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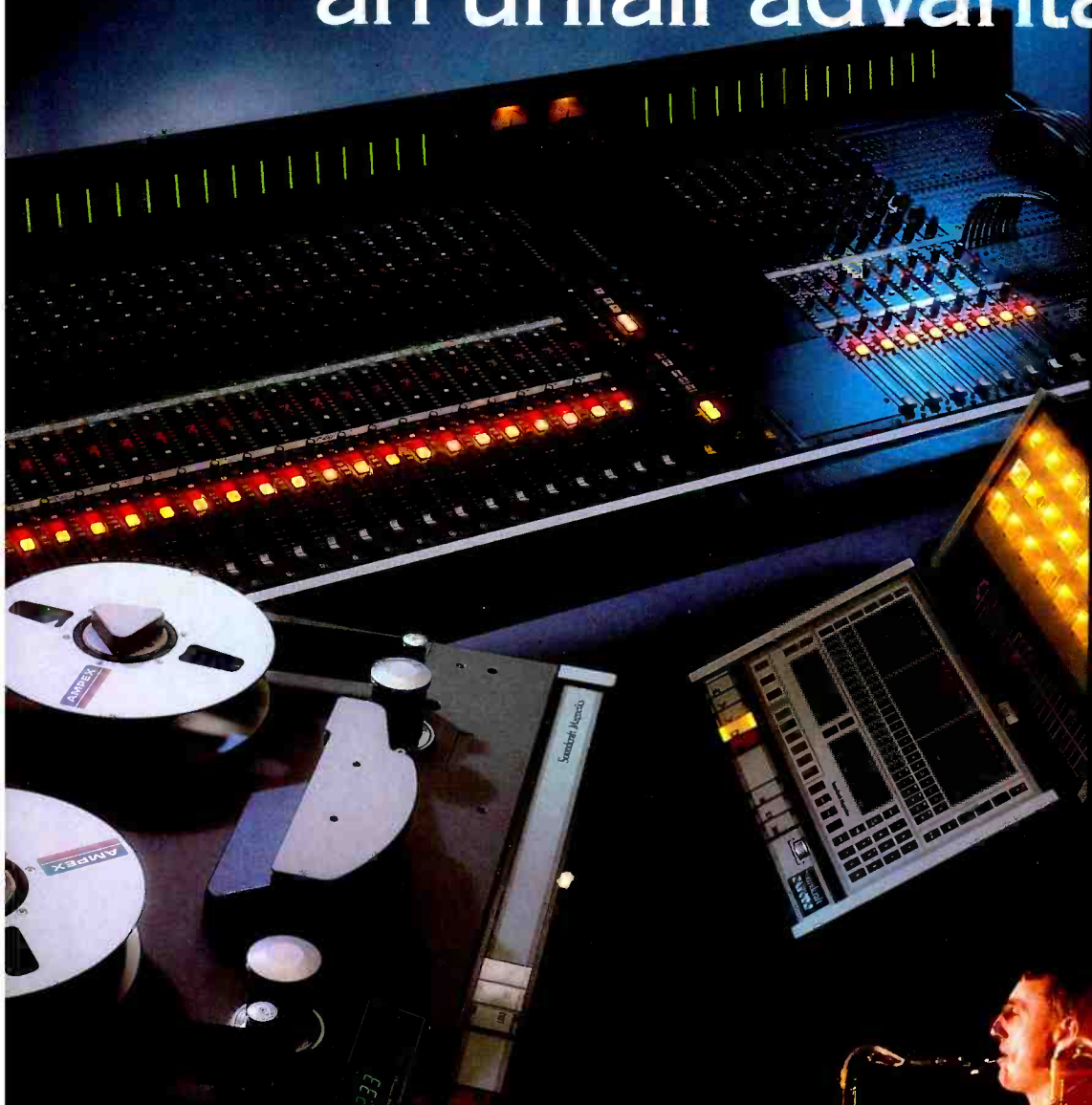
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EDITORIAL

This month's comment from Keith Spencer-Allen

Changing the past

There weren't threats of physical abuse. There weren't exactly fist fights in the bars. There wasn't any blood spilt. There was, however, the closest to verbal professional character assassination that I can remember hearing under such learned circumstances.

The occasion of this excitement was the CD mastering workshop at the Los Angeles AES Convention in November last year. And the floor was divided between the yeas and nays. The event started with presentations from the panel but this really only covered the technical and business aspects of the subject with the detailed mastering aspects of sound treatment rather glossed over. Come question time, however, the subject of whether or not to treat back catalogue before transfer to CD soon surfaced and the camps aligned themselves. During these particular workshops the audience was divided into three sections and mics were positioned in the gangways to enable members of the audience to ask questions and the camps neatly aligned between the left and right sides of the hall. (I can recommend trying to obtain the AES tapes of the event for hearing passions rise.)

This was not the first time of course that the subject has been discussed—we have in fact carried comment on it within our own pages—but I'd never realised that passions were running high. I think in reality that both gentlemen concerned were not quite so far apart in their true feelings as their public positions indicated.

The background to the subject is really quite simple. The compact disc and other future digital consumer formats allow high quality audio into the home. Provided that the signal chain retains digital integrity from early in the recording process to the finished consumer item, then this should mirror fairly closely the original master. Therefore a good original master will have most chance of sounding good in final format while a deficient tape has rather less.

I think that at this stage we have to differentiate between recent recordings and older material—recordings that were previously available in pre-digital formats. Theoretically modern recordings should all be of sufficient technical quality for transfer to CD. Certain record companies like to

cover themselves on the CD package by almost stating that analogue recording will always give an inferior result that CD will reveal. This is not really the full truth but this is a different subject. But what do we do about 'historical' recordings?

The debate really crystallises around the ethics of treating such recordings or perhaps how much to treat. For example few would doubt that Decca's approach to remastering, i.e. copying analogue masters to digital format and remaking any edits in the digital domain is beneficial. But how far can you go? What about dynamic range enhancement, re-equalisation or even remixing?

The answer has to be the use of personal taste. For example I would ideally like to hear Sgt Pepper without the surface noise and distortions of the vinyl disc (naturally). Further I would expect to hear rather more detail of the original recording (for better or worse). I think that I could live with the tape noise but *never* could I come to terms with a full remix. However, there have been cases where returning to the original master to replace an awful spring reverb sound with a modern digital processor to achieve the same intended effect is quite acceptable. There may be times when it could be fun to return to the original multitrack and remix and include a modern approach on the same CD as a bonus track(s).

I firmly believe that it is essential to consult as many of those involved in original recording to find their original aims and if any modern aids would be of benefit to their original intentions. It is very important that such decisions are not left to record companies or to unsupervised mastering houses—they are not the world's best protectors of recorded musical heritage. Witness the recent CD release of back catalogue from a major 60/70s band with the playing order of their concept album reversed.

As we said some months ago, with more back catalogue being released, someone somewhere is right at this moment considering rereleasing products that you recorded. Protect your reputation and the consumer's expectation.

Happy New Year.

STUDIO SOUND

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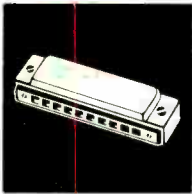
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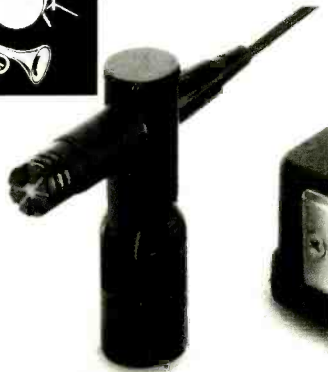
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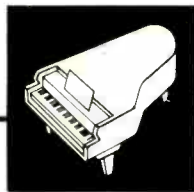
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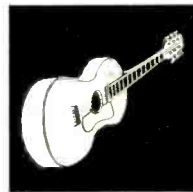
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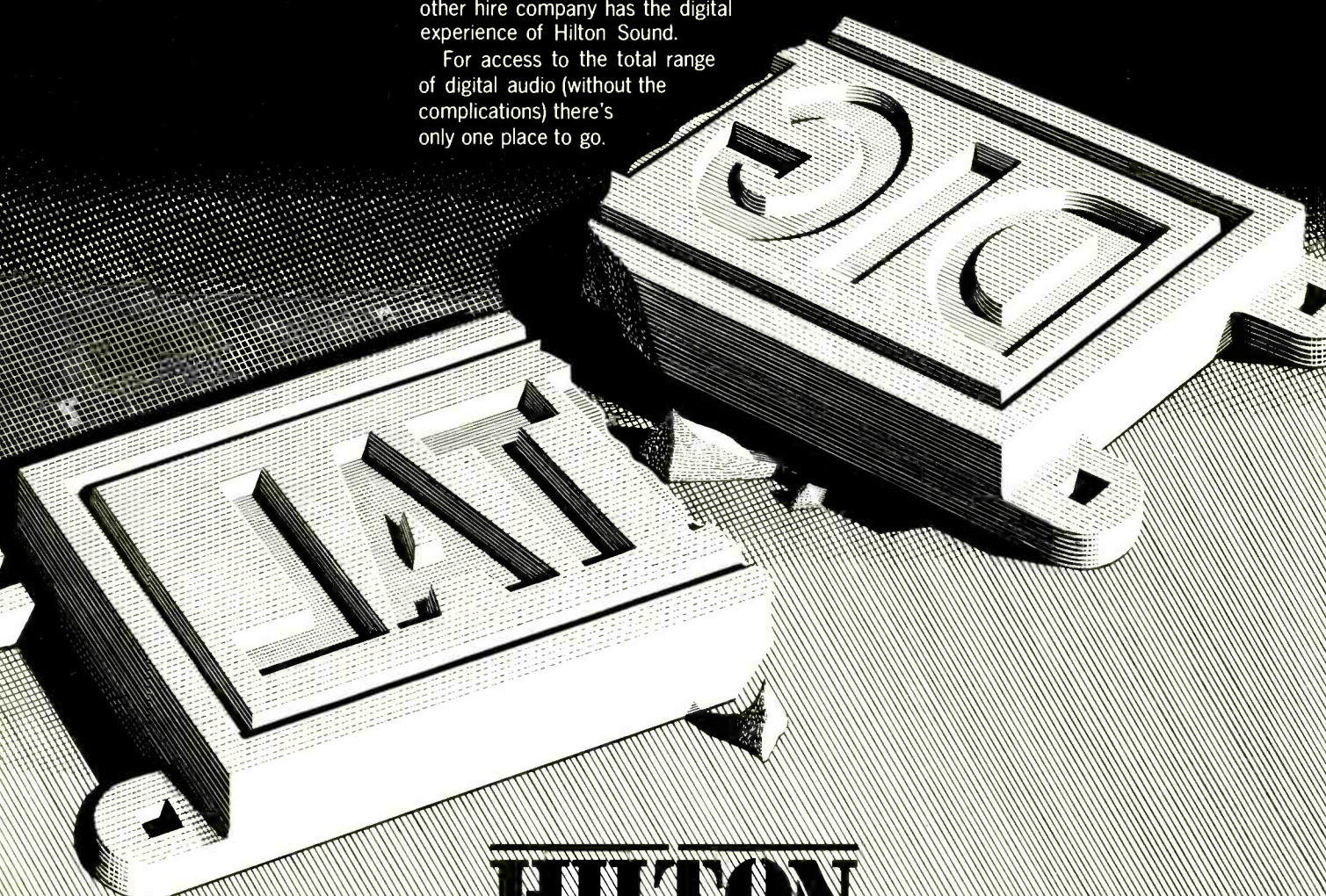
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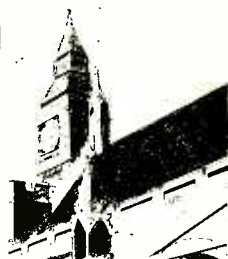
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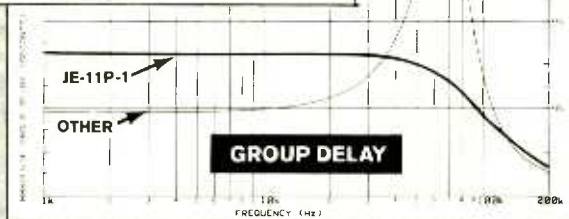
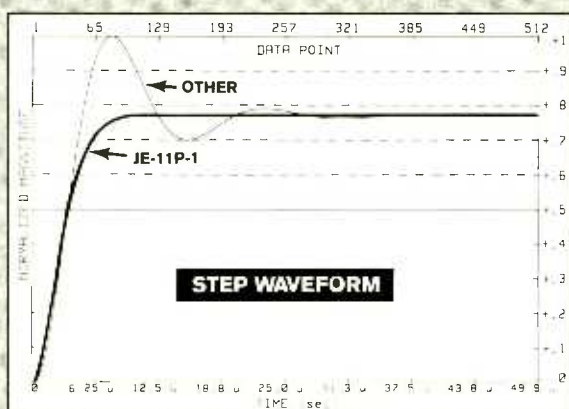
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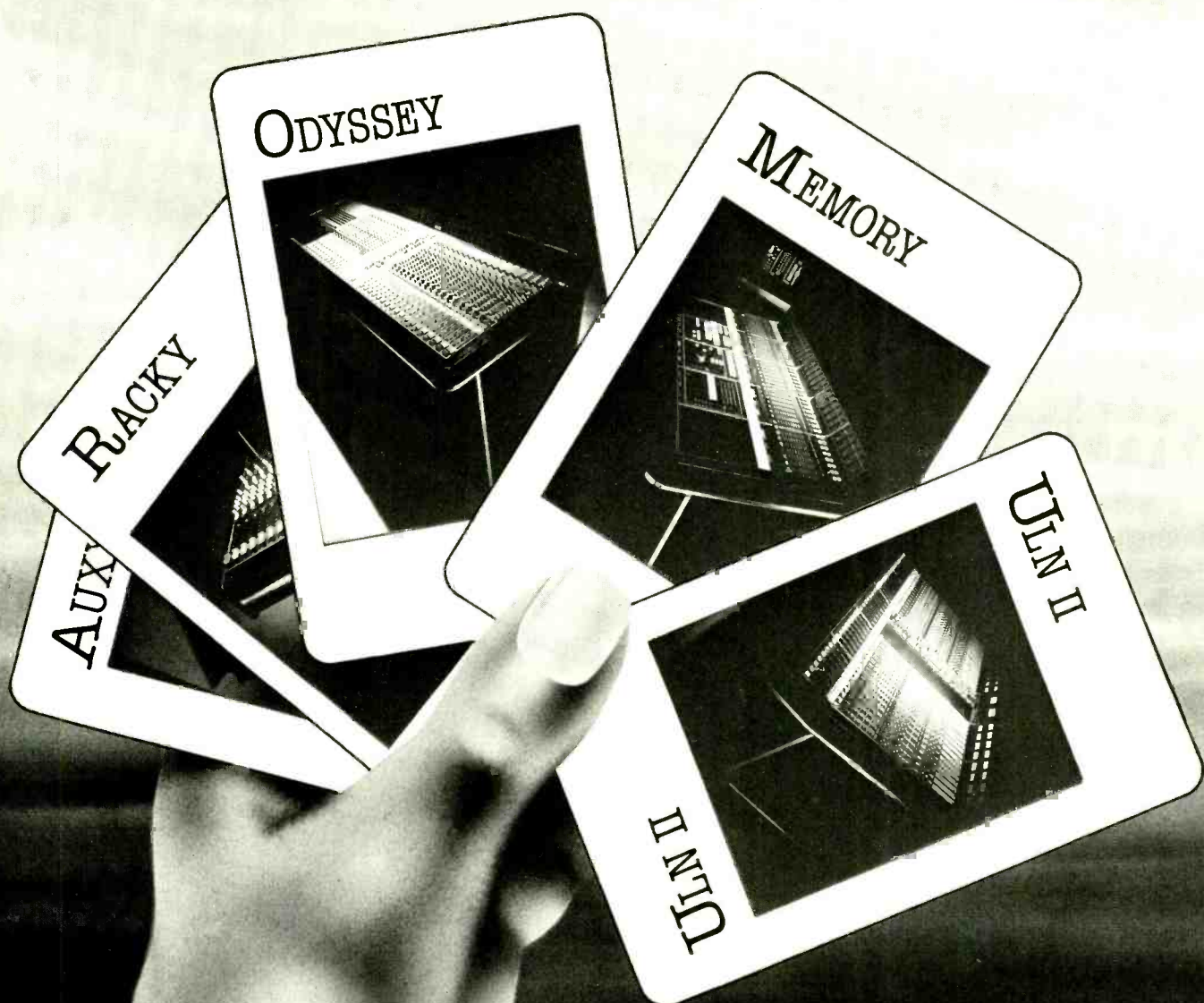
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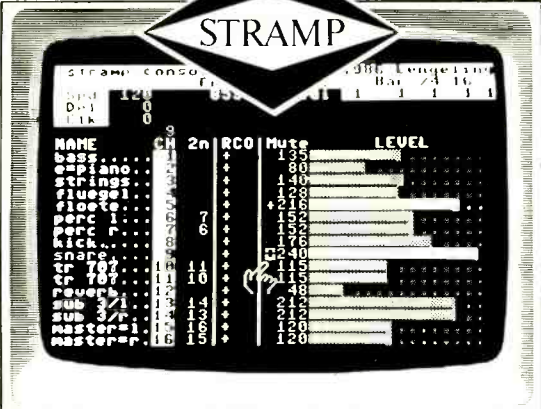


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ASONA

for Complete Cassette Production

The new semi-automatic WINDER 2015 compliments the ASONA line of loop-bin/slave duplication systems.

Approximately 950 C-60 cassettes can be produced per shift with one winder.

The winding and splicing phases are fully automated, enabling two winders to be operated by one person, or five machines by two persons.

Length preselection is provided for blank tape, automatic cue-tone detection for recorded tape.

Robust construction, with a minimum of moving parts.

Low maintenance requirements, low personnel costs.

Economically priced.

ASONA Winder 2015

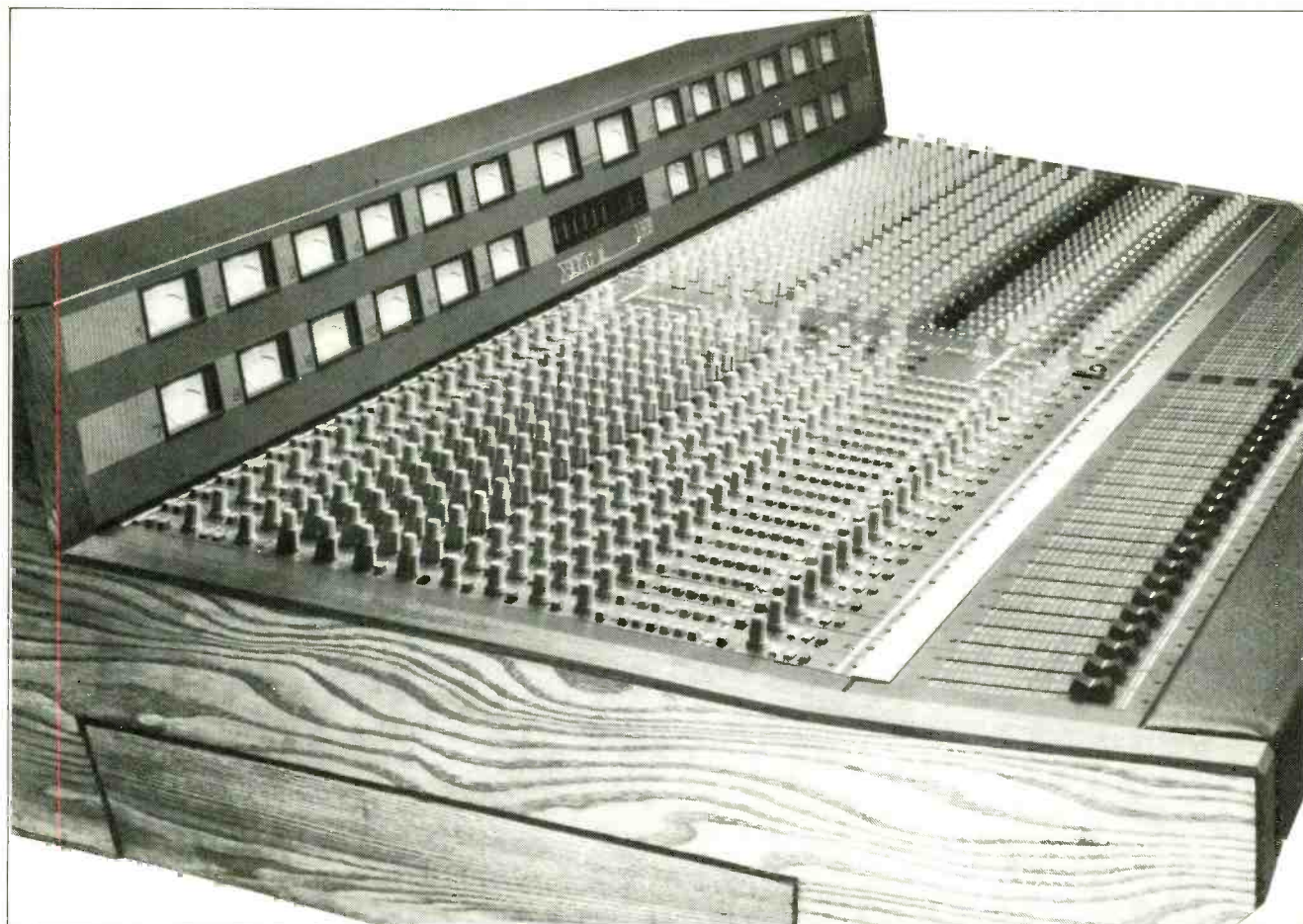
The WINDER 2015 is designed for universal installation. Completely self-contained; may be plugged in wherever needed. No compressed air or external vacuum required. Compact size; easily transported with integrated carrying handles.



**We can tailor a cassette production system to your needs.
 Write or call for a proposal.**

ASONA is manufactured in West Germany by **AUVIS ASONA GmbH & Co. KG**, Bahnhofstraße 60, D-7634 Kippenheim
 Tel.: (0)7825-1068, Telex: 754325 auvis d

Take a good look, because you will not be able to hear it.



Analogue it may be, performance it most definitely has, with lower noise than 16 bit digital playback, having a dynamic range in excess of 100dB, packed with features, and looks to match.

- Fully modular
- 24 Bus
- Split and in-line configurations
- Capacity for 56 modules, + producers desk option
- Fader automation ready
- Dual operating levels on separate connectors
- SSR Remote as standard, giving MIDI synced muting
- Balanced inputs and outputs
- Silent FET mute switching
- Gold on gold edge connector system

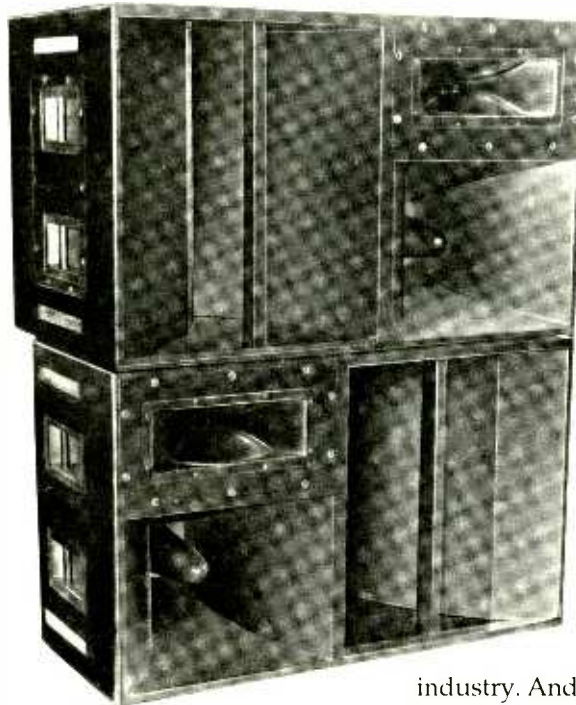
The list of well designed, and expertly engineered features goes on and on. For complete information on the SIGMA 24 console range, make contact **NOW**.

AHB *Mixing Art with Science* mbi/AHB

IF ANY OTHER "ONE BOX" SYSTEM WAS THIS ADVANCED, AND THIS COST EFFECTIVE, AND THIS WELL BUILT, WE MIGHT HAVE SOME COMPETITION.

HOW ADVANCED?

EAW "One Box" systems utilize advanced horn technology enabling 3 to 8 dB more acoustic output than even the costliest competitive vented systems. And the horns that EAW builds sound like no other horns. They all make use of exceptionally complex throat sections eliminating the beamy hollow sound typical of other horn loaded systems. EAW's horn technology is so advanced that it was selected by the Japanese Audio Consulting Society as the best high output system in the world after they compared it to 14 of the best vented and horn loaded systems from the US, Europe and Japan.



tech aircraft flying hardware - 100mm voice coil RCF Laboratory Series Cone Drivers featuring exceptionally low distortion and virtually no power compression - heavy duty vinyl dipped perforated steel grill assemblies for indestructible road worthiness. No other competitor has the experience to compete in this category.

WHY EAW KF SERIES?

Because we are the source for professional "One Box" loudspeaker systems. When we invented the "One Box" system we raised the expectations of an entire

industry. And now, we are in the process of advancing the technology we pioneered.

HOW COST EFFECTIVE ?

EAW is the largest manufacturer of "One Box" systems in the United States and our large computer controlled wood working stations enable us economies of scale no other system manufacturer can compete with. As a result EAW's KF Series "One Box" systems offer more performance per dollar than any competitive system. But the real bottom line for rental companies is return on investment, and this is where EAW has no competition. As a result of our reliance on sound engineering, not fad design techniques, our systems remain competitive for a long time. In fact EAW's first "One Box" systems built in 1978 for Carlo Sound are still in demand today, and Carlo Sound is still getting returns on their investment while lesser competitive systems have been long retired.

HOW WELL BUILT?

EAW KF Series are built from the finest materials available, including - exterior surfaces made from 18 ply to the inch cross-grain laminated European birch with the highest sheer strength of any commercially available wood product - horn flares injected with high density polyurethane foam for absolute acoustical integrity - high

The Source For "One Box" Systems.

You can maximize your next quarter revenues by contacting EAW today. Our loudspeaker systems are easy for your crews to use, as well as a positive attribute your customers are looking for. So, if quarterly revenues are important to you, now is the time to contact EAW. To expedite the process, in the US call Frank at 617-620-1478, in Europe call Martin at Holland PA Service at 020-233954, In Australia call Tony at (02)-571236 or in Japan call Unicus at 03-662-8518.

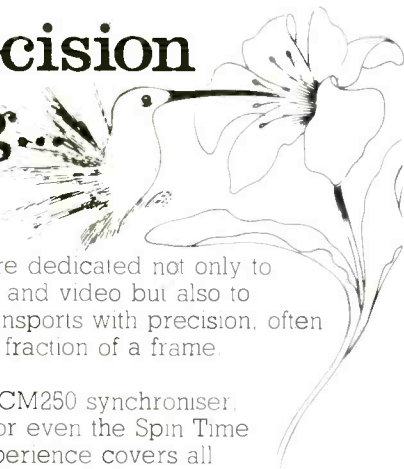


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Whether it be the CM250 synchroniser, CM50 autolocator or even the Spin Time tape timer, our experience covers all areas of timing and control of tape including the all important knowledge of audio and video machine interfaces.

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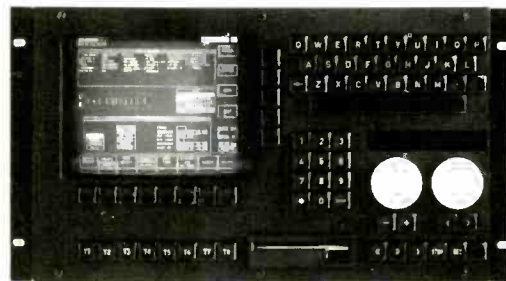
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ams AUDIOFILE

The word is spreading

The word is AudioFile. The all important letters are AMS. The AMS AudioFile, the world's leading hard disc based digital recording, editing and playback system, (although quite a mouthful) is on everyone's lips at the moment. And for good reason. Because it's also at the fingertips of leading exponents of sound engineering. So if you'd like a word or two about the AMS AudioFile contact us today.



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The Queen's Award for Export Achievement to Edendek Ltd. 1984/85 and AMS Industries plc 1986

In July 1985 Edendek Ltd. became AMS Industries plc

SOWTER AUDIO FREQUENCY TRANSFORMERS

You name it! We make it!

For the past 45 years we have concentrated on the design and manufacture of high grade audio transformers during which period our total sold exceeds half a million. We continually take full advantage of all the improvements in magnetic and insulating materials and in measuring techniques utilising the most up to date instrumentation.

We have a very large number of original designs made for clients all over the world but naturally there are certain types of Sowter Transformers which are in constant demand. These have taken into account the tendency towards small size without sacrifice of performance, particularly for PCB mounting, and a few of these are listed below. They can be supplied with or without mumetal shielding cans. Performance requirements can be modified on request (utilising our readily available questionnaire) and generally without alteration in price.

We specialise in **LOW COST AND QUICK DELIVERY** which means a few days only or ex-stock.

TYPICAL PERFORMANCES

Sowter Type No	3575	4652	3678	6499	4079	6471	6469
Description	Miniature bridging transformer	Line output	Multi primary microphone transformer	Line output high level low distortion toroidal core	Splitter combiner transformer	Midget mic transformer for BT private systems	Very high quality microphone transformer
Impedances	10k Ω 10k Ω can be fed from 50-600 Ω	600 Ω or 150 Ω inputs or outputs	Py 60, 200 or 600 Ω 5k Ω down to 1k Ω	600 Ω 600 Ω	200 Ω 8 Ω Primary TW 200 Ω Secondaries	Py 600 Ω Sv 60k Ω	200 Ω Primary for 1k Ω loading; (Bifilar) 8:1 step up
Frequency range	20Hz 20kHz	20Hz 20kHz	30Hz 20kHz	20 20kHz	20Hz 20kHz	300Hz 3k4Hz	20Hz 20kHz
Performance	-0.10dB over above range	-0.25dB over above range	-0.5dB over above range	\pm 0.3dB 40Hz 15kHz \pm 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. at 40Hz	7.75V r.m.s. on 600 Ω	on 5k Ω 23.4V 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
Maximum Distortion	With 10V r.m.s. at 40Hz only 0.12%	Using 800 Ω and low impedance source it is 0.1%	Less than 0.1% at 1kHz	0.1% at 30Hz at 26dBm	negligible 0.1% at 1kHz	negligible	0.1% at 20Hz
Shielding	Electrostatic screens and mumetal can	Mumetal can if desired at extra cost	Mumetal can	Toroidal can	Mumetal can rigid fixing bolts	PCB mounting	Mumetal can
Dimensions	33mm diam - 22mm high	36mm high - 43mm - 33mm	33mm diam - 22mm high	50mm diam - 36mm high	33mm diam - 37mm high	11.1mm high 19mm - 17mm	33mm diam - 22mm high
Prices each at works	15 £10.83 50 £9.77 100 £8.27	15 £9.67 50 £8.89 100 £8.69	15 £9.67 50 £8.67 100 £8.41	15 £17.12 50 £15.69 100 £15.35	15 £14.59 50 £13.37 100 £13.08	15 £3.89 50 £3.55 100 £3.29	15 £11.38 50 £10.12 100 £9.92

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STUDIO SOUND'S

PRO-AUDIO DIRECTORY 1986/7

From the publishers of the world's leading professional recording magazine **Studio Sound**, comes the latest edition of their sister publication, **The Pro-Audio Directory**.

This unique and vital reference source has been completely updated and revised to provide in one volume information on every aspect of the professional recording industry; From Acoustic Materials to Tape Recorders; From Mixing Consoles through to Synthesisers.

In addition to its forty extensive hardware sections are chapters covering Dealers in the UK, USA and Worldwide. Pin-pointing which equipment can be brought where – anywhere in the world.

The ultimate section is the extensive address listing featuring the full details of over 3,000 companies mentioned in the directory, including key contact names. Also there is a cross reference listing of Worldwide Distributors detailing international availability of any given product. This information is not available in any other publication.

The Pro-Audio Directory has all the information you need, and to make sure it is straight forward to use, this edition sees a complete redesign with an even greater emphasis on clarity.

To ensure you stay in touch with the expanding, rapidly changing world of professional recording order your copy of the specialised **Pro-Audio Directory** now.



