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November 1987

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COMPARISON CHART	SATURN	A820	MX80	JH24
PROCESSOR CONTROL OF AUDIO	YES	YES	NO	NO
AUTOMATIC ALIGNMENT	YES	YES	NO	NO
ALIGNMENT AND METERING FROM STANDARD REMOTE	YES	NO	NO	NO
SPEEDS/EQS	3/3	3/2	2/2	2/2
PROCESSOR CONTROL OF TRANSPORT	YES	YES	YES	NO
OPEN LOOP TENSION CONTROL	YES	NO	NO	NO
REWIND TIME (2400 FT)	56 S	(56 S)*	80 S	85 S
FULL FUNCTION LOCATOR WITH PROGRAMMABLE FUNCTION KEYS	YES	NO	NO	NO
14" REEL CAPACITY	YES	YES	NO	YES
W & F (30 ips)	<0.03%	0.03%	0.04%	0.03%
S/N (500 nWb/m, 20Hz-20kHz, 30 ips REC/REP)	66dB	-	61dB	64dB
VARSPEED RANGE (30 ips)	+100% -50%	-	150%	120%

* MEASURED AT EXHIBITION, NOT PUBLISHED

Yet its price is little more than an Otari MX-80, a machine it outperforms in virtually every respect.

With such a significant saving, a Dolby SR system becomes a realistic proposition you can actually buy a Saturn with SR for less than an A-820 without.

Saturn's technical superiority is underlined in features like the COLT (Calculated Open Loop Tension) transport with its unrivalled tape handling, the fully digital Total Remote control and autoalignment.

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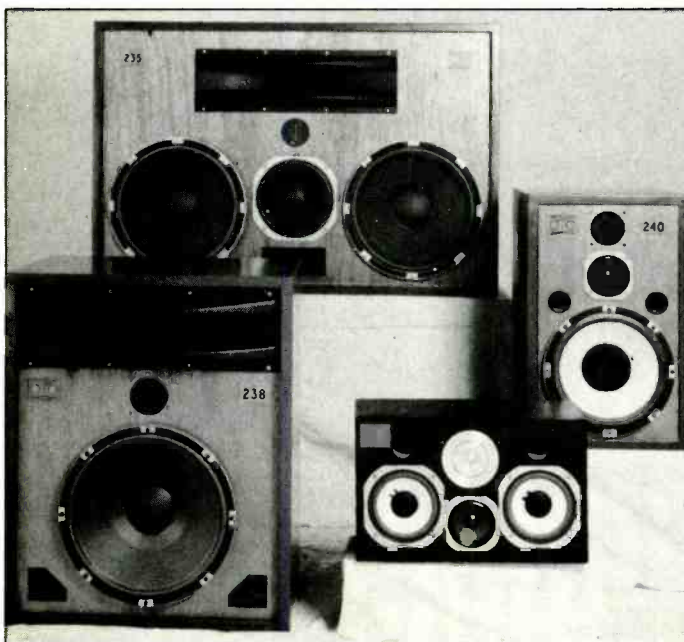
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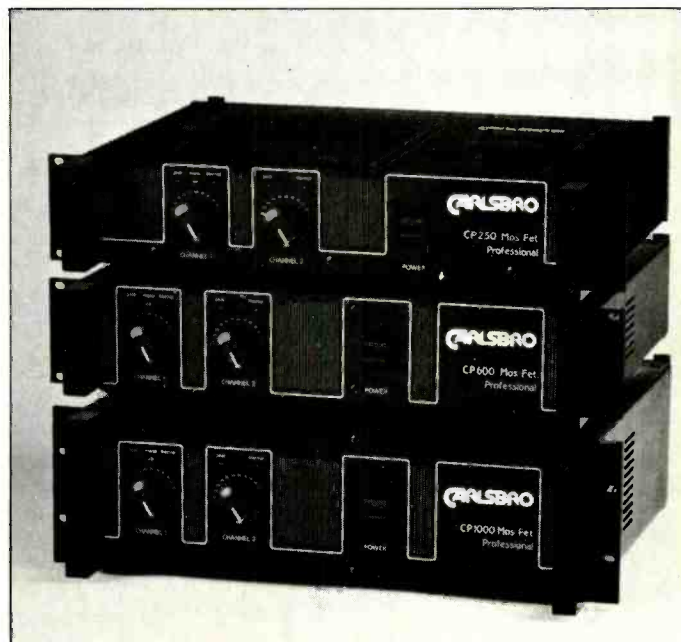
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Range of Reflexion Arts monitors (see page 29)



Power amps from Carlsboro (see page 41)



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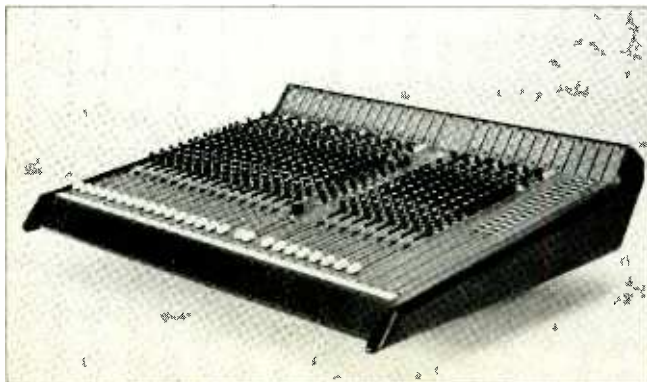
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STUDIO SOUND

AND BROADCAST ENGINEERING

November, 1987
Volume 29 Number 11
ISSN 0144-5944

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Robert J. Sinnott, 2 Park Avenue, 10th
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Dingwall Avenue, Croydon CR9 2TA, UK
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International tel: +44 1 686 2599
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E-mail: 78-DGS1071
IMC: STUDIO SOUND-UK/US
Fax: 01-760 0973

CIRCULATION ENQUIRIES

Controlled circulation: Controlled Circulation
Dept, Studio Sound, Link House Magazines Ltd,
Central House, 27 Park Street, Croydon CRO
1YD, UK

Paid subscriptions: Subscription Dept, Studio
Sound, Link House Magazines Ltd, 120-126
Lavender Avenue, Mitcham, Surrey CR4 3HP,
UK

2nd class postage paid New York, NY: Postmaster
please send address corrections to Studio Sound
c/o Expeditors of the Printed Word Ltd, 515
Madison Avenue, New York, NY 10022, USA

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Printed in England



A LINK HOUSE
PUBLICATION

Studio Sound and Broadcast Engineering
incorporates Sound International and Beat
Instrumental

Studio Sound is published on the second Friday
of the month preceding the cover date. The
magazine is available on a rigidly controlled
requested basis, only to qualified personnel (see
back page for terms)

Annual subscriptions are available for non-
qualifying personnel or where more than two
copies are required in a studio or small
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Total average net circulation of 14,686 per issue
during 1986. UK: 6,094. Overseas: 8,592
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EDITORIAL

Some of you out there are living dangerously and I just hope you know who you are. We have heard your proud boasts about the way you do things and, in the misquoted words of Queen Victoria: "We are not impressed."

Many years ago when I was but a coffee maker/sandwich collector cum trainee engineer all mixing consoles used to have a soft piece of cloth somewhere on their more upright regions, behind which lurked one of the most dreadful speakers that you ever heard. I can remember the chief engineer telling me that it was there to give a 'real world reference' from the studio's main monitors. How it did that I have no idea—most likely it came from the back of some stock room somewhere in London's Lisle Street, which used to be the last refuge for the electrical surplus. Its only resemblance to the real world was that it was closer to the size of home systems than the monitors but so peculiarly coloured in its response that it was more likely a negative benefit. If you then consider that this speaker was then mounted in a wood and metal cabinet of about 9 ft x 3 ft x 3 ft—just where is the real world?

Chief engineer: "Well perhaps it has just a little more bass response than it should. Just don't rely on it." The truest words he ever said. Just don't rely on it. Perhaps he could have put it more meaningfully, such as 'Never trust a monitor under 10 cubic feet', but that wasn't his way.

I haven't seen a serious console with a built-in speaker for years except those used for intercoms, although the cult of the small speaker carries on. So what is the role of small monitors within the control room? They quite neatly fall into being either reference monitors or nearfield monitors. A reference monitor is a compact speaker that is meant to give some kind of indication of how the track being worked on will sound on a speaker of that size. This is quite a valid concept but you are placing rather a lot of emphasis on these speakers, particularly if your main monitors say one thing and the reference monitors say another. Just how loud is that tambourine?

The nearfield monitor is just a monitor that has been scaled down to get it nearer to the engineer who will then hear less of the room acoustic as part of his monitoring listening. As its size is decreased so is its low frequency response. There is also a sub-set of these monitors that includes hijacked hi-fi-type speakers referred to as secondary monitors and in certain circumstances they can work very well, although these are rather a matter of taste. There are now speakers being built for precisely this market and very good some of them are but the requirements are rather ill-defined. There is still some truth in the feeling that these smaller monitors are far more accurate than the larger types. This, however, is less true than it was a couple of years ago. It really comes down to the amount of reliance that you wish to place upon them. There is no reason why music should ever be mixed entirely on small speakers. There is no reason other than perhaps in broadcast TV but only under special circumstances.

Even the old chief engineer knew this as he used to bring his home hi-fi into the studio when mixing one of his projects. Today the compact monitor is far, far better than in those old days. There is also a completely new generation of nearfield monitors but they are still all lacking in the low frequency region. For these reasons a nearfield monitor will never be much more than an upgraded reference monitor in fully professional terms. The compact disc has a response that extends at least two octaves below most of these monitors and if you cannot hear this region then you are working blind. The responsibility for standards has to remain with the studio, the engineer and the producer, as the record company will only rarely care.

Those who are proudly proclaiming that they have mixed a complete album on mini speakers ought to be ashamed of themselves. There is no way they can be aware of the low end although the CD consumer may very well be. Remember the lows!

Cover: The main feature of this month's cover is a graphic of the Windmill Munro M4 monitor. This was created by Windmill Lane Productions using the Bosch FGS 4500 digital computer graphics system. The power amplifier is a Carver PM-1.5 photographed by Roger Phillips



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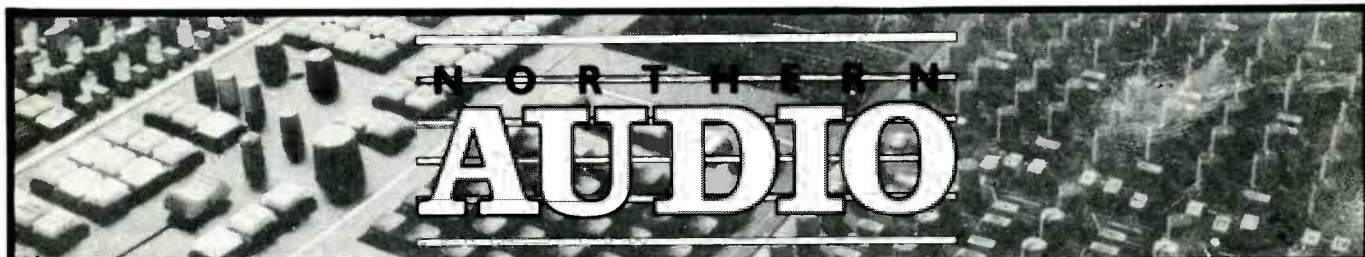
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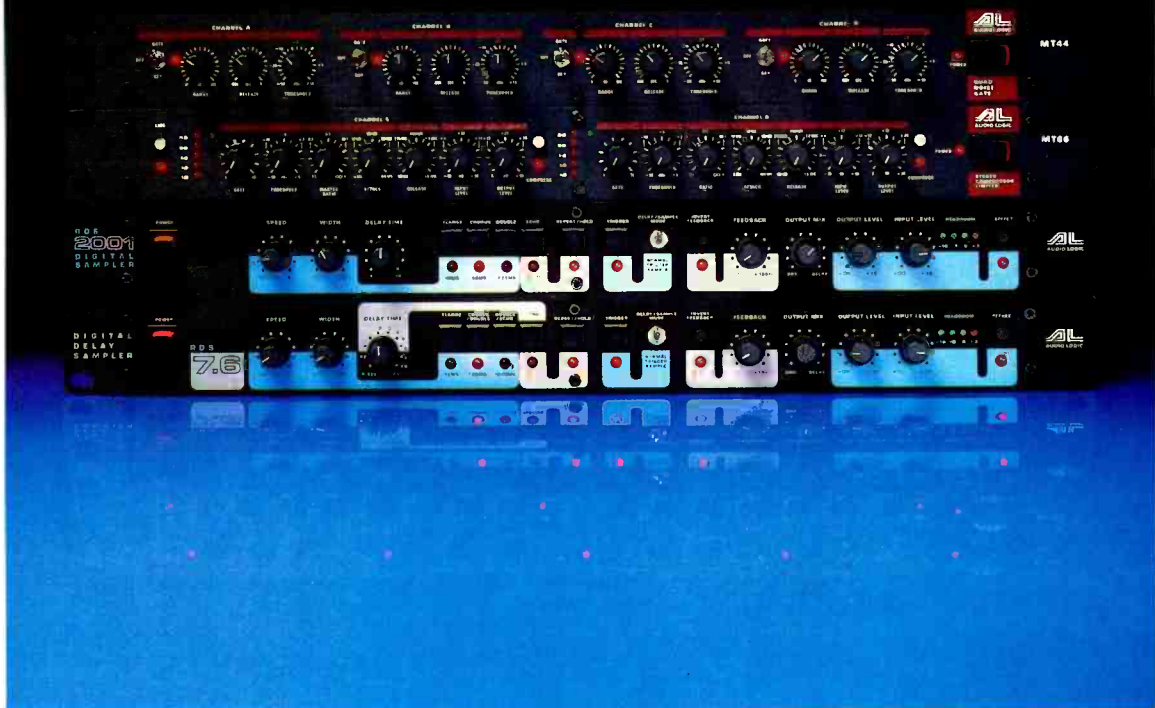
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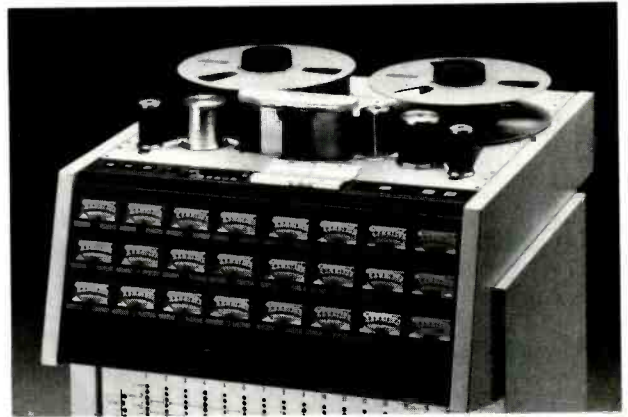
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◀ **MTR-90** Top quality multitrack in 1" 8 track and 2" 16 or 24 track versions. Pinchrollerless PLL capstan transport under electronic control with fast lock-up, digitally timed gapless punch in/out and 14" max reel size. Facilities include spot erase, bidirectional cue, elapsed-time indicators and easy-access tilting deckplate. Interfaces provided for transformerless audio I/O (or transformer option), RS232C I/O and SMPTE. Optional: Dolby SR* overbridge.



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▲ **MTR-20** New stereo mastering recorder with quartz-PLL capstan and closed-loop Optimum Tape Guidance System with electronic control. Full auto-align plus 2 memory set-ups per speed/EQ, 4-point autolocator, optional broadcast I/O including fader start, gapless punch in/out, reverse play/erase, library wind mode and tape time/timecode display. Options: full autolocator, 1 or 2-button punch in/out, variable wind speed and many more.

OTARI®

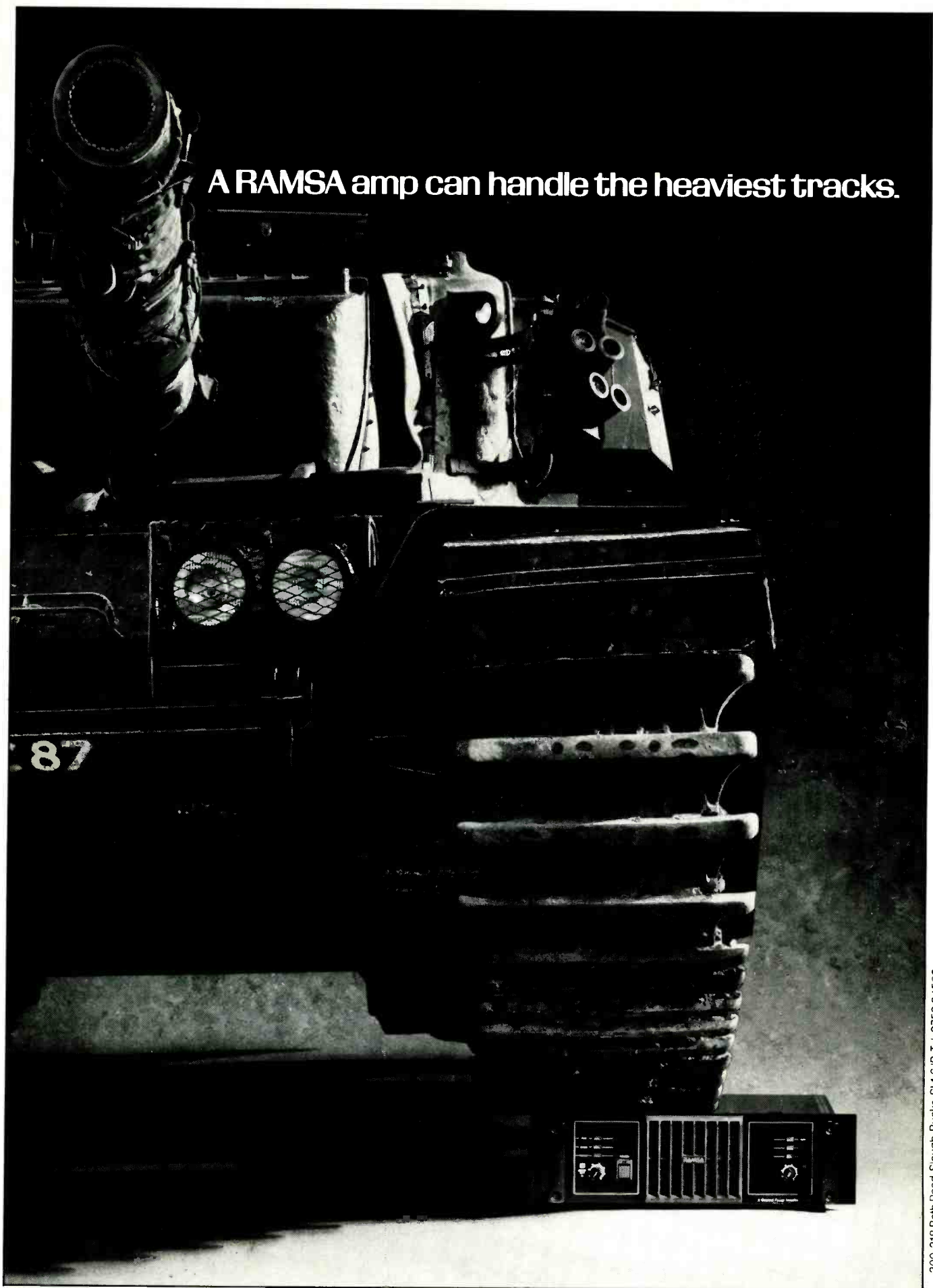
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Stirling **ITA**

1 Canfield Place, London NW6 3BT. Telephone 01-625 4515
Fax. 01-372 6370. Tlx. 946240 CWEASY G Ref No. 19014280

*Dolby SR and HX-Pro are trademarks of Dolby Laboratories Ltd.

A RAMSA amp can handle the heaviest tracks.



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RAMSA
PRO-SOUND

All RAMSA amps carry a five year guarantee. See the full range of amps, microphones and speakers at your specialist dealers.



Six hours later he's smiling

And the reason why?

He's happy with the final mix, and feeling relaxed wearing the DT100 Headphones.

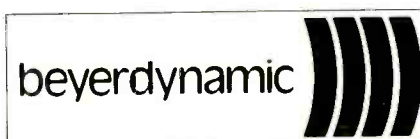
Designed for professionals, this headphone can be worn for long periods in total comfort.

The DT100 is a standard control headphone, used worldwide by studio engineers and home recording artists.

Reproducing a true and transparent sound with a natural bass response.

The DT100 Headphones are multi-purpose, rugged and reliable, just right for the technician.

Demand the best from your equipment. Insist on a Beyerdynamic headphone.



EXCELLENCE IN SOUND

*BeyerDynamic, Unit 14, Cliffe Industrial Estate,
Lewes, Sussex BN8 6JL. Tel: 0273 479411*

Tannoy-Goodmans merger

Goodmans Loudspeakers Ltd have announced the merger between themselves and Tannoy Group Ltd to form TGI plc (Tannoy-Goodmans International), who intend to seek a full listing on the stock exchange early in 1988. Initially, TGI will have three subsidiaries: Goodmans Loudspeakers, Tannoy Ltd and Morduant-Short Ltd (recently acquired by Goodmans). Group chairman is Norman Crocker and

chief executive is Terry Bennett, currently chairman and MD of Tannoy and Goodmans, respectively.

TGI becomes the largest UK manufacturer in the loudspeaker industry, with an annual turnover already in excess of £35 million. The head office will be based at 2 Marples Way, Havant, Hants PO9 1JS, UK. Tel: 0705 486344. Further information from Roger Fearn, at the above address.

NEWS

Addendum

SSL in Moscow

The Novosti Press agency (APN) in Moscow have confirmed an order for an *SL 6000 E*. APN, who specialise in producing public relations material in a variety of media, are now moving into the video field and have commissioned the construction of a major project in Moscow.

The first phase of the project will be geared to an electronic field production (EFP) operation, using

compact video equipment for producing and recording on location. The resulting material will be edited and processed in the new facility, involving audio for video post-production on the SSL stereo video console.

APN's future plans include the extension of the Moscow facility to a full-blown production centre.

£25 million tape investment

Nippon Magphane Ltd, a jointly owned subsidiary of Rhone-Poulenc (France) and Toyobo (Japan), are to invest 6 billion Yen (approx £25 million) in a new production line for Terphane polyester based films for audio and video tapes at the Tsuruga

plant in Japan. This is part of Rhone-Poulenc's strategy to be more active in the tapes market. They have two lines in their plant near Lyon, and a recent \$35 million investment was made for a Brazilian plant, due for completion in autumn 1988.

Change of address

• Digital Creations Corporation have moved to: 50 Werman Court, Plainview, NY 11803, USA. Tel: (516) 756-9620. Fax: (516) 756-9622. Telex: (510) 600-5040.

• Teac UK have moved to: 5 Marlin House, The Croxley Centre, Watford WD1 8YA, UK. Tel: 0923 225235. Fax: 0923 36290. Telex: 915417.

We would like to correct an address in the Disc Recording survey carried in the September issue. Under New England Digital we gave UK distribution as Harman (Audio) UK Ltd, which is correct but rather than moving to the Slough address

following the Turnkey/Harman merger, the division representing *Synclavier* have remained at their original address, which is Brent View Road, London NW9 7EL. Tel: 01-202 4366. Telex: 25769.

New from MIDEM

The MIDEM exhibition to be held in Cannes might be of interest to British studios, according to the organisation's sales director, Peter Rhodes. British studios are apparently missing out on the advantages of getting together with major manufacturers, record companies and publishers. At the time of writing, more than 20 CD pressing plants had booked space, including the likes of Philips-DuPont and Sony, along with record companies such as CBS, PolyGram and Nimbus, plus a large number of

pro-audio equipment manufacturers and music publishers.


Rhodes pointed out that British studios were entitled to government grants, and that a first-time exhibitor would pay only £1,200 for a fully equipped stand, including telephone, electricity and so on, once the grant was taken into account.

Rhodes urged any studios interested to get in touch quickly, since the deadline for booking space was in the first weeks of November. Further information from Peter Rhodes, tel: 01-499 2317.

Award to Teldec

Teldec GmbH of West Germany have won the 1987 Maker of the Microphone Award, presented annually in memory of Emile Berliner, inventor of the microphone and the disc record, for 'an outstanding contribution to the world of sound'. Teldec were recognised for

their invention of the direct metal disc record mastering system, which is now being applied to optical based discs. The occasion seemed fitting as 1987 marked the 100th anniversary of Berliner's invention of the disc record.



**THE NAME OF
THE MANUFACTURER OF THIS
NEW LOUDSPEAKER CONNECTOR
WON'T COME AS A SHOCK.**

DISC reference CDs

Reference CDs are now available from DISC of California: just as LP reference discs can be made for musicians, producers and record companies, this new service provides a reference CD playable on any standard CD player.

The CD reference disc uses a glass substrate with the same dimensions as a pressed CD. When the 'cutting' is finished, the disc is metallised and given a protective coating, as with pressed CDs.

DISC work from a ¼ in U-matic digital master tape that has been recorded in the PCM 1610/30 format. The PQ codes are entered on audio track 1 from the cue sheet. DISC guarantee indexing accuracy within ±1 SMPTE time frame.

One CD reference disc with up to 72 minutes playing time will cost from \$750 with a 24 hr turnround, down to \$500 for a 5-day turnround (excluding shipping time). Quantity discounts are available.

This service is primarily for CD-Audio discs but CD-ROM reference discs are also available provided the master data program is supplied on the U-matic tape format.

DISC design and manufacture compact disc mastering systems, CD stamper analysers and supplies peripherals for manufacturing compact discs.

Digital Intelligence Systems Corp, 2865 Pullman Street, Santa Ana, CA 92705, USA. Tel: (714) 261-5654.

Agencies

● Syco have been appointed exclusive London agents for the new Stepp DGX guitar controller, and have announced that they will be providing complete MIDI packages

based around it.

● gtc Ltd have been appointed sole UK distributors of the Quantec QRS/XL realtime signal processor.

Forthcoming events

November 5th to 8th The Institute of Acoustics' Reproduced Sound 3 (in collaboration with the AES, ACSE, EMAS and APRS), Windermere Hydro Hotel, Windermere, UK.

November 14th to 15th The Turnkey Hands On Show, Centrepoint, London.

November 16th to 18th Entertainment and the Arts '87, International Conference and Exhibition Centre, Harrogate, UK.

November 16th to 20th 28th Salon International des Composants Electroniques, Paris, France.

November 23rd to 26th Digital Information Exchange '87, Private Member's Suite, London Zoo, UK.

1988

March 1st to 4th AES 84th Convention. Palais des Congrès,

Paris, France.

March 9th to 13th Frankfurt Musik Messe '88, Frankfurt, West Germany.

March 21st to 24th 7th International Conference on Video, Audio and Data Recording, University of York, UK.

April 5th to 8th Acoustics '88, University of Cambridge, UK.

April 8th to 12th NAB, Las Vegas, USA.

April 25th to 28th Audio Visual '88, Wembley Exhibition Centre, UK.

May 18th to 20th ShowTech Berlin '88, Berlin Exhibition

Grounds/International Congress Centre, Berlin, West Germany.

September 23rd to 27th International Broadcasting Convention '88, Metropole Conference and Exhibition Centre, Brighton, UK.



Tall stories part II— Slow crane coming

This month's continuing saga of the plight of airborne consoles comes from FWO Bauch. When last we heard, Bauch had just sold a Harrison series 10 to London-based radio and TV commercial specialists Saunders and Gordon, whose third-floor premises house their new multitrack studio. On delivery, it was soon established that the staircase would not be wide enough for the Harrison (not to mention the 47

people needed to carry it), so an alternative route was sought—through the window, which as luck would have it was wide enough without removal. A crane was used to lift the Harrison expertly through the window (a throughput as it's known in the trade), where Bauch transport personnel immediately took over. And so ends another heart-warming story from the world of pro-audio.



NEITHER WILL THE CONNECTOR.

The new AXR/PDN connector from ITT Cannon is a safer speaker connector. Designed to handle high power outputs we've also designed the contacts to make sure you don't end up handling high power outputs as well. It has all the benefits of a smaller body shell with a simple cable clamp arrangement and like AXR is available in a wide range of configurations. The PDN (Phase, Drain, Neutral) insert is a 3-pole connector and is available with optional colour coded boots.

For full technical details call Tim Richardson at the address below. There's no sound alternative.

ITT CANNON
JOIN THE FORCES OF THE FUTURE.

Jays Close, Viables Estate, Basingstoke, Hampshire RG22 4BW. Tel: 0256 473171 Telex: 858105

NEWS



Lucasfilm engineers at SSL (see Todd-AO/Glen Glenn)

Contracts

- Morning Studio in Milan have purchased a new Neve V series console with *Necam 96* automation. The console includes the largest *Necam* display yet used—a 1.5 m wide projection screen between the main monitor speakers for video when the desk is used for dubbing.
- Recent contracts for Amek include an automated 40-input *G2520* to Viewplan in Stockport; a large *BCII* to Telegenic Ltd in London; three large *BCII* consoles to Molinare in London for their *A/V* complex, plus a 56-input chassis *G2520* with digital fading together with a *BCII* all-stereo input submixer for their new post-production suite; four *BCII* consoles to Turkish Radio and TV; a new studio chassis console from the *BCII* range for Radio Telefis Eireann; and a contract to supply Sunset Sound Inc of Los Angeles with an *APC1000* assignable console, a 56-input version in 64-input chassis with *GML* automation, plus recall and reset systems.
- Crest Audio are to supply Maryland Sound Industries with 100 of their new *8001* amplifiers, in preparation for the forthcoming Pink Floyd tour.
- Stirling/ITA are to supply Saunders and Gordon's Studio Four with an Otari *MTR-90* fitted with the

Stirling ITA/Dolby overbridge plus a Dolby A rack, along with other gear from Yamaha, AMS, AKG and Sony. Stirling have also announced the first sale of the new *DDA DCM 232* in-line console: a 40-channel version goes to Woodbine Street studios of Leamington Spa.

- Apogee Electronics have supplied their *944-S* and *944-G* anti-aliasing filters to mastering facilities including A&M Studios, Atlantic Records, Capitol Recording, Editel, Masterdisk and Precision Lacquer, all for their *PCM-1630s*. The Hit Factory, the Power Station and Alan Parsons have all updated their *3324s* with Apogee filters. Meanwhile, Apogee are to collaborate with New York engineer/designer Dave Smith in the design of a D/A conversion box expected to be out by March 1988.
- Recent news from SSL includes a contract worth more than \$2 million to supply Todd-AO/Glen Glenn with eight *SL 5000M* film sound production consoles between October 1987 and July 1988. Other contracts include the installation of an *SL 4000E* master studio system to the Enterprise's Studio C in Burbank, California, while across the Pacific in Japan, JVC Studios are about to install their seventh SSL and Onkio Haus their fifth.

In brief

- The AES Educational Foundation have announced the recipients of their educational grants for the 1987-88 academic year. Richard Karstens, Vincent Luciani, Daniel Powell, J Clarke Stevens and David Yuen—all in post-graduate studies—were selected on a basis of demonstrated past interest and achievements in audio, and on faculty recommendations. Additional information and application forms are available from the AES at 60 East 42nd Street, New York, NY 10165, USA. Tel: (212) 661-8528.

- A new multitrack, MIDI-recording, post-production facility has opened in Los Angeles. The 'million-dollar operation' is equipped with a Neve *8058* 48-input console with an additional 48 Wolstein Labs inputs, a Studer *A800* plus a full complement of outboard and MIDI gear. Further information from Jefferson Chitouras, tel: (213) 461-0734.

- News from Bombay is that since its launch in June 1986, *Playback and Fast Forward*, which is free of charge, has successfully established itself as the leading pro-audio magazine in India. With the industry there growing steadily, *Playback* wants to make manufacturers aware of the potential in India. Contact Anil Chopra, Publisher, *Playback and Fast Forward*, Business Press Private Ltd, Maker Tower 'E', 18th Floor, Cuffe Parade, Bombay 400 005, India. Tel: 366478.

- UK company Applied Microsystems, manufacturers of timecode synchroniser equipment, have been acquired by ASC. Applied Microsystems will supply software and new designs to ASC who will take over the manufacturing and marketing aspects.

- gtc, the German manufacturers of timecode-based equipment, have set up a sales and marketing division in the UK. Further information is available from systems consultant Bob Nicholas at: gtc Ltd, 5 Fulmer Drive, Gerrards Cross, Bucks SL9 7HH, UK. Tel: 0753 884319.

- Molinare have announced the start

of their £¼ million refurbishment. Carried out by Windmill Munro, the work is expected to be completed by November 1st. Projects include a new entrance, two completely rebuilt dubbing studios and complete inter-studio compatibility.

- The British Standards Institution have announced a new testing service that allows manufacturers to claim that a sample of their product has been passed by BSI Testing as complying with the relevant BS number and report. For more information and technical reports, manufacturers and agents can contact Robin Dandy, assistant director of BSI Testing on: (Hemel Hempstead) 0442 230442.

