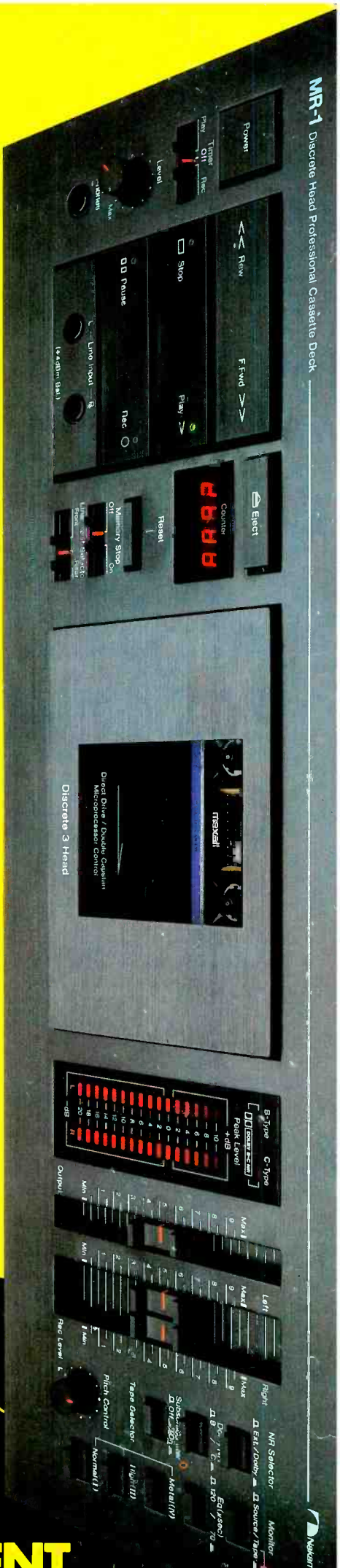


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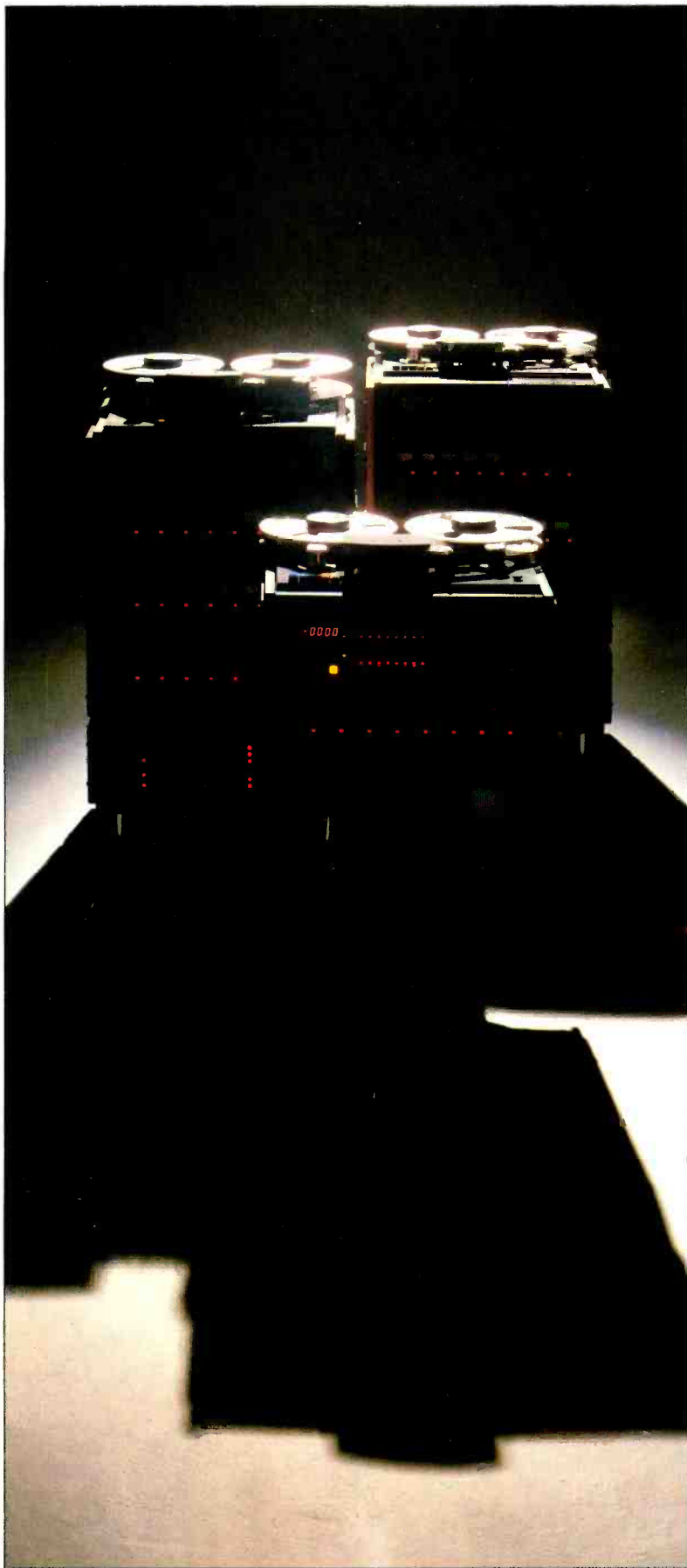
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A LINK HOUSE PUBLICATION



MR-1 Discrete Head Professional Cassette Deck

STUDIO MANAGEMENT CASSETTE MACHINES FOR THE STUDIO



THE MAKING OF A TRACK RECORD.

Choosing a multitrack is one of the toughest decisions you'll have to make.

Its sound quality will play a large part in your studio's output.

Its features and expandability need to be taken into account, and weighed against cost.

Reliability is even harder to assess.

The Soundcraft Series 760 Mark 3 multitracks are acquiring an enviable reputation among producers and artistes with private studios, for those very reasons.

Dave Stewart and Annie Lennox recorded their last two albums on a Series 760 with Autolocator and a 2400 console.

Thomas Dolby and Tom Robinson own Mark 3s, as does Tony Visconti (who knows a good sound when he hears one).

At London's Easy Street, a 24 track Series 760 and a TS24 have hosted chart albums from Wang Chung to Dennis Brown, from Heaven 17 and The Pretenders to Sly and Robbie.

Leading Indie studio Woodbine have averaged a chart single a week for the last year with their 762 Mark 3.

Why did they choose Soundcraft?

Most importantly, the audio quality is often compared to the highest priced machines on the market.

Many of our clients say we're more pleasing on the ear, thanks to lower colouration: our Mark 3s' square waves are square, our LF response is flat and you can't hear the noise for silence.

We suggest you listen, and compare.

The revisions for the Mark 3 were more than cosmetic, as they've proved in practice. They include a new DC servo-controlled transport, modular wiring layout and a flat-wired self-contained headblock assembly.

They're built to keep performing – and they do.

The Mark 3, in fact, represents the chance to acquire a much higher standard of audio quality and engineering for the price than ever before.

So you can see why so many great names have decided on the Series 760 Mark 3.

Because they know a great track record when they hear one.

Soundcraft



760 SERIES MK 3.

STUDIO SOUND

AND BROADCAST ENGINEERING

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

January 1986 Number 1
Volume 28 ISSN 0133-5944

Room Service?