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N O R T H E R N A U D I O

PROFESSIONAL STUDIO EQUIPMENT SECONDHAND PRODUCTS

USED CONSOLES

Weststar 36 channel 4 band parametric eq 8 sends LED PPM peak stand etc.
 This console is six months old £55,000
 S.S.L. 4000E 40 frame 32 fitted, with two extra stereo modules, light meters
 and total recall. Fitted July '84 £95,000
 Harrison 32/32 56 frame 56 fitted with Alison 65K programer and Fadex,
 7 years old in good condition £38,000
 Neve V range with Necam 2 48 frame with 36 fitted. 16 months old in good
 condition £115,000
 Neve 8128 32 frame 28 with 4 reverb channels, 3 years old £40,000
 Harrison 32/32 40 frame 36 fitted with Alison Fadex 65K £27,000
 Soundcraft TS 24 32/24, 14 months old, in good condition £23,500
 Three Soundcraft 2400 28/24 with patch and VU meters, 4 years old £10,500
 Soundcraft 1600 24/824 mon with patch and stand, as new £6,500

USED MACHINES

3M 32/4/2 digital machine, complete with editor £45,000
 3M M79 24 track with autolocate £9,000
 Studer A80 Mk2 narrow body, no autolocate £14,900
 Trident TSR 24 track recorder, 3 years old £9,500
 Otari MTR 90 Mk1 autolocate, 4 years old in good condition £14,900
 Lyrec 24 track recorder with autolocate, no meter bridge £12,500
 Studer A800 Mk 2/3, 2 years old, in good order £27,500
 2 Ampex ATR 102 stereo machines £7,500

Lexicon 200 DIG reverb £1,950
 24 Dolby SP series, in rack, unused £9,500
 Publison DHM89B2 with 5 seconds £2,950
 Quantec QRS standard (new product) £6,500
 Lexicon 224X with 4.4 and remote £4,995
 Eventide 949 harmonizers, the pair £2,400
 JBL 4430 monitors, 1 year old £1,900
 UREI 813B monitors, six months old £2,500
 Yamaha NS 1000M monitors £600
 Tannoy Little Reds, new £720
 Dolby 360 units, 14 in stock, each £395
 Dolby 301 stereo units, 11 in stock, each £395
 Midiverb, new, two units left, each £365
 We stock new: Revox tape machines, Drawmer effects, Soundcraft, Bokse
 effects, Lexicon, Publison, Quad, Yamaha, Tannoy, Studer, A.M.S. effects,
 AKG, Sennheisser, Beyer, Shure, Neumann.

NOTICE

We also act for studios as selling agents, let us handle the hassle of getting rid of unwanted items, it does not matter where you are in the world, why not drop us a line listing your equipment or ring us on the numbers below for the best rates. We assure you of our best attention and service plus the utmost confidentiality at all times.

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DIARY DIARY

People, events, services

Agfa international forum

During the Photokina exhibition in Cologne, Agfa-Gevaert launched an international forum of over 100 people from the audio and video industries with the aims of fostering international dialogue between experts in the sphere of professional magnetic recording. Special

events and a magazine entitled *Tape 1* are planned. Additionally there will be a Forum award made every two years for technical and creative work which will also have a cash prize. Details of entry for this award will be made available in the near future.

In brief

The Canadian Broadcasting Corporation used an **AMS AudioFile** as the primary audio component in their live production of the Juno Music Awards. It was used to trigger live music stings as the awards were in different categories and up to 70 mono cues were loaded with duration from 20 seconds to

several minutes. . . The **UK Performing Right Society** has awarded the John Lennon Memorial Scholarship for this year to Nicola Lipp. This scholarship supports a year's postgraduate study incorporating recording techniques at the University of Surrey Music Dept.

Prestel link with Telecom Gold

Earlier last month an X29-based link enabled Prestel users to access Telecom Gold. This is the first stage in establishing full interconnection which will eventually include the transfer of messages across both networks.

Prestel users will still only

pay the equivalent of a local telephone call when accessing Telecom Gold (plus the usual service costs). Customers wishing to access Telecom Gold will be routed from Prestel's messaging database (Prestel page *777 #). For further information contact Mike Abbot, Prestel on 01-822 1056.

IBS forthcoming events

The Institute of Broadcast Sound has announced a programme of meetings for 1987 which include *Nicam 728*; Sony R-DAT; Optimod; *AudioFile In Use*; MIDI; Ray Dolby on *Spectral Recording*; Light Entertainment Forum; Madame Tussaud's New

Digital System at Chessington; BBC Mobile Truck; joint meeting with Directors Guild of Great Britain; and a residential seminar — Stereo Sound for TV. Details from Elaine Thorpe, 6 Greenfields, Maidenhead, Berks SL6 1BA, UK. Tel: 0628 74355.

- Sue Pedley has been appointed to the board of Millbank Electronics Group Ltd as manufacturing director. She was previously manufacturing services manager.

- Apogee Sound Inc has announced the appointment of Jim Sides as production manager. He was previously with McCune Sound and Audio/Visual Headquarters. Also Joe Manning has been appointed vice-president of sales. He was previously regional manager for Hoover Audio Visual.

- Rick Dzdzera has been appointed technical director at Silk Sound. He was formerly deputy chief engineer at LBC.

- Raper & Wayman has appointed Chris Collings as system sales manager for the Audio Kinetics *Pacer* and Fostex synchronisers. Collings will also be responsible for all A/V and recording studio systems alongside Jon Raper and Rodney Wayman. Collings was previously sales manager for Fostex products and export manager for Seck mixer products at Bandive.

- Neotek has announced the appointment of David Ruttenburg as sales manager. Ruttenburg is a recent graduate of the University of Miami School of Music Engineering Technology.

- The Pro Audio Group of Bruel & Kjaer has recently appointed Jim Rondinelli to support and expand B & K's

People

presence in the US. Rondinelli will be responsible for the development, distribution and promotion of the series *4000* mics in the USA.

- Mick Brophy has joined the Amek sales team. He will provide sales assistance and support to dealers and customers for the Amek and TAC range of studio and sound reinforcement consoles.

- Ann Mortimer has been appointed marketing executive to 3M's Professional Markets group. The PM group handles sales of Scotch video tape to TV stations, facilities and production companies.

- Soundtracs plc has announced the appointment of Fred Van Eijk to the position of European sales manager. His responsibilities will include customer liaison within the Netherlands, Belgium, France, West Germany, Denmark, Norway and Sweden. Van Eijk will be based in Maastricht and can be contacted on (043) 214054.

- Millbank Electronics has appointed Andrew Askew as quality manager.

- Robert B Bonney has been named as the new chairman of EECO Inc. Bonney along with Burgess Dempster, the former chairman who died in September, founded the Electronic Engineering Company of California (now EECO) in 1947.

- Fidelipac has announced two new promotions. Roger Thanhauser, who joined the company a year ago, has been made director of engineering and Fred Buehler is to become customer service manager.

- Graeme Perkins has joined Sarm Studios West as studio manager. Perkins was formerly manager of General Bookings and studio manager at Superbear Studios and Regents Park Studios.

- Gary Rotta has been appointed chief engineer at the newly renovated Photo Magnetic Studios on New York's East 44th Street.

- HM Electronics (HME) has recently increased its sales staff. J Michael Hughes has been appointed to the newly created position of director of marketing and will be responsible for co-ordinating all sales and marketing activities. Randy Opela, formerly with Switchcraft, will be responsible for all pro-audio products as national sales manager. Bill Otis has been appointed pro-audio product manager.

- Tony Crockett has recently joined Branch & Appleby as sales manager. In addition to looking after the film and tape heads side of the business Crockett will provide sales support for Magna-Tech film recorders, Optimix automation systems and the B&A

automated dialogue replacement computer.

- The Audio Arts Division of the Center for the Media Arts in New York has appointed Gene Perla as industry representative.

- John Wayte has joined Paul Farrah Sound as sales manager. Wayte was previously head of sound at Entec.

- Professional Audio has appointed Benjamin Allen, formerly associated with Hilton Sound and Eel Pie Recording, to head their sales team. Allen's main involvement will be with the new Trident *Di-An* console and the promotion of complete studio packages.

- William Orbit is now the sole owner of Guerilla Studios after a policy disagreement with Grant Gilbert, one of the original directors. Dick O'Dell, formerly of Y Records will manage Orbit's affairs and those of the studio.

- Marion (Tony) Antonio has been appointed materials manager at Altec Lansing. Antonio will be based in Oklahoma City and his responsibilities include purchasing, production control, shipping, quality control and customer service. Antonio previously worked for Gulton, General Electric and Hubbel.

- Jon Evans has joined Britannia Row to provide additional technical back up to the sales and hire departments. Previously Evans was with Trident and Turnkey.

Way ahead.

Anyone who's anyone in the world of recording knows about Branch and Appleby's sound heads. For performance and quality we're in a track of our own.

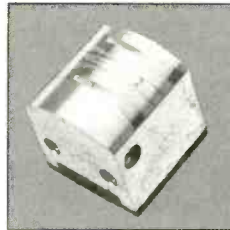
But what might surprise you is the range of other equipment we design, make and supply for the recording industry.

Systems for sound recording, recording control and console automation. Synchronisers, Timecode equipment and so on. For example the products featured here.

And we back all of this high level equipment with an equally high level of service and advice.

With a regular inspection, reprofile and relap service to keep your heads in optimum condition and fast head replacement should things go wrong during recording.

So call us about recording equipment and we'll get our heads together.



Skotel

A range of Full Broadcast Specification LTC and VITC readers and generators available as LED or High Quality, Versatile Video inserter options. The systems are based on powerful micro-processors for continuous reading verification and for the utmost system reliability and versatility.

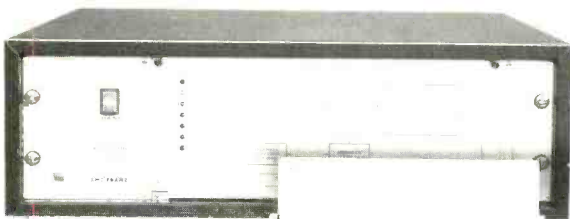
B&A

Researching into the future

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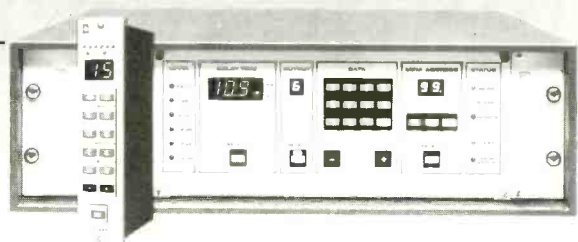
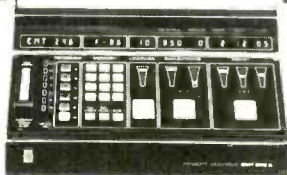


Studio Technology of world wide fame

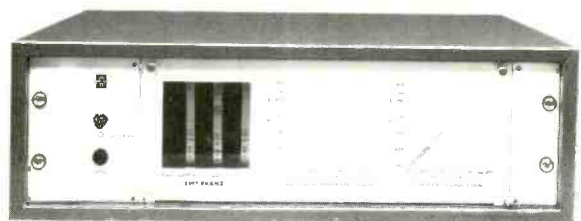


THE EMT 246 DIGITAL REVERBERATOR expands the boundaries: New reverberation programs with optimized eigentone distribution allow reverb times from 0.25 to 20 seconds. The

"sound" of the reverberation is freely adaptable due to the adjustments in bandwidth, pre-delay, level of early reflections, as well as frequency content of the reverberation. In spite of the abundance of parameters, operation of the unit is quite simple, even if things should become hectic. And, if need be, one of the 190 (!) program memories may be of assistance.



THE EMT 445 DIGITAL AUDIO DELAY UNIT combines separate entities: picture with sound, when transmitting via satellite and cable or in combination with video standards conversion or framestores; sound with sound, when transmitting via wire and air. The high-resolution delay will help you with these tasks. Even stereophonic signals may be delayed with absolute phase coherence: ideally suited for analog disk cutting.



THE EMT 266 X TRANSIENT LIMITER solves your worries: because (with adaptive pre-emphasis) you will never exceed the maximum frequency deviation for FM transmissions, but, moreover, are able to process maximum levels at the input of the limiter: because transients are limited in a click-free manner with digital recording or in tape duplication applications. It's all made possible by the principle of transient limiting.



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FEDERAL REPUBLIC OF GERMANY

DIARY DIARY

People, events, services

Contracts

- Audix Ltd has delivered the all digital Access talkback system to the BBC's television studios in Belfast. Developed in conjunction with the BBC, the system uses a single coaxial cable and will operate 45 stations between two main studios providing all the necessary interfaces (talkback, camera, outside source and studio floor), telephone control systems and logic mains controls.
- Exclusive Saje console distributor for Germany, Austria and Switzerland, BFE AG Mainz, has recently installed the first *ULN Mark II* console in Germany. The console, which was bought by Kangaroo Studio in Karlsruhe, features comp/lim and de-esser on all channels and NR in the eight aux send and headphones circuits.
- Audio Kinetics has recently supplied Audio International with *MasterMix* console automation. The system using AK's own VCA faders is fitted to a 48-channel Cadac console. Olympic Studios has taken delivery of its second *MasterMix* system which is fitted (using AK faders) to the 32-channel Trident console at the new Chelsea studios. Audio Kinetics has also installed the *Eclipse* audio editor at the ITN studios in London. Other installations include CFTO (two). Service Audio Mixon, Pierre-Daniel Rheault and Pathe Films in Canada and another system has been installed in Switzerland.
- Industrial Acoustics Co is constructing a studio complex for Hereward Radio in Peterborough. The contract calls for five structurally isolated studios contained within a curtain of IAC Noise-Lock acoustic panelwork and will contain two self operated studios, a commercial production studio, a voice booth and a talks studio. IAC has also won a keenly contested SSSVC contract to provide a new radio facility in Gibraltar.
- Harris Grant Associates has been appointed acoustic design consultant to Peter Gabriel Ltd for the construction of two recording studios, two control rooms and a sound stage complex at Real World

Studios, near Bath. Control Room One, claimed to be the largest purpose built control room in the world, will be designed as both a reference and recording room. Other projects include the recently completed remix room at Red Bus; preparatory work for a two-studio complex in Medecina, Italy; a third studio and control room for the Odyssey Group in London; additional consultancy work for Sarm West Studio/Control Room One and the Synclavier Programming Suite; and the studio suite at Foyer Audio's new complex at the Colosseum site in Leeds.

- Professional Audio has sold a Renkus-Heinz *Arena* system to new rental company DB Hire. DB Hire specialises in speaker and amplifier combinations and chose the system because of its compact size and high sound pressure level.
- Soundcraft has sold its first *TS12* in-line console to Windmill Lane Studios, Ireland. The console will be the centre piece of the recently opened Studio Three, Windmill's brand new computer music facility.
- Different Fur Recording is scheduled to become the first SSL studio in the San Francisco/Northern California area. The *SL 4056 E* series console with *Total Recall* was installed in December. Redesign of the studio and control room and the addition of a new machine room equipped with a Sony *3324* and Studer *A80* is also underway.
- Spectrum Studios in Portland Oregon are building a more extensive facility seven blocks west of their current location. The new facility will have 20,000 ft² of space and parking for 25 cars. The four-studio complex will include a spacious music studio with automated mixing and digital mastering, an audio sweetening-for-video facility with Foley, two broadcast production studios, music and sound scoring suite and a tape duplication room. Russ Berger of the Joiner-Rose Group in Dallas is designing the complex, Ingram & Associates are the architects and Johnson Acoustical Supply the general contractor.

Take the A train

Musicians in Scotland recently had the opportunity to visit Future World Recording Studios courtesy of a free train service. Running from Aberdeen via Dundee and Edinburgh the Glasgow-bound service provided potential clients with a day out and the chance to look over the new recording complex in Union Street.

Future World is on four floors and includes two 16-track and one 24-track

studio, a video studio (with makeup department), voice box, graphic studio, photographic studio, screen printing department and a café for musicians to meet and relax in. The staff of the voice box are professional teachers who cover dictation, interpretation and keyboard technique.

Future World Recording Studios, 54 Union Street, Glasgow, UK. Tel: 041-221 8965.

Literature received

- Mail order guitar spares company Part & Parcel has produced a new mini catalogue: *The Part & Parcel Leads, Adaptors and Plugs List*. This lists products from the UK, USA, Germany and Japan and claims to include virtually every guitar/amp/effects lead from 6 in upwards. Free copies available (include SAE) from Part & Parcel, 217 Wood Street, Kettering, Northants N16 9SD, UK.
- The new Belden European Catalogue is now available from Anixter UK. Claimed to be the world's largest supplier of Belden products the catalogue is available from all Anixter depots or direct from Anixter (UK) Ltd, 632/652 London Road, Isleworth, Middlesex TW7R 4EY. Tel: 01-568 1681.
- Crown (Amcron) has produced a new 24-page brochure which describes the company's range of *PZM* mics and accessories. In addition to product specifications the brochure also provides comprehensive *PZM* theory and applications notes. 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, UK. Tel: 01-960 2144.

- *Solve the Mystery of UFOs* is a 28-page booklet produced by BICC designed to explain the mysteries of fibre optics. The new guide which costs £1.50 is aimed at anyone in business or industry who wants to know more about fibre optic technology. Dept UFO, BICC Electronic Cables Ltd, Helsby, Warrington, WA6 0DJ, UK.
- West Hyde has recently produced a new 104-page catalogue illustrating its range of Internorm 19 in rack cases, Europak VME card frame along with various other plastic cases and accessories for electronic equipment. The new catalogue is available, free of charge, from West Hyde Developments Ltd, 9-10 Park Street, Industrial Estate, Aylesbury, Bucks HP20 1ET, UK. Tel: 0296 20441.
- A new 16-page catalogue of TMK test instruments has been published. Copies are available from Harris Electronics (London) Ltd, 138 Grays Inn Road, London WC1X 8AX, UK. Tel: 01-837 7937.

Address changes

- The Mitsubishi Pro-Audio Group has moved to larger premises in St Albans. The new site will provide 4,000 ft² of office and warehouse space and will contain a purpose built demonstration studio with Mitsubishi digital recorders and consoles. The Mitsubishi Pro-Audio Group, Unit 13, Alban Park, Hatfield Road, St Albans, Herts.
- Abbeydale Recording

Studios has moved from Wembley to new premises at Wesley House, 75 Wesley Avenue, Park Royal, London NW10 7DA. The new premises are larger offering more control area and better relaxation facilities.

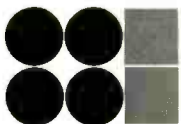
- Cerwin-Vega has moved to new corporate headquarters at 555 E Easy Street, Simi Valley, CA 93065, USA. Tel: (805) 584-9332. Telex: 662250. ▷

Leading Edge Sampling Technology?

The laboratory standard sampling equipment illustrated on the right will not give you 21 seconds of 20 KHz sampling on each stereo channel, full editing and triggering, plus delay, pitch transposition, sound shrinking and reverberation; all in stereo.

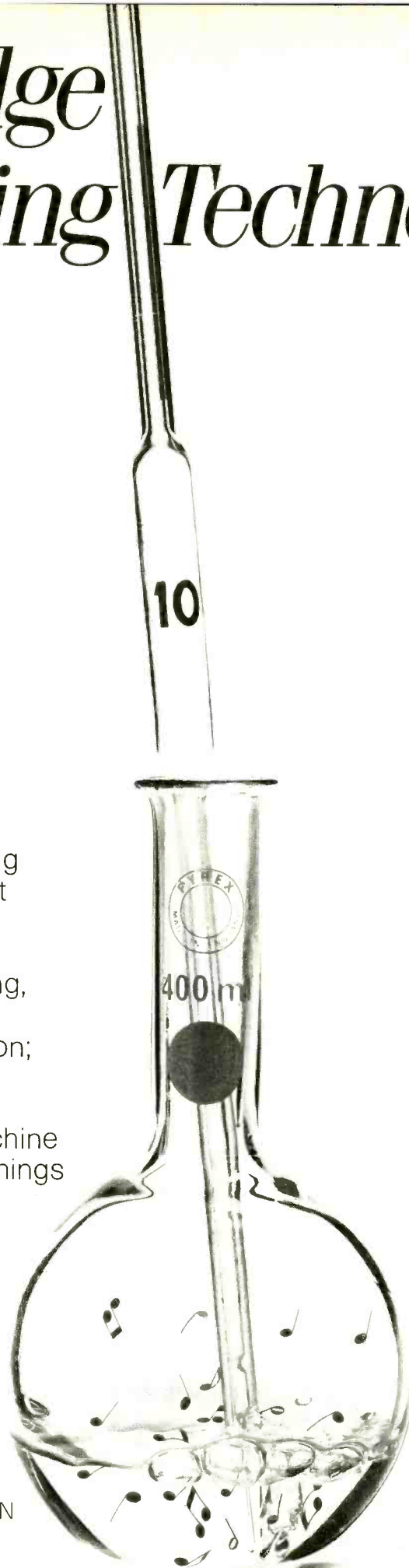
The Publison IM 90 Infernal Machine (*not illustrated*) will do all these things and more.

Distributed in the UK By:



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

Publison 18 Avenue de la Republique, 92170 Bagnole France



NO W WITH MULT I SA MP LI NG

DIARY DIARY

People, events, services

London Zoo was the unlikely setting for the second Digital Information Exchange. Given the jungle of recording formats we now have, cynics might argue that it was rather appropriate.

This mutual brain-picking session was spread over three days, each with its own theme. Day one centred on broadcasting and video, day two on studio recording and the last day looked at scientific research.

Day one

Richard Salter of Sony Broadcast kicked off by looking at the way audio and video disciplines are merging. Video, until quite recently, meant television broadcast technology. Audio engineers had little contact with video technology until the introduction of timecode automation. At a less technical level, television people have discovered hi-fi sound and stereo and record companies make pop videos routinely.

Richard Salter says we are at the beginning of what might be a complete merging of audio and video into binary numbers and high speed processing. "Whatever the eventual outcome, each of us will either take the stance of an ostrich, or have a sizeable period of learning to go through. As the technologies have been along different paths in the past, each should benefit from the experiences of the other: try suggesting razor blade editing to a video engineer. Likewise, we can all sympathise with the video people contemplating digital formats."

Stuart Nevison of AMS explained and demonstrated the *AudioFile* hard disk recording system. Then Robert Edwards, sound director with Television South, gave a user's perspective. He described how his company used *AudioFile* as a kind of glorified cart machine for playing spot effects into a hi-tech children's game show that goes out live on the ITV network (Britain's main commercial TV channel).

The programme, called *Catchphrase*, has an audio event roughly once every five seconds. With cart machines, the number of effects is such that three cart machine

Digital Information Exchange

operators would be needed. Any one of four spot effects may be needed, two of which are fired by the producer and one by a game controller, the fourth by a gram op. There is also a constantly changing set of *Catchphrase* animation tunes available from a library, plus all the usual TV programme stings.

Day two

Taking the opportunity to debunk rumours to the contrary, Ian Jones, managing director of HHB Hire & Sales, said the Sony *PCM-F1* and *701ES* would continue to be manufactured for the foreseeable future.

Nick Hopewell-Smith, a consultant, looked at CD in the UK retail market. In spite of shortages and price increases, the growth in CD sales continues to accelerate.

In 1983, around 300,000 discs were delivered to the trade. In 1984 some 800,000 were sold. In 1985 the figure was 3.1 million. The BPI is revising its projections for 1986 upwards to 7 million.

In 1984 the average number of discs sold per player peaked at 26. In 1985 the figure dropped to 20, and now it is estimated at 17½. This is attributed to the recent introduction of cheaper hardware, whose owners are less willing than the early owners of expensive players to pay current retail prices for discs. Borrowing from public libraries is on the increase.

Nick Hopewell-Smith argued that prices will have to come down if CD is to become the dominant medium in the future. Hardware prices in the UK have already dropped from £500 for a player to £140.

Although there is the beginning of price competition between record retailers, record companies have little incentive to cut wholesale prices while demand exceeds worldwide pressing capacity.

The existing prices for CDs could be justified to the consumer if more tracks were added, up to 70 minutes instead of around 40, and if the sound quality were outstanding.

David Smith, senior project engineer with Editel in New

York, reported on the progress of digital audio in the USA. He said that 18.5 million CDs were sold in the US in 1986, an increase of 350% over 1985.

The early days of CD in America were marked by the rise of small, entrepreneurial labels such as GRP, DNP and Telarc, with sales in the order of 1 to 4 million discs.

Typically these companies started with Sony *F1* or *1610/1630* hardware and two to four mics. An example of the kind of product was *In The Digital Mood* by the Glen Miller orchestra, recorded 'live' to 2-track digital.

Some companies are seriously considering abandoning vinyl because sales are falling so quickly. Lots of CD manufacturing capacity is scheduled to come on line in 1987. The new year will also see the arrival of CD-I and CD-ROM.

As far as digital multitrack recording in the United States is concerned, Sony *PCM-3324* is the de facto standard, accounting for 80 to 90% of the machines in use. *PD* is making a little progress: one problem is that the Otari *PD* machine has switchable pre-emphasis but the Mitsubishi machine doesn't. Pre-emphasised tapes recorded on an Otari won't play properly on a Mitsubishi.

In the film post-production field, Burbank and Glen Glenn are now using digital multitrack instead of sprocketed magfilm.

David Smith summarised the American industry's reaction to Dolby *SR* thus: "Gee, I don't have to buy a digital multitrack."

Sales of digital multitracks are being held back by both the format war and Dolby *SR*. Some individuals are still criticising what they hear as the cold, abrasive sound of digital. Editel has tried installing 4x over-sampling chips from CD player D/A converters in their *3324* machines. This modification is going to be marketed in the UK through HHB.

David Smith was also enthusiastic about 2-channel DASH: "We would very much like to see the DASH 2-track standard become more popular in the United States."

Alan Parsons said studios are charging "ludicrously low rates", which cannot justify the capital expenditure needed to equip for digital recording. Record companies don't understand why it costs twice as much. Video facilities get away with charging record companies high rates because video looks hi-tech. Record companies do not see digital audio in the same way.

48-track analogue recording is common but 48-digital is rarely offered. 32 tracks are often not enough but few desks could make use of 64.

Alan Parsons then commented on analogue with Dolby *SR* as an alternative to digital multitrack. He views *SR* as a very good noise reduction system but little more; even with *SR*, analogue tape still clips transients and drums lack punch.

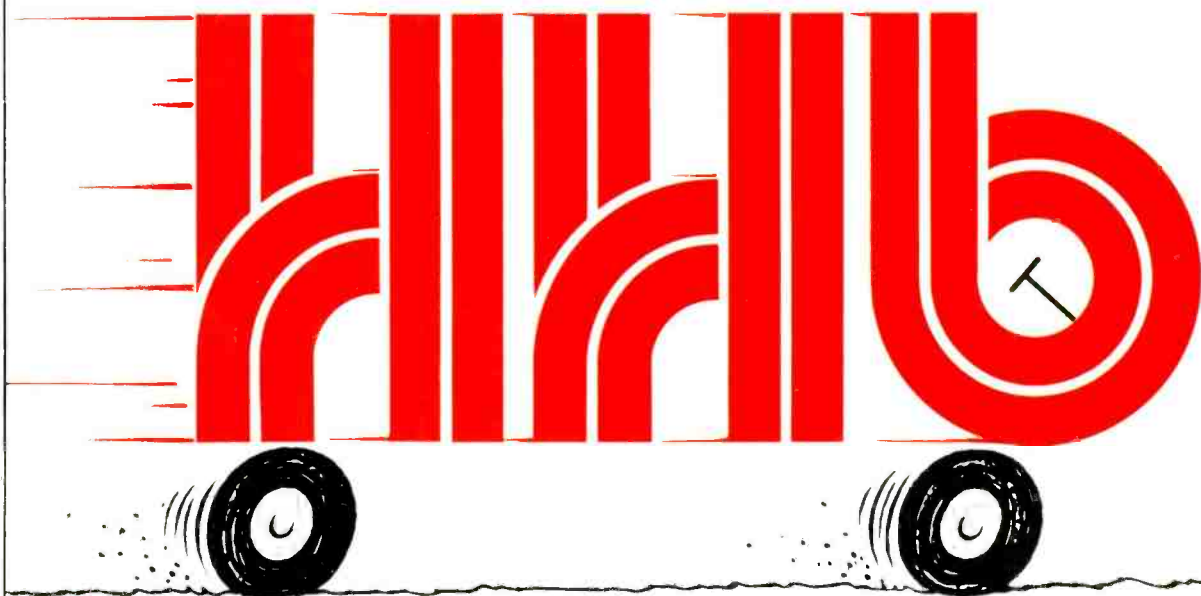
Also, digital tape doesn't suffer when played hundreds of times. The error correction will be working harder but this is not noticeable. Good drop-ins and drop-outs are possible with digital. With analogue tape, achieving good consistent drop-outs is still difficult.

With digital recording, two machines are needed, says Alan Parsons. He is not keen on razor blade editing and points out that video editors got rid of it as fast as they could. With electronic editing, the original can be preserved. It is possible to preview without recording, and inaccuracies can be trimmed.

A second machine is also useful to manipulate sound in sections and shift it in time, for example if one chorus is needed several times. The same technique of digital lifting and dumping also facilitates the formatting of different versions of the same work, eg 12 in disco mix, etc.

On a more mundane level, digital machines tend to be heavier than their analogue counterparts. Alan Parsons Productions is building loading ramps to ease the delivery and collection of machines.

One big advantage of digital is the reduced line-up time. A 48-track Dolby analogue line-up may involve up to 624 different tweaks, taking two hours. With digital, the only day-to-day tweaks are level in and level out. In practice even



We're on the move

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suite, as well as far greater levels of comfort for staff and visitors alike.

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So to make sure you don't lose us and we don't lose you, please make a note of

our new address and telephone number.

Here's to the next ten. . . .

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DIARY DIARY

People, events, services

these can be left alone for weeks. At Alan Parsons Productions, they just switch on and go, with maybe a tone check—just 1 kHz across all tracks.

As far as sampling rates are concerned, 48 kHz is a must for the Neve DSP. Alan Parsons uses 44.1 kHz, for direct transfers to 1610/1630. No pre-emphasis is used, because in common with others they have found they can get more loudness on a CD without it.

Mixes on digital tape can be modified after they have been done, by adding a bit of the wanted instrument during a dub; there is no generation loss. An instrument can be boosted or attenuated by adding a little of its channel either in phase or in antiphase.

Alan Parsons is clearly a digital convert: "I'm utterly convinced that digital is the way to go. It's no accident that CD hardware is selling the way it is. Everybody's a hi-fi buff these days."

He also commented that digital recording is more than a near-perfect storage medium. "Digital... has the potential to become a creative part of the recording process."

Ian Silvester, technical manager with hire company Audio FX, gave some practical tips on making digital work effectively. This consisted of comments on error correction and how to minimise errors. He suggested line-up and routine maintenance and cleaning procedures.

He also suggested that 3324 tape box labels should include the following information: when and where the recording was made, what machine, tone levels, pre-emphasis on/off, sampling frequency.

No test tape is available for the 3324 but studios could improvise one of their own. This should include a section of very clear music to check for distortion, plus pink noise from the machine's internal generator to check the error correction.

Phil Wilton, a senior product engineer with Sony Broadcast, presented a paper on the latest developments in 2-channel DASH. The tape speed depends on the number of audio channels. Two-channel DASH runs at 7½ in/s ('slow

Digital Information Exchange

DASH') but this was too slow for accurate editing of music.

The DASH family of standards also provides for 2-channel recordings to be made at 15 in/s; instead of each channel being carried on four digital tracks, the higher speed allows it to be carried on two. The two that are left are used to make a second recording of the same information but displaced along the tape by 204 data blocks ('medium' or 'twin' DASH). Apart from doubling the redundancy, razor blade edits can only obliterate data in one place at a time.

A new development is double density DASH. This puts additional digital tracks in between the original ones; now twin DASH can operate at 7½ in/s as well as 15.

Doug Dickey of SSL gave a talk entitled 'Towards the all-digital studio'. He started by injecting the word 'practical', in response to some of the looper ideas in circulation. To produce a practical digital studio, designers need to consider reliability, efficiency, maintainability, audio quality, ease of use, creative advantage, initial capital costs, operating expenses, longevity of service and interface efficiency: "These are the real issues on which the health of the recording studio industry depends... regardless of the specific technology."

He made one revelation about his company's DSP development work so far: SSL has had a 24 bit audio processing computer working for a year.

Because of the complexity of digital consoles and the shortage of designers who understood pro-audio and supercomputers, design cycles could be so lengthy that consoles would be obsolete before they left the factory. "We realised from the very early design stages that what was needed was not a new digital console design that would be obsolete by the time it was built but a completely new way of designing digital consoles that would eliminate those problems. We wanted to shorten the design cycle but more than that, we wanted to design consoles in a totally hardware-independent fashion.