- Transcom Digital in New York have made available to outside programmers and producers their new 18,000 ft² production/post-production facility. Major equipment includes an SSL *SL 6000 E*, Sony *3324*, and a CompuSonics-based digital audio network, integrating up to 10 hours of sound effects and music storage with the console and recorder. For more information, contact: Eleanor Kearney, Transcom Digital, 902 Broadway, New York, NY 10010, USA. Tel: (212) 529-1000.

- D P Ayyappan has opened a consultancy in acoustics in the US, specialising in architectural acoustics in theatres, studios and liturgical facilities. Information from: 1908 University Drive, Richardson, Texas 75081, USA. Tel: (214) 644-2130.

- Soundcraft Electronics have announced their move into a new R&D block, giving almost four times the space for product development. Besides the recent 50% increase in staff, the facility houses eight CAD systems, logic analysers and an in-circuit emulator for software development in assignable console and automation projects.

- Wireworks, the New Jersey-based cabling suppliers, were designated official cable supplier for the opening and closing ceremonies of this year's Pan American Games, which were held in Indianapolis in August.

People

- Horst Hanfeld has been appointed divisional director to head up the audio-video division of BASF UK Ltd. Hanfeld comes from the Australian headquarters where for the last 10 years he was manager of the consumer products division and a member of the board.

- Harrison Information Technology have appointed David Graham as UK sales manager for their range of pro-audio equipment. Graham comes most recently from *International Musician* where he was ad manager.

- Electro Sound have appointed Bob Becker as plant manager, who will assume responsibility for all day-to-day plant operations and associated aspects.

- The Bose Corporation have appointed Alan Kilford as managing director of Bose UK, following his 14-month tenure as general manager.
- Soundcraft have appointed Amanda Bateman to head their marketing co-ordination. Bateman comes from film and video production company AKA.



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NEWS

Argent's MIDI Communicator

London-based Argent's have released two MIDI interfaces for the Apple Macintosh. The *MIDI Communicator* sits beneath the Macintosh, concealing the mains, printer, modem and MIDI cabling. The Apple's printer and modem ports are used for MIDI communication, with the actual hardware connecting to extension

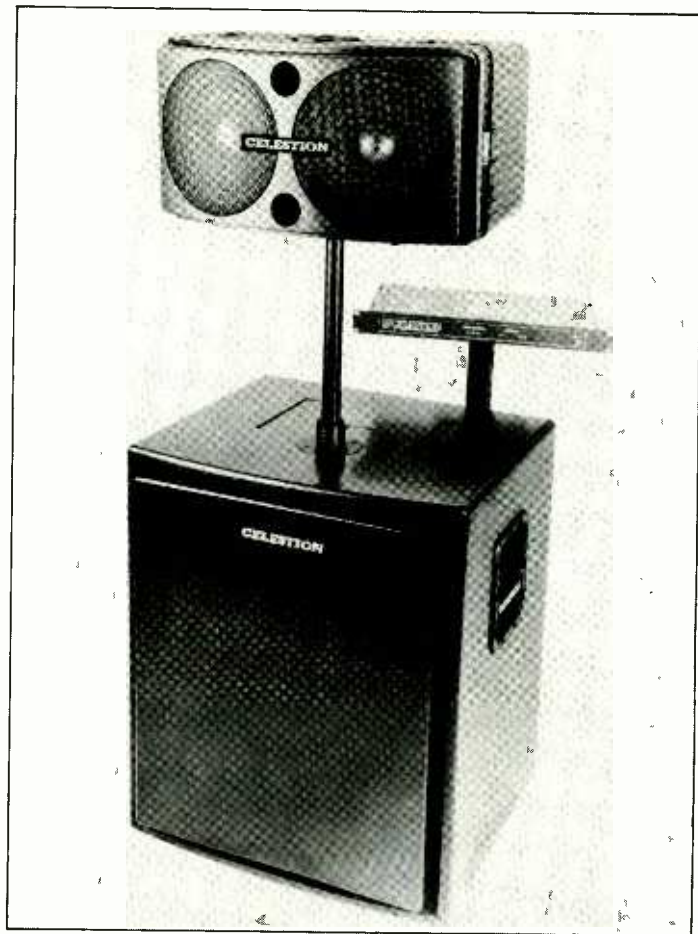
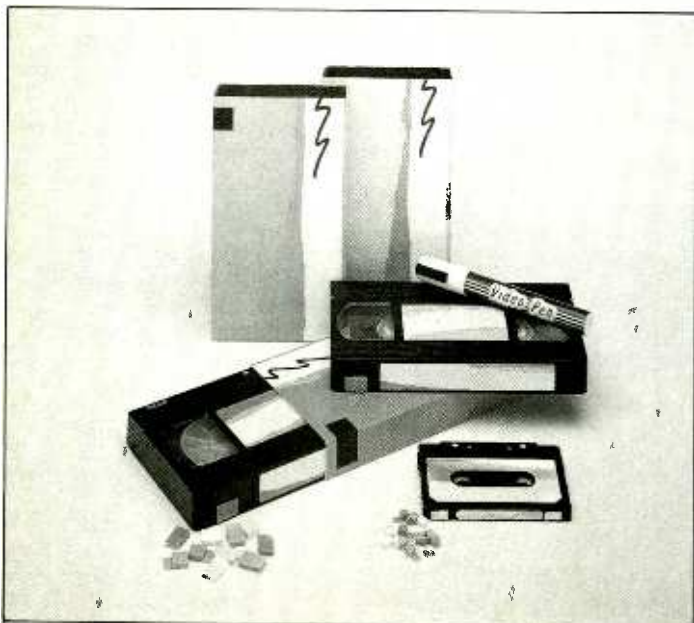
ports on the interface at the side, providing two MIDI inputs and eight MIDI outputs. The *Mini MIDI Communicator* is a budget model with integral power supply having one MIDI input and four MIDI outs. Argent's, 20 Denmark Street, London WC2, UK. Tel: 01-379 6690.

Wonder Widgets Video Pen

Wonder Widgets, the London-based manufacturers of tape accessories, have developed the 'write & wipe' *Video Pen*. Available in a range of bright, opaque inks, the pen can be used on any non-porous surface and wiped clean with a damp cloth. This means mixing desks, synthesizers, cassette cases and so on are all fair game as potential writing surfaces.

Also new is the *Audio Widget*, for replacing the safety tab on audio cassettes. Also available are *Video Widgets*, video labels and video cassette cases.

Wonder Widgets Ltd, 218 Canalot Production Studios, Kensal Road, London W10 5BN, UK. Tel: 01-960 5768.



Celestion SR series

Celestion have recently introduced their *SR* series sound reinforcement system, comprising the *SR1* and *SR2* loudspeaker units, plus the *SRC1* 'intelligent' controller. The heart of the system is a pair of *SR1* 8 in drivers mounted alongside each other in a single cabinet. Each driver is of a dome/cone configuration, with a frequency range of 50 Hz to 20 kHz, and able to handle up to 500 W. This unit is mounted on the *SR2* subwoofer cabinet, via a tubular support. The subwoofer itself is a single 18 in driver capable of handling 1000 W, and putting out frequencies from 40 to 150 Hz. Finally, the *SRC1* electronic

controller monitors voice coil temperature and cone excursion, with circuitry, which the manufacturers claim the leading edge of potentially harmful LF transients and inaudibly compresses them before instantly restoring complete low end power.

The cabinets of both loudspeaker units are made of high impact, injection moulded reinforced polymer, and can be easily painted to suit any environment.

Celestion International Ltd, Foxhall Road, Ipswich IP3 8JP, UK. Tel: 0473 723131.

USA: Celestion Industries Inc, Kuniholm Drive, Holliston, MA 01746. Tel: (617) 429-6706.

RCF loudspeakers

RCF of Italy have introduced several new products to their range of loudspeaker components. The *N681* is a 1 in exit driver with a 100-hour sine wave power handling of 35 W (100 W programme), using a titanium diaphragm with aluminium voice coil on a polyamide former. The *N980* is a 2 in exit driver with a carbon fibre diaphragm and copper voice coil on a polyamide former; power handling is rated at 250 W programme. The *N481K* is an update of the *N481*, having phenolic diaphragm with copper voice coil on a polyamide former and power handling of 45 W RMS. The *H6040* is a 60x40°

structural polyurethane constant directivity horn, while the *H9041* is a miniature (1 in) constant directivity horn. A new 12 in loudspeaker is the *12P400*, handling 200 W RMS with a frequency response of 34 Hz to 4 kHz, and a new 15 in model is the *15P200A*, with a copper voice coil on a polyamide former, and handling 300 W RMS.

RCF International Srl, Piazza Matiri 7 Luglio, 3, I-42100 Reggio Emilia, Italy.

UK: Court Acoustics Sales Ltd, 29 Beethoven Street, London W10 4LG. Tel: 01-960 8178.

SONY®



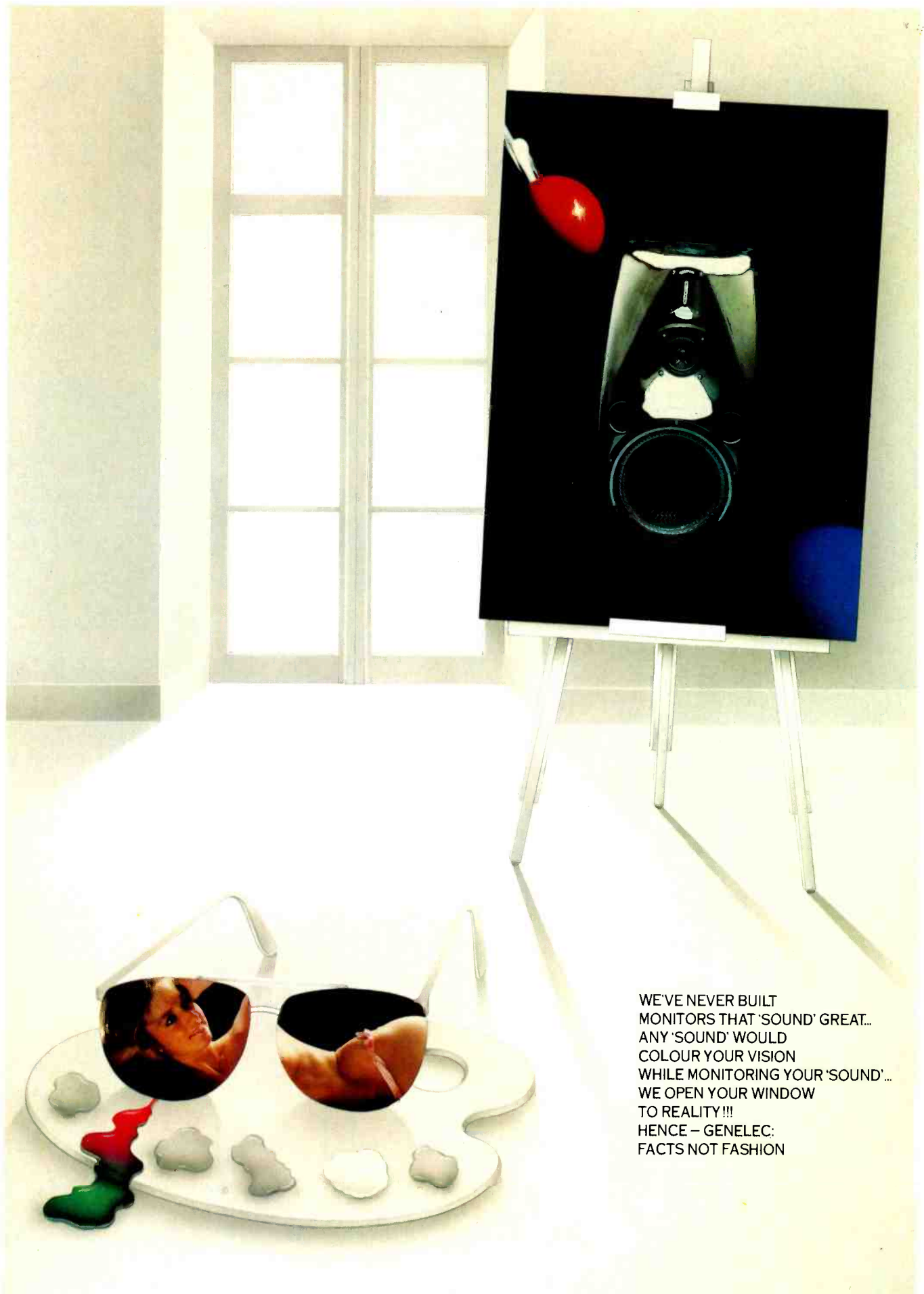
An unbeatable track record

The number of tracks is one of life's dilemmas.

There are not enough for some, too many for others. So working on the theory that 24 tracks were enough for many projects but 48 were often necessary, we designed the PCM-3324. We followed that with the RM-3310 Remote Control and Synchronizer... 24 or 48 tracks as you like, when you like. Not only that, we made sure that the DASH format provided for up to 48 tracks on a single machine, guaranteeing upward compatibility.

Producers were not slow to realise the creative advantages of this way of working. Studio Managers saw a safer return on their investment, so thanks to them we had a success on our hands. Now we have added the IF-3310 and VSU-3310 to further improve system flexibility.

If you want to know how to solve the track dilemma, find out more about the Sony system, then contact our customers who'll tell you just how good it is. Who are they?... If you don't know perhaps you shouldn't be reading this advertisement.



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MONITORS THAT 'SOUND' GREAT...
ANY 'SOUND' WOULD
COLOUR YOUR VISION
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Audioscript B.V. tel. 02158-5124, NORWAY, Siv Ing Benum A/S tel. 02-145460, SPAIN,
Aprilia International tel. 3-2128915, SWEDEN, Intersonic AB tel. 08-7445850,
SWITZERLAND, Emm-Studio AG tel. 061-542045, WEST GERMANY, FFD
Vertriebsgesellschaft tel. 089-2780404, HONG KONG, Power Source Development Ltd.
tel. 3-7446189, JAPAN, Otartec Corporation tel. 03-392-7811, USA, Redwood Marketing
tel. 615-3314743, UK, Scenic Sounds tel. 01-387 1262.

NEWS

TC 8201 test generator/analyser

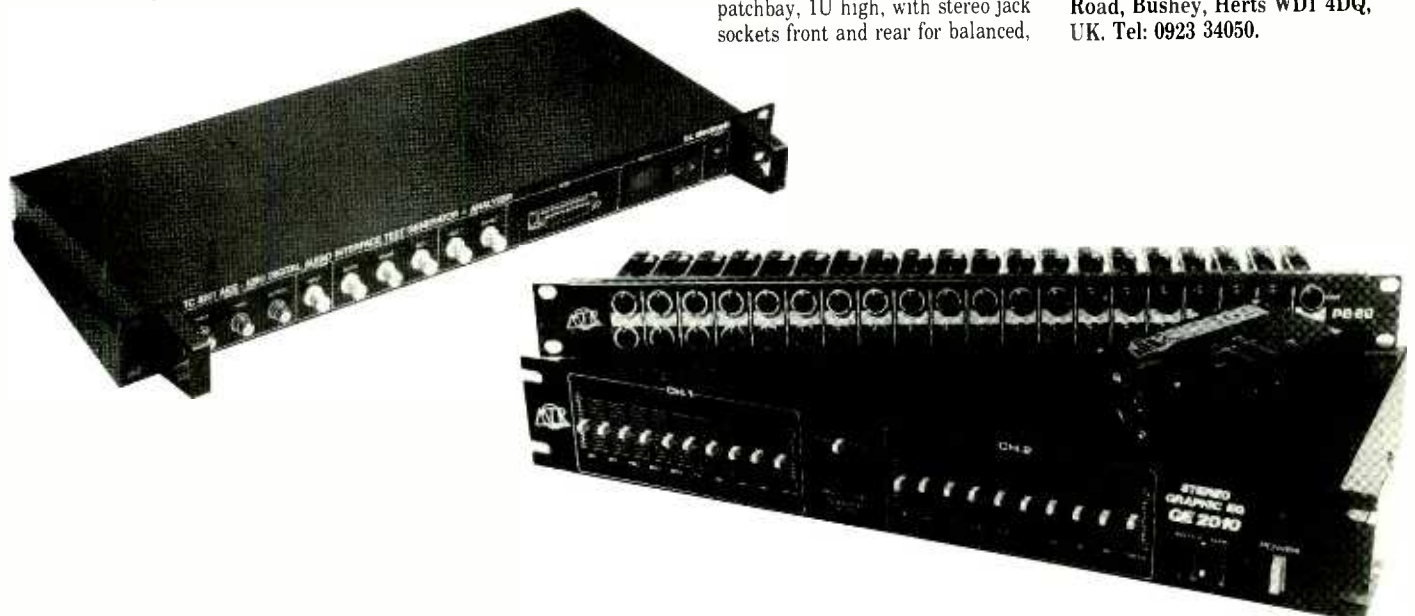
TC Electronic of Denmark has introduced a *TC 8201* digital audio interface test generator/analyser, intended for testing digital audio output on both professional and consumer equipment conforming to the AES/EBU and IEC specifications. It has detailed access to both digital audio information, and the subcode associating the audio information.

The generator section can send anything up to 24-bit resolution waveform with any length up to 100 ms. These are selectable either directly or via a menu, as is the subcode information to be sent. The analyser measures audio input frequency, amplitude, sample rate, distortion and signal-to-noise, and has access to single samples. The analyser displays the subcode information in a decoded and readable format. Both the generator and analyser can operate independently on any sampling frequency from 28 to 53 kHz, or they can be locked together. The unit is

run through any RS232 ASCII terminal.

Also new from TC Electronic are options for the *TC 2290* multi-effect unit and sampler. The SA02 (sampling option 2) enables crossfading by using a dual-head D/A converter, and includes sequencing, looping, sound on sound, and chromatic pitch adjustment. The Fast Trig option (*FATR*) plays sampling on audio trig with an accuracy of $\pm 2 \mu\text{s}$. The Stereo Sampling link (*STSA*) can lock two *TC 2290s* together in true phase-correct stereo sampling for up to 32 seconds. **tc electronic, Grimhoejvej 3, DK 8220 Braband, Denmark. Tel: 06 262800.**

UK: State of the Art Distribution, High Lane Village, Near Stockport, Cheshire SK6 8AA. Tel: 06632 2442.
USA: tc electronic, PO Box 5039, 52 Woodbine Street, Bergenfield, NJ 07621. Tel: (201) 384-4221.



Fazioli grand

Italian piano manufacturers Fazioli have recently unveiled their 3.8 m grand piano, their largest and the largest hand-built grand in the world. Following our article on Fazioli in the March issue of *Studio Sound*, the piano was introduced at the Goldoni Theatre, Venice, in June, and from

all accounts was an unqualified success.

Fazioli Pianoforte srl, 33077 Sacile-Pordenone, Via Ronche 47, Italy. Tel: 0434 72026.

UK: Christofori Ltd, 20 Conduit Place, London W2, UK. Tel: 01-402 4304.

BBC Sound FX CDs

The BBC, with the largest sound effects library in the world, are now providing professional users with an introductory set of 10 *Sound Fx CDs* with more than 450 effects, over 90% of which are newly recorded in digital stereo. The discs are supplied in a compact stacking system, and

each is accompanied by a booklet with a comprehensive index. A chart detailing the contents of each disc is included in the package.

BBC Records and Tapes, Room C231, Woodlands, 80 Wood Lane, London W12 0TT, UK. Tel: 01-576 0602.

Soundtracs MRX

Soundtracs have updated the *MR* series of consoles with the introduction of the *MRX* series. Major changes include entirely new cosmetics and extended mainframe versions, with a choice of either 24 or 32 inputs without patchbay, or 26 and 34 inputs with patchbay that can be supplied with optional stereo input modules.

Main features include 4-band EQ with two sweepable midranges and

six dedicated aux sends on the inputs, 3-band EQ, six aux sends and 16-track monitoring on the groups. LED bargraphs are standard, for 16-track tape, auxs, LR mix and solo. **Soundtracs plc, 91 Ewell Road, Surbiton, Surrey KT6 6AH, UK. Tel: 01-399 3392.**

USA: AKG Acoustics Inc, 77 Selleck Street, Stamford, CT 06902. Tel: (203) 348-2121.

Three more from MTR

MTR have announced three new products. The *GE 2010* is a 19 in rack mountable stereo 10-band graphic equaliser, which is 2U high with multi-detent faders, jack and phono connectors, EQ bypass and a tape copying facility. The *PB-80*, which replaces the *PB-1*, is a 40-way patchbay, 1U high, with stereo jack sockets front and rear for balanced,

unbalanced and MIDI patching. Finally, there is the active balanced Direct Injection box, with a 3-way ground switch (ground, floating or lifted), 3-way attenuator (-40, -20 or 0 dB), powered by a 9 V battery or phantom power.

MTR Ltd, Ford House, 58 Cross Road, Bushey, Herts WD1 4DQ, UK. Tel: 0923 34050.

SOURCE INDEPENDENT MEASUREMENT

SIM engineer Bob McCarthy manned the equipment at a recent Wembley Arena concert. He talked to David Mellor about the current system and its possibilities

Source independence, as the name implies, is the distinguishing feature of this system of room equalisation developed by Meyer Sound Laboratories. Stevie Wonder was the source on this particular occasion but that should be of minimal importance if *SIM* works as well as we are told it does. The 'room' was Wembley Arena, its acoustics being memorable to PA engineers and paying customers alike.

'Source Independent' means the system does not require a known test signal to make frequency and phase response measurements. The 'industry standard' method is 1/3-octave realtime analysis using pink noise, which contains equal energy per 1/3-octave bandwidth. A system is lined up so that it gives out similarly equal energy, or some variation of that, which may be considered preferable.

The difference between this and *SIM*, is that *SIM* is a 2-channel measurement. The signal feed from the mixing desk is compared with the signal from a reference microphone in the auditorium and the difference between the two observed by the operator. Whatever the output of the console, provided that it has energy at all frequencies of interest, it can be monitored at the microphone position and checked for frequency and phase. Music can be used as the test signal, so measurement can be carried out throughout the duration of a concert. Measurements, and graphic displays, are handled by a Hewlett Packard 3582A Fast Fourier Transform spectrum analyser (FFT), which is like a conventional spectrum analyser but more precise and clever. Any necessary corrections are made manually using Meyer *CP10* parametric equalisers.

Bob McCarthy explains: "You have a source and a microphone in the room. The purpose of this system is to go into a room with the sound system and eliminate or minimise the acoustical contribution of that room and bring it back as close as you can to a free-field acoustic environment, that is a flat frequency reproduction

of the system. What I'm trying to do is give the mixing engineer the power to take exactly what is coming out of his desk and for that to be the sound that people are hearing in the hall. The secondary goal is for that to be the same sound in both level and frequency response throughout the hall."

So, when a capacity crowd arrives in Wembley Arena, the *SIM* engineer can update the system and hopefully bring it back to a flat response. What 'flat' means, in this case, is an accurate reproduction of what is coming out of the mixing desk. If the engineer is EQ'ing the vocal or whatever, then that is not part of the measurement system. In the Wembley system, the mix engineer, Chris Lindopp, was given his own graphic equaliser so he could adjust for an overall sound he liked.

"After hearing rooms that have typically 20 or 30 dB in the very deep low end, it's a bit of a shock for them to hear a sound system which is

producing a flat frequency response. We give them that tool so they can work their way back to a familiar place. The idea is to leave the artistic control of the sound in the mix engineer's hands. Our role is much more scientific, it's to give them the same sound everywhere and to give them the sound that they are putting out."

At Wembley Bob McCarthy had four B&K microphones, one at the mix position and three flying in free air in front of the various clusters. Hopefully, the sound at the mix position is identical to what is coming out of all the speaker clusters. How much attention does the system need during the concert to keep things in order?

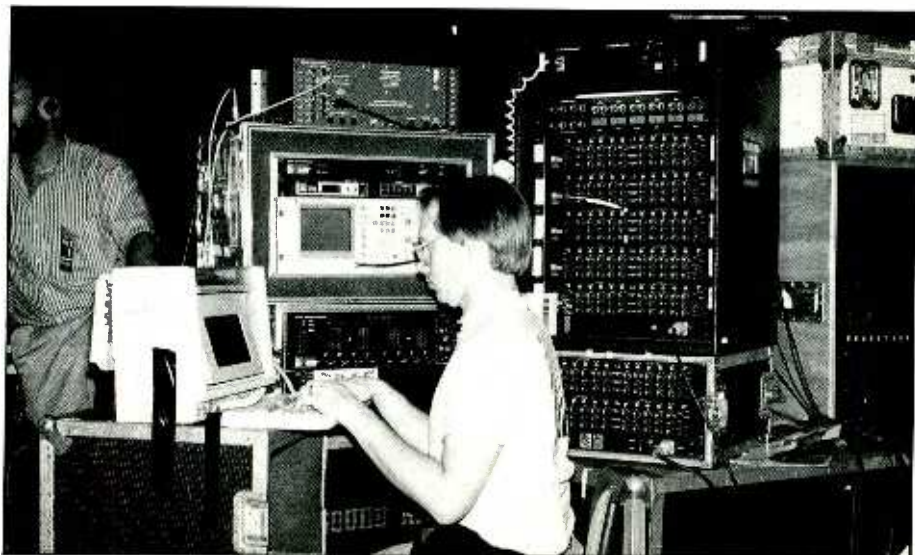
"Every night of this particular concert series we've had a different level of attendance, which has kept me pretty busy. The humidity has been quite different, one night it rained and the other nights it's been drier. I've found myself having to make minor adjustments for the first 30 to 45 minutes of the show before the system had gone completely solidly back (to flat), and then it's a dynamic process. When the people get dancing they generate quite a lot of heat, that has its own effect. I'm always looking, it's like a radar scanner, I just keep going through each mic for as long as the concert's going on. If I see something, I home in on it and make sure that it's really a problem—then I fix it."

PA

Fig 1 shows the set-up for this series of concerts. The sound system was very similar to that used for Luciano Pavarotti's recitals in the same hall last year. All speakers, including monitors, bore the Meyer brand. The main clusters each comprised 10 *MSL-3s* for long throw, four *MSL-3s* for medium throw and four *UPA-1s* for downfill. Side clusters had four *MSL-3s* and two *UPA-1s*. There were also four subwoofers at stage level. As one of the aims of *SIM* is to achieve and maintain even coverage throughout a hall, physical speaker alignment has to be right first. As in any installation, a lot of time is spent walking through the seams of the system checking for hot-spots and dead areas.

SIM could be used with speakers from manufacturers other than Meyer but not unless they fulfilled a number of criteria.

"We won't just *SIM* any sound system. The system needs to be linear. That means it needs to be low distortion. It means that the frequency



Bob McCarthy operates the SIM system

response does not change with level. It must have a flat phase response. It must have a flat frequency response when in free field. It must be arrayable.

"The speakers we're using are low distortion—the high frequency drivers are less than 1% distortion—they are linear over level until you actually run the system into limiting. It has a flat time response, all these units are phase corrected. They are set to a flat frequency response when in free field. The significance of this is that now your speaker system is not in free field anymore, that is it's in Wembley Arena and when they no longer exhibit a flat frequency response you can begin to attribute that to the room itself rather than to the speakers. When you make the corrections you're restoring them to the free field response. You're putting them outdoors.

"Arrayable means that when you put more than one speaker up in the system you get an amiable pattern of coverage rather than a destructive pattern. When you start to look at the dispersion of this system, because of the fact that it's arrayable I can put microphones in the field of this system and I can make judgements on how it's going to sound."

Origins

When *SIM* was first conceived, the Meyer engineers attempted to make equalisation corrections using standard 1/3-octave graphic equalisers. The problem was that resonances did not always coincide sufficiently closely to the band centres. It was found, for instance, that trying to correct a resonance at 450 Hz using the

400 Hz and 500 Hz filters would often create more problems than it solved, when viewed on the Fast Fourier Transform spectrum analyser.

"It became obvious to us that the only proper tool to do this is the parametric equaliser. The Meyer *CP10* was developed on a prototype level then we actually went out doing shows and we finally arrived at the frequency and the bandwidth settings for what we're doing. It stops at 1/10 of an octave, which is the minimum bandwidth on the *CP10*. From our experience this is the minimum size of resonance occurring in a room that appears to be truly universal and not position dependent. If you look with sufficient resolution with the microphone at some position, you are going to find a whole series of reflections and cancellations. If you look at 1/1000-octave resolution you are going to find thousands of tiny notches. Anytime there is a reflection off any surface it will come back at some point and give a cancellation. At another point it will give an addition. What we found is that if we move the microphone 1 cm, all those tiny 1/1000-octave cancellations move around. When a problem comes up that is 1/10-octave wide and is of sufficient level to warrant being dealt with, then it's something that you can deal with, and that correction will cover a large area of the hall. We look at higher resolution but we make corrections at 1/10-octave or any larger bandwidth."

Fig 2 shows the equalisation chain. The master EQ adjusts the long throw system, tracking from that is the medium throw, and tracking from its output is the downfill. The other clusters operate in a similar manner. In setting up the equalisation system, obviously the choice is between a series and a parallel connection for the

equalisers. In this case the series connection won.

"This is something that we've tried both ways. The main long throw system is an independent system, it's the first system into an area therefore it gets its own independent EQ. We've found that a slave system—a dependent system—tracks best if it has the same EQ plus whatever corrections that are needed to fit in. Likewise, there is a third level-dependent system on the front fill. We've found that when we did it the other way, just sending them all in parallel, we ended up having to make the same corrections over and over again, everybody had to get rid of 180 Hz so they used up three filters when we could have done it in one. Furthermore, from venue to venue the relationships of the clusters tend to track, the relationships between the independent system and the dependent systems tend to stay very close to the same."

In order to get valid measurement, the system needs to be synchronised so that the input arriving at one channel of the FFT, that is the output of the mixing desk, and what's entering the microphone have to arrive at the same time. Because it takes time for sound to travel through air the feed from the desk needs to be delayed in order to synchronise it to the microphone, a delay line is therefore one of the pieces of the *SIM* system. The delay can be set by looking at the phase response when it's flat, then synchronisation has been achieved. Although delayed speakers were not used in this particular set-up, *SIM* can cope and even help to set the delay. The delay can be measured by the FFT rather than calculated (or guessed).

So far, it appears that *SIM* consists of the FFT and a few parametric equalisers—and indeed it does. To make a practical system takes rather more hardware, otherwise to make adjustments during a concert would be too time consuming to be worthwhile.

The heart of the whole system is the Hewlett Packard Integral Personal Computer, which runs the 'SIMCAD' software. Its function is to control the various line switchers and the microphone switcher, and also the delay line so the *SIM* engineer can quickly measure any parameter in which he is interested.

"The mic switcher gives phantom power to the microphones, it has an SPL meter for the microphones, and switcher to the various mics. The role of the line switcher is a little more interesting because what I do in *SIM* is not only to look at the desk versus the microphones but in addition I look at the equaliser itself and I do that by viewing its response on the FFT. In the course of the night I can look at three different types of measurement on a single branch (a speaker system monitored by a microphone). I can look at the EQ itself, I can look at the equalised room and I can look at the room as if it had no EQ."

As well as displaying frequency and phase information, the FFT can also supply a graphic display of 'coherence' versus frequency. Suppose you had one musician—a flautist—playing one continuous note. Although the FFT only has good data for that one frequency, it will give an amplitude versus frequency display as though it had a full range of good data. What is happening is that it is picking up noise in the auditorium and displaying that. The answer is for the FFT to look at both inputs—from the console and the auditorium—to see how much similarity there is. Where there is a lot of similarity, the coherence is said to be good. Anything less than 40% coherence would be taken by the *SIM* operator as bad data and ignored.

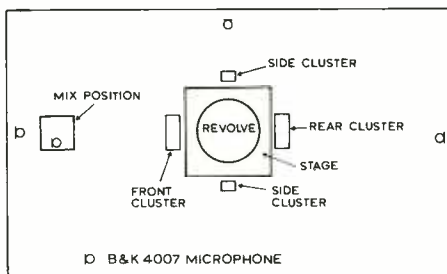


Fig 1



Hewlett Packard FFT and Lexicon digital delay



Hewlett Packard integral personal computer showing stored SIM trace

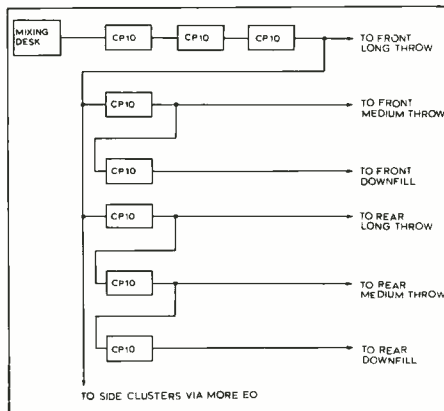
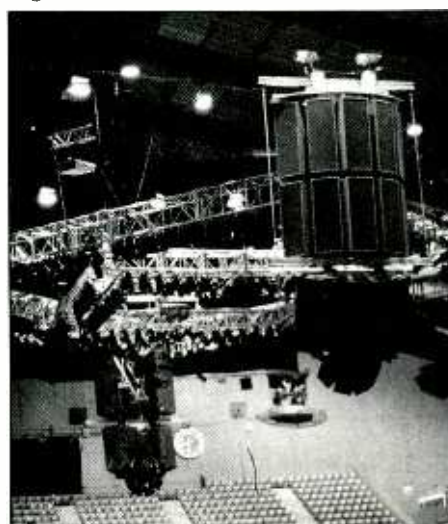


Fig 2



Sound Hire's Meyer system for Stevie Wonder concert

SOURCE INDEPENDENT MEASUREMENT

Although the Pavarotti concerts at Wembley took place less than 18 months ago the *SIM* system has become somewhat more sophisticated since then.

