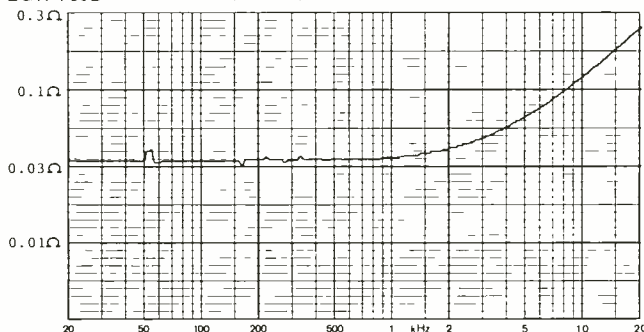
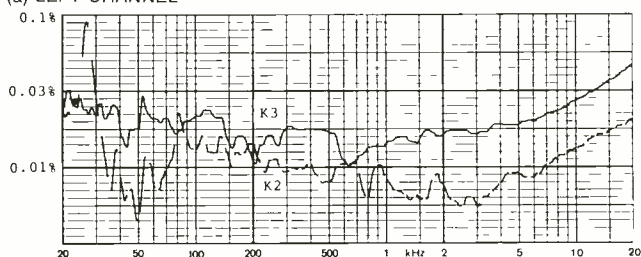
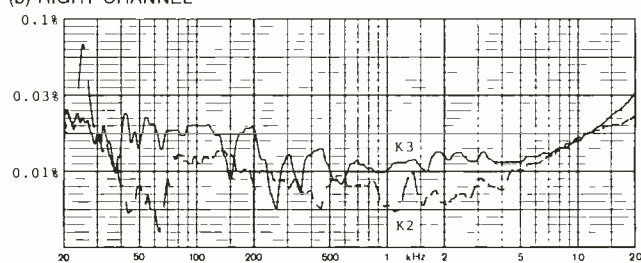


FIG 2 BGW 750D  
HARMONIC DISTORTION 1 W INTO 4  $\Omega$

(a) LEFT CHANNEL



(b) RIGHT CHANNEL



# The Mitsubishi X-850 We thought we'd better look after it.



After all, it is the best. Nothing else gives you 32 channels of state-of-the-art PCM digital audio plus extra time-code and analog tracks. Nothing else gives you the best error-correction circuitry in the world and the revolutionary innovation of razorblade editing – a digital first!

There's only one company to call for the Mitsubishi X-850.  
Hilton Sound.

Nobody else is as far ahead of the field in professional audio.  
Nobody else has the combination of expert knowledge and superb service.  
And nobody else was judged suitable to have the first Mitsubishi X-850 available for hire in the UK.

**HILTON SOUND – THE FIRST FOR MITSUBISHI.**



10 Steedman Street,  
London, S.E.17  
Tel: 01-708 0483  
(24 hr Service)  
EMAIL REF: HILTON-SOUND UK  
DGS 1311

# REVIEW REVIEW

1 W working into 8  $\Omega$  and 4  $\Omega$  for both channels and found to vary a little with temperature. Table 3 shows the worst case measured for both channels.

Generally the distortion products were of a harmonic nature with the exception being at 20 kHz at 1 W when crossover products were significant in the left channel.

Intermodulation distortion to the CCIF twin tone method using tones separated by 70 Hz was measured at the rated outputs and at 1 W output using signals having the same peak output as a sine wave driving the rated powers.

At the maximum rated powers the second and third order intermodulation products both remain below 0.01% up to 50 kHz above which there was an extremely rapid rise in distortion possibly indicating potential transient distortion potential.

At lower powers the performance remained very good below 20 kHz. Fig 3 shows the situation at 1 W irrespective of load above 4  $\Omega$  where the increase in third order ( $f_1-f_2-f_1$ ) at high frequencies remains significant.

Intermodulation distortion to the SMPTE method using 50 Hz and 7 kHz

tones mixed in a 4:1 amplitude ratio was found to be good as shown in Table 4 where the power output is the equivalent peak sine wave power reference the rated output.

The application of a 1 kHz square wave into a load of 8  $\Omega$  in parallel with 2  $\mu$ F produced an output similar to Fig 4 at any power level below clipping. Working into resistive loads the rise time for the two channels was 4.45/3.92  $\mu$ s and the fall time 4.44/3.68  $\mu$ s with the slew rate being around 20 V/ $\mu$ s.

The amplifier appeared to be completely stable into any load.

## Frequency response and noise

The frequency response remained constant at any level below the rated output and was as shown in Fig 5 for the two channels which were within +0/-0.2 dB from 10 Hz to 15 kHz falling to -0.3 dB at 20 kHz. Above this the two channels had a slightly different response associated with the inverting stage used for bridge operation, this difference is not, however, of any consequence.

Noise in the outputs varied slightly with the gain setting, being worst at gain settings about -6 dB with the inputs shorted. There were also minor differences between channels, however, as shown in Table 5 the noise performance is good.

Whilst mains hum was audible in the noise its level was very low and mains harmonics which are subjectively more audible were of no practical consequence.

## Metering and indicators

The bar graph meters had good visibility and were peak responding with a rise time to 0 dB of 80 ms and a fall time of 250 ms. The range of 60 dB which was accurately calibrated gave a useful indication with low level programme material.

Whilst 0 dB on the meters corresponded to 170 W into 8  $\Omega$  the real clipping indicator became illuminated precisely at the onset of clipping with a satisfactory response time of 7 ms.

Of the remaining indicators the power line limits and DC rail unbalance functions were faulty as previously mentioned and it was found that the

TABLE 3

Frequency	1 kHz	10 kHz	15 kHz	20 kHz
250 W 8 $\Omega$	0.008/0.012%	0.015/0.018%	0.021/0.026%	0.025/0.039%
1 W 8 $\Omega$	0.011/0.012%	0.022/0.024%	0.03/0.032%	0.045/0.055%
400 W 4 $\Omega$	0.006/0.012%	0.013/0.02%	0.02/0.03%	0.03/0.04%
1 W 4 $\Omega$	0.015/0.011%	0.025/0.023%	0.03/0.03%	0.45/0.05%

TABLE 4

Output	8 $\Omega$ load		4 $\Omega$ load	
	Left	Right	Left	Right
0 dB	0.009%	0.065%	0.007%	0.02%
-5 dB	0.010%	0.012%	0.006%	0.025%
-10 dB	0.012%	0.014%	0.009%	0.026%
-15 dB	0.015%	0.016%	0.014%	0.029%
-20 dB	0.02%	0.019%	0.024%	0.032%
-30 dB	0.05%	0.025%	0.061%	0.066%

TABLE 5

Measurement method	Noise Reference 250 W into 8 $\Omega$	
	Worst case	Best case
22 Hz to 22 kHz RMS	115.0/112.5 dB	114.0/112.5 dB
A-weighted RMS	122.0/120.0 dB	119.0/118.0 dB
CCIR-weighted RMS	114.0/112.0 dB	111.0/111.0 dB
CCIR-weighted quasi-peak	110.0/108.0 dB	106.0/106.0 dB

FIG 3  
BGW 750D  
CCIF IM DISTORTION  
(MULTIPLY FREQUENCY SCALE BY 10)

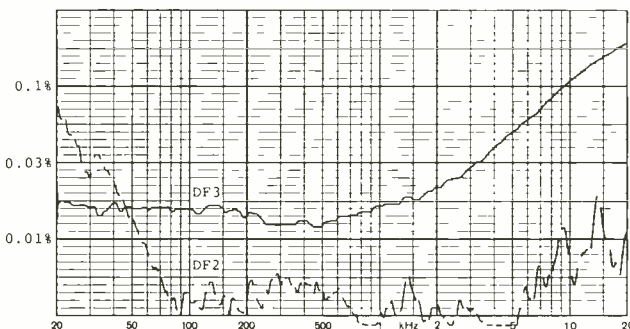


FIG 5  
BGW 750D  
FREQUENCY RESPONSE OF LEFT AND RIGHT CHANNELS

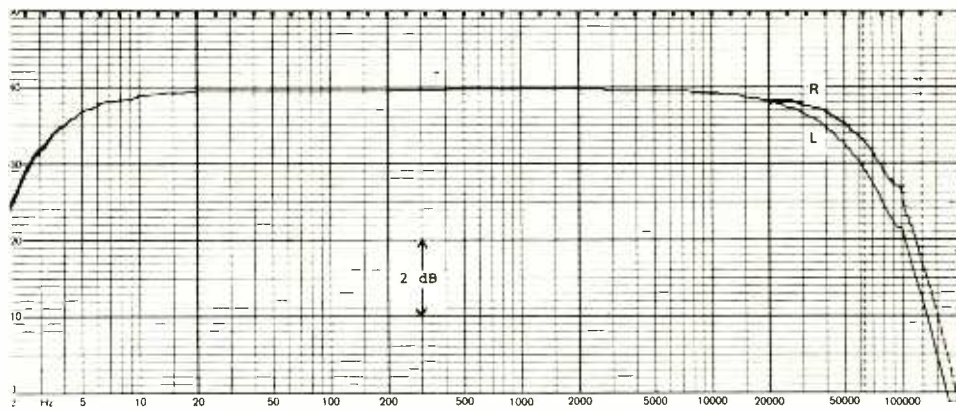
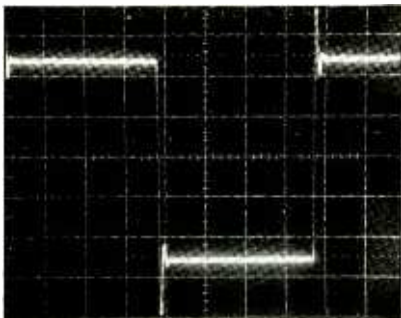


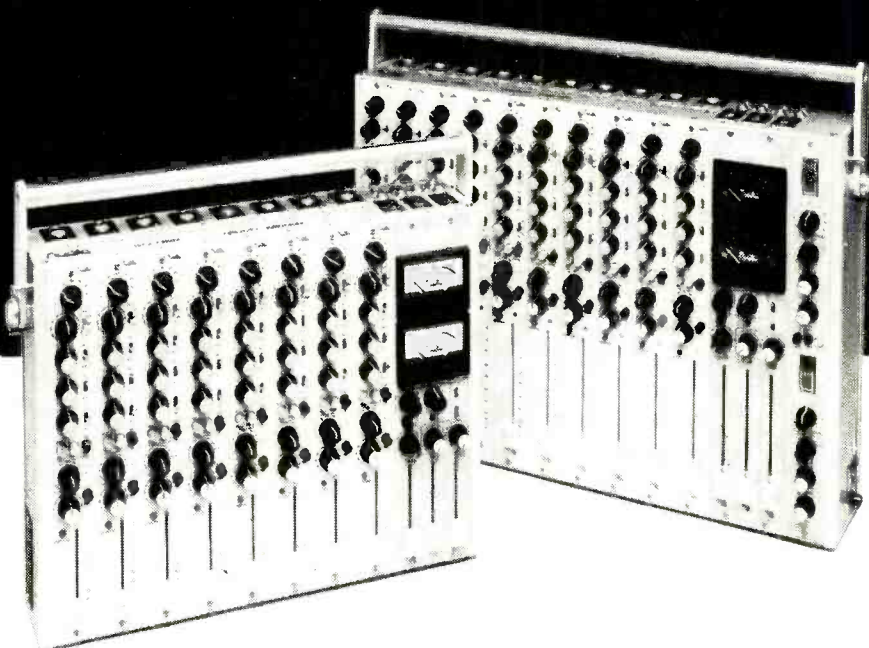
FIG 4  
BGW 750D  
1 kHz SQUARE WAVE  
INTO 8  $\Omega$  LOAD



Worldwide List of Audio Developments Ltd., Agents

COUNTRY	AGENT
Australia	Rank Electronics Tel: 2 449 5666 Telex: 71289 Contact: Andrew Harrison
Austria	Peertronic Tel: 43 222 832224 Telex: 134072 Contact: Gunther Friedrich
Balkan States	Constantin Stavriniadis Tel: 4121 39 5015 Telex: 26297 Contact: C. Stavriniadis
Canada	Gerr Electro Acoustics Ltd. Tel: 416 868 0528 Telex: 065 24385 Contact: G. Eschweiler
China	Ace (Int'l) Co. Tel: 852 3 7452343 Telex: 40442 Contact: Michael Pang / Whyman Chan
Denmark	Kinovox Tel: 452 187617 Telex: 40394 Contact: Steen Peitersen
Finland	Studiotec KY Tel: 358 0 514133 Telex: 125284 Contact: Peter Stralman
France	Simplex Electronique Tel: 331 271 5330 Telex: 230045 Contact: J.C. Thobois
Germany	Nagra Kudelski GMBH Tel: 4989 656633 Telex: 529893 Contact: J. Weber
Greece	K. Stavriniidou Tel: 607 7782938 Telex: 210934 Contact: K. Stavriniidou
Hungary	Cinac Tel: 4124 711600 Telex: 451070 Contact: Henri Suter
India	Cinerama PVT Ltd. Tel: 293873 Telex: 1171198 Contact: S. Agarwal
Israel	Sontronics Electronic Equip. Ltd. Tel: 9723 442233 Telex: 361579-Ref SSK Contact: S. Shmueli
Italy	Audio International SRL Tel: 392 7384751 Telex: 322251 Contact: R. Beppato
Japan	General Traders Ltd. Tel: 813 2912761 Telex: 24754 Contact: H. Saitoh
Korea	Saetong Corp. Tel: 783 6551 5 Telex: 23596 Contact: J.B. Kim
Kuwait	Light & Sound Elec. Co. Tel: 965 434307 Telex: 4528 Contact: A. Al-Baghli
New Zealand	General Video Int. Ltd. Tel: 644 881 169 Telex: 30129 Contact: Gerry Smith
Norway	Siving Benum & Co. Tel: 472 44 2255 Telex: 17681 Contact: Bjorn Benum
Singapore	Rank O'Connors Sing. PVT Ltd. Tel: 65 637944 Telex: 21023 Contact: Patrick Ching
South Africa	Prosound (PTY) Ltd. Tel: 27 11 337 6556 Telex: 485712 Contact: D. Feldman
Spain	Telco Electronic S.L. Tel: 341 231 5601 Telex: 27348 Contact: J. Escrig
Sweden	Intersonic N.B. Tel: 468 744 5850 Telex: 11136 Contact: R. Isacson
Taiwan	Linfair Eng. & Trading Ltd. Tel: 886 23214454 Telex: 22563 Contact: Duncan Chang
Thailand	Ace (Thailand) Co. Ltd. Tel: 2812512 Telex: 72300 Contact: Bundhit Thongpen
Tunisia	Soger Electronique Tel: 2161254 230 Telex: 13447 Contact: C. Barouch
Turkey	Nefan Ltd. Tel: 465952 Telex: 26304 Contact: A. Fresco
Zimbabwe	Audex (PVT) Ltd. Tel: 26370 Contact: W. Mueller
U.S. Office	Audio Developments Inc. Tel: 818 843 7567 Contact: Ron Fuller

# TOTAL CONTROL AT YOUR FINGERTIPS



JUST TWO OF OUR WIDE RANGE OF PROFESSIONAL MIXERS FOR BROADCASTING, FILM SOUND AND POST PRODUCTION. CONSOLE MOUNTED, RACK MOUNTING AND PORTABLE VERSIONS AVAILABLE TO ORDER.