And most of all we wanted tools that would allow our most experienced analogue console engineers to design digital consoles. We weren't going to throw that expertise away, that's stupid.

"My confidence in the future of the practical all-digital studio stems from our completion of these tools. They're done and they work brilliantly."

This work is described in three technical papers presented at the 1986 Los Angeles AES Convention.

"Working at a CAD terminal, the analogue console design engineer specifies the system by drawing a largely traditional schematic on the screen. The schematics are built from a library of familiar pictorial representations, each of which may represent, for example, an equaliser or a delay unit."

The system eventually converts models of such operations into a pair of programs—one for the audio computers and one for the control computer. The control programs are written in a high level language, namely 'C', which is not made machine-specific until it is finally compiled.

As new hardware is designed, the CAD software can be extended to handle it; there is no need to write a completely new package. Thus the console can have its hardware updated without any new work by the console designer; different designs and generations of processor board can also work side by side in the same console.

"Our ability to do this automatically means we will be able to substantially upgrade SSL digital studios systems in the field with almost no design overhead.

"SSL digital studio systems will thus be defined solely by two large chunks of software and a control surface layout.

"All stages of the design cycle are significantly shortened by this method. Among other advantages, it is not necessary to know all the details of the actual processor or the actual control panel before completing the design. This has enabled us to look at parallel development

programmes: one area looking at storage, one area looking at converters, another controls and displays, another the sound processors, and yet another overall systems design. All of which is completely different from the normal serial design process where one phase needs to be completed before the next phase proceeds."

Another by-product is that the system documentation is written before the system is even built.

Most importantly, Doug Dickey expects software-defined digital consoles to be reasonably cheap. "Unlike their analogue counterparts, they will become steadily less expensive to manufacture. In another 10 years, VLSI implementations may well bring about parity between fully digital consoles and standard analogue consoles."

Michael Gray, the CD technical co-ordinator at EMI Music, described the processes involved in producing compact discs. This starts, in the case of back catalogue, with a search through all available tapes for the best version. The tapes are assessed and a decision made whether to transfer straight, remix or digitally remaster. At the other end of the process, the job involves analysing returns to detect quality control problems.

Day three

The third day was aimed at research scientists with an interest in digital audio. Dr John Holmes, speech technology consultant at the UK Government's Alvey Directorate, outlined the work of the Alvey Project on voice recognition and speech synthesis.

Jean-Paul Lefevre, managing director of the French company Oros, described his company's machinery for interfacing EIAJ format digital recorders with computers, and converting the sampling rate to 5 kHz; and Dr Nick Taylor of AMS gave a more technical description of *AudioFile's* inside.

The afternoon sessions on the third day consisted of a look at the future of CD, including interactive CD-I and CD-ROM. □

Low-cost digital audio comes of age.

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

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

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

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

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THE SONY PCMF1 AND PCM701ES DIGITAL AUDIO PROCESSORS.

DIARY DIARY

People, events, services

Contracts

● Alpha Audio Automation Systems has supplied the first Lynx compatible *BOSS* system to Digital Magnetics of Hollywood.

● Soundcraft has announced the following recent sales: a 40-channel series 8000 console to Oceania Audio, a leading PA hire company in New Zealand; *Saturn* multitracks to Westlake Audio LA, Solar Audio in Nova Scotia, Black Barn Studios in Surrey UK, Easy Street in London, George Klaus's studio in Montreal, and Studio Emme in Florence, Italy; a 24-channel *TS24* for the audio sweetening studio of Sound Craft Inc Tokyo; a *TS24* to Mineo Ichinohashi Studio Inc Tokyo for VPP use; and two series 200B consoles fitted with P&G faders for CD mastering rooms at Canyon Record Inc Tokyo.

● DDA has received orders for *AMR24* consoles from Blue Max Productions of Hong Kong for a 28/24/2; a 36/24/2

for the School of Music and a 28/24/2 for DIG Studio in Tokyo; a 40-input console with 64 channels of *MasterMix* (also on monitor section) for STK Studiotechnik Klever West Germany; and for Beethoven Street Studios London for a 28/24/2 via Turnkey.

● Amek has announced recent sales including a customised audio console for a new post-production suite at Viewplan Facilities Stockport UK video centre; a second *BCII* to Granada TV; and a 32-input Angela with *MasterMix* fader automation for Joan Armatrading.

● Alice (Stancoil Ltd) has been awarded a major contract to re-equip the radio facilities of the BBC's New York office which is the hub of their North American operation. This will consist of three presentation studios and a central apparatus room including audio switching facilities.

Address changes

● Live sound equipment manufacturer Martin Audio Ltd has moved to larger premises at Cressex Industrial Estate, 19 Lincoln Road, High Wycombe, Bucks HP12 3RD, UK. Tel: (0494) 35312. Telex: 8338048.

● From January 1st, DDA has been operating from a new factory/office unit. Their address is Unit 1, Inwood Business Park, Whitton Road, Hounslow, Middlesex TW3 2EB. Tel: 01-570 7161. Fax: 01-577 3677. Telex: 932905 LARCH Attn DDA 322.

● Audilec Distribution Ltd, UK supplier of sound reinforcement equipment, has

moved its base and their new address is 6 Hornsby Square, Southfield Industrial Park, Laindon, Essex SS15 6SD. Tel: (0268) 419198/9.

● The London School of Audio Engineering has moved to 2nd Level, St Marks Building, 16 Chillingworth Road, London N7 8QJ. Tel: 01-609 2653.

● Eltron (Pty) Ltd, South African pro-audio distributor has moved to custom built premises. Their new address is 2 Susman Avenue, Blairgowrie, Randburg, 2194. Postal Address is PO Box 44598 Linden, Johannesburg 2104. Tel: (011) 787 0355. Telex: 430719 SA.

New secretary for the APRS

The new secretary general of the APRS is to be Philip Vaughan, currently director of client services at Robert Booth Advertising, Reading and formerly with Ampex for a total of 15 years. He succeeds

Edward Masek who is retiring as APRS secretary. Mr Masek will however be maintaining close links with the APRS as its treasurer and as organiser of the 1987 APRS show.

CLEAR REASON

For the music studio owner, no decision is more critical than choosing a console. Both financially and creatively, the success of your operation may well depend on the capabilities and quality of the system you select, and the company that supports it. Clear reason, we suggest, to consider the SL 4000 E Series Master Studio System from Solid State Logic. But certainly not the only reason.



plus switchable phantom power, patchfree audio subgrouping, AFL and PFL monitoring, fader start for external devices,

Consider, for instance, that only SSL has built-in track remotes on every channel, integrated with the industry's most versatile monitor fader and foldback facilities. Or that SSL alone provides pushbutton signal processor routing for each channel's noise gate and expander, compressor/limiter, high and low pass filters, and parametric equaliser —

and stereo modules with balance and Image Width controls.

Consider that SSL makes the industry's only comprehensive studio control system — with integral synchronisation of up to five audio/video machines,



concise English commands, tape location by timecode, foot/frames, cue numbers or key words, and complete session list management. And that SSL alone offers extensive fader, group and mute automation and mix manipulation plus optional programmable parametric equalisation and panning, multi-repeatable Events Control, and Automatic Dialogue Replacement.

DIARY DIARY

People, events, services

Agencies

- SSL has announced that EMT-Franz GmbH will be its sole representative in West Germany.
- Audio Technica Ltd UK importer of Audio Technica products has appointed Clyde Electronics Ltd as main distributor to professional users within the UK.
- Rifa Electronics of Stockholm, part of the Ericsson Group, has been

appointed distributor for Bulgul products in Sweden.

- UK dealers Future Film Developments and Audio Systems Components Ltd have both been appointed Sony Broadcast pro-audio dealers. Both can supply the entire Sony analogue product range.
- Paul Farrah Sound has been appointed sole UK distributor for the Anchor range of self-powered monitors.

AES 5th International Conference

Advance information has been released on a 5th AES International Conference entitled Music & Digital Technology. Dates were not finalised at publication time but it is scheduled for three days in early May in Los Angeles. Conference chairman will be John Strawn who has informed us that the papers will run from Friday to

Sunday morning. Included in the planned events is a banquet with principle speaker John Chowning, and a full concert for MIDI and non standard I/O devices. At the time of writing confirmed participants in the conference include Wendy Carlos, Bob Moog, J L Cooper, Evan Brooks (DigiDesign), Craig Anderton and Curtis Roades.

Westlake European marketing

There has recently been some confusion over the marketing of Westlake Audio products in Europe. For two years now Britannia Row has been the European distributor of Westlake monitors and products are available to end

users in the UK from them or from the principal UK dealer Stirling Audio.

Full details of European dealers outside the UK are available through Britannia Row in London. Tel: 01-226 3377. Telex: 268279.

Software update

- Audio Kinetics has introduced a powerful new extension to the *Eclipse*—the *Eclipse Off-Line* option which consists of program disk, 'intelligent' cable and operational document. Using an IBM PC (or compatible) with the AK-IBM RS232 interface provides the following facilities and a number of new options.

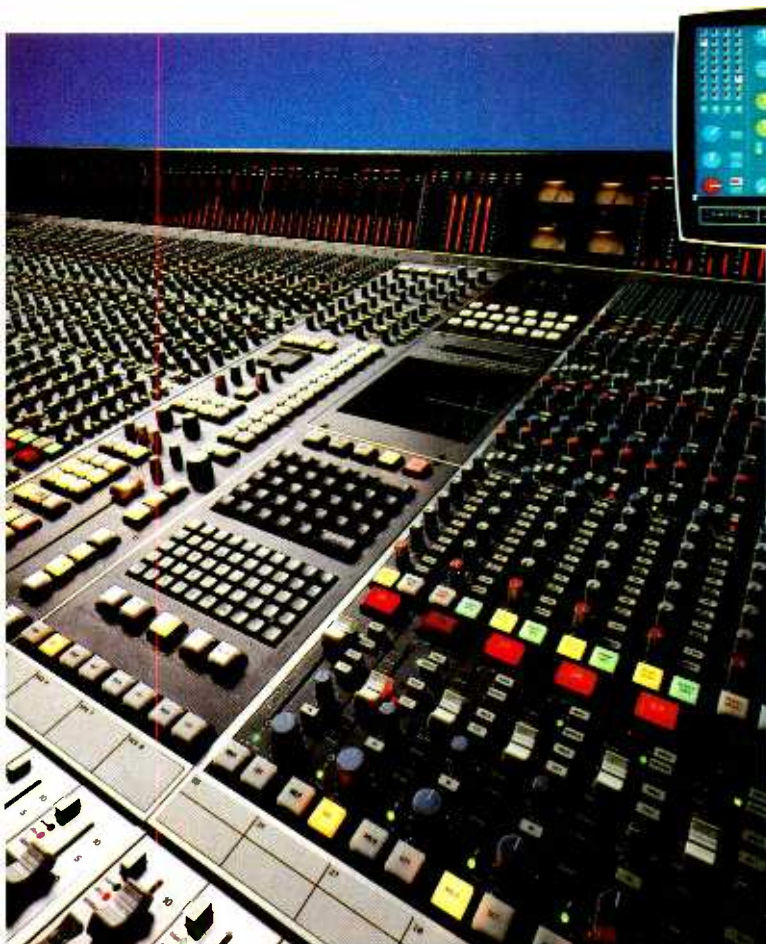
Off-Line Preparation: this facility enables 100 new loops to be loaded or existing loops to be edited to disk before entering the Edit Suite also

Events and Q.Keys can be pre-programmed.

On-Line Down-Load: end of session down load to disk of all generated loops and events allowing rapid recall at any subsequent session thereby minimising On-Line time.

Q.Key Storage: storage facility for personal Q.Key data.

Hard Copy: printing option (IBM compatible printer) for Loop information. Provides Edit Decision list, Events and Q.Key data.



Then consider that SSL's Studio Computer alone goes beyond mixing automation to provide Total Recall™ — a unique system, completely independent of the audio path, which stores all I/O module settings after each session. The new TR AutoScan function makes

it faster than ever to recreate headphone and monitor mixes, equalisation, or entire console setups with quarter dB accuracy and rapid verification. And SSL alone offers data-compatibility with more than 300 installations — in over 80 cities around the world.

Finally, consider a company whose record of practical innovation, ongoing development and in-depth technical support has earned repeat orders from many of the world's toughest customers — a company that other manufacturers use as a standard for comparison. We join them in urging you to compare. Our 40 page colour brochure on the SL 4000 E Series is a good place to start. It's yours for the asking, and it just might make your difficult decision a whole lot easier. Clear reason, may we suggest, to write or call us today.

Solid State Logic

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NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

Revox new products

Revox has introduced two new products with professional applications. The first is the *B242* power amplifier which provides a minimum of 200 WRMS/channel (400 W in bridged mono) with a THD of 0.005%. The rear panel includes an impedance matching switch (4 or 8 Ω). Outputs are *XLR*-type; inputs are RCA phonos.

Other features include independent power supplies, output meters and electronic short circuit protection.

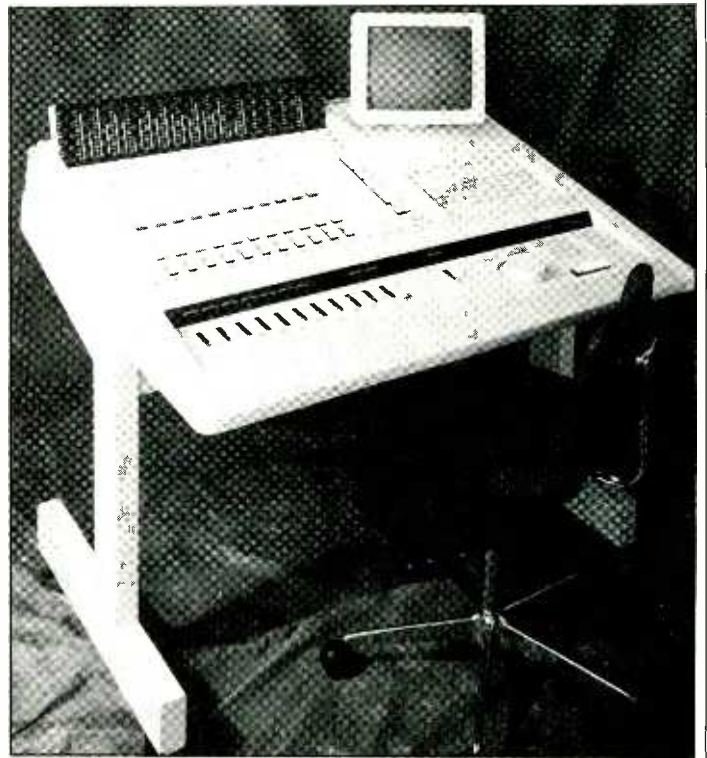
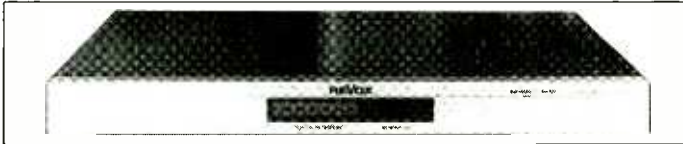
For use with almost any personal computer, the Revox *B203-1* is designed to provide an inexpensive solution to audio source automation. The *B203-1* is designed to control

up to eight Studer Revox units including any combination of *PR99* or *B77* open reel machines, *B215* or *A710* cassette decks and *B225* or *A725* CD players. In effect the *B203-1* provides an intelligent link between the Studer Revox bi-bus system and a conventional RS232 port.

Studer International AG, Althardstrasse 150, CH-8105, Regensdorf, Switzerland. Tel: 01-840 2960.

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

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



dbx RTA

dbx is developing a real time analyser that allows a musical signal to be used to analyse frequency response. The unit, a $\frac{1}{3}$ -octave, 31-band device, can be used with its in-built CRT or connected to an external colour monitor (IBM/EGA standard). PC interfacing is via multiple RS232 ports and a parallel port (with screen dump capability) is provided for connection to a printer. The unit can create a frequency response curve based on a musical input rather than with just pink noise.

In addition to providing accurate conventional frequency response measurements the new system will allow storage and manipulation of multiple measurement results.

Automated measurements are also possible via an external computer.

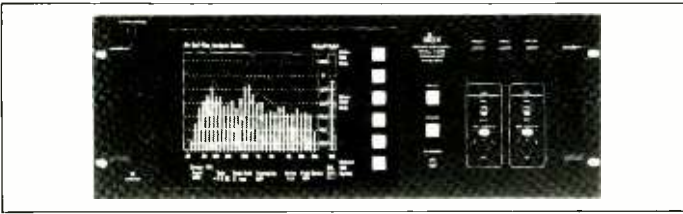
Future applications envisaged by dbx include

frequency response adjustments of auditorium, stadium or concert hall sound reinforcement systems based on readings made during the concert thus eliminating the trial and error process currently used for sound system set-ups. On the broadcast side transmitter and studio frequency response checks will be possible while the station is on the air and broadcasting. The new technology is also expected to have applications in architectural acoustics, sound and vibration analysis and noise control.

Various software packages are being considered and the final system is expected to be available towards the end of 1987.

dbx, Professional Products Division, 71 Chapel Street, Newton, MA 02195, USA. Tel: (617) 964-3210.

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



Lexicon Opus

Lexicon launched part of the results of their RD1 long term research & development programme, the *Opus*, at the SMPTE and the Los Angeles AES conventions. The *Opus* is an integrated random access digital audio production system that marries a hard disk recording system with full editing capability and a mixing facility in the form of a single work station and its associated remote equipment racks and disk racks. Particular attention has been paid to the audio editing capabilities to make this process very simple to complete. Analogue reel rocking type editing is possible as it has the full abilities of a disk-based system including time slip, crossfades, ambiences loops, splits and predubs. The QWERTY and numerics keyboards are used for labelling functions and entering timecode values respectively rather than control functions. The screen displays menus and system information and also indents soft keys. The mixing section uses many dedicated functions—faders and panpots, etc, as Lexicon feels this is the approach required at the moment.

With the full complement of hard disks, *Opus* can provide up to eight track hours of random access memory with the ability to record or replay up to eight events simultaneously. There is also provision for write-once optical disc storage of downloaded audio. This operates in what is referred to as background mode—continuously backing up the hard disk information.

In the digital domain converters are 16 bit PCM with a total capacity of 28 inputs and outputs. Interfaces are currently Sony 1610/1630-compatible and others are to follow. Sampling rates are switchable 44.056, 44.1 and 48 kHz with all processing internally remaining in the digital domain.

At the conventions the editing aspects of the system were functional while other aspects were still awaiting completion. The first *Opus* systems are destined for delivery in the spring.
Lexicon Inc, 60 Turner Street, Waltham, MA 02154, USA. Tel: (617) 891-6790.
UK: FWO Bauch Ltd, 59 Theobald Street, Boreham Wood, Herts WD6 4RZ. Tel: 01-953 0091.



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NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

Denon DN-052ED PCM editing system

Denon/Nippon Columbia has recently announced the introduction of the *DN-052ED* hard disk digital editing system. The system provides real time electronic editing of digital or analogue 2- and 4-track masters. The standard system (8 disk drives) provides 94 min 2-channel recording and 47 min 4-channel. Up to 6 hr 2-channel recording can be provided with additional storage.

The *DN-052ED* comes complete with control console, VDU and 19 in processing and storage rack. The system transfers the digital or analogue master recording to hard disk (this way the originally recordings remain 'untouched') then digitally manipulating the information on the hard disk. Inputs and outputs are 16 bit, 2's complement code using a 64-slot parallel interface with switchable 44.056, 44.1 and 48 kHz sampling frequencies.

Up to 200 edits can be performed with the standard configuration and the crossfade duration is variable between 6 ms and 999 ms. The colour VDU display provides visual

confirmation of all edit point parameters. Individual presetting is possible at every crossfade point. Level is also digitally adjustable (-∞ to +6) in 0.2 dB steps. In addition to normal playback speed, ×2, ×½, ×¼ and ×⅛ playback is possible. Editing accuracy is quoted as up to one sample of the sampling frequency (ie 22 μs at 44.1 kHz sampling).

Benefits of the system include extremely fast access, accurate and non-destruct splicing, rehearse procedures and also the ability to use the system as a stereo recorder or for 4- to 2-channel digital mixdowns. This is in addition to replicating conventional editing techniques such as rocking the tape across the heads to find the edit point. **Nippon Columbia Co Ltd, 14-14, 4-Chome, Akasaka, Minato-Ku, Tokyo 107, Japan.**

Europe: Denon Electronic GmbH, Halskestrasse 32, 4030 Ratingen 1, West Germany. Tel: 02102 4985-0.

UK: Hayden Labs Ltd, Hayden House, Chiltern Hill, Chalfont St. Peter, Bucks SL9 9BS.

CMX CASS 1E

CMX has recently introduced a special edit-only version of the *CASS 1* Computer Aided Sound Sweetener. The unit allows simultaneous control of up to six audio tape machines or VTRs plus 14 general purpose interfaces. The *CASS 1E* is designed for users who may already have console automation but who want improved audio editing capabilities with their existing

console system.

The *CASS 1E* system provides hard disk and floppy disk storage in addition to a CMX compatible 8 in floppy option, and can be upgraded to a full *CASS 1* system.

CMX Corp, 2230 Martin Ave, Santa Clara, CA 95050, USA. Tel: (408) 988-2000.

UK: FWO Bauch Ltd, 59 Theobald Street, Boreham Wood, Herts WD6 4RZ.



Alesis Microverb

Alesis has developed a low cost 16 bit digital reverb to provide a choice of several reverb simulations in an easy to use package while meeting professional standards in terms of subjective effect and technical specification. Unlike the *MidiVerb*, the *Microverb* features variable input impedance and is designed to operate over a wide range of input levels (-10 to +20 dBV peak). Level and balance controls are provided enabling direct connection, rather than routing via the console.

The unit provides 13 conventional reverb settings ranging from small room, plate through to cavernous hall. There are also two gated effects and a reverse setting.

Specifications include a dry frequency response up to

20 kHz and a reverb response to 10 kHz (±2 dB, ±1 kHz). Distortion is claimed to be typically 1% and dynamic range 90 dB.

Controls include gain, mix ratio, output level and program with stereo inputs and outputs. A 3-colour indication system is used for level checks, orange indicating the unit is on, green showing the presence of a signal and red overload.

Connections are via ¼ in jacks and a rack mounting kit is also available if required.

Alesis, PO Box 3908, Los Angeles, CA 90078, USA. Tel: (213) 467-8000.

UK: Sound Technology Ltd, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR. Tel: 0462 675675.

Sennheiser M8 Professional mixer

The *M8 Professional* high quality portable mixer is made up of four modular sections plus chassis and each section (Input module, Master module, Powering module and Display module) is available in a variety of options. There is also an optional Intercom module. The standard version includes eight input modules (6-, 10- or 12-input versions are also available) with 104 mm P&G faders; input gain (fine and coarse); switchable low frequency roll-off; 3-band EQ; mute; PFL; pan; overload indicator (triggered from three different sections of the desk) and single Aux output with level control and pre- or post-EQ or post-fader switching. Options include non locking PFL button; PFL switch in fader; NC/NO fader remotes and preferred centre panpots and/or EQ.

The standard Master module features selectable +15 dB or +6 dBu outputs; L and R limiters (with stereo link); 1 kHz tone generator; 6-position monitor selector; Monitor/Line switching; channel inversion switch; phase and balance control. Options include 10 kHz tone, separate +6 dBu transformer balanced output and +6 dBu outputs for left and right

master channels (provided optional Intercom module is fitted).

The optional Intercom module includes built in mic; XLR connector; level control; pre-listen amplifier with loudspeaker; source selector; PFL headphone jack, -20 dB attenuator and Cue Aux/Cue Line/Talkback/Com Studio switching.

The Display module provides the basic input/output connections; a 25-way extension socket for cascading two units; extended scale peak level meters; 9-pin connector for external metering and 48 V phantom powering. Options include additional AB, 12 or 24 V powering, meter illumination and line input with fixed -20 dB pre-attenuation.

All mixers can be powered from the mains, external 12-24 VDC supply or 10 internal batteries.

Sennheiser Electronic KG, D-3002 Wedemark, West Germany. Tel: 05130/583-0.

UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9BS. Tel: 0753 888447.

USA: Sennheiser Electronic Corp (NY), 48 West 38th Street, New York, NY 10018. Tel: (212) 944-9440.

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NEW PRODUCTS

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Equipment, modifications, options, software

Yamaha DMP7 mixer

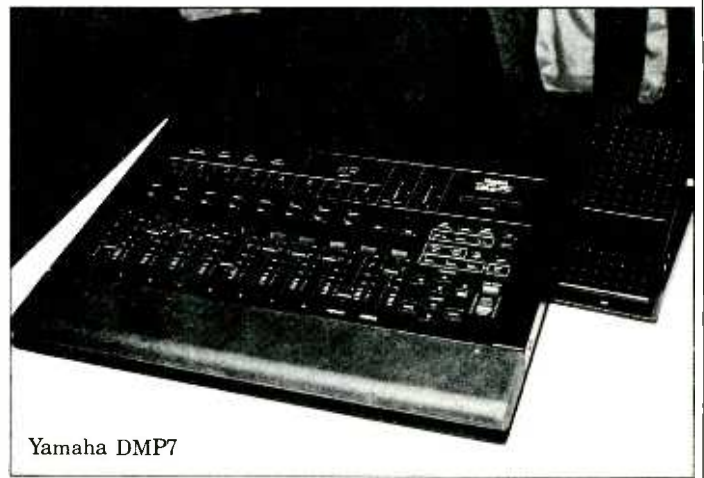
Yamaha has developed an all-digital automated mixing and sound effects unit. The new 8/2 mixer includes three internal effect loops with digital, programmable effects. Digital equalisation is provided on each channel and the 32 internal and 67 external memories can store all mix, EQ and effects parameters for instant recall or 'scene changes'. Up to four units can be cascaded to provide a total of 32 inputs. All interfaces are analogue.

Other features of the *DMP7* include motorised faders, MIDI control and internal digital stereo compressor. A 3-band EQ system is used with low (32 to 500 Hz), mid (250 Hz to 5.6 kHz) and high (2.2 to 16 kHz) settings. Range is ± 15 dB. Also variable is Q (0.1 to 5.0) and there is peak and shelf response selection.

Specifications include 16 bit

sampling, a S/N of 80 dB, frequency response of 20 Hz to 20 kHz, and a THD figure of 0.03% (1 kHz, +4 dB stereo out). Other features include 17-position panpot, MIDI (Program Change, Control Change and Note On/Off Event), Effects Send 1 and 2 (15 effects), Effects Send 3 (5 effects of send to external unit) and a motor driven stereo master fader. Effects on 1 and 2 include reverb, gate reverb, delay, echo, flange, phasing, etc.

An optional dedicated 8-channel mic and line amplifier (*MLA7*) is also available which converts the *DMP7* unbalanced, -10 dB levels to +4 dB balanced.
UK: Yamaha-Kemble Music (UK) Ltd, Mount Avenue, Bletchley, Milton Keynes, MK1 1JE. Tel: 0908 71771.
USA: Yamaha International Corp, PO Box 6600, Buena Park, CA 90620.



Yamaha DMP7

In brief

Ampex has introduced 30 and 75 min play length U-matic digital audio cassettes as part of the 467 range to complement the already available 60 min... **Alpha Audio Automation Systems** has announced that the *BOSS*

automated audio editor will now support Timeline's *Lynx VSI* synchroniser interfacing via the *Lynx VSI RS422* ports. The *BOSS* will already interface with the Adams-Smith 2600 and the CIPHER Digital 4700 *Shadow*

LETTERS

LETTERS

Letters should be marked 'For Publication' and sent to the Editor at the Croydon address on page 3

Call for correspondents

Dear Sir, I am a sound engineer working for one of Britain's biggest independent radio commercial production units at Metro Radio, Newcastle upon Tyne, Great Britain. I would welcome the opportunity to correspond with anyone working in a similar field anywhere else in the world. I would anticipate that such correspondence would be of mutual benefit and could include exchanging ideas, sound effects, commercial show reels, etc.

Yours faithfully, D Ian Britton, Metro Radio, Swalwell, Newcastle upon Tyne NE99 1BB, UK.

Syncing patent I

Dear Sir, I was rather amused reading the 'Syncing Patent' item in the Barry Fox Business column June issue.

In late 1960s Mr Hans Hilmer (at that time tape assistant, now sound engineer at Studio Hamburg) invented exactly the same syncing procedure at Berlin Ariola

Studio. He would sit behind his two 6-track machines with cans on, listening carefully to the more or less identical tracks on master and slave, managing speed equalisation manually. Not because it was cheaper this way: A linking system didn't exist then. Anyhow, the inventor of 'syncing patent' is logically Mr Hilmer, not Mr Kemp.

Yours faithfully, Christian Bruhn, Manager, Barbarosa Tonstudio, Postfach 710205, Imgardstrasse 11, 8000 München 71, West Germany.

Syncing patent II

Dear Sir, I was most interested to read the article headed 'Syncing Patent' in your June publication since the method outlined is precisely the one that BBC Radio studio manager Mike Robinson devised for our second series of Sight and Sound transmissions in the Autumn of 1977.

Due to an industrial dispute at the time the stereo sound had to be transmitted remote from the VT area in TV Centre. Mike suggested to me that he could

reproduce the stereo sound in sync with the pictures by having split feeds into a pair of headphones. With the TV mono sound in one channel and the A+B stereo in the other channel he had only to keep the sound image in the centre of his head to hold the stereo sound in synchronisation for the duration of each 60 min programme. On average we would have 25 to 30 seconds during the opening announcement for each programme to get our stereo sound in sync with the mono TV sound before switching it into the VHF/FM network. The stereo sound was reproduced from two tracks of a Studer A80 8-track machine which Mike controlled with a varispeed. We transmitted 26 programmes by using this method and although it was somewhat nerve wracking it proved to be totally successful.

Incidentally, we did explain this to Janet Angus when she interviewed us about radio/TV simulcasts a couple of years ago. As for gaining a patent for the idea I think it would stand as much chance as a patent for breathing by numbers!

Yours faithfully, Jeff Griffin, Producer, BBC Radio 1, Broadcasting House, London W1A 1AA, UK.



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MUSIC PAGE

MUSIC PAGE

Compiled by Mark Jenkins and Carl Snape

Steinberg Research

Steinberg Research is to release a new SMPTE generator which will be totally interactive with the newly revised *Pro-24* program. It connects to the Atari *ST* via the RS232 port. The generator will be available as a separate item and according to Steinberg this new development will set new standards in sequencing from timecode.

Other Atari releases include a music notation/scorewriter program and a visual editor for the Atari *S900* sampler which will include the facility to transfer data for use with the Sequential *2000* and *2002*.

On the Commodore front Steinberg has re-packaged hardware versions both of which now include sync-to-tape and graphic editing. The *Pro-16 Plus* will include a scorewriting program. Disk-based software additions include visual editors and sound librarians for the Roland *Alpha Juno I* and *II* and the Korg *DW8000*.

Steinberg's new Oxfordshire facility will provide dealers and end users with a support program designed to cater for the special needs of the software market. Part of this support is a computer line giving 24 hr access to an electronic bulletin board where users will be able to pass on advice, post queries and generally communicate with Steinberg and other users. The new premises also feature a special studio which will provide hands on training for sales staff and double as a demonstration facility. **Steinberg Research, Billwerder Neuer Deich 228, 2000 Hamburg 28, West Germany. Tel: 040 7898516/66.** UK: Steinberg Research, The Spendlove Centre, Charlbury, Oxford OX7 3PQ. Tel: 0608 811325. CAS

Canadian MIDI

The Canadian MIDI Users' Group (C-MUG) has announced the opening of a free MIDI dedicated bulletin board service (BBS). Operating under the name MIDILINE, this 300/1200 baud service offers Canadian MIDI users a communication link to other MIDI users across North America and overseas.

The MIDILINE BBS uses Fido comms software for fast up and downloading and enables access to the worldwide FidoNet network. This includes over 1100 individual FidoNet nodes among which are The American MIDI Users Group (AMUG) in Dallas, Texas, and MIDICOM in Montreal. The Canadian MIDI Users Group is currently accepting applications for Fido MIDI BBS in the Toronto area and hopes to establish nodes in every major city across Canada.

Initially MIDILINE {data tel: (613) 966-6823} will operate from 5pm till 9am during the week and 24 hours at weekends and holidays and will be free of charge to C-MUG members. In

addition C-MUG will continue to produce their monthly newsletter providing members without a computer and/or modem with a hard copy of what is going on in the MIDI community.