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

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

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

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

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

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

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

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

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

So if you're on the horns of the 24 track dilemma, why not try HHB's

Room Service, and call Martin Westwood.



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EDITORIAL

EDITORIAL

This month's comment from Carl Snape

Cog wheels and cassettes

Studios appear to have a love/hate relationship with the cassette recorder. The cassette itself is a wonderfully convenient medium easy to carry around and handy to listen to but when the discussion gets round to serious recording the whole subject of 'rickety little plastic shells containing snivelly bits of tape' usually gets treated as a joke. It's a brave man who uses the words 'cassettes' and 'professional recording' in the same sentence. Despite all this the latest generation of cassette recorders is slowly coming of age. It appears to be a painful process particularly for the professional user.

Most manufacturers of cassette recorders have this wonderful philosophy that a few extra flashing lights and a generous coating of black paint will turn the average high street cassette deck into a serious professional machine. Blind faith must be wonderful.

Some manufacturers—a mere handful if that—appear to have worked a minor miracle in getting some resemblance of quality from that mere thread of 3.81 mm tape. However, despite all the good intentions, the majority of cassette machines are still unduly cumbersome to use. Why it is that autolocate systems are virtually non-existent and linear counters appear to be nothing but 'cog wheels with lights on' I do not know.

It seems almost unbelievable that whilst the average domestic video recorder can run back and forwards, stand still, advance frame-by-frame and find a thousand and one locations at the touch of a button, cassette recorders are dogged by systems that typically can only find 0000 (and usually not that precisely!). They also have fast rewind functions such that if you want to restart a recording after only a bar or so you end up whizzing back halfway into the previous track. Being a dab hand with the transport keys is a definite asset. There is obviously more to that descriptive term—piano-type keys—than meets the eye.

You can cheat of course and reset the zero counter but

will you ever really be sure it stopped at exactly 0000 even if the tape counter says it has? And doesn't going into play, just to check, defeat the whole object of the exercise? You may be asking yourself why in this day and age we are still using zero counters anyway. That seems like a perfectly valid comment but have you tried finding a cassette recorder with an accurate real-time tape counter? Surely an accurate tape remaining counter isn't too much to ask for, either. Life can be difficult enough at 5.00am after a heavy session without having to tackle the cassette deck in unarmed combat.

No doubt the manufacturer will tell you that it is too expensive to develop a reliable system—or at least, the final machine would be too expensive. Perhaps there is some truth in this but it does seem an easy get out. Surely, if a job is worth doing it's worth doing properly? Even if that means you have to go back to first principles in order to get it right. I find it difficult to believe that locating a precise piece of tape in a cassette recorder is beyond the imagination and ingenuity of the manufacturers.

Currently cassettes and personal stereos are enjoying unprecedented popularity among consumers yet it would appear that even this is having little effect down in the design department. Perhaps they know something we don't. Just when the cassette recorder could do with a final technological 'push up the hill' could it be that all the bright young designers have abandoned analogue? With the advent of 8 mm tape—essentially a cassette, similar in physical size to a standard audio cassette but twice the thickness—maybe we have reached the end of the road as far as innovative new cassette machines are concerned and from now on we will see 8 mm digital cassettes starting to take over. One thing is certain, however: it won't happen overnight. In the meantime, is there anybody out there who can fit a set of ½ in heads, wire in the *Q.Lock* and supply a rack-mounting kit for my *Sony Walkman*?