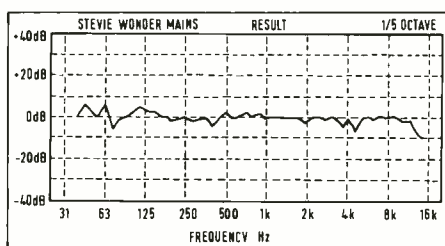
"When Pavarotti was in town we had the same computer and the same analyser but at that time the delay line and the switching to the equalisers had to be manually set and there was no facility to switch to a second microphone or third or fourth. They had to use one single microphone which they had to traipse about to different places in the hall during set-up, but you could only monitor from one point during the show. This unit that I've built here can take eight microphones. The system is set up so that it can handle 10 of these switchers. That would be 80 microphones and no EQs or 80 EQs and no mics or something in between. Above about 16 microphones I think you're getting way above practicality for any kind of show. If it was a two-hour show you would may be only have about three minutes per microphone. I love having four mics and I would be glad to expand it to more than that. In terms of set-up it's a tremendous advantage, and when they say go, I can set the system up very quickly."

Domains

It's considered almost axiomatic these days that, in any room, you cannot cure a time domain problem with a frequency domain remedy. For example, most rooms will have different reverberation times at different frequencies and probably have the odd resonance or two. Is it possible to have control over this and make reverberation time changes merely by changing the EQ of the signal being sent to the speakers?

"We do actually have control. Provided that no-one actually moves the walls of the building and no-one moves the speakers, the reflection paths which occur in the building are fixed events, provided those parameters don't change, the reflection paths don't change—the things that might change them very slightly would be a rise in humidity, or a temperature variation at one side of the hall.

"Because we continue to average we are looking not only at the room but the ambience in the room as well. There are other types of measurement systems that actually have a sliding filter that filters out so you are only hearing the initial wave of the sound system, therefore you are able to measure a system as though it isn't in a room. That's an interesting theoretical practice but the facts are that the audience is in the room.



SIM coherence display—stored computer trace (Wembley Arena)

Our job is to minimise the effects of the room."

One definition of acoustic perfection in any room might be that the reverberation time at all frequencies is equal. Could *SIM* claim to do this by purely electronic means?

"That is one of the prime things that we do. Take a typical very non-linear hall like Wembley. You've heard big slaps coming off walls and things which seem to go rumbling on forever. With very careful equalisation it has the subjective effect as if we'd removed the slaps and the big long decay times. I'd be very surprised if you didn't hear a decreased decay time in that room. You will definitely hear a lack of slap because of two things: the careful arraying of the system to keep energy off the flat surfaces in that room where there are no people, and the careful equalisation. When a band of frequencies goes out of control, when it's 10 dB above the norm, that means that its pattern is much longer than the other frequencies, which is what keeps it rumbling around the room. It's around for longer because it had more energy to get into that reflective pattern. Whereas other frequencies had *x* amount of energy these frequencies have more and so they stay for longer."

When you know how *SIM* works and look at the equipment it uses, it's tempting to think that anyone could put a *SIM* system together with off-the-shelf components and a few relay switch boxes. It may be slightly more complex than it appears at first sight.

"I don't doubt that other people could make it.. There are a couple of criteria that are quite important though. Number one, people that design sound systems don't very much like hum to be introduced, therefore all the EQ ins and outs have a proprietary isolation input, which is a wonderful isolation that keeps me from being able to introduce hum into the sound system. In addition, this whole system is addressed on the GPIB (General Purpose Interface Bus), a computer interface bus that gives the information to these switchers and addresses this delay line. We had to

customise a delay line and build an external unit in order to interface it with the GPIB. It was no simple task.

"Everything now responds on the computer bus. I don't set the delay line and I don't push switches on this thing. When I say 'mix position', bingo it turns on the right relays and sets the right delay. If I set mic position EQ, it sets the right relays and bypasses the delay because I don't delay between EQ in and out, there's no propagation delay because you are not looking at a microphone. So it's got quite a few things to keep track of."

Although the *SIM* equipment is highly automated, Bob McCarthy seemed pretty busy all through the first half of the concert. It's one matter to know how the equipment works and to be able to operate SIMCAD, quite another to interpret the traces on the FFT screen into EQ changes on the parametrics. It isn't an art because when the changes have been made correctly it can be seen on the FFT that all is well. It's more a question of how long does it take to determine what change has to be made and how long it takes to make it. Training a *SIM* operator takes some time.

Development

McCarthy: "The present format will be used for the next year or two. In the very long range it will continue to develop. The software is in a continuous state of development. Obviously the end and final step of the whole thing is to present a black box that analyses, gain sets and equalises. That's a big project, I can't give you a timescale. The system has to be able to detect, by itself, good data from bad data and only act on the good data. It has to very carefully smooth the curves out so it doesn't over-equalise for the microphone's position. It has to do all this dynamically. The sound industry is just not ready, they're barely ready to have someone sitting in the booth adjusting the house EQ and taking that away from the sole domain of the balance engineer. People are nervous of giving their system over to a black box that is going to magically equalise your system. Just imagine, giving it over to someone they can talk to is scary enough when they don't know exactly what I'm doing. It's going to take some adaptation."

The ultimate question is, of course, what did it sound like? Well, it didn't sound bad and as Bob said, no objectionable slaps or echoes were noticeable. A success then? Wembley Arena is notorious acoustically and to see the frequency response displays was illuminating. If *SIM* works, then it should be completely down to the mix engineer, to get a good sound, and as the engineer on the night said: "It's another tool to be used."

He seemed happy. □

SIM

Hewlett Packard 9807A integral personal computer with SIMCAD software
 Hewlett Packard HP 3582A spectrum analyser
 Lexicon 1300 digital delay (modified by Meyer)
 MS 4x2M mic switcher
 MS 8x2L line switcher (quantity according to system configuration)
 Meyer CP 10 5-band parametric equaliser (quantity according to system configuration)
 B&K 4007 microphones (quantity according to system configuration)

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MONITORING

A compilation of monitoring speaker manufacturers and agents, together with a brief description of their products, from information available to us at the time of writing

Acoustic Energy

AE1: compact 200 W power handling nearfield 2-way monitor, 5 in LF and 1 in drivers.

AE2: two 5 in LF units with 1 in tweeter, 400 W programme.

Acoustic Energy Ltd, 3A Alexandria Road, London W13 0NP, UK. Tel: 01-840 6305.

AKG

LSM150: reference monitor, up to 50 W.

Akustische U Kino-Geräte GmbH, Brunhildengasse 1, Wien, A-1150, Austria. Tel: (222) 956517.

UK: AKG Acoustics Ltd, Vienna Court, Catteshall Lane, Godalming GU7 1JG. Tel: 04868 25702.

USA: AKG Acoustics Inc, 77 Selleck Street, Stamford, CT 06902. Tel: (203) 348-2121.

Altec Lansing

9813B: 3-way monitor 40 W.

9842-8A/D: 2-way control room monitor.

9849-8A/D: 2-way control room monitor.

Altec Lansing Corp, PO Box 26105, Oklahoma City, OK 73126-0105, USA. Tel: (405) 324-5311.

UK: Shuttlesound Ltd, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-871 0966.

APL

Control Room Monitor: 3-way active with dome/cone coaxial, time-corrected alignment.

Acoustical Physics Laboratories, 3877 Foxford Drive, Doraville, GA 30340, USA. Tel: (404) 934-9217.

ATC

SCM50: 3-way softdome midrange, 12 in bass driver, 50 to 500 W in 50 litre enclosure.

SCM50A: same as above but with electronic crossovers and three MOSFET amps.

SCM100: 3-way softdome midrange, 15 in bass driver, 50 to 50 W in 100 litre enclosure.

SCM100A: same as above but with electronic crossovers and three MOSFET amps.
Loudspeaker Technology Ltd, Aston Down, Stroud, Gloucestershire, UK. Tel: 028576 561.

Auratone

5C: reference monitor, up to 60 W.

T6: reference monitor, up to 80 W.

Auratone Corporation, PO Box 698, Coronado, CA 92118, USA. Tel: (619) 297-2820.

UK: Scenic Sounds Equipment Ltd, Unit 2, 12 William Road, London NW1 3EN. Tel: 01-387 1262.

B&W

CM1: 2-way nearfield, 120 W max.

801FS: 3-way, minimum 100 W into 8 Ω .

808: 5-way (two 300 mm bass drivers, two 100 mm midranges and one HF driver), with optional facilities for bi- and tri-amping; same power handling as 801FS.

B&W Loudspeakers Ltd, Meadow Road, Worthing BN11 2RX, UK. Tel: 0903 820415.

North America: B&W Loudspeakers of America, 345 Nugget Avenue, Unit 22, Scarborough, Ontario M1S 4J4, Canada. Tel: (416) 297-0595.

Boxer

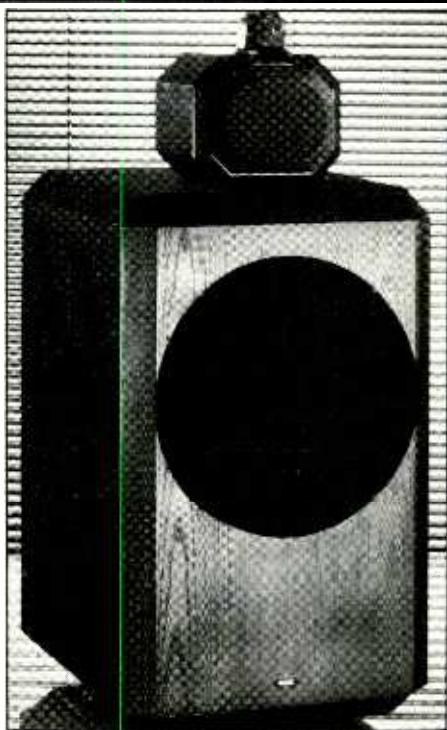
Boxer 2: 3-way active, tri-amped, with two 12 in drivers, including crossovers.

Boxer 2 Film: same as above but including extra monitor and smaller boxes for cinemas Dolby 'Surround' use.

Boxer 4: 3-way active, tri-amped, with four 12 in drivers, including crossovers.

Boxer 4 Film: with same additional components as *Boxer 2 Film* including crossover.

DRL London Associates, Unit 15, North Field Industrial Estate, Beresford Avenue,



B&W 801



Altec Lansing 9842-8A/8D



Court SN20, SN30 and SN60



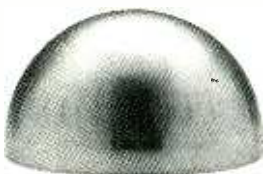
The new SR series from Celestion with its sheer power, pure sound quality and compact size is setting a precedent for the future in the SR market.

Developing this innovative system was the next logical step for a company who have consistently proved that the evolution of sound excellence should never be compromised.

Using the latest laser and computer technology, our research engineers have perfected a totally new, three component system; the Celestion SR series. It sounds better, installs practically everywhere, and is virtually indestructible.

**The SR1—
innovative features for pure sound quality.**

The SR1 is the key product in the range with a design based on a revolutionary new driver, capable of full range reproduction, free from harmful resonances even at the highest sound pressure levels.

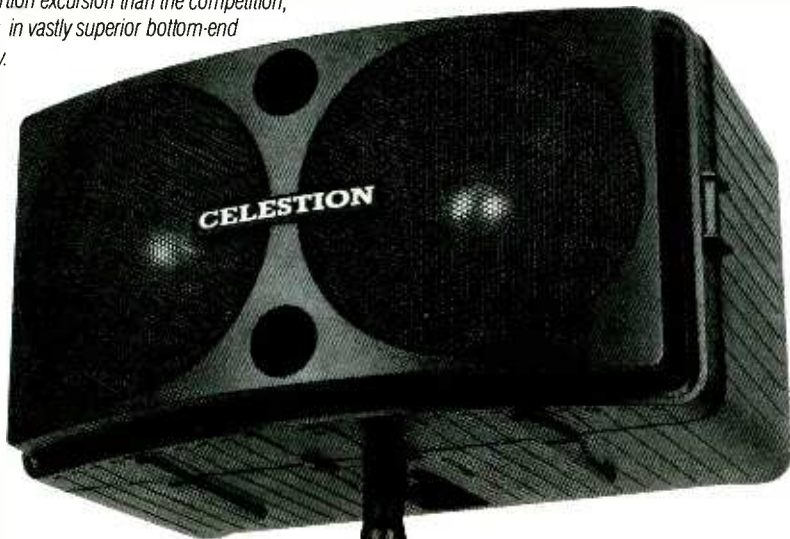


The secret lies in the strongly reinforced, hemispheric shape of its dome radiator which is immune to the ringing, flexing and twisting that causes distortion in all other standard designs.

The result is a sweeter, clearer top-end performance.

The dome is directly coupled to a reinforced Kapton former which supports a powerful 16mm long voice coil, edge wound with ribbon wire for extra efficiency and rigidity.

This exceptionally long coil is no less than twice the depth of the speaker's front plate allowing a greater low distortion excursion than the competition, resulting in vastly superior bottom-end capability.



THE SR SERIES FROM CELESTION.

This unified coil/dome structure forms the centre of an 8" cone driver that is at the heart of the SR1 system. Since the dome and cone are one, the system is naturally time aligned, hence avoiding phase/frequency response aberrations.

The rigidity of the centre structure allows higher power levels to be applied to the driver at all frequencies without distortion, which means that the necessary amounts of equalisation can be effected without loss of quality.

Each SR1 unit has two of the new 8" drivers contained in an indestructible cabinet, capable of withstanding any amount of rough handling without damage.

Designed to provide high quality, foreground music in fixed installations and for the portable musician market or as a monitor, the SR1's wide range of mounting options gives tremendous installation versatility.

SR2.

Integrating totally with the SR1, the SR2 coupled-cavity bass bins create a powerful, biamped system for

larger venues where higher sound pressure levels at low frequencies can be achieved.

Employing an 18" driver which is capable of handling a massive 1000 Watts—at a sensitivity of 98dB, frequency response 40-150Hz, the SR2 speaker is housed in a compact dual cavity cabinet which is tuned to create a natural bandpass.

Like the SR1, it is extremely hard wearing, incorporating inaccessible apertures which make it difficult to place objects into the unit.

For both fixed installation and portable use the SR2 is totally flexible. It can be used on multi-configurations together with the SR1 as it has simple brackets and fastening facilities compatible with the SR1 or other SR2s (including provision for pole-mounting the SR1).

SRC1—an integral part of the SR system.

The SRC1 controller is the 'brains' of the SR system as it is not only an equaliser, but also an intelligent protection system which renders the SR1 virtually electrically indestructible!



You simply can't blow it up. And to ensure fool proof protection, nothing will work unless the controller is properly connected in circuit. Both peak overload and three levels of thermal protection are provided, and unlike comparable systems this controller monitors conditions at both line and feed levels.

So not only does the output of your mixer pass through the controller, but so do the power amp's speaker feeds.

**The SR series from
Celestion—once heard
never forgotten.**

As you'll soon be hearing, the SR series is just the beginning of an exciting revolution in sound reinforcement.

And remarkably, the price too is sensationally low. For a demonstration of the new SR series or further information please contact:



Celestion International Limited, Ipswich IP3 & JP
England Tel: 0473 723131 Telex: 98365 Ditton G

CELESTION
YOU'LL BE HEARING MORE FROM US.

MONITORING

Wembley, Middx HA0 1YB, UK. Tel: 01-900 0355.

USA: Valley Audio, 2821 Erica Place, PO Box 40743, Nashville, TN 37204-3111. Tel: (615) 383-4732.

Celestion

SL600: 2-way nearfield monitor, 120 W.

SL700: upgrade option on SL600.

Celestion International Ltd, Ditton Works, Foxhall Road, Ipswich, Suffolk IP3 8JP, UK. Tel: 0473 723131.

USA: Celestion Industries Inc, Kuniholm Drive, Holliston, MA 01746. Tel: (617) 429-6706.

Cetec Gauss

7258: single coaxial freefield, up to 400 W.

7228: single coaxial freefield, up to 400 W.

7351: 3-way bi-amped, wall-mount, up to 400 W.

Cetec Gauss, 9130 Glenoaks Boulevard, Sun Valley, CA 91352, USA. Tel: (213) 875-1900.

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

Court

SN20: 2-way passive, up to 150 W.

SN30: 3-way passive, up to 200 W.

SN60: 4-way, passive or active, 200 or 400 W respectively.

S J Court & Associates, 3 Primrose Hill Studios, Oppidans Road, London NW3 3AG, UK. Tel: 01-586 5139.

Davies

841: 3-way passive with separate bass driver reflex chamber and HF Annular driver; minimum 175 W RMS into 8 Ω . Two options are brick enclosure with infinite baffle for claimed response of below 10 Hz, or two 15 in drivers per side in separate reflex enclosures.

S W Davies Ltd, 5/7 Buck Street, London NW1 8NJ, UK. Tel: 01-485 8559.

UK: Audio Design Ltd, Unit 3, Horseshoe Park, Pangbourne, Berks. Tel: 07357 4545.

USA contact: Straight Wire Audio Inc, 4611 Columbia Pike, Arlington, VA 22204. Tel: (703) 979-1990.

Dynaudio

3-way active monitor and compact 2-way monitor. Dynaudio ApS, Sverigesvej 15, DK-8660 Skanderborg, Denmark. Tel: 6-523 411.

Eastlake

JM3T: 2-way active control room monitor, 400 and 100 W.

JM7T: 2-way active control room monitor, 400 and 100 W.

Eastlake Audio (UK) Ltd, Unit 2, 10 William Road, London NW1 3EN, UK. Tel: 01-262 3198.



E-V Sentry 500E

Electro-Voice

Sentry 100EL: 2-way active up to 50 W.

Sentry 100A: 2-way passive up to 30 W.

Sentry 500E: 2-way up to 100 W.

THE BEST REQUESTED QUESTED

SARM WEST, TOWNHOUSE, SWANYARD, BATTERY, SOHO, RIDGE FARM, MASTER ROCK, POWERPLANT, ALAN PARSONS, WESTSIDE, HOOK END MANOR, UTOPIA, CAVA, KONK, JACOBS, LINSTER, TRIDENT, ROOSTER, WORKHOUSE, J MICHELE, JARRE, LOGIC, EDEN, FARMYARD, GREENE STREET, FAIRLIGHT SELT, GREAT LINFORD MANOR, ALASKA...

It's no coincidence that over 70 top studios use Quedsted Monitoring Systems.

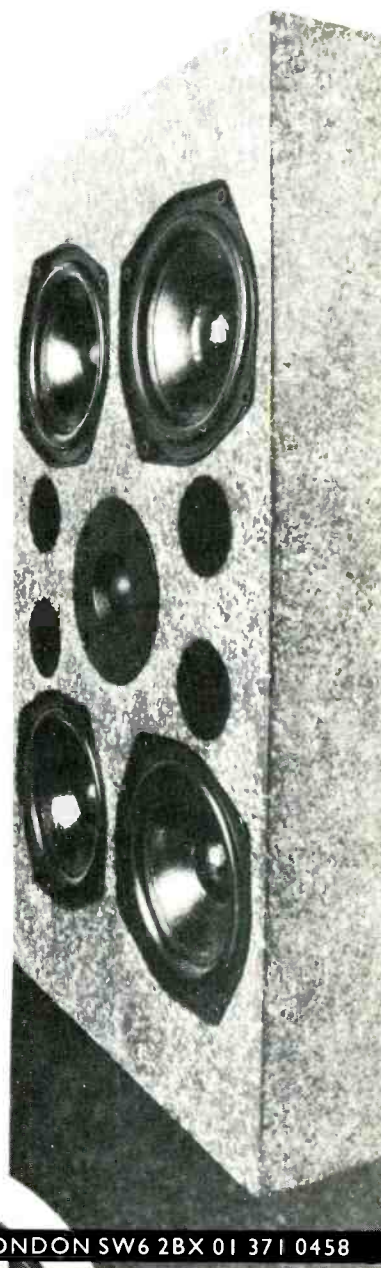
And with launch of the new Quedsted H405 compact near-field monitor every studio can now afford to fit the best. Ring for a demonstration.

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MONITORING

Sentry 505: 2-way up to 100 W designed for wall mounting.

Electro-Voice Inc, 600 Cecil Street, Buchanan, MI 49107, USA. Tel: (616) 695-6831.

UK: Shuttlesound Ltd, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-871 0966.

Fostex

RM 765: co-axial reference monitor, 120 W.

RM 780: co-axial reference monitor, 150 W.

USA: Fostex Corporation of America, 15431 Blackburn Avenue, Norwalk, CA 90650. Tel: (213) 921-1112.

Genelec

1019A: 2-way active nearfield, to 96 dB.

S30: 3-way active nearfield, to 105 dB.

1022A: 3-way active freefield, to 110 dB.

1024B: 3-way active freefield, to 115 dB.

1025A: 4-way active control room monitor (two 15 in bass drivers), to 122 dB.

Genelec, PO Box 36, 74101 Iisalmi, Finland.
Tel: 358 77 13311.

UK: Scenic Sounds Equipment Ltd, Unit 2, 12 William Road, London NW1 3EN. Tel: 01-387 1262.

Hidley/Kinoshita

1: 2-way passive, single woofer.

2: 2-way passive, twin woofer, horizontally mounted.

3V: 2-way passive, down to 31 Hz.

4V: 2-way passive, down to 24 Hz.

5V: 2-way passive, down to 20 Hz.

Hidley Design, Route de Glion 24, Residence Panorama 6-B, CH 1820 Montreux, Switzerland.

UK contact: Stirling ITA, 1 Canfield Place, London NW6 3BT. Tel: 01-625 4515.

JBL

4312A: 3-way freefield, up to 100 W.

4406: 2-way nearfield, up to 75 W.

4408: 2-way nearfield, up to 100 W.

4410: 3-way nearfield, up to 125 W.

4412: 3-way nearfield, up to 150 W.

4425: 2-way with bi-radial high frequency horn/compression driver, up to 200 W.

4430: 3-way with bi-radial horn, up to 200 W.

4435: 4-way passive freefield, same as above but with two 15 in bass drivers going up to 400 W.

Control 1: 2-way reference up to 150 W.

JBL Professional, 8500 Balboa Boulevard, PO Box 2200, Northridge, CA 91329, USA. Tel: (818) 893-8411.

UK: Harman Audio (UK) Ltd, Mill Street, Slough, Berkshire SL2 5DD. Tel: 0753 35306.

KEF

KM1: 3-way active (four LF, two midrange and one tweeter), tri-amped, up to 400 W.

KM1P: ported version of above.

P60 system: pair of 2-way nearfields, up to 150 W, plus *K300* amplifier delivering 150 W/channel.

KEF Electronics Ltd, Tovil, Maidstone, Kent ME15 6QP, UK. Tel: 0622 672261.

UK: Michael Stevens & Partners, Invicta Works, Elliott Road, Bromley, Kent BR2 9NT. Tel: 01-460 7299.

USA: KEF Electronics of America Inc, 14120-K Sullyfield Circle, Chantilly, VA 22021. Tel: (703) 631-8810.

Keith Monks

LS5/3: 2-way, BBC spec.

Keith Monks Ltd, Progress House, Albert Road, Aldershot, Hants GU11 1SZ, UK. Tel: 0252 334121.



Klark Acoustic JADE 1 MkII

Klark Acoustic

JADE I Mk II: 2-way nearfield active, with MOSFET amplification up to 100 W.
Klark-Teknik, Klark Industrial Park, Walter Nash Road, Kidderminster, Worcestershire DY11 7HJ, UK. Tel: 0562 741515.

USA: Klark-Teknik Electronics Inc, 30B Banfi Plaza North, Farmingdale, NY 11735. Tel: (516) 249-3660.

Klein & Hummel

Model OY: 3-way active freefield.

Klein & Hummel, D-7302 Ostfildern 4, Kennat, Postfach 3102, West Germany. Tel: 0711 45 50 26.

UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091.

USA: Gotham Audio Corp, 1790 Broadway, New York, NY 10019-1412. Tel: (212) 765-3410.

Lockwood

Universal Major: 2-way freefield, up to 120 W.

Studio Academy 1: dual concentric freefield, up to 85 W.

Studio Academy 2: dual concentric freefield, up to 60 W.

Studio Academy 3: dual concentric freefield, up to 50 W.

Lockwood, 51 High Road, Bushey Heath, Herts WD2 1EE, UK. Tel: 01-866 0671.

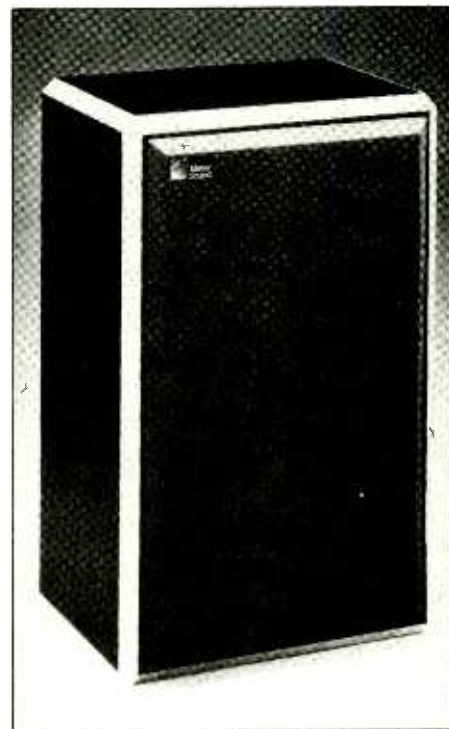
Meyer

833: 2-way freefield, up to 400 W.

834: subwoofer in cabinet, up to 200 W.

Meyer Sound Laboratories Inc, 2832 San Pablo Avenue, Berkeley, CA 94702, USA. Tel: (415) 486 1166.

UK: Autograph Sales Ltd, 2 Spring Place, Kentish Town, London NW5 3BA. Tel: 01-267 6677.



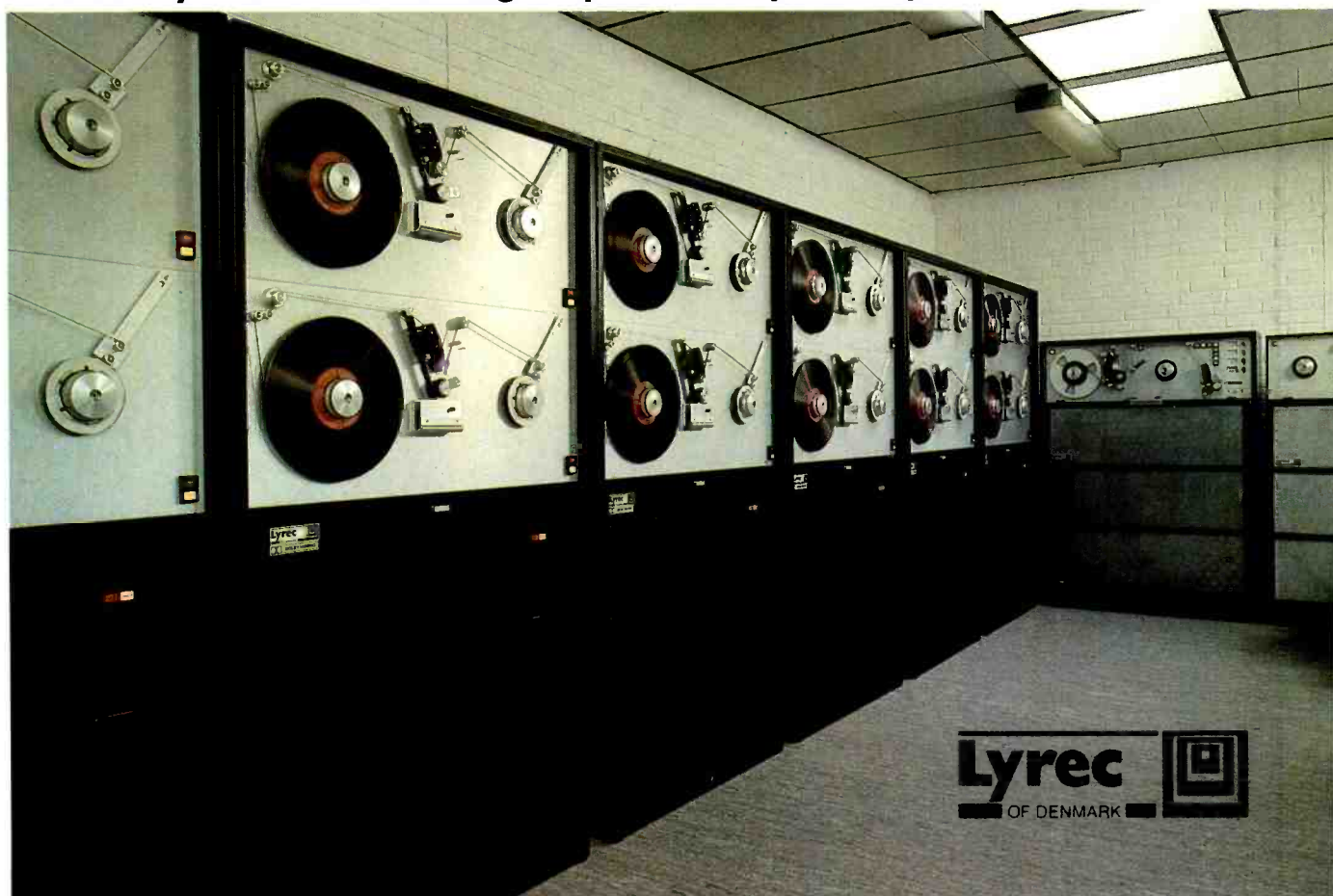
Meyer 833



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Lyrec Manufacturing A/S Hollandsvej 12, DK-2800 Lyngby, Denmark. Tel: +45 2 876322 Tlx: 37568 LYREC

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MONITORING

Munro

M3: 3-way control room monitor with dome HF.
M4: 4-way control room monitor, similar to *M3* but with additional low/mid driver.
M5: 5-way large control room monitor, including two 30 in LF units.
Windmill Munro Design, 26 Soho Square, London W1, UK. Tel: 01-434 0011.

Quad

ESL-63: electrostatic loudspeaker with classical monitoring application.
Quad Electroacoustics Ltd, Huntington PE18 7DB, UK. Tel: 0480 52561.
USA: Tovil Distributors, 14120-K Sullyfield Circle, Chantilly, VA 22021. Tel: (703) 631-8810.

Quested

HM415: 4-way active freefield 800 litre.
H405: 2-way passive nearfield.
H210: 3-way passive nearfield.
Q412: 3-way active freefield.
Q215: 3-way active freefield.
Q212: 3-way active freefield.
Q115: 3-way active freefield (not marketed but can be made on request).
Q112: 3-way active freefield.
Q209SB: 4-way active freefield.
Q209: 3-way active freefield.
Quested Monitoring Systems Ltd, 59 Maltings Close, Bagleys Lane, London SW6 2BX. Tel: 01-734 6080.
USA: Apogee Electronics Corp, 1517, 20th Street, Santa Monica, CA 90404. Tel: (213) 828-1930.

RCF

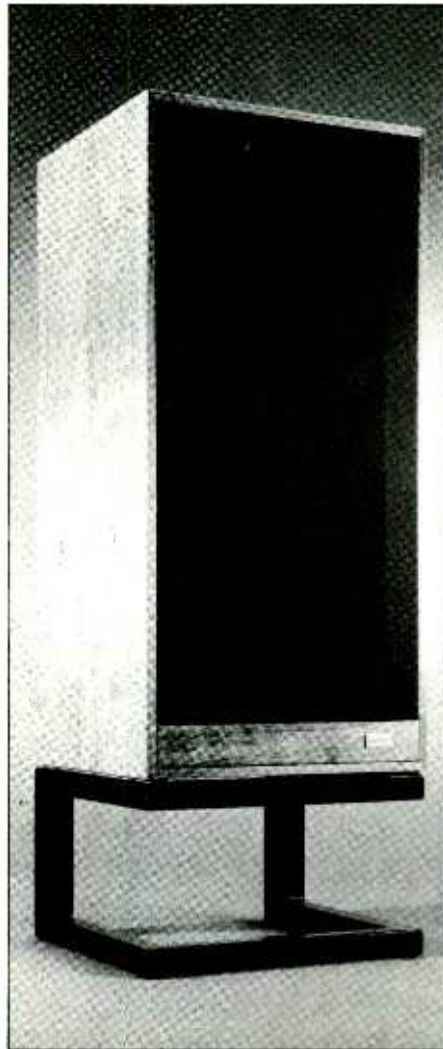
SCD 6000: 3-way nearfield, up to 200 W.
SCD 6010: 3-way nearfield, up to 150 W.
SCD 6020: 2-way nearfield, up to 40 W.
Radio Cine Furniture, Via Notaru 1/a, Reggio Emilia, San Maurizio, I-42029, Italy. Tel: (522) 401 4133.
UK: Court Acoustics Sales Ltd, 29 Beethoven Street, London W10 4LG. Tel: 01-960 8178.