Eric Baragar, Sysop, Canadian MIDI Users Group, Box 1043, Belleville, Ontario, Canada K8N 5B6. Tel: (613) 962-0549/962-0603. CAS

The 13th Salon de Musique de Paris featured more new equipment launches than are usually associated with a show dedicated mainly to the public and distributors rather than to manufacturers. Most of these were from small French companies or from US companies not well represented in the UK, rather than from the major exhibitors such as Roland, Yamaha, Casio, Korg or Akai.

Musicland Distribution

MLD license the Kurzweil, Simmons, E-Mu, Photon and other high-tech lines for France. Not yet seen in the UK, the Kurzweil *Ensemble Grand* is a sampled piano with upright styling and additional organ, synthesiser, string and other sounds. A programmable sampled drum section has optional preset patterns and auto fills, and a real time sequencer based on that of the Kurzweil *250* with dynamic assignment of voices allows the soloist to simulate a trio or larger group with ease.

The Photon guitar has infra-red pickups for rapid string response and a standard MIDI output for connection to synthesisers and expanders. In obvious competition with the Roland and *Shadow* systems, it is a little more expensive than both. The instrument is manufactured in California; UK distribution has not yet been established. **Musicland Distribution, 66-68 Bd Beaumarchais, 75011 Paris, France. Tel: 0331 43 55 26 68.** UK: (Kurzweil) Syco Systems Ltd, 20 Conduit Street, London W2. Tel: 01-724 2451. USA: Kurzweil Inc, 411 Waverly Oaks Way, Waltham, MA 02154. MJ

Digigram MC5 sequencer

The Digigram *MC5* is a multitrack MIDI sequencer similar to the Roland *MSQ700*. Music can be programmed in real or step time from MIDI keyboards or in single notes or chords in step time using black and white buttons laid out as a miniature keyboard on the top panel.

All 16 MIDI channels can be recorded and sections of music can be edited and copied. A completed piece can be printed out by connecting an Epson-type printer

to a rear panel Centronics port—print speed is five or 10 times faster than that from similar home computer-based packages and print quality is very high. **Digigram, Chemin des Pres Zirst, 38240 Meylan, France. Tel: 0 33 76 90 38.** MJ

RSF SD140 drum machine

RSF's new sampling drum machine is the *SD140*, which follows the more conventional *DD14* and *DD30* models. The *SD140* holds up to 14 user sounds plus 14 built-in sounds, and has 10 outputs, MIDI, velocity response and Yamaha-like styling using touch membrane switches.

RSF Synthetiseurs, Usine D'Aston, 09310 Les Cabannes, France. Tel: 0 33 61 64 97 43. MJ

Syncom MIDI merger

UK company Syncom previewed their *MIDIMerge 4* through their French distributors. It is a 4-input MIDI combiner with information filtering abilities which allows several performances from a drum machine, keyboards, MIDI guitar, percussion pads and other devices to be recorded on to a single sequencer or computer MIDI channel simultaneously.

Syncom, Unit C, Hill Farm, Gt Dunham, Kings Lynn, Norfolk PE32 2LQ, UK. MJ

Enfer DX7 accessories

Enfer Diffusion has developed a range of accessories specifically for the Yamaha *DX7* synthesiser. The range includes ROM and RAM cartridges for new sounds and an internal memory expansion board featuring 128 memories and MIDI output channel selection.

Enfer Diffusion, 6 Rue Ernest-Cresson, 75014 Paris, France. Tel: 0 331 45 39 11 58. MJ

Solton instruments

Manufactured in Italy, the Solton range has been available for two years or so but is not imported into the UK.

The *Project 100* is a MIDI polyphonic synthesiser similar to the Roland *Juno 106* but featuring a joystick performance control. The *MDR 16* is a disk-based multitrack MIDI sequencer, and the *Programmer 24* is an accompaniment unit with PCM drum sounds, MIDI and many programmable features.

France: Solton, Fratelli Crosio, 7 Cite De L'Ameublement, 75011 Paris. Tel: 0 331 43 72 91 57. MJ

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CONSOLE DESIGN AND MIDI

Allen & Heath Brenell has been manufacturing a wide range of equipment for recording and live sound applications since 1970. It was one of the first manufacturers to produce comparatively low cost modular multitrack mixing consoles. In this article technical director Glenn Rogers outlines the AHB approach to mixing console design with particular reference to MIDI which the company has developed extensively in relation to mixing consoles

Mixing console facilities have increased and improved dramatically as tape recorder technology and electronic component technology has forged ahead. A wide range of tape machines exists with formats from 4-track on cassette to 16-track on ½ in, to 24-track on 2 in, to digital multitrack formats. Alongside the development of tape recorders and mixers, electronics technology was finding a home in musical instruments and effects. Parallel with this, revolutions were taking place in computer technology with the introduction of microprocessors and this was having a profound effect on all aspects of professional audio.

AHB's response as a manufacturer was the introduction of the *CMC* range of mixers in 1984.

These consoles are ultra compact multitrack mixers designed to complement the new tape machine introduced by Postex at that time, the *B16*. What made the *CMC* special was the inclusion of a microcomputer within the mixer.

The microcomputer provides control of the input channel to output group assignment and the muting of the channel and monitor circuits. This provides the customer with two main advantages: reduced console size;

memory and programmability of routing and muting functions.

By making the routing a digitally controlled function, the large bank of routing switches normally associated with a 16-bus mixer have been reduced to one switch which selects the channel output to go to the main stereo mix or the digital routing section. This, together with the use of dual concentric controls and effective control layout, enabled the production of very compact full 16-bus, 24- and 32-channel mixers.

The microcomputer inside the *CMC* has 32 memories split into two banks. Each memory contains a complete set of mixer parameters, ie routing and muting for each available channel. The computer has a user friendly keypad with clearly defined function keys and operating modes. The internal memories can be selected by the keypad or stepped through sequentially using a footswitch.

The *CMC*'s internal microcomputer provides a taster of the system's full capabilities. It has a computer interface connector which enables control of the mixer to be taken over by an external computer system.

At about the same time as the *CMC* range was introduced, the Musical Instrument Digital Interface, MIDI for short, was starting to appear on electronic keyboard instruments.

MIDI is an interface system that was

first proposed at an AES convention in 1981 by Sequential Circuits. The proposal was changed and improved by a consortium of keyboard manufacturers until the MIDI 1.0 standard was agreed on. MIDI hardware consists of an optically isolated current loop serial transmission system with a 31.25 kbaud rate. The serial word is 10 bits long with 8 data bits, the most significant of which determines whether the word is a control byte or data byte. Separate circuits are used for transmit and receive and a Thru socket is provided to re-transmit, enabling chaining of receiving MIDI devices.

The MIDI protocol has two message types, System Messages and Channel Messages.

System messages are ones which are received by all MIDI devices regardless of the channel number they are assigned and include real-time messages such as start/stop/clock, System Common messages such as song select/song position and System Exclusive messages.

Channel messages are ones which are received and then acted upon if the channel number corresponds to that of the receiving device. This message set includes note on-and-off program change/control change/mode/pressure/etc.

MIDI offered new and exciting ways of connecting and controlling synthesisers. It wasn't very long before sequencers for the system became available, and very quickly they proved to be far more versatile than anything previously offered to the customer. The MIDI revolution had arrived. The end users then began to realise there was still more potential in the system that hadn't yet been realised.

Manufacturers of drum machines, effects devices, acoustic instruments and even mixers and amplifiers were being asked to provide MIDI facilities. As the MIDI system was never intended for this diverse collection of equipment, many manufacturers were at a loss as to what to do with it. MIDI was quickly introduced on drum machines as they were basically electronic musical instruments and each drum sound was assigned a note code or range of note codes to enable them to be controlled using the MIDI note on-and-off message. The timing codes were also easily implemented.

Effects devices started to make use of MIDI to change their settings. By receiving the program change message, a new effect program could be selected using MIDI. With digital effects units now very common, MIDI is very 'at home' as a remote control system on these devices.

Interfaces are now widely available for converting the sound from acoustic instruments into MIDI data streams for control of MIDI equipped synthesisers. Many other specialised MIDI units, such as MIDI computers, MIDI drum pads, MIDI delays, etc, are now available.

Mixer manufacturers, however, had a much harder time in satisfying the requests for MIDI implementation as the majority of mixers were still largely analogue and were unrelated to the parameters under MIDI control.

The *CMC* range of mixers offered digital control of certain functions. The design and sales departments at AHB were quick to see a way of using the MIDI system to link the mixer into the complete MIDI studio. Two MIDI message types can be put to good use, these are the program change channel message and the real time messages.

The *CMR* is a dedicated remote control unit for the *CMC* range which features MIDI control. It is a self-contained computer which can be held in the hand and it features interchangeable memory modules, LCD display and touch type keypad. The functions are divided into two main groups, those for entering information about the mixer's settings into memory and those used for controlled access of the information.

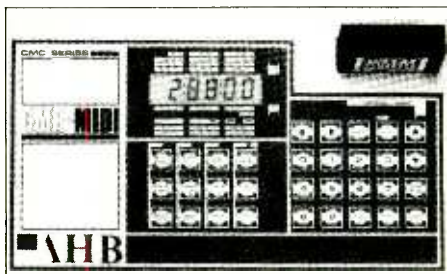
The mixer data is stored as 100 patches (memories) of the channel mute data, each patch containing data for all channels and 100 patches of channel routing data.

The performance modes enable the use of MIDI to link mixer data patches to received MIDI data. The program change message can be used in a similar way to its implementation on effects devices and calls up alternative mixer settings, with each setting containing information for all the mixer's digitally controlled functions.

The *CMR* has a 100-element look-up table which cross-refers MIDI program numbers on any specified MIDI channel to a mute and a route patch. For example see **Table 1**. This facility enables program changes on one or a number of MIDI instruments or sequencers, on different channels, to reconfigure the mixer. Now, channel-to-track assignments can be changed while recording from the instrument when voices are changed and/or effects returns or other channels can be muted.

The MIDI real time messages are used to control a sequencer in the *CMR*. The

CMR remote control for the *CMC*



CMC series compact multitrack mixer



TABLE 1

TABLE ENTRY	MIDI CHAN	MIDI PROG	MUTE	ROUTE
00	01	10	05	07
03	10	01	00	02

CMR has 10 songs each of 100 steps, with the facility to link them sequentially. Each step contains timing data, a Route and a Mute patch. In the MIDI clock mode, the *CMR* sequencer will respond to the Start, Stop, Clock, and Continue Start. This enables it to be used alongside MIDI sequencers, the mixer can then be updated in synchronisation with other MIDI systems. With a MIDI musical sequencer playing many parts simultaneously on different instruments, the *CMR* can be used to turn on and off selected channels or to control the routing to provide level changes to facilitate semi-automated mixdown.

The *CMR* sequence also receives the system common message Song Position Pointer. By using this information, the *CMR* can locate itself to the correct position to enable it to synchronise with MIDI sequencers started at any point. This makes the system very powerful and easy to use. If combined with a device which can read SMPTE code and generate MIDI timing data, a time conscious system is provided for the *CMC* mixer range.

The MIDI 1.0 specification does not provide any specific messages for use by mixer manufacturers. The only other message type of use is the Control Change message. This enables up to 122 parameters to be controlled and they can be arranged as continuous or switched controls as stated in the MIDI specification.

The continuous controller data can be either 7 bit or 14 bit. A number of these codes are commonly used on synthesisers for things like modulation wheels, foot controllers, volume, pedals, etc. To use these messages for a mixer, one of the MIDI channels would have to be used specifically for the mixer. The MIDI transmission rate limits the usefulness of this set of messages as each control would use a separate message each of which requires 3 bytes and takes approximately 1 ms to transmit for 7 data bits and 6 bytes and taking approximately 2 ms to transmit for 14 data bits. The only other way of using the standard MIDI system is with the System Exclusive message. This allows instruments specific information to be transferred by using the manufacturers

exclusive number. With this method, however, the controls can only be manipulated by a dedicated programming unit.

Following on from the *CMC* range, AHB introduced the *Keymix* range in 1986. This uses the same basic ideas as the *CMC* and presents them in an expandable rack mounting format aimed at the MIDI keyboard player. The *KMR* controller for the system performs exactly the same functions as the *CMR*.

The *Keymix* system is a stereo mixer so no output routing is required. The routing capabilities, however, are put to good use assigning channel auxiliary send controls to 1 of 8 auxiliary outputs. This allows many effects devices to be connected to the system and the instruments to be routed to them as required. The musician is then able to perform with many of the complicated effects pre-set ready for selection.

Once the customers saw MIDI being implemented on mixers, they immediately expected this facility to be extended to fader automation. A really low cost fader automation system of any type is still some way off and, apart from the cost, it is unlikely that the current MIDI specification will effectively support a comprehensive fader automation system, because of data transmission efficiency, even if a message protocol were established.

With all these developments in MIDI, the professional recording studios were also having to become conversant with MIDI. Many of the devices musicians were bringing into the studio were sporting MIDI sockets. As a consequence of this, AHB's *Sigma* range of professional modular mixers can be fitted with an Automute system which is controlled by an *SSR* control unit. The *SSR* is a derivative of the *CMR* and provides the same functions with one exception. The routing is not implemented but an additional MIDI facility is provided. With the growing number of MIDI effects devices, such as the *SPX90* finding a home in studios, some means of easily controlling them is becoming more and more desirable.

The MIDI Prog mode of the *SSR* allows a table of MIDI program change messages on any MIDI channel to be set up. These table entries can then be called up in the MIDI or Sequencer operating modes and single or multiple messages can be sent. Thus the *SSR* with its muting facilities provides the lowest level of console automation and the MIDI facilities provide a powerful controller for the studio's MIDI equipment.

As a further development of the digital control of AHB's mixers, a Commodore based package for the *CMC* and *Sigma* is soon to be introduced which provides SMPTE and MIDI facilities. This gives the user the best of both systems.

So, what does the future hold for true MIDI mixers? There are several areas which need a great deal of thought before any definite answers can be given.

The first is the ergonomics of a digitally controlled mixer using MIDI. Could it be styled along the

lines of a synthesiser where a single data entry slider is used to control the settings, and faders (replacing the keyboard) are the 'hands on' controls? It may be a black box where control is totally by software, and graphical representation of the mixer is manipulated by a mouse or joystick, etc. The alternative is to keep the conventional mixer layout. All these possibilities have advantages and disadvantages for customer and designer. The lowest cost system would be a purely software manipulated one, the most expensive a conventional mixer panel. The one most synthesiser owners would identify with would be the first alternative.

The second area is which MIDI messages could be used to transmit and receive the data? The control change message doesn't offer enough scope for a full function mixer to be effectively controlled because of the limited number of controls available. It also has the drawback of tying up one of the 16 MIDI channels. One alternative is to use the System Exclusive message and define a new protocol under a common 'exclusive number' for mixer manufacturers belonging to the MMA (MIDI

CONSOLE DESIGN AND MIDI

Manufacturers Association).

A third problem is deciding on the resolution of the controls. The control resolution is dependent on whether the control is to be operated dynamically (continuously variable during the course of a mixdown) or statically (only changed when no program is passing through the control). For example, if a panpot were only operated statically then 16 steps are sufficient to provide good control of the stereo image but if it were to be used dynamically to sweep from left to right, then something in the region of 128 steps would be needed to give a smooth result.

Another point for consideration is how the mixer can be used. It is likely that the customer will often want to use it

without having to use the MIDI interface. This means that data from the mixer's controls must be combined with MIDI input data to operate the mixer. The MIDI system should only be used to provide recording and replay of operations and external control when necessary.

Table 2 shows a proposal which allows the MIDI system to be considered for use by mixing consoles. The control format operates under the System Exclusive message and uses one of the currently unassigned exclusive numbers.

In one system exclusive message any number of channels and parameters can be updated. It is also to everyone's advantage if common parameters are defined (see Table 3).

The MIDI data would only be transmitted when a control update was needed. The format provides for systems which use high resolution, medium resolution or switched controls in any combination.

There are still some unused system common message types, ie 241 (F1 HEX), 244 (F4 HEX) and 245 (F5 HEX) which could be used instead of the System Exclusive message proposed but the MMA is reluctant to use these codes in case of future developments in synthesiser technology.

There are other developments with MIDI that will help in its acceptance as a usable system for mixer control. A MIDI system that runs at a higher transmission rate is now in use by Sequential on their *Prophet 2000*.

There are objections to calling this system MIDI and the MMA have still to agree how this will be implemented. The use of a new time code for MIDI, MTC, which also allows SMPTE type code representing frames, seconds, minutes, hours, etc. to be transmitted over the MIDI system, will also make the system more attractive in the studio environment.

There is one thing for sure, MIDI is here to stay. It is one of the few 'standards' success stories. Everyone from manufacturer to customer, has too much invested in MIDI to allow rash changes and incompatibilities to be introduced into the system. There will undoubtedly be future developments in MIDI instruments and technology—and that includes MIDI mixers. □

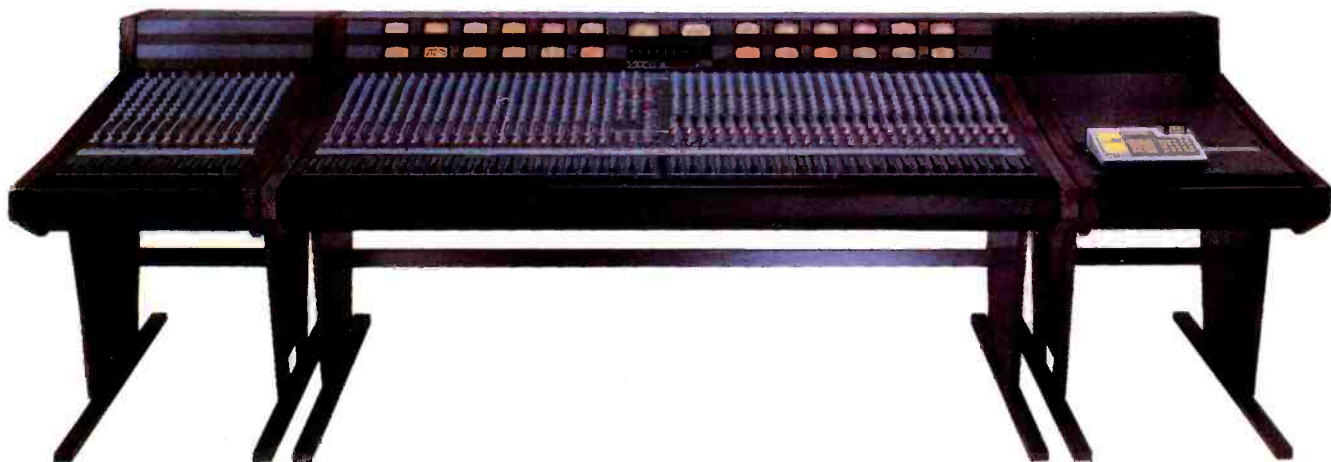
TABLE 2

FO	7D	[CHANNEL]	[PARAMETER]	[DATA 1]	([DATA 2])
FO	System Exclusive message header				
7D	ID number (common to all mixer manufacturers)				
[CHANNEL]	0-127, the mixer channel currently being updated				
[PARAMETER]	0-127, the MIDI controllable parameters on the mixer's channel. 0-63 are used for 7 bit data controls, 64-127 for 14 bit data controls				
[DATA 1]	0-127, parameter value for parameter 0-63 or MSB for parameter 64-127				
[DATA 2]	0-127, LSB of parameters 64-127				
[F7]	End marker for system exclusive message				

TABLE 3

PARAMETER			
0	Fader, 7 bit resolution	72	Spare
64	Fader, 14 bit resolution	9	EQ2
1	Channel mutes	73	Spare
65	Spare	15	EQ8
2	Auxiliary send mutes (7)	79	Spare
66	Auxiliary send mutes (14)	16	Input level mic
3	Channel routing small system	80	Spare
67	Channel routing large system	17	Input level line
4	Auxiliary routing	81	Spare
68	Auxiliary routing	18	Aux 1 send level 7 bit
5	Channel panpot	82	Aux 1 send level 14 bit
69	Spare		
6	Monitor panpot	27	Aux 10 send level 7 bit
70	Spare	91	Aux 10 send level 14 bit
7	Switches (7)	28	Monitor fader, 7 bit
71	Switches (14)	92	Monitor fader, 14 bit
8	EQ1	etc	

The Sigma modular mixer can be fitted with an Automute system controlled by the SSR



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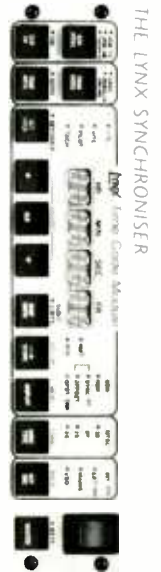
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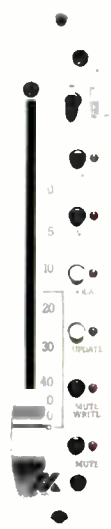
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OTARI DTR900

STUDIO FILE

STUDIO FILE

With a reputation for going their own way, Marcus Studios in London has two recording studios which Marcus Osterdahl and Leif Mases have more or less designed themselves. The partnership of these two Swedes goes back many years to when they set up studios in Stockholm which also incorporated tape and cassette duplication. As far back as 1977 that particular partnership came to an end as Marcus prepared to come to England whilst Leif stayed in Sweden to design and build Abba's Polar Studio.

By 1983 Leif was once again looking for pastures new and he followed Marcus to Bayswater where the partnership was resumed.

Over the years both men have built and designed several recording facilities. The experience each has gained through various projects has led to very definite ideas about what is required of a room and how to set about achieving this.

1985 saw the massive Studio One refurbished, rebuilding and re-equipping Studio Two with very particular sounds and ergonomics in mind.

The building, situated in Kensington Gardens Square, is fairly typical of the area: In the 1930s it served as home for the Whiteley's Gentlemen's Club, reputed to be one of the essential social venues for London's Smart Set. It was popular for its location, a convenience which equally influences recording artists; Queensway where you can buy almost anything virtually round the clock day or night, it is a mile from the West End and only a few minutes from Hyde Park.

The club's large main room was kept intact and today serves as the recording area for Studio One. Because of the size of the building it has been possible to create two completely separate independent facilities each with its own recreation, relaxation and refreshment facilities. It also provides office space for various other Marcus interests—record and publishing companies, etc.

The rebuild represents a major reinvestment during a period when many studios struggled for work. Marcus felt that they should bring their

Marcus Studios, London



Studio One control room

rooms and equipment into line with the direction they felt the industry was headed.

To this end they were joined by Ross Caston who left SSL to become part of the Marcus household and help tailor Studio Two to receive its new 4000 Series console. "Ross has worked in a lot of studios all over the world and is expert on the SSL; Tim Hunt our engineer is also very involved in running the company—he is not just an engineer and he contributes to everything that is happening. With these people, Marcus and my experience, we have a lot of combined knowledge."

Looking at control room design in broad terms, Leif splits the problems into two major areas: "One is acoustics and the second is interior design and you just can't combine the two without some compromises. You go into some of these studios and it is a bit of a laugh sometimes what some of them do. At the end of the day the sound has to come first."

Soundwise they were aiming to create the impression of nearfield monitoring in a large room, ie a tighter sound than they had before. They also wanted the feel to be more natural, in keeping with current acoustic thinking, "Ambient but keeping tight monitors. We wanted a more even sound; no matter where you are the sound should be the same. Vertical dispersion of the sound is equally important: the sound must be even—sitting or standing. For this reason we have positioned

the monitors more level with the listening position rather than pointing down at you."

Studio Two underwent considerable rearranging. Always a studio in its own right it previously consisted of one control and one recording room. The control room size was to increase and the recording area divided into two within the limits of the building. The floor was a major problem; being situated on the second floor there was a limit to how much weight the structure could support. Marcus were unhappy with the floor they had but it could not support a concrete floor. Instead they put in a sandwich construction.

The studio's aim was to have one live area which it was possible to isolate from the other, more dead area, both with good visual communication to the control room. They have also incorporated a 'telephone booth' type iso room in the corner. "In order to achieve a good live sound we had to adopt a slightly unusual method. We wanted the room to be as symmetrical as possible so that wherever you are the sound would not be altered. We wanted to avoid the pinging bathroom sound which you get from very flat glass surfaces. You create problems when there is no dispersion of the sound making the distance the mics are placed from the walls critical."

The result is a 450 sq ft room with a dome construction in the ceiling and walls clad in

Italian Quartzite. The back wall features recesses in the stone to accommodate guitar amps.

"Acoustically we worked with minimum trapping. Instead, we implemented the geometry of the room with very solid surfaces to break up standing waves. We built the basic room shape first and then began breaking up the reflections. We didn't want this to be guesswork and so we spent long nights tuning it very carefully.

"The shape of the room is underestimated today. Bass trapping efficiency is high so you often end up with a very dry room. You always need a fairly dry room but you can't have it completely dead—you need some reflections. You also need a solid wall to put your guitar amp in front of; it is no good just putting up some fabric, that doesn't act as a wall."

The deader main recording area is placed immediately in front of the control room principally because you would be more likely to use this area for lead vocals and it is preferable to have the vocalist near the control room. It is quite heavily trapped with soft walls except the patio doors, the glass door in to the iso booth and the control room window. The ceiling is absorbent and the floor hard. "We think it is important to have a hard floor—you can always put a carpet there if you want to soften it."

As the monitoring in the control room has been changed, the previously employed 3-way JBLs are now located in the studio beneath the control room window. This gives them an alternative sound to that of the control room and the system may also be utilised for ambience during mixdown.

"There is not one part of the room where you would get more than one reflection back to the microphone which is too near in time; it wouldn't bounce back. In the live room you get a whole cluster of sound but it is a short, well defined sound—nice and bright, not over splashy on the cymbals."

Downlights are positioned in the stone round the room and there is a ring of Pioneer car speakers primarily for foldback




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STUDIO FILE

STUDIO FILE

and also monitoring.

With the design of the control room, the advice of David Hawkins/Eastlake was sought. "We have had a lot of help from David and his team and I cannot recommend him highly enough. Quite apart from all the measuring and determining the room characteristics, he gets hold of exactly the right materials so much cheaper than you could do it yourself. David also knows all the regulations and only works with approved materials. This is something that people often forget about and it saves a fortune in the end. He has made some things possible which we could not possibly have done without him. We have done a lot of the work ourselves, but under a lot of guidance."

Although the control room was completely gutted they did actually want to retain as far as possible the sound of the previous room. The main problem was the need to accommodate an increasing amount of outboard gear in the room as well as have space for keyboard players to work, quite apart from the fact that the 56-channel SSL console was going to occupy a lot of space.

"The size of the control room is much more important now so that you can use piles of keyboards at the same time. You get guys coming in and spending days building up their system and then it just suddenly spits out a song and it's all over!"

By taking the tape machines out into a separate room the old recesses could be abandoned. The installation of new monitors (Eastlake) and the console VDU, a new air conditioning system (with three separate systems serving control room/power amps and console computer/machine room) plus completely rewiring the whole room made the project complete. Taking advantage of a new ceiling, the lighting was changed to incandescent downlighting.

"Obviously changing the monitors will alter the sound but we were trying to preserve the room's acoustics because they were very good. We didn't want to alienate clients who were used to and liked the sound. So we have the same basic idea but done in a

Marcus, continued

different way, for example we used slot absorbers in a wooden frame in our efforts to make it look more contemporary. The front and part of the side walls are finished in rough cut walnut. The side walls are angled with tuned traps behind to stop low frequencies travelling round the room, and there is new bass trapping on the monitor wall."

An unusual feature is the so-called Tape Op's Corner for the tape op to sit in with the SSL remote. The opposite corner is relegated to the producer with all the MIDI tielines etc coming up, enabling him to sit and drive the master whilst located right next to the effects rack and leaving all the keyboards up in front of the desk.

The removal of all tape machines also allowed them to rethink their wiring—this is where Ross came into his own. The room is prewired for 32-track; any 2-track machine can go into any required section of the desk; 24 channels of Dolby may be by-passed if so desired.

"Any combination required may be achieved very quickly. It is especially useful for bringing in other equipment. The wiring system is the maintenance man's dream. We have got tie lines everywhere—MIDI, guitar, speaker, video, video camera, audio, power supply voltages—we even have 9 V power outlets on the walls; basically everything you have ever wanted. It means that if you can try out five things in five minutes as opposed to two hours you are far more likely to do so. Thus we are providing an environment for experiment. The wild ideas can be tried and this is how progress is made; it will affect the music we record here. An inspiration will be provided by the possibilities available."

Onboard effects complement consists of two AMS *DMX 15.80S*, Lexicon *Prime Time*, two Roland *SDE3000*, *Dimension D*, Bel *BD80*, Eventide *Harmonizer* and Phaser, Bel *BF20* Flanger, Marshall *Time Modulator*, Drawmer *Multitracker*, six noise gates and stereo

compressor/limiter, Audio+Design *Auto Panner*, *760RS* stereo compressor/expander, and *Vocal Stressor* Orban 3-channel de-esser and stereo parametric EQ, two UREI *LA4* compressors, one *I176* limiter and two 27-band graphic equalisers, two dbx *160* compressors, Aphex *Compellor*, eight *CEA-1* compressor/expanders, Aphex *B Aural Exciter*, Helios stereo equaliser and one Redpost digital metronome.

Reverb is catered for by *EMT 140* stereo valve and *240 Goldfoil* plates and an AMS digital *RMX 16*. Noise reduction is either Dolby or dbx and reference monitoring is Yamaha *NS10s*, Auratones, RORs or Tannoys. For microphones, the Marcus collection is suitably extensive including Neumann (both valve and FET), Beyer, Shure, *PZM*, Sennheiser, AKG, PML, Electro-Voice the Calrec *Soundfield*, STC and RCF.

With an eye to the future the machine room has been designed and prewired to take six machines (three multitrack and three stereo) in addition to video machines.

Next to the machines is another room housing the SSL computer and the power amps on sliding racks to facilitate maintenance.

The tape machines are: Sony *PCM-3324* 24-track digital, Studer *A800* 24-track with 16-track headblock if required; two Studer *A80* (¼ or ½ in), Sony *PCM701 ES* and there are also two Aiwa cassette decks.

The new Studio Two is finished off with newly designed lounge, kitchenette and listening area.

Regular visitors to Marcus will know that one important feature of this facility has escaped the rebuild: the store room. Having heard this room referred to as "that ridiculously live room at Marcus", "that crazy room at Marcus", and from Leif's own mouth: "... a real bathroom job—great!" You wonder what has hit you when you start to talk in there. Opening off the drum area it is very easy to incorporate in a session.

The way in which they set about Control Room One was

slightly different because they were altering an existing room rather than starting afresh. "We were able to go in and measure and decide exactly what to do as we went along instead of having to rely on guesswork."

The front wall was moved forward, the monitors repositioned with an infinite speaker baffle system, the side walls treated and the back wall-retrapped and tuned.

"The monitors are custom Eastlake 2-way monitors with TAD horn incorporating motion feedback system on the bass drivers making them flat down to 20 Hz and also reducing the cabinet sound. It gives a very good clean tight bass. It also reduces the problem of two bass drivers which usually gives distorted bass resonance as they interact." Leif has over the years been involved in many electronic designs and intends to patent this monitoring system.

The Studio One equipment list is similar to Studio Two's with additional Studer *A80* 24-track to facilitate 48-track recording, another of each of the *EMT* plates, Audio+Design *Panscan*, Neve stereo compressor/limiter, Pultec valve equaliser, Orban stereo synth and a Klark Teknik stereo graphic equaliser. Marcus is renowned for its Studio One recording area which is enormous. The main area is some 1500 sq ft, with a 500 sq ft live room, two overdub rooms of 125 and 45 sq ft, plus various isolated recesses down one side of the room.

"The glass rooms people build are coming in for some criticism. They give a certain sound which is pingy, trebly. As for the bass trapping, it is like a vacuum cleaner sucking the sound out and it sounds very middly and boxy. The problem is to get an even sound, otherwise when you play there are sounds which ping around with no balance."

It is this view of conventional studios which has led Leif and Marcus to follow their own path. Will the new rooms have the dramatic effect on the way people work? Only time will tell. □

Janet Angus
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STUDIO FILE

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The two Record Plant (NY) mobiles are familiarly known as the White Truck and Black Pete however, don't ever ask for the latter as you are liable to be taken for a practical joker. Both trucks were at home at the time of our visit. "This doesn't often happen!" noted Phil Gitomer the man in charge. "At least one is usually out, however, you've timed it to come down during a maintenance period."