STUDIO SOUND

— AND BROADCAST ENGINEERING —

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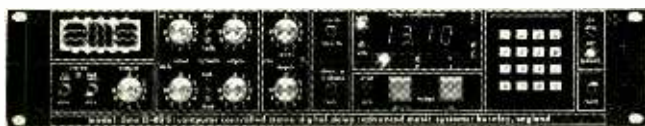
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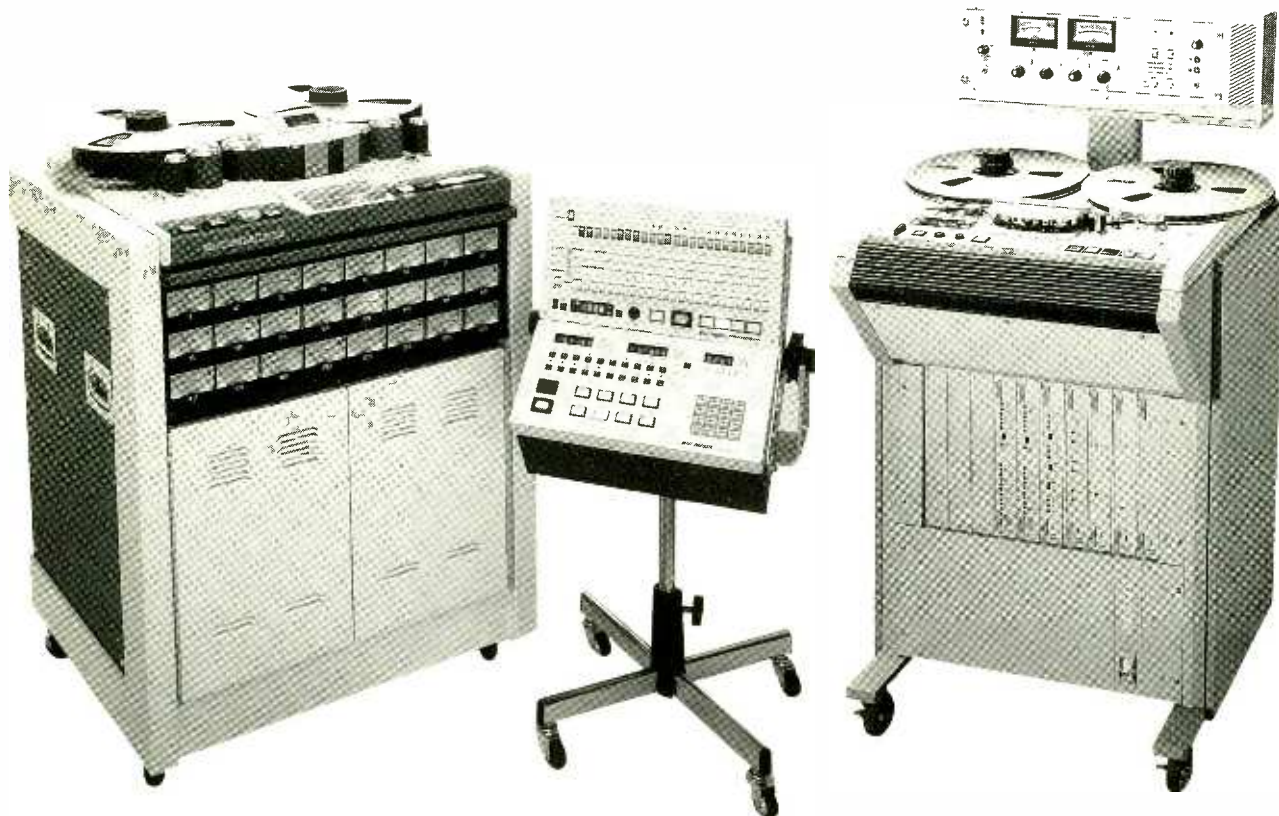
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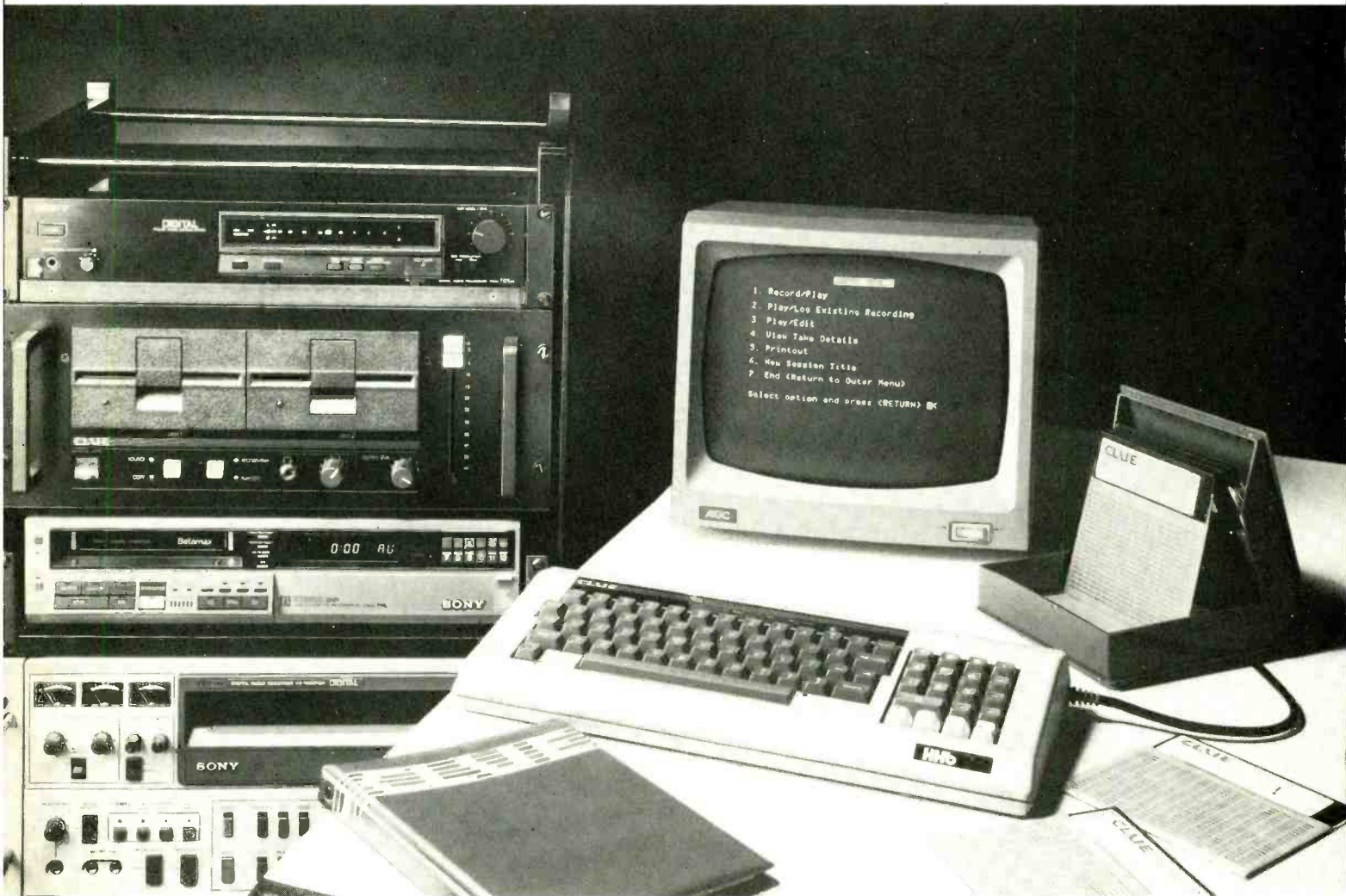
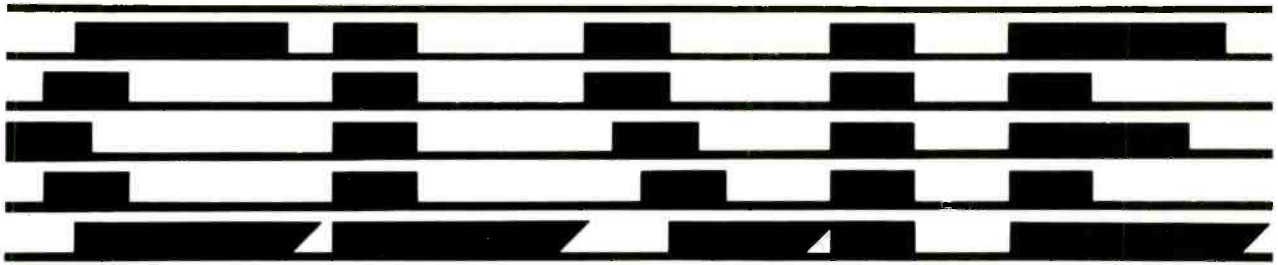
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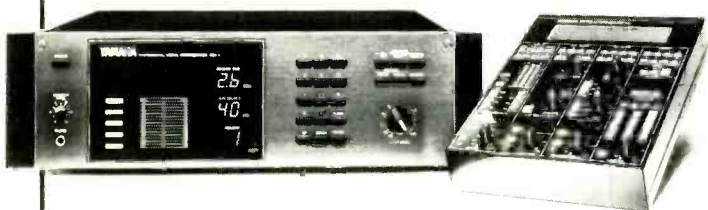
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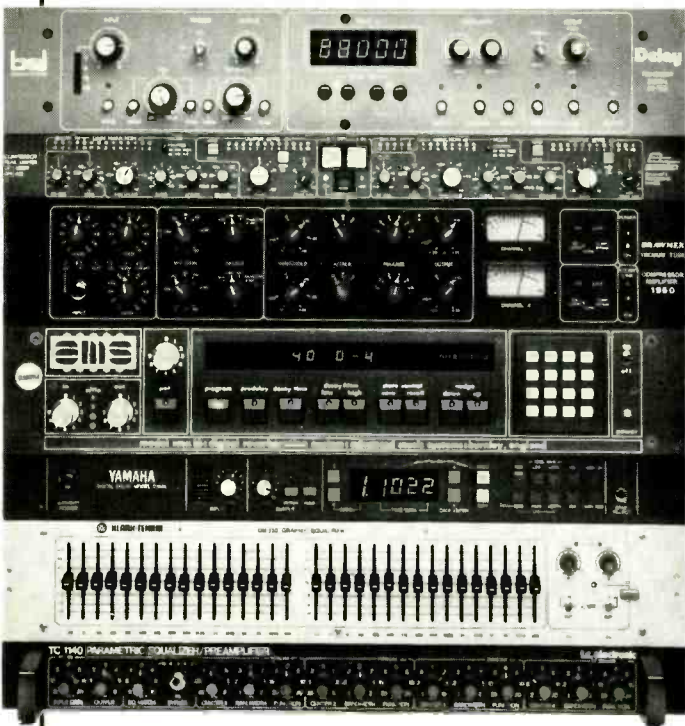
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At £1040 the REV 7 must be the year's best buy: send now for colour brochure.