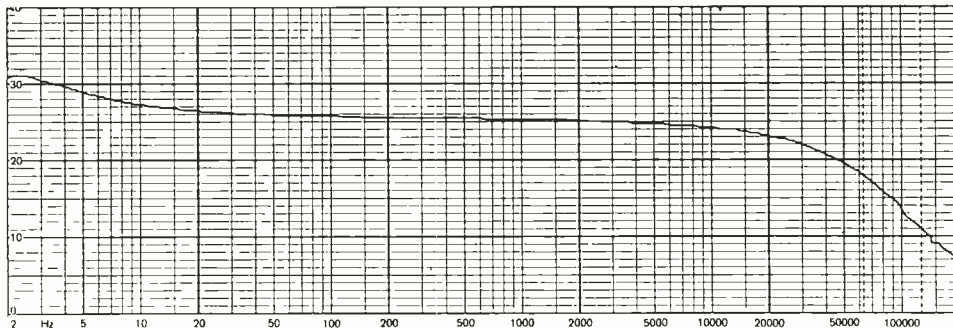
**Audio**  
DEVELOPMENTS LTD

Audio Developments Ltd, Hall Lane, Walsall Wood,  
Walsall, West Midlands, WS9 9AU  
Telephone: Brownhills (0543) 375351 Telex No: Audev G 338224

# REVIEW REVIEW

Hugh Ford reviews a power amplifier

FIG 6  
BGW 750D  
PHASE RESPONSE  $\pm 180^\circ$   
(ZERO LEVEL  $-180^\circ$ )



channels of the DC protection indicators were reversed. These indicators became clearly illuminated just before the onset of DC protection which instantaneously closed down an amplifier channel. This occurred at  $\pm 15$  V peak output at 1 Hz or  $\pm 28$  V output at 5 Hz—all a reasonable compromise for high power loudspeakers.

If the amplifier output was shorted the amplifier immediately lost drive with the clipping indicator becoming illuminated and the mains input power reducing.

## Other matters

Crosstalk between the channels was minimal being 96 dB at 1 kHz increasing at 6 dB/octave with frequency. As shown

in Fig 6 phase shift was minimal within the audio band.

Under all operating conditions the amplifier ran relatively cool. If the fan was switched off on the rear panel it came into operation at full speed from time to time, however, with the fan switched on it ran fairly quietly all the time and never entered its more noisy high speed mode.

## Summary

The performance of this amplifier suggests that it is a good 'workhorse' suitable for heavy duty operation and capable of taking considerable punishment.

Noise and distortion were to a good standard for a practical high power amplifier but distortion is not up to hi-fi freak requirements.

Mechanically the unit is well built and suitable for rack-mounting or mobile use but for the latter applications I would like to have seen the output terminals protected from mechanical damage. A further asset is that access for servicing is very good.

As explained, two of the front panel warning LEDs did not function correctly but this is probably a very minor problem. Of much more serious a nature are the mains safety shortcomings—the manufacturer must put this right with some urgency.

# SOUNDCRAFT SA1000

Soundcraft's series of power amplifiers comprises four models covering drive capabilities between 100 W and 770 W/channel, the most powerful rated at 2.35 kW into 4  $\Omega$  in the bridge mode.

The SA1000 reviewed here is the second most powerful model suitable for many applications where high level monitoring is required; it offers in the order of 500 W/channel into 4  $\Omega$ . In terms of both mechanical construction and in the electronics this is an unusual amplifier which is made to a very high standard in Norway.

Being a rack-mounting unit the amplifier is equipped with ears but these are an integral part of the sides in the form of cast alloy heatsinks. These are also extended to form carrying handles at the front of the amplifier with

rear mountings being provided for rack-mounting where extra strength is required such as in mobile applications.

The top and bottom covers are perforated steel sheets fixed to the sides,

the holes in the top cover being rather too large, such that metallic debris could fall through the top cover into the amplifier.

The front panel is a dark anodised

## MANUFACTURER'S SPECIFICATION

**Maximum power available at <0.5% THD plus noise with 1 kHz sine wave:** as a stereo amp, both channels driven into 4  $\Omega$ —465 W/channel, into 8  $\Omega$ —288 W/channel. As a stereo amp, single channel driven into 4  $\Omega$ —550 W, into 8  $\Omega$ —318 W. In bridge mode driving a load of 8  $\Omega$ —880 W, 16  $\Omega$ —552 W.

**Dynamic headroom (peak power):** +1.76 dBW or 200 W (603 W) into 4  $\Omega$ ; +1.35 dBW or 98 W (368 W) into 8  $\Omega$ .

**Frequency response:** both channels driven into 4  $\Omega$  at 400 W, reference 1 kHz, range 50 Hz to 20 kHz, deviation +0.0 to -0.2 dB.

**Distortion:** THD—250 mW to rated power output, 5 Hz to 50 kHz <0.05%. IM—<0.02%. TIM—undetectable to 3 significant figures.

**Damping factor:** >300 at all frequencies.

**Voltage slew rate:** >200 V/ $\mu$ s.

**Current slew rate:** >40 A/ $\mu$ s.

**Rise time (active circuits):** 1.5  $\mu$ s.

**Crosstalk:** >70 dB.

**Noise:** >97 dB below full output (A-weighted).

**Phase shift:** <4° at 20 Hz.

**CMRR:** >80 dB at 1 kHz.

**Sensitivity:** 1.4 V RMS at input for maximum output with controls at maximum.

**Dimensions:** (hwd) 5/4  $\times$  19  $\times$  17 in.

**Weight:** 60 lb net/70 lb packed.

**Manufacturer:** Adyton Trading A/S,

Innherredsvei 7B, 7000 Trondheim, Norway.

UK: Soundcraft Electronics Ltd, Unit 2, Boreham Wood Industrial Park, Rowley Lane, Boreham Wood, Herts WD6 5TZ.



To help maintain our competitive pricing policy Neutrik connectors arrive at Eardley House in consolidated shipments together with components from our various European manufacturing principals



Sole Agent UK

**Eardley Electronics Ltd.**

Eardley House,  
182-184 Campden Hill Road, London W8 7AS

Telephone: 01-221 0606

Telex: 23894 Telefax: 01-727 9556

**A Network of Distributors Nationwide**



We mix with many consoles



**Internationally Acclaimed Connector Technology**

The 'D' Connector for printed circuit board mounting

First introduced in 1981



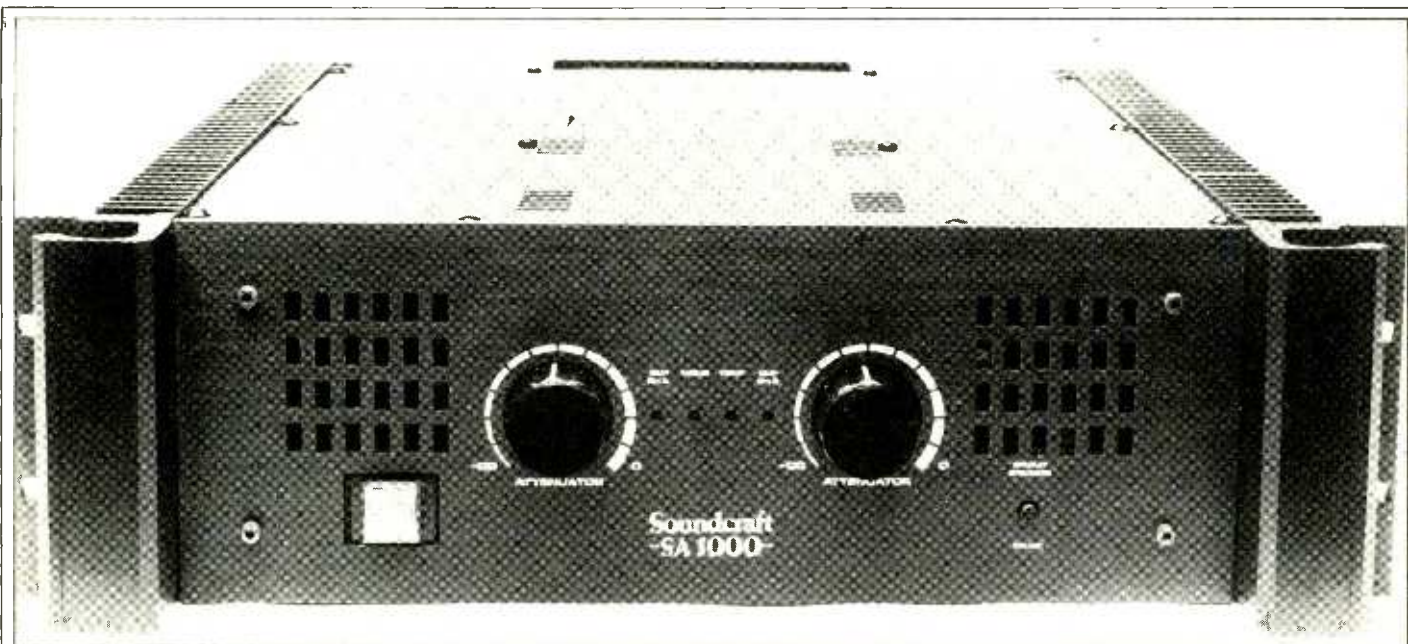
Sole Agent UK

**Eardley Electronics Ltd.**

Telephone: 01-221 0606

Telex: 23894

# REVIEW REVIEW



The SA1000 power amplifier

alloy plate which has white markings, with perforations at either side for cooling air. The sensitivity is controlled by two detented potentiometers with sensible knobs and without calibrations. Between the controls recessed LEDs are illuminated in case of output clipping for either channel, overheating and monophonic operation. Also on the front panel are a recessed overload circuit breaker and the illuminated power on/off switch. As with many high power amplifiers the loudspeaker outputs are relay connected with a switch-on delay.

At the centre rear of the amp there is a rather noisy cooling fan pushing air into the housing through a filter. The fan has its own fuse and the fan continues to run if the amplifier circuit breaker trips or in the event of thermal shutdown. The latter occurs if the output devices of either channel or the power transformer overheat.

At either side of the rear panel the

outputs are duplicated at sensibly sized terminals/banana sockets on the standard  $\frac{3}{4}$  in spacing with the two pairs of positive outputs being used in monophonic operation. The latter is obtained with a slide switch recessed behind the rear panel.

Signal inputs rated at 1.4 VRMS for full output are electronically balanced at XLR-3 sockets wired in parallel with  $\frac{1}{4}$  in jack sockets—further jack sockets would be nice for paralleling amplifiers in sound reinforcement applications. Most sensibly the audio ground can be separated from the power line ground by removing a link between two terminals. The power line input is via a substantial 6 ft long fixed lead with the correct UK colour coding but no plug fitted.

Within the amplifier the power transformer is a single large toroid mounted within a screen at the front centre of the amplifier, thus keeping the centre of gravity near the front

panel. Behind the power transformer are twin 33,000  $\mu$ F 100 V electrolytic capacitors smoothing the power to the output stages. The latter consists of 10 complementary MOSFET devices for each channel mounted on to an alloy 'L' bracket which is secured to the heatsinks at the sides of the amplifier.

With the exception of the two MOSFET drivers for the output stages which are also on the 'L' brackets the remaining electronics are on a single printed circuit board for each channel and a small board behind the front panel. These are all of very high quality with an excellent components layout and clear component indentifications.

The low power stages are fed by a separate stabilised supply having its own secondary windings on the power transformer. At the amplifier input the signals are fed directly to a balanced transconductance amplifier which is followed by the level control. This section

FIG 1  
SOUNDCRAFT SA1000  
COMMON MODE REJECTION (BOTH CHANNELS)  
(MULTIPLY FREQUENCY SCALE BY 10)

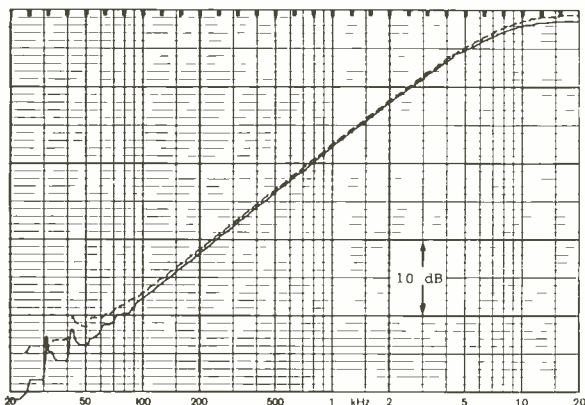
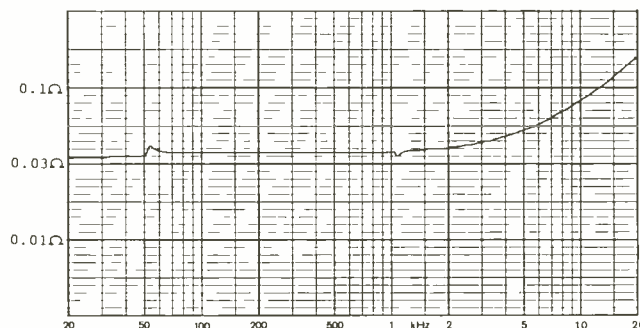


FIG 2  
SOUNDCRAFT SA1000  
OUTPUT IMPEDANCE



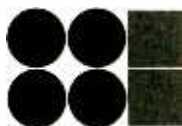


# Leading Edge Sampling Technology?

The laboratory standard sampling equipment illustrated on the right will not give you 21 seconds of 20 KHz sampling on each stereo channel, full editing and triggering, plus delay, pitch transposition, sound shrinking and reverberation; all in stereo.