Phil has been involved with the trucks virtually from the start and is now director of remote operations, "which means I don't get to do as much engineering as I used to but I'm by no means glued to the seat in my office. Running remotes is a 25 hour a day job and I probably do more running around now than I ever did. Bookings, travel, maintenance—they all have to be slotted in and can give rise to headaches."

The first truck (the White one) came into service during 1970/71 and is built around a Chevrolet C-60 with an overall height of 12 ft 6 in (3.81 m), width of 8 ft (2.44 m), length of 26 ft (7.92 m) and weight 26,000 lb (11,800 kg approx).

Entrance to the truck is by the rear or either side. A lot of careful thought obviously went into the layout design. Despite the fact that the interior space is not exactly huge, there is an impression of 'roominess'. "It can get pretty crowded at times and after you have four or five people in here that's when you start clearing people out."

Recording centres around a 48/24 Trident series 80 console and two Ampex 1200 24-track recorders with 14 in reel capacity. The outboard gear is fairly basic consisting of two Pultec EQH-2 programme equalisers, a rack of API equaliser modules (five 550 and five 560), two dbx 160 compressors, two UREI LA-3A limiters and two LN 1176 limiters.

"This represents the basic truck setup, however, if a client wants more outboard gear we can take it from the main studio pool or hire it in. I find that everyone wants a different reverb, or what-have-you, so it is a lot easier to have a basic setup that no one will argue with and then add further equipment if it is

Record Plant (New York) remote operations

required."

Monitoring is vertically mounted UREI 813A speakers with provision for the connection of nearfield speakers. Two cassette machines are installed for monitor mix copies. No 2-track recorders?

"We used to have them in but we found that customers very rarely wanted a 2-track copy, cassettes are much more convenient. After all, most of the time all we are doing is tracking. Again, if a client wants a 2-track in here it's no problem but we do tend to keep out anything that is superfluous to our needs."

The truck has 54 microphone lines coming into it via multiways plus three auxiliary (TV interface) cables.

"The moment we started doing remotes where TV was involved we installed an auxiliary television interface system that would make life easy for all concerned. Each cable uses AMP Quick-Latch connectors and incorporates 12 audio circuits, three video circuits and a separate timecode line. Both trucks each have three of these cables."

The patchbay is very extensive and permits numerous configurations with the minimum of fuss. There are also Record Plant custom items such as distribution amplifiers and a system of six XLR/BNC code and sync tielines that distribute sync/SMPTE to various points around the truck for easy hookup to machines, etc.

The monitor bridge has space for two video monitors which are mounted one above

the other and the intercom system is made by a small firm named Chaos Audio!

"The intercoms are made by a friend of ours who, after problems on the road with comms equipment, decided to build his own system that would stand up to heavy use and be very intelligible. Both trucks are equipped with Chaos — sometimes in more ways than one — and we have never had a fault yet.

"Remote operations are a lot tougher on equipment than a fixed studio and everything in the trucks is heavily modified to perform and/or travel better. The Trident console has lots of modifications to it to make working easier and have better handling at the input stages. It's a good basic console that we have been able to customise to meet our requirements. For instance, it has 24 buses but we have also fitted 32 line amps for 32-track work. The same with the Ampex machines: they have literally been taken apart and rebuilt and they are now how Ampex ought to have made them!"

One of the modifications has been to bring many of the test points, such as mains, up to the deck plate for fast checkups on line-up without having always to dive inside the recorder.

The two video monitors—colour and black and white—can be used for video feeds from OB vehicles and the truck's own CCTV camera for the stage.

The interior of the White truck features a solid wood floor with wood panelling underneath the monitors and

on the lower half of the walls. The upper half is covered with absorbent padding together with moquette facing on the racks and cupboards. The overall effect is very attractive and it is difficult to feel that one is in a truck.

Weighing 42,000 lb (approx 20,000 kg) is the more recent Black truck. This is a Peterbuilt tractor van (rigid) with a height of 13 ft 1 in (3.98 m), width of 8 ft (2.44 m) length of 36 ft 1 in (11 m) and powered by a 14.75 litre turbocharged engine. The truck is very impressive—a combination of black and chrome—with an extremely comfortable cabin to make those long drives bearable!

Access is by either of the side doors placed towards the front of the truck or through the engineers' door in the rear.

Due to the space available, the Record Plant design has enabled a 'VIP lounge' to be installed between the console and the monitors. This effectively keeps clients out of the way of the production team during recording as well as providing a comfortable area for the production team to put their feet up during breaks! The two side doors give direct access so no one is disturbed during recording.

The interior comprises a wood floor with carpet and soft lounge chairs in the lounge area, panelled ceiling and front walls with the walls to the rear of the side doors being half wood and half absorbent panels as the White truck. Racks and cupboards, together with the rear wall and door are covered with moquette. The atmosphere is very pleasant with an acoustic that belies the size of the room. We were joined by one

Phil Gitomer inside the white truck



The black truck



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STUDIO FILE

STUDIO FILE

of Phil's main lieutenants, Kooster McAllister, "We work long hours in here without ever getting burned out by the room. The sound is good and it is quite suitable for mixdowns should the client want that. The air conditioning in both trucks is very efficient as well, which makes for comfortable working conditions."

Insulation from outside noise is essentially very good." High energy low frequency will get through to a certain extent but we have never been bothered by external interference."

The centrepiece is a custom built API console with 44 input channels and 24 buses, however, 32-track line amplifiers have also been fitted. The channel equalisation is API 560 10-band graphics with a rack of API 550A 3-band parametrics available for further tweaking as Phil explained, "The console has been specifically built for live

Record Plant remotes, cont'd

recording though it is, of course, fully capable of doing mixdowns for albums should the client not want to come into the studio. It has features like fail-safe solo, fader reverse, eight VCA groups and quad panning which comes in handy for mix-minus applications.

"As remote recording is nearly always very much a one-off operation we had special attention paid to the input and amplifier stages of the console and these use API 2520 op amps which have an excellent response and headroom, ensuring a good clean sound going to tape."

The outboard inventory is similar to the White truck with four UREI LN 1176 and two LA-3 limiters plus two dbx 160 compressors. An Ursa Major 832 digital reverb had also just been installed together with a clutch of Lexicon PCM 60s.

"These provide good basic reverberation and the 832 has some nice effects on it. We'll see what the client reaction is to see whether we leave them in as a permanent fixture or as part of the equipment pool. There is obviously a certain amount of exchange between the two trucks. For instance, one day might see all the LA-3s in the White truck and all the dbxs here and so on."

Recording centres around two highly modified Ampex MM1200 24-tracks with three cassette machines for mix copies.

Monitoring consists of Westlake 2-way systems fitted with TAD drivers and powered by Bryston amplifiers, however, as Phil noted, "there is a tendency to use good 'little' speakers for a lot of jobs" and suitable outputs to connect these up—four per side—have been installed at the rear of the console. The

meter overbridge provides a convenient flat surface on which to place small speakers without the main line of fire of the Westlakes being obstructed.

As with the White truck, two TV monitors are installed vertically between the main speakers and 'Black Pete' also has two CCTV systems rather than just the one.

The truck features extensive patching facilities and has a large patchbay dedicated to the 96 microphone lines that come into the studio.

Phil: "The way big shows are run doesn't leave much time for repatching so in fact the 96 lines are two groups of 48. This means that the act which is running will be plugged into one set of 48 while the second set will be prepared for the following band, etc. When the changeover comes up we just throw these exchange switches here on the patch and the new setup is into the console.



Looks like it's

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STUDIO FILE

STUDIO FILE

Another thing that always used to cause trouble was phantom powering—who provides it? In the heat of the moment it is easy to overlook a phantom switch on the console so we opted for a different solution. We have a separate high quality 48 V power supply with indicator lamps and power switches for each microphone line. This way we can see at a glance where we are and avoid problems."

Kooster adds: "The trucks are in a constant state of evolution—nothing stands still. In some ways you could call it job security as an outside engineer won't always be able to see at a glance what is going on with all the patching and distribution! Every improvement is usually the result of a third time situation where someone has said, 'why can't we do this?'—so we do it!

"The main thing is that we could put in digital machines tomorrow and be ready to go

as, of course, we've already done with remotes using hired recorders. The important point is that the system is there; the gear, when you come down to it, is really secondary. It has to be good and reliable but it is lost if the system isn't there to bring it all together."

Both trucks carry a range of side lockers underneath the chassis for cable drums, microphone stands, etc. A large inventory of microphones is available, mainly Shure, Beyer and Sennheiser, although all makes are available on request. Each truck carries a comprehensive stage rack distribution system for send and return lines, together with satellite boxes to make life easier when groups of lines have to be patched in.

A list of the Record Plant remote clients reads like a 'Who's Who' of the music industry with such diversities as *Night of 100 Stars*, Merle Haggard, *Live Aid* and *Farm Aid*, MTV Awards, Bruce

Springsteen, the Nashville Network and the Opera Company of Philadelphia's production of *Faust*. How did Phil and Kooster see the mobile business in the future?

"Things are definitely different. There are a lot more small remotes who are charging silly prices and taking business away from the better equipped and established trucks. It's a question of money. It is either pay us to go down to Florida or use what is down there and save on the travel expenses, etc—and hope that the result is as good!

"We don't feel the pinch too much because we have been around for some time, though we don't do as much mileage as a few years ago. We find ourselves diversifying a lot more between rock and music shows, theatre, A/V productions, OBs—that kind of thing.

"It's the structure of the business; the money is there,

it's just what you spend it on—5-star hotels or 3-star plus a remote! This said, there is an upswing and bands are getting out and playing again, which can only be good for everybody."

Would they prefer to do something else? Broad grins coupled with a very emphatic, "You've got to be kidding!"

Terry Nelson
Record Plant Studios, 321 West 44th Street, New York, NY 10036, USA. Tel: (212) 581-6505.

After this article was written, David Hewitt of Remote Recording Services bought the Black truck after a period of hiring. Phil Gitomer is now operations manager at Remote Recording Services Inc in New York.

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CAPTURING SOUND AT ITS PUREST

IN PERSPECTIVE

IN PERSPECTIVE

Comment from Martin Polon our US columnist

The current status of the tapeless studio can be summed up by a story that may be either apocalyptic or apocryphal.

A visitor to an emerging Third World country is walking down a main street in the early evening. This country has begun to develop high technology and pride over such activity is a national contagion. A well dressed man approaches the visitor carrying two medium sized suitcases. The visitor asks the man for the time. The man puts the suitcases down, draws himself up and looks at his watch. The visitor is immediately awed because the watch emanates with the orange glow of a plasma display. The man proudly announces, "It is 19:16 hours, on the third day of the new moon's cycle with low tide due at 2:08 in the morning and the air temperature is 67° F with 51% water vapour in the air as the wind moves at 16 miles per hour." The man concludes by announcing that he can repeat the entire cycle in metric if needed. The visitor is visibly moved. He comments that this new country has taken such giant steps.

"Is there anything that could be improved with this fantastic product?" he concludes.

"Well," says the local as he picks up his suitcases, "they could certainly make the batteries smaller."

For the world audio industry to enter an era of tapeless recording, it is necessary for the technology to progress to a point where we can 'make the batteries smaller'.

In the audio business, the 1980s has not been a time of great stability. Change has occurred at a pace that makes one wonder if technological innovation is on a treadmill. New product life is a mere shadow of its former self. The audio industry had a previous decade (the 1970s) of stable technology coupled with spectacular financial growth. Cassettes became one of the dominant formats for consumer release while the LP record peaked in the consumer marketplace. Recording studios added channels of mixing capacity and tracks of recording storage, all in compatible analogue formats. Noise reduction became commonplace. Changes wrought through technology were evolutionary rather than revolutionary. And these evolutions could be financed by operating profits rather than a second mortgage on the studio.

The 1980s has brought revolution. Computer technology has arrived, in the initial form of non-standard studio digital recording and consumer release via the compact disc. It seems clear that this is just the beginning of a series of changes that will occur with such consumer innovations as the rotary head digital recorder (R-DAT), the recording optical disc (R-DISC) and, at the studio level, the eventual obsolescence of

The tapeless studio —a progress report

moving tape transports in favour of recording into mass storage systems.

Yet these changes have saved the professional audio and recording industries from becoming 'mature' businesses. Maturity is exactly where the industry was headed by the end of the 1970s with analogue LPs and cassettes. A business school definition of a mature economic sector indicates adequate profitability and stable growth at lower percentiles. Digital has restored the excitement that has always been a part of the record and audio business. Perhaps the most exciting digital flourish is that of the tapeless studio. The bottom line in the development of the tapeless studio is the rapid and unyielding progress in mass memory for the computer industry.

Computer industry research and development forces make further gains in mass memory over even the radical advances discussed here, seem inevitable. IBM, for example, spends in excess of \$3.5 billion yearly on R&D, about half of its net income and 29% of all pre-tax income for the worldwide computer giant. That figure is greater than the yearly net income for all sales of professional audio equipment from all manufacturers worldwide. IBM alone has the equivalent gross national product of Norway. In fact, the computer industry can be measured as an industry having gross income activity in the range of \$200 billion a year. There is R&D spending in excess of \$30 billion a year in the civilian and defence sectors of computer development.

Growing demand for voice recognition, voice recording and voice synthesis has placed the computer industry firmly in the audio business, with products such as voice mail. The search for advanced memory chips has spurred the breaking of the 1 Mbyte barrier in RAM chip development, with alternative success for bubble chips reaching the 16 Mbyte level. The solid state recording matrix moves that much closer. The marriage of the computer with the telephone system has created demand for a whole range of new digital signal processors (DSP) that will impact the future of computer audio consoles as well.

This is not to say that the world audio industry is not committed to research and development. It is just that the financial wherewithal is frequently missing on a large scale in audio and audio-related industries. It has been estimated that research in audio for all products (home and professional) is unlikely to exceed 2% of the total spend by the computer companies or \$600 million in a comparable year.

Clearly, the major names in professional tape recording products and

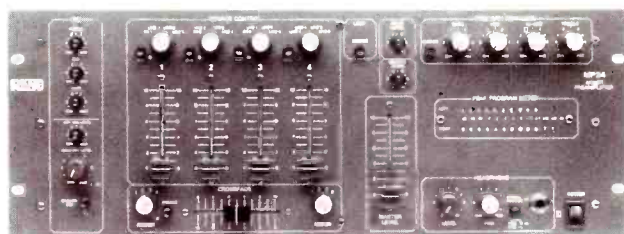
studio products are working hard to capture and market the new technologies. It appears likely that many of these same names will have state-of-the-art entries to the professional audio marketplace as the technologies evolve. That is true in some cases due to connections with larger companies based in computer technology and in some instances because of the large volume of research being done for consumer audio especially in Japan. One researcher opted "My company makes 20 times the profit and spends 30 times the research budget on consumer audio as it does on professional products. In the old days, the research that was undertaken for the professional audio marketplace dribbled down to the home hi-fi. Now, the process is reversed."

But the former emphasis on research in audio has frequently fallen victim to the vagaries of cost cutting. For example, the giant CBS empire is about to spin (or throw) off its seminal research unit which began and flourished with such technical luminaries as Peter Goldmark and Ben Bauer. The CBS Laboratory effort has yielded much of the progress in LP records, colour television development, high fidelity systems for the home, stereophonic sound, loudness curves for broadcast sound and, most recently, a brilliant scheme to improve received stereo quality for FM broadcasting. The fiscal battle for control of CBS over the past several years has so weakened the company that such cutbacks seem inevitable. Other corporate names that helped professional audio to pass the then current limits of technology, such as Ampex and RCA have all but disappeared from the studio.

Currently, tapeless recording is being implemented via hard disk systems in most cases. But many observers feel that hard disk recording is just an interim step until price and speed improvements allow optical recording, fast RAM chips or other semiconductor-based memory options, to provide the ideal format for tapeless recording. The necessary parameters for successful tapeless recording include rapid access time for input and output, virtually instant edit capability, absolute reliability for the stored recording, permanent back-up recording capacity and of course sufficient memory capacity for multitrack recording. It is impossible to obtain all these features in a non-moving computer memory system for audio recording today with a price tag of less than the multi-million dollar range. But the future is frequently 'only six months away' in the development of computer technology.

The rule of thumb used by some developers for any kind of recording memory is to begin with a normal sampling rate of 16 bits and calculate that each second of recording time is equal to 96 kbytes of memory. Thus, rounding the 96 k to 100 k we find that

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**RIGHT
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IN PERSPECTIVE

IN PERSPECTIVE

Comment from Martin Polon, our US columnist

one minute requires 6 million bytes of memory or 60 seconds times 100,000 (100 k) bytes. Expanding further, we find that 60 minutes of recording time will require 360 Mbytes or 60 minutes times 6 Mbytes. So, one hour of recording time for each track will require 360 Mbytes of memory and the sum total needed for multitrack recording will be the number of tracks multiplied by the figure for one hour's time.

The following hardware developments occurring in the computer industry seem most likely to impact the development of the tapeless studio.

- Conventional Dynamic RAM chips (DRAM)

Speed and memory size remain the big stumbling blocks here. But corners are being turned in leaping past the 1 Mbyte per chip barrier. The most likely scenario will find the large primarily captive (in-house) chip makers such as ATT, IBM, Matsushita and Sony staying apace with the large merchant chip firms: Fujitsu, Hitachi, NEC and Texas Instruments. Even with the leap frogging of per-chip capacity expected, the speed factor remains a major stumbling block. Nevertheless, some analysts see the dynamic RAM as the least expensive option in solid state memory. The recent US/Japan trade agreement on memory chips has caused chip pricing to soar upwards but this is expected to ease in the long term. Curiously, Holland's N V Philips Gloelampenfabriken and the West German firm Siemens—no strangers to the audio business—have established a partnership worth \$800 million towards the development of very large capacity memory chips. This joint venture is also receiving half that amount in subsidy from the respective governments.

- Gallium Arsenide (GA)

A virtual wonder material allowing operating speeds in excess of 10 times the speeds of conventional chips based on silicon. Chips made from the material allow for the processing of optical information as well as electronic signals. This material holds significant promise for audio, both in terms of speed in conventional electronic applications and

with the possible direction of audio processing via optical computing. Japan has a sizeable lead in working with gallium arsenide. Japanese semiconductor research labs at Fujitsu, Hitachi and NEC have moved into the world class status of such facilities at ATT, IBM, NHK (Japanese broadcasting research) and NTT (Japanese telecommunications research). Other contenders include start-up operations such as Gigabit Logic in Los Angeles.

- Bubble memory

Despite the sense of failed promise from the late 1970s that clings to bubble memory, the storage medium is alive and well thanks in large part to specialised usage in ruggedised military equipment and for industrial automation. The reliability and robustness of bubble memory has sustained these markets and would certainly be an asset in audio recording; consider the options for portable recorders. Active bubble suppliers are Fujitsu, Hitachi and Intel. NEC has development work underway and several start-up operations are flourishing in the US. Four Mbyte chips have become the norm and the bubble makers expect to jump to 16 Mbyte units with improved speed at some point in this decade. This jump is considered to be a landmark move that will open the door to 64 Mbyte bubble chips. A further improvement in bubble storage densities is expected from the application of Bloch-line technology to the bubble memory. Carnegie-Mellon University, Canon, Hitachi and Sony are actively pursuing Bloch-line technology. Many experts consider the bubble memory with Bloch-line implementation to be the most promising memory format for computer (and by definition audio) applications of the next decade.

- Large scale optical storage

Unlike the recording compact disc or similar systems evolving for the home, the large scale optical disk offers the enormous capacity necessary for multitrack professional audio recording in the digital domain. Most systems available at this time are based on write once, read to infinity technology. Metal film 'write once' systems have achieved

some success in commercial use but are not favoured for future erasable systems. The large scale optical disk is being developed with various coatings and in three formats for laser writing and reading. Magneto-optical flux systems have been in development by Hitachi, Kokusai Denshin Denwa (KDD), Matsushita Electric, 3M, Philips, Sony, Tokyo Sanyo Electric, Toshiba and Verbatim. Phase-change in crystalline or specifically alloyed metallic media is another optical disk approach taken by Fujitsu, Hitachi, Philips and others. Colour-change systems using organic dyes affected by the laser, have been the focus of work by Eastman Kodak and other companies. Optical disk systems are not 'just around the corner' yet but there is no doubt of their impact on the technology of mass storage of computer-audio-video information in the 1990s, if not sooner. Consider the involvement of audio, broadcast and photo-related companies such as Canon, Daicel, Daido, Nakamichi, NHK Labs, Nikon, Olympus, Ricoh and Sharp. Of course, US computer makers such as DEC, IBM, and Xerox are not sitting this technology out either. It is curious to note that many consider Philips' partner in the CD venture to have a substantial lead in the optical disk area—who else but Sony. It is not clear that all these efforts will emerge victorious for professional audio recording but it's likely that several will.

- Electrically Erasable Programmable Read Only Memory (EEPROM)

EEPROM may or may not pan out as a usable primary format for audio recording. The educated guess is that it will not, due to speed problems in writing into the memory format although this memory technology could provide the answer to back-up storage for the tapeless audio recorder. A ROM pack could be plugged into the tapeless recorder to provide permanent, reliable back-up and long term storage. These ROM packs would be the solid state equivalents of the studio tape library.

- Other efforts

The Japanese fifth generation project will add artificial intelligence, expert systems and parallel processing to the available technology pool. IBM, other US companies and European vendors are also involved with these developments. These technologies are all part of the mix that computer technology will bring to the audio industry in the next 10 years.

But that is only half the story. It will be inevitable that software will define the audio recording facility in the future. With the veritable plethora of computer systems and memory devices available, the development of operational audio software will define hardware functions and render computer products for studio use virtually free of obsolescence. New developments and new technologies will be delivered by software. An exciting future awaits all in our industry! □

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CLASSICAL AMBIENCE

Producer Michael Ponder originally conceived the idea for *Songs by Eric Coates* in association with Austin Coates, son of the late composer. The songs for baritone and piano accompaniment attracted him and he decided to pursue recording and issuing a set of the songs. There was a gestation period when such things as who to ask to sing, who to accompany, which company to release it, where to record, who to engineer, etc. were all considered. In the event Brian Rayner Cook agreed to sing the songs, which suit him, and Raphael Terroni was to accompany—so they were sent off to rehearse and at the subsequent sessions not so veiled references to 12 hr rehearsals were heard coming down the mic lines... It is easy for the rest of us (and the public) to forget the amount of preparation that precedes the serious business of committing one's art to a hopefully enduring recording.

Independent producers operate in the classical field and sometimes just an idea is hawked around or perhaps a speculative final edited master is offered. Academy Sound and Vision (ASV) in the shape of Joan Coulson, only recently ex-EMI, put the idea to ASV boss, Jack Boyce and the project was on with no delay on the release date.

Michael Ponder believes in

Released on LP, cassette and CD, Songs by Eric Coates was recorded and edited using the JVC Digital Audio Mastering System, a Calrec Soundfield and Quad ESL63 Monitoring. Mike Skeet describes the sessions

the Calrec *Soundfield* Microphone (SFM) as a stereo mic for his productions. Hiring one in for sessions has economies over owning one, so the official Calrec *Mk4 Soundfield* 'hire' model was hired from this author. Perhaps I would come along and operate it?

The smooth but largish acoustic of St Silas the Martyr Church in London's Kentish Town was suggested as a venue. There is some control over the amount of resonance by going under a highish choir and organ balcony and so, with a sort of promise that 'it could be fixed in the live mix', Michael arranged to visit the church to inspect it and the usage fee. Its flutter-free smooth decay won him over. Incidentally, the last production recorded there has now appeared on the EMI label. (See *Studio Sound* 'Ambisonics Round and Round' September 1985.)

The straight to stereo mastering course would ordinarily have been Sony *F1*, assembly of chosen takes or

parts of takes, transfer to Sony *1610* for editing and production mastering but for a chance visit to the Bell and Howell stand at the 1986 APRS exhibition. Technical services manager Peter Lindsley told me that Nimbus had just bought their second JVC Digital Mastering/Editing system and I came away with a brochure and the plan that I would suggest to the producer that Peter Lindsley and colleague, professional audio product manager, Bart Moolenbeek might record and edit the planned ASV sessions to get further hands on experience of their own product. It all fell into place rather smoothly.

Sessions

Two mid week days, spaced by a rest day, were arranged for the recording. A Steinway was delivered during the setting up time and the vicar, Father Cobb, was detailed to supervise its off loading and setting up at the end remote from the altar. The Church Hall 'control room' was more resonant than really desired but amply took the assembled sets of recording gear and attendant bodies. Interestingly the chosen monitor speakers,

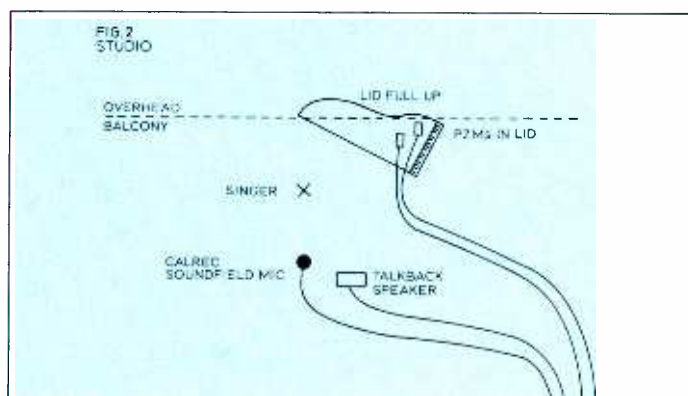
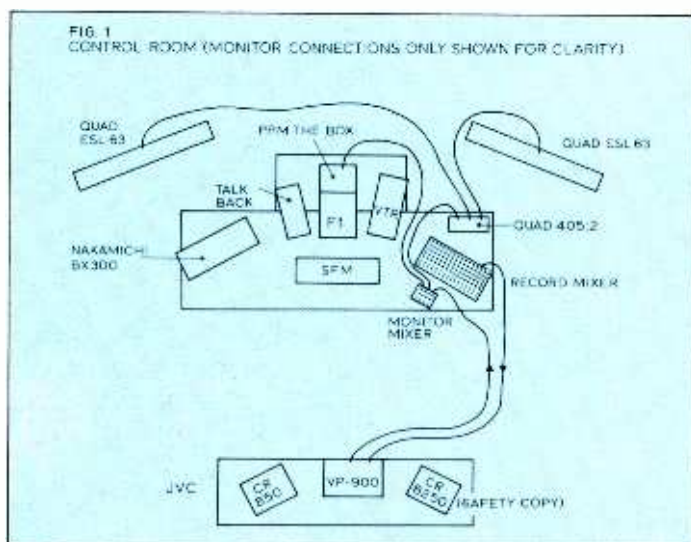
Quad *ESL63* electrostatics, being figure-of-eight doublets were much less affected by the room than others.

The basic arrangement of equipment is shown in **Fig 1** and **Fig 2**. Apart from the JVC setup I had my usual Sony *F1* rig, mainly because the talkback is built in my custom cases but also to give me something to do after (or more accurately!) before I called the take numbers.

The recording setup was *SFM* line output to custom built mixer line input, two Tandy *PZMs* under the Steinway lid via mic inputs and pan mixed into the stereo from the *SFM* after on board graphic EQ low mid and LF cut. Parallel line level feeds were then sent to the Sony *F1* and the Bell and Howell/JVC rig further down the room. Auxiliary gear positioned centrally between the Quad monitors included Surrey Electronics twin pointer PPM and Tapetalk's *The Box* stereo soundstage monitor. I have used both at countless sessions over the years and the combination presents many facets of the microphone pickup and mixing. Particularly useful for this is *The Box* and I feel it deserves wider acceptance.

Simultaneously it shows stereo positioning, stereo balance and width (including ambience width), peak levels in their position in the soundstage and when working analogue, instant assessment of azimuth. Also linked to a mixer output were a couple of Nakamichi *BX300* cassette decks to provide copies of takes for the producer to study at home.

The Bell and Howell team



had brought along their *VP-900* Digital Audio Processor and *CR-850* U-Format (U-Matic) $\frac{3}{4}$ in editing VTR. Although a full NTSC video recorder, it was designed with digital audio recording in mind and is quieter acoustically than ordinary VTRs. Fuji *H521BR* tape was in use giving the customary 1 hr runs. JVC also has a $\frac{1}{2}$ in editing VTR, *BR-8600* which uses VHS cassettes with the NTSC signal format and 2 hr continuous runs are possible. As is always prudent in any digital VTR situation a parallel safety copy was run on a second VTR. This of course made my *F1* routine very much a safety 'safety' copy! Additionally, Bart went through the precaution of winding forward and back again all the tapes he used. The *AE-900V* Digital Audio Editor was also used on this production at a later stage. (See Reviews in *Studio Sound*, August 1986.)

Miking

I have recorded for Michael Ponder with the *Mk4* Calrec *Soundfield* mic on a number of previous occasions and he has learnt to recognise, what for him in classical music is vital, a natural musical tonal balance. Playing viola in leading London orchestras for many years he has heard many playbacks with hard and brittle string sound from other miking arrangements. He likens the sound to that from the classic *STC/BBC/Coles 4038* ribbon microphone. So the objective here would be to naturally capture Brian Rayner Cook's voice in the excellent St Silas acoustic with the piano accompaniment suitably controlled. No frequency equalisation would be involved.

It is interesting to find two 'camps' regarding the function of the *SFM*; there is also a great deal of misunderstanding about it. It has been described in print as that 'four in one microphone' and on another occasion 'the all round microphone'. Verbally I've heard it called, 'that wishy washy sounding microphone'. Forget the tetrahedral array of the four capsules (the origins of 'four in one' and 'all round') and think of it merely as a stereo crossed pair of microphones. Forget also about the *Soundfield's* use for Ambisonic surround sound (the 'wishy washy' remark referring to some Ambisonic recordings sounding distant and over reverberant in stereo). The great majority of enlightened hirers use it

simply as a crossed pair for stereo and have no commercial use for its Ambisonic role.

The final crossed pair is derived from the B-Format signals. It is the manipulation of these that creates the attractive user-flexibility. There are four B-Format signals (here we go again!). They describe the sound field at the mic's position in all planes and consist of three figure-of-eight and an omni. One figure-of-eight relates to the front and back (X), one side-to-side (Y), one up and down (Z) with the omni component (W) being the fourth. It's all really an extension of the good old M&S (mid and side)! The *SFM* simply takes it further and produces a crossed pair of remote variable polar pattern and variable angle. We can also aim it by remote rotation and tilt. Even more uniquely we have 'dominance' (or 'zoom') where we can subjectively halve or double the mic to performer distance.

It follows, of course, that if we recorded the B-Format signals directly we could take up our options at a later date but here we were straight into stereo. Monitoring on the Quads on site happily gave us a fair representation of what we finally heard back at base. Physical mic stand and boom movement and adjustment of the Control Unit's controls caused us to settle on hypercardioids at 120° with a touch of rear dominance in the louder songs to get a bit more 'air' around the singer.

Balance

Classical musicians invariably put 'balance' before other recording considerations. Often, for them, it's just the balance between the different instruments. From the recording engineer's standpoint there is the added aspect of balance against the acoustic and if you consider the subject further, there are the resultant perspectives or apparent distances from the listener. In multi-instrumental set ups, the sound radiation patterns of the various instrumental designs do affect judgements of perspective and this in turn, the apparent 'balance' of the ensemble.

Here we have two instruments only—baritone voice and piano. Modern grand pianos are 'loud' instruments: to be effective in orchestral concert situations, they need to be. In duo set ups as we are considering, with the conventional arrangement of the other performer in the 'well' curve of the piano, lid fully up, and a single crossed

pair microphone, one has all sorts of balance problems. With the microphone at a sensible distance and polar pattern to get a decent perspective, in this case on the voice, balance is impossible as the piano dominates in level and will probably be too heavy in the lower registers. Move the singer further from the piano and the mic back as well and the piano perspective is all wrong; it's too distant despite being in 'level balance'. The piano, with its lid full up is launching its sound fully into the 'studio' acoustic, adding to its distant perspective. Putting the lid down or closing it partially adversely affects piano tone.

Throwing 'totally' purist techniques out of the window therefore, the scheme employed at this session was to have the piano facing away from the singer and with its lid fully raised, firing under the overhanging choir and organ balcony to reduce the amount of feed to the church acoustic. A pair of *PZMs* were fixed (the Vicar's Sellotape being better than gaffer tape which gave way at one stage) to the lid's underside around 0.5 m apart. The main mic was set up to get the desired perspective on the voice and a piano level that is just below that for 'proper' balance.

At the same time stereo positioning has to be considered. Voice in the middle and piano accompaniment half left is conventional. Certainly not one in the left speaker and the other in the right! Ambience should then be evenly distributed as far as the voice is concerned with the likelihood of piano ambience being somewhat complementary to the right of the centre soloist. Fig 2 shows the studio layout and readers will immediately guess that a certain subtlety was necessary—the main mic's left right feeds were reversed.