Reflexion Arts

233: 3-way active monitoring system.
235: 3-way active monitoring system, higher rating.
238: 3-way passive monitor.
240: 3-way passive monitor.
250: 4-way nearfield monitor.
Music Services International, 14-18 Market Road, London N7 9PL, UK. Tel: 01-609 0246.

Rogers

LS2: 2-way compact, up to 100 W.
LS6: 2-way compact, up to 100 W.
LS7t: 2-way nearfield, up to 200 W.
Studio 1a: 2-way passive nearfield, up to 200 W. Active version available.
LS3/5a: 2-way, up to 60 W, BBC spec.
LS5/9: 2-way, up to 150 W, BBC spec.
LS5/8: 2-way active, using Quad 405-2 dual power amp, BBC spec.
RM2: 2-way freefield, up to 200 W.
PM510.S2: passive version of *LS5/8*, up to 350 W.
Swisstone Electronics Ltd, 310 Commonside East, Mitcham, Surrey CR4 1HX, UK. Tel: 01-640 2172.
UK: Michael Stevens & Partners, Invicta Works, Elliott Road, Bromley, Kent BR2 9NT. Tel: 01-460 7299.



Spendor SP1

USA: Audio Influx Corp, PO Box 381, Highland Lakes, NJ 07422-0381. Tel: (201) 764-8958.

Spendor

SP1: 3-way passive, up to 90 W.
SP2: 2-way passive, up to 80 W.
Prelude 2: 2-way passive, up to 75 W.
BCI: 3-way passive nearfield, up to 55 W.
BCII: same as above but with large voice coil and magnet assembly.
BCIII: 4-way passive, up to 70 W.
LS3/5A: 2-way, up to 40 W, BBC spec.
A series: active versions of *SP1*, *BCI* and *BCIII* are available.
Spendor Audio Systems Ltd, Station Road Industrial Estate, Hailsham, Sussex BN27 2ER, UK. Tel: 0323 843474.
USA: RCS Audio International, 1035 Thomas Jefferson Street Northwest, Washington DC 20007. Tel: (202) 342-0400.

SOTA

CF-1000: 4-way control room monitor.
CF-2000: similar to above but with extra bass driver for rooms more than 120 m².
State of the Art Electronik Inc, 43-1010 Polytek Street, Ottawa, Ontario K1J 8Z2, Canada. Tel: (613) 744-1003.

Studer

A2706: 3-way freefield, up to 120 W.
Studer International AG, Althardstrasse 10, CH-8105 Regensdorf, Switzerland. Tel: 840 29 60.
UK: FWO Bauch Ltd, 49 Theobald Road, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091
USA: Studer Revox America Inc, 1425 Elm Hill Pike, Nashville, TN 37210. Tel: (615) 254-5651.

TAD

TAD-1: 2-way, bi-amped control room monitor, up to 600 W.
TAD-2: 2-way, bi-amped control room monitor, up to 300 W.
Technical Audio Devices, 5000 Airport Plaza Drive, Long Beach, CA 90815, USA. Tel: (213) 420-5700.

Tannoy

DTM-8: single dual concentric nearfield, up to 110 W.
LGM: single dual concentric, up to 200 W.
SGM 10B: single dual concentric, up to 150 W.
SGM 12X: single dual concentric, up to 200 W.
SGM 1000: single dual concentric, up to 100 W.
SGM 3000: single dual concentric, up to 300 W.
FSM-U: 2-way (dual concentric plus bass driver), up to 500 W.
Tannoy Ltd, The Bilton Centre, Coronation Road, Cressex Industrial Estate, High Wycombe, Bucks HP12 3SB, UK. Tel: 0494 37431.
UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091.
North America: Tannoy North America Inc, 97 Victoria Street, Kitchener, Ontario N2H 5C1, Canada. Tel: (519) 745-1158.

MONITORING

Toa

312-ME-AV: 3-way nearfield, up to 135 W.

280-ME-AV: 3-way nearfield, up to 90 W.

265-ME-AV: 2-way nearfield, up to 75 W.

RS-21M: compact reference monitor.

UK: Toa Electronics Ltd, Tallon Road, Hutton Industrial Estate, Hutton, Brentwood, Essex CM13 1TG. Tel: 0277 233882.

USA: Toa Electronics, PO Box 2047, South San Francisco, CA 94080. Tel: (415) 588-2538.

UREI

809A: single coaxial (12 in driver) nearfield, up to 100 W.

811C: single coaxial nearfield, up to 150 W.

813C: 2-way (coaxial and one LF driver), up to 150 W.

815C: 3-way (coaxial and two LF drivers), up to 150 W.

JBL Professional, 8500 Balboa Boulevard, PO Box 2200, Northridge, CA 91329, USA. Tel: (818) 893-8411.

UK: Harman Audio (UK) Ltd, Mill Street, Slough, Berks SL2 5DD. Tel: 0753 35306.

Visionik

D 6000/7000: 2-way reference, up to 50 W/60 W resp.

D 8000/9000: 3-way nearfield, up to 100 W/120 W resp.

Kurt M Bruns (GmbH & Co),

Nordkanalstrasse 46, 200 Hamburg 1, West Germany. Tel: (040) 232111.

UK: RJ Education Supplies Co Ltd, Unit 2,

Westham Trading Estate, London Road, Westham, Kent TN6 3BR. Tel: 0959 62255.

USA: Visonik of America, 701 Heinz Avenue, Berkeley, CA 94710. Tel: (415) 548-4005.

Wellard

Middle Monitor: 2-way active nearfield.
Wellard Research Ltd, Whitehall Park, Weobley, Hereford HR4 8QT, UK. Tel: 0544 318800.

Westlake

TM-3, TM-4: 3-way control room monitor, bi-amplified, up to 400 W. *TM-4* tri-amplified.

HR-1: 4-way control room monitor, up to 300 W.

BBSM-4/BBSM-5: 2-way nearfield, up to 50 W/60 W resp.

BBSM-6/BBSM-8: 3-way monitor, up to 60 W/100 W resp.

BBSM-10/BBSM-12: 3-way monitor, up to 120 W/180 W resp.

BBSM-15: 3-way monitor, optionally bi-amplified, up to 300 W.

Westlake Audio, 2696 Lavery Court, Unit 18, Newbury Park, CA 91320, USA. Tel: (805) 499-3686.

UK: Pro-Britto Ltd, 53 Corsica Street, London N5 1JT. Tel: 01-226 1226.

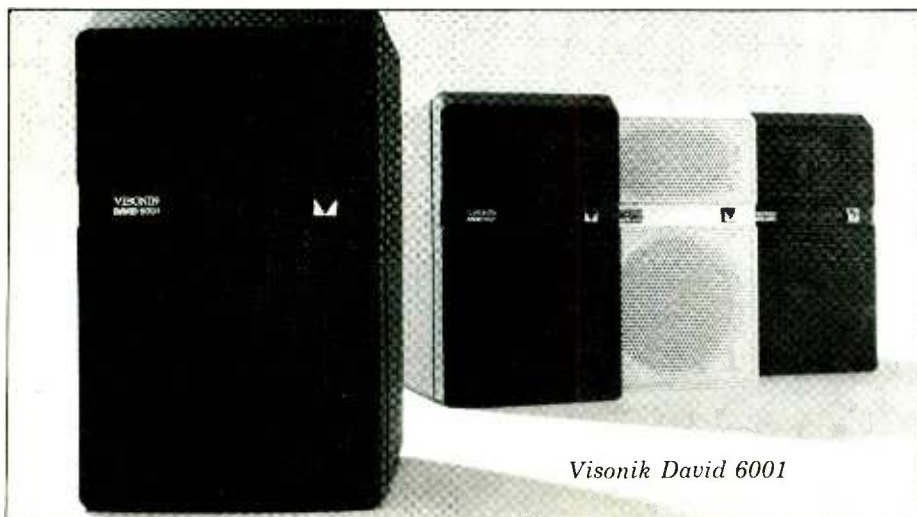
Yamaha

NS 10M: 2-way nearfield.

NS 10S: 2-way nearfield, up to 50 W, modified for studio use.

UK: Yamaha-Kemble Music (UK) Ltd, Mount Avenue, Bletchley, Milton Keynes MK1 1JE. Tel: 0908 71771.

USA: Yamaha International Corp, PO Box 6600, Beuna Park, CA 90620. Tel: (714) 522-9105. □



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CONTACT: SIMON CURRY.

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LOWER TREGENNA, ST. COLUMB MINOR,

NR. NEW QUAY, CORNWALL, TR8 4HS.

TEL: (0637) 875824. CONTACT: ROGER VINTON.

LONDON: ELECTROMUSIC, 89-97 ST. JOHN STREET,

LONDON, EC1M 4AB. TEL: (01) 253 9079.

CONTACT: MIKE NOVAK.

NORTH: THE MUSIC COMPANY, UNIT K,

HALLAM ROAD INDUSTRIAL ESTATE,

CANAL ROAD, BRADFORD, TEL: (0274) 370966.

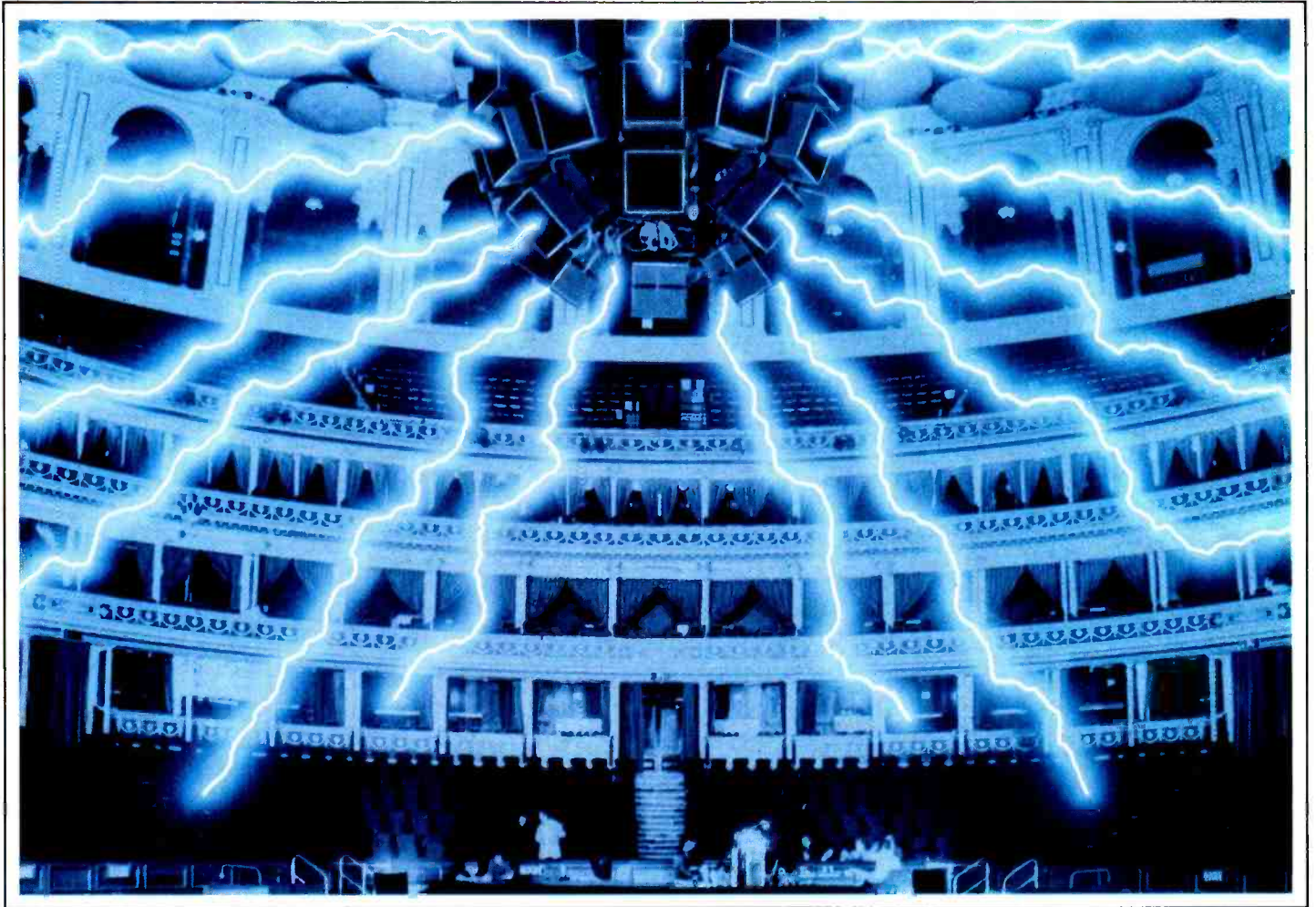
CONTACT: PAUL SMITH

SCOTLAND: THE WAREHOUSE, UNIT 14,

50 WEST HARBOUR ROAD, EDINBURGH, EH5 1PU.

TEL: (031) 552 8194. CONTACT: NEIL HUTTON.

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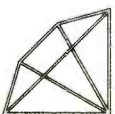
Installations from the Grand Ole Opry in Nashville to Blackpool Winter Gardens, from the Sydney Entertainment Centre to the Portsmouth Guildhall, testify to that.

To give your ears a chance to judge for themselves, call one of the official distributors listed or our Head Office, to arrange a personal demonstration and details of our comprehensive installation service.

We guarantee you'll reach a wider audience than you'd ever thought possible.

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If you're going 24-track, now is the time to go TASCAM.

TASCAM

POWER AMPLIFIERS

We have compiled a list of amplifier manufacturers and agents, together with a brief description of their products, from information available to us at the time of writing

This survey of power amplifiers is intended to include units designed for professional use primarily in the areas of recording studio monitoring systems. It also includes some units for use in live sound although we have omitted units for commercial sound installation where identifiable. Because the definition of what comprises a power amplifier suitable for these applications is open to a degree of interpretation, there may be some omissions. Further the number of manufacturers active in this field is so large and internationally based that there are almost certainly names that have not been included. We will endeavour to include any subsequent information received at a later date.

All power amplifiers are 2-channel with all wattages quoted in RMS watts unless otherwise stated.

ACES

M150: single-channel 100 W into 8 Ω .
S300: 100 W/channel into 8 Ω .
S750: 150 W/channel into 8 Ω .
S960: 150 W/channel into 8 Ω , 480 W/channel into 2 Ω . Separate power supplies.
ACES (UK) Ltd, Featherbed Lane, Shrewsbury, Shropshire SY1 4NJ, UK. Tel: 0743 66671.
USA: Power Studio, 13453 Hollow Oval, Stongsville, OH 44136. Tel: (216) 238 9426.
USA: The Rock Studio, 430 Kansas Street, Norman, OK 73069. Tel: (405) 329-8431.

Altec Lansing

1268: 60 W/channel into 8 Ω ; 200 W bridged into 8 Ω .
1269: 120 W/channel into 8 Ω ; 400 W bridged into 8 Ω .
1270B: 220 W/channel into 8 Ω ; 800 W bridged into 8 Ω .
Altec Lansing Corp, PO Box 26105, Oklahoma City, OK 73126-0105, USA. Tel: (405) 324-5311.
UK: Shuttlesound, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-870 9300.

AMR

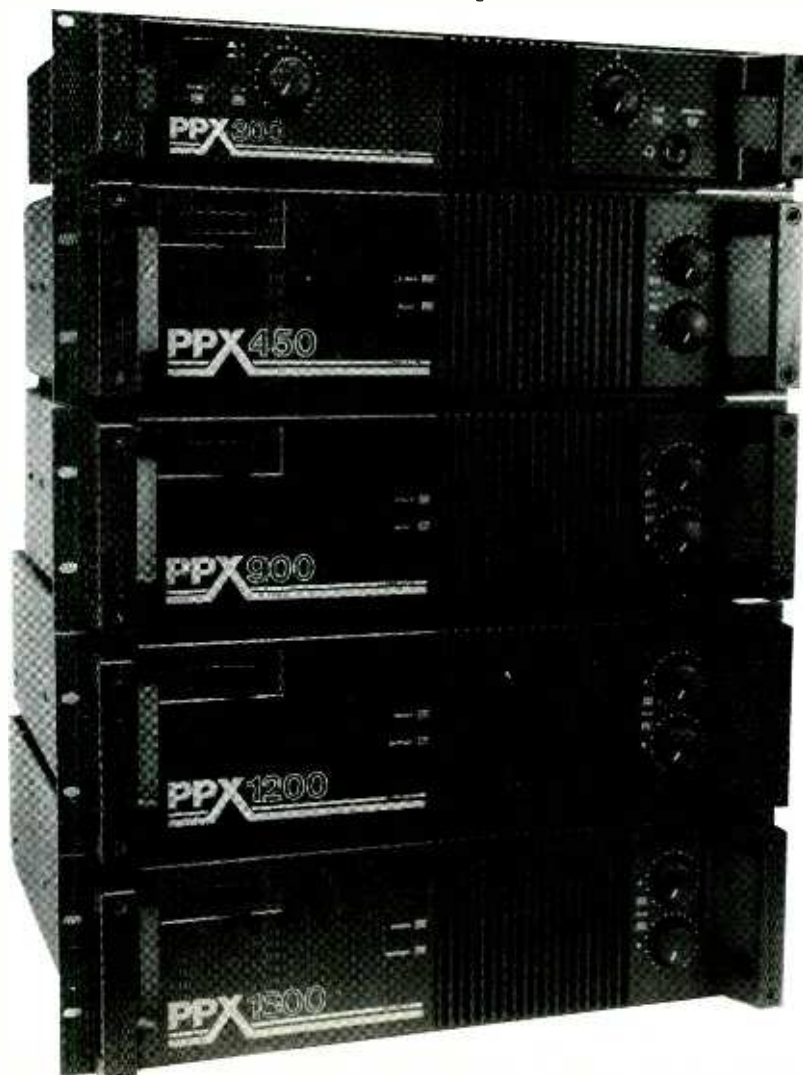
PMA-200: 100 W/channel into 8 Ω .
PMA-70+: 35 W/channel into 8 Ω . Half rack width.
Audio Media Research, PO Box 1230, Meridian, MS 39301, USA. Tel: (601) 483-5372.
UK: Audio Media Research, Hatton House, Hunters Road, Weldon North Industrial Estate, Corby, Northamptonshire NN17 1JE. Tel: 0536 205520.

BGW

250D & E: 100 W/channel into 8 Ω , 300 W bridged into 8 Ω . Difference between models in metering.
750D & E: 250 W/channel into 8 Ω , 800 W bridged into 8 Ω .
GTA: 350 W/channel into 8 Ω , 1800 W bridged into 4 Ω .
320B: 100 W/channel into 8 Ω .
620B: 200 W/channel into 8 Ω .
2125: single-channel 100 W into 8 Ω .
8000: single-channel 225 W into 8 Ω .
7500: single-channel 200 W into 8 Ω .
6500: single-channel 100 W into 8 Ω .
85: 35 W/channel into 8 Ω , 90 W bridged into 8 Ω . Broadcast use.
150: 50 W/channel into 8 Ω , 150 W bridged into 8 Ω . Broadcast use.
SPA-1: amplifier system to power sub bass in sound reinforcement systems. Incorporates crossover and EQ. 250 W/channel into 8 Ω , 1200 bridged into 4 Ω .
SPA-3: 3-way amp system with crossover and EQ. 250 W/channel into 8 Ω , 1200 W bridged into 4 Ω .
BGW Systems Inc, 13130 S Yukon Avenue, Hawthorne, CA 90250, USA. Tel: (213) 973-8090.
UK: Pro-Britro, 53 Corsica Street, London N5 1JT. Tel: 01-226 1226.

Bose

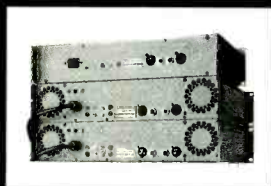
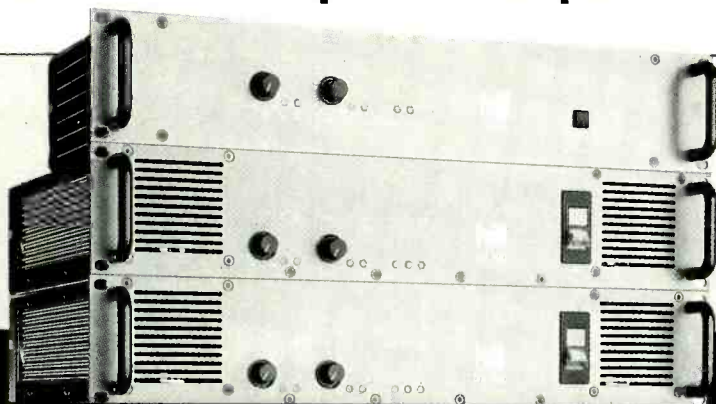
1800 series II: 280 W/channel RMS into 8 Ω ; 425 W/channel RMS into 4 Ω .
Bose Corporation, 100 Mountain Road, Framingham, MA 01701, USA. Tel: (617) 879-7330.
UK: Bose UK Ltd, Trinity Trading Estate, Sittingbourne, Kent ME10 2PD. Tel: 0795 75341.



POWER AMPLIFIERS



introducing the DX300, DX800
and DX1500 power amplifiers



The DX300, DX800 and DX1500 amplifiers all feature balanced XLR inputs, balanced and unbalanced 1/4" inputs, banana outputs, ground lift switch and a terminal block with access to all inputs and outputs.

DX300 output power: 200 watts into 8Ω (per channel, both channels driven, 20Hz-20kHz, -0.5dB) 400 watts into 8Ω, 450 watts into 4Ω (burst power*) distortion (250mW to rated power at 8Ω): IMD SMPTE: <0.01% THD (1kHz): 0.01% THD (20kHz DIN): <0.02% size: 2 rack spaces, 8 1/2" behind front panel weight: 7Kgs, 16 lbs. cooling: 2 passive heatsinks.

DX800 output power: 250 watts into 8Ω, 400 watts into 4Ω (per channel, both channels driven, 20Hz-20kHz, -0.5dB), 800 watts into 8Ω (bridged mono), 900 watts into 4Ω (burst power*) distortion (250mW to rated power at 8Ω): IMD SMPTE: <0.01% THD (1kHz): <0.01% THD (20Hz-20kHz DIN): <0.02% size: 2 rack spaces, 13" behind front panel weight: 13Kgs, 29 lbs. cooling: 1 servo controlled DC fan.

DX1500 output power: 300 watts into 8Ω, 500 watts into 4Ω, 750 watts into 2Ω (per channel, both channels driven, 20Hz-20kHz, -0.5dB), 1000 watts into 8Ω, 1500 watts into 4Ω (bridged mono) 1500 watts into 2Ω, 1600 watts into 1Ω (burst power*) distortion (250mW to rated power at 8Ω): IMD SMPTE: <0.01% THD (1kHz): <0.01% THD (20Hz-20kHz DIN): <0.02% size: 2 rack spaces, 13" behind front panel weight: 15Kgs, 34 lbs. cooling: 2 servo controlled DC fans.

*Burst power is a 1kHz tone for 10ms every 100ms, single channel (an indication of the amplifiers ability to handle music transients and tolerate deviations in nominal speaker impedance)

Total Audio Transparency

Manufactured in the UK:
Hill Audio Ltd., Hollingbourne House, Hollingbourne, Kent ME17 1QJ England
Tel: (062 780) 555/6/7 Tlx: 966641 HILL

U.S. Sales Office:
Hill Audio Inc., 5002B N. Royal Atlanta Dr., Tucker, GA 30084 USA
Tel: (404) 934-1851 Tlx: 293827 HLAD



Boulder

500: 150 W/channel RMS into 8 Ω; 250 W/channel RMS into 4 Ω; 500 W bridged into 8 Ω.

Boulder Amplifiers, 4850 Sterling Drive, Boulder, CO 80301, USA. Tel: (303) 449-8220.
UK contact: Syco Systems Ltd, 20 Conduit Place, London W2. Tel: 01-724 2451.

Bryston

2B: 50 W/channel RMS into 8 Ω; 200 W bridged into 8 Ω.

3B: 100 W/channel RMS into 8 Ω; 400 W bridged into 8 Ω.

4B: 250 W/channel RMS into 8 Ω; 800 W bridged into 8 Ω.

6B: single-channel, 500 W into 8 Ω; 800 W into 1 Ω.

Bryston Ltd, 57 Westmore Drive, Rexdale, Ontario, Canada M9V 3Y6. Tel: 746-1800.

UK: Roksan Engineering Ltd, The Turnmill, 63 Clerkenwell Rd, London EC1R 5BH. Tel: 01-251 1021.

USA: Brystonvermont, RFD 4, Berlin, Montpelier, VT 05602. Tel: (802) 223-6159.

Carlsboro

CP 250: 250 W/channel into 8 Ω; 250 W bridged into 8 Ω.

CP 600: 200 W/channel into 8 Ω; 600 W bridged into 8 Ω.

CP 1000: 300 W/channel into 8 Ω; 1000 W bridged into 8 Ω.

S600: 200 W/channel into 8 Ω; 300 W/channel into 4 Ω.

S300: 105 W/channel into 8 Ω; 150 W/channel into 4 Ω.

Carlsboro Sales Ltd, Cross Drive, Low Moor Road Industrial Estate, Kirkby-in-Ashfield, Notts NG17 7LD, UK. Tel: 0623 753902.

Carver

PM-1.5: 450 W/channel into 8 Ω; 1500 W bridged into 8 Ω.

PM-175: 175 W/channel into 8 Ω; 500 W bridged into 8 Ω.

PM-350: 350 W/channel into 8 Ω; 900 W bridged into 8 Ω.

Carver Corp, PO Box 1237, Lynnwood, WA 98046, USA.

UK: Kelsey Acoustics Ltd, 28 Powis Terrace, London W11 1JH. Tel: 01-727 1046.

C-Audio

SR 808: 805 W/channel RMS into 4 Ω; 1700 W into 8 Ω bridged; 2500 W into 4 Ω bridged.

SR 606: 600 W/channel RMS into 4 Ω; 1200 W into 8 Ω bridged; 1500 W into 4 Ω bridged.

SR 404: 400 W/channel RMS into 4 Ω; 800 W into 8 Ω bridged; 1100 W into 4 Ω bridged.

SR 202: 200 W/channel RMS into 4 Ω; 400 W into 8 Ω bridged.

C-Audio Ltd, Barnwell Road Business Park, Cambridge CB5 8UY, UK. Tel: 0223 211333.

Citronic

PPX 300: 100 W RMS/channel into 8 Ω; 300 W bridged into 4 Ω.

PPX 450: 140 W RMS/channel into 8 Ω; 450 W bridged into 4 Ω.

PPX 900: 280 W RMS/channel into 8 Ω; 900 W bridged into 4 Ω.

Why No Other Touring Amp Stacks Up To BGW's GRAND TOURING AMPLIFIER...



1. GTA Packs 1800 Watts Into Just 5 1/4". That's more than 2 horsepower! The GTA delivers 900 watts per channel into 2 ohm loads; 1800 watts bridged punch, the GTA's massive power supplies store an enormous 320 joules of energy. It's the most powerful amplifier ever from BGW.

2. It's Heavy-Duty All The Way. Make no mistake, this is no "flyweight wonder". Our engineers don't believe in taking shortcuts. From its one-piece welded steel chassis to totally redundant dual-mono design (with field-swappable modules), the Grand Touring Amplifier is built to take everything the road can dish out. It's the first powerful compact amp with legendary BGW reliability.

3. Details, Details, Details. For all its raw power, the GTA is a highly refined amplifier. It features low feedback circuitry for superb sonic performance. D.C. speaker protection is included, of course. The GTA internally accommodates two BGW crossover cards. And BGW builds-in the subsonic filters that you need, but other manufacturers "forget".

4. Have It Your Way. Choose high performance active balanced inputs (featuring 70dB+ common mode rejection), or specify transformer isolated inputs (to eliminate stubborn ground loops).

5. What Price Glory? Less than you'd expect. Under a dollar per watt buys you the massive power, small size, full roster of features, magnificent performance, and rock-solid reliability of the GTA.

6. It All Adds Up. Our new Grand Touring Amplifier clearly stacks up as THE road amp of choice. Your next move? Call BGW at 1 (800) 252-4800 Toll-Free (In CA-(213) 973-8090), to arrange for a demo trial.

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 13130 South Yukon Avenue.
 Hawthorne, CA 90250



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 601 Milner Ave. Scarborough Ontario
 M10 1M8 (416) 292-5161



UK Distribution: PRO-BRITRO LTD.
 53 Corsica Street, London N5 1JT
 Telephone: 01-226 1226
 Telex: 26284 Proud G
 Fax: 01-359 1454

POWER AMPLIFIERS

PPX 1200: 400 W RMS/channel into 8 Ω ; 1200 W into 4 Ω .

PPX 1600: 480 W RMS/channel into 8 Ω ; 1600 W into 8 Ω .

Citronic Ltd, Halifax Road, Bowerhill, Melksham, Wilts SN12 6UB, UK. Tel: 0225 705600.

Crest

PL300: 220 W/channel into 8 Ω ; 650 W bridged into 8 Ω .

PL400: 290 W/channel into 8 Ω ; 900 W bridged into 8 Ω .

3001: 240 W/channel into 8 Ω ; 1240 W bridged into 4 Ω .

3000: as 3001 but with VU meters.

4001: 325 W/channel into 8 Ω ; 1500 W bridged into 4 Ω .

4000: as 4001 but with VU meters.

8001: 750 W/channel into 8 Ω ; 1200 W/channel into 4 Ω ; 2400 W bridged into 8 Ω and 3000 W bridged into 4 Ω .

Crest Audio, 150 Florence Avenue, Hawthorne, NJ 07506, USA. Tel: (201) 423-1300.

Europe: Crest Audio (UK) Ltd, PO Box 36, Royston, Herts SG8 7RQ. Tel: 076 382465.

Crown/Amcron

D-75: 40 W/channel into 8 Ω .

D-150A series II: 96 W/channel RMS into 8 Ω ; 280 W RMS bridged into 8 Ω .

DC-300A series II: 180 W/channel RMS into 8 Ω ; 600 W bridged into 8 Ω .

MT-600: 230 W/channel into 8 Ω ; 600 W bridged into 4 Ω .

MT-600LX: as MT-600 but with XLRs, display and custom front panel adaptable to user's connectors.

MT-1200: 320 W/channel into 8 Ω ; 1200 W bridged into 4 Ω .

MT-1200LX: as MT-600 but with XLRs, display

and custom front panel adaptable to user's connectors.

Power Base-1: 200 W/channel into 8 Ω ; 400 W bridged into 8 or 16 Ω .

PSA-2X: 220 W/channel RMS into 8 Ω ; 1200 W RMS bridged into 4 Ω .

DO-2000: single-channel, 600 W into 8 Ω .

Crown International Inc, 1718 West Mishawaka Road, Elkhart, IN 46517, USA. Tel: (219) 294-5571.

UK: HHB Hire & Sales, 73-75 Scrubs Lane, London NW10 6QU. Tel: 01-960 2144.

UK: Shuttlesound Ltd, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-871 0966.

d&b audiotechnik

AMP: 220 W/channel into 8 Ω ; 800 W bridged into 8 Ω .

d&b audiotechnik, Steinstrasse 40, D-7054 Korb, West Germany. Tel: (07151) 3 10 18.

Dynamic Precision

No. 1: 250 W/channel into 8 Ω , 1300 W into 4 Ω bridged.



TWIN TWIN PPM



Two TWIN movements and two PPM9 boards give simultaneous monitoring of A/B on red and green and M/S on white and yellow pointers. Together these provide complete information about stereo signals, in contrast to the ambiguous readings of phase meters. PPM9 is a two channel PPM driver featuring inherent stability with the law under microprocessor control. Manufactured under licence from the BBC.

ALSO: PPM7, the highest specification analogue drive circuit on the market; PPM3, unbalanced; PPM5, 20 pin DIL hybrid; illuminated TWIN boxes; PPM8, IEC/DIN -50/+60 dB scale.

**SURREY ELECTRONICS LTD, The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG
Tel: 0483 275997**

Norwegian Audio Designs A/S, Jerikoveien 10, 1067 Oslo 10, Norway. Tel: 2 32 20 40.