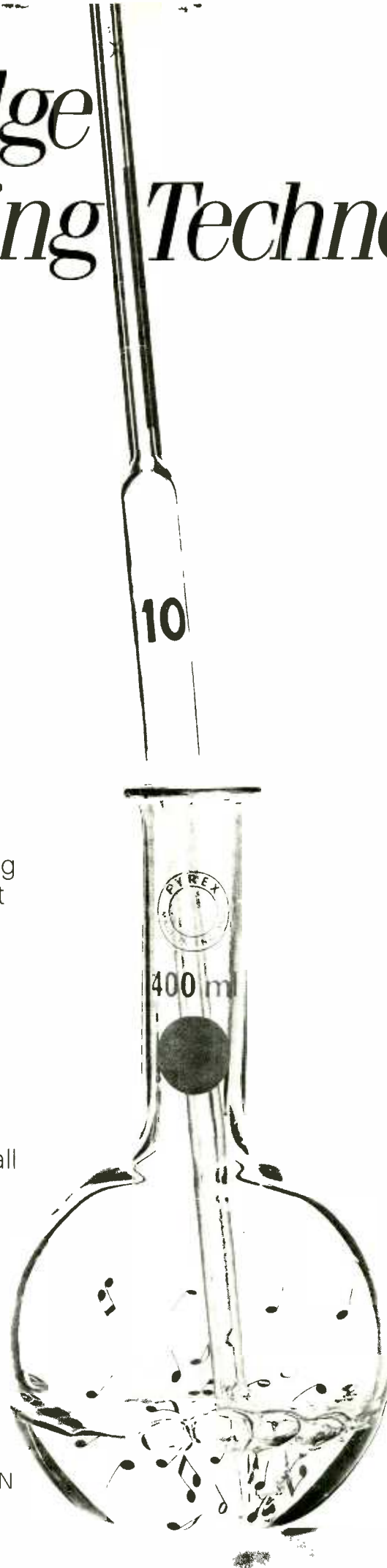
The Publison IM 90 Infernal Machine (*not illustrated*) will do all these things and more.

Distributed in the UK By:



Scenic Sounds Equipment Limited  
Unit 2, 12 William Road, London NW1 3EN  
Tel: 01-387 1262, 01-734 2812  
Telex: 27939 SCENIC G

Publison 5-11 rue Crespin du Gast, 75011 Paris, France



# REVIEW REVIEW

FIG 3a  
SOUNDCRAFT SA1000  
HARMONIC DISTORTION AT 1 W INTO 8  $\Omega$

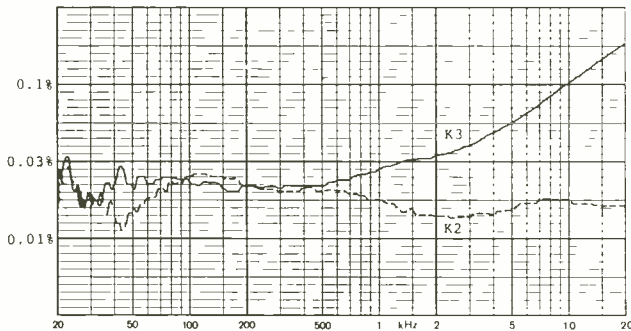


FIG 3c  
SOUNDCRAFT SA1000  
IM DISTORTION AT 1 W INTO 8  $\Omega$   
(MULTIPLY FREQUENCY SCALE BY 10)

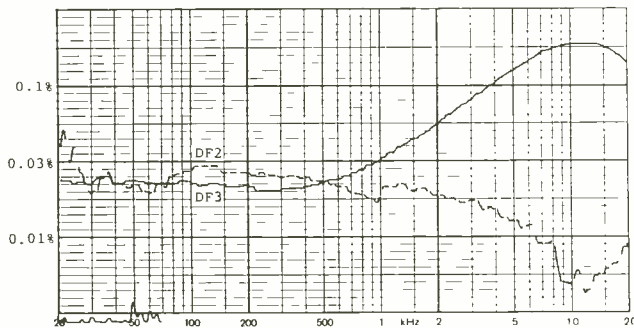


FIG 3b  
SOUNDCRAFT SA1000  
HARMONIC DISTORTION AT 450 W INTO 4  $\Omega$

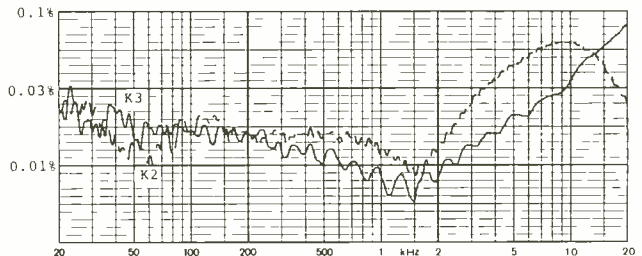


FIG 3d  
SOUNDCRAFT SA1000  
IM DISTORTION AT 270 W INTO 8  $\Omega$   
(MULTIPLY FREQUENCY SCALE BY 10)

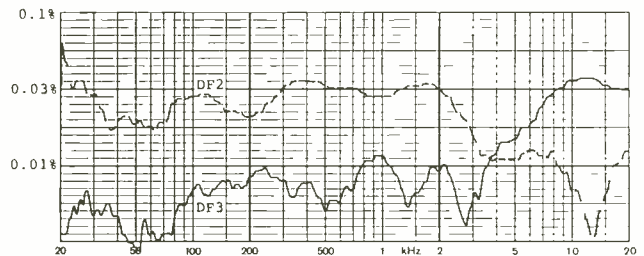
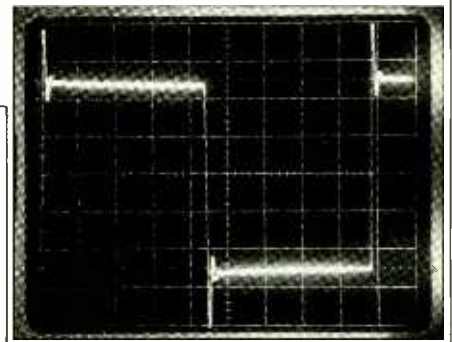


FIG 4  
SOUNDCRAFT SA1000  
1 kHz SQUARE WAVE INTO 8  $\Omega$



and the low power driver section are on a laser trimmed hybrid circuit of special design.

As the amplifier does not rely on overall DC feedback for stability parts of the pre-driver and the power driver plus output stages may be separated for servicing by removing inbuilt links—a real blessing as those who have dealt with DC coupled amplifiers will know! Furthermore there are only two sealed pre-set controls for each channel setting bias and quiescent current.

The remaining sections of each channel are the offset protection and output relay control, clip indicators and short circuit protection. Offset protection operates on signals below about 1 Hz and is accomplished by integrating the channel's output. If the integrated output goes positive or negative then both channel's output relays are opened.

Clipping indication is unusual as the signal is taken from the pre-driver output and fed to opto-couplers which are arranged to operate if the voltage exceeds the rail voltages, the opto-couplers in turn energise the warning LEDs such that the operation of the LEDs does not feed back into the audio signals.

Finally, short circuit protection takes a signal from an emitter resistor in each of the positive and negative output stages and feeds this to the pre-driver hybrid circuit. If this input voltage exceeds a pre-set threshold the drive to the output

stages is reduced. This alone would initiate protection when driving highly reactive loads so the output voltage signal is effectively compared with the output current signal from the emitter resistors so that the amplifier does not operate protection circuits for milliseconds provided that an output voltage is present, ie the output is not completely shorted.

## Inputs and outputs

The electronically balanced inputs had an impedance of 28.9 k $\Omega$  constant with the gain setting with the maximum acceptable input voltage being 13 V in the balanced mode or 7.7 V when operating single ended in which case the input impedance was halved.

Both channels had an identical gain to close limits with the rated input of 1.4 VRMS at maximum gain delivering 278 W into 8  $\Omega$  or 559 W into 4  $\Omega$ . The common mode rejection, shown in Fig 1 for both channels, was good being 88 dB at 1 kHz.

A slight peculiarity which will not normally be of consequence is that the inputs are DC coupled to the input amplifier, thus, any DC offset in the input may lead to distortion. The input level control offered approximately 1 dB resolution between detents down to -10 dB increasing to 1.5 dB.

At the outputs the DC offset amounted to -14/+14 mV for the two channels

with the modulus of the output impedance being shown in Fig 2 to offer a damping factor near 300 reference 8  $\Omega$  below 1 kHz.

## Power output and distortion

Using a stabilised 240 V  $\pm$ 0.5% 50 Hz supply in conjunction with 1% load resistors and a highly accurate digital voltmeter the power output for a significant increase in distortion at 1 kHz was as shown in Table 1. This shows the unit should be well capable of driving any normal loudspeaker load with plenty of power in hand when driving into 2  $\Omega$ . The onset of clipping when driving 10 ms duration bursts of 1 kHz every 100 ms was at 390 W into 8  $\Omega$ , 630 W into 4  $\Omega$  or 1055 W into 2  $\Omega$  which is little above the output available from single channels showing that the power supplies have good regulation.

Individual harmonic distortion was measured at various levels into both 4  $\Omega$  and into 8  $\Omega$  and was found to vary

# STUDIOMASTER

## MOSFET AMPLIFIERS



### MOSFET 500

OUTPUT POWER: 250W RMS per channel into 4ohms. 160 W per channel into 8ohms. T.H.D.: At 1kHz 200W/4ohms less than 0.003%. At 20Hz to 20kHz 100W/8ohms less than 0.015%. At 20Hz to 20kHz 200W/4ohms less than 0.03%. FULL POWER BANDWIDTH: +0-1dB 5Hz to 200kHz. SLEW RATE: Greater than 100V/ $\mu$ sec. HUM & NOISE: Better than 80dB down, ref. full output. CHANNEL SEPARATION: At 1kHz greater than 70dB. SENSITIVITY: +4dBV (1.23V). INPUT IMPEDANCE: Greater than 20kohms. Unconditionally stable e.g. 4ohms +2 $\mu$ F. No overshoot at all into resisting loads. Indefinite short and open circuit or load mismatch protection. Thermal overload protection when misused. DC fault detection protects the load loudspeaker if any DC voltage greater than  $\pm 6.5$  volts is present at the amplifier output. DIMENSIONS: 19" x 5 $\frac{1}{4}$ " x 11 $\frac{1}{2}$ " excluding handles.

### MOSFET 1000

OUTPUT POWER: 500W RMS per channel into 4ohms. 300W per channel into 8ohms. T.H.D.: At 1kHz 400W/4ohms less than 0.003%. At 20Hz to 20kHz 200W/8ohms less than 0.015%. At 20Hz to 20kHz 400W/4ohms less than 0.03%. FULL POWER BANDWIDTH: +0-1dB 5Hz to 200kHz. SLEW RATE: Greater than 100V/ $\mu$ sec. HUM & NOISE: Better than 80dB down, ref. full output. CHANNEL SEPARATION: At 1kHz greater than 70dB. SENSITIVITY: +4dBV (1.23V). INPUT IMPEDANCE: Greater than 20kohms. Unconditionally stable e.g. 4ohms +2 $\mu$ F. No overshoot at all into resisting loads. Indefinite short and open circuit or load mismatch protection. Thermal overload protection when misused. DC fault detection protects the load loudspeaker if any DC voltage greater than  $\pm 6.5$  volts is present at the amplifier output. DIMENSIONS: 19" x 5 $\frac{1}{4}$ " x 11 $\frac{1}{2}$ " excluding handles.

### MOSFET 2000

OUTPUT POWER: Each amplifier in 4 channel mode: Greater than 500W RMS into 2ohms 450W RMS into 4ohms 300W RMS into 8ohms. Each amplifier in 2 channel mode: Greater than 1000W RMS into 4ohms. 900W RMS into 8ohms. T.H.D.: (4-channel mode) At 1kHz 400W/4ohms less than 0.003%. At 20Hz to 20kHz 200W/8ohms less than 0.015%. At 20Hz to 20kHz 400W/4ohms less than 0.03%. FULL POWER BANDWIDTH: +0-1dB 5Hz to 200kHz. SLEW RATE: Greater than 100V/ $\mu$ sec. HUM & NOISE: Better than 80dB down, ref. full output. CHANNEL SEPARATION: At 1kHz greater than 70dB. SENSITIVITY: +4dBV (1.23V). INPUT IMPEDANCE: Greater than 20ohms. Unconditionally stable e.g. 4ohms +2 $\mu$ F. No overshoot at all into resisting loads. Indefinite short and open circuit or load mismatch protection. Thermal overload protection when misused. DC fault detection protects the load loudspeaker if any DC voltage greater than  $\pm 6.5$  volts is present at the amplifier output. DIMENSIONS: 19" x 5 $\frac{1}{4}$ " x 17 $\frac{1}{4}$ " excluding handles.

STUDIOMASTER MOSFET 500 & 1000 power amplifiers have built a formidable reputation for rugged reliability and above all perfect clear sound reproduction right up to maximum levels.

Building on this reputation, Studiomaster have developed the MOSFET 2000. The revolutionary 2000 contains dual power supplies and 4 discrete 500W channels which can be bridged into pairs to give two massive 1000W amplifiers in only 3U!

All the Studiomaster MOSFET series feature extensive protection against short circuit, thermal overload and D.C. offset.

Each of the amplifiers features a T.H.D. figure at less than 0.005% which means, quite simply, that you can confidently use ALL the power available in your MOSFET without losing clarity.

STUDIOMASTER, Alcock Works, Chaul End Lane, Leagrave, Luton, Beds LU4 2EZ  
Telephone: (0525) 221331 (3 lines) Telex: 825612 STUDIO G Fax: 0525 221-894

# REVIEW REVIEW

with level, being worst around 1 W into 8  $\Omega$  or 4  $\Omega$  with **Fig 3a** typical at this level.

At higher and lower levels the distortion fell with the performance at 450 W into 4  $\Omega$  shown in **Fig 3b** being very close to the performance at 270 W into 8  $\Omega$ .

Total harmonic distortion at times measured higher than the manufacturer's specification but this is probably the result of using a different make of distortion analyser (a Sound Technology unit was used for this review).

**Table 2** shows the total harmonic distortion and noise for both channels at 1 W and at their rated outputs. At high levels the nature of the distortion was mainly harmonic with both channels showing a degree of crossover distortion

at 1 W into 4  $\Omega$  otherwise the distortion showed little change with level.