Back to the piano mics. Being 'close' to the piano their introduction in the mix, panned spacially left of centre, produces more than just a level balance. They bring the piano forward, particularly in the upper register as the graphic EQ in their feed has LF and lower middle roll off.

Overall the conflicting requirements of balance seemed to have been met. It is always difficult on location to know if one has got it 'right'. There's always an element of the 'committee' in making a decision. If anyone thought it sounded close I would simply say, 'there's always more ambience back at base.'

Lining up

After the JVC kit had been installed I was asked if I had an oscillator with me. I guessed that *SFM* line up tone was really being asked for. The feed comes out equally on stereo left and right if polar patterns are omni and the 'Soundfield' controls are bypassed. My custom mixer line input is zero gain and so the tone was lined up on *F1* at -15 dB on its scale (it's inaccurate and actually measures 13 dB below digital crunch). The parallel feed to the *VP-900* was made unbalanced over some 6 m of cable and this again was set up to -15 dB on the processor's scale and no doubt a genuine 15 dB below its digital crunch. This reference level facility, giving 0.1 dB steps of indication either side of the main -15 dB reference point, allowed very accurate setting of the *VP-900* input levels.

Both processor monitor outputs were connected to a line level sub-mixer back on my table. This allowed either to be monitored during recording or playback: in the *F1* case only after the D/A stage but in the JVC case as a true input feed or after the full A/D and D/A process. The Surrey Electronics PPM metering, *The Box* and *Quad 405.2/ESL63* monitoring were connected after this sub-mixer. Presets made sure that both processors produced identical levels at reference on the PPM. No comparison between the JVC and Sony was possible as there were more serious things afoot—like making the recording in the first place!

After the initial balancing of the mics I asked the performers for a 'loud' song on which to set the peak levels. This only gives a basic clue as in true takes things are often louder. Basically it indicated a nice working level some 8 to 10 dB above our lining up reference. In the event, Bart later reported that the JVC's peak hold facility showed only 1 dB below digital crunch (in both channels!) on one of the loud songs and this after I had secretly reduced the *SFM* feed a few dB and backed away with a little rear dominance.

Editing

Classical music is invariably extensively edited from the 2-channel session takes. Editing in the digital mode is, of course, essential. This is a copy system where the appropriate sections are digitally copied in sequence

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and accurately 'butted' together but with extensive rehearsal and adjustment facilities before a couple of more buttons are pressed and the thing is done for real without a razor blade in sight.

The 'de-facto' industry standard for all this is, of course, Sony's *DAE-1100* system in conjunction with the *PCM 1610/1630* recording equipment, but JVC has its *AE-900* Digital Audio Editor working with the *VP-900* processor and two VTRs. Bart Moolenbeek had set them up at Bell & Howell's premises for Michael Ponder's use. The upshot was that Ponder was shown the routines involved and then largely completed the job himself. Having done a lot of razor blade editing in the past, he took a couple of day long sessions to become familiar with the *AE-900* system. His main memory now is of speed and accuracy. Yet another classical producer had become digital editor literate!

The editing of the Coates songs was carried out with butt starts to each song, straight into the church ambience. That it doesn't show is a tribute to how low the St Silas background is. At the end of each song one has the natural decay of the acoustic, then a gentle fade down to

CLASSICAL AMBIENCE

digital silence. Four seconds later a new song is butt started according to ASV policy apparently, although I would have preferred a couple of seconds more for the wider emotions of the Coates songs.

Interestingly when Brian Rayner Cook heard the 'completed' master he wanted changes to 11 out of the 19 done. This apparently often happens with the artist taking a different viewpoint from the producer who perhaps takes the wider 'performance' view. There is a danger, Michael Ponder feels, that getting performances over 'technically' right, can result in loss of some overall 'musicality'.

Comparisons are not invidious

The JVC digital editor offers some valid 'extras' over the Sony system. It edits with a bi-polarity (BP) timecode

buried in the recorded digital information. This allows the rehearsal, prior to edit, to be done from the temporary 'chip' store, albeit in mono. This, in addition to the more usual way of running the VTRs, is quicker as the machinery does not need to be run back and forth.

Level changes can be made on the individual left or right channels, for stereo balance correction, apart from just of the stereo pair. Just as a piece of tape can be inserted into an analogue tape at an edit point to aid diagnosis of a problem, so with the JVC system it is possible to select the 'out' up to the chosen edit point and then choose the 'in' for a separate audition.

The JVC console has fewer buttons than Sony's with the fully comprehensive facilities offered by clever dual use. SMPTE timecode can be put on the conventional audio track too with the JVC's

TC-900 unit and this was done for the masters supplied to ASV. JVC also have a couple of digital standards converters allowing conversion of *VP-900* to *1610/1630* and vice versa and another that works to *EIEJ* or in other words *PCM F1/701*. Various facilities also lurk in the JVC armoury for syncing digital sound to video.

At ASV the issue number DCA567 was allocated for the LP and the appropriate JVC master sent to EMI for DMM cutting. As EMI have the JVC system in house, the DMM master was cut directly from the JVC tape. An *F1* 'lathe copy', incorporating any subtleties needed for the cut, was made and this becomes the cassette interim master, the loopbin being copied from this at the duplicating plant.

Disctec is apparently to do the CD for ASV. Initially the glass masters need producing elsewhere so Polygram will be in receipt of the other JVC master so that the CD production can get underway.

Finally, I've just found out why there was such a tight deadline. The BBC Radio 3 programme *This Week's Composer* was waiting to play six songs from the LP and that less than five weeks after Michael Ponder became digital editor literate! □

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THE BRIT ROW CONNECTION

Richard Vickers reports on UK use of MSI's sound system

Most of today's larger live sound companies have their origins in the early to mid 1970s—often the legacy of bands who belatedly realised their expensive PA equipment and road crew should be out earning money, rather than losing it whenever they stopped touring. Although a fair amount of experimentation was done by many budding designers it was usually much easier—assuming you could afford it—to buy the technology of an established designer/manufacturer such as Turner, Midas, Martin or Kelsey Morris, among others. This 'off the shelf' approach gave a company entry to a ready-made market and effectively guaranteed an income, as long as their operators came up to scratch.

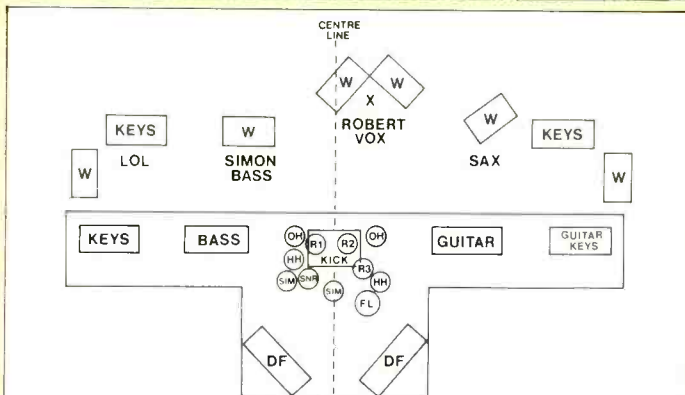
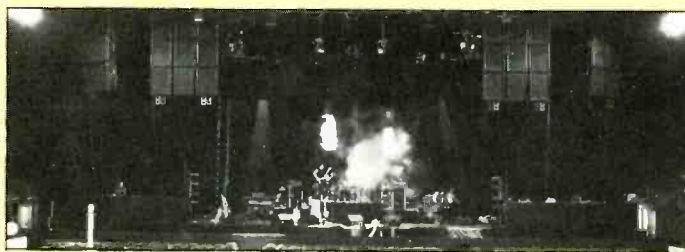
During the late 1970s and early 1980s a few companies went further. They preferred to offer a broader selection of head-end hardware rather than spend huge sums on speaker system design and construction. For a working PA company like Britannia Row, this philosophy also brought the understandably welcome flexibility to offer the 'flavour of the month' since almost any system could be sub-hired to complement a tour. When that tour finished, the theory continues, you don't have a system that's running up huge bills by sitting in someone's warehouse, looking lost.

Britannia Row has followed this policy for some years now. Originally Pink Floyd's PA company, they've used a number of systems over the years including rigs from Kelsey Morris, Court, Martin, Turbosound, Meyer and, more recently, Maryland Sound Industries whose equipment they've used to provide the sound for the Cure's recent world tour.

A cure for the system

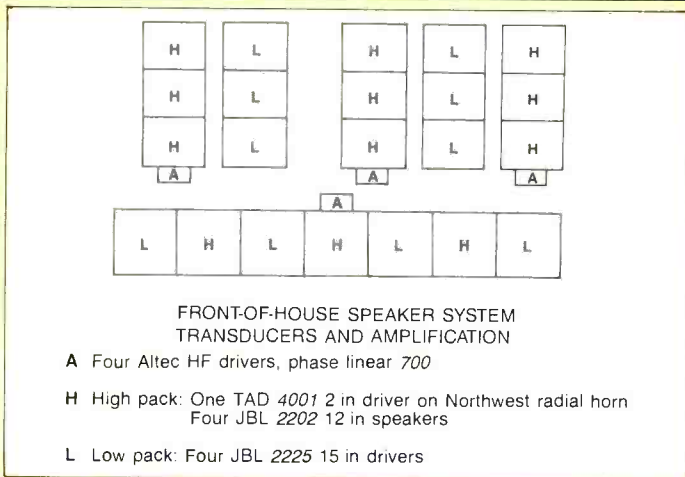
It used to be whispered that American engineers preferred to play with the mechanics of their systems rather than use their ears—if that's true, then this system is a good example of how any imbalance has been corrected these days. Equally adaptable for flying or stacking, this 23 bin-per-side modular rig has (with the exception of the flying hardware) been extremely well thought out.

During the Cure's tour



MICROPHONE CHART—THE CURE

Channel	Insert treatment	Mic type
1-3		
4 Kick drum	Compressor/noise gate	Beyer M88
5 Snare top	Noise gate	Beyer M201
6 Snare bottom	Noise gate	AKG 224
7 Hi-hat left		AKG 451 + CK5
8 Hi-hat right		AKG 451 + CK5
9 Rack tom 1	Noise gate	Sennheiser MD 421
10 Rack tom 2	Noise gate	Sennheiser MD 421
11 Rack tom 3	Noise gate	Sennheiser MD 421
12 Rack tom 4	Noise gate	Sennheiser MD 421
13 Floor tom	Noise gate	Sennheiser MD 421
14 Overhead left		AKG 414
15 Overhead right		AKG 414
16 Simmons left		XLR direct
17 Simmons right		XLR direct
18 Bass DI	Compressor	Direct inject
19 Bass guitar	Noise gate	Electro-Voice RE 20
20 Guitar stage right		Beyer M88
21 Acoustic		Direct inject
22 Lead guitar		Beyer M88
23 Keys 1 stage right	Compressor	Direct inject
24 Keys 2 stage right	Compressor	Direct inject
25 Keys 3 stage left	Compressor	Direct inject
26 Keys 4 stage left	Compressor	Direct inject
27 Sax	Compressor	Countryman
28 Vocal	Compressor	Beyer M88
29 Klark-Teknik DN 780	Effect return	
30 Klark-Teknik DN 780	Effect return	
31 AMS DMX-1580S	Effect return	
32 AMS DMX-1580S	Effect return	



set-up times proved to be exceptionally short. Micky Sturgin: "It usually took around 2 to 2½ hr to set the system up—from opening the back of the truck until cocktails!"

Or, as Steve Spencer (rigger) put it, "When you're setting up on the ground it's so easy that it shouldn't take you more than 2 hr from unloading to being ready to monitor."

Patching revisited

The heart of the MSI system lies in the patching points at the monitor position and at the front-of-house desk. From there, it's possible to access every signal at both points on the 'Tiny Telephone' patchbays. In fact, it is one of the most sophisticated hook-up and patching systems yet in a modern PA rig.

Its beauty lies in permitting extensive pre-tour patching so once the set-up's been decided it can be left untouched for the rest of the tour. All cables are 'connector-compatible' apart from the 52-pair main multi which means any cable can be used anywhere; be it in an amplifier bank, satellite input box or signal return hook-up. Even the amp banks have Molex switching for L and R input signals so after being set in rehearsals normal daily patching can effectively be forgotten.

The next step in MSI's modular story is the main multicore. The 52-pair main multi, in a 32-input situation, has enough spare lines for the crossover returns to the stage. With more inputs—as there were for the Cure—an extra 8-way cable, carrying an additional ninth pair for the intercom system, is run for the crossover returns. This creates a total of 12 tie lines for stage-return signals like monitor effects.

Micky again: "The whole set-up is based on 8-way blocks. We can insert six of them, so we have a 48-line system on stage. Then there are two record splits so I can dump the Beeb in another room with a separate line out and get their patching safe—and well away from the stage."

"The support band is what I call a 'dead patch'—it's already done. All I do is put in an 8-way pack, plug in and it's done. It takes me about 3 minutes to wire the support band. They're hooked up with Veam connectors, which are like Littons. We have to use the American technology because that's what came with the system!"

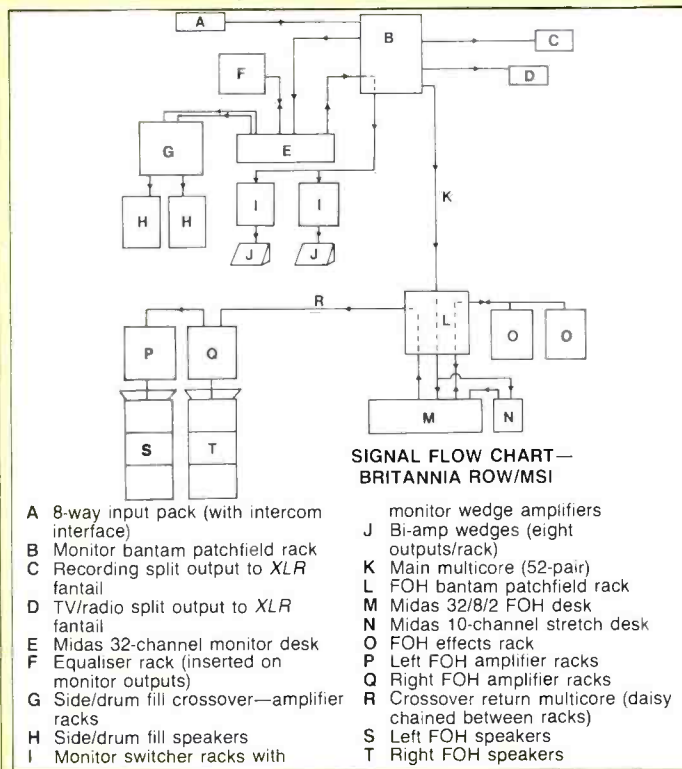
Monitoring

The monitor system set-up can only be described as superb—just two monitor racks handle all the signal processing and distribution. Each rack has eight mix distribution modules with 16 programmable sends per channel. Each module has its own limiter/compressor/crossover module which means all the essentials are contained in one 3U space at the top of the racks, just above the wedges' power amplifiers.

Drum fill signals are taken direct from the monitor desk, and fed via a BSS stereo 3-way crossover to the power amps that drive the 3-way full range cabinets.

Speakers

The standard MSI front-of-house modular cabinets come in two types: High and Low. The Low pack contains four 15 in JBL 2225s in a vented direct-radiating enclosure, driven by an SAE 500P



Steve Bater, then head of the road crew, talks to Richard Vickers about the MSI system.

RV: As a company that doesn't have to rely on any particular speaker system designer, there's a whole field of enclosure technology open to you. You have the options of either using your ears and picking the formula you like, or following market trends. So why, considering it's a concept that hasn't really changed since the early cinema bass horn/compression driver combinations, did you decide against a dedicated speaker system and hire in the technology instead?

SB: With the money and resources we have available we could certainly design a speaker system here but it wouldn't be that much better than everyone else has achieved. When we first looked at it, Clair had already done the S4 system, Turbosound had done their number and John Meyer's stuff was around; that was the level of competition. And how much did that all cost to develop—a million quid or something? So other than Dave Martin and Tony Andrews, there wasn't really anyone in the country building speaker systems.

At the same time, Dave Martin was selling his stuff quite happily to a lot of people, Turbosound ran their own rental company anyway, and it seemed that no-one could really afford to hold complete rigs—except for old

Interview

standard Martin systems. You need a whole load of control end, besides the speaker systems, so we decided to buy the control end and rent it to touring companies, which is what we've done more or less, barring the odd impasse due to desk availability.

We became pretty cynical about it really (speaker systems that is), they all work; it's a matter of particular systems for particular acts. A lot of it depends on the production requirements for that act—whether they want it flown, how much power they want, how many trucks they're using and all the rest of it. In the end, that's what really makes the difference between whether you use a Turbosound, Meyer or Martin system—the bloody cost!

RV: And you can adapt to the 'flavour of the month', whatever it happens to be. How did you come into contact with Maryland? Was that through demand from overseas acts coming here?

SB: No, it was because MSI wanted a foothold in the European market. Not because what's happening here is particularly interesting for them but because an awful lot of English and European acts tour extensively in the States, and since they wanted to extend their market in the States the natural way was to put something into Europe to pick up acts that tour regularly here.

For example, we put Roger

Waters into the States with MSI and we've just done Wham! with MSI monitoring (Showco did the front end). I can see it happening more and more.

We'll be able to introduce acts to a known American sound company over here, and at the same time we'll duplicate our UK systems in America. We'll be an attractive package for a band that's looking at a six week tour in Europe and three months in the States—which is the standard pattern if you want to make a living.

It's just what MSI were looking for—a company that specialised in control end, who therefore weren't competing in speakers and wire systems. We didn't have our own axe to grind so we were ideal for them, I should imagine.

RV: Presumably the new association between TFA and Turbosound also prompted you to look in different directions, instead of just to Turbosound who you'd used extensively before?

SB: That had been going on for a while anyway because Turbosound Rentals had lots of cabinets and their role in life was obviously to get as many as possible out of the door—not really doing tours, just shifting speaker cabinets. Their tours were incidental; they used people who could provide them with cheaper control equipment than we could, even before Mike Lowe went to TFA.

When he did go, they

amplifier. The High pack has four 12 in JBL 2202s, this time using an SAE 250P amplifier, in a vented enclosure of the same dimensions as the Low pack allowing room for the TAD 4001 2 in compression driver which is driven by a Crest 3501S and mounted on a Northwest/MSI flare.

To the standard MSI system Britannia Row later added four Altec tweeter packs a side (four drivers per pack) powered by a single BGW 750 power amp. The signal was bandpassed with a BSS 2-way stereo crossover and a Klark-Teknik DN 22 graphic equaliser.

Flying MSI

At Wembley, five vertical arrays—two Lows, three Highs—were flown each side, while four Lows and three Highs were mounted on risers either side of the stage, acting as a nearfield sound source for the audience closest to the

inherited TFA's old control systems, plus some new ones and the ones they've bought subsequently. Getting work off Turbosound was a dead duck because of their less expensive control end suppliers.

We'd already used Meyer stuff, mainly from Cane Green who are based on our premises. There's also Audio Lease, with whom we have a very good working relationship, who have Meyer stuff as well. It's just a bit more convenient to handle than Turbo stuff on some shows.

We still rent in speaker systems, of course, and in fact only last week we used a Meyer rig for a show.

We're hoping to get a smaller MSI system over to do productions that don't cost so much, in smaller places—because a lot of the MSI stuff is pretty big and is really scaled for American auditoria rather than the sort of theatres you get over here.

Basically, I don't see that as a UK company there's any need for us to beat the drum for any particular system, as long as it's as good as anybody else's.

RV: Although you say the MSI cabinets are big, they look fairly compact for the number of drivers. They seem to be based on vented cabinet theory.

SB: It's really an expansion of the Clair system, with more state-of-the-art drivers. It's devolved into two boxes by going that way—and it's a little bit more efficient. It's a

THE BRIT ROW CONNECTION

stage. Brit Row, however, admit to being dissatisfied with this aspect of the system.

"The flying thing needs working on," says Micky, "it's not very satisfactory except when it's used horizontally. We're going to solve that in the British fashion: using a wooden insert between the beams to line them up. It'll allow us to splay the cabinets as we want."

Is the reason for using a straight three bar and a straight two bar because they are not splaying?

Steve: "It's the coverage we'd have used had we been splaying. We only got the three bars from the States last Friday so we haven't been able to put it in the air and play with it. It was really a case of get it into the country, get it to Wembley and put it in the air for the show."

Sturgin said the problem would be rectified at the end of this tour, before the rig is used again.

fairly standard compact system: it's a sensible compromise. The more efficient ones seem to separate out the 15 in drivers or 18 in drivers, in some cases from the mids and high mids, the 12s and the TADs.

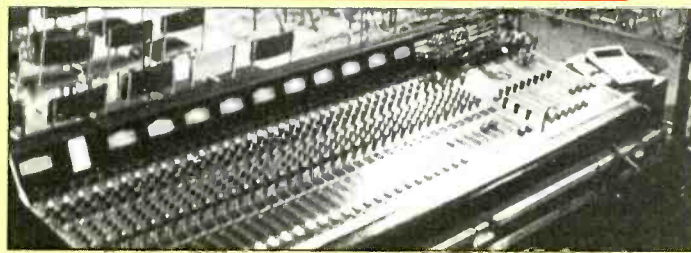
It's a very respectable system and you don't need many of them to cover fairly large venues. We had 44 cabinets in Wembley—which is probably us going over the top as usual!—but it's new for us and it's fun to put it all in. We did Crystal Palace and High Wycombe, both with space for 15 or 20,000 people—a full festival situation. We ran both with only 15 cabinets a side and they were perfectly satisfactory in terms of sound levels.

RV: I noticed you've added a few Altec High packs. Did you find the top end projection on the standard system lacking?

SB: We got concerned about them because we started blowing up TADs! With the Cure, in fact, we have probably a worst-case situation.

Roger Measham has a track record for destroying 2 in TAD drivers... (much laughter). We used a Turbo rig on the tour last year and got into a terrible state—in fact we changed over to 2445s in the end because Roger, for some reason, kept on blowing up the TADs!

There's no rational reason for this that we can tell but he destroys them. We lost a few after one of our festival



Midas Pro-4 32/8/2 main console

FOH control

All signals at the mix position were accessed from the front-of-house patchbay. The mic lines fed the Midas Pro 4 32/8/2 main console, augmented by a 10-channel Midas Pro 4 'stretch' console.

Effect send and returns, again accessed on the patchbay, were treated by eight *Kepex* noise gates (drums), three *Drawner* noise gates (brass and keyboards),

AMS 15-80S (delay vocal), *BSS DPR402* (vocal and sax), *Klark-Teknik DN 780* reverb (drums), *Lexicon Super Prime Time* (guitars/keyboards), *Eventide H949* (drums) and *Lexicon 224XL* (vocals/keyboards). Main outputs went to the patchbay and then, via a *Klark-Teknik DN 360* stereo 30-band graphic, to two *MSI HSX301* 3-way mono crossovers on the main system.

The HF signals for Brit Row's extra Altec HF packs

your speaker cables.

Using 52-pair cable from the front-of-house desk to the stage means you've got lots of tie-lines available. That means you can use the 52-pair, when you're only running a 32- or 40-channel rig, to run your returns back. You only need one cable and there's lots of space for spares to run back and forth to the stage—the effects returns or subgroup returns that are so common these days.

The system has been designed very well to take a very, very short time to rig which is why the people on the Cure tour developed such an elaborate and interesting variety of cocktails!

RV: I believe a range of effects is included in the standard package. Can you explain why MSI decided to extend these facilities to all their clients?

SB: It was what people were asking for. It's a case of 'the flavour of last year' really, and probably today you won't find so many people wanting a *Lexicon 224XL*, for example. These things change all the time but on a rig you always need a reverb, some kind of DDL and a harmoniser—and that's a pretty standard requirement.

RV: On this tour you've used Midas head end. What other options do you have?

SB: On the Cure tour we had a 32/8/2 Midas; basically, the Cure, barring effects, is a 24- to 27-channel rig which doesn't need an elaborate desk in terms of channels, though we've stretched it by 10 for

were bandpassed via a *Klark-Teknik DN 22 2x11*-band graphic and a *BSS 2-way* stereo crossover.

In conclusion

An unexpected problem for the crew turned out to be the durability of the HF drivers.

Roger Measham: "I find there's a certain frequency in the Crest amps we use for the top end that just doesn't like TAD drivers. So what I do is simply limit the top end instead of the whole system."

This last line of HF defence is provided by two dbx *160X* comp/limiters.

Finally, how does the MSI system compare with the other systems Brit Row has used?

Micky: "I think it scores over the Meyer gear in its bottom end, to be honest."

Steve: "And at the top end, with the extra Altec tweeter packs, I'd say it's certainly up to Meyer standard. It needs very little EQ—it's a very flat box." □

shows before the tour started, all of which we replaced from the States with 1985 stock because there's a bit of a historical problem at TAD. I didn't want to blow up any more so we put the Altec tweeters on.

Once we'd put these on we quite liked the sound. The HF projection in the larger shows was actually a lot better; there's a tremendous difference when you turn the Altecs off.

At Britannia Row we really have no standards—because that's what actually works!

No integrity at all—none whatsoever! (Much laughter.)

They sounded good and Roger liked them, and it stopped him destroying TADs which were really expensive, so we kept them.

We've just heard that MSI do include Yamaha tweeter packs on their small systems, just to give a bit more crispness in the high end.

RV: The whole system seems extremely well packaged—most of the cabinets are glassfibred for extended life, and so on. The routing system seemed absolutely spot on. This feature, presumably, was quite a benefit once you'd brought over the system?

SB: The wiring system on the rig is magnificent, especially on the monitoring system.

We've got 16 sends of monitoring tied up in two racks. So in a tour situation, after the rehearsal stage when you've done your patching on the patchbay it's five cables exactly—desk, switcher racks, graphics. That's it, apart from

support, to give everybody an easy time.

The Cure tour goes from the UK to America and Japan and then back, so we've used one of our medium range boards, not one of the most elaborate boards because there's no point in giving the guy a *Pro 40* all-parametric, all-singing, all-dancing board if the next thing he's going to be using is a *Soundcraft* or a *Yamaha PM2000* or whatever from the local company.

In fact in America he'll be using *MSI* but God knows what else; possibly a *Harrison* in the States. Now we've got a selection of boards at Britannia Row—*Pro 4* Midas 32/8/2s, *Pro 40* Midas 48/12/4 *Yamaha PM2000*, and access through *Maryland Sound* to *Harrison* boards, mainly to the live 32-channel units.

RV: Do clients regularly specify board types?

SB: Mostly people are interested in effects sends, and with boards like the *Yamaha PM2000* and the *Pro 40* Midas, which have six and eight sends respectively, that isn't a problem. It's the same with monitors these days, being able to access more buses is what people are interested in. They're interested in having parametric EQ, more buses and matrixes so they can run central vocal clusters and that sort of thing. And these are the kind of problems that *Pro 40* and *PM2000* boards were designed to overcome. □



The NFA-1

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BUSINESS BUSINESS



Barry Fox investigates the facts behind the industry news

Simulcasting

The way is now clear for Britain's cobweb of Independent Local Radio stations to become a network. First tests with a satellite link to let them share programmes in stereo were a success. The system was first used for routine programming early in October—a series of live sound relays from Liverpool for *Eurorock '86*, the European Broadcasting Union rock music festival.

This was a run-up to the simulcast between ILR stations and Channel 4 television on Saturday 25 October. The simulprog was a 90 minute helping of recorded highlights from the Queen rock concerts held at Wembley last July. Viewers were either able to watch on Ch 4 in mono on their conventional TV sets or mute the mono TV sound and listen simultaneously in stereo on a hi-fi radio system tuned to their local ILR station. As far as we can tell, from a muddled announcement about 'completely new joint rate cards' made in advertisementspeak by some PR people representing someone with some finger somewhere in the pie, the ILR stations get the technical kit free. And they can keep it for future relays and simulcasts.

Until now, it has been theoretically possible, but in practice far too much of a hassle, for the 46 ILR stations in Britain to team up and simulcast in stereo with local ITV stations. The coming of Ch 4 as a commercial network made things easier but still sufficiently difficult for Ch 4 to turn down the first refusal on simulcasting *Live Aid*. Almost all simulcasts to date have been done by BBC TV and national BBC radio.

Likewise the ILR stations have been networking mainly in mono since they began in 1973. They share news and some current affair programmes in mono with LBC/IRN in London. A few programmes are networked by BT lines to some stations in stereo. A few stations receive off air from neighbours and re-broadcast.

The new ILR satellite network is stereo and digital. Each station has a 1.7 m receiving dish which can pick up signals from either the Eutelsat or Intelsat communication satellites.

For *Eurorock* the sound went as an analogue pair from Liverpool to Manchester. There it was converted to PCM code by a Sony processor and dumped on a standard video waveform. British Telecom sent the signal to the Telecom Tower in London on a standard vision link. Capital and LBC took feeds direct from the Tower. For the rest of the country the signal went on to BT's satellite uplink at the Teleport in Woolwich, and from there up to Intelsat V which beamed it back down again to the ILR station dishes around the UK. Each station decodes to analogue after reception, so the signal stays in digital form over all the major transmission paths including the space link.

The first pre-broadcast tests ran into difficulty because different ILR stations were using different decoders and some were on 14 bit some on 16 bit. The standard was set at 14 bit and the only hiccup on *Eurorock* was a break in Wales. Scotland may hit problems in the future if it rains. The north of the UK is on the edge of the reception footprint, because the satellite over the equator is inevitably hanging very low in the sky up there. Water droplets in the air can tip the balance on digital signals where there is marginal reception.

For simulcasts the sound and picture signals originate from Ch 4 in London. The pictures and TV mono sound are broadcast from terrestrial transmitters, and the stereo radio sound is going on a 72,000 km round trip out into space and back before transmission by the ILR stations. This delays the stereo sound and puts it out of sync with the pictures.

It is an expensive business delaying TV pictures in real time, requiring a string of frame stores. Fortunately there's a much easier and cheaper way. Ch 4 just syncs the audio and video tapes together with a 6 frame offset. The audio stays 0.25 s ahead of the video, which cancels out the space lag.

All the advertisers have to do now is come up with some commercials which have a strong enough soundtrack to stand on their own on radio. Granada TV teamed up with Piccadilly in Manchester to simulcast a rock show relay. Piccadilly just re-broadcast the TV commercials without pictures. Some worked perfectly well. But those with a strong visual message sounded decidedly thin on radio.

Domestic audio quality to outstrip the professionals

For the first time in the history of audio, home equipment costing a few hundred pounds can generate signals which are as good as—or better than—studio gear. A compact disc player costing £200 is more accurate at recapturing signals from disc than some analogue recorders are at putting them on to tape. A £500 domestic VHS FM hi-fi video recorder outstrips the quality of the 1 in video master tapes used by most duplicators.

The old REW video duplication plant in Wandsworth (bought by Thorn-EMI in 1979, and then bought out for around £1.75 million by its managers and renamed Tapetech in mid 1986) has been trying some tricks to redress the balance. In the long term Sony has the only real answer.

Tapetech duplicates everything in hi-fi format—every cassette has FM helical scan stereo tracks as well as conventional linear tracks. Often the hi-fi track simply shows up the duff quality

of the linear track on the master tape. This is usually an umpteenth generation copy, sometimes sourced after NTSC-to-PAL standards conversion from an optical film track. Even if it's not, the linear analogue tracks of 1 in C-format video cannot match FM, even at the C-format tape speed of 24 cm/s.

The stop gap trick is to sync the 1 in master video tape with a digital audio cassette so that the analogue linear tracks on the master tape need never be used. *Beverley Hills Cop*, released a year or so ago, was the first video feature with digitally sourced sound. Instead of using a Sony *F1* and Beta cassette recorder, Tapetech use an *F1* and VHS cassette for the digital audio. They find it easier to sync VHS to the 1 in video than Beta. The surprising thing is the way that digital sourcing improves the conventional linear tracks when reproduced on a decent domestic VHS machine—proving the point that the master source has been the weakest link.

DAT would be even easier to use than *F1/VHS*. But syncing any two machines is inherently inelegant. Enter Sony's new toy, the *BVH 2800*. It achieves the apparently impossible and records linear 16 bit *PCM* stereo on a C-format tape in addition to standard format TV pictures and analogue stereo.