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

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

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

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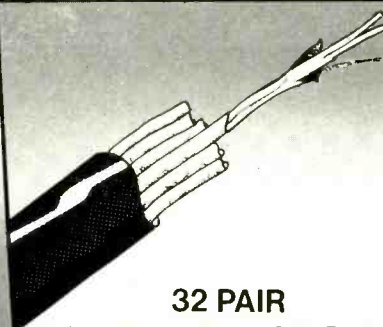


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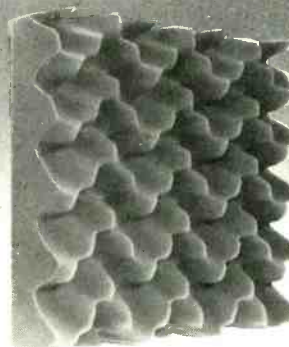


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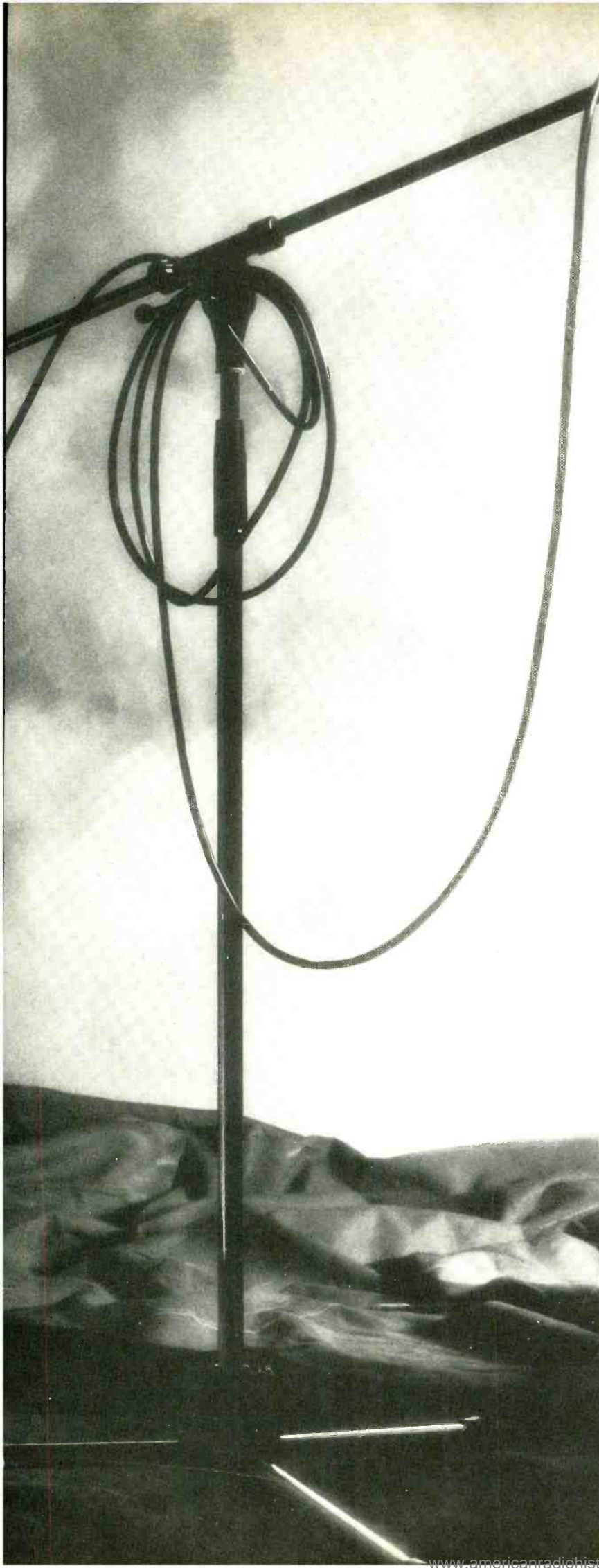
- 400 watts RMS per channel into 4 ohms.
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We believe that these facts, coupled with Amcron's reputation speak for themselves. But if you wish to know more about the Micro-Tech 1000 and how it can solve your headroom problems, call HHB Hire & Sales at: Unit F New Crescent Works, Nicoll Rd, London NW10 9AX. Tel: 01-961 3295. Telex: 923393.







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Studiomaster monitor console

The first in a new range of high quality mixers has been announced by Studiomaster. The 12M monitor mixing console has a basic 24/12 layout expandable to 32 inputs. Each channel features 4-band EQ, 20 dB pad, phase reverse, 48 V phantom powering, two assignable pre/post sends and a high Q infinitely variable notch filter. Each of the 12 outputs has parametric EQ and a 12-segment, 2-colour LED

display is fitted to each input/output channel. Other features include ALPS master faders, inserts on inputs and outputs, and assignable talkback.

Studiomaster, Home Farm, Northall, Nr Dunstable, Beds, UK. Tel: 0525 221331.
USA: International Music Corporation, 1316 East Lancaster Street, PO Box 2344, Fort Worth, TX 76113. Tel: (817) 336-5114. Telex: 758285.

Ampex tape

The Ampex Corporation have announced two enhancements to 467 digital mastering tape in the form of reel construction and tape length. The reels for the 10½ in and 14 in reels of ½ and 1 in 467 will feature a solid back flange and a 2-windage hole front flange for better protection of the tape edges during handling. The tape length on both reels will also be increased from 9200 to 9700 ft

providing users with 64 min of recording time at 30 in/s making post production syncing of video and digital audio easier for 60 min programmes.

Ampex Magnetic Tape Division, 401 Broadway, MS 22-02, Redwood City, CA 94063-3199, USA. Tel: (415) 367-3988.
UK: Ampex (Great Britain) Ltd, Acre Road, Reading RG2 0QR. Tel: 0734 875200.

Rane audio products

Recently available in the UK are a number of Rane professional audio products. The GE27 is a ½-octave ISO constant-Q graphic equaliser with long throw (45 mm) sliders and built-in RFI, sub and ultrasonic filters. For real-time applications the RE27 features a built-in pink noise generator, colour coded analyser display and includes condenser mic, cable and case. As with the GE27 the RE27 features 45 mm sliders, constant-Q and ½-octave sections.

A 2-channel ¾-octave system is also available (RE14 real-time equaliser and GE14 graphic equaliser) as is a separate 1U high real-time analyser—the RA27 which features 27 ANSI class 11 ½-octave filters. 3-colour LED display, microphone, 40 ft cable and pink noise generator.

For parametric applications the PE15 parametric equaliser and notch filter provides five discrete bands in a 1U high unit. Bandwidth range is from 1.5 to 0.03 octaves and end bands can be switched to shelving modes.

The AC22 and AC23 are 24 dB/octave 4th order state variable Linkwitz-Riley design time correcting crossover networks with zero phase shift and zero lobing error. Both units include a 0-2 ms delay for phase alignment of drive units. The AC22 unit is a stereo 2-way/mono 3-way device and the AC23 is stereo 3-way/mono 4- or 5-way. For specific phase alignment of loudspeakers the CD48 crossover alignment delay provides four independent time delay channels (up to 8 ms per channel cascable to 32 ms) allowing phase alignment of a 5-way system with up to 8 ft of horizontal displacement between drive units.