Intermodulation distortion to the CCIF twin tone method was measured using tones separated by 70 Hz and as with harmonic distortion was found to vary with level, again being worst around 1 W output as shown in **Fig 3c** where the third order product ( $f_1 - (f_2 - f_1)$ ) predominates.

**Fig 3d** is typical of the intermodulation distortion at high powers where the second order products are similar but the third order product has dropped below the instrumentation residual.

Intermodulation distortion to the SMPTE method using 50 Hz and 8 kHz tones mixed 4:1 was measured at the rated power into 8  $\Omega$  and into 4  $\Omega$  and at 5 dB increments down to -20 dB.

The results varied little, ranging

between 0.01% which is close to the residual from the instrumentation up to 0.02%—a good performance.

The application of a 1 kHz square wave into a load of 8  $\Omega$  in parallel with 2  $\mu\text{F}$  produced **Fig 4** which was consistent between channels and did not vary with any level below clipping.

When working into resistive loads the rise and fall times were both 4.5  $\mu\text{s}$  with a slew rate in the order of 40 V/ $\mu\text{s}$ .

## Frequency response and noise

As shown in **Fig 5** the overall frequency response was within +0/-0.2 dB from 50 Hz to 20 kHz as specified with the -1 dB points being at 18 Hz and at 50 kHz above which there is a sensible roll-off.

FIG 5  
SOUNDCRAFT SA1000  
FREQUENCY RESPONSE

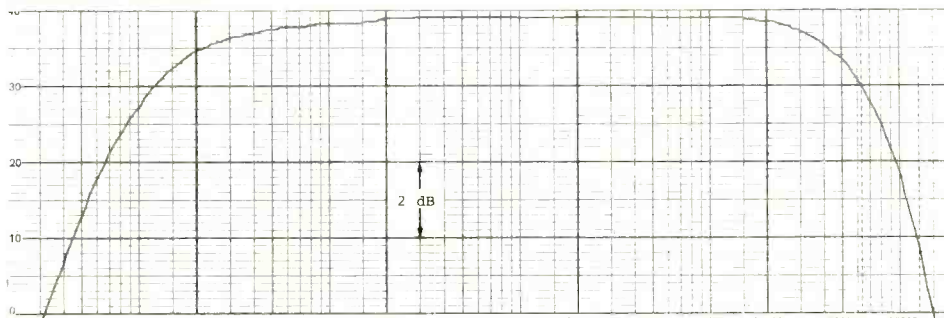


FIG 6  
SOUNDCRAFT SA1000  
CROSSTALK

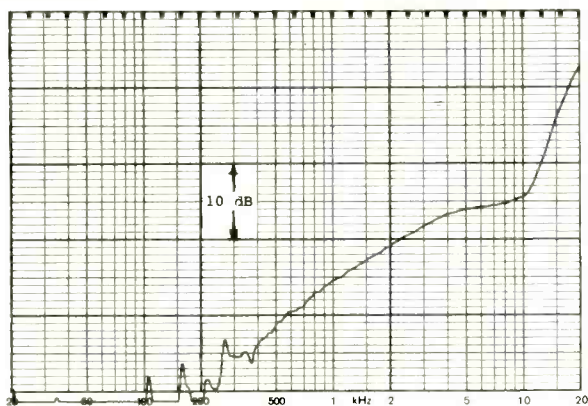


FIG 7  
SOUNDCRAFT SA1000  
PHASE SHIFT  $\pm 180^\circ$   
ZERO LEVEL  $-180^\circ$

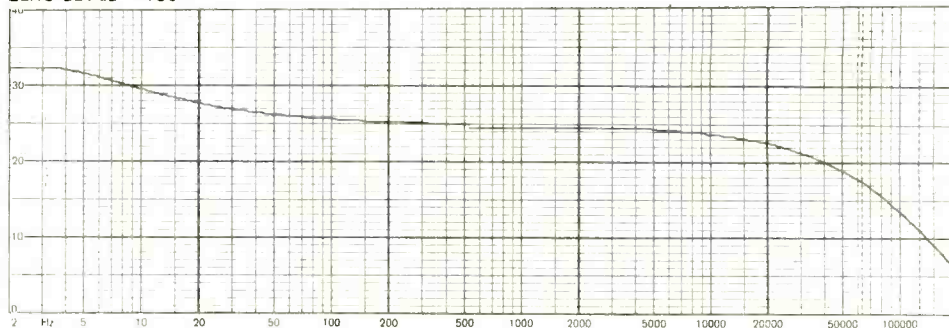


TABLE 1  
Load

Load	Single channels		Both channels	
	Left	Right	Left	Right
8 $\Omega$	351 W	351 W	325 W	325 W
4 $\Omega$	611 W	608 W	546 W	550 W
2 $\Omega$	1004 W	1013 W	—	—

TABLE 2

	1 kHz	10 kHz	15 kHz	20 kHz
1 W 8 $\Omega$	0.04/0.04%	0.09/0.13%	0.12/0.19%	0.15/0.24%
1 W 4 $\Omega$	0.05/0.06%	0.12/0.21%	0.18/0.30%	0.22/0.37%
270 W 8 $\Omega$	0.01/0.01%	0.04/0.04%	0.06/0.03%	0.08/0.04%
450 W 4 $\Omega$	0.01/0.01%	0.05/0.05%	0.09/0.05%	0.13/0.07%

TABLE 3 Output noise reference 270 W into 8  $\Omega$

Measurement method	Minimum gain		Maximum gain	
	Left	Right	Left	Right
22 Hz to 22 kHz RMS	103.5 dB	106.2 dB	95.8 dB	97.8 dB
A-weighted RMS	111.1 dB	110.5 dB	99.4 dB	101.4 dB
CCIR-weighted RMS	104.9 dB	106.6 dB	91.6 dB	93.6 dB
CCIR-weighted quasi-peak	93.1 dB	100.2 dB	87.1 dB	89.4 dB

# ACOUSTICAL INTERFACE™ SYSTEM

PS9200 DUAL CHANNEL POWER SUPPLY



Shown PS9200, 4012 and 7013

**Precision Acoustical Measurements  
with FFT's, Scopes and Meters.**

**The system includes:**

- Type 1 Measurement Microphone(s), Companion Preamplifier(s) and Cables.
- Available in 1, 1/2 and 1/4 Inch Models.

**ACO Pacific, Inc.,** 2604 Read Avenue  
(415) 595-8588 Belmont, CA 94002

**ACOustics Begins with ACO**

# AKG ACOUSTICS

C 460 B comb-ULS/62 – The linear omni-directional condenser microphone.



**AKG  
Proudly  
Presents the  
New Ultra  
Linear Series  
Condenser  
Microphones  
of the Future:**

*The New Ultra Linear Series from AKG is a generation of microphones with unprecedented, truly linear characteristics. Low self noise combined with high headroom ensures a microphone dynamic range of at least 120 dB for the entire audio range. Direct A/B comparisons with conventional designs in their class will clearly reveal the excellent characteristics of the Ultra Linear Series microphones. Write for your free copy of the C 460 B comb-ULS brochure today.*

C 460 B comb-ULS/61 – The linear cardioid condenser microphone.



ADV 329/2/E



AKG Acoustics Ltd.  
Catteshall Wharf  
Catteshall Lane/  
Godalming  
Surrey GU7 1JG  
TF: (04868) 25702  
TX: 859013 akmic g

AKG AKUSTISCHE U. KINO-GERATE  
GESELLSCHAFT M.B.H.  
Brunnhildengasse 1  
A-1150 Wien, Austria  
TF: (43222) 95 65 17-0\*  
TX: (47) 131839 akgac a



# MUSTANG COMMUNICATIONS

PROFESSIONAL SOUND AMPLIFICATION

## COMPREHENSIVE POWER AMPS? ... specify MUSTANG VX range

only a year old but already establishing a reputation in the industry as nearly 20 years of Mustang design experience has resulted in a truly comprehensively engineered system like no other on the market. Very briefly, the Mustang VX features MOSFET, powers up to 1kW in 2U, optional input EQ modules, failsafe protection, easy field serviceability, fast delivery, and absolute dependability — just like the Company.



The Mustang catalogue gives the full specifications of all four VX units and over 100 other PA and sound related products, with their prices. Contact us now.

**MUSTANG COMMUNICATIONS**  
EASTFIELD, SCARBOROUGH, ENGLAND YO11 3UT  
Phone: 0723 582555 Telex: 527698

# REVIEW REVIEW

Technical power amplifier evaluations by Hugh Ford

The first sample of the amplifier exhibited excessive hum which I believe to have originated from a defective voltage regulator. This amplifier was very smartly replaced.

Noise in the inputs was measured at minimum and at maximum gain with the results shown in **Table 3** reference an output of 270 W into 8  $\Omega$ . Whilst noise at minimum gain is low, power line hum was a significant component of the noise, however, minimum gain is an unlikely operational condition and the hum is at a low level.

## Other matters

Crosstalk between the channels was very good as shown in **Fig 6** being 95 dB at 1 kHz. Phase shift from 2 Hz to 200 kHz is shown in **Fig 7** to be of little interest in the audio band.

Checking the front panel clipping indicators showed that they became illuminated at precisely the onset of clipping with the response time for a reasonably visible indication being 8 ms irrespective of frequency.

The amplifier had a completely clean recovery from symmetrical or asymmetrical overload without any DC shifting effects. Whilst DC protection operates by releasing the relays in both channel outputs substantial voltage swings could be output below 1 Hz before the DC protection operated.

Shorting the outputs had no undesirable effect with the amplifier simply shutting down to a low power if the output was shorted.

It was also noticed that the inputs are DC coupled to the input stages such that any DC present at the inputs may cause distortion.

## Summary

The construction quality is outstanding—I cannot recollect having seen an amplifier to match this one. Furthermore the concept of being able to disconnect the amplifier chain into three separate sections for servicing is excellent.

The simple and practical addition of duplicated input and output connections will be an advantage in sound reinforcement applications as will the high power fan cooling when rack-mounting but the addition of a second jack connector would aid 'daisy chaining'. The cooling fan was, however, very noisy and the manufacturer is considering versions with a special quiet fan. In my opinion many applications will not require fan cooling.

In terms of electronic performance this unit does not rank amongst the super hi-fi amplifiers which tend to suffer from reliability problems. Instead this is a unit designed to survive tough professional use with a realistic performance. □



# PERREUX PMF 5150B

**T**he Perreux *PMF 5150B* is a massive twin channel power amplifier, both in terms of its weight said to be 77 lb and its power output in the order of 1 kW per channel into 4  $\Omega$ . Primarily designed for mounting into a 19 in rack the amplifier is 6U high and is convection cooled by three large finned heatsinks which form either side of the amplifier. The sides are joined at the rear by a formed alloy section to which are fitted the two gold plated phono type input connectors, very large gold plated output terminals and five fuseholders in addition to the fixed input power line.

For the 230 V version (not 240 V) the power line fuses like the four fuses which protect the two sets of  $\pm 110$  VDC lines are rated at 8 A with a 15 A blow rating. This is the only form of protection in the amplifier which has no form of current limiting or low frequency protection.

At the front the sides are joined by heavy alloy extrusions to which is fitted an alloy front panel which contains the pushbutton power on/off switch and a power on LED. Sensibly the heavy single power transformer is mounted in an alloy screen behind the front panel, thus keeping the centre of gravity close to the rack mounting. Two heavy duty handles are fitted at the front and rear of the amplifier making handling easier and giving a degree of protection to the front and rear panel fits.

Within the vinyl-covered steel top and bottom covers, a single printed circuit board covers the base of the unit.

Separate secondary transformer windings are used for each amplifier channel with bridge rectifiers being heatsinked within the amplifier. Each channel has four 10,000  $\mu$ F capacitors mounted on to a reinforcement at the centre of the amplifier.

The low power stages are located at either side of the main printed circuit board with the 12 complementary MOSFET class A/B output devices for each channel connected directly to the printed circuit board.

Generally the standard of construction is very good and tidy with the use of high quality components and an excellent standard of workmanship.

## MANUFACTURER'S SPECIFICATION

**Continuous current output:** 30 A.  
**Voltage swing:** 220 V peak to peak.  
**Distortion:** 0.03% THD and IM under any and all conditions prior to clipping.  
**Open loop bandwidth:** greater than 500 kHz at 1 W.  
**Phase response:** +2° at 20 Hz, -2° at 30 kHz.  
**Rise time:** typically 1  $\mu$ s.  
**TIM distortion:** below residual of test equipment.  
**Frequency response:** 20 Hz to 20 kHz  $\pm 0.02$  dB.  
10 Hz to 100 kHz  $\pm 0.5$  dB.  
**Channel separation:** 60 dB or better 20 Hz to 20 kHz.  
**Hum and noise:** 100 dB below rated output, 20 Hz to 20 kHz unweighted.  
**Damping factor:** over 200 from 10 Hz to 1 kHz.  
**Input impedance:** 10 k $\Omega$ .  
**Input sensitivity:** 1.5 V RMS for rated output at 100 Hz.  
**Dimensions:** 480 mm (W)  $\times$  162 mm (H)  $\times$  525 mm (D) (19  $\times$  10  $\frac{1}{2}$   $\times$  20  $\frac{1}{2}$  in) **note:** add 45 mm (1  $\frac{1}{2}$  in) depth for front handles.  
**Manufacturer:** Perreux Sound Ltd, PO Box 847, Niven Street, Napier, New Zealand.  
**USA:** Perreux International, 875 Merrick Avenue, Westbury, New York 11590, USA.  
**UK Agent:** D W Labs Ltd, PO Box 43, Dunstable, Bedfordshire.

# REVIEW REVIEW

However the screws securing the top cover had left a small amount of metallic swarf within the amplifier. Whilst no servicing information was provided (there are two pre-set potentiometers per channel) components were properly identified.

Unfortunately I have two complaints concerning the electrical safety of this amplifier: firstly the neutral conductor of the incoming mains supply has a very insubstantial termination taking the form of a small section of printed circuit board secured to a single small bolt with the adjacent power line fuse not having an insulating boot.

Secondly the amplifier's capability of delivering at least 220 V peak to peak represents a life-threatening voltage. This threat is not indicated on the amplifier or in its instruction manual and the live output terminals are not protected from accidental contact. I consider this to be a very serious matter. (Please see 'Letters' for manufacturer's comment.)

## Inputs and outputs

The audio inputs offered an impedance of 15.5 k $\Omega$  in parallel with 72/100 pF for the two channels suitable for interfacing with any modern pre-amplifier of line level output. As the manufacturer is rather vague about the rated power output and specifies a rated input level of 1.5 VRMS the power output at this input level was determined.