The key is that the C-format leaves room on the tape for extra synchronisation or cue tracks along the edge of the tape. These can tape sync pulse and teletext signals but are seldom used. They are sacrificed on the new machine and used for *PCM* audio instead. No attempt is made to record *PCM* in linear code along the sync track—in the manner of *DASH* or *S-DAT*. The *PCM* signal is fed to extra heads on the rotating video head drum. Although these scan the whole width of the tape they are switched on only for the split second when they cross the area reserved for the cue tracks. So snatches of helically scanned *PCM* are recorded across the cue track, instead of a continuous linear track. Buffer memory bridges the gaps.

The idea isn't new. Philips and Grundig tried exactly the same trick to record *PCM* sound on the now obsolete *V2000* home video format. This also had a linear cue pulse track very similar to the C-format track.

There is currently a boom in video duplication, following an industry decision to sell titles for 'under a tenner' (£10). This has shifted the emphasis away from rental and on to impulse purchase. The video duplicators have never had it so good, working every minute of every day to meet demand at around £2.50 per cassette. The clever ones will be those who invest their current profits into new technology, like 1 in *PCM* sourcing, for the future. The *BVH 2800* costs around £80,000. Sony is chuffed that Rank has ordered three. □

The quality of TC 2290 sampling is only limited by the original

The TC 2290 is the first digital delay in the world to give you 100% true-to-life sampling and delay effects up to 32 seconds. Make an A-B comparison with any analog or digital master tape or a compact disc, and your trained ears will notice the difference: there is none.



The new TC 2290 digital delay is based on a totally new converter principle. With a linear frequency response up to 20 kHz \pm 0.5 dB, an additional roll-off up to 33 kHz and a unique 100 dB dynamic range, the TC 2290 gives you a very warm, transparent and crystal-clear musical sound with no noise whatsoever.

It has 18 bit performance – better sound quality than a compact disc, a lot of new innovative effects and a price tag that reads like a misprint.

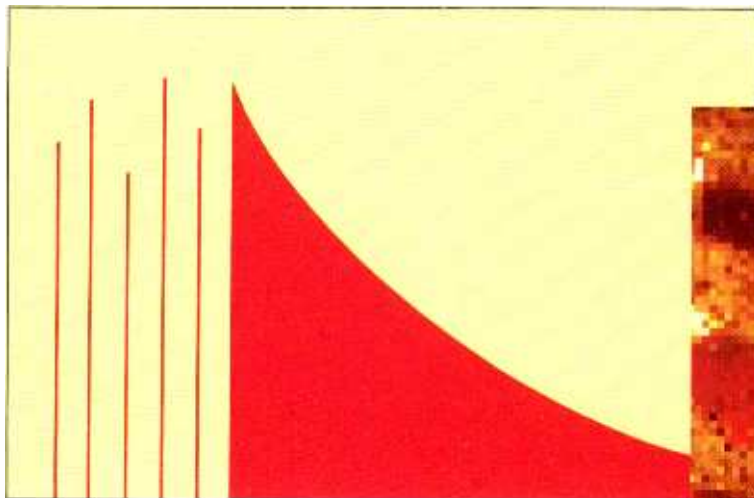
See your dealer for a demonstration of the TC standard of delay, programmable sampling with editing, dynamic delay with ducking, delayed chorus (modulation at all delay times), automatic delay panning, 100 presets and MIDI features making it possible to control the TC 2290 from a computer.

We don't expect you to remember all this. So we have put it all and a lot more in a brochure, which the dealer will let you take home as a fair second-best. Instead of the TC 2290 itself.

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New sounds only change what we hear.



Digital reverb sounded like this.

First generation digital reverb offers control over a few discrete pre-echos. These are followed by the exponentially decaying reverb envelope typical of plates or small chambers.



New approaches to ambience, imaging and sampling

The new 480L digital effects system from Lexicon was created to produce more accurate room simulations. However, within its innovative software and hardware are possibilities that extend far beyond the limits of realism: combinations of plate, gated and ambient reverbs, unique cascaded time-based effects, sampling. Personal settings can be stored and transported on RAM cartridges.

Controlled from the familiar LARC, the 480L's multiple high speed processors operate in several configurations. Samples can be processed with reverb and time-based effects, all in the digital domain. Two control rooms can use one 480L. Or two 480Ls can be connected through their digital I/O ports. A 480L can even be connected to a 224XL and both units operated from a single LARC.

Moving forward by looking back

The 480L is a generation beyond other digital processors in both hardware and software. Yet many of its advances were conceived in centuries-old con-

cert halls. Close analysis uncovered basic flaws in the usual digital techniques of ambient simulation.

In real halls, the rate of the first 15 dB of decay is crucial to the perception of spaciousness and ambience. For many listening positions, this initial decay is longer than the measurement of total reverb time would suggest. To emulate these fine old halls, it is necessary to control the initial decay independently of the overall reverb time.

Hall programs of unprecedented realism

The initial reverb envelope defines apparent room size and ambience to the ear. In real spaces, this buildup and decay is gradual, with a complex, non-exponential profile. The use of digital pre-delays does increase apparent room size, but adds unnaturally defined attacks that make the sound artificial. The 480L's SHAPE and SPREAD parameters emulate the complex profile of natural reverb. SHAPE affects the contour of the reverb envelope, while SPREAD controls the time factor for that contour. When balanced with SIZE (reverb density) and RT60 MID, SHAPE and SPREAD create deep, warm, spacious ambience without excessive decay times.

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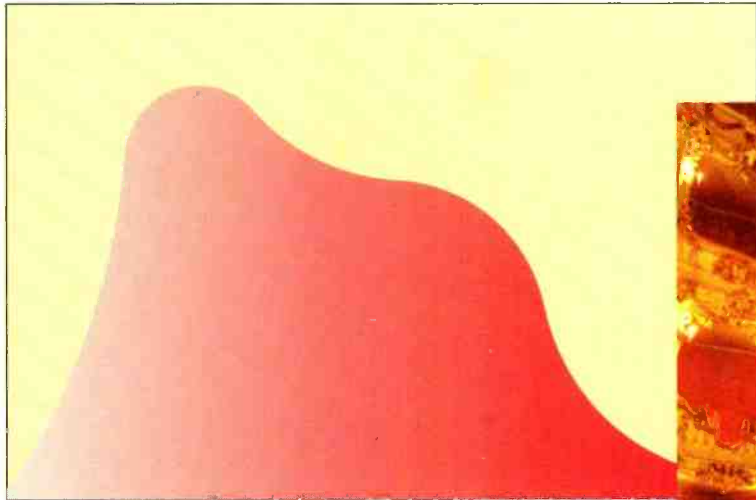
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The 480L's innovative SHAPE and SPREAD controls continuously adjust the diffused reverb profile to match the ideal ambience characteristics of a real hall — with uniquely natural pre-delay

Digital processing for digital production

The 480L is engineered for the unforgiving all-digital audio environment, with its higher standards of accuracy and dynamic range. The PCM 1610/1630 compatible *digital I/O interface* lets you add true stereo ambience and sampling, *all in the digital domain*. 18 bit linear internal architecture and converters produce a wet signal dynamic range of 98 dB. Now you can add reverb without adding noise — even on a digital master.

The next stage — and beyond

Right now, the 480L is a powerful and dramatic step forward in digital signal processing technology. Yet its present software doesn't strain the architecture, which is itself designed for future hardware additions. If you need continually expanding creative options more than disposable packages of cliché sounds, experience new possibilities. Treat your ears — and your imagination — to an hour with the new 480L Digital Effects System from Lexicon.



Gexco International Inc. is the worldwide distributor of the Lexicon 480L and other high quality products for the recording, broadcast and postproduction industries

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REVIEW REVIEW

A technical report by Hugh Ford

WANDEL & GOLTERMANN NFA-1



The Wandel and Goltermann *NFA-1* when fitted with all the available options is a truly multi-purpose audio measuring instrument capable of measuring level, frequency selective level, weighted and unweighted noise, phase, wow and flutter, turntable rumble and other functions.

Also included in the instrument is a generator which produces sine waves from 15 Hz to 60 kHz with the analyser section generally covering 15 Hz to 200 kHz. In addition to sine waves the generator can be switched to give a CCIF type twin tone output which may be swept or switched to give a simultaneous output of 17 different tone frequencies and levels useful for the rapid determination of frequency response with a suitable analyser such as the *NFA-1* itself.

Housed in a heavy duty case suitable

for rack mounting the instrument is 6 U high and fitted with substantial carrying handles, however, its weight, puts the instrument in the bracket of 'just portable'.

Mains power is applied at the rear via an IEC connector with a nearby screwdriver-operated tap changer covering 110 VAC to 227 VAC operation and a properly identified power line fuse. A small compartment near the fuse contains a miniature tool box containing a spare fuse and various tools for such operations as removing printed circuit boards.

The only controls at the rear are a potentiometer for adjusting the brilliance of the front panel CRT display and a DIL switch associated with the IEC 625/IEEE computer interface when this is fitted. BNC sockets provide a composite video output suitable for a video printer or external monitor, an input and output for

an external filter, the fixed internal 10 MHz frequency reference and the 4 MHz to 6 MHz variable frequency used in the heterodyne analyser section.

The remaining user features at the rear are the Amphenol connector for the IEEE computer interface and two further Amphenol connectors providing analogue outputs from the wow and flutter section (when fitted) and the analogue output from the analyser section.

On the lower front panel the floating audio outputs are available at twin 3-pole CF connectors for the two audio channels. These connectors are fortunately compatible with 4 mm banana plugs but not on the standard $\frac{3}{4}$ in spacing. *XLR* connectors are available as an option. A third generator output is available unbalanced and at 6 dB lower level at a BNC socket.

The analyser inputs have a similar arrangement to the generator outputs, without duplication of the CF connectors, providing twin-channel balanced inputs plus a third unbalanced input.

Selection of the desired inputs and outputs is by momentary pushbutton switches at the base of the front panel which is sloped for operator convenience. Each switch has a green LED to indicate the operational channels which may be the unbalanced connection or any combination of the two balanced/floating connections.

Further pushbuttons with annunciator panels select the input and output impedances with the ability to monitor the output voltage as generator EMF or output terminal voltage into the currently selected load impedance under software control. The minimum output impedance approximates 10 Ω with the selectable impedances being 150, 200 or 600 Ω with the output level reading relative to 1 mW into 600 Ω or the minimum impedance and 150 Ω whilst reading with reference to 1 mW into 150 Ω .

A similar arrangement exists at the inputs which may be terminated in 150, 300, 600 or approximately 100k Ω whilst reading with reference to 1 mW into 600 Ω , or 150 Ω and the maximum impedance whilst reading with reference to 1 mW into 150 Ω .

Now to some driving instructions. The instrument communicates with the operator via a 5 in wide green CRT which displays text or text plus graphical data to the left of the front panel. To the immediate right of the CRT is a vertical row of six unidentified pushbuttons with two separate buttons being labelled MENU MODE and AUX PARAM. At switch-on a self test routine is entered followed 15 s later by a display of the last measurement performed. At this stage pressing MENU MODE is the first process in selecting a new test which produces the following display where X corresponds to the vertical array of pushbuttons.

MANUFACTURER'S SPECIFICATION

Editor's note: this is an edited version due to the length of the specification. Further details are available from the manufacturer or agents.

Result display

Numerical and graphical display on 7 in flat screen.

Resolution in graphics area: (wh) 248x241 pixels.

Selftest

Automatically checks the whole digital section when the *NFA-1* is switched on. Automatic calibration is carried out at regular intervals, so checking important test circuits.

Set-up memory

Non-volatile storage of up to 49 user definable front panel set-ups.

Additional inputs and outputs

Input and output for external filter. Output for 10 MHz standard frequency. Video output (composite video signal, BNC connector).

Wideband level output (multiple connector).

Sound recorder measuring section

For special measurements on sound recorders, eg tape recorders and record players, etc. to DIN 45507, IEC 386, NAB, JIS.

Test signal frequency: 2820 to 3310 Hz.

Level range: -50 to +30 dB.

Measurements ranges 1, 2 and 5: 0.05% to 10%.

Resolution of digital display: to 0.001%.

Statistical evaluation: calculates and displays sigma digitally.

Spectral analysis of frequency variations: frequency range 0 to 120 Hz.

Drift: measurement range $\pm 10\%$, resolution of digital display 0.01%.

Run-up time (the time taken for frequency variations to fall below a certain settable limit): measurement interval 1 to 10 s, resolution of digital display 0.1% of measurement interval.

<IEC 625> interface board

With connectors to IEEE 488 or to IEC 625 with IEEE 488/IEC 625 adaptor S 832.

General specifications

Power supply: nominal ranges of use of AC line voltage, switchable—110/117/127/220/227/235 V, -12% to +10%, nominal range of use of AC line frequency 47.5 to 63 Hz.

Power consumption: approximately 120 VA. Safety class to IEC 348 and VDE 0411: class 1. Data retention: a built-in, trickle-charged NiCad ensures that set-ups stored in memory are not lost.

Ambient temperature: nominal range of use: 0 to +40°C, storage and transportation: -40 to +65°C.

Dimensions: (whd) bench version 477 x 288 x 434 mm, 19 in frame (6U) 443 x 264 x 379 mm, 19 in conversion kit BN 700/00.06.

Weight: (including options) approximately 30 kg. Manufacturers: Wandel & Goltermann GmbH & Co, Postbox 45, D-7412 Eningen uA, West Germany. UK: Wandel & Goltermann Ltd, Progress House, 412 Greenford Road, Greenford, Middx. UB6 9AH.



IN THE PAST WE HAD A BIG ADVANTAGE OVER THE COMPETITION. NOW WE'VE GOT A SMALL ONE.

Until UREI's 813 Time Align® Monitor entered the studio, speaker systems had become a "smear" on the industry. A "time smear," in which high and low frequencies subtly assaulted the ear because they arrived out of sync. The results were general listener fatigue and unrealistic sound, particularly on lead instruments and vocals.

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REVIEW REVIEW

- SELECTIVE LEVEL _____ X
- WIDEBAND LEVEL & PHASE _____ X
- NONLINEAR DISTORTION _____ X
- NOISE LEVEL _____ X
- SOUND RECORDER MEASUREMENTS _____ X
- SPECIAL MODES _____ X

Pressing the appropriate pushbutton then selects the broad category of test to be performed and displays a secondary menu which details the test to be done as follows.

- SELECTIVE LEVEL _____ X
- vs FREQUENCY _____ X
- vs GENERATOR LEVEL _____ X
- vs TIME _____ X

- WIDEBAND LEVEL & PHASE _____ X
- vs GENERATOR FREQUENCY _____ X
- vs GENERATOR LEVEL _____ X
- vs TIME _____ X
- vs MEASURED FREQUENCY _____ X

- NONLINEAR DISTORTION _____ X
- HARMONIC DISTORTION _____ X
- DIFFERENCE FREQUENCY DISTORTION _____ X

- NOISE LEVEL _____ X
- VOICE CHANNEL _____ X
- SOUND PROGRAMME CHANNEL _____ X

- SOUND RECORDER MEASUREMENTS _____ X
- WOW & FLUTTER _____ X
- RUN-UP TIME _____ X
- RUMBLE _____ X
- FIM _____ X

Somehow the manufacturer has forgotten to give the special mode an inbuilt title but this is what it offers.

- FREQUENCY OFFSET _____ X
- GENERATOR ONLY _____ X
- STATUS _____ X

With the exception of the latter menu the possible measurements are so far obvious and in most cases pressing the selector button proceeds to a display of graphical data and text. The frequency offset function provides a display of frequency up to 200 kHz versus time with a maximum resolution of 10 Hz full scale. The display may be set to actual frequency or relative to a reference frequency in the range 1 kHz to 5 kHz.

In the GEN ONLY mode the generator sweep speed and level may be controlled and the sweep speed is faster as the frequency steps are not controlled by the analyser section. In practice both the sweep speed, frequencies and levels are user determined.

The third special mode, STATUS, simply displays the current software update and which options are fitted to the unit plus the IEEE bus address.

In the modes where the unit does not proceed to graphical data, which are the nonlinear distortion, wow and flutter, and run-up modes, a further menu is displayed. Either harmonic or twin-tone distortion may be plotted versus time, versus generator level or versus received total level in addition to which harmonic distortion may be plotted versus fundamental level or individual harmonics plotted. Also twin-tone distortion may be plotted versus the lower frequency.

The third menu options with wow and flutter include the opportunity to plot wow and flutter versus time, to display the statistics 1 sigma, 2 sigma and 3 sigma or to plot the wow and flutter spectrum over ranges 0 to 10 Hz up to 10 to 1000 Hz in a 1:2:5 sequence.

In the rumble mode the spectrum may be similarly displayed with an upper frequency limit of 100 Hz in addition to the option of displaying rumble versus time.

A typical display is shown in Fig 1 where the level difference between the two input channels and the phase difference are displayed from 20 Hz to 20 kHz. Also displayed are the generator level and frequency at the bottom of the display plus the receiver level difference and phase difference between the two input channels—whilst the latter are blank in the diagram their use will be dealt with later.

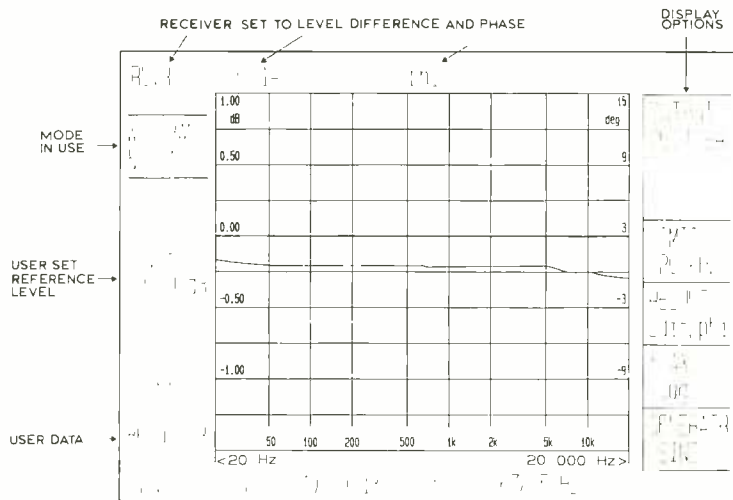
To the left of the display is the current mode, the user defined system level in dB relative to 0.7746 V and user data which may consist of up to eight numeric characters or the characters 'm', 'k', '.' or '-'.

To the right of the display are six boxes which correspond to the six pushbutton switches to the right of the display. The top box always shows OUTPUT PLOTTER until the top button is pressed. This allows the complete display or just the currently plotted curve to be dumped via the IEEE interface to any Hewlett-Packard GL (Graphics Language) compatible plotter without the use of a controller. The possibility of just dumping the current curve allows any number of curves to be very rapidly overlaid.

The additional five boxes vary in function depending upon the current menu in use with operation of the adjacent buttons changing parameters.

Returning to the MENU buttons the AUX PARAM button produces a display as follows.

FIG 1 NFA-1
GENERATOR LEVEL AND FREQUENCY



REVIEW REVIEW

MEASURING SCALE, REFERENCE _____	X
Y SCALE _____	X
X SCALE, AUTOSTOP _____	X
	X
	X
SPECIAL PARAMETERS _____	X

The top three of these selections are used for the setting of initial plotting scales for the current measurement mode and include facilities for single sweeps and continuous sweeps, etc, whilst the SPECIAL PARAMETERS allow entry of user data into the display, change between English and German language in the display and allow the oscillator EMF or terminal voltage into the rated

load to be displayed. In all cases it is possible to revert to the standard values as preset in the instrument with two keystrokes.

These, and other functions operate in conjunction with a decimal keyboard to the right of the display, which also includes the characters 'k' and 'm' which may be used as multipliers, a full stop (decimal point), a minus sign, a CLEAR button and an ENTER button.

A secondary function of the keyboard buttons is to change the displayed range and scaling whilst the existing plot is retained. Thus a measurement may be taken with any scale and then converted to another scale for detailed examination. For instance the full scale Y deflection can be varied between 2.5 dB and 100 dB with the selectable range being from

-250 dB to +150 dB. It was, however, found that these functions were rather slow in operation.

A further, and very important use of the keyboard, is the ability to store and recall up to 49 test settings in a battery backed memory. This operation is accomplished by an extremely simple set of keystrokes. In order to store or recall set-ups either the STO or the RCL buttons are pressed which results in four sets of three column displays.

The display shows the occupied store numbers in sequence, a code number for the function in each store and the percentage memory that it occupies. At this stage the desired store number is entered from the keypad and ENTER pressed. The desired store is then filled or recalled as desired.

Any attempt to write into an occupied store fails with a 'beep'. Store may be emptied by entering the desired store number preceded by a minus sign. Whilst this is a quick and simple method to use it does have the disadvantage that it is necessary to remember or write down the measurement function entered into each store.

So far I have not mentioned the methods of setting levels and frequency of the measurement or the measurement modes for each test. Three pushbuttons with adjacent LEDs select the measurements modes to MANUAL, AUTO STEP or HOLD. The auto step mode automatically steps or sweeps frequency with the ability to stop at any point by using the hold button, whilst in the manual mode there are two ways of setting frequency.

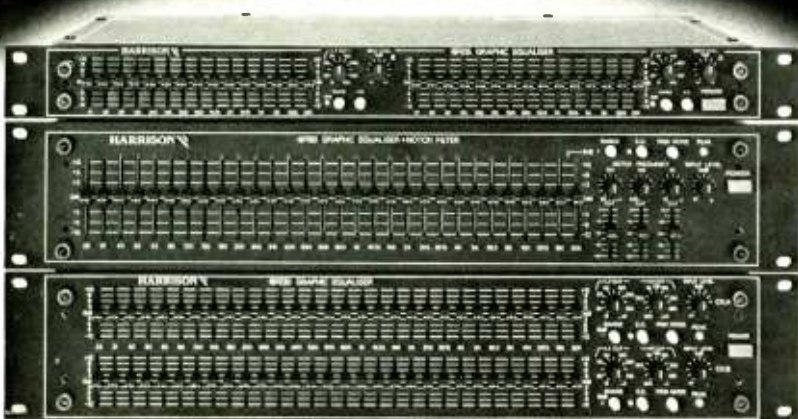
The first method sets also generator level and each involves the use of four pushbuttons in vertical array. Pressing the f or the L button shows the frequency or level section in the display in reverse video and allows direct entry of parameters from the keyboard.

Below these buttons are delta f and delta L buttons which are used to set frequency and level steps originating from the arrow up and arrow down buttons underneath. The delta frequency increment button may not however be used when plotting against frequency and the level increment buttons may not be used when plotting against generator level.

Other than the local/remote button which switches the IEEE interface we come to the final operator feature which provides a cursor function and also an analogue frequency setting facility. By means of a 360° control the generator frequency may be swept in 0.5 Hz steps up to 20 kHz and in 30 Hz steps at higher frequencies or the analyser sections swept in 1 Hz increments with the control having coarse or fine sensitivity.

Where appropriate the control may also be used to set the analyser frequency and it may also be set to a cursor function

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when a vertical line enters the display as shown in Fig 2. Turning the 360° control then moves the cursor along the X axis whilst displaying the cursor frequency (or whatever function is displayed on the X axis) at the bottom of the display and the reading at the cursor's position at the top of the display.

Inputs and outputs

The impedances of the audio inputs and outputs were checked against their nominal impedances and were found to be very close to nominal (see Table 1).

The common mode rejection at the input was typically very good as shown in Fig 3 with the balance at the outputs being (in terms of voltage difference to output level) 71 dB at 1 kHz falling to 47 dB at 20 kHz and 46 dB at 60 kHz.

The maximum available generator level in the sine wave mode was found to be +26.01 dB reference 0.775 VRMS (15.47 VRMS) variable in 0.01 dB steps down to -77 dB (109 μV) with the output at the unbalanced BNC connections being 6 dB lower. In the two-tone and 17-tone modes the same peak to peak output levels are available.

When the system is set to read the

level into the rated load the displayed levels are a further 6 dB lower with the balanced or unbalanced outputs in use correcting the levels at the start of a test. If the output in use is changed during a test the displayed level does not take account of the change and could cause confusion.

Both the maximum readable input level of +32 dB.7V (30 VRMS) and the maximum rated input voltage are too low for some applications such as measurements on high power amplifiers where at least twice this input voltage capability is essential. Also there is, in some circumstances, an interaction between the outputs with the load on one output affecting the level at the second output.

The external filter output at the rear panel had a source impedance of 603 Ω delivering a level -20.13 dB below the input level irrespective of the filter switching. The external filter input was activated by the internal switching and had an impedance of 595 Ω.

The 10 MHz clock output delivered a sine wave of 1.43 Vp-p amplitude from a source impedance of 75 Ω and the frequency accuracy was within 0.000,023%. At the variable frequency

4 MHz to 6 MHz output the frequency was 4 MHz+(2× the analyser tuned frequency) in the form of a 1.74 Vp-p square wave having a rise time of 40.6 ns and fall time of 32.8 ns from a source impedance <75 Ω.

On the monitoring side three outputs are available at the 14-way Amphenol connector. These are AC and DC wideband outputs before the detector—these outputs can be autoranged and are after any noise weighting. The third output is approximately 240 Hz output present in the selective modes with the amplitude corresponding to the measured value. The final output is the composite video output which delivered approximately 1 Vp-p into 75 Ω using the 50 Hz 625 line video standard with negative syncs.

Generator performance

The frequency accuracy of the generator section was excellent. Furthermore the accuracy of the output level reading had a worst case error of 0.02 dB over the output level range +26 dB to -77 dB reference 0.7746 V with the minimum output level steps of 0.01 dB also being beyond reproach.

In the twin-tone and the multi-tone modes of operation the level difference between the tones was less than 0.1 dB with the typical overall flatness of the generator varying slightly with output level. Fig 4 shows the measured results from 15 Hz to 60 kHz at +30 dB out where the deviation up to 20 kHz was <±0.02 dB reference 1 kHz.

Harmonic distortion was at a very low level but the generator output contains non-harmonically related products which restricts its use as a source for

FIG. 2 NFA-1
CURSOR FUNCTION

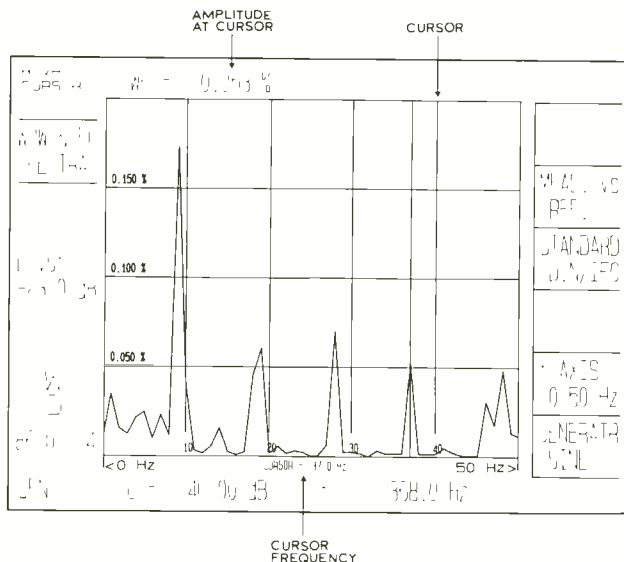


FIG. 3 NFA-1
CMR OF INPUT 'A' MATCHED TO 600 Ω

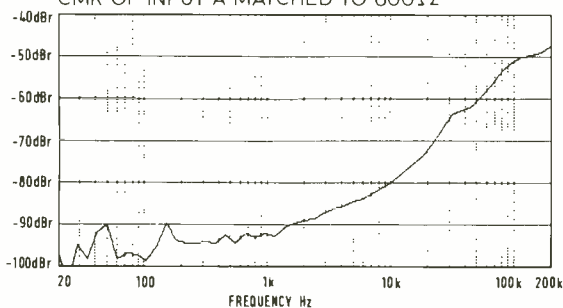
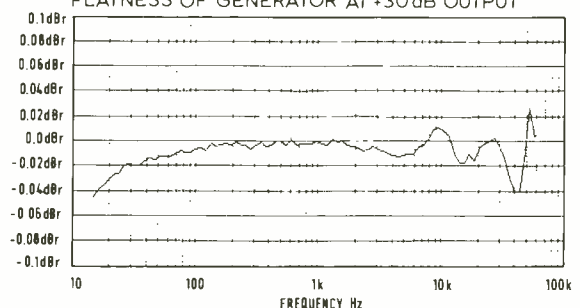


TABLE 1

Nominal output impedance	Actual impedance		
	Ch 1	Ch 2	Ch 3 (BNC)
600 Ω	600.8 Ω	600.7 Ω	599.2 Ω
200 Ω	199.4 Ω	199.2 Ω	199.8 Ω
150 Ω	149.6 Ω	149.5 Ω	149.9 Ω
Low	11.8 Ω	10.2 Ω	5.3 Ω

Nominal input impedance	Actual impedance		
	Ch 1	Ch 2	Ch 3 (BNC)
100 kΩ	100.2 kΩ/100 pF	99.9 kΩ/80 pF	99.9 kΩ/95 pF
600 Ω	607.9 Ω	607.2 Ω	607.2 Ω
300 Ω	302.6 Ω	302.6 Ω	302.6 Ω
150 Ω	150.7 Ω	150.8 Ω	150.9 Ω

FIG. 4 NFA-1
FLATNESS OF GENERATOR AT +30 dB OUTPUT



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measuring THD plus noise (see Table 2).

Fig 5 gives some idea of the output 'noise' with the generator set to 1 kHz where many high frequency products are clear in the output, these often varied with the generator frequency and were not harmonically related to the fundamental.

In the twin-tone CCIF intermodulation distortion mode the residual distortion products were all at <0.0032% (-90 dB) at either +20 dB or 0 dB output.

The generator on/off switch isolated the outputs by >120 dB at any frequency at the floating outputs with the individual output on/off switches giving better than 100 dB isolation at any frequency or 120 dB at 1 kHz.

Level reading

In the wideband mode the level accuracy from 15 Hz to 200 kHz is shown in Fig 6

for 0 dB and +20 dB input with the averaging time set too long to stabilise the 15 Hz measurement. The accuracy from 40 Hz to 20 kHz is far better than the manufacturer's specification of ± 0.1 dB.

The frequency counter remained in action and was accurate to the internal frequency source down to -40 dB input, below which it promptly indicated 0 Hz thus eliminating erroneous readings.

The accuracy of level measurement was within 0.1 dB down to -74 dB in the 200 kHz bandwidth mode increasing to 1 dB at -80 dB or in the 20 kHz bandwidth mode within 0.1 dB down to -90 dB increasing to 1 dB at -96 dB in the 20 kHz bandwidth mode. In the two bandwidths noise was at -105 dB and -115 dB with the input shunted into 150 Ω .

In the selective mode the

characteristics of the filters were plotted at 1 kHz and are shown in Fig 7 where the amplitude alignment is precise and the bandwidth very accurate as shown in Table 3.

In the narrow bandwidth modes the instrument is restricted by its 1 Hz resolution but there are few applications where this may be of significance.

Distortion modes

In the distortion mode the instrument acts as a heterodyne analyser using the above manually selected bandwidths or in an automatic mode. In either case it is possible to measure individual harmonics up to the 9th harmonic provided they are below the upper measuring limit of 200 kHz.