Other Rane products include the HC6 headphone console; the SM26 splitter/mixer; a six channel, 100 W per channel multichannel amplifier (MA 6) and a compact 19 in rack mountable 12 in/6 out matrix mixer—the MM12.

Rane Corporation, 6510 215th SW, Mountlake Terrace, WA 98043, USA.
UK: Music Lab Sales, 72-74 Eversholt Street, London NW1 1BY. Tel: 01-388 5392.



Alesis ai digital reverb

Alesis showed a prototype version of a new full featured reverb system during the NY AES. Designated the ai, the unit consists of a rack-mounted processor and a handheld remote controller which interfaces to the processor through a telephone type modular connector cable. All system control, variable manipulation and program storage is contained within the remote—resulting in portability allowing the user to unplug all his information and plug into another similar unit. The user-developed programs are held in non-volatile EEPROM which doesn't require any power to retain memory and provides up to 90 memory positions and 10 factory 'seeds'.

The remote has a 16 character display and the control parameters are accessed through the 12 pushbuttons and the value set by the rotary wheel. The display will show the variable value and the unit of measurement. Each of the buttons has two functions selected by the length of time held down. The remote allows recalling and storage of programs, naming (up to 12 characters), access to a large bank of help and suggestions messages. System variables available on the remote include level meter, input select, MIDI channel, memory protection, system gain, high and low frequency response limits. The reverb algorithm

variables include stopped decay time, running decay time, size, dynamic decay delay, lo/mid frequency decay time ratio, lo/mid crossover frequency, depth, high frequency damping, early and late diffusion, slapback delay, slapback amplitude and pre-delay. There are a wide range of algorithm types in addition to reverb, eg finite impulse filters of up to 3 s and 220 discrete taps, and a multi-tapped DDL with controllable gain and pan per tap. The remote also contains the instruction manual.

The processor uses silicon gate CMOS VLSI which Alesis say gives the unit the ability to process at extremely high speeds. The unit, however, is claimed to run cool and not need any cooling system. All the above information is described as provisional and the production units may differ in some respects. Production is due to start at the end of 1985.

Provisional spec: mono in/stereo out; 16 kHz bandwidth; 35.714 kHz sampling rate; 90 dB dynamic range on delay; processor 2 U standard rack width; remote 6.7×3.7×1.3 in.

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: 04626 75675.

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 ancilliary products from other manufacturers, that have further increased the flexibility and versatility of the range. Examples of these products are the 'CLUE' logging and editing system from HHB, as well as various interfaces which allow digital communication with the PCM 1610.

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

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

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

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Equipment, modifications, options, software

Lexicon PCM-70 digital effects system

Launched at the New York AES Convention in October the *PCM-70* is a digital effects system with substantial software (in the form of plug-in chips) back up. The initial software package enables the *PCM-70* to function as a digital effects processor. The newly-developed digital effects and reverb programs are derived from algorithms found in the more expensive Lexicon processors.

Despite the deceptively simple looking front panel more than 80 different parameter types (for example delay times, beats per minute, feedback, wet/dry mix, high/low pass filters and room size, etc) are contained in the programs. Also in the initial package are 30 separate programs covering chorus and echo, resonant chords and multiband delays. Reverb effects include new versions of rich chamber, rich plate, concert hall and infinite reverb in addition to 50 user-assignable programs making in a total of 90 instantly accessible separate programs.

The front panel of the *PCM-70* features dedicated keys and a 'soft' control knob which can be assigned to up to 10 separate parameters providing a 'Grandmaster control'. All these patches can be assigned internally or via

external devices with the MIDI facilities.

The *PCM-70* incorporates Lexicon's unique Dynamic MIDI control enabling full remote control of the *PCM-70* via a MIDI keyboard, computer or other MIDI control devices. Up to 10 effects or reverb parameters can be assigned and these can be varied (through the controller) while the musician is playing. Parameters can even be assigned to vary with key velocity, pressure or after-touch. If the MIDI data is recorded on to a MIDI sequencer then the *PCM-70* will provide automated operation during mixdown. All 128 MIDI specified presets can be used in recalling programs and user registers.

The *PCM-70* is the fourth generation of Lexicon digital technology and due to the extensive use of LSI chips only takes up 1U of rack space. The unit offers an extended response up to 15 kHz (-1 dB) and provides a stereo output from a mono source. Multiple *PCM-70* units can be used together.

Lexicon Inc, 60 Turner Street, Waltham, MA 02154, USA. Tel: (617) 891-6790.

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



Symetrix 544 quad expander/gate

The Symetrix 544 quad expander/gate is designed specifically for professional studio and live performances and is said to provide maximum processing power for minimum space. The unit has four channels in a 1U high unit and provides user-variable settings for attack and release time, range/ratio and threshold.

Each channel can be set to trigger internally or may be keyed from an external input. Gate response is said to be

optimised for highly transient signals. The downward expander is exceptionally linear and doubles as an expander and noise reducer. Each channel on the 544 has a 5-segment LED to show gain reduction.

Symetrix, 4211 24th Ave West, Seattle, WA 98199, USA. Tel: (206) 282 2555.

UK: Bob Wilson, Sound Technology Ltd, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR. Tel: 0463 675675.

Shure microphones

Shure's condenser microphone range has been extended with three new models. The *16L-LC* is a low impedance, unidirectional, battery-powered electret condenser primarily intended for home multitrack use as well as stage vocals and miking up instruments and is the top of the recently introduced *Prologue* range.

The *SM94* for instrument and recording applications and the *SM96* for vocals both have unidirectional (cardioid) polar patterns that, say Shure, will not 'collapse' at high frequencies, permitting uniform off-axis response throughout the audio spectrum.

The company has also introduced their first professional quality miniature unidirectional condenser mic specifically for instrument and amp miking, and they claim it is able to withstand close miking of drums, brass,

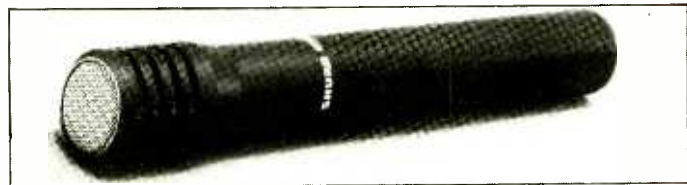
amplifiers and other high SPL sources without distortion. It is supplied with windshield, preamp, swivel adaptor and mic-to-preamp cable.

The *FP16* is the latest in the audio distribution amp range and is a 19 in rack-mounting, one input six output unit for routing audio feeds. Features include individually selectable mic or line level on input as well as each output; phantom power at input for utilisation of condenser mics; link input and output jacks for interconnecting several *FP16s* or adding signal processing equipment.

Applications include radio and TV, ENG and EFP and microphone splitting for live sound reinforcement.

Shure Bros Inc, 222 Hartrey Avenue, Evanston, IL 60204, USA. Tel: (312) 866-2200.

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



Joint Audio Kinetics/Tascam synchroniser

Audio Kinetics and Tascam announced the introduction of a new chase synchroniser system during the New York AES. The *Pacer* and *Code 1* are single rack space units that work with all international timecodes. The units feature an internal timecode generator which is capable of jam sync operation and can be locked to house sync or an external video sources. Twin dynamic readers are capable of reading code from 1/20 to 80 times play speed in both directions.