UK: Phase Audio UK Ltd, 80 St Mary's Road, Market Harborough, Leicester LE16 7DX. Tel: 0858 31717.

FM Acoustics

FM300A: 100 W/channel into 8 Ω ; 150 W/channel into 4 Ω and 180 W/channel into 2 Ω .

FM600A: 250 W/channel into 8 Ω ; 350 W/channel into 4 Ω and 400 W/channel into 2 Ω .

FM800A: 400 W/channel into 8 Ω ; 600 W/channel into 4 Ω and 850 W/channel into 2 Ω .

FM801: 420 W channel into 8 Ω ; 750 W/channel into 4 Ω and 1000 W/channel into 2 Ω .

FM1000: 450 W/channel into 8 Ω ; 750 W/channel into 4 Ω , 1300 W/channel into 2 Ω and 1800 W/channel into 1 Ω .

FM Acoustics Ltd, Tiefenhofstrasse, CH-8820 Wadenswil, Switzerland. Tel: 01 780 64 44.

USA: FM Acoustics USA, PO Box 854, Benica, CA 94510. Tel: (707) 745-4444

Hafler

P125: 62 W/channel RMS into 8 Ω ; 125 W into 16 Ω bridged.

P225: 105 W/channel RMS into 8 Ω ; 350 W into 8 Ω bridged.

P505: 255 W/channel RMS into 8 Ω ; 800 W into 8 Ω bridged.

P500: 255 W/channel RMS into 8 Ω ; 800 W into 8 Ω bridged.

XL280: 145 W/channel RMS into 8 Ω ; 400 W into 8 Ω bridged.

David Hafler Company, 5910 Crescent Boulevard, Pennsauken, NJ 01809, USA. Tel: (609) 662-6355.

UK: HW International Ltd, 3-5 Eden Grove, London N7 8EQ. Tel: 01-607 2717.

HH Electronics

VX 150: 80 W/channel RMS into 4 Ω ; 160 W into 8 Ω bridged.

VX 200: 105 W/channel RMS into 4 Ω ; 210 W into 8 Ω bridged.

VX 300: 155 W/channel RMS into 4 Ω ; 310 W into 8 Ω bridged.

VX 450: 230 W/channel RMS into 4 Ω ; 460 W into 8 Ω bridged.

VX 600: 310 W/channel RMS into 4 Ω ; 620 W into 8 Ω bridged.

VX 900: 470 W/channel RMS into 4 Ω ; 940 W into 8 Ω bridged.

VX 1200: 610 W/channel RMS into 4 Ω ; 1220 W into 8 Ω bridged.

HH Electronics Ltd, 9 Clifton Road, Off St Peter's Road, Huntingdon, Cambs PE17 7DW, UK. Tel: 0480 432227.

UK: Elliott Bros (Audio Systems) Ltd, Osney Mead, Oxford OX2 0ER. Tel: 0865 249259.

USA: Audio Techniques Inc, 652 Glenbrook Road, Stamford, CT 06906. Tel: (203) 359-2312.

Hiletron

3076: single-channel, 100 W into 8 Ω .

Teksam Srl, Via 1 Maggio, 47, 20021

Baranzate, Milano, Italy.

UK: Michael Stevens & Partners, Invicta Works, Elliott Road, Bromley, Kent BR2 9NT. Tel: 01-460 7299.

Hill

DX300: 200 W/channel RMS into 8 Ω .

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Or better still why not try them for yourself?

You won't be surprised!

As with all Toa equipment the ME-AV range assures top quality performance and total reliability.

Especially designed for use with audio visual equipment. The 3-way 312 ME-AV (135 watts) the 280 ME-AV (90 watts) and the 2-way 265 ME-AV (75 watts) near field reference monitors incorporate magnetically shielded speaker components to eliminate interference on nearby video screens.



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Power Station selects t.c.electronic installs 6 TC-2290 sampler/delays

“I love the sound, the ease of operation, and the complete control over all parameters. With the three modulation parameters, speed, depth and waveform on the front panel, and the special key functions to access software T.C. allows fine tuning of parameters that are predetermined in other units.

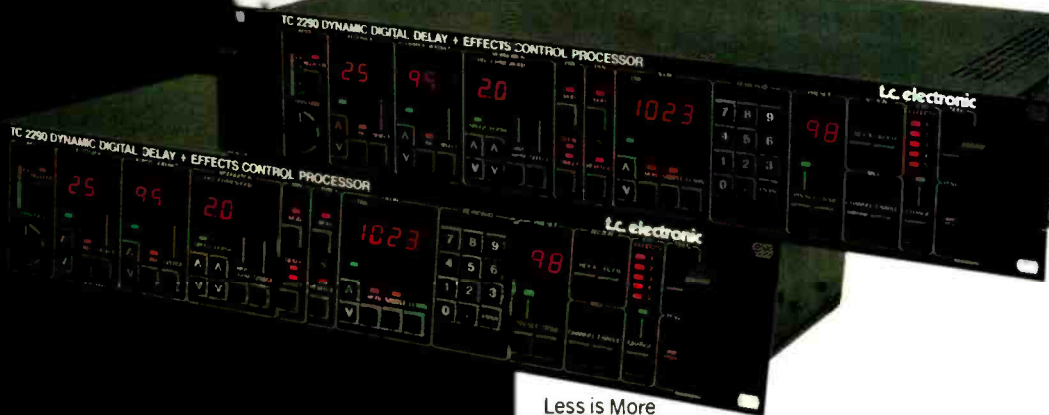
The combination of dynamic delay and pan modulation allow quite a variety of effects within a single processing device. T.C. was very smart about this. The 2290 does a lot more, and is more affordable than any other unit we've used. **”**

Engineer Don Rodenbach

A demonstration model of the new TC 2290 was sent to Power Station by Martin Audio. The first engineer to use the 2290 was Don Rodenbach, who was so pleased with the sound, and features of the 2290, as well as "the clarity of the :32 samples," that he bought one for his own rack. His unit then started making the rounds of various sessions at Power Station. Today there are six TC 2290 units at Power Station and no waiting. Each unit has 32 second capability for sampling (and delay), can be locked in perfect synch with a second 2290 for stereo sampling (*The new stereo link update*), and has Sampling 2 software, along with "Fast Trigger," update.

Sampling 2 Features

- 1) Multi-layering of samples. Up to 16 samples on top of each other with no degradation of signal, into the same pre-set.
- 2) Fancy Dancing-samples triggering samples any order, or number, as many times as desired.
- 3) :32 second delay possibility
- 4) Crossfade-After the first sample is triggered, a second sample can be triggered, and the first sample will continue to play simultaneously.
- 5) Note counter for pitchshift of samples.
- 6) 1 millisecond sample looping and sound on sound possible.



Less is More

The TC 2290 offers 2 bits more resolution, at a quarter the price of any truly competitive unit. T.C.'s 18 bit resolution, 1 MegaHz sampling rate, and 20-20KHz bandwidth (rolling off at 33KHz even out to 32 seconds) make the TC 2290 a remarkable unit for sampling, multi-effect delays, and panning programs.

Write for more informations.

OF DENMARK

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AUSTRALIA: (03) 4805988, FINLAND: 90-914133, GREECE: 01-3628541,
SWITZERLAND: 073 226616.

POWER AMPLIFIERS

DX800: 250 W/channel RMS into 8 Ω; 800 W into 8 Ω bridged.
DX1500: 300 W/channel RMS into 8 Ω; 1500 W into 4 Ω bridged.
DX1000: 375 W/channel RMS into 8 Ω; 1200 W into 8 Ω bridged.
DX2000: 400 W/channel RMS into 8 Ω; 2000 W into 4 Ω bridged.
DX3000: 550 W/channel RMS into 8 Ω; 3000 W into 4 Ω bridged.
DX1000A: 500 W/channel RMS into 8 Ω; 1600 W into 8 Ω bridged.
Hill Audio Ltd, Hollingbourne House, Hollingbourne, Kent, UK. Tel: 062 780 555.
USA: Hill Audio Inc, 5002B N Royal Atlanta Dr, Tucker, GA 30084. Tel: (404) 934-1851.

HIT

Xi150: 75 W/channel into 4 Ω.
Xi300: 150 W/channel into 4 Ω.
Xi600: 170 W/channel into 8 Ω; 600 W bridged into 8 Ω.
Xi1000: 300 W/channel into 8 Ω; 1000 W bridged into 8 Ω.
Xi1200: 350 W/channel into 8 Ω; 1200 W bridged into 8 Ω.
Xi1600: 450 W/channel into 8 Ω; 1000 W/channel into 2 Ω, 1600 W bridged into 8 Ω.
P900: 270 W/channel into 8 Ω; 900 W bridged into 8 Ω.
DSA300: 150 W/channel into 4 Ω, 300 W bridged into 8 Ω.
DSA500: 250 W/channel into 4 Ω; 500 W bridged into 8 Ω.
DSA800: 400 W/channel into 4 Ω; 800 W bridged into 8 Ω.
DSA1200: 600 W/channel into 4 Ω; 1200 W bridged into 8 Ω.
Harrison Information Technology Ltd, Unit 3, Button End, Harston, Cambs CB2 5NX, UK. Tel: 0223 871771.

Industrial Research

DH 4020: 100 W/channel RMS into 8 Ω; 300 W into 8 Ω bridged.
Industrial Research Products Inc, 321 Bond Street, Elk Grove Village, IL 60007, USA. Tel: (312) 439-3600.
UK: Knowles Electronics Ltd, Victoria Road, Burgess Hill, Sussex RH15 9LP. Tel: 04446 5432.



JBL/UREI

6215: 35 W/channel into 8 Ω; 90 W bridged into 8 Ω.
6230: 75 W/channel into 8 Ω; 300 W bridged into 8 Ω.
6260: 150 W/channel into 8 Ω; 600 W bridged into 8 Ω.
6290: 300 W/channel into 8 Ω; 1200 W bridged into 8 Ω.
JBL Professional, 8500 Balboa Boulevard, Northridge, CA 91329, USA. Tel: (818) 893-8411.
UK: Harman (Audio) UK Ltd, Mill Street, Slough SL2 5DD. Tel: 0753 76911.

Lenco

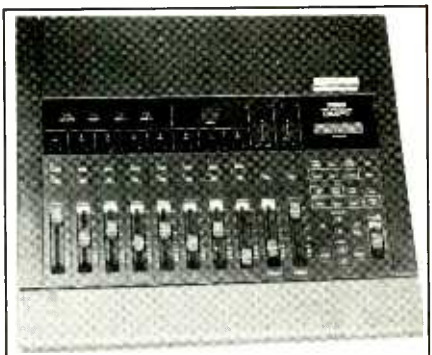
PPA-100: 100 W/channel into 8 Ω.
Lenco, 300 North Maryland Street, PO Box 348, Jackson, MO 63755, USA. Tel: (314) 243-3147.

Meyer

MS-1000: 300 W RMS/channel into 8 Ω; 1000 W bridged into 4 Ω.
Meyer Sound Laboratories Inc, 2832 San Pablo Avenue, Berkley, CA 94702, USA. Tel: (415) 485-1166.

Peavey

CS-800: 400 W/channel into 4 Ω; 800 W bridged into 8 Ω.
CS-900: 450 W/channel into 4 Ω; 900 W bridged into 8 Ω.
CS-1200: 600 W/channel into 4 Ω; 1200 W bridged into 9 Ω.
M-2600 MkV: single-channel 130 W into 4 Ω.
M-3000 MkV: single-channel 210 W into 4 Ω.
M-4000: single-channel 200 W into 4 Ω.
M-7000: single-channel 350 W into 4 Ω.
DECA-424: 200 W/channel into 4 Ω. Digital Energy Conversion series.
DECA-724: 350 W/channel into 4 Ω.
DECA-1200: 600 W/channel into 4 Ω.
Peavey Electronics Corp, 711 A Street, Meridan, MS 39301, USA. Tel: (601) 483-3565.
UK: Peavey Electronics (UK) Ltd, Hatton House, Hunters Road, Weldon North Industrial Estate, Corby, Northants NN17 1JE. Tel: 0536 205520.



YAMAHA D.M.P. 7

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 Akai MG 14D rack mounted 14 track ex-demo £2,500
 Sony PCM 501 digital mastering (new) £495
 BOKSE US8 Universal synchroniser £245
 Q.Play programmable remote for E16, B16 + M80 £99
 Fostex E16 w/remote - Mint £3,600
 Slapback scintillator (exciter) (new) £125
 Yamaha 31 band graphic eq. (2 only) £160 each
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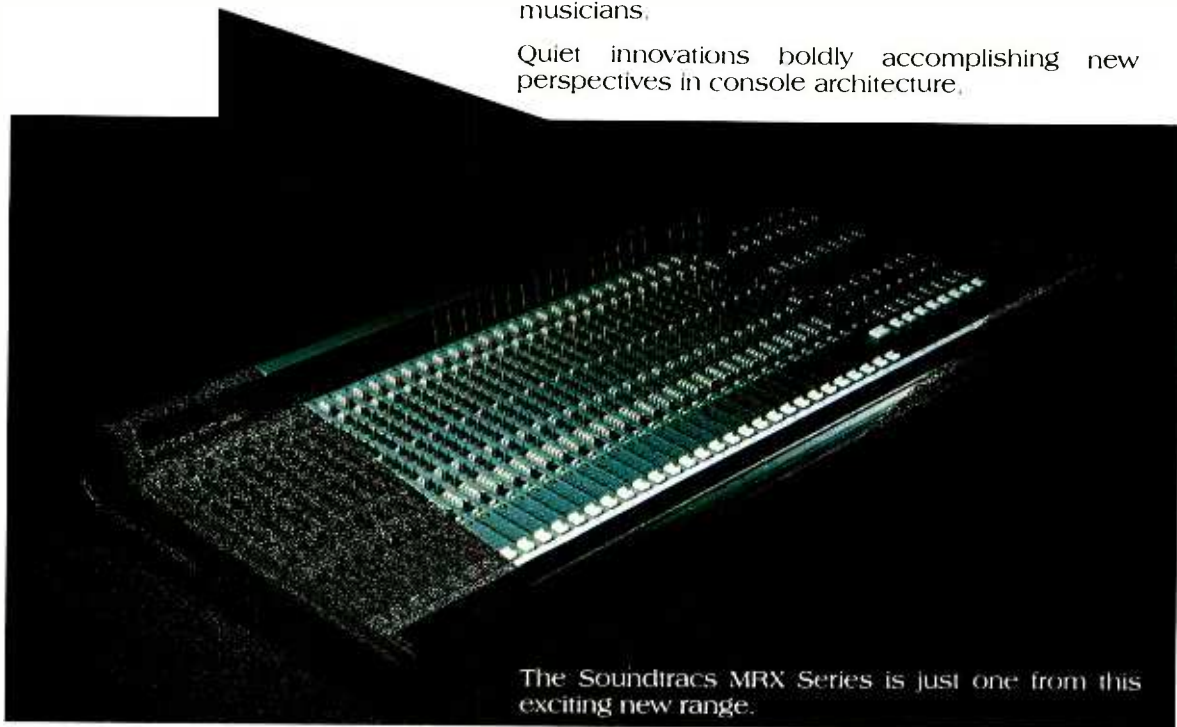
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POWER AMPLIFIERS

Perreaux

3000B: 180 W RMS/channel into 8 Ω ; 400 W RMS bridged into 8 Ω .

6000B: 300 W RMS/channel into 8 Ω .

6200B: similar to 6000B but designed for low impedance loads: 650 W RMS/channel into 2 Ω .

8000C: 500 W RMS/channel into 8 Ω ; 900 W RMS/channel into 4 Ω ; variable reference output level metering.

9000B: spec as 8000C but with simple clipping indicators.

Perreaux Sound Ltd, Niven Street, PO Box 847, Napier, New Zealand. Tel: (070) 435-219.

UK: DW Labs Ltd, Unit 30, Roman Way, London Road, Godmanchester, Huntingdon, Cambs PE18 8LN. Tel: 0480 413277.

USA: Perreaux International, 875 Merrick Avenue, Westbury, NY 11590. Tel: (516) 683-3000.

Quad

520F: 100 W/channel into 8 Ω .

510: single-channel 135 W into impedance from 2 to 75 Ω .

405-2: 100 W/channel into loads from 4 to 16 Ω .

606: 180 W/channel into 8 Ω .

306: 70 W/channel into 8 Ω .

Quad Electroacoustics Ltd, Huntingdon, Cambs PE18 7DB, UK. Tel: 0480 52561.

USA: Quad USA, 695 Oak Grove Avenue, Suite 3a, Menlo Park, CA 94025. Tel: (800) 227-9985.

QSC

1080: 35 W/channel RMS into 8 Ω ; 100 W bridged into 8 Ω .

1200: 100 W/channel RMS into 8 Ω ; 300 W bridged into 8 Ω .

1400: 200 W/channel RMS into 8 Ω ; 600 W bridged into 8 Ω .

1700: 325 W/channel RMS into 8 Ω ; 1000 W bridged into 8 Ω .

3200: 110 W/channel RMS into 8 Ω ; 280 W bridged into 8 Ω .

3350: 200 W/channel RMS into 8 Ω ; 600 W bridged into 8 Ω .

3500: 300 W/channel RMS into 8 Ω ; 900 W bridged into 8 Ω .

3800: 375 W/channel RMS into 8 Ω ; 1200 W bridged into 8 Ω .

MX1500: 330 W/channel RMS into 8 Ω ; 1000 W bridged into 8 Ω .

QSC Audio Products Inc, 1926 Placentia Avenue, Costa Mesa, CA 92627, USA. Tel: (714) 645-2540.

UK: Music Lab Sales, 72-74 Eversholt Street, London NW1 1BY. Tel: 01-388 5392.

Ramsa

WP-9110: 100 W/channel into 8 Ω .

WP-9220: 200 W/channel into 8 Ω .

UK: Panasonic UK Ltd, 300 Bath Road, Slough, Berks SL1 6JB. Tel: 0753 34522.

USA: Panasonic Professional Audio Division, Matsushita Corp of America, 1 Panasonic Way, Secaucus, NJ 07094. Tel: (201) 348-7000.

Rauch

DVT25S: 100 W/channel into 8 Ω .

DVT50S: 140 W/channel into 8 Ω ; 430 W bridged into 8 Ω .

DVT250S: 325 W/channel into 8 Ω ; 1000 W bridged into 8 Ω .

DVT500S: 1000 W/channel into 8 Ω .

Powerbloc 44: 295 W/channel into 8 Ω ; 990 W bridged into 8 Ω .

Rauch Precision Engineering Ltd, Unit 27, Tything Road, Arden Forest Industrial Estate, Alcester, Warwickshire, UK. Tel: 0789 763789.

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

Reflexion Arts

4180/700: 3U unit containing four 180 W/channel amps with pair 2-way crossovers.

Reflexion Arts, 14-18 Market Road, London N7 9PL, UK. Tel: 01-609 5999.

SAE

A202: 100 W/channel into 8 Ω .

A502: 200 W/channel into 8 Ω ; 500 W bridged.

Scientific Audio Electronics Inc, PO Box 60271, Terminal Annexe, Los Angeles, CA 90060, USA.

UK: Presence Audio, The Old Posthouse, Plummers Plain, Horsham, Sussex RH13 6NU. Tel: 0403 76777.

Studer

A68: 175 W/channel into 4 Ω .

Studer International AG, Althardstrasse 150, CH-8105, Regensdorf, Switzerland. Tel: 01 840 29 60.

UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091.

USA: Studer Revox America Inc, 1425 Elm Hill Pike, Nashville, TN 37210. Tel: (615) 254-5651.

Studiomaster

Mosfet 1000: 300 W RMS/channel into 4 Ω .

Mosfet 500: 160 W RMS/channel into 4 Ω .

Stellar Fet 1: 100 W RMS/channel into 4 Ω .

Recording Studio Design Ltd, Studiomaster House, Faircharm Trading Estate, Chaul End Lane, Luton, Beds LU4 8EZ, UK. Tel: 0582 570370.

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

Tannoy

SR840: 250 W/channel into 8 Ω ; 1220 W bridged into 4 Ω .

Tannoy Ltd, The Bilton Centre, Coronation Road, Cressex Industrial Estate, High Wycombe, Bucks HP12 3SB, UK. Tel: 0494 450606.

UK: FWO Bauch Ltd, 49 Theobald Road, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091.

North America: Tannoy North America Inc, 300 Gage Avenue, Unit 1, Kitchener, Ontario N2M 2C8, Canada. Tel: (519) 745-1158.

TOA

P-300D: 300 W/channel into 8 Ω .

P-300M: single-channel 300 W into 8 Ω .

P-150D: 150 W/channel into 8 Ω .

P-150M: single-channel 150 W into 8 Ω .

P-75D: 75 W/channel into 8 Ω .

TOA Electric Co Ltd, Kobe, Japan.

UK: TOA Electronics Ltd, Hutton Industrial Estate, Tallon Road, Brentwood, Essex CM13 1TG. Tel: 0277 233882.

USA: TOA Electronics Inc, 480 Carlton Court, South San Francisco, CA 94080. Tel: (415) 588-2538.

Turner

B502: 340 W/channel into 4 Ω ; 190 W/channel into 8 Ω .

B302: 150 W/channel into 4 Ω ; 100 W/channel into 8 Ω .

Turner Electronic Industries Ltd, PO Box 49, Etchingham, East Sussex TN19 7NZ, UK. Tel: 0435 882581.

Yamaha

P1150: single-channel, 100 W into 8 Ω .

P1250: single-channel, 170 W into 8 Ω .

P2150: 100 W/channel into 8 Ω ; 300 W bridged into 8 Ω .

P2250: 170 W/channel into 8 Ω ; 500 W bridged into 8 Ω .

P2075: 75 W/channel into 4 Ω ; 150 W bridged into 8 Ω .

P1150C: single-channel, 100 W into 8 Ω .

P1250C: single-channel, 170 W into 8 Ω .

P2150C: 100 W/channel into 8 Ω ; 300 W bridged into 8 Ω .

P2250C: 170 W/channel into 8 Ω ; 500 W bridged into 8 Ω .

PC1002: 100 W/channel into 8 Ω ; 300 W bridged into 8 Ω .

PC2002: 240 W/channel into 8 Ω ; 700 W bridged into 8 Ω .

PC2002M: as PC2002 but with meters.

PC5002M: 500 W/channel into 8 Ω ; 1500 W bridged into 8 Ω .

Yamaha, Nippon Gakki Co Ltd, Hamamatsu, Japan.

UK: Yamaha-Kemble Music (UK) Ltd, Mount Avenue, Bletchley, Milton Keynes MK1 1JE. Tel: 0908 71771.

USA: Yamaha International, PO Box 6600, Buena Park, CA 90620. Tel: (714) 522-9011.

YBA

YBA1: 85 W/channel into 8 Ω .

YBA2: 70 W/channel into 8 Ω .

YBA3: 150 W/channel into 8 Ω .

YBA Company, Phlox Electronics, F-91440 Bures-sur-Yvette, France.

UK: Presence Audio, The Old Posthouse, Plummers Plain, Horsham, Sussex RH13 6NU. Tel: 0403 76777. □

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FP42

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FP16



FP31

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FP11



FP12

It's ideal for multiple headphone feeds, troubleshooting, and as an intercom.

SHURE

For Further Information Contact: HW International, 3/5 Eden Grove, London N7 8EQ. Tel: 01-607 2717.

MARTIN POLON'S PERSPECTIVE

The young male customer just past puberty has been inside the brightly lit record store for almost an hour. The only thing that has broken his obvious cycle of indecision is his entrancement with the garishly made up and black clad female 'Models' that back up Robert Palmer with the sensual video *Addicted To Love* on the store's monitors. The pimply-faced clerk has played that particular video five times in the hour. Finally, the customer approaches the clerk and states his interest in buying the Palmer album. The clerk asks, "What format?" The young man stares dumbfoundedly. "I mean do you want an LP, a CD, a CD-V, CD-I, Optical Disc, Analogue Cassette, Digital Audio Tape, Super VHS-HiFi, VHS-HiFi, Laser Disc, Digital Laser Disc or on a ROM chip." The young man stares open-mouthed and then points dazedly at an LP record. "Oh, one of those old things, uh?" asks the clerk. "It makes sense since the Palmer album is one of the 'golden oldies'. It will have to come from central warehouse. We don't have the room here for all of that. You pay now and you'll have it on Tuesday."

The LP is dead; long live... the CD? Or is black vinyl really dead and is the CD really on top? Will the record companies sell their LP pressing plants to Third-World and Eastern Bloc countries where the LP will soldier on into the next century. Will small and large labels alike find out that the Western World will not cavalierly discard 250 million LP record players and will a trip to Albania or Paraguay become a necessity for custom pressing?

Where the business of selling recorded music goes for the rest of this century is very much a function of which media becomes the new standard or if such a standard can even exist in the current climate of rapid technological change. The CD could and should be the logical successor to the LP. Record company executives privately admit that five years from now they would like to be clear of the LP business, however, CD is threatened directly by the portability potential and lower consumer costs offered by DAT. Concomitantly, the CD could well become the victim of a consumer 'whispering' campaign if the record industry does indeed use the notch and the technical press grabs the issue. However, the implied threat of 'The Big Notch' would not be the direct effect of 'can you hear it?' It would be the question of 'is it degraded in quality' as the audio consumer press carries out its threatened propaganda war against the actual use of the notch (if that really happens). Like the Faulkner script for Howard Hawkes's *The Big Sleep*, you don't have to understand 'The Notch', or even be able to hear it, to know that the public could well see it as a degradation of quality. Ask cranberry producers, Mexican beer brewers and baby formula manufacturers about just how fickle the public interest is when the perception of damage is raised by, and in, the press.

One can almost see record company personnel

interviewers in double-breasted suits with snap-brim fedoras interrogating potential new employees. "Have you now or have you ever been an owner of a Digital Audio Tape (DAT) machine? Will you sign a loyalty oath to that effect?"

However, the record companies need the quality of the digital tape if they intend to succeed in the business of selling music off optical storage. One must first understand that the record companies of the world desire to sell music but without the headaches of distribution imposed by the current technologies and the need for physical inventory, warehousing, transportation and book-keeping. The record companies want to record and sell music without the need for jewel boxes, album art, in-store promotions, shipping and that ever-popular classic of the industry—returns.

Storage could be accomplished in several different technologies, with the in-store WORM (Write Once, Read Many) optical disc or Dolby Delta-Modulated CDs being the most likely favourite since hard disc systems do crash from time to time. The WORM disc would have a gigabyte capacity and the high modulation density CDs would have similar capacity. A 'jukebox' with a number of these discs would allow a relatively small store to have a library of 10,000 to 15,000 current and past record titles for downloading. A custom cassette would be assembled from any musical source in the collection with any cut or selection from any album available for inclusion.

The reason such a scheme (and the record companies) needs the acknowledged 'master' quality of DAT is that all the previous attempts at in-store digital delivery of recorded music via telephone line or directly from hard disc foundered due not to the delivery system but rather because of the poor quality of home audio tape playback. The number of homes with stereophonic cassette decks of high enough quality are few and far between. An overall success for DAT could make this kind of direct music marketing much more successful. It is curious to consider that if the record companies succeed in legislatively killing off DAT, mandate euthanasia for the LP and notch the CD to the detriment of both the industry and the public, we could be left only with the analogue cassette as the most successful surviving medium for this system and for all other methods of music distribution in the short term.

Several aspects of the retail personality of the music consumer do complicate successful application of direct distribution systems. Most consumers buy on impulse and want delivery NOW. Study after study confirms that recorded music sales tend to follow that model, especially for the record companies' current under-30s target audience and their rock music purchases. Most major record retailers who would be high volume candidates for such a system have migrated to shopping malls or high street locations. The likelihood of consumers waiting overnight and then having to return to the shopping mall or high street location seems unlikely in terms of

the way people spend their money, their shopping impulses and their lives. Further, the problem of having clerks make up the custom 'album' tapes to fill the customer's order could make the very success of such a system its failure. It could require a large night staff and extra duplicators and master systems to meet unpredictable public demand.

The record retailer worldwide also has strong thoughts on where the record industry is trying to go with this concept of in-store delivery. Key retailers sense the record companies' drift towards intangible software and welcome the concept of reduced inventory. The only problem that most express concern about is in whose store the in-store system will be located. A record retailer in England felt so strongly about the whole thing that he threatened to leave the business. "If this happens, there will be no need for a record store. The one-hour photo operation, the service counter in your Sainsbury or Safeway that rents you a flick, the W H Smith's book chain, a counter at a Boots chemist... Why, practically any high street retailer could have a terminal and produce these custom tape albums. A real boon for the record companies with the in-store computers doing all the accounting. But no more record stores. At least not for me."

Another potential direction for the electronic entertainment industry would be the CD derivative systems such as CD-V or CD-ROM or CD-I. Many analysts dismiss CD-V out of hand as a 'silly and expensive' format best suited to music videos due to the shortfall of video playback time with the format. The players have given the laser and digital audio laser video disc systems a much needed shot in the arm since they will play both formats. Beyond this, we have the marriage of computer data with the capacity of the CD in the form of CD-ROM and the extension of audio and video to CD-ROM with CD-I. These formats have had some impact on the computer industry with projections of future potential being substantial. However, the dynamics of consumer product technology mandate that only a recording version of CD-I and then some, would create the necessary demand to sweep the marketplace.

The recording CD could be the 'ideal' product of the consumer electronics industry for the 1990s. It would replace the LP, the CD, the video disc player, the VCR and the floppy disc and hard disc for the home computer. One problem with such a system is that the ideal size and characteristics of such an optical recording/playback system might not allow compatibility with CD. Current development in optical WORM drives ignores the physical and technical dimensions of the CD. Since the computer industry is one of the driving forces for such a product, to escape the minor mechanical uncertainties of floppy and hard disc systems, the marketplace might not accept the format of a 15 year old technology. Then we would have yet another 'standard', however, with Philips and Sony actively pursuing this technology, compatibility will remain a major consideration.

Also, the time frame for recording optical disc remains uncertain because the developers of optical disc systems feel that the issue of unlimited erasability is immutable. Current technology is in place to record and to reproduce but erasure is viable only for a finite number of uses. Current laboratory figures seem to indicate anywhere from 50 to 100 times as the practical limit with a thousand cycles as an attainable goal. It is felt that the consumer marketplace would not accept any limits and that is probably an accurate measurement.

A STAR IS BORN!



X-86

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DIGITAL AUDIO

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 PD
PRO AUDIO

MARTIN POLON'S PERSPECTIVE

Then there is the frequently held perception that this ideal product of recording optical disc will cause mass consumer adoption. "Ethel, give me a hand with all of this junk." Ethel runs in from the kitchen, gasping. "Harold, why are you throwing out the VCR, the record player, the CD and Junior's floppy disc machine?" "Why Ethel,"

gesticulates Harold, "we don't need all of these other things. Our recording CD will do it all." Cut to the neighbours eagerly picking up the discarded units from the trash piled in front of the house.

Yet another problem is that one unit that does it all becomes one unit to fight about as Junior

wants to use the computer while Sis wants to hear Billy Joel with Dad looking forward to watching *The Battle of Britain* and Mum is interested in recording *Dallas*. Cut to two police cars in front of the ideal home that has just bought the ideal product. That kind of incompatibility, no unit can solve.

If there is a major fly in the ointment, the issue of product and software life cycles is it. The consuming public has come to believe in the long life of product cycles in the consumer electronics and electronic entertainment industry. The 78 RPM record had a 30+ year life cycle. It appears that the LP record will have reached a 40+ year life cycle before it expires slowly of benign neglect by the small labels and malignant neglect by the major ones. While the Philips cassette could expire before it reaches the 40 year mark, it will probably drag along for some time to come. Along comes new technology—high technology—and we can now promise the record consuming public five years... maybe! One development is hardly out of the starting gate before the next development is in place for release. CDs followed by CD-V and then DAT tape followed by CD-I followed by Recording Optical Disc and so on, *ad infinitum*.

It is also not apparently clear to those who are planning these cycles of technological assault on the home, just how strongly consumers expect some permanence in their home entertainment, if not in the rest of their lives. A recent study found 78% of those questioned indicated strongly that they would reject consumer electronic and electronic entertainment products and formats that did not have at least a 10 year life cycle. Curiously, the older the consumer the greater the interest in longevity of hardware and software. Follow up studies filtered out those with an innate fear of technology and found that concern about a lack of appropriate software motivated the response of the over-35s. The issue was an association of Prince and Boy George with new technology, as though optical disc would have no dixieland jazz, country or big band releases available. Unfortunately, the perceived experience with CD versus LP seems to have caused that response. The music favoured by the huge population (and affluence) bulge of the over-35s has diminished in availability in the marketplace over the last 10 years in contrast to releases for the youth market so favoured by major labels today. The reality of release media evolution has been somewhat different from the public's perception and, of course, CDs do not have a great deal to do with the trends of record company release management. But it does point out again how fragile the hold on the public's discretionary dollar is for all sectors of electronic entertainment.