In all cases the residual harmonic distortion was far below the specified -80 dB (0.01%) for the analyser and

TABLE 2

Frequency	0 dB Output			+20 dB Output		
	2nd	3rd	Total+N*	2nd	3rd	Total+N*
1 kHz	0.002%	0.001%	0.018%	0.005%	0.001%	0.008%
10 kHz	0.001%	<0.001%	0.014%	0.005%	<0.001%	0.008%
20 kHz	0.005%	<0.001%	0.015%	0.005%	<0.001%	0.014%
60 kHz	0.005%	<0.001%	0.11%	0.005%	<0.001%	0.047%

*100 Hz to 80 kHz up to 20 kHz then 400 Hz to >500 kHz at 60 kHz

TABLE 3

Nominal bandwidth	Level at peak	-3 dB points	Bandwidth
100 Hz	-0.06 dB	948/1044 Hz	96 Hz
30 Hz	-0.04 dB	985/1014 Hz	29 Hz
18 Hz	-0.04 dB	991/1009 Hz	18 Hz
12 Hz	0.00 dB	994/1006 Hz	12 Hz
6 Hz	-0.07 dB	997/1003 Hz	6 Hz

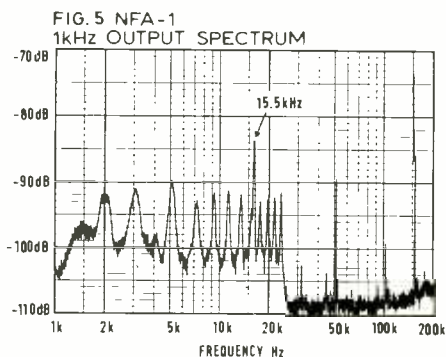


FIG. 7 NFA-1 FILTER CHARACTERISTICS AT 1kHz

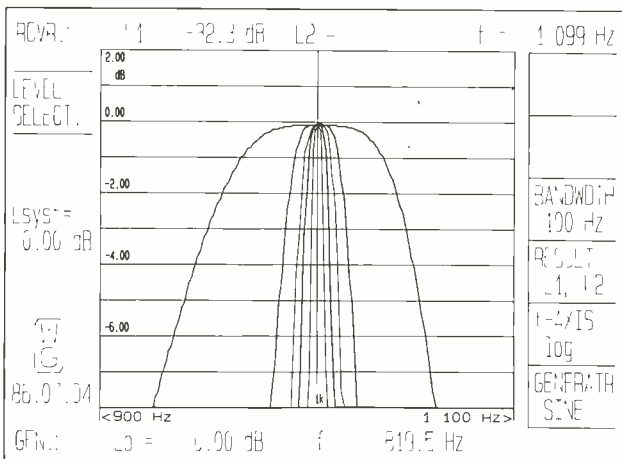


TABLE 4

Frequency	2nd harmonic	3rd harmonic	Total 2nd to 9th
100 Hz	0.005% (0.003%)	0.007% (0.002%)	0.012% (0.006%)
1 kHz	0.002% (0.002%)	0.003% (0.001%)	0.004% (0.002%)
10 kHz	0.006% (0.001%)	0.001% (0.001%)	0.009% (0.002%)
60 kHz	0.012% (0.002%)	0.003% (0.001%)	0.002% (0.002%)*

*2nd to 3rd at 60 kHz

FIG. 6 NFA-1 WIDEBAND MODE LEVEL ACCURACY

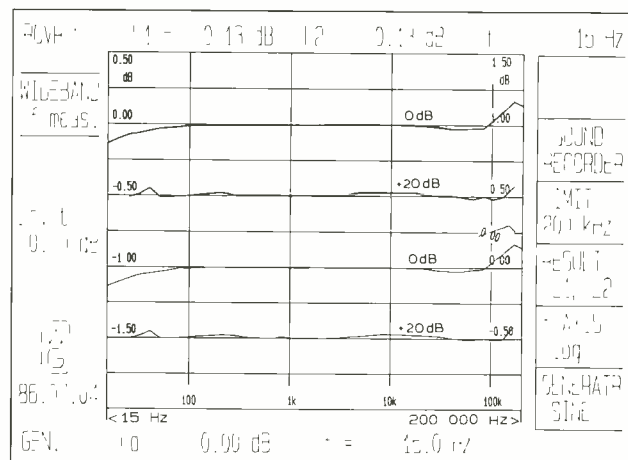
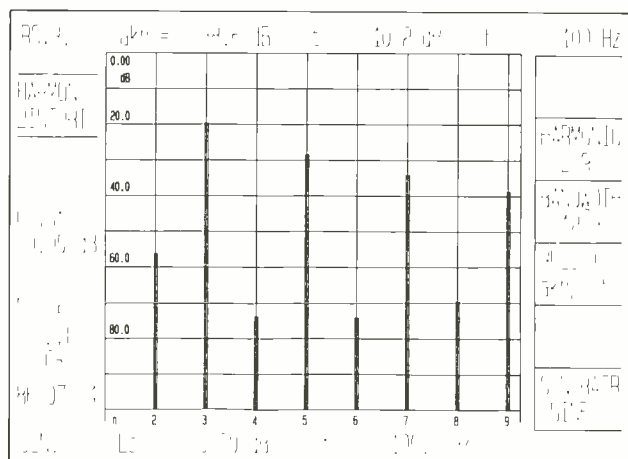


FIG. 8 NFA-1 INDIVIDUAL HARMONICS



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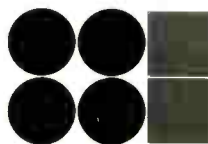
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generator up to 20 kHz with Table 4 showing the instrument's residual at 0 dB level and in brackets the analyser's residual when fed by a very high quality oscillator. A particularly nice feature is that harmonics can be plotted versus frequency or level and individual harmonics may be plotted as in Fig 8.

In the CCIF twin-tone intermodulation distortion mode it is possible to measure the individual second and third order products (f_2-f_1 or $f_1-(f_2-f_1)$) but the upper frequency is restricted to less than 20 kHz which is a limitation. Unlike instruments that simply measure the second order products using a low pass filter, the use of a heterodyne analyser allows measurements at low frequencies.

The residual distortion is not particularly low but typical of a heterodyne analyser. The figures for an 80 Hz difference frequency are given in Table 5.

Noise measurements

The review sample was fitted with the CCITT P53 'telephone' weighting, the CCIR Recommendation 468 weighting and the CCIR unweighted curves all of which were remarkably accurate in level setting at 1 kHz and in frequency response, the CCIR weighted curve being within better than 0.11 dB of nominal at all frequencies.

Further optional filters are available covering the IEC A-weighted measurement, a 400 Hz high pass filter and a 1 kHz notch filter for measuring quantising noise in digital systems.

The residual noise was not exceptionally good but adequate for most applications. Table 6 relates noise to 0.7746 VRMS.

Checking the effective ballistics of the

quasi-peak metering to CCIR Recommendation 468 showed that it was generally within specification but just outside limits on the 10 bursts/second of 5 ms bursts of 5 kHz tone where the reading was -3.6 dB against the standard limits of -2.9/+1.7 dB. It should be noted that many digital instruments do not comply with the standard.

Wow and flutter

This instrument is probably the most comprehensive wow and flutter analyser available, measuring wow and flutter to the three standards of interest with a variety of bandwidths. Furthermore the unit may display wow and flutter versus time, wow and flutter as a spectrum and a statistical analysis of wow and flutter whilst also showing one, two and three sigma values.

In all modes the cursor is available for detailed examination of the displays with more than adequate resolution. Fig 3 shows the common weighting curve for IEC, NAB or JIS measurements, the tolerances on the weighting being about a quarter of those permitted in the IEC standard.

The remaining curves permit the analysis of wow, flutter or wideband flutter components up to 1 kHz. The analysis can be performed by a fast Fourier transform (FFT).

Indicated values of steady wow and flutter were within 1.5% of actual with the residual within the instrument being only 0.002% worst case allowing very accurate readings of practical devices.

While it is not difficult to achieve the NAB and JIS rectifier characteristics in a digital instrument it is not very easy to meet the IEC peak measurement

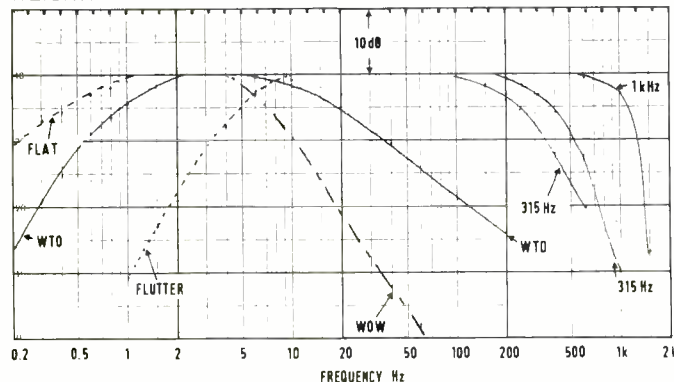
TABLE 5

Frequency	Generator		Overall	
	Residual	2nd	Residual (2nd/2nd+3rd)	
20 kHz	0.007%		0.008%/0.019%	
10 kHz	0.003%		0.006%/0.011%	
5 kHz	0.003%		0.003%/0.01%	
3 kHz	0.0025%		0.005%/0.006%	

TABLE 6

Measurement	Residual noise reference 0.7746 VRMS	
	CCIR	CCITT
Unweighted RMS	-96.6 dB	-97.0 dB
Weighted RMS	-102.6 dB	-122.5 dB
Unweighted peak	-96.4 dB	-97.0 dB
Weighted peak	-102.5 dB	-122.0 dB

FIG.9 NFA-1
WEIGHTING CURVES



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requirement. This instrument was, however, well within the IEC standard for unidirectional bursts of frequency modulation.

In the run-up time mode the instrument plots the instantaneous frequency deviation as seen through the selected weighting filter versus time, a relay being operated at the start of the sweep in order to start the device under test. Thus, the frequency weighted wave form of the wow and flutter components are plotted.

Rumble and FIM

The IEC, NAB and DIN rumble measurements all use the same filters with the NAB measurement using the DIN 'unweighted' characteristic. Both these filters were well within the standard limits from 10 Hz to 1 kHz but appeared to be outside limits at the extreme frequencies of 2 Hz and 3.15 kHz.

As is standard an average responding rectifier is used with the NAB measurement using the standard VU characteristics and the IEC (DIN) measurement using a longer time constant.

Residual rumble in either mode was, reference 0.775 VRMS, -57 dB weighted or -51 dB unweighted when measuring rumble versus time. In the rumble spectrum analysis mode using the FFT analyser the residual rumble was around -65 dB but with 50 Hz and 100 Hz components appearing at -53 dB as shown in Fig 10.

Practical rumble measurements are always limited by the test discs available and even if original acetates are used this is a limitation. A rather clever mechanical device is available from Thorens, however, known as a 'Rumpel-Messkoppler' (rumble measurement coupler). This overcomes the problems of test discs with certain limitations.

A less often used measurement on turntables is that of FIM (Frequency

InterModulation distortion) which is a form of frequency modulation which arises from tracking and tracing errors. A test record containing 3 kHz and 300 Hz simultaneous tones is used and the resultant frequency modulation of the 3 kHz tone examined in the nominal band 270 Hz to 330 Hz and displayed versus time as if it were wow and flutter.

The actual band was found to have -0.5 dB points at 218 Hz and 492 Hz falling to -3 dB at 379 Hz and 167 Hz and then falling at -12 dB/octave with the instrument being completely insensitive to amplitude fluctuations.

Whilst the display extended beyond 10% FIM this was the maximum that could be measured with the measurement accuracy being excellent and the residual FIM being 0.002%.

Phase measurement

Whilst phase measurements may be displayed from 10 Hz to 200 kHz the accuracy of the display outside the specified 15 Hz to 20 kHz is significantly decreased. Within the specified range the phase errors were found to be less than 1° but at 200 kHz the phase indicated could be up to 7° in error.

As instrument users tend to believe what they see measured it would be wise to have some indication on the display that such errors may be present when out of range phase measurements are made, or alternatively for the display to be blanked when out of range.

Bus control

The instrument is available with either the IEEE Amphenol type connector or the 25-pin 'D' connector used by the IEC standard, the control lines being identical in function. As is usual the address of the instrument is set by a dual in line (DIL) switch but this includes three extra functions. The LON switch tells the instrument to act as a listener only, the TOL switch tells the instrument to act as a talker only such

that it addresses a plotter on address 29 or a printer on address 30.

The third switch SC has the rather more complicated function of telling the instrument to act as a system controller such that it addresses a plotter on address 29 or a printer on address 30. This may be done whilst the instrument is used with a controller provided that the controller allows the interrupt system to prevent other bus activity while the instrument is acting as a controller.

With the exception of the cursor function virtually all parameters that can be set manually may be set by the controller by means of (sometimes rather complicated) alphanumeric strings, however, setting the basic measurement modes is extremely simple. All that is necessary is to output 'M' for mode followed by a string of numbers representing the key sequence of the six keys next to the display. For instance to set for a wow and flutter spectrum the sequence 'M,5,2,4,' is output.

As the instrument responds to a parallel poll it is possible to determine its status at any time, furthermore, measurement data from all measurement points is available for processing.

In common with other IEEE controlled instruments writing software is a time consuming occupation and the internal storage will deal adequately with many laboratory measurements. Wandel and Goltermann do, however, offer a service for writing 'bespoke' software.

Conclusions

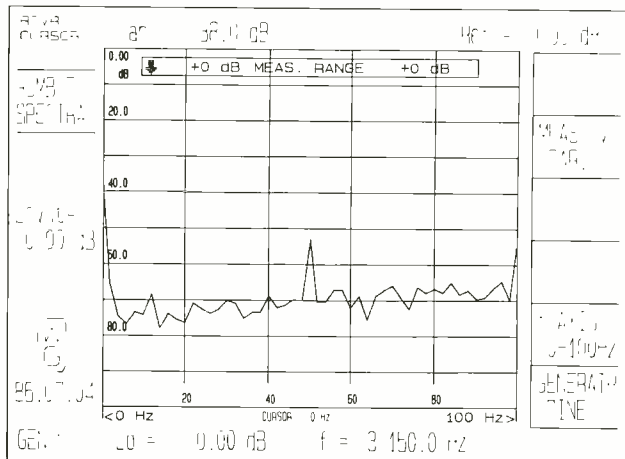
Whilst this is a lengthy review I have been unable to include many features of this complex instrument. The comprehensive operator's manual consists of over 200 pages!

Not only is this a versatile instrument which will find many applications but all measurements were performed to great accuracy. Measurement speeds varied and although this is not the fastest of instruments for some measurements it is capable of measuring signals from remote sources and does not rely on its internal oscillator for making most measurements. This makes it suitable for measuring links and lines.

As a development tool for mechanical devices there are unusual and very powerful functions which are equally appropriate to servicing such devices. The unit is expensive though, and while the cost is reasonable for a development laboratory many service organisations will find it hard to justify the expense.

There are, however, other areas where this is an attractive proposition. For instance tape duplicating plants would find the *NFA-1* a quick and powerful instrument for checking production and locating faults in the duplicating equipment. This of course applies equally to studios but not many own test gear costing even a fraction of the price of the *NFA-1*. □

FIG 10 NFA-1
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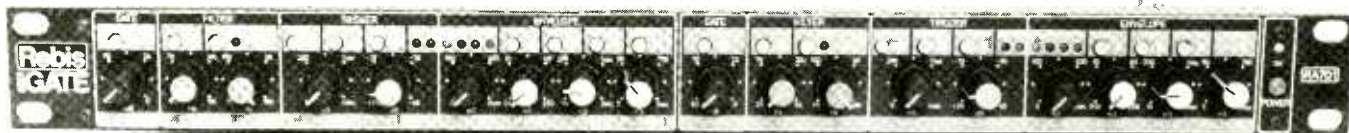


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REVIEW REVIEW

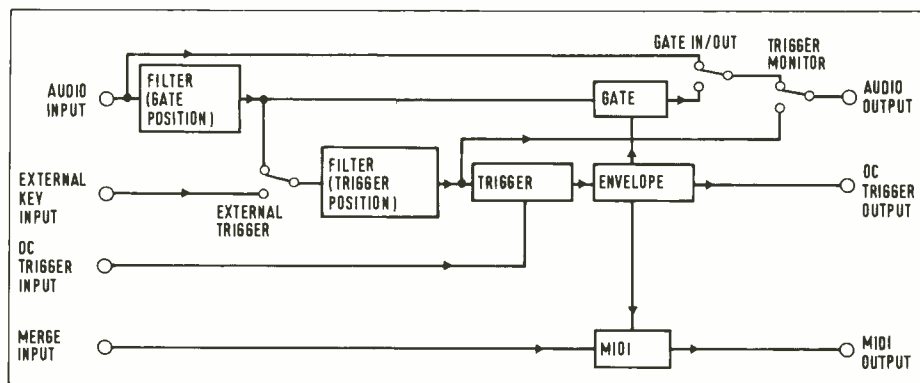
A user report by Dave Foister



REBIS RA 701

The increasing acceptance of MIDI as the standard general purpose data interface for the music industry has prompted many manufacturers into a re-appraisal of established techniques and traditional processing devices. We have mixing consoles with MIDI driven automation, reverberation systems with real time MIDI parameter control, and now the Rebis RA701 MIDI gate. The Rebis gate differs from most other MIDI toys, though, in that instead of responding to external MIDI commands it uses conventional analogue audio signals to generate MIDI data.

Primarily it is a gate, and a sophisticated gate at that. It features two fully independent channels, linkable for stereo working and special configurations, comprehensive envelope control and on-board filters. The 4-stage envelope is particularly versatile, notably because of the inclusion of a delay control: once the input signal rises above the threshold, the opening of the gate can be delayed by up to 2 s. The attack time for the gate opening is variable from 10 μ s to 250 ms. The fastest time is so fast that it introduces clicks on most types of signal, however, the law and range of the control allow these to be easily eliminated while retaining an apparently instant attack. Once the input drops below threshold, the gate will hold open for up to 3 s and then release to fully closed in up to 2 s and attenuation with the gate closed is variable up to 90 dB. A 'fixed' button forces the envelope, once triggered, to go through all four stages without waiting for the input to fall, opening up even more shaping possibilities, and a 4-colour LED display shows the progress of the envelope through its stages. This is in addition to the LED which lights when the signal reaches threshold. All this indication still operates when the gate is bypassed so the gate could be set up



'blind' in live work.

An obvious use of the envelope controls is the shaping of special reverberation effects from a basic spring or plate reverb. The variable delay allows a pre-delay to be simulated without tying up delay lines, and attack, hold and release adjustments produce classic backwards and gated reverb effects as well as more subtle variations of reverb build and decay times. On other programme

MANUFACTURER'S SPECIFICATION

Channels: two.
Inputs: maximum level +21 dBm; impedance 100 k Ω .
Outputs: maximum level +21 dBm into 600 Ω ; impedance less than 50 Ω .
Balancing: optional electronic.
Distortion: less than 0.05% 20 Hz to 20 kHz.
Noise: -104 dBm 20 Hz to 20 kHz; zero attenuation.
Frequency response: ± 0.5 dB 20 Hz to 20 kHz.
DC trigger inputs: +5 V to open gate.
DC trigger outputs: +5 V when gate opens.
MIDI output: after envelope delay sends: channel number (adjustable 1 to 16); note on; key number (adjustable 0 to 127); velocity (0 to 127/ fixed 64). After hold period sends: matching channel number; note off; matching key number.
Power requirement: 220/240 VAC, 30 W maximum (110/120 V by internal connections).
Fuse: 500 mA.
Dimensions: (whd) 19 x 1.4 x 9.9 in/ 483 x 44 x 245 mm.
Weight: 3.6 kg nett.
Rebis Audio, Kinver Street, Stourbridge, West Midlands DY8 5AB, UK.

material the gate is extremely effective and user-friendly in its basic cleaning up role as well as allowing special envelope effects to be produced. The control envelope can also be inverted to produce ducking effects and a special Mask function stops the gate re-triggering for a variable period.

On-board filtering consists of high and low pass filters, both rolling off at 12 dB/octave, which can be switched in to either the direct signal path or the side chain. In the latter mode it obviously removes the need in most cases for an externally EQ'd signal fed to the key input to isolate the required sound. The range of the filters is very wide, with a broad overlap, which means a filter 'window' can be set up almost anywhere in the spectrum. Setting this up is made easier by the fact that the filtered signal can be monitored via a front-panel switch. These facilities, along with an impressive audio performance would make the RA701 worth considering at the price, but its MIDI capability turns it into a genuinely innovative device.

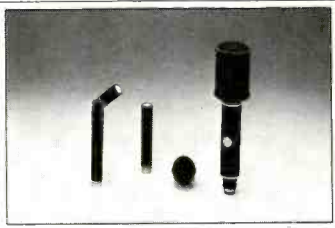
Driving samplers and sampling delay lines from audio-derived trigger pulses, to replace drum sounds in particular, is a well-established technique and the RA701 provides a 5 V trigger output for this purpose among others, however, some

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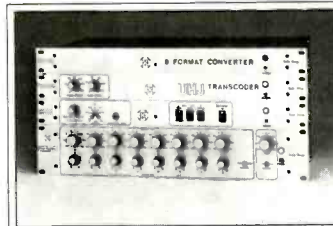
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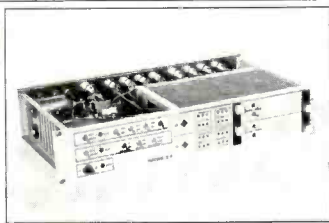
DIGITAL

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AD-MIX Digital Mixing.
1610/30-3324 Interfaces.
DIGI-4 Four Channel Recording



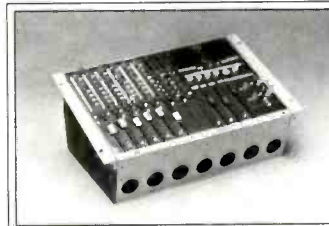
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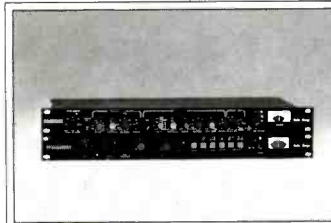
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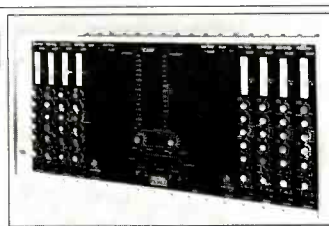
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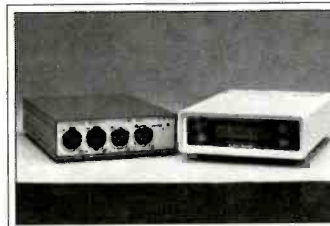
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REVIEW REVIEW

of the most readily available drum samples exist in many MIDI digital drum machines and can only be remotely triggered by sending the relevant MIDI note number. The RA701 allows such machines to be triggered from audio signal sources, and it does this by sending a MIDI note on command, together with a note number, every time the gate opens. The two gates in the unit send separate individually selectable note numbers so one RA701 could be used to drive, for instance, a bass drum and snare drum. The note numbers are set by groups of eight miniature switches on the rear panel, although as this is a bit fiddly it's usually easier to re-assign the numbers to the voices on the drum machine itself. In this connection it would have been nice to see a manual trigger button on each gate as some drum machines require an actual note to be sent to them to re-assign voices. This would have been useful when setting up other effects as well, although in fairness it's hard to see where it could have been fitted in—Rebis have never skimped on controls and indicators so the RA701's front panel, while managing not to look cluttered, certainly doesn't leave much space for anything else.

The gate will also send MIDI velocity information, related to the input signal amplitude in three ranges selectable on the rear panel. Once the right combination of input level and control range has been found this provides an impressive degree of realism, avoiding the machine-like sameness which could otherwise result. If you want robotic consistency, however, this feature can be switched out. I used the 701 to replace bass drum and snare on a track I was working on with velocity sensitive TR707 sounds and when I played it to the musicians who had been working on it, it never occurred to them that they were listening to a machine—they just thought I had EQ'd the drums.

Where most MIDI devices have an 'in' socket, the RA701 has a 'merge' input enabling several units to be chained together, all sending different note numbers from different triggers and possibly transmitting on different MIDI channels. A whole drum kit could then be replaced with samples from one or more machines or several musical notes or effects from one or more synthesisers could be 'played' by signals on tape or even live (the gate sends note off at the end of its hold period).

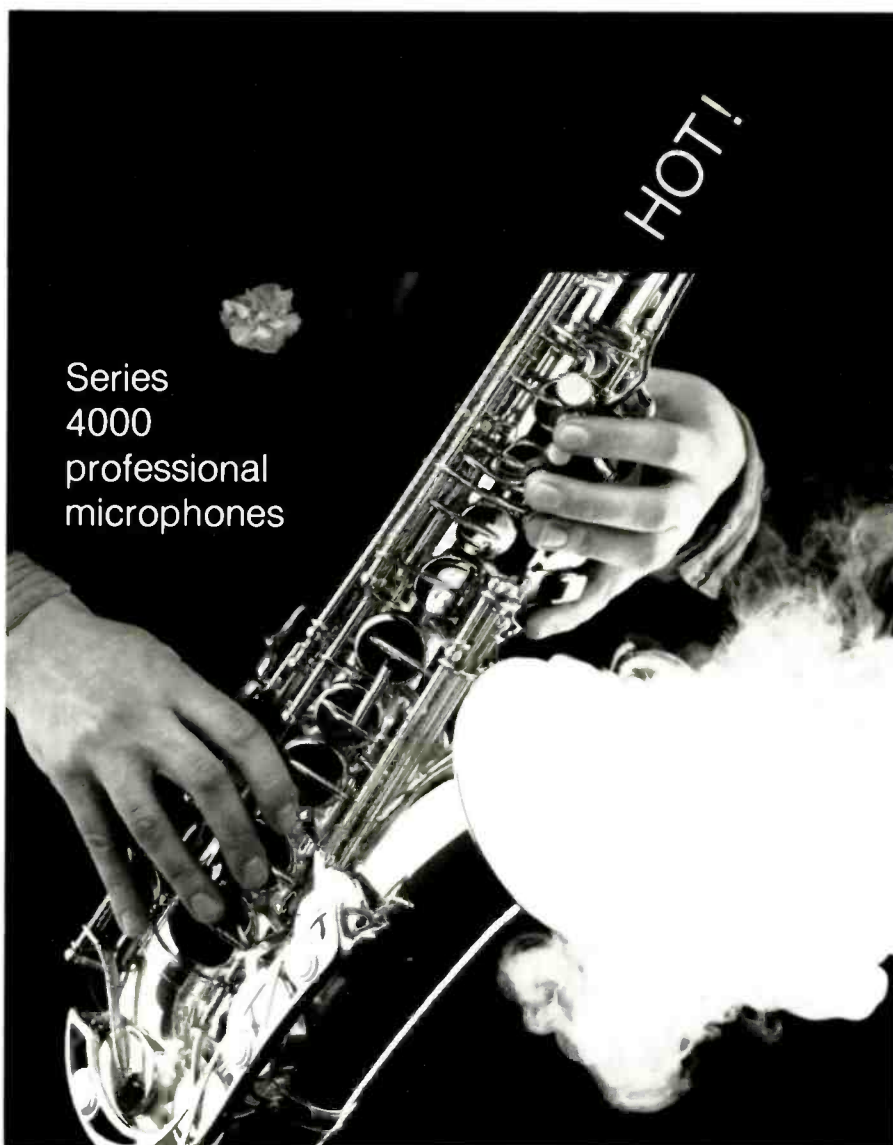
The potential is clearly enormous. The RA701 could be a time saver enabling good known drum sounds to be achieved quickly and consistently on hurried sessions. It could salvage poorly recorded drums (or recordings of poor drums, which isn't the same thing at all) and in a live situation it allows clean, perfectly separated drum sounds with no feedback or spill problems. Its potential with synthesisers is less obvious but well

worth experiment and as MIDI controlled outboard gear proliferates it could be used to drive such devices from programme material, altering reverb times depending on which drums were being played for instance, or translating audio signal levels into MIDI velocity information.

It can, of course, be used as a gate and a MIDI trigger simultaneously. Many weird and wonderful effects are available by linking the two gates and using one to process dynamics and the other to send MIDI data. The Mask function becomes particularly useful in this context, allowing a snare to trigger a

MIDI handclap only on alternate beats, for instance. The Mask time is a little tricky to set up but an unusual and useful feature nonetheless.

Genuinely new ideas are a comparative rarity these days. MIDI applications have produced a reasonable crop but few as novel as the RA701. What's more, it's not just a gimmick to sell a few more gates, it's a genuinely useful and unique device, and it works. It's easy to use, it performs impeccably and is inexpensive enough to find a place in many home studios as well as the big commercial ones, who incidentally should all rush out and try one. □



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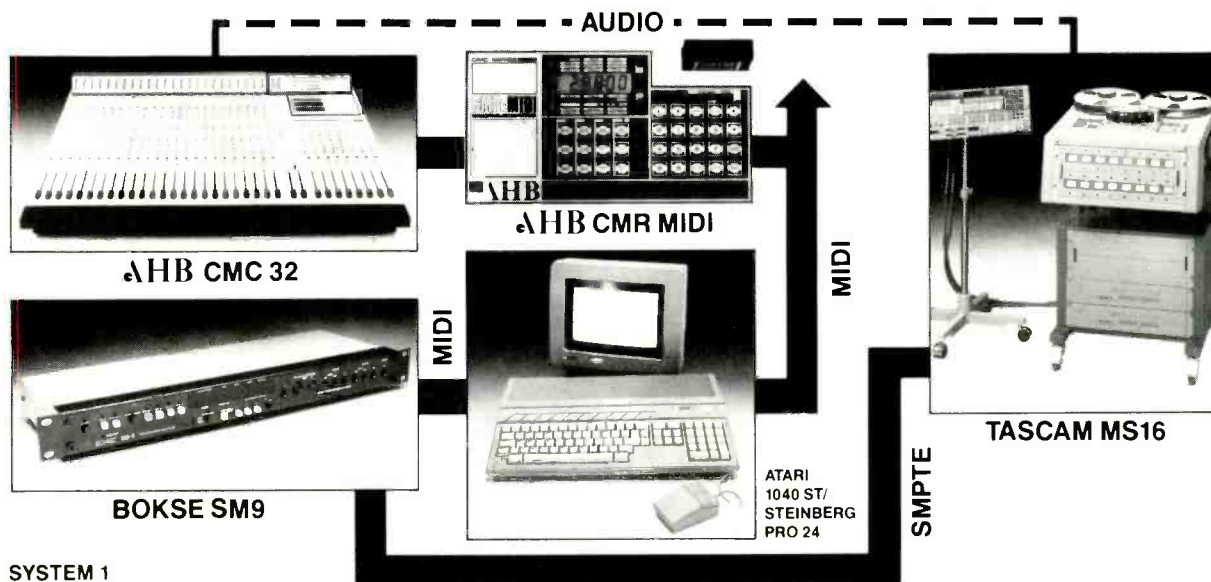
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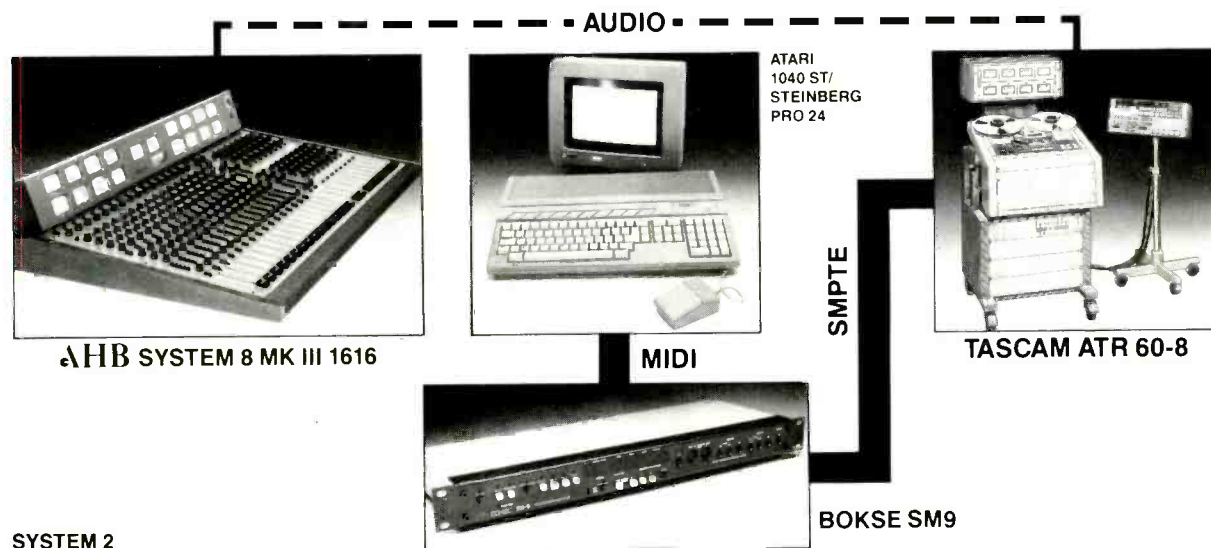
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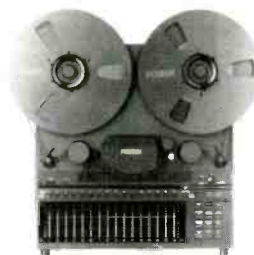
Utilising the Atari/Steinberg Pro 24 24 track midi sequencer and the Bokse SM9 SMPTE EBU/Midi events controller and sequencer, the system offers fantastic versatility. 32 Channels are available on the console at remix affording really professional mixes at a realistic price.

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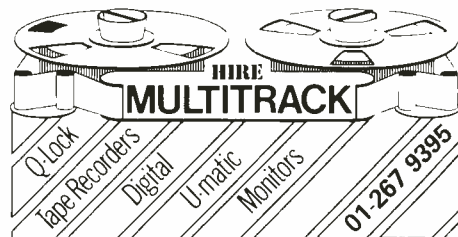
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AHB CMC
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