The synchroniser is a hard lock system with chase capability offering slave machine control with an optional control pad or via the RS232C/422 computer port. The systems also feature automatic calibration with battery back-up and an automatic offset calculation ability which can be manually trimmed by frame and

subframe. The system is designed for a wide range of applications from locking up two tape machines to adding audio to control track editing or a 3/4 or 1 in video production suites.

The *Pacer* is expected to be shipped early in 1986 with prices unconfirmed at present although expected to be very competitive.

Audio Kinetics Inc, 1650 Highway 35, Suite 5, Middletown, NJ 07748, USA. Tel: (201) 671-8668.

UK: Audio Kinetics (UK) Ltd, Kinetic Centre, Theobald Street, Boreham Wood, Herts WD6 4PJ, UK. Tel: 01-953 8118.

Teac Corp of America, 7733 Telegraph Road, Montebello, CA 90640, USA. Tel: (213) 726-0303.

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



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UREI 813C monitors

UREI choose the NY AES to launch the next generation of the 813 series *Time Align* monitors which feature improved performance and specifications while retaining, claim UREI, the same sound character. The 813C uses a new proprietary coaxial design unit with a 4 in LF voice coil and a titanium diaphragm in the compression driver. This is coupled with a new high powered sub-woofer and new minimum loss crossover network giving a system with a claimed power rating in excess of 200 W.

The 813C is also equipped with a BNC connector

allowing easy connection to the Conductor Compensation feature on the UREI 6500 power amplifier. This is a secondary amplifier feedback loop which UREI say effectively eliminates transient overshoots and other problems originating in the speaker cables and also provides a far high damping factor.

UREI, James B Lansing Sound Inc, 8500 Balboa Boulevard, Northridge, CA 91329, USA. Tel: (213) 893-8411.

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

Rebis RA226 digital sampler

The Rebis RA226 is a solid state recording device providing either 5.25 s of storage (16 kHz bandwidth) or up to 21 s with a 4 kHz bandwidth. Memory capacity can be expanded by adding up to three plug-in RAM 5S memory cards, each providing a further 5.25 to 21 s storage.

An input control and LED display provides optimum level settings through the unit. An End control fixes the delay length and Feedback varies the number of repeats. Multiple sampling is possible using the Record Start/End facility. Stored sounds can be played in either the Forward

or Reverse modes using the appropriate pushbutton and any part of the recorded sample can be left out of the playback. Four basic play modes of Loop and Latch are possible. The delay mode can also be used without losing any of the memories.

The RA226 will rack-mount at 3U and requires 40 V/250 mA. Proposed future software/hardware options include an automatic edit glitch and a remote control with multi-sample play. **Rebis Audio Ltd, Kinver Street, Stourbridge, West Midlands DY8 5AB, UK. Tel: 0384 71865.**

To commemorate 10 years of building recording consoles, Harrison Systems introduced the *Series 10* console at the New York AES in October. Proclaimed the world's first fully automated console, or virtual console, the *Series 10* can be configured to suit the requirements of the moment, be it music recording, post-production for television, film re-recording or high quality sound reinforcement.

In real terms, in a large studio that encompassing a wide range of work, the console can be configured to suit the job in hand and be recalled at a later date. For example, a post-production setup can be stored at the end of a session, the console reconfigured for a music recording multitrack session and then recalled for a continuing post-production project as if nothing had happened between times.

Total automation means that all levels, equalisation, panning movements, dynamics processing and routing setups are stored to within subframe accuracy, including all dynamic changes within these functions. The *Series 10* uses Penny & Giles motor driven faders as standard.

Another innovation in the *Series 10* is the absence of VCAs. With the Harrison all analogue functions are digitally controlled using their proprietary DCA (digitally controlled attenuator) technology. This is intended to offer the best of both worlds, with the 'musical' sound of wide bandwidth analogue-

Harrison Series 10 console

combined with full digital control.

A departure from previous systems is the treatment of each channel module as an independent processor incorporated into an overall central automation computer system. Design philosophy is based around—central control, local display. To this end each *Series 10* module is fitted with two high speed CMOS (12 MHz) microprocessors and this does away with the delays associated with other automation systems due to scan delay, or accumulated delay problems. Total resetting time for a fully loaded console is claimed to be 60 ms or less than 2 video frames.

The *Series 10* automation

can be referenced to any standard timecode format, automatically reading 24 frame SMPTE film, 25 frame EBU video, 30 frame SMPTE video and 30 frame SMPTE drop frame video codes. Data storage is via a Winchester 20 Mbyte hard disk system using 8 in double-sided, double-density floppy disks.

The console itself has a squat, chunky appearance with soft leather padding around the upper half of the mainframe, including the meter bridge and rear of the console. The side cheeks are quite high which means that the face of the console is reasonably enclosed. Whilst being aesthetically pleasing, this also means that the

console will act much less as a reflector and cut down on annoying acoustic 'splash' when in the control room.

Though first appearances belie this, each *Series 10* module contains two complete and totally automated signal paths with the visible controls, apart from ergonomically spaced rows of pushbuttons, being the motorised fader, a group of three knobs and a further group of two. This provides the maximum number of controls, according to Harrison, that an engineer can operate at any given time. The controls have what are known as assignable functions and now would be a good time to have a look at the features contained on each of the modules.

The *Series 10* is claimed to



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have the highest technical specifications of any Harrison console with ultra fast low noise amplifier technology being used throughout, with each module containing:

- 2 automated level controls
- 2 automated programme muters
- 2 automated programme pan functions: one stereo and one stereo/quad/LCRS cinema format
- 2 automated 4-band parametric equalisers
- 2 automated high and low pass filters
- 2 automated compressors and gates, the latter having key inputs and inverted gate functions
- 2 automated assignment, or routing, sections: 1-32 main, 1-16 mix
- 8 auxiliary sends
- 2 automated balanced insert points which may be selected to be at any position in either signal path.

As can be surmised, each module offers many possibilities for operation and signal flow, such as instant swapping of A and B inputs, main signal plus its own effects return, dual signal paths, etc. The controls for the assignable functions could typically be the upper two knobs for two auxiliary sends, the lower three for a frequency band from the parametric EQ, or input level controls and compressor/gate functions, etc. An important point is that each module will operate manually in the event of the central automation computer failing, the module still being under the control of its local microprocessors and thus able to function as a stand alone signal processor. This means that static positions of the fader for each signal path will be remembered and called up.

Routing on the *Series 10* is very flexible with 32 main, or multitrack, buses and 16 mix buses, which makes simultaneous tracklaying and programme mixing very easy.

The central control space, which takes up 16 module positions, is situated at the centre of the mainframe. Here all module signal flow and routing functions are controlled with displays for master status, etc. In order to provide the engineer with visual information on console status, either centrally controlled functions or local

controls, each module is equipped with a four character alpha-numeric display (or electronic tracksheet). This provides information on routing, EQ and dynamics settings, etc.

The *Series 10* computer does not directly control or synchronise audio and/or video tape machines. However, various machine control systems are available as options with varying degrees of sophistication and price. The various computers can talk to each other via a defined protocol. It is fairly obvious that machine control is not the only thing that can be interfaced and any microprocessor controlled equipment, such as digital reverbs, etc. could be put under the control of the console central computer with little effort—providing that the necessary parts are available. Harrison are not advertising the *Series 10* as an integrated studio control centre as yet, but it takes little imagination to see that this would be the logical step.