Obviously, not all the blame for this confusion can be placed at the doorstep of the record companies. The consumer hardware makers are eagerly embracing each new step of technology as a way of boosting sagging sales, as consumer electronics settles in as a mature industry. It would seem far better to accept one or two complementary formats such as digital disc and digital tape and create evolutionary changes in product improvement, retaining all compatibility. The public, after all, can deal with evolution far better than with revolution.

Record dealers are all carefully noting the proliferation of formats. "Clearly, this mismanagement of technology will end up leaving us [record retailers] no options and nowhere to go. For starters, I cannot afford to stock the variations that are coming down the pike. Now, let's say that the movie about the '50s rocker, *La*

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Bamba, will be available today as in this year or next, on LP, on CD-V, on CD, eventually on DAT, on analogue cassette, as a CD single, on laser video disc, and on VHS-HiFi; in all cases either as a standalone record or as part of the home video release of the movie. If I carried 20 units in each current format at my cost, my investment would be about \$100 in LP, \$240 for CD-V, \$200 for CD, \$100 for DAT, \$80 for analogue cassette, \$120 for a CD single, \$400 for laser video disc and \$400 for the VHS tapes. Obviously I am estimating a bit, off the top of my head and I don't give away all of my trade secrets, but these figures are relatively adequate as an example. I am expending \$1640 to maintain moderate stock in one store. I have four stores in different communities. That means I will spend \$6560 on one release. The number 20 is probably low so I could be spending more. If it was a new Michael Jackson effort and I was a betting man, I might stock 100 in each format or some balance in between. But, my bottom line is that I am carrying a minimum of \$6,560 per title. If I try and stock 2,000 titles in all formats in each store, I will need \$13,120,000 in operating capital. At what I pay for commercial money, I could be paying over \$1 million a year in interest. In the 'good old days' of five years ago, I stocked only LPs and a few cassettes at far less than 10% of the potential cost of multiple formats today. Now I am exaggerating the consequences of multiple formats to make my point but not so much as you might think.

We cannot cope with the cost or space requirements of the SKUs (stock control units) required to do business in multiple formats. The small independent record dealer is already an endangered species. This will finish him off."

There is a bottom line here and it is very clearly defined. There are very real limits to what the public will tolerate in the consumption of electronic entertainment. To begin with, the state of the recording industry from 1947 until 1977 is worth ruminating about. At the end of the '40s, all the players were in the same camp as it were, large and small. The development laboratories of the large corporations were working separately but eventually everybody aligned. That means that ATT, CBS, GE, RCA and many others all played a part in the birth of the LP record and its companion 45 RPM single. The RIAA, IEEE, EIA and the AES all worked towards establishing standards for equalisation and usage. Quality control in software production was the byword. Ten years later, stereophonic recordings saw the joint efforts of all the above contributors and London Decca, DDG, Electrola, EMI, Philips, Teldec and Telefunken to name a few. Everybody worked together to produce a common software for playback on common hardware to create a common good. Everybody benefited. What disputes there were occurred behind closed doors. The public was not exposed to an airing of laundry so dirty as to shake its confidence, excrementally speaking. Witness and contrast today's ugly RIAA-IFPI-EIA-EIAJ dispute over CD, DAT and notching, aired in the open chambers of the US Congress, the European Parliament and with the aid and abetment of the world's press. All we are doing as an industry today is telling the public in so many words: 'You cannot trust us. We may or may not deliver music without modification. We may or may not sell you a system that will be obsolete in five years. Most of all, do as we say but do not do as we do.'

It will be very curious to see how well the public picks up on our industry's cues. Oh well, next stop, the ROM record. □

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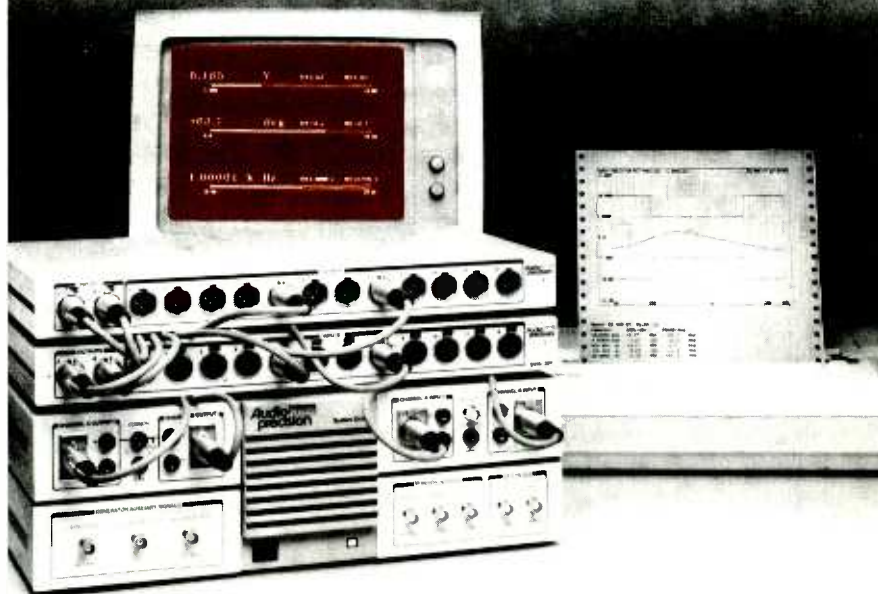
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BARRY FOX'S BUSINESS

It happened with *Laservision* video disc, with metal powder audio tape and with *V2000* video tape. Philips demonstrated exciting new technology and generated widespread publicity but then hit technical problems and delayed sales. By the time significant quantities of saleable products reached the shops, interest had died.

Laservision and *V2000* failed commercially. Metal powder audio tape cassettes sell in miserably small numbers. Exactly the same thing happened with compact disc but the system was so good, and so heavily supported by the Japanese, that it survived the initial foul-ups that are now forgotten.

Now there are warning signs of a re-run with CD Video. If Philips put CD-V on the market before it is technically ready and before there is adequate software, the trade, press and public will rebel. But Philips have now, in the company's own words, 'launched' CD-V: in America at the June Consumer Electronics Show; in September in Britain, at a London nightclub party; and in Germany and the rest of Europe at the Berlin Funkausstellung exhibition.

"The first CD-V player," say Philips, "will be priced between £400 and £500..." and will be available "...in selected outlets in London from November, and nationwide from January."

'Selected outlets in London' spells limited opportunity to capitalise on the pre-Christmas sales boom. Post-Christmas sales time is hardly the best moment to launch an expensive new consumer electronic product. Already the pre-Christmas roll-out of CD-V in America has been postponed until the first quarter of 1988. On the evidence of what I saw of PAL CD-V both in Berlin and at the London launch, I just cannot see significant quantities of saleable players and discs reaching the shops in Britain until the spring. By then the tide of publicity will have ebbed.

At the Berlin show, only a few companies were showing CD Video and then usually in NTSC standard. Although the main entrance hall was given over to a CD-V display, most of the players were NTSC. The racks of 5 in discs were mainly audio CDs.

There were several PAL CD-V players in the Philips pavilion but picture quality varied from barely acceptable to downright awful, depending on the discs. Significantly, the same disc played on Pioneer's PAL CD-V player produced far better pictures.

There were only a very few CD-V discs

available (some 12 in, some 8 in and some 5 in) and handfuls trickled through every day from Blackburn. The Polygram publicity for CD-V singles listed a string of artists, with a catch-all caption 'Various record companies have announced they are working on releases by...'

By far the strongest commitment comes from Unitel with an impressive catalogue of opera. The plan for feature films to be marketed as 'collectible concepts' are still very vague.

At the Berlin show Philips' engineers were still trying to pinpoint the problems seen on screen from PAL 5 in discs: interference bars are caused by the motor mechanism sucking too much current from the power supply; noise, which makes the picture look grainy and adds an unwelcome swirl to saturated colours, is due to poor signal-to-noise ratio caused by inaccurate tracking of the solid state laser so it reads two tracks instead of one; dropouts (either white or black depending on the compensation circuitry used) are caused by blemishes in the pressing and faulty mastering; picture breakup and loss of sync occurs when the disc signals are not strong enough to lock the player; colour smudges are due to delay line mismatches.

Clearly the Pioneer combi PAL player has better servo control and dropout compensation than the Philips *CDV 475* combi. The Pioneer NTSC player also appears better than the Yamaha. All the Philips PAL players at Berlin carried a large yellow label on the rear declaring 'This apparatus has been assembled with piece parts from the trial run and thus not intended for measurements as it does not meet the requirements of the specification'.

In London, at the Kensington Roof Gardens launch party, most of the celebrities present probably went away boggling at the high quality CD-V pictures. But I have to play spoilsport and report that the pictures displayed on monitors round the club and back-projected on to a large screen were sourced from three separate systems: a Betacam professional broadcast tape unit, a Pioneer NTSC CD-V player and a Philips CD-V PAL player. The Betacam pictures, used for the main presentation, were of course excellent. So were the NTSC CD-V pictures screened later.

At the end of the formal launch presentation there was a brief demonstration of PAL CD-V, with Curiosity Killed the Cat's new single *Free* loaded into a Philips combi player. Because the player takes around 10 seconds to cue up, the displayed signal was sourced from a second, pre-cued PAL player behind the scenes. Fair enough. But immediately there was a marked loss of

picture quality, with a stationary interference bar right down the middle of the screen. After that it was downhill all the way for PAL CD-V.

While music industry celebrities ate, posed, danced, got drunk and wondered at the miracle of life and CD-V, the disco DJs switched between audio-only records, Betacam pop videos, NTSC CD-V pop videos and—very occasionally—PAL 5 in CD-Vs. These were immediately recognisable as embarrassingly bad. On one occasion a PAL CD-V was switched off halfway through because interference and loss of sync made the pictures unwatchable. Wisely the DJ switched the video source to a camera trained on the dance floor.

Alongside the dance floor a display of future products, including a portable clip player and CD Video rack system were—despite low key lighting—clearly identifiable as dummy mock-ups, with painted pictures instead of screens.

Philips said, at the beginning of September, that the Hasselt factory in Belgium was already producing CD-V combi players. It is worrying to think of a factory mass-producing players while Philips engineers were unable to tweak CD-V prototypes to produce PAL pictures approaching the quality of VHS tape. And how can Philips, inventors of *Laservision* who have been making video discs for over a decade, end up 'launching' a product that is clearly not ready for sale?

Reliable sources suggest that some people inside Philips and Polygram started out believing that quality did not matter for 5 in pop videos. By the time they were set straight valuable development time had been lost.

The Philips Du Pont pressing plant at Blackburn has also had problems. By the Berlin/London launch, Blackburn had pressed 60, 5 in clip titles in NTSC and 15 in PAL. Several of these were never demonstrated because the original source material was so poor.

So far all the 5 in CD-V discs have been mastered in Eindhoven and then the stampers made at Blackburn for pressing in Blackburn. But 5 in mastering equipment has now been installed at Blackburn and was due to be ready for October. This should ease the mastering bottleneck that has slowed software supply. Blackburn already masters 8 and 12 in CD-V discs as well as industrial *Laservision* (with analogue soundtrack) for both PAL and NTSC.

Currently Blackburn have many dissatisfied customers in the industrial *Laservision* field because the LV mastering facility had to shut down from May 29th through to the beginning of August due, first, to dust clogging the air conditioning system, and then holidays. The dust was caused by building work involved in installing new 5 in equipment. The air conditioning had to be completely stripped down and this has created a large backlog for industrial *Laservision* orders. But there was no pressing shut down.

Blackburn acknowledge that the quality of PAL 5 in clip pictures has been very poor, and has been trying to establish what's the fault of the player and what's the fault of the disc.

In early September Dave Wilson, customer services manager at Blackburn, said of current 5 in clip product, "We have measured the quality parameters and are now very happy with signal-to-noise ratio. Dropout levels are excellent—as good as for professional *Laservision*. But some source material is still poor."

The unspoken inference from Blackburn's guarded statements is that Philips' prototype players could not yet do justice to discs that meet the CD-V spec. This was borne out by the far better results obtained from Pioneer players. □

WHICH IS MORE INVESTING IN DIGITAL

Few people would dispute that digital audio is here to stay.

The absence of progressive degradation gives it a decisive advantage over traditional analogue. The sound quality which digital offers is increasingly demanded by record companies, producers, musicians and film makers.

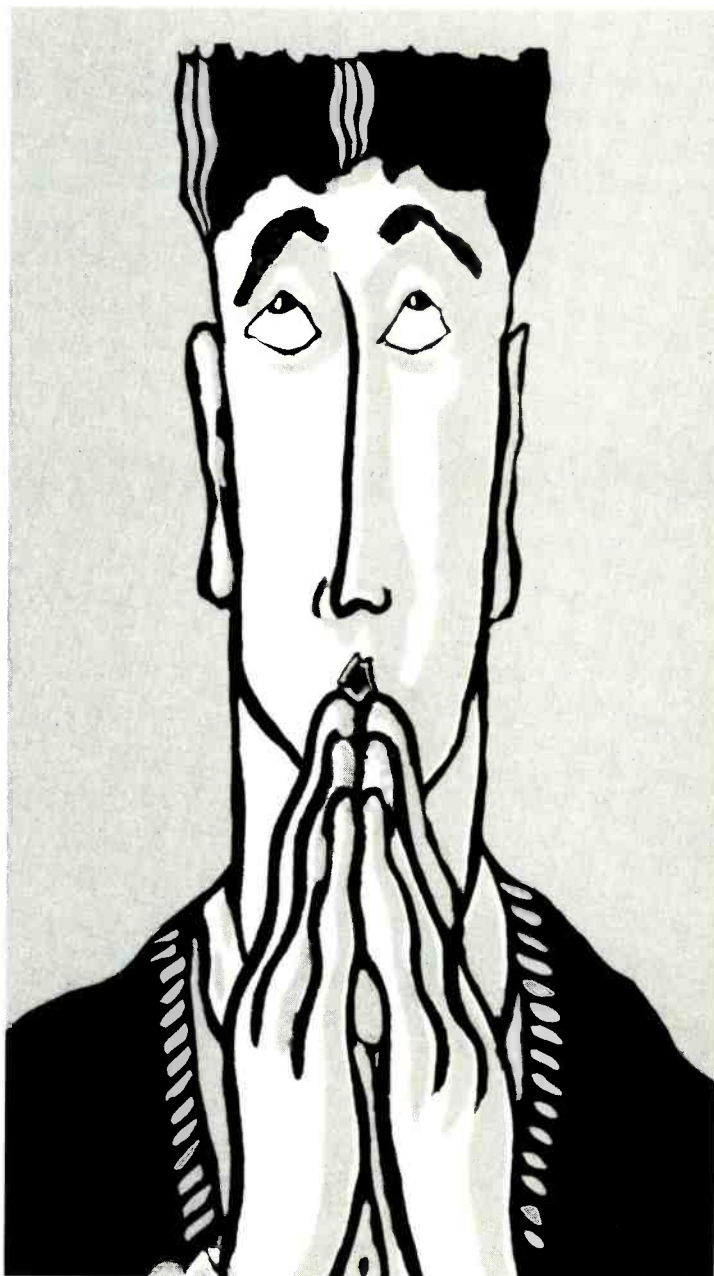
Yet, in digital tape machines, the benefits are accompanied by drawbacks. The incompatibility of formats; the problems involved in editing; the uncertain reliability and longevity of temperamental tape.

They represent an unsatisfactory compromise between the technology of today and the storage medium of the past. They are unavoidably limited, both in their current application and their future upgradability.

To quote Doug Dickey of SSL, at last year's Digital Information Exchange: "Digital recording proliferates despite everything because of its inherent advantages. The worrying thing is that in the midst of all this, there lurks the spectre of what may well prove to be the most expensive round of early obsolescence ever suffered by the audio industry."

So where does the future lie? With tape, or with a tapeless alternative?

Not surprisingly, many people are biding their



time at present. Waiting for clearer indications before putting their money on the line, in the knowledge that the decisions they make will have a fundamental effect on the direction and prosperity of their business.

But in the highly competitive environments of recording and post-production, no-one can afford

DANGEROUS? AUDIO OR IGNORING IT?



to lag behind. Going into digital too late could be as fatal as going into it too rashly.

Which way is up?

Sitting on the fence is a position which becomes more and more uncomfortable, the longer you try to maintain it.

The sooner you can invest with confidence and start acquiring experience and a reputation in the new technology, the better. That confidence, however, relies on three essential factors.

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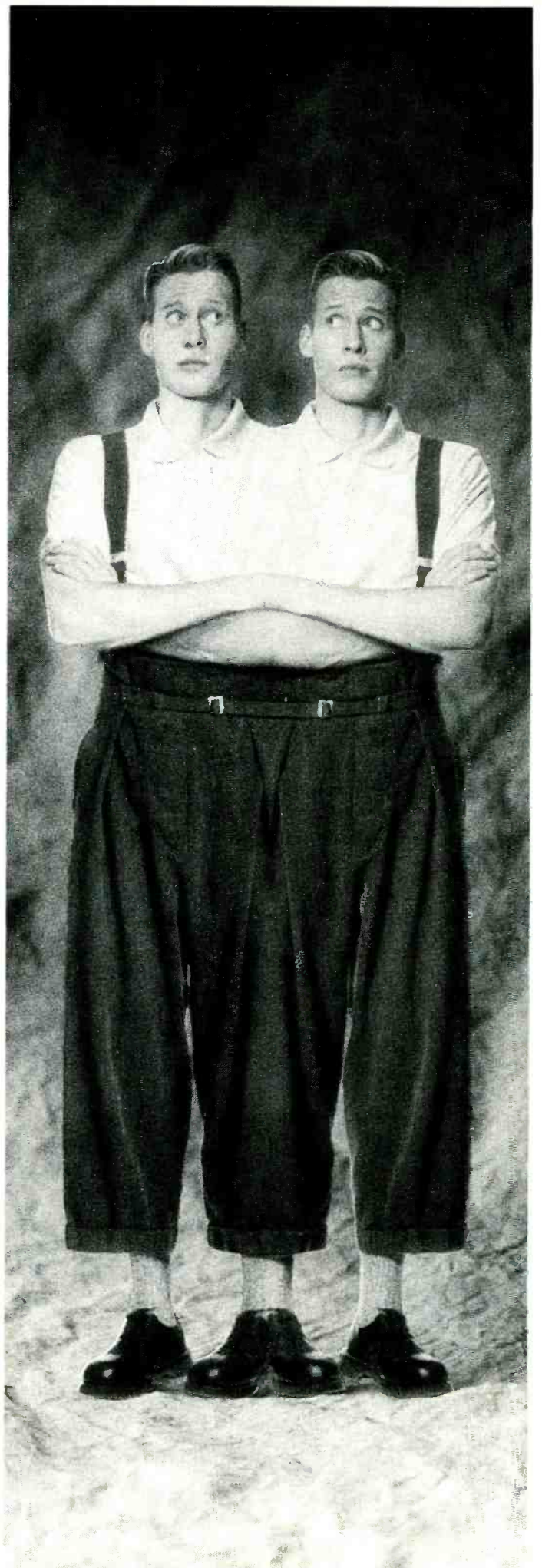
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Three years ago the name Puk simply inspired silly jokes about the connotations of its English pronunciation. Nowadays it represents one of the largest most adventurous and luxurious residential recording facilities in Europe.

The original Puk Studio One created a ripple of interest throughout the recording world partly because of its sheer size, partly because the mixing console was the new Calrec UA8000 music console and partly because the monitoring system was the biggest monster ever to come within 100 miles of a studio's control room. (See *Studio Sound*, November 1985.)

Since that first facility, designed by Andy Munro, the project has spawned a second identical recording studio, four 3-bedroomed houses and a leisure facility, the like of which no other studio in Europe begins to approach.

A remotely located studio in Denmark had a lot to learn

PUK TWO

Denmark's Puk have realised the need to entertain and accommodate visiting artists, in a big way. Janet Angus visited as they were about to open Studio Two and extended leisure facilities

about the needs and demands of international clientele, a fact which the people at Puk readily admit. The original accommodation at the studio proved inadequate and attempts to house bands in local hotels was even more unsatisfactory. Remote Danish towns and villages simply do not know how to cope with international rock stars and their lifestyles.

There was only one thing for it, build accommodation facilities to match the studios. The four terraced houses were designed by the studio's architect Mogens Hansen in bright and comfortable Scandinavian style. Each has three bedrooms, shower room, a kitchen/dining area and living room with Bang & Olufsen hi-fi/video/TV system including satellite reception. Furnishing is again consistent with the Danish manner with leather suites, marble coffee tables and comfortable beds, etc. Whitewashed on the outside, the walls are brick and pine painted white on the inside.

"If you're wondering why there is no bath in the bathroom I'll show you," said Puk, the studio's owner, mysteriously.

Located at the end of the row of houses is a large new building. 'This is a barefoot area' says the notice on the door. Inside it's relaxation heaven. Two saunas, jacuzzi, sunbed—all with variable mood lighting—table tennis and snooker rooms, gym area and, pièce de résistance: the indoor heated swimming pool with luxurious poolside furniture and windows all round overlooking the in-the-process-of-being-landscaped garden and fields beyond.

Puk (real name John Quist) decided to carry his almost maniacal search for the ultimate through to the recreation facilities. As he said, it's difficult to explain on paper just how fabulous these facilities are. "We can write that we have a swimming pool, but so what? Big deal. You can't tell people what it is really like. It is good for band members to escape from each other and the control room if they want. It's good here in the summer, but imagine what it will be like in the winter when you sit in here and see it is snowing outside and it's all warm and lovely in the pool."

There is also a small kitchen and upstairs is the snooker room and gym and a seating area overlooking the pool.

No expense is spared: the small chandelier-type light at the pool side alone cost £2,000. In all, the houses and recreation centre have cost the studio in the region of £1 million. Is it really worth investing that kind of money?

"If we get lots of clients, yes; if we don't, no! The point is the old accommodation we had was not good enough, and bands get tired of hotels. This is more private. As a studio we need to be completely self contained and we want to attract the sort of clients who really appreciate something like this."

The taxman apparently took some convincing that it was a business expense and not purely for private use. Danish taxmen also have a problem understanding the international recording market.

Bearing in mind the fact that most of the world thought Puk was pretty mad to spend the sort of money represented solely by Studio One, the fact that there is now Studio Two and all this accommodation just begs the question, where on earth has all the money come from?

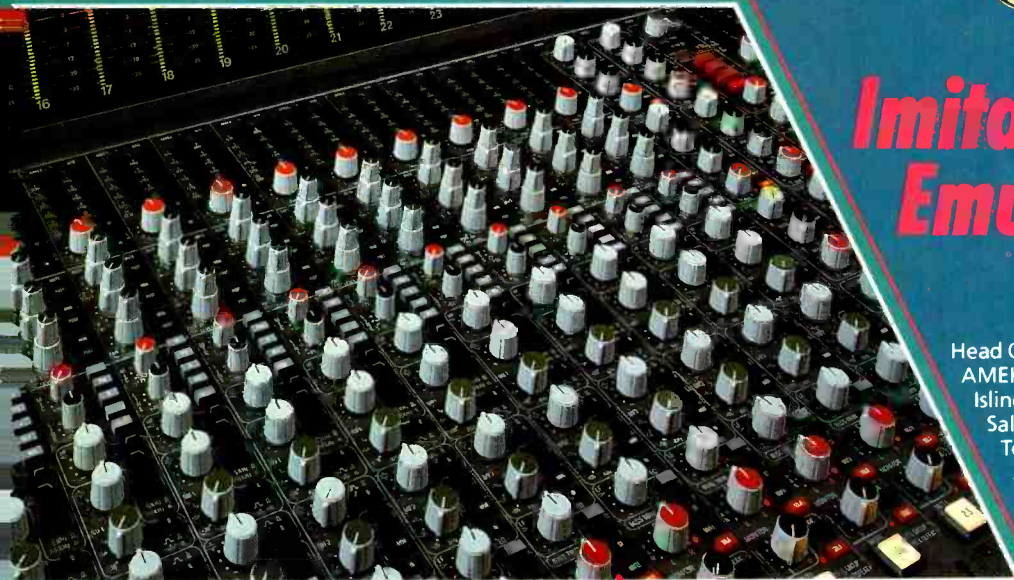
"We don't have to respond to an outside investor wanting to make lots of interest on his investment. We have bank loans, mortgages on the houses, etc, and we are able to re-invest as much money as we like. We didn't plan all this in one go. Three years ago it was only going to be the one studio."

Studio manager Mogens Balle dismisses everything in six words: "It's just the way Puk is." He always starts out with fairly modest ideas and they just escalate.

Three years on, the 5-way monitoring system, 'designed for digital', has been receiving a favourable response from visiting engineers. Comprising two 30 in and two 15 in Postex, 8 in JBL, JBL 2445 and a Postex tweeter per side, quite apart from anything else, at first sight it looks pretty frightening. At the



AMEK *Angela*



Imitation and Emulation

Today, the mid-range console market is crowded with manufacturers who want to fill the space in the middle of your control room with their console.

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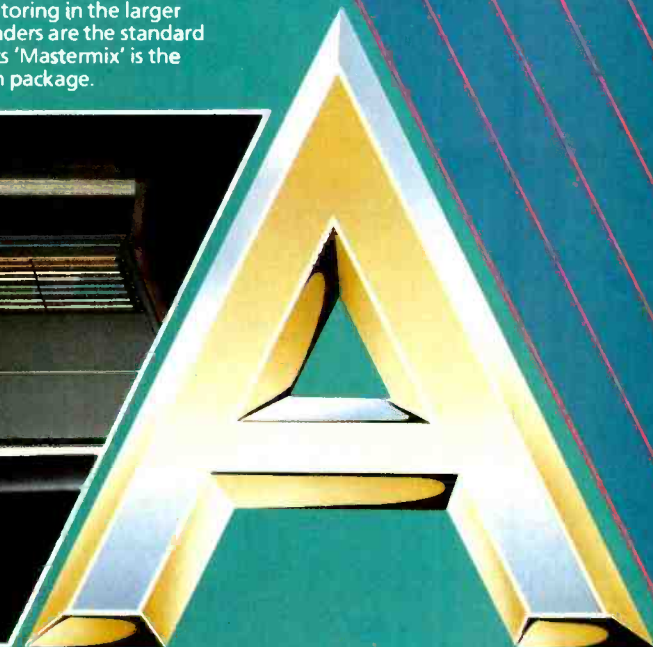
Let them claim. We wish them well. Fashions come and go; our emphasis is on engineering. There are now over 180

AMEK ANGELA installations worldwide. We set the standard in ergonomics, performance, specifications, equalization and build quality. Imitation is the sincerest form of flattery. Emulation is a little more difficult.

Actually, we admit one concession, but not to our competitors. The new 1987 ANGELA is now finished in grey, to harmonize with the rest of the AMEK product line. Otherwise, ANGELA is still available in 3 chassis sizes each with onboard or external jackfields, giving 28 to 62 dual-channel i/o modules (ie, 56 to 124 inputs, plus returns) and a choice of either 24- or 48-track monitoring in the larger versions. Manual or VCA faders are the standard options, and Audio Kinetics 'Mastermix' is the recommended automation package.

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time of its installation, Andy Munro described it thus: "It is driven by a 5-way amp system consisting of custom-built SLT MOSFETs in bridge mode, very carefully quality matched and giving a total power of something like 4,000 W per side. It is designed to give peak transient sound pressure levels in the region of 140 dB with comfortable maximum SPL of 130 dB. The point is not to generate sound pressure levels of 140 dB but to get a minimum headroom of 10 dB even on what would normally be considered to be peak levels."

Balle explains that on first arrival clients tend to be very sceptical about the monitoring. "After all, the bass driver is the size of a jacuzzi. But they get used to it and use it more and more."

Puk: "Everyone in the industry is talking digital—digital quality, special microphone leads, 16-bit versus 18-bit, special microphones, talk, talk, talk—all that, and then they listen on a pair of 2,000 DK (approx £180) speakers. That's because most of

high bass really clearly."

"The problem for many studios is that they simply don't have the room to build it," continued Puk. "The way people worry about the Fairlight being 16-bit and then record on digital, which is only 20 Hz to 20 kHz is silly; why isn't it good enough?"

"It doesn't matter what speakers you prefer to balance on, you need a good analytical system as well. Our system is just one of the theories of monitor speakers but you just have to listen and your instinct says it's right. The resolution is so much better on the big systems so your mix will also sound good on small speakers. People should stop going on about all the other elements in the chain until they sort their monitoring out because what people are listening on at home is better these days too."

Those with good memories may recall that in September '85, a few months after the opening of Studio One, the old Puk 16-/24-track facility adjoining it burnt down. A short in a lead underneath the multitrack resulted in very near disaster.

It was 3.30 am, and Puk was going to bed: "The light went out. Thinking it was just the bulb I went out into the hall but the light there wasn't working either. So it must be the fuse but I couldn't push the lever back up. I went in search of a candle in the kitchen next to the studio. Suddenly there was such a loud bang from the studio. I opened the studio door and there was so much smoke and so much heat. I tried to phone for help but I couldn't see the phone to dial the numbers. They seemed so slow to come—it took them 12 minutes and after six I phoned them again: 'What are you doing? We are burning!' Then, when they arrived, the firemen threw the *Synclavier* and Fairlight and all this equipment out of the window and started pouring water all over it! It was just terrible."

The happy ending of course was a brand new Studio Two built in the mirror image of Studio One. The control room, apart from being reversed, is identical to One in every way except the mixing console: this time it is SSL. Puk naturally didn't intend it this way but as usual he just got carried away. The initial concept of a big control room with relatively cheap equipment ("It's easy to update equipment, but not rooms") just grew.

"Puk's policy," laughs Balle, "when he can't choose between two things is just to buy them both. We had lots of clients asking about SSL. It was not an easy decision but we are very happy with it. We were going to go SSL with analogue multitrack but of course ended up with digital (Sony 3324). At the time we were really Mitsubishi enthusiasts but having both types of machine we now know that both are brilliant. We have two Mitsubishis (enabling safety copies, etc) and three Sony (for the number of tracks) machines. We originally thought that one Fairlight would be enough but it didn't work. A band either wants to use it or they don't and if they do they want it all the time, so we had to get another. The series *III* is very fine and the sampling quality very good."

Puk: "When the Calrec computer is ready we will get it and we will also get the new SSL computer. Of course we will get it. A lot of English engineers have grown up with SSL. Producers and engineers want to work with a piece of gear that they are familiar with. Having said that all those who have worked with the Calrec console love it and our *MasterMix* is brilliant: it's fast and really good."

The SSL console, in order not to disturb the acoustics of the room which were designed with the Calrec in mind, is a 64-frame with 56 channels plus patchbay, making it exactly the same surface width as the Calrec. Otherwise, the outboard equipment is as abundant as that in Studio One. The recording areas are different: three rooms, an isolation/programming room off the control room and a piano room behind the control room as in Studio One. The only difference between the piano rooms is that Two has less glass in it.

Balle: "The room faces west and we didn't want it to get too much sun, it would be too hot to work in." But surely the sun rises in the east? "Yes but bands get up late. We have a joke out here that Puk thinks the sun rises in the south because he gets up so late."

Long debates on how to make the two facilities look different didn't get them anywhere—even a change in the colour of the fabric could not be agreed upon. After all Studio One has gone down so well, why change a winning formula? □

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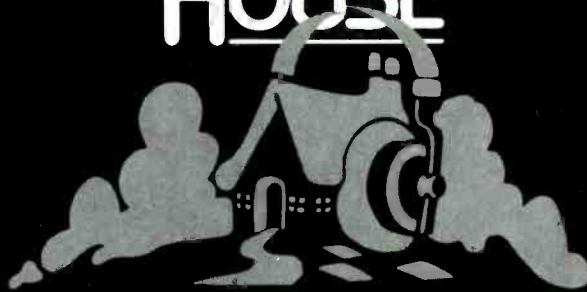
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Even from his earliest recorded output Mike Oldfield has had a reputation for doing things himself. Although *Tubular Bells* was not the first 'one man' album, it has probably been the most successful and quite clearly redefined the use of the term 'solo album'. His career has continued with a succession of albums since those heady days of the early '70s, all largely using the similar working technique of solo operation. As is almost the norm these days, successful artists look to set up their own recording facilities and this was something that Mike did in the mid '70s—a time when this was not so usual, certainly not on quite the scale he did. For a solo artist easy access to recording equipment is a must as working methods can be far more time consuming. For these reasons Mike Oldfield has invested a great deal of money in recording equipment.

The majority of his recording is now completed in his own facility although not exclusively so. At the time of writing he was in the process of planning a new studio to house his equipment, which in the meantime is spread throughout a number of different locations. The new studio will also house Mike's other interest—video—and he hopes it will allow him to further his experiments in combining audio and video as a single medium.

By the time you read this, the first new Mike Oldfield album

for several years—*Islands*—should have been released and from the recording aspect alone this will be an interesting listen. During the last 18 months he has changed his console for a Harrison series 10 and Dolby SR has been added to the tape machines. With this combination of equipment, representing something of a peak in analogue recording equipment development, it seemed a good idea to ask some questions about the series 10 and Dolby SR and how this may have changed working practice, if at all, for someone who is very closely involved with both the musical and technical sides of recording.