At 1 kHz when driving both channels the outputs were 488/484 W into 8  $\Omega$  or 970/950 W into 4  $\Omega$  when driving single channels, the amplifier clipping with this input level when driving both channels into 4  $\Omega$  with 230 VAC at the mains input lead.

At the loudspeaker outputs the DC offset was 1/30 mV for the two channels which exhibited the same output impedance characteristics with a damping factor of 171 at 1 kHz reference 8  $\Omega$ . Fig 1 shows the relation between output impedance and frequency with the bumps in the plot at 50 Hz and 100 Hz resulting from beats with the power line frequency.

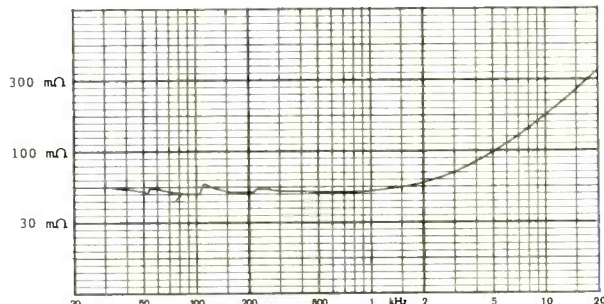
A matter which may be of concern is a very large inrush current at switch on. Whilst this does not appear at the amplifier outputs it could well upset other equipment—charging 80,000  $\mu$ F to 110 V with no current limiting is no mean matter with the surge current probably being hundreds of amps.

## Power and distortion

Power output and distortion parameters were determined using a stabilised supply at the manufacturer's rated input of 230 V  $\pm$ 0.5% at 50 Hz. Loading was achieved with multiple 250 W forced air cooled non-inductive 1% load resistors.

The power output at the onset of clipping for the two channels driving 8  $\Omega$

FIG 1  
PERREAUX PMF 5150B  
OUTPUT IMPEDANCE



# multimix

16:2:1 12:4:2:1 16:4:2:1

All from one 19" rack mount console

- 3 band Equalisation
- 2 auxiliary sends
- 90mm smooth action faders
- Mic and Line inputs
- Subgroup direct outputs
- RIAA equalised inputs
- Peak LED on inputs
- 12 way LED displays on masters
- Phantom power on every input
- 5532 Op-amps throughout



Hill Audio, Inc.  
231 Marquis Court  
Lilburn, GA 30247 USA  
(404) 923-3193  
TLX 293827 HLAD  
Headwater Industries  
635 Caron Avenue  
Windsor, Ontario N9E 5B8, Canada  
(519) 256-2454  
Hill Audio, Ltd.  
Hollingbourne House  
Hollingbourne, Kent ME17 1QJ, England  
(062 780) 555  
TLX 966641 HILL



# REVIEW REVIEW

and 4 Ω loads (at 1 kHz) is shown in **Table 1**.

The peak power handling capability was significantly higher than the results shown in **Table 1** with the following output being available with a 10 ms burst of 1 kHz sinewave every 100ms as shown in **Table 2**.

The ability to deliver such high peak powers into 2 Ω means that the amplifier can cope with any loudspeaker load where it is not uncommon for loudspeakers to have a true impedance of less than half their rated impedance at some frequencies.

Individual harmonic distortion was measured at a great variety of levels in both 4 Ω and 8 Ω loads and was found to consist mainly of the second and third harmonics with the less objectionable second harmonic predominating, both channels offering a closely matched performance.

At low powers the second and third harmonic remained below 0.01% into either 4 Ω or 8 Ω between 20 Hz and 20 kHz. **Fig 2** shows that for 900 W into 4 Ω harmonic distortion remained below 0.03% up to 18 kHz above which it rose slightly.

Total harmonic distortion was measured at 1 kHz, 10 kHz and 20 kHz at various powers into both 4 Ω and 8 Ω with no sign at all of crossover products, the distortion is shown in **Table 3**.

Intermodulation distortion was measured to the CCIF twin tone method using tones separated by 70 Hz under various conditions and found to be to a very high standard. The worst case, for 900 W peak equivalent output into 4 Ω is shown in **Fig 3** to remain very low up to 20 kHz above which it rose rapidly only at high powers.

The result of feeding a 1 kHz square wave into 8 Ω in parallel with 2 μF is

shown in **Fig 4** with the measured rise time of the amplifier being 1.75 μs and fall time 2.20 μs, both for 10% to 90% amplitude of a square wave fed into 8 Ω.

## Frequency response and noise

The frequency response at 1 W into 8 Ω is shown to be very flat within the audio band in **Fig 5** being +0/-0.4 dB from 10 Hz to 60 kHz. As a matter of interest the manufacturers claim of ±0.02 dB from 20 Hz to 20 kHz was checked at 1 W output and found to be justified.

At higher powers the low frequency response remained static with the upper high frequency limit lowering to -3 dB at 120 kHz when delivering 450 W into 8 Ω with no significant change at 20 kHz.

Noise in the output was identical for the two channels and depended upon the

**TABLE 1**  
Power output at clipping

	Left	Right
Both channels into 8 Ω	540 W	540 W
Single channels into 8 Ω	580 W	580 W
Both channels into 4 Ω	910 W	910 W
Single channels into 4 Ω	1050 W	1030 W

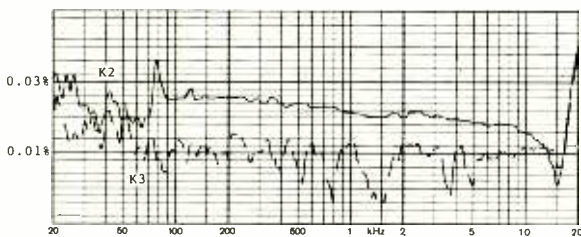
**TABLE 2**  
Burst power output at clipping—single channels

Load	Left	Right
8 Ω	625 W	625 W
4 Ω	1230 W	1210 W
2 Ω	2070 W	2070 W

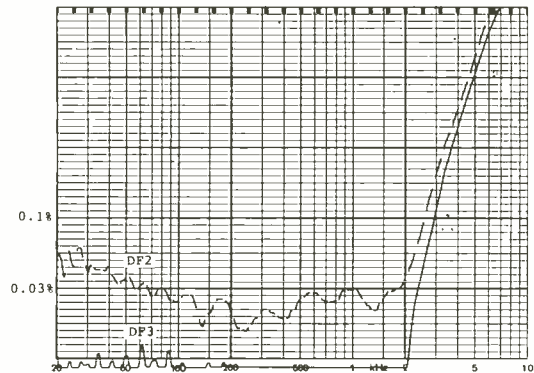
**TABLE 3**  
Power output

Power output	900 W	450 W	100 W	10 W
8 Ω	1 kHz	0.0055%	0.005%	<noise
	10 kHz	0.018%	0.0077%	0.0048%
	20 kHz	0.035%	0.015%	0.0078%
4 Ω	1 kHz	0.006%	0.0053%	0.006%
	10 kHz	0.030%	0.016%	0.010%
	20 kHz	0.150%	0.028%	0.0145%

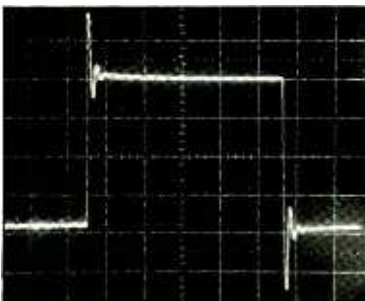
**FIG 2**  
PERREAUX PMF 5150B  
HARMONIC DISTORTION AT 900 INTO 4 Ω



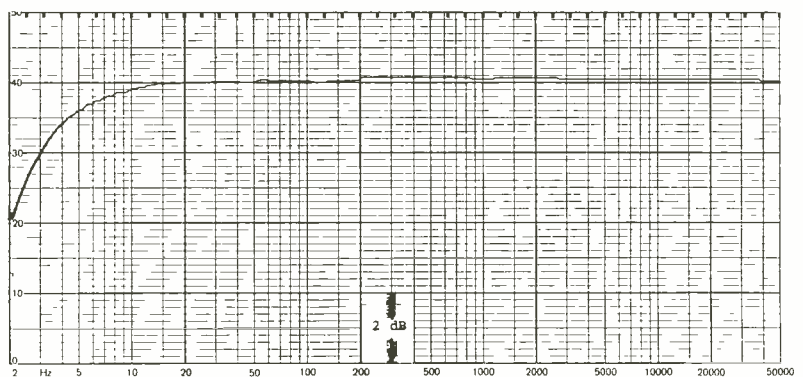
**FIG 3**  
PERREAUX PMF 5150B  
CCIF IM DISTORTION  
(MULTIPLY FREQUENCY SCALE BY 10)



**FIG 4**  
PERREAUX PMF 5150B  
1 kHz SQUAREWAVE INTO 8 Ω



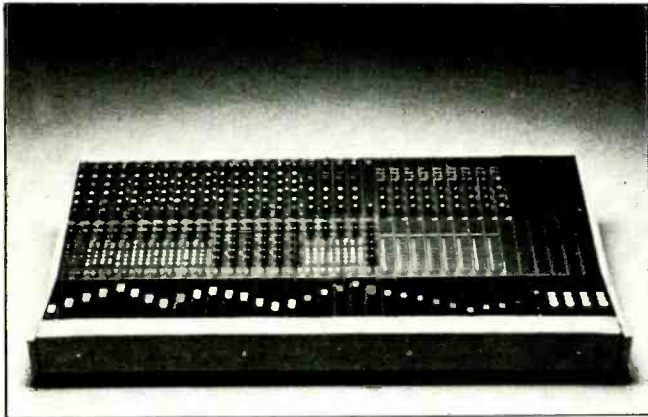
**FIG 5**  
PERREAUX PMF 5150B  
FREQUENCY RESPONSE AT 1 W





# MS-MULTIMIX

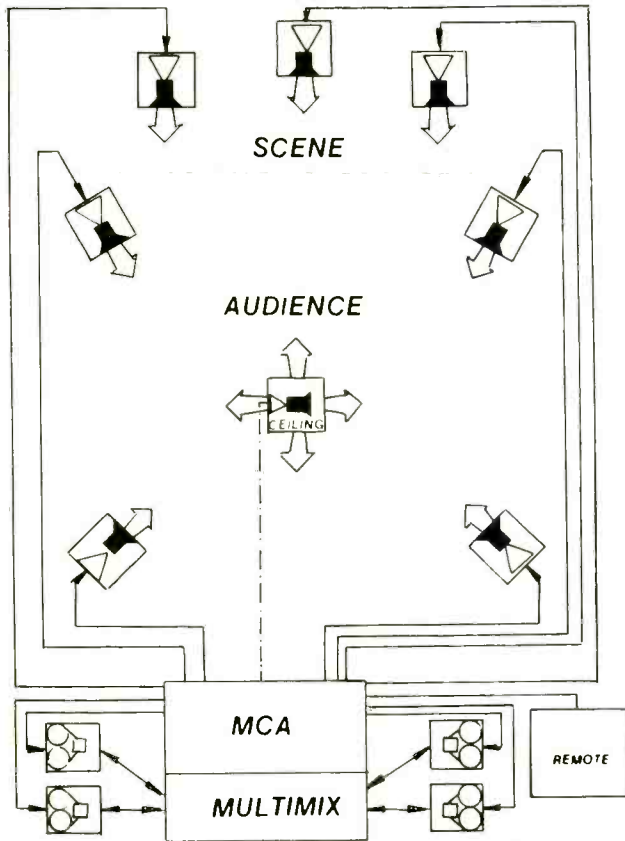
## TOTALLY MODULAR



- True modularity to really meet your requirements, in theater and multipurpose hall installations.
- A family of some 20 different input, grouping, fader, metering and output modules.
- Special modules for control room and headphone monitoring, test signals, talkback, remote control etc.
- Heavy duty steel chassis
- Transformer balanced inputs and outputs.
- Wide range meters, 60dB display

### MCA; MICROCOMPUTER CONTROLLED AUDIO SYSTEM

- Stores up to 600 cues (scenes) on floppy disk
- Controls up to four tape recorders.
- Assignable digital fader and meter to set and control output levels.
- Eight output groups.
- System operation by single cue entry push button.
- Pocket terminal for remote control and cueing.
- Optional speaker switching matrix.



**MS-AUDIOTRON**

Laitilantie 10 00420 HELSINKI 42  
 FINLAND ☎ 90-5664644  
 Telex: 125778 msa sf

# ams

## AUDIOFILE

## THE PROGRAMMABLE MULTITRACK

# ams

• ADVANCED MUSIC SYSTEMS •

Wallstreams Lane, Worsthorne, Burnley, Lancs,  
 BB10 3PP, England.

Tel: (0282) 57011 Telex 63108 AMS-G.



# REVIEW REVIEW

FIG 6  
PERREAUX PMF 5150B  
CROSSTALK

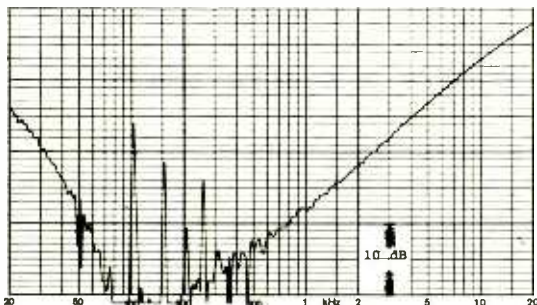


FIG 7  
PERREAUX PMF 5150B  
PHASE SHIFT  $\pm 25^\circ$  ZERO LEVEL  $-25^\circ$

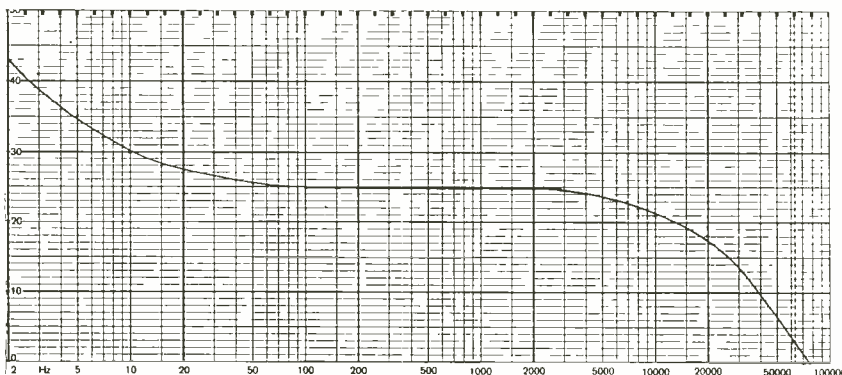


TABLE 4

22 Hz to 22 kHz RMS  
A weighted RMS  
CCIR weighted RMS  
CCIR weighted QUASI-PEAK  
CCIR ARM ref 2 kHz

Noise referred to 450 W into 8  $\Omega$

Power on	Power off
-107 dB	-118 dB
-116 dB	-123 dB
-112 dB	-114 dB
-106 dB	-109 dB
-119 dB	-120 dB

source impedance of the inputs, however in practice a low impedance source will normally be used, thus the noise was measured with the inputs shorted. Hum in the outputs was a major source of noise, therefore the output noise was measured with the amplifier powered at 230 VAC and with the power switched off. In the latter condition the smoothing capacitors keep the amplifier powered for quite a long time.