Metering on the *Series 10* consists of two new 40-segment LED PPM/VU meters per module position and these are very pleasant to read. However, other types of meters are available on request.

Mainframe sizes to accommodate 16, 32, 48 or 64 modules, plus the central control area, are available as standard with the possibility of ordering special frames where required. Thus a 48-position frame would provide 96 input channels, for example.

In order to complete the range of tasks that can be performed by the *Series 10*, a special disc mastering module is under preparation which can be incorporated either into a standard *Series 10* console or small mastering desk.

Initial reactions from the audio industry during the AES was very receptive with seven orders at the time of writing. However, the price tag is fairly hefty!

Harrison Systems Inc, PO Box 22964, Nashville TN 37202, USA. Tel: (615) 834 1184.

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

Quad Eight Superstar console/ Compumix IV

Quad Eight marked their first show as part of the Mitsubishi Pro Audio Group with what was certainly the longest console at the New York AES, the *Superstar*, with an overall length of just over 14 ft. Concurrent with the debut of the *Superstar* was the first showing of Quad Eight's new *Compumix IV* automation system.

In its basic form the *Superstar* derives much from the *Westar* console with a variety of interchangeable modules for input amplifiers, equalisation, etc. There is now a dual input microphone amplifier available—selectable A input or B input—where one is transformerless and the other 'with the iron'. Other facilities include eight auxiliary sends, fader reverse and assignment of monitor/mixdown to two independent stereo buses for added versatility. The console is also field expandable with frame sections housing eight modules so you can start off with a reasonable 48 inputs before expanding up to 72.

Metering is with 60-segment bargraph LED meters offering a variety of displays for each module, being switch selectable from peak, VU or VCA level. The overall display can also function as a 1/3-octave spectrum analyser, either mono or stereo depending on the number of meters. In addition to the channel metering there are bargraphs for master mono, left and right with mechanical VU meters duplicating these, and a phase (or correlation) meter.

The *Superstar* also has an optional overbridge that fits on to the meter housing in order to accommodate a new compressor/limiter/gate module. The dynamics processing can be used in-line with the module or on the patchbay as a separate unit.

The *Superstar* exhibited at New York consisted of 11 frame sections plus a two wide section dedicated to the patchbay. The master and central assignment section takes up 12 module positions giving a maximum capacity of 76 input channels in this frame size.

The routing on the *Superstar* is microprocessor controlled and accessed via the central assignment section. This consists of two plasma display panels with touch control. Routing is through a 64-output matrix with a maximum input number of 96. The system provides help through informative menu displays as well as interrogating the operator (electronic prompting) over major changes in status. The assignment panel appears to be very easy to use and 10 presets in local memory are available. All data can be transferred to disk when the console is used with the *Compumix IV* automation system.

The matrix is built up from 16x16 switching cards bused to 16 output summing cards with logic controlled monolithic switching elements using zero volt current switching for lowest possible distortion and feed through.

With the trend towards making more compact consoles, the *Superstar* stands out as a monster in the large system format. However, the 64-busing is looking towards using two 32-track digital machines together and thus 64-track mixdown plus the necessary returns. Whilst it is true that one operator could do the job, it would be more true to say that the console exhibited at New York was a two man desk where the assistant, or second, engineer would really be justifying his job title.

One of the interesting innovations in the *Superstar* is the IDF, or Intelligent Digital Fader. This is part of the *Compumix IV* automation system though the console will operate with the IDFs independently of the automation.

The fader module consists of a 6805-based computer controlling mute and fader signals as well as grouping, ie routing is via the central assignment plasma display and grouping is through the IDFs on each input channel. Operation of the IDF can be considered on a two level basis as the modules communicate over two separate parallel



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buses, a 'back door' bus operating at every 1/10 frame for group, mute and solo functions and a 'front door' bus for the automation where the modules communicate once a frame with a 6809-based computer located in the console—or each console section for larger systems.

The IDF offers four levels of grouping, viz: individual level control, grouping, sub-grouping, grand master. Again, two modes of operation present themselves. Group numbers available are from 0 to 9 and A to F, giving a total of 16 in all. Should operation with 16 groups be desired the necessary groups can be selected with the requisite modules designated group masters. The other alternative is to use what Quad Eight call a higher level of grouping. In this mode 1 to 9 will form the groups, A to F the sub-groups (or sub-master) and 0 the grand master over all faders. An example of this would be four elements of a rhythm section grouped under 1, 2, 3, 4 with these groups then grouped under sub-group A. Other sections could be similarly grouped, to say sub-groups B, C, D, with 0 becoming the overall master. Independent channels may of course be sub-grouped to A to F without passing by the groups 1 to 9.

Another feature is that any module, or channel, can be designated to a master status at any of the four grouping levels without losing its individual identity, thus eliminating the need for dedicated masters. You just pick one when you need one!

The fader element of the IDF is not a 'fader' in the traditional sense but an 8-bit digital grey-code absolute

position encoder. The fader position is directly encoded in 8-bit form without the need for an A/D converter, this then being translated into a 10-bit format. From the resulting data, the IDF calculates the exact corresponding decibel value using 14-bit arithmetic, the digital expression of that decibel value being converted by a 12-bit converter into a DC control voltage for the channel VCA.

Though developed to meet the peculiar needs for film re-recording, *Compumix IV* is more than suitable for the needs of music recording and is, in fact, capable of more than the average system. One innovation is the use of individual computers handling dedicated functions at different levels. So far we have noted the use of the individual channel computers and the console computer. The latter communicates with what is known as the host computer via an ARCNET local area network link (1 Mbit/s serial communications).

The host computer is a 68000-based 32-bit real-time processor running a multi-user, multi-tasking version of FORTH, with Smalltalk programming extensions written at Quad Eight. Functions performed include data synchronisation, operator interface and video graphics. Auxiliary high-resolution RGB graphics (colour) displays are handled by a separate subprocessor. The whole system, IDFs included, is self-diagnostic with displays and there is a 1200-baud modem to allow direct communication with the Quad Eight factory for remote diagnostics.

As well as fade and mute functions, *Compumix IV* can also automate peripheral units

such as equalisers, joystick panners, multichannel film panners, A/B input transfer and insert switching. The system can lock up to either SMPTE timecode or film tachometer signals and has display conversion for the two formats, ie SMPTE can be shown in feet and frames and vice versa.

One of the things that makes *Compumix IV* a powerful tool is that the 80 Mbyte Winchester hard disk system makes it possible for four simultaneous mixes to be laid down independently. This means that in the creation of a film mix, for example, the mixers doing music, effects and dialogue can concentrate on several versions of a reel mix without worrying about his colleagues. Different mixes can then be merged or updated without consensus decisions.

For complete accuracy, *Compumix IV* stores all data in real-time form and is able to change the status of every automated control on the console in a single frame and replay it with absolute timing accuracy. This real-time storage allows on-line editorial, with the merging of four mix files being made by touching a square on the plasma display panel, eg Mix A to Mix B to Mix C and back to A. As well as storing four real-time mixes, the 80 Mbyte hard disk also allows for temporary storage space for eight compressed mixes that can be re-exploded to real-time with total accuracy because all changes happening within a given frame are logged in that frame. The disk storage capacity allows for the automating of up to 256 modules, or channels, in a multi-console system, together

with peripheral functions.