Background

The album Mike has just finished has taken about two and a half years to complete although this was not continuous working time. As if to contradict everything so far, some of the early sessions for the album were recorded 'live' with other musicians playing in the studio using his previous console and without any form of noise reduction at all. With the arrival of Dolby SR these recordings were copied SR encoded and parts have been edited into later recorded material, particularly the instrumental title. This may give some indication of the type of material the album includes—a mixture of songs and a long complex instrumental with multiple musical changes that involve complete changes of instrumentation tempo and about every other musical change you can make—a complete mixing nightmare! To make life more difficult Mike also decided to use different producers for different tracks across the album.

Working

With so many other changes is this album also in the solo tradition?

Mike Oldfield: "Yes, but these days it has become more of a case of sitting down with the Fairlight. I spent three months in Switzerland just doing the programming."

This is a little more understandable when you listen to the 20 minute instrumental *Wind Chimes* and the wide variety of instrumentation such as tympani, oboes, bassoons, and other traditional acoustic instruments, and are told that these are all samples played from the Fairlight. In fact there are not many acoustic instruments on the track at all.

At present, the Fairlight is always recorded rather than being sync'd to the track. This is a pattern of working that Mike has adopted from the time when the Fairlight software would not SMPTE chase—something very necessary for this work style.

"Maybe on the next album I won't record the Fairlight but if you have been working on a sequence for a week and you can put it down on tape it is one less thing to worry about." In fact the Fairlight is probably the most demanding thing in numbers of channels that the series 10 sees in its record mode with up to 16 inputs involved. These will then be submixed dependent upon the content. If they are keyboard-type parts they will normally be mixed down to two tracks while bass or percussion tracks will be kept separate.

With the recording of the Fairlight and the fact that most of the instruments are played by Mike, this would tend to suggest that several multitrack machines are being used but you would be quite wrong. The sole multitrack is a 24-track Studer A800.

I think that people always regret using a large number of tracks. I always say: 'Make a decision, burn the bridge so you can't go back.' It reduces your choices and saves you time

Coinciding with a new album, Mike Oldfield talks to Keith Spencer-Allen about analogue recording and his choice of console

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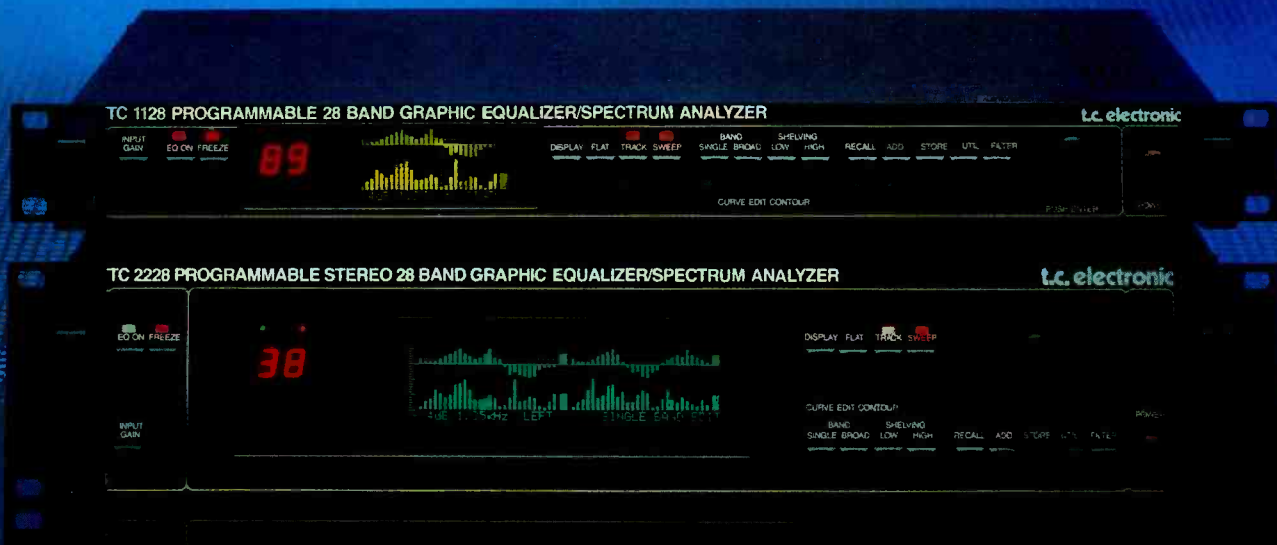
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And worse still: before there was chase lock on the Fairlight a further three tracks were being used for code, leaving just 21 for audio recording.

"I think that people always regret using a large number of tracks. For a start you have to wait for the slave machines to lock up. Drummer Simon Phillips (who co-produced *Wind Chimes*) was telling me about some sessions he has played on where they have had four or five slave reels and so the producer sits at the desk and says, 'Let's try this track with this drummer, this bass guitar and this guitar. No! We don't like it so let's try these drums with this bass and this sax solo!' It really must get out of control. It is nice to have some limitations. I always say 'Make a decision, burn the bridge so you can't go back'. It reduces your choices and saves you time."

Does this mean then that Mike sees the recording process as the creative side and the mixdown as just the balancing aspect?

"No, the mixing is creative but I like to be able to listen to the recording with the faders static and have at least a rough mix. The tape should be completely clean and if something is not needed then I would erase it. In the mix I just want to adjust and fine tune."

One could have assumed that using a console with the dynamic automation possibilities of the series 10 it would have been very tempting to leave alternate or additional tracks on the tape to keep some options open at the mix stage but Mike prefers to use the mix automation in a rather more creative way, which will be mentioned later. And although with SR tape noise is no longer a problem on long instrumentals, all the non-active tracks were muted on the series 10 so it was possible to check that everything was working and make sure that it could be mixed in one pass.

Working with SR

"I was quite happy using no noise reduction but it did mean that when mixing you had to go through muting everything. And also adding top was a problem. Music (recorded) has a lot more top these days and with SR you don't have to worry about boosting the high end, especially on an instrument such as a bass that doesn't have much of a high end to cover up any hiss. As a result I have never had so much top on an album as this. I felt that my last two albums were not as bright as other people's probably because they were working digitally and could add top on everything but using the Dolby SR I have not had to worry about that."

Were there any line-up problems at all or any other operational difficulties?

"Well it's the main thing about it—just plug the cards in and there are no extra things to worry about because of SR. I think the worse thing about using it was that you could hear the noise coming from other places such as mix channels, compressors and the EQ. I found that I was listening for that."

Did Mike have any comments about the increased headroom or improved transient response? Did it make working less level-conscious and therefore quicker?

"Only on drums. I used to watch levels very carefully otherwise the snare drum sound would really suffer but it isn't a worry now. For other instruments I have got used to playing to the meters anyway."

The SR cards were also carried between several different studios and apparently there were no compatibility problems at all.

Mike: "There's not a lot to say about them, is there?"

Perhaps not on the operational side other than the fact that they work well. Mixdown was made to three different machines—Sony PCM 1630, Ampex ATR100 with SR and a Studer DASH machine. Mike's comment was that he couldn't tell the difference between the finished mixes on any of them when using AB'ing.

There is also the possibility of not decoding the recorded track. This was done accidentally on one track and left that way because it sounded good—the encoded sound sounding less processed than even Dolby A.

At this point it should be asked why he had not considered digital multitracks since they would bring many of the advantages he was looking for. Was this a conscious decision?

"Yes, I don't like them. To be honest they sound distorted to



MIKE OLDFIELD'S NEW PASTURES

my ears. On this album one of the SR tapes was copied to a digital format for a producer who worked with one but I was really disappointed with the results and it was remixed from the SR tape. We cut the album at Tape One on a Neve digital console. At that stage going to digital format does not seem to make very much difference but at the multitrack stage it does.”

Mike’s method of working also involved many multitrack edits and as such the ability to remain in the analogue domain makes life much easier.

The series 10

The series 10 is a major step on from most other console designs but it does seem to demand some adjustment from the user to accommodate its potential. How long did it take to get the feel of it?

“Well, it’s a really different machine and I think it took about two months to become familiar with it. For a start it is really two desks depending on whether you are looking at the left or right side, and that can drive you mad. Also getting used to the fact that a knob isn’t a knob but a controller was difficult. But the more you work on it, it becomes instinctive and then it becomes a miraculous machine—a dream come true.”

Most of the talk about the Harrison has centred on its mixdown abilities. What is it like as a recording desk?

“Well, I’ve only ever recorded myself on it. I would imagine it would be a nightmare for an unfamiliar engineer to record a live band.”

Did this give any problems at all with the different producers that Mike was co-producing with as presumably they would not so easily be able to be part of the technical aspects?

Mike: “It was funny really. Some of them were really scared of it, ‘How do I put some top on the guitar?’ It didn’t really

restrict their input as I was operating on the desk and we were working together.”

Having had one of the first series 10s there were a few software problems (surprise surprise) initially but that was quickly remedied and apparently works very well now.

One aspect of the console that some people have expressed doubts over has been the large number of LEDs per channel that indicate various functions; they look slightly intimidating, initially. How is it in practical terms?

“They are all colour coded and you really just get used to it. You soon know for example that an orange LED means that it’s reading something back from the computer. There are also buttons that have different functions depending on how they are pressed but you do become familiar with the technique. I would have taken three days to mix a single but with the series 10 it takes about half a day now and I can still come back and change just one thing.”

I was interested to find out if Mike still thought in terms of recording and mixing with the series 10 and whether there was a dividing line between the two activities. Or was it that he was able to use the automation on both? The answer lies in the different types of automation that the desk can offer—realtime and snapshot—and they use whichever is the more appropriate. For example, when recording it is possible to use automation on your monitoring, or rather record those settings to memory. Mike will quite frequently use snapshots for verse or chorus settings on the console that can be recalled or reset from memory when required. In cases such as these he would use snapshots rather than realtime automation because it is quicker than having to give the tape a 10-second pre-roll for the desk to get into gear when you are working on a simple five second section.

“There were certain sounds that I discovered—they were a combination of Fairlight and Kurzweil MIDI’d together and they all had their specific settings on the Harrison. It was then easy to bring back that setting whenever I wanted it for other tracks as well. I have got into the habit of saving anything that began to sound right and then that would be used as the basis for mixing.”

Although we only touched on the subject, the series 10 also allows control of the input patching, or as Mike put it “everything apart from the aux masters”.

Turning to the mixdown, particularly on the very long instrumental, it is obvious that this will present quite a challenge even with the series 10. Previously, these titles would have been edit mixes but now the aim is for the continuous run.

The console is obviously very helpful when mixing with such intricacy but how long did *Wind Chimes* take to mix?

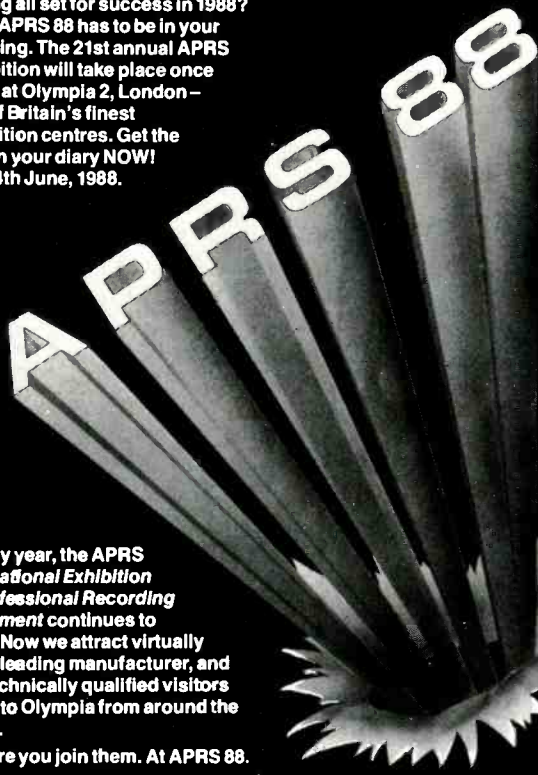
“It took about three weeks—something like that—and in the end the size of stored data got so large within the 10 that if you wanted to change one pan position you had to wait two minutes afterwards for the instruction to be merged with the mix.”

Hardly a surprise that three weeks worth of instruction to the console for a 20-minute track should slow operation down but Mike says that he has been talking to Harrison about the possibilities of a sectional mix mode where you can work on just a small section at a time and then merge the one section into the main automation data rather than every single automation change as it occurs. These only become a problem, of course, when the automation is rather stretched by people working on long instrumentals with multitudinous changes.

“The only problem that we now have is the auxiliary

The series 10 is a really different machine and I think it took about two months to become familiar with it. But the more you work on it, it becomes instinctive

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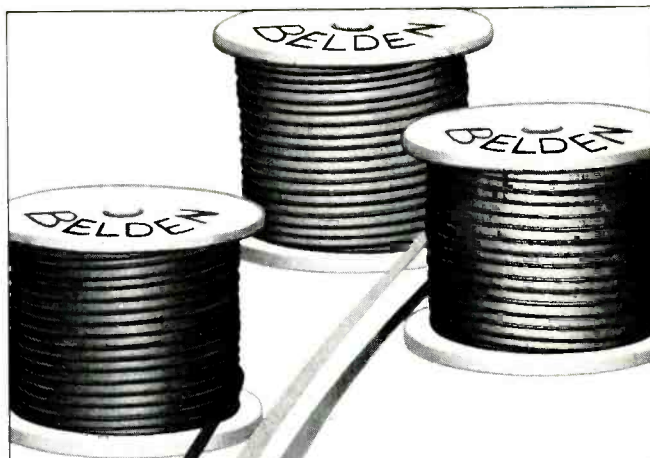


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equipment. We still have to go along changing DDL time, reverb times and settings—it would be nice to tie that in. And we will soon be using MIDI for control although I am having to change some of the equipment to do it.

"The mix is built up initially in the snapshot mode: you can store 100 and just step through them as you need. Once we have got a snapshot for each section from the beginning to end we return to the beginning, put the console into realtime automation, out of automation at the end of the section and when that is completed, back into snaps for the next section, and then into automation and so on. When you've got everything moving like that you can just use the automation to smooth over the changes."

One of the highlights of the full series 10 demonstration has been the dynamic automation of aspects of the mix, such as panning and EQ, in ways that would be almost impossible on any more manual console. For instance, the title *Wind Chimes* has effects like guitar fills that move in regular precise patterns in the stereo picture and fully in tempo. Some of the more exposed drum beats and toms have their sustain panned to alternate left and right. EQ changes, for what sounds like both effect and mixing reasons, in smooth transitions and all these effects could be occurring within a very short space of time. In the wrong hands this could sound very unpleasant but the results of a continuously changing sound picture is a very exciting tool when used to emphasise musical sections.

"It was great being able to sweep the EQ at the same time as panning something from left to right. In places on *Wind Chimes* we have automated panning on every channel for a merry-go-round effect. Previously, panning used to be a static thing and if a lot of movement was needed you needed a lot of hands and it would have been very random, whereas this desk allows you to choose exactly where you want the pan by a digital readout of the position."

The only problem that we now have is the auxiliary equipment. We still have to go along changing the DDL time, reverb times and settings—it would be nice to tie that in

Video

Currently Mike is working on the video to accompany the album that hopefully will be commercially released as a video album at a later date. Did he see the audio and the video aspects as one thing when creating the album?

"It was my original idea to build up the album and pictures at the same time. In fact, I had the video control desk next to the audio desk but it was just too much to think about at once. In fact, it probably put me back about a year trying to do that. You need all your concentration just to do the music and then all your concentration for the video even though we did film a few things at the time for later use."

Mike describes his investment in video as 'substantial', which includes four Sony 1 in C-format VTRs, some high quality vision mixers, a Quantel *Mirage* effects system (that allows the manipulation of a flat image as if it were a solid object) and a portable 1 in C-format *VPR5* that is being used in helicopters and over cliffs, etc. He is also involved in creating the album covers through video manipulation of a frame store.

Although he operates the video equipment himself as well as in collaboration with other people such as computer graphics specialists, he makes no claim to specialist knowledge in video or audio other than how to operate the equipment and claims that he is not technically minded at all. That is until equipment fails in out of the way places and he is desperate to work. Then we hear the stories of dismantling tape machines and measuring transistor voltages by telephone—just a little more than your average artist.

Returning to the combination of audio and video, Mike sees possibilities in the combination of the two but still believes "Music is worthwhile by itself as you can let your imagination run away with the music."

"If you have been given a specific picture to watch it can't do that. That's not to say that I am not going to do it but I don't know if it will become really popular or remain a fringe thing."

Did he envisage a particular kind of set-up for his studio and video equipment in the near future?

"I will keep the video and studio separate and maybe just send an audio mix to one of the VTRs and then 'overdub' pictures on top. It was my original idea to put them together but it takes such a long time to do both. I can't be thinking, playing with the Fairlight and working the video desk at the same time. If I were working with a team of people maybe it would be possible but it's too much for just one person." □

Music is worthwhile by itself as you can let your imagination run away with the music. If you have been given a specific picture to watch it can't do that

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TRUTH: JBL eliminates these consequences by achieving a new "truth" in sound: JBL's remarkable new 4400 Series. The design, size, and materials have been specifically tailored to each monitor's function. For example, the 2-way 4406 6" Monitor is ideally designed for console or close-in listening. While the 2-way 8" 4408 is ideal for broadcast applications. The 3-way 10" 4410 Monitor captures maximum spatial detail at greater listening distances. And the 3-way 12" 4412 Monitor is mounted with a tight-cluster arrangement for close-in monitoring.

CONSEQUENCES: "Universal" monitors, those not specifically designed for a precise application or environment, invariably compromise technology, with inferior sound the result.

TRUTH: JBL's 4400 Series Studio Monitors achieve a new "truth" in sound with

an extended high frequency response that remains effortlessly smooth through the critical 3,000 to 20,000 Hz range. And even extends beyond audibility to 27 kHz, reducing phase shift within the audible band for a more open and natural sound. The 4400 Series' incomparable high end clarity is the result of JBL's use of pure titanium for its unique ribbed-dome tweeter and diamond surround, capable of withstanding forces surpassing a phenomenal 1000 G's.

CONSEQUENCES: When pushed hard, most tweeters simply fail. Transient detail blurs, and the material itself deforms and breaks down. Other materials can't take the stress, and crack under pressure.

TRUTH: The Frequency Dividing Network in each 4400 Series monitor allows optimum transitions between drivers in both amplitude and phase. The precisely calibrated reference controls let you adjust for personal preferences, room variations, and specific equalization.

CONSEQUENCES: When the interaction between drivers is not carefully orchestrated, the results can be edgy, indistinctive, or simply "false" sound.

TRUTH: All 4400 Studio Monitors feature JBL's exclusive Symmetrical Field Geometry magnetic structure, which dramatically reduces second harmonic

distortion, and is key in producing the 4400's deep, powerful, clean bass.

CONSEQUENCES: Conventional magnetic structures utilize non-symmetrical magnetic fields, which add significantly to distortion due to a nonlinear pull on the voice coil.

TRUTH: 4400 Series monitors also feature special low diffraction grill frame designs, which reduce time delay distortion. Extra-large voice coils and ultra-rigid cast frames result in both mechanical and thermal stability under heavy professional use.

CONSEQUENCES: For reasons of economics, monitors will often use stamped rather than cast frames, resulting in both mechanical distortion and power compression.

TRUTH: The JBL 4400 Studio Monitor Series captures the full dynamic range, extended high frequency, and precise character of your sound as no other monitors in the business. Experience the 4400 Series Studio Monitors at your JBL dealer's today.

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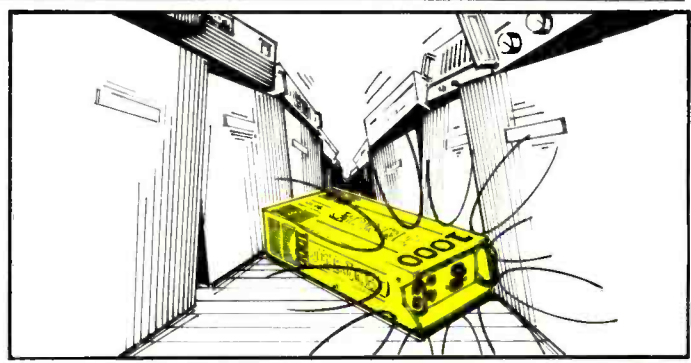
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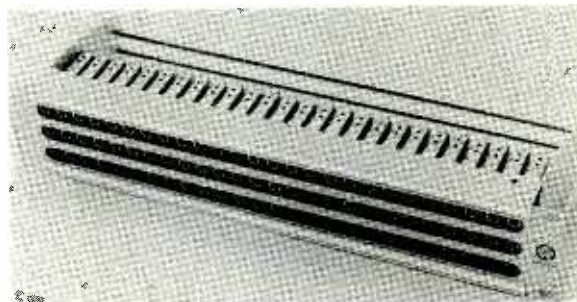
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Frequency range	20Hz-20kHz	20Hz-20kHz	30Hz-20kHz	20-20kHz	20Hz-20kHz	300Hz-3kHz	20Hz-20kHz
Performance	-0.1dB over above range	-0.25dB over above range	-0.5dB over above range	+0.3dB 40Hz-15kHz -0.5dB 20Hz-20kHz	-0.5dB over above range	-0.5dB over above range	-0.2dB over above range
Maximum Level	7.75V r.m.s. on secondary	7.75V r.m.s. on 600 (2)	on 5k (2) 4V r.m.s. at 30Hz	26dBm at 30Hz	2.3V r.m.s. at 30Hz	0.6V p.p. on Py	2.0V r.m.s. on Py at 30Hz
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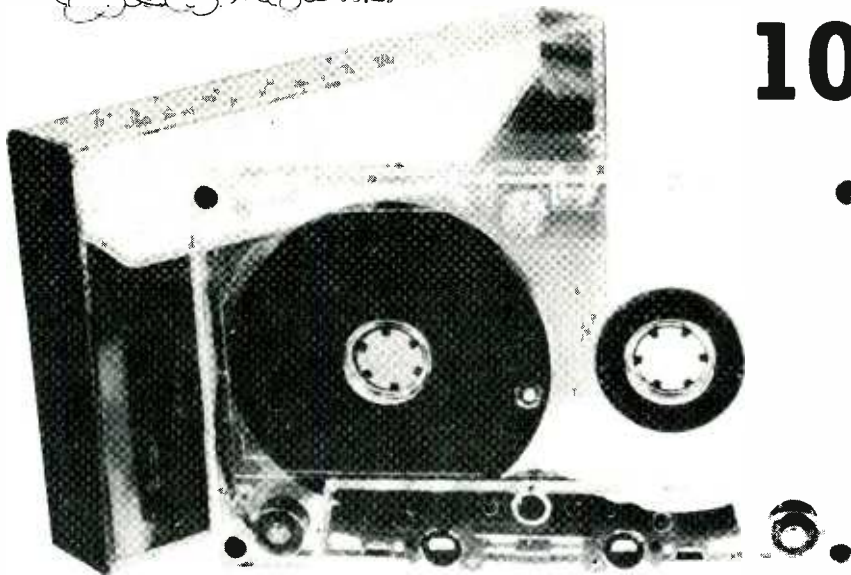
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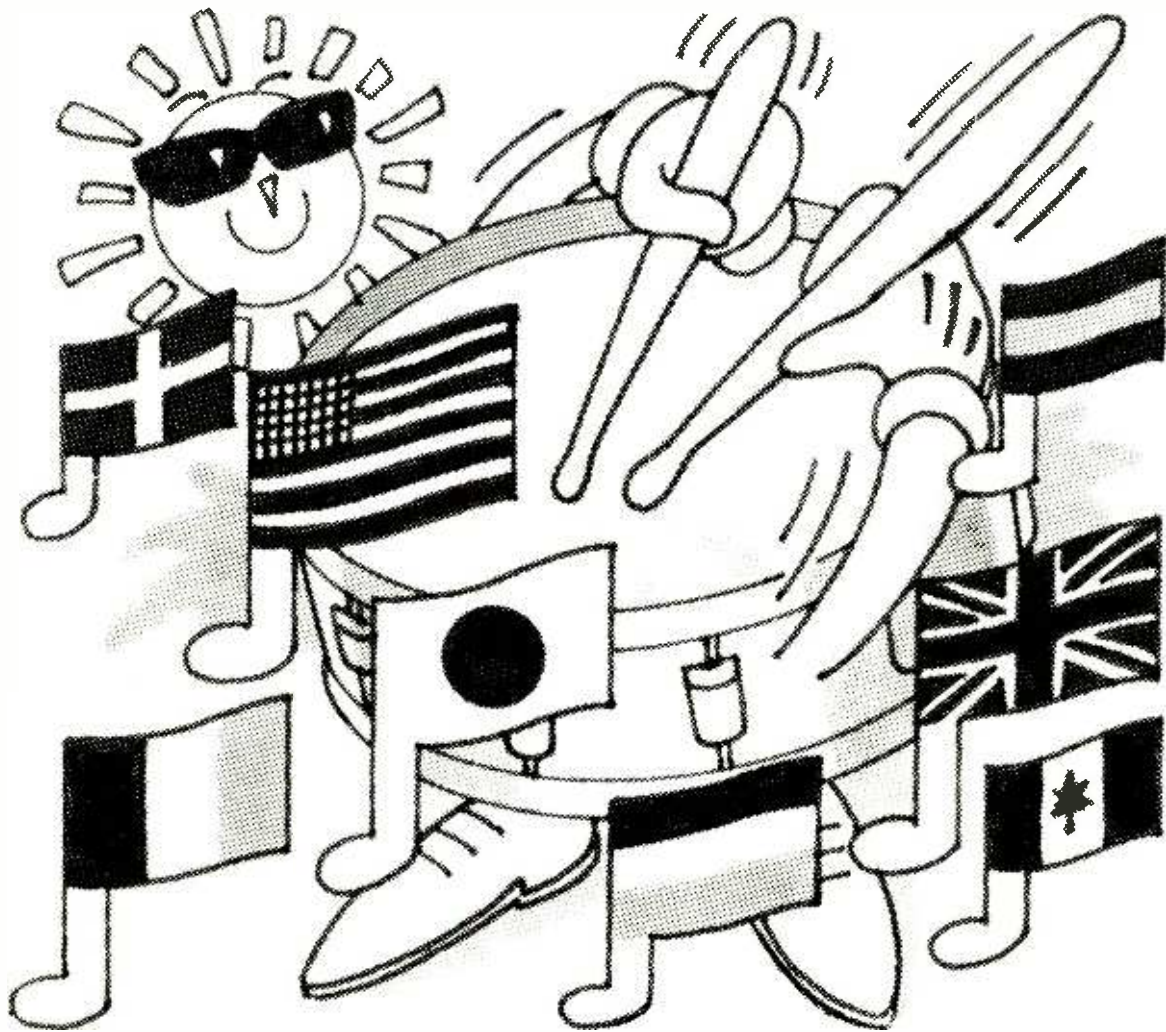
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REVIEW

A technical evaluation of the RCF SCD 6000 monitor by Neil Grant



The RCF SCD 6000 speaker falls into an increasingly interesting category of monitors somewhere between the book shelf type of device and the larger systems that are either separately mounted on stands, or built within the existing structure of the control room in some way.

There is a growing market for a middle range speaker; one that can be used as comfortably within the smaller, independent, or home studio,

as within the second facility that is a part of a fully commercial installation.

There are now a number of serious contenders for this market, and the SCD 6000 is a studio monitor purpose-designed for this size of facility. This speaker, however, has a number of interesting and unusual features that could be of more interest than would otherwise be the case with a system that was simply adapted.

This is a direct radiating system that uses a softdome midrange and tweeter assembly, along

with a 300 mm bass driver within a simple reflex ported chamber. Interestingly, the mid and high frequency drivers share a common magnet motor system. This magnet system has a common back plate and front plate, with two pole pieces, and a single mounting assembly, carrying the two dome diaphragms. This has enabled the designers to place the two diaphragms close together: between 30 and 80 mm closer than with typical comparative designs that use separate motor units, it is claimed.

The advantages in this system are that the acoustic centres of the mid and high frequency drivers are placed closer together, and thus any offsets between the acoustic centres in the vertical plane are minimised. This reduces the imaging and amplitude anomalies that can occur when listening to two drivers that are radiating the same information but are displaced from each other, as would normally be the case with a design using discrete components.

Externally, the cabinets reflect more of a high fidelity ancestry, than that of a series of studio monitors. The carcass of each cabinet is fabricated from a medium density 20 mm particle board, and the main baffle assembly from 30 mm medium density particle board. The low frequency driver is screwed directly to the baffle board, and then neatly trimmed off with a fabric-covered moulding and surround, while the mid and high frequency units are bolted to a metal high pressure die-casting, which is in turn bolted to the main baffle. This can be rotated through 90°, neatly solving the problem of orientating the cabinet to suit the installation yet maintaining the mid and high frequency drivers in vertical alignment to preserve lateral imaging.

A further casting forms the reflex vent, and holds two switch selectable attenuators, controlling the mid and high range level.

The speaker terminations to the rear of the cabinet are rather lightweight and set into a moulding. This is unsatisfactory for terminating competent contemporary cables.

Cabinet construction is reasonable, though repeatedly dismantling the baffle assemblies—as the tests proceeded and access was required to the crossover, components and drivers—proved increasingly alarming. There are metal trim pieces between the mid and high range mounting plate, the attenuator fitting and the low frequency driver trim. Removing the various panels, keeping track of the trim pieces and correctly re-assembling the whole became increasingly tiring and tiresome as time went by.

There was also some concern as to the long term stability of some of the fixings, such as the screw fastenings for the bass driver; it is hoped, of course, that these should not need inspection or removal in use, but they were clearly not designed for repeated removal.

The crossover assembly is neatly wired and an outline circuit is provided in the accompanying literature.

The crossover is a relatively simple assembly of second order high, low and band pass networks in the traditional manner, with the addition of RLC networks in the mid and bass sections to remove resonant peaks in the free air response of these drivers, and a Zobel network in parallel with the midrange driver. This acts to balance the rising inductance of the voice coil assembly through the stop band of the mid band low pass network, thus terminating the network with a relatively linear impedance.

Both mid range and high frequency domes are supplied with ferro-fluid in place in the gap. I have always been concerned about the use of

Manufacturer's specification

3-way system:

Continuous power: 200 W
Programme power: 400 W
Impedance: 8 Ω
Sensitivity: (1 W/1 m) 90 dB
Frequency response: 44 Hz to 20 kHz ±3 dB
Crossover frequencies: 900 Hz and 4.5 kHz
Controls: attenuators—±2 dB on mid and high frequency units

Woofers:

Nominal diameter: 300 mm
Voice coil diameter: 75 mm
Voice coil material: copper
Magnet assembly weight: 7.5 kg
Flux density: 1.3 tesla

Mid/tweeter unit:

Magnetic assembly weight: 7.5 kg
Midrange voice coil diameter: 50 mm
Midrange voice coil material: copper
Midrange flux density: 1.6 tesla
Tweeter voice coil diameter: 25 mm
Tweeter voice coil material: copper
Tweeter flux density: 1.67 tesla

General:

Cabinet weight: 30 kg
Dimensions: 674 × 372 × 350 mm

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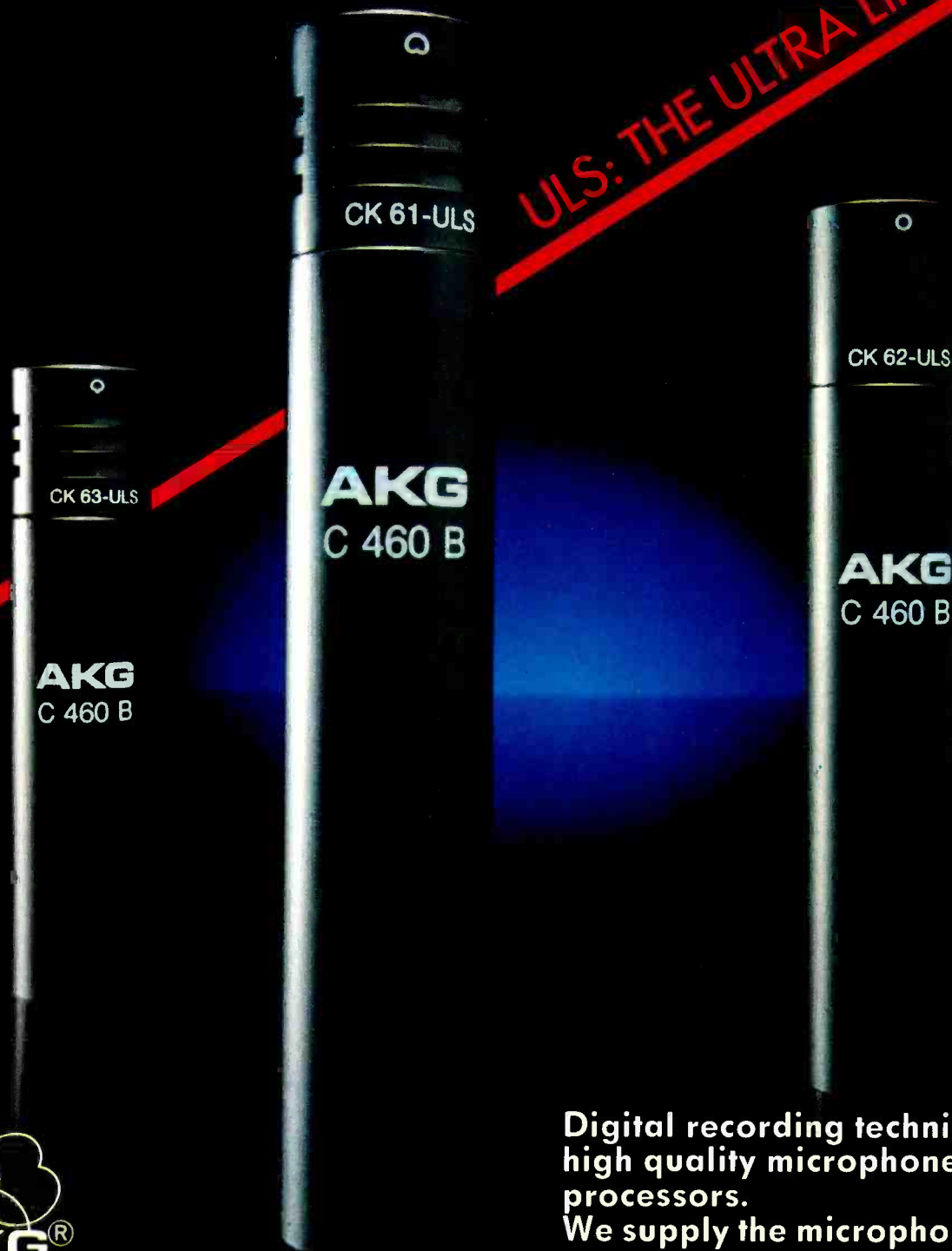
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REVIEW

ferro-fluids in relatively high power systems that are subject to the sort of abuse present in a recording environment. If either of these two drivers is electrically destroyed in a way that leaves debris in the voice coil gap, it could be extremely difficult, if not impossible, to remove without de-magnetising and stripping down the whole assembly.