Clearly the noise performance is good as shown in Table 4 but, it seems a shame that mains hum degrades the output noise which could be audible in some more remote circumstances.

## Other matters

Crosstalk between the two channels was low as shown in Fig 6 which is far better than the manufacturer's claimed 60 dB from 20 Hz to 20 kHz. On the other hand the phase shift shown in Fig 7, whilst being minimal in the audio band, disagrees with the claimed  $-2^\circ$  at 20 kHz where the phase shift was  $-7.3^\circ$ .

Applying asymmetrical bursts into overload and other signals likely to provoke instability showed the amplifier to recover from overload without any undesirable effects.

Mains power consumption was constant with frequency in view of the use of fast output devices, with the efficiency of the amplifier being around 50% when working at full power into 4  $\Omega$ .

Subjective testing on a number of 'awkward' compact disc recordings confirmed that the amplifier had an excellent performance with an overall clean sound with particularly good control of low frequencies. Good compact disc recordings are particularly taxing on power amplifiers in view of the capability of recording very high level transients. Driving this amplifier into clipping did not produce any particularly unpleasant sounds and with some compact discs the delivery of 900 W into 4  $\Omega$  on peaks is not all that loud a level—less than many control rooms.

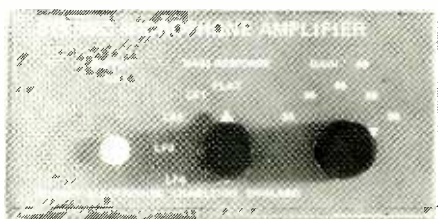
## Summary

This is clearly a top class high power

amplifier which measures well and sounds good. The only matter of direct concern is the electrical safety which can be easily improved and the large inrush current on switch on.

Always running cool without the use of forced air cooling makes this unit attractive for control room use and for other applications where the noise of cooling fans cannot be tolerated. Being a high power amplifier without any form of protection, except fuses in the power supplies, care is needed in the selection of a suitable pre-amplifier or input filtering. Accidentally dropping a pickup arm or rewinding tape with the gain turned up will almost certainly destroy any loudspeaker that does not have in built protection.

## STEREO MICROPHONE AMPLIFIER



- \*50 or 200 Ohm balanced microphones to balanced lines
- \*Variety of low frequency characteristics for improving the clarity of recordings
- \*Inputs filtered against radio interference
- \*Complete boxed unit or double mumetal screened amplifier module alone

SURREY ELECTRONICS LTD, The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG  
Tel. 0483 275997



## The New Shure FP31. Makes light work of ENG mixing.

The Shure FP31 is a 3-in 1-out mixer specifically designed for ENG crews demanding a professional audio mixer in the smallest, lightest package possible. Powered by standard 9V batteries or external power source, and with an impressive array of features including built-in slate microphone, the FP31 offers a unique combination of performance and portability. Contact HW International for full details.

# SHURE®

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

# Subscribe Now.

**STUDIO  
SOUND**  
AND BROADCAST ENGINEERING

### JOIN THE AUDIO PROFESSIONALS

You're obviously interested in professional audio.

You want to know what's going on in the world of professional sound, be it in music recording, new equipment, techniques or live sound reinforcement.

There's only one answer, subscribe to  
**STUDIO SOUND.**

STUDIO SOUND gives you the hard facts, techniques and opinions which cannot be matched by any other publication in the field.

**Keep in touch  
Subscribe to Studio Sound Now  
The International Publication for the  
Professionals in Sound**

Please send me \_\_\_\_\_ magazine for 12 issues.  
I enclose a cheque/postal order/International Money Order  
payable to LINK HOUSE MAGAZINES for £18.00 UK or  
£24.50 Overseas. US rates: \$40 surface, \$75 airmail.

Or debit my credit card account

VISA

MasterCard

Access

AMERICAN EXPRESS

(please tick box)

CREDIT CARD NO. \_\_\_\_\_

SIGNATURE \_\_\_\_\_  Credit card holders can order  
simply by ringing 01-760 0054,  
quoting your credit card number

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

(please print in block capitals)

Commencing with the \_\_\_\_\_ issue I understand that I am  
committed to one year's subscription to the above magazine, and should I wish to  
cancel my subscription, no refund will be made.

To:  
The Subscriptions Department, Link House Magazines Ltd.,  
Central House, 27 Park Street, Croydon CR10 1YD.  
Tel: 01-760 0054

# CLASSIFIEDS

Advertisements for this section must be pre-paid. The rate is 50p per word, minimum £12.50. Box Nos. £3.00 extra. Semi-display rates on application. Copy and remittance for advertisements in APRIL issue must reach these offices by 12th FEBRUARY addressed to: The Advertisement Manager, **Studio Sound**, Link House, Dingwall Avenue, Croydon CR9 2TA. Cheques made payable to Link House Publications (Croydon) Ltd. **Note:** Advertisement copy must be clearly printed in block capitals or typewritten.

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

The attention of advertisers is drawn to "The Business Advertisements (Disclosure) Order 1977", which requires that, from 1st January 1978, all advertisements by persons who seek to sell goods in the course of business must make that fact clear. From the above date consumers therefore should know whether an advertisement relates to a sale by a trader or a private seller.

## SERVICES

**MUSIC SUITE**—Low cost real time cassette duplication. Labels, blank cassettes, boxes, etc.—Fast and efficient service. Phone for price list 0239 711032 (C)

**QUALITY HIGH-SPEED** and real-time audio and video cassette copying and processing. Any quantity. While you wait. 24-hour, 7-days-a-week service. Central London W2. GWBB Audiovision. Tel: 01-723 1583/5190. (X)

**CASSETTE LABELS PRINTED.** Self-adhesive or plain, also inlay cards, any quantity supplied, small orders welcome. High quality—low cost. Samples/price list. Tel: 0326 313605. (B)

**THE COMPLETE SERVICE.** Disc cutting (masters and demos), pressings, sleeves, cassettes, labels. Fixed and mobile recording studios. Free brochure. TAM STUDIO, 13a Hamilton Way, London N3. Tel. 01-346 0033 (X)

**WHO SAYS YOU DON'T NOTICE THESE SMALL ADS!** For as little as £12.50 + VAT you too could be getting your service message across. For more details contact Adrian Tippin at STUDIO SOUND. Tel: 01-686 2599.

### MAGNETIC TAPE/FILM HEADS

\*We manufacture to order, ¼", ½", 1" and 2" tape heads and a wide variety of film heads at very competitive prices. Please specify machine type for an early quotation.  
\*We also offer a prompt RELAPPING service at standard prices.

BRANCH & APPLEBY LTD.  
Stonefield Way, Ruislip, Middx. HA4 0YL  
Tel. 01-864 1577

### CASSETTE DUPLICATORS

**SALES SERVICE MAINTENANCE**  
High speed cassette duplicators throughout the United Kingdom and export

GRAFF WOLLENSAK SONY  
**Sound Cassette Services Ltd.**  
P.O. Box 2, Chard, Somerset  
0460 67237

**LONDON SERVICING FACILITIES**

*Check It Out...*

**DIRECT FROM OUR MODERN U.K. PRESSING PLANT**

- CUTTING · PRESSING
- TEST PRESSING
- LABELS · SLEEVES
- CASSETTES
- ARTWORK
- COMPETITIVE PRICES

**MARKET LEADERS**

**SRT**

**01-446 3218**

100 C-60 cassettes beautifully copied in stereo from £59.50 (plus VAT)  
We can copy from 100 to 5,000 high quality cassettes on our high speed loop-bin system, load them precisely into top-class shells. Price includes library case and all production work from your ¼ in edited master. Any length C-5 to C-90. Ring for price check.

### STUDIO REPUBLIC

47 High Street, Pinner 01-863 5555 · 01-866 5555



**THE CASSETTE DUPLICATING SPECIALISTS**  
Real time & high speed duplication  
Blank cassettes wound to length  
TEL: 061-881 2402

**Let Saki expertise relap your tape heads in London**

Factory-approved laboratory and training guarantees finish to original performance specification

**ALL MAKES RELAPPED**

Tapetek, 44A Brighton Road, London N16 8EG  
Tel: 01-254 5203 or 0860 317260 (mobile)

Replacement Saki heads from:  
Tape Marketing, 13 Elm Road  
Faringdon, Oxon SN7 7EJ



### SPEEDY REVOX SERVICE

Plus TEAC/TASCAM, FOSTEX, UHER, most Mixers.  
Amplifiers, Effects. Priority Bookings taken  
Collection/Delivery arranged.  
A personal service by experienced engineers.

34 Danbury Street, London N1 8JU  
Telephone 01-359 9342/3030

### RAPER & WAYMAN

### WHY PAY LONDON RATES?

Professional Disc Mastering operation offering top quality with over 20 years experience. Contact Brian East, "Suncliffe", 43 Sandgate Hill, Folkestone, Kent.

### SPECTRUM SOUND

0303 38752

**CASSETTE DUPLICATING:**  
**GAUSS** Loop-Bin / **TELEX** In-Cassette  
High Quality Blanks / Label Printing  
**OPEN REEL DUPLICATING**

(ANY SPEED - ALSO TO BROADCAST SPEC.)

**SPEECH RECORDING**

(VOICE - OVERS; LANGUAGES; AUDIO - VISUALS)

**SPEECH-PLUS RECORDINGS LTD.**

UNIT 32, NO. 19, PAGES WALK, LONDON SE1 4SB. TEL: 01-231 0961

CLASSIFIEDS

## SERVICES

### HIGH QUALITY CASSETTE DUPLICATION AND SPECIALISED LENGTH BLANK CASSETTES

ICM C-O's

*Leeholme Audio* AGFA/BASF TAPES

Leeholme Audio Services Ltd., 350-4 Leabridge Road, Leyton, London, E10 Telephone 01-556 4748

### Revox & Uher Sales & Service

16mm sound 35mm slide projectors, open reel and cassette recorders, amplifiers, etc., serviced and repaired. Bell & Howell, Elf, Ferrograph, Revox, Tandberg, Uher approved service agents. Maintenance contracts available. Visit our Amateur Radio Showroom at:- 58 High Street, Newport Pagnell. Tel: 0908 610625.

### Photo Acoustics Ltd

### REAL TIME CASSETTE DUPLICATION

Dolby B/C Standard / Chrome Tape

CUSTOM WOUND BLANK CASSETTES

Tel: Cardiff (0222) 790040

Backyard Recording Studios Ltd.  
60 Orchard Park, St. Mellons Cardiff

**backyard**  
STUDIO

## ANALOGUE/ DIGITAL TAPE

At Playback we sell BLANK TAPE ( & DISKS). In fact we stock everything from an analogue TDK D46 through to digital AMPEX 467. In VIDEO we stock all formats - 1" down to 8mm. Our FLOPPYS work in SSLs and LINN drum machines. We are very pleased with the companies we keep.

TDK · SONY · MAXELL  
AGFA · AMPEX · FUJI · BASF

## Playback

15 PERCY STREET  
LONDON W1P 1FD  
TEL: 01-637 8392

### MEASURE IT

If you can hear it we can measure it and whats more tell you what to do with the minimum of inconvenience.

MUNRO ASSOCIATES. 01-480 7121

### THE SOUND & VISION WORKSHOP LIMITED

**3M**  
SPARES  
SERVICE

SOLE  
U.K.  
AGENTS

COMPETITIVE 3M HEAD PRICES  
EXCHANGE MOTORS AND  
BOARDS. ALL SPARES IN STOCK.  
EXPORT ENQUIRIES WELCOME

SERVICE FOR ALL MULTITRACK RECORDERS · SPARES · REBUILDS  
PROFESSIONAL AUDIO ELECTRONICS · SALES · EQUIPMENT

153A Victoria Street,  
St. Albans, Herts. AL1 3TA  
Tel: (0727) 58977 24hr.

### YOU NEED IT... WE SUPPLY IT

Precision wound cassettes, high speed duplication. Both using Ampex, Basf, Capital open reel copying. Full printing facilities (side labels & inlays). Major suppliers of Ampex open reel tape. Also razors, leader tape, splicing tape spools and boxes, etc., etc

Rainhill Tape Specialists  
31 Eccleston Street  
Prescot, Merseyside L34 5QA  
051-430 9001

### SELF ADHESIVE CASSETTE LABELS

We are specialists in self adhesive cassette & computer labels and can supply them in a wide variety of formats. Send or phone for our full price list and size chart. Telephone (0795) 28425 - 24 hours

INDUSTRIAL PROCESS - Self Adhesive Labels SUPERFAST  
UNIT A4, SMEED-DEAN CENTRE  
SITTINGBOURNE, KENT ME10 3RN, ENGLAND

J&S records

### MUSIC-SPEECH-COMPUTER

REAL-TIME or (Slow) HIGH-SPEED Quality Cassette Duplication and Blanks from 1 to 1000+. Computer printed Cassette Labels, Speech and 1/4" reel-to-reel recording/editing. Fast Security Delivery service.

J&S records - a division of FILTERBOND LTD.  
19 Sadlers Way, Hertford SG14 2DZ. 0992-551188.