The auxiliary colour graphics CRT display provides useful information by showing up to 90 faders with mutes on a single page. Equaliser settings are shown as frequency curves and knob settings. Peripheral devices under automation control are also displayed.

In addition to the usual read and write switches for fader and mute automation, the IDF has several other functions including the LINK function which allows for a finer control of fader moves and settings. One of the things the LINK switch does is to move the fader window over the gain range (thanks to 10-bit data conversion). Unlinking the fader knob and the VCA allows the engineer to reposition the knob while VCA gain remains static. The fader is relinked and allows the operator extra travel for increased gain or smoother fadedowns, depending on the situation required. Another advantage of the LINK function is that it eliminates the need to null the fader before an update.

The IDF is also capable of executing very fast fader moves extremely smoothly or doing cross-fades (merging) by calculating ramps between successive gain settings. This is due to running the IDF clock at 10 times the frame rate which would mean that for a fade executed in a 1/4 s using film frame rate, the move would be quantised in 60 increments and thus produce a very smooth sound.

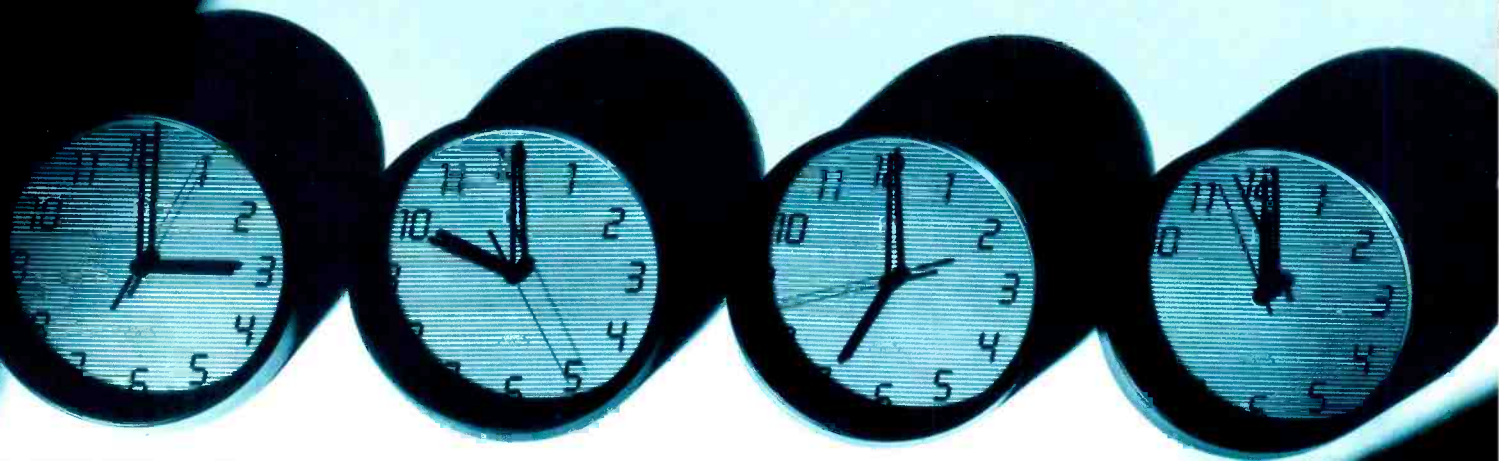
Though developed for film mixing, *Compumix IV* in conjunction with the *Superstar* console provide a very powerful production tool for all forms of recording. Facilities already using the system include Universal Studios, MGM, The Burbank Studios and Trans/Audio in New York. **Quad-Eight/Westrex, 225 Parkside Drive, San Fernando, CA 91340, USA. Tel: (818) 898-2341.**

Quad-Eight/Westrex, Eastern Sales Office, 2400 Crestmoor Road, Suite 327, Nashville, TN 37215, USA. Tel: (615) 386-7127.

UK: Quad-Eight/Westrex Ltd, Unit 1, Fairway Drive, Long Drive, Greenford, Middx UB6 8PW. Tel: 01-578 0957. □

Terry Nelson

LOCK AROUND THE CLOCK.

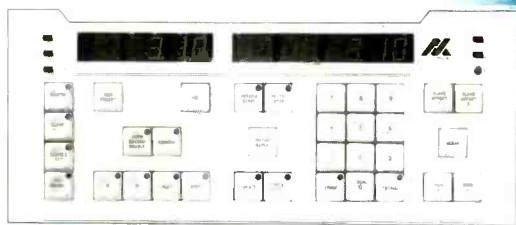


LONDON

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The ability to synchronise video and audio recorders is an increasingly vital facility required in studios all over the world. As much as three-quarters of today's audio recordings involve a visual aspect, and recording is more international than ever before. Basic tracks in New York, string and brass overdubs in London, dubbing in Los Angeles... modern international productions need an international standard for machine synchronisation, and there's really only

one: Q-Lock by Audio Kinetics.

It's the same all over the world. The simple, uncluttered controls. The custom interfaces that suit your machines. The remarkable software capability. The integrated system with built-in expansion possibilities. It all adds up to accuracy and ease of use, and that means speed and creative flexibility. It means Q-Lock. If you're looking for an international standard, you've found it.

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Middletown, New Jersey 07748, U.S.A.
Tel: (201) 671-8668



DIARY DIARY

People, events, services

Gateway synthesiser course

Gateway Studio recently opened its Synthesiser Course to complement its Primary Recording Course. Lecturer Steve Howell covers modular and programmable systems, analogue and digital sequencers, MIDI synthesisers, drum machines and sequencers, synchronisation codes, sampling and FM

synthesiser programming. Advanced systems such as the Synclavier and PPG are briefly examined and the course gives small group hands-on experience. Each course runs Monday to Friday. The fee is £200 plus VAT. Gateway Studio, 1A Salcott Road, London SW11 6DQ, UK. Tel: 01-223 8901.

Literature received

Crown International has a four page illustrated brochure detailing the operation and features of the *Micro-Tech 1000* stereo power amplifier. Literature Room, Crown International Inc, 1718 West Mishawaka Road, Elkhart, IN 46517, USA. . . HHB has produced a full colour brochure illustrating and describing the *CLUE COMPUTER* logging unit and editor. Designed for use with the Sony *PCM-F1* and *PCM 701ES* the system provides comprehensive logging of tapes and an intelligent autolocate system. The system also allows the user to edit between different video standards, ie PAL/NTSC. . . Fane Acoustics has produced a technical brochure describing their *Studio* series of professional sound reinforcement loudspeaker drive units. Over 17 items are illustrated with typical response curves, application notes and

specifications. . . The Proceedings of the Institute of Acoustics (1984) Volume 6 is on sale. Published in five parts (eight books) the volume contains reprints of the 194 papers presented at the Institute's meetings and conferences held during 1984. The set costs £107 and is available from the Institute of Acoustics, 25 Chambers Street, Edinburgh, EH1 1HU. Tel: 031-225 2143. . . The Autumn edition of *Neve Today* with details of current projects and contracts as well as equipment update and general news. Neve Electronics International