In theory, the ferro-fluid should act to improve the dissipation of heat away from the voice coil assembly to the thermal mass of the motor unit but in practice it is still very easy to exceed the thermal limits of these drivers.

Each system is supplied with a pair of 'proof of performance' curves, warranty card and a reasonably detailed leaflet. The leaflet provides a comprehensive collection of data and predicted

curves, and it would have been nice if the proof of performance measurements had been original but they were photocopies.

The leaflet provides general background and advertising information, some mechanical and performance details, amplitude, distortion, impedance curves, and an exhaustive set of directional and polar information. This is in the form of normalised horizontal and vertical off-axis response curves for both cabinet orientations and a series of 16 standard polar plots with both horizontal and vertical information overlaid.

Electrical performance

The cabinet is generally described as an 8Ω unit and Fig 1 shows that this is generally the case, with the impedance dropping below 8Ω at 30 and 250 Hz.

In general terms this is a benign load that most amplifiers should have little difficulty driving. Variation of the level controls over their stated maximum produced surprisingly little variation in the electrical impedance, as the modulus of

impedance covering the balance of the bandwidth in Fig 2 shows.

The worst case phase angle measured was a capacitive phase angle of some 53° , and was below the pass band of the system.

Time Domain

Fig 3 shows the magnitude of the time response of one cabinet, the energy time curve. This shows the bulk of the energy present has passed through the system within a little over 2 ms. This is creditable and is due partly to the coherence of the upper two sources with the rather band limited performance of the low frequency section of the system.

Generally there is little diffraction, the lack of grille assemblies and similar protrusions helping, and the transient performance of the system is good.

Frequency domain

Fig 4 is the on-axis amplitude response. This generally progresses smoothly but rises quite

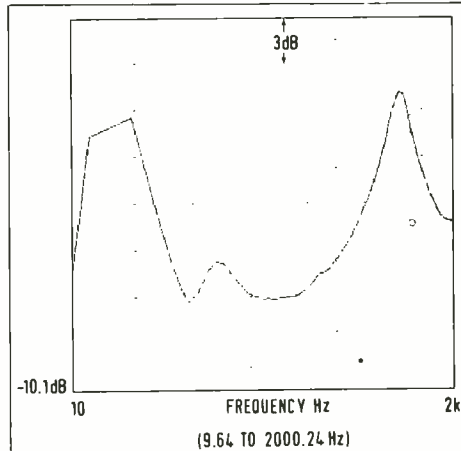


FIG 1 MODULUS OF IMPEDANCE—LOW FREQUENCY
0 dB is located at 8Ω
Log frequency axis: 2.7 decades
Resolution: $1.0836E + 02$ m and $3.1653E + 00$ Hz
Sweep rate and bandwidth: 10.02 Hz/s and $3.1653E + 00$ Hz

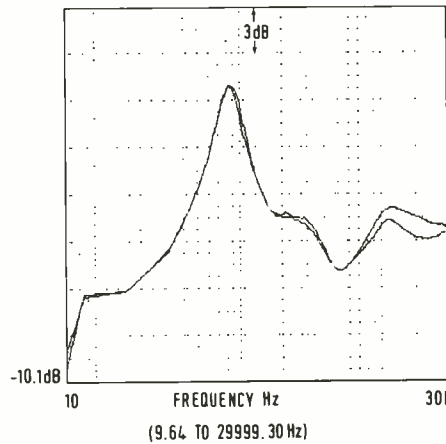


FIG 2 MODULUS OF IMPEDANCE—MID AND HIGH FREQUENCY
0 dB is located at 8Ω
Log frequency axis: 2.7 decades
Resolution: $1.0836 + 01$ m and $3.1653E + 01$ Hz
Sweep rate and bandwidth: 1001.91 Hz/s and $3.1653E + 01$ Hz
Input configuration: balanced with 30 dB of input gain and 18 dB of IF gain

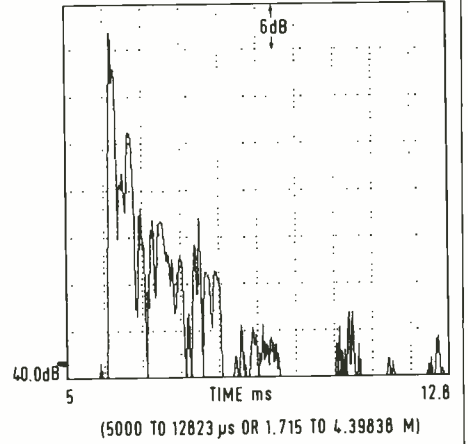


FIG 3 ENERGY TIME CURVE—MAGNITUDE OF TIME RESPONSE
0 dB is located at 0.00002 Pa
Scale: $7.3366E - 01$ m/in or $2.8884E - 01$ m/cm
 $2138 \mu\text{s/in}$ or $842 \mu\text{s/cm}$
Line spacing: $19.6072 \mu\text{s}$ or $6.72526E - 3$ m
Line width: $26.6658 \mu\text{s}$ or $9.14636E - 3$ m
Sweep rate: 500.96 Hz/s
Sweep range: -20000.20 to 31001.50 Hz
Window file name: A:HAMMING.W8T

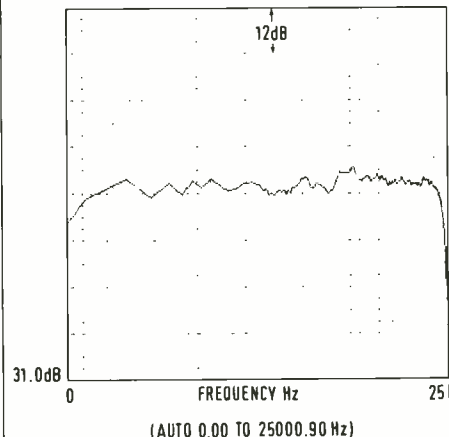


FIG 4 FREQUENCY RESPONSE—ON-AXIS AMPLITUDE
0 dB is located at 0.00002 Pa
Log frequency axis: 2.7 decades
Resolution: $7.6111E + 00$ m and $4.5066E + 01$ Hz
Time of test: $5942 \mu\text{s}$, $2.0379E + 00$ m
Sweep rate and bandwidth: 2030.90 Hz/s and $4.5066E + 01$ Hz

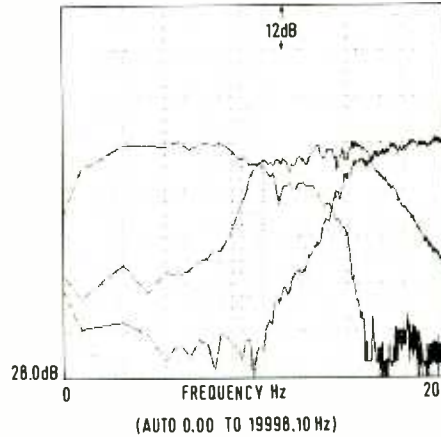


FIG 5 FREQUENCY RESPONSE—DRIVER OVERLAYS
0 dB is located at 0.00002 Pa
Log frequency axis: 2.7 decades
Resolution: $4.3912E + 00$ m and $7.8112E + 01$ Hz
Time of test: $5969 \mu\text{s}$, $2.0472E + 00$ m
Sweep rate and bandwidth: 2030.90 Hz/s and $2.6000E + 01$ Hz

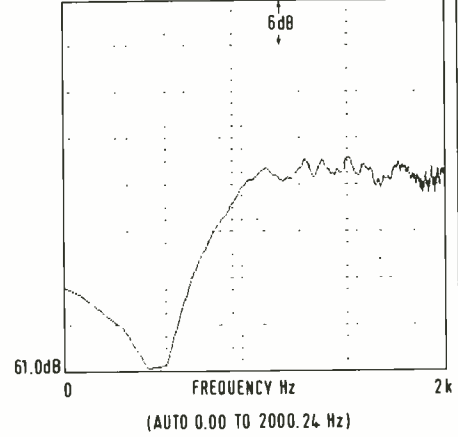


FIG 6 LOW FREQUENCY RESPONSE—BASS SECTION
0 dB is located at 0.00002 Pa
Log frequency axis: 2.7 decades
Resolution: $2.4198E + 01$ m and $1.4175E + 01$ Hz
Sweep rate and bandwidth: 200.92 Hz/s and $1.4175E + 01$ Hz

REVIEW

noticeably between 4 and 5 kHz. The high frequency response extends to a little over 20 kHz, a reasonable performance only for a 25 mm driver with a paper voice coil former, though the curve is smooth and even.

Examining Fig 5, the rise in the upper mid band response can be traced to excess energy at the crossover point between the mid and high

frequency drivers. The high frequency driver is really very well behaved but the midrange unit shows a marked rising response and a peak just prior to the crossover region, much of which is reflected in the combined response.

The rising response is a function of the half space flush mounting and a lack of any directional control over the device in the first octave of its pass band, and could only be corrected with a separate mounting flange, which might well affect the dispersion of the system over those frequencies.

Acoustically the crossover points are at 900 Hz, and 6 kHz.

The low frequency performance is shown in some more detail in Fig 6, and though smooth, well damped and controlled, there is little real bass extension.

Charitably, the -3 dB point is at 71 Hz, given a whole space measurement, and to achieve the figures quoted in the RCF literature, it would be necessary to mount the speaker back into a wall structure, and re-measure in half space.

It was noticeable during tests that there was substantial 'chuffing' from the reflex port during low frequency sweeps. Generally this occurred below the system cut-off but could be discerned in programme material as well. The reasons for this are the restricted size and cut-off of the port itself.

There are two 4-position switch attenuators mounted on the front panel, which together control mid and high frequency level and which individually tilt the high frequency response, cut and boost the upper mid band.

Though both these controls worked well, and much more satisfactorily than the more common potentiometer arrangement, the range of control was very limited, and was just a little bit subtle for some of the potential users.

Fig 7 illustrates the range of response. The top curve set shows the result of the four positions of the high frequency level control. The centre curve set shows the effect of the mid range control, whereas the lower curve set shows the combined effect of moving both attenuator sets together. The total range in this last condition is barely ± 2 dB, and it would be an improvement to increase the effective range of control, though otherwise these work in a nice, predictable fashion.

Fig 8 confirms my earlier comments with regard to the transient response of the system. This illustrates the cabinet's behaviour to the passing of transient information. This display is the rear half of a quasi 3D file set, showing the decay of the system. The rather aggressive peak between 4 and 5 kHz is still very much in evidence, along with some mid band diffraction scattering, and a little lower mid band resonance. The low frequency decay is well controlled and very well damped.

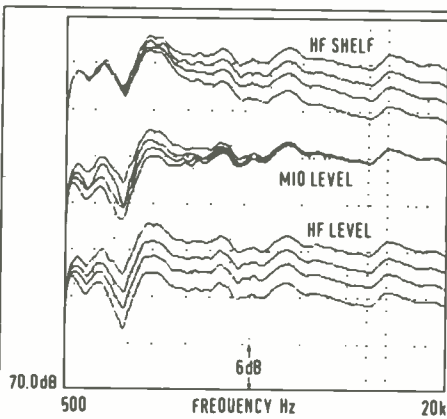


FIG 7 MID AND HIGH FREQUENCY LEVEL CONTROLS
0 dB is located at 0.00002 Pa
Scale: 5330.96 Hz/in or 2098.80 Hz/cm
Resolution: 5.7058E - 01 m and 6.0115E + 02 Hz
Time of test: 5969 μ s, 2.0472E + 00 m
Sweep rate and bandwidth: 75143.30 Hz/s and 1.2500E + 02 Hz

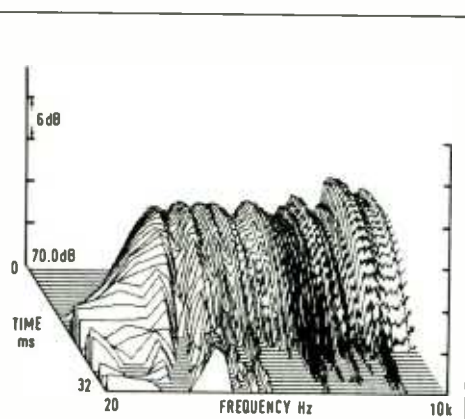


FIG 8 ON-AXIS 3D DECAYS, BROAD BAND RESPONSE
0 dB is located at 0.00002 Pa
Resolution: 4.7928E + 00 m and 71.57 Hz
Time of test: 32,000 μ s 1.0976E + 01 m (front) to 0 μ s 0.0000E + 00 m (back) - 1032 μ s/step or 0.354064516129 m
Sweep rate and bandwidth: 5009.55 Hz/s and 70.00 Hz

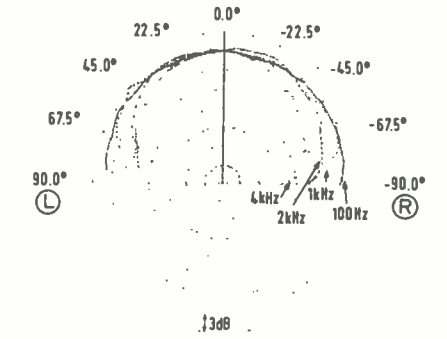


FIG 9 HORIZONTAL POLAR RESPONSE—SET 'A'
Data gathered at 5.6° increments
Centre of display is 21.00 dB down

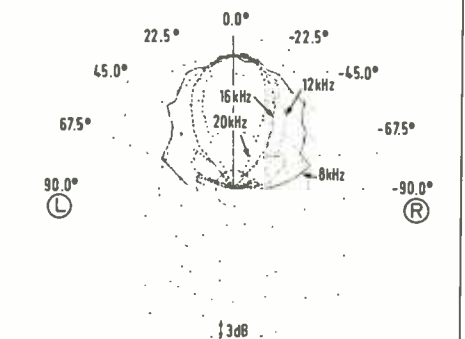


FIG 10 HORIZONTAL POLAR RESPONSE—SET 'B'
Data gathered at 5.6° increments
Centre of display is 21.00 dB down

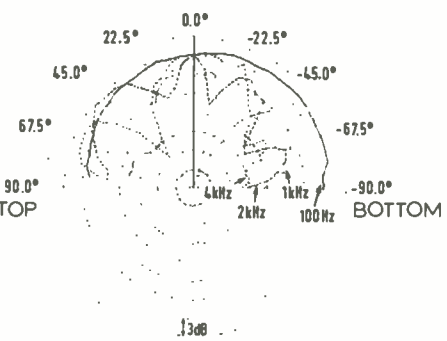


FIG 11 VERTICAL POLAR RESPONSE—SET 'A'
Data gathered at 5.6° increments
Centre of display is 21.00 dB down

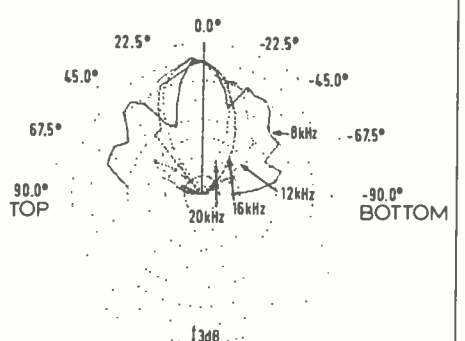


FIG 12 VERTICAL POLAR RESPONSE—SET 'B'
Data gathered at 5.6° increments
Centre of display is 21.00 dB down

Polar response

Considering the extensive series of measurements of the dispersion of the cabinets, it was felt necessary to go a little further than had been the case in previous reviews in order to corroborate, or otherwise, the manufacturer's data.

The measurements themselves were taken in the usual fashion, by rotating a microphone round the forward face of the cabinet through 180° in 5.6° increments. The T_0 , the time delay offset in the measurement, is held constant for all the sweeps, which are loaded into a 3D file. This data can then be displayed as a quasi 3D file, or post-processed in polar form.

Figs 9 and 10 show some of the 400 available polar responses for the horizontal position, and Figs 11 and 12 show the same displays for the vertical dispersion. In this case the bass section of the cabinet is to the right of the display, and the high frequency section is to the left.

Fig 9 shows the 100 Hz, 1 kHz, 2 kHz, and 4 kHz curves for the horizontal axis overlaid. These are in general agreement with the supplied data and are good in their class. Fig 10 overlays the curves for 8 kHz, 12 kHz, 16 kHz and 20 kHz. While these measurements show more resolution than the published data there is still good correlation, and the horizontal dispersion is acceptably good.

Fig 11 shows overlays of 100 Hz, 1 kHz, 2 kHz, and 4 kHz and these are not quite so good. Note

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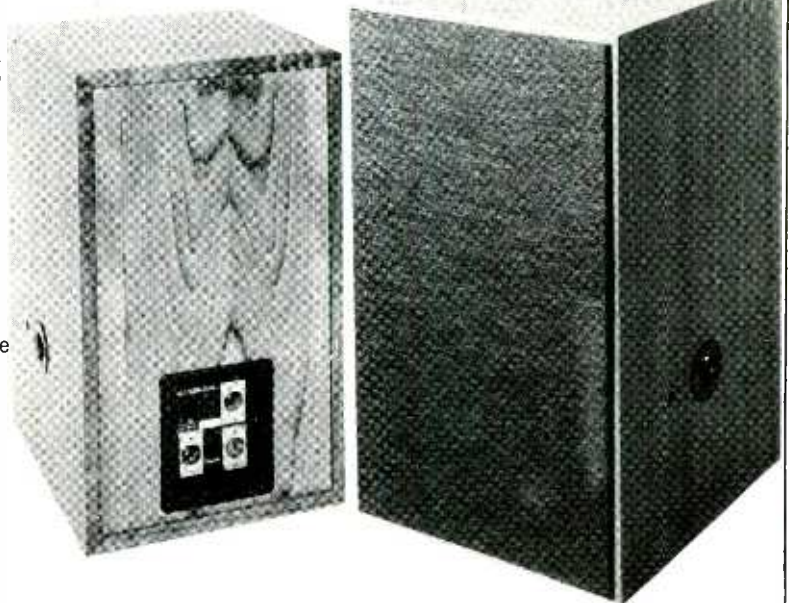
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REVIEW

the skew in the direction of the bass driver of the 100 Hz response (this is to be expected) and then the severe lobing of the 1 kHz and 4 kHz curves,

the 2 kHz curve, however, is acceptably even.

This is due to the effect of the path length differences seen by the microphone as the sweep passes through the crossover region. At these points there are two sources of the same signal, as discussed previously, and these sources are displaced from each other. In the case of the SCD 6000 these sources may be closer than in competitive products but the results are still obviously there. The lobing is due to cancellation because of path length differences between the two sources and the measurement microphone.

This is not reflected in the polar data supplied

by the manufacturer though, to be fair, it can easily be discerned in the beam-width and dispersion data also supplied. The polar data merely lacks the resolution to discriminate the detail necessary.

Fig 12 shows the balance of the polar information for the vertical sweep, overlaying 8 kHz, 12 kHz, 16 kHz, and 20 kHz. This is much more similar to the horizontal information now that the crossover regions are passed, and is generally good. Note the bias towards the high frequency section of the cabinet that would be expected.

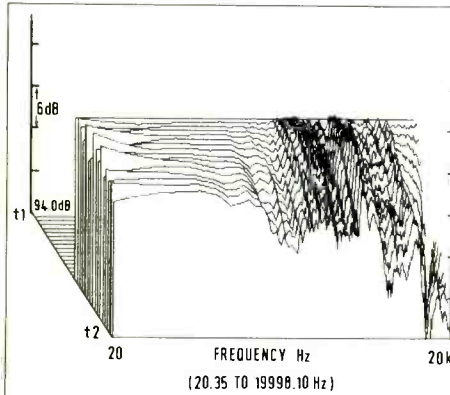


FIG 13 RIGHT HAND HALF—QUASI 3D OF HORIZONTAL POLAR RESPONSE NORMALISED TO ON-AXIS RESPONSE
0 dB is located at 0.00002 normalised
Resolution: 3.3109E +00 m and 1.0362E +02 Hz
Time of test: 5942 μ s 2.0381E +00 m (front) to 5942 μ s 2.0381E +00 m (back) 0 μ s/step or 0 m
Sweep rate and bandwidth: 10734.80 Hz/s and 1.0362E +02 Hz

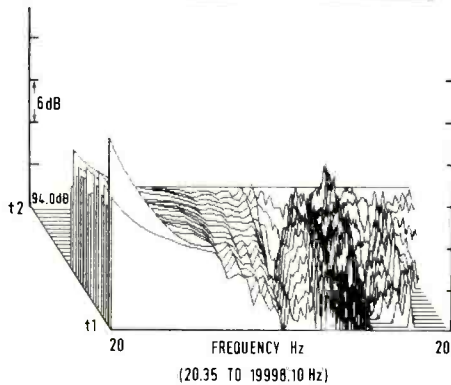


FIG 14 LOWER SECTION—QUASI 3D OF LOWER HALF OF THE VERTICAL POLAR RESPONSE NORMALISED TO ON-AXIS RESPONSE
0 dB is located at 0.00002 normalised
Resolution: 3.3109E +00 m and 1.0362E +02 Hz
Time of test: 5942 μ s 2.0381E +00 m (front) to 5942 μ s 2.0381E +00 m (back) 0 μ s/step or 0 m
Sweep rate and bandwidth: 10734.80 Hz/s and 1.0362E +02 Hz

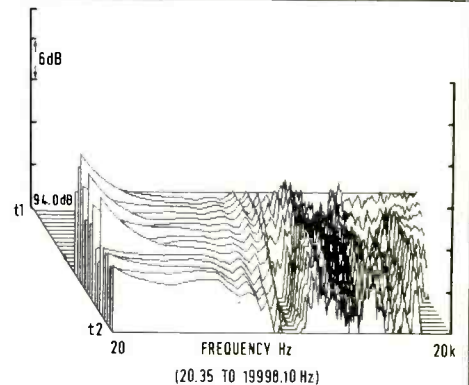


FIG 15 UPPER SECTION—QUASI 3D OF UPPER HALF OF THE POLAR RESPONSE NORMALISED TO ON-AXIS RESPONSE
0 dB is located at 0.00002 normalised
Resolution: 3.3109E +00 m and 1.0362E +02 Hz
Time of test: 5942 μ s 2.0381E +00 m (front) to 5942 μ s 2.0381E +00 m (back) 0 μ s/step or 0 m
Sweep rate and bandwidth: 10734.80 Hz/s and 1.0362E +02 Hz

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REVIEW

As an alternative view, the 3D polar file set has been displayed as an assembled file in Figs 13, 14 and 15.

In Fig 13 the right half of the horizontal sweep only is shown, the left half, being almost identical and hidden to the rear of the file set, has been suppressed.

It is now obvious that the low frequency radiation is nearly hemispherical and the two crossover regions at 900 Hz, and 6 kHz can be seen as valleys. This is due to the directivity of the low frequency driver at the crossover point being greater than that of the midrange driver

that it should be matching, which results in a step in the power response. The same is true of the matching to the high frequency driver.

The effect of this is that the frequency balance of the speaker changes off-axis, altering frequency perception as the engineer moves around the room. This will affect both amplitude and image decisions. To be fair to the SCD 6000, it is not particularly bad in this respect but considering the care taken to minimise these problems, it should be better.

Figs 14 and 15 illustrate the behaviour of the cabinet in the vertical direction, Fig 14 being the lower section, passing from the base of the cabinet towards the centre, and Fig 15 the sweep from the centre to the top of the cabinet. This last curve has been displayed on the nearer side of the file set for clarity.

The crossover losses are now clearly obvious as sharp valleys. It should be noted that for all these measurements, the mid and high range were mounted vertically, the cabinet being in standard book shelf format.

Fig 16 illustrates the excellent distortion performance of the system, and the slightly greater than published sensitivity of 91 dB for 1 W at 1 m.

The principal distortion components are consistent over the measured range, though starting to rise markedly above the 100 W limit. This performance is good, and what would be expected of a competent dome-based system of this type.

Conclusions

This is a speaker system that has obviously been tooled for serious quantity production. In small runs, the complex top plate of the mid high range driver would be prohibitively expensive, let alone the castings and mouldings used on the baffle structure of the cabinets.

The result is different, visually distinctive, and will possibly polarise reactions from potential customers. Provided access to the internals or drive units is not required frequently, the mechanics of the cabinet are adequate for the job, though hardly robust.

Set against price, the system performance is good, though the general on-axis balance is felt to be aggressive, with too little control over the overall shape of the curve. Transient behaviour is excellent, the horizontal dispersion good, the vertical problematic.

The cabinets are a little too large to sit comfortably, either vertically or horizontally on top of a current console, and it would be of concern as to how these units are mounted over a console. In smaller rooms a Unicol or similar stand could be used, or a simple arrangement of shelving. This could exclude these cabinets from some control rooms.

There is not a substantial power handling margin, especially in the upper frequency range, and there would be concern over diaphragm damage if the units were stressed beyond the limits recommended in the brochure, which are accurate but not conservative.

Providing the finishing style is to your tastes, this is an inexpensive, innovative and somewhat idiosyncratic system that is worth auditioning as a general monitor and large nearfield device for the home studio, or smaller production facility. □

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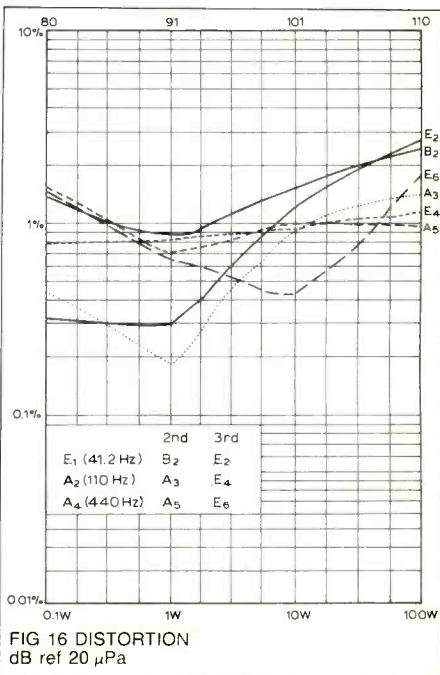


FIG 16 DISTORTION dB ref 20 µPa



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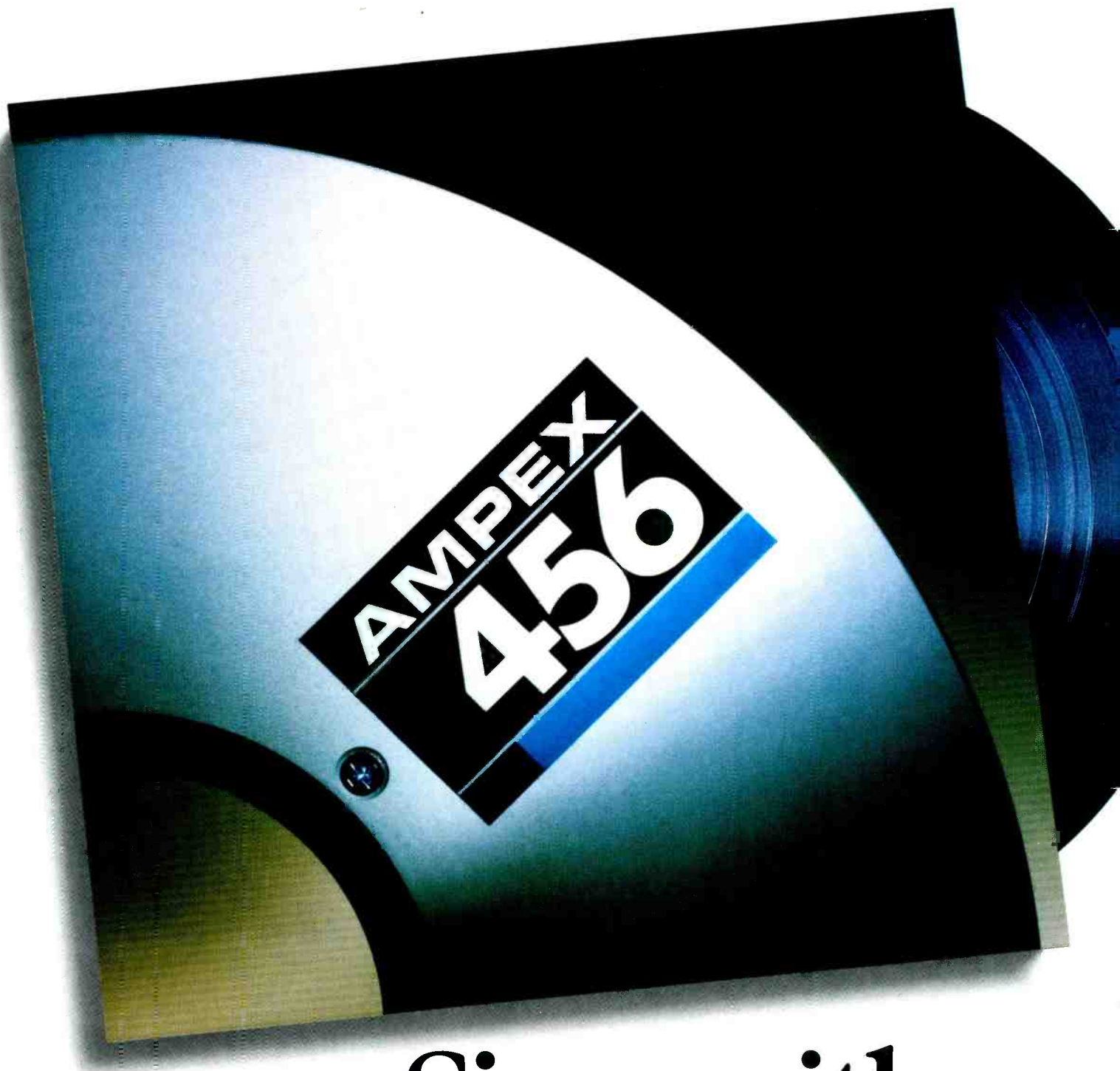
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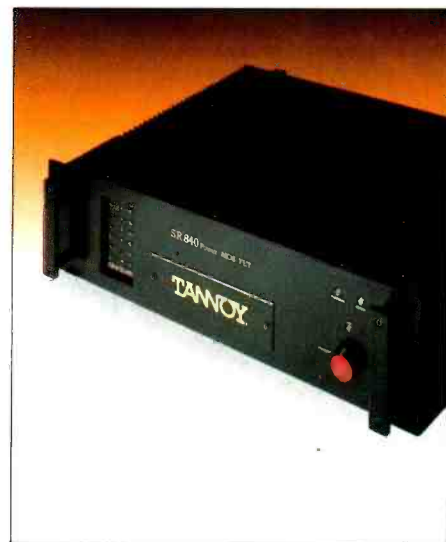
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