## SOUND BUSINESS

The home of home studio recording onwards and upwards to the fully professional



Suppliers of all Studio Equipment and Musical Instruments - New and Secondhand

PLUS: STUDIO TECHNICAL INFORMATION SERVICE  
SUPPLY AND INSTALLATION · RECORD PRODUCTION  
SOUND BUSINESS LABEL 'MAGIC TUNNEL RECORDS'.  
SUPPLIERS OF: TASCAM · YAMAHA · FOSTEX · DRAWMER  
ALLEN & HEATH · STUDIOMASTER · SOUNDCRAFT  
ELECTROVOICE · TANNOY · JBL · AKG · LEXICON · DBX  
AMEK · BELL · SOUNDTRACS · ORBAN · REBIS · MTR  
LYREC · TRIDENT · AMPEX TAPE · DYNAMIX · ETC, ETC  
BEST PRICES - MANY SPECIAL DISCOUNTS  
FULL BACK-UP

Open 7 days a week, 9am to 9pm. LONDON CENTRAL LINE

SOUND BUSINESS HOUSE  
SOUTH WOODFORD, LONDON E18 1DG  
TEL: 01-989 6359

### WEST 5 Tapes Ltd.

Rapid supply of high quality blank bulk cassettes C1-C120  
Example C60 31p

5-screw C-Zero - no minimum or maximum order

Phone Dave West 01-502 2447  
West 5 Tapes Ltd, Unit 34, Oakwood Hill  
Industrial Estate, Loughton, Essex

### QUALITY CASSETTE COPYING

High speed on Loop Bin System/Real time on Nakamichi Machines. Exact length blank cassettes

ACCURATE SOUND LIMITED  
Melton Road, Queniborough Industrial Estate  
Queniborough, Leicester LE7 8FP  
Telephone (0533) 602064

### REAL TIME CASSETTE COPYING

All work carried out on Nakamichi machines to the highest standard. Normal or chrome tape available.

We also supply blank cassettes wound to length. AGFA, BASF Chrome and Maxell XLII tape available.

GATEWAY CASSETTE SERVICES  
1 GAUDEN ROAD, LONDON SW4 6LR  
TEL: 01-627 4758

### FOR ALL YOUR RECORDING NEEDS

AMPEX AUDIO AND VIDEO TAPE MAIN DISTRIBUTORS  
Spools, boxes, blades, splicing and leader tape. Blank precision wound cassettes C1-120, labels, library cases and cards. C-zeros, pancake, etc. Broadcast Cartridges.



103 Washway Road  
Sale, Cheshire M33 1TY  
Tel: 061-905 1127

FOR QUALITY, PRICE AND SERVICE

### BOOMLESS BOGIE IN BUCKS!!

Best wishes to Barry (purple bits) Caws with his "flat as a pancake" monitoring, in the new 8 track writing demo facility the Boogie Bunker at High Wycombe

Well you came to the right people didn't you  
Boomless pancakes & Boogie, for not a tot of Bucks

STUDIO INNOVATIONS

740 6060

661 9380

### FOR SALE-TRADE

FOR SALE SONY DRE-2000 digital reverb. Stlg. 4,700, tax excluded. Write M. Lunt, 50, av. du Daim, 1170 Brussels, Belgium or telex 20558 Brussels.

JBL - 4341 4-way studio monitors. Walnut cabinet. New, never used. In maker's box. Circumstances forces sale. Cost £3,200. Negotiable for quick sale £1,450 o.n.o. Tel: 01-908 3967.

USED STUDIO EQUIPMENT FOR SALE? Advertise it now in STUDIO SOUND CLASSIFIEDS for as little as £12.50 + VAT. For more details call Adrian Tiffin at STUDIO SOUND. Tel: 01-686 2599.

DISC CUTTING EQUIPMENT and systems bought, sold, installed and manufactured (under licence from ORTOFON). TAM/ENGLAND, 13a Hamilton Way, London N3 1AN. Telephone 01-346 0033. (X)

TEAC 244/34/38 discounts and HP and leasing. Erricks VCD, Brighthouse 722121 (Bob) (X)

### USED EQUIPMENT PACKAGES

Don Larking Audio Sales has masses of used equipment taken in part exchange and available at very competitive prices

PACKAGE 1 24-TRACK  
SOUNDCRAFT SCM762 24 track recorder with autolocator RAINDIRK Concord 28 input in line console plus set of interconnecting cables £16,500

PACKAGE 2 24-TRACK  
SOUNDCRAFT SCM762 24 track recorder with remote control SOUNDCRAFT HIB 32 input console with professional patchbay, plus set of interconnecting cables £18,000

PACKAGE 3 16-TRACK  
MCI 16 track 2" recorder with remote control AMEK 2000 20 input in line console plus set of interconnecting cables £7,000  
PACKAGE 4 16-TRACK  
FOSTEX B 16 16 track "i" machine MCI 400 in line mixing console plus set of interconnecting cables £6,000

ALSO IN STOCK:  
3M 16 and 24 track machines STUDER 16 and 24 track machines AMPEX MM1200 24 track machine PLUS wide variety of mixing consoles and outboard equipment

Don Larking  
audio sales

Luton 29 Guildford Street Luton Beds  
Telephone Luton (0582) 450066 Telex 825488 DONLAR G

## CLASSIFIEDS

## FOR SALE—TRADE

### FOR SALE

In MCI 556C console Plasma — Spectra view MCI automation. 1st class condition ..... £64,000

Melquist VCA Faders Retrofit for various consoles. Will adapt to Melquist or Allison Automation 45 faders (includes 8 group masters and power supply) ..... £2,250

B+K Sound Level Meter Model 2203 with 1/3 octave filter set model 1616 and noise generator model 1405..... £2,000

For more details

TEL: VIDEO SONICS on 482 2855

Rebis Omega mixing console 30 into 24 with optimix 48-way computer mix down facility including full patch bay.

Superb condition £16,500 + VAT

Telephone Bill Cayley on:  
01-609 0246

## AUDIO SERVICES SECOND HAND BARGAIN SALE S.E.L.E.C.T.I.O.N.

- 1) BRENNEL MINI 8, F/C, Remote, Timer £1,995
- 2) AHB MOD III 16:8, F/C, cw. 50Mtr multicores £995
- 3) Loads of NEUMANN VALVE MICS £POA
- 4) SOUNDCRAFT SCM 762 2'16T with M and A 26:16:2 DESK cw. STAND, 384 hole bantam patch bay, full REBIS rack plus full function remote £8,950
- 5) Loads of S/H AKG C451EB's and loads of CK capsules £POA
- 6) AKG C414E, good cond £295
- 7) SHURE SM 81, superb (4 available) £225 each
- 8) FOSTEX B16, 12 months old, still boxed £2,750
- 9) ALLEN & HEATH SYSTEM 8 MK II 168, mint £1,195
- 10) MCI JH110BC 1" PRO 8T, bargain £2,495
- 11) TRIDENT TRIMIX 10:8 in 18 way frame, perfect £1,595
- 12) SONY PCM 701ES, only 6 months old £595
- 13) TASCAM 34, used £595
- 14) TASCAM 234, mint £395
- 15) DYNAMIX D3000, 16:8:2, ex-demo £1,650
- 16) PACE EP141 comp/lim, S/H (2 available) £95 each
- 17) TEAC 80-8, 2 years old, v.g.c. £1,250
- 18) TASCAM 52 IEC/NAB SWITCHABLE, demo model £1,595
- 19) REVOX G36, good cond £395
- 20) TASCAM 38, boxed, immaculate £1,450
- 21) FOSTEX A-8, 18 months old £850
- 22) A&DR F760 RXS compex limiter, immaculate £795
- 23) AUDIO DEVELOPMENTS 18:8:2, P&G faders exc cond £995
- 24) YAMAHA CP80, 2 F/C £ offers
- 25) QUAD-EIGHT CPR 16 DIGITAL REVERB £795
- 26) MASTERROOM MR2 £295
- 27) AMPEX MM1000 1" 8T, nice little runner £995

**06632 4244 | 01-586 3167**

Studio House, 4 Wellington Road  
High Lane Village, St. Johns Wood,  
Nr Stockport SK6 8AA London NW8

TELEX  
665721 SOTA



Your Northern appointed agent for:

NEUMANN	J B L	LEXICON	SOUNDCRAFT
SENNHEISER	TANNOY	DRAWMER	STUDIOMASTER
SHURE	REVOX	D B X	B. E. L.
BEYER	TASCAM	YAMAHA	APHEX
UREI	QUAD	AMPEX	APPLIED
			MICROSYSTEMS

18-42 Charlotte Street, WAKEFIELD, W. Yorks WF1 1UH  
Tel: (0924) 371766

## EQUIPMENT FOR SALE



USED SOUND EQUIPMENT

### SALE

1 x dbx 500 BOOM BOX	£100.00
1 x dbx 503 DYNAMIC RANGE EXPANDER	£150.00
1 x DELTALAB DL-2 ACOUSTIC COMPUTER	£450.00
3 x SCAMP RACK AND POWER SUPPLY	£130.00 EACH
2 x S04 PARAMETRIC EQUALISER MODULES	£100.00 EACH
1 x S01 COMPRESSOR MODULE	£90.00
1 x S06 DYNAMIC NOISE GATE	£85.00
1 x S24 ADI MODULE	£165.00
5 x S08 DISTRIBUTION AMPLIFIER	£110.00 EACH
2 x S100 DUAL GATE	£80.00 EACH
1 x S05 DYNAMIC NOISE GATE	£85.00
1 x S23 PAN MODULE	£110.00
1 x UREI 560 FEEDBACK SUPPRESSOR	£150.00
1 x TRIDENT CB9066 PARAMETRIC EQUALISER	£150.00
1 x LEXICON MODEL 92 DIGITAL DELAY	£360.00
1 x KLARK TEKNIK 36 ANALOGUE TIME PROCESSOR	£250.00
3 x TEAC AN180 NOISE REDUCTION UNITS	£50.00 EACH
1 x TEAC AN80 NOISE REDUCTION UNIT	£50.00
6 x ELECTROVOICE LR4B	£120.00 EACH
1 x NAGRA III MONO TAPE MACHINE	£1,000.00
2 x EXR AURAL EXCITER	£200.00 EACH
2 x TRIDENT TRIMIX 31/88 THEATRE MATRIX CONSOLE	£4,850.00 EACH
1 x TRIDENT TRIMIX 39/88 THEATRE MATRIX CONSOLE	£5,800.00

VARIOUS TRIDENT FLEXIMIX FRAMES AND MODULES

8-WAY EMPTY FRAME	£150.00
15-WAY EMPTY FRAME	£165.00
INPUT MODULE	£50.00
SUB-GROUP MODULE	£40.00
STEREO OUTPUT MODULE	£60.00

Contact: AUTOGRAPH SOUND RECORDING  
2 Spring Place, London NW5 3BA  
01-485 4515 10am to 9.30pm

## FOR SALE—PRIVATE

QUANTEC ROOM SIMULATOR. Immaculate condition/boxed. Top model, ie 2 in 4 out option. From writers home studio. Offers invited. Tel: 0273 770734. (B).

E.M.T. K140 STEREO REVERB PLATE. Value £1,800. Also A.K.G. BX15 Reverb £500. Studio mics — much and various — best makes. Phone for details. 01-521 2040.

RECORDING CONSOLE. NEVE 36-channel input, 16 subgroups, 48-track monitors all available on remix. With 6 Neve compressor/limiters and completely comprehensive patchbay. Offers. 01-521 2040.

COLLECTORS. BBC AXBT-type ribbon microphone. Excellent working order. Colin Bateman, Stonesfield (099 389) 8282.

AMEK ANGELA 28x24+ patchbay. 2 years old. VCA's not fitted. £13,000. Q-Lock interface cables and card+eproms for Ampex 100 recorder £175. Eventide Flanger £150. Rebis rack, equalisers, gates £45. Rack £100, compressors £55. Tel: 01-671 3731.

## FOR HIRE

# DIGITAL AUDIO RENTALS

SONY DIGITAL

PCM 1630 DIGITAL AUDIO PROCESSORS

5850D/A U-MATIC RECORDERS

DMR 2000 U-MATIC RECORDERS

PCM 1610 DIGITAL AUDIO PROCESSORS

DAE 1100 DIGITAL AUDIO EDITOR

PCM F1 DIGITAL AUDIO PROCESSORS

SLF1 BETAMAX RECORDERS

DTA 2000 TAPE ANALYSIS

FULLY EQUIPPED AIR CONDITIONED  
DIGITAL EDITING & TRANSFER FACILITY



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

## SAM THERAPY

FOR AURAL EXCITEMENT

FAIRLIGHT + . . .

32-TRACK STUDIO

Tel: 01-221 5967/960 1336

THE  
P.A.  
COMPANY  
HIRE • SALES  
INSTALLATIONS  
01-607 0087  
PROFESSIONAL SOUND SYSTEMS AND  
CONTROL EQUIPMENT (TOYS)

## MIDI SYSTEMS

01-995 4730  
24 HOUR SERVICE

WE HIRE

Personal Multitrack systems from a Portastudio to a full 16-track home recording package.

A range of the latest and most cost-effective digital f/x for use at home or in the studio.

Comprehensive range of signal processors, mics and studio monitors to complete your package.

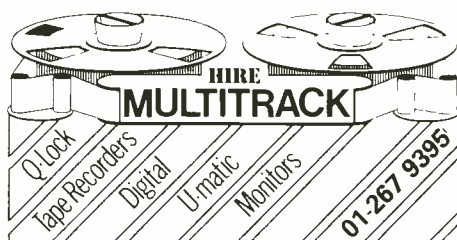
The latest MIDI compatible keyboards, expander modules, sequencers and interfacing equipment.

Digital Drum Machines, some with alternative sounds and Simmons electronic drum kits.

Our large range of equipment is being constantly revised so send for the latest edition of our professional hire list

## CLASSIFIEDS

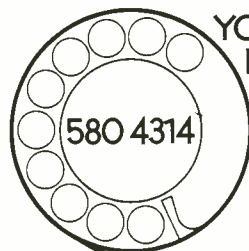
## FOR HIRE



## TECRON TEF 10

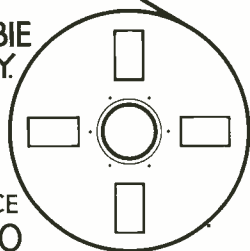
Time Energy Frequency  
Measurement Service

**MUNRO ASSOCIATES. 01-480 7121**



YOU'RE SEVEN  
DIGITS AWAY  
FROM  
THE BEST  
DIGITAL HIRE  
IN TOWN.

CALL DEBBIE  
OR BEVERLEY.



24 HOUR SERVICE  
0836-211 330

## WORKING IN THE USA?



"THE AUDIO RENTAL PEOPLE"

Complete selection of pro audio equipment for hire.  
Outboard Equip ★ Digital Recorders ★ Walkie Talkies  
A/T Scharff Rentals. 1619 Broadway, New York.  
Phone (212) 582-7360/IMC(367)/MCI Mail 260-0455



LEXICON 224XL LARC  
AMS 15-80s 6.4sec/1.6sec  
PUBLISON INFERNAL MACHINE 90:  
- 21 SEC. STEREO SAMPLING

**01-228 0984**

## EMULATOR II

PLUS FULL SOUND LIBRARY

ALSO: LINN DRUM, SIMMONS KIT, KEYBOARDS ETC.

**STUDIO SUPPLY SERVICE**  
061 928 5037

THE MANCHESTER BASED HIRE COMPANY

## STUDIO FOR SALE

Recording Studios  
HAMPSTEAD NW2

24-track studio for sale  
Freehold.

**CHISWICK W4**

8-track studio, leasehold  
Ref. SRG: Teacher, Marks & Co  
01-493 4422

## FOR SALE

24 TRACK STUDIO

JACKSON MUSIC GROUP  
The Studios, Rickmansworth,  
Herts. England WD3 2XD

Telephone: 0923 772351 or Vodafone 0836 203557

## STUDIO DESIGNERS AND CONSULTANTS

## TIME DELAY SPECTROMETRY

Discover why your studio sounds  
the way it does... or should

**MUNRO ASSOCIATES. 01-480 7121**

## STUDIO CONSTRUCTION

Studio environments built to the highest standards.

Our services include:

Fully engineered floating floors, suspended ceilings, high density doors, sound  
lock lobbies, concrete and brickwork, double glazing, low frequency absorbers,  
attenuated ventilation systems, insulating sealants, acoustic screens, electrical  
and electronic installation, equipment sales and commissioning

U.K. and international projects undertaken

Planning, design and materials export.

Ring **RECORD CONSTRUCTION LTD**  
01-985 7573 - London, England

## KENNETH SHEARER AND ASSOCIATES

Consultants in acoustics and noise control

Over 30 years' experience in the custom design of all  
kinds of recording and TV studios, remix, dubbing and  
viewing suites - new and conversions, down to 25 Hz.

**Tel: 0442 54821**

## WANTED

TANNOY BUCKINGHAM MONITORS no  
longer required? I need a pair, in good to  
excellent condition, at a reasonable price. Tel:  
01-568 2765.

## WANTED

## WANTED DEAD OR ALIVE

Neumann valve mics  
Types U47, U48, U67  
Tel: 01-387 9356

## APPOINTMENTS



Appointment Services Ltd  
International Technical  
Recruitment Consultants  
Charles House,  
7 Leicester Place  
London WC2H 7BP  
Telephone 01-437 9282, 25 lines

## WHAT ARE YOUR PROSPECTS IN 86?

As the world leader in the  
recruitment of professional audio  
personnel at all levels from junior  
engineers to managing directors.

If you would like to discuss  
any recruitment requirements,  
expansion programmes, or see  
what possibilities are available for  
you! Then call us on

**01-437 9282.**

*If you  
have a product  
or service you  
want to  
promote  
successfully  
then  
let this space  
work for you*

*For more details  
contact  
ADRIAN TIPPIN  
Tel: 01-686 2599  
Ext 189*

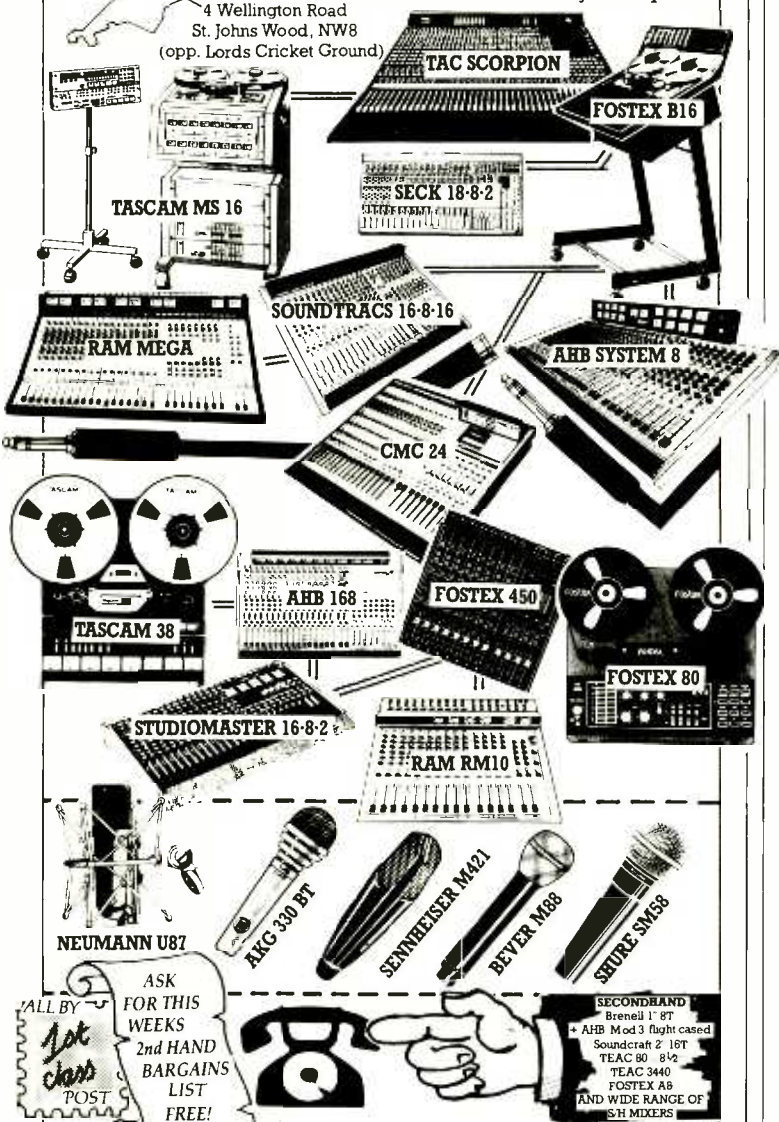
**CLASSIFIEDS**

# HOME STUDIO RECORDING CENTRES

**STOCKPORT CHESHIRE**  
Studio House, High Lane  
Stockport SK6 8AA

**ST. JOHNS WOOD LONDON**  
4 Wellington Road  
St. Johns Wood, NW8  
(opp. Lords Cricket Ground)

**A promise**  
"The best studio package price inclusive of wiring", and we'll even refund your travelling expenses when you call at Studio House or St. Johns Wood, London, to order the studio you require.



ASK FOR THIS WEEK'S 2nd HAND BARGAINS LIST FREE!

SECONDHAND Brenell 1" 8T + AHB Mod 3 flight cased Soundcraft 2 16T TEAC 80 842 TEAC 3440 FOSTEX AB AND WIDE RANGE OF SH MIXERS



# AUDIO SERVICES

06632 4244 OR 01-586 3167  
HEAD OFFICE

mail order



# INDEX TO ADVERTISERS

APRS	18
AMS Industries PLC	99
ACO Pacific Inc	95
AKG	95
AMEK Ltd	83
Ampex (UK)	IBC
Aphex Systems	25
Audio Design Calrec Ltd	10
Audio Developments	87
Audio Kinetics	16, 17
Audio Service Co	26, 106
Britannia Row	21
Capitol Magnetics	OBC
Citronic Ltd	61
Connectronics Ltd	22
Court + Associates	24
DBX	55
Don Larking Audio	76
Eardley Electronics	89
Essex Tape Supplies	26
FWO Bauch Ltd	59
Foundation First	42
Future Film Developments Ltd	22
H H Electronics Ltd	20
H W International (Shure)	21, 101
HHB Hire & Sales	13, 15, 31
Hill Audio Ltd	97
Hilton Sound	18, 85
ITA	33
Klark Teknik Research Ltd	48, 49
Lexicon	65
MS Audiotron	99
Mitsubishi Pro Audio	37
Multitrack Hire Ltd	45
Music Labs Group Ltd	4, 6, 8, 9
Mustang Communications	95
Northern Audio	24
Otari	28, 29
Palmer Av Systems	26
Panasonic	81
Professional Audio	73
Publison	91
Qu-Play	27
Rane Corporation	7
Rycote Microphone Windshields	46
SCV	19
SED	12
SAJE	23
Scenic Sounds	55, 65, 91
School of Audio Engineering	18
Seasim Controls Ltd	10
Solid State Logic	41
Sony Broadcast Ltd	43, 79
Sound Technology	34, 35
Soundcraft Electronics Ltd	IFC
Soundout Labs	77
Sowter Ltd, EA	26
Stage Accompany	47
Stirling Audio Systems	68, 69
Studer	59
Studiomaster	93
Studio Spares	11
Surrey Electronics	100
Sycos Systems Ltd	56, 57, 66, 67
Symetrix	12
Tascam	53
TracSystems	75
Trad Sales & Services	22
Trident Audio Developments	14
Turbosound	63
Yamaha/Kemble	38, 39

Studio Sound is available without charge to qualified readers: these are directors, managers, executives and key personnel actively engaged in sound recording in any part of the world. The Publisher reserves the right to refuse applications considered inappropriate and restrict the number of free copies sent to any one company or organisation. Non-qualifying readers can buy Studio Sound at an annual subscription of £18.00. All enquiries to: Subscription Department, Link House Magazines, Central House, 27 Park Street, Croydon CR0 1YD. Tel: 01-760 0054. Published by the proprietors Link House Magazines Limited, Link House, Dingwall Avenue, Croydon CR9 2TA and printed by Lawrence-Allen Ltd., Gloucester Street, Weston-super-Mare, Avon BS23 1TB.





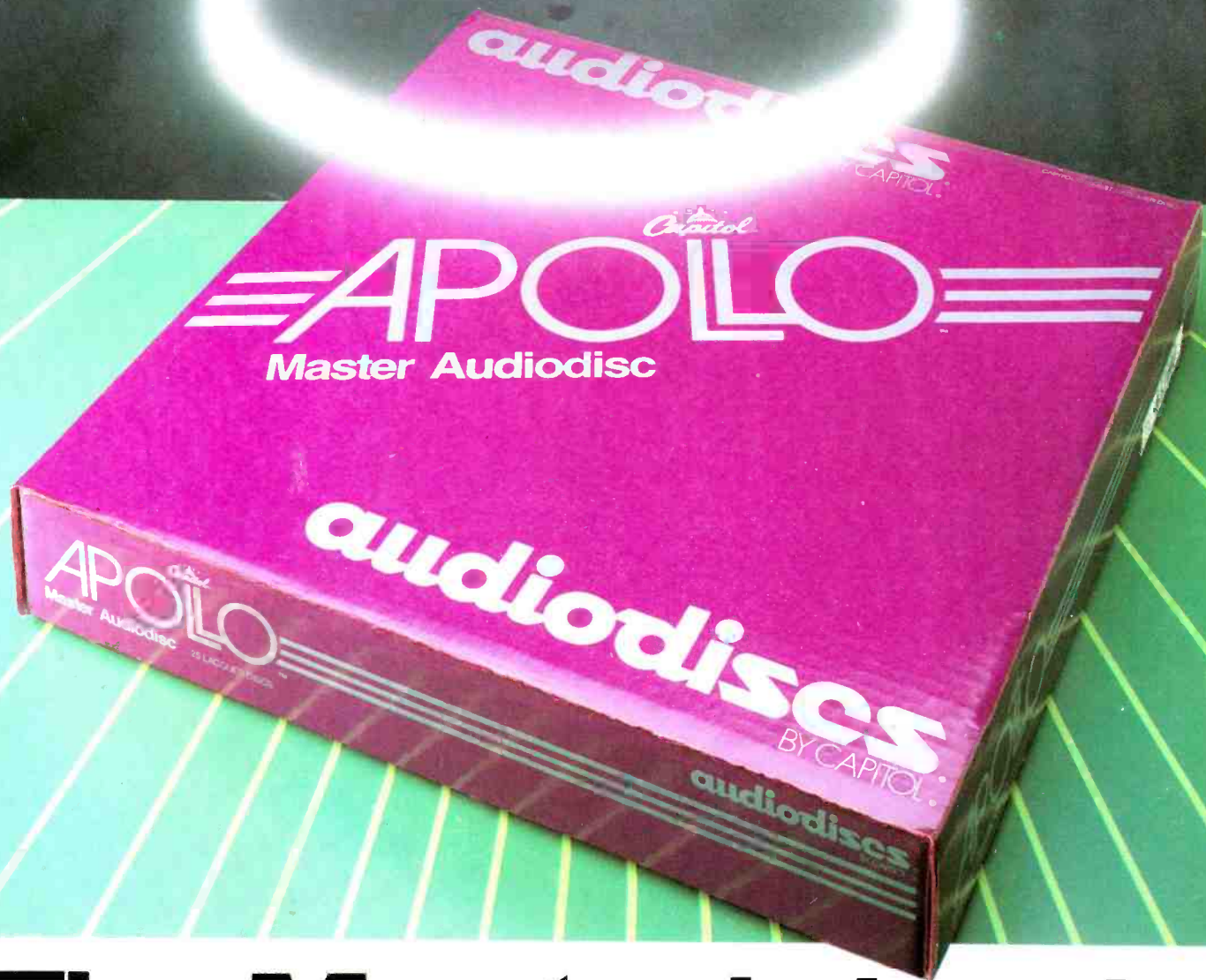
# THE EVOLUTION OF SUCCESS

*To stay number one, you've got to make the best even better. Which is why for ten years Ampex has continued advancing the performance of mastering tape. Through a decade of increased performance and reliability, Grand Master® 456 remains the tape behind the sound of success. Which is why more top albums are recorded on Ampex tape than any other tape in the world. For Grand Master 456, the beat goes on.*

**AMPEX**

Ampex International, Magnetic Tape Division, Acre Road, Reading RG2 0GR, England. (44) 734-875200 Ampex Corporation • One of The Signal Companies

**AND THE BEAT GOES ON**



# The Master is back.

We're perfectionists at Capitol Magnetic Products, so when our Apollo Master Audiodiscs no longer reached our own exacting standards we refused to supply what we regarded as an unacceptable product.

Fortunately, we had the expertise to not only identify and correct the original problem, but in doing so we have been able to further improve Apollo's overall performance, therefore we are proud to announce Apollo's return.

Capitol Magnetic Products Ltd.,  
1-3 Uxbridge Rd., Hayes, Middlesex  
UB4 0SY. Telephone 01-561 0922.  
Telex 917029. Fax 01-573 9623.

*Capitol*  
**APOLO** ™  
MASTER AUDIODISC

**Apollo is back, now better than ever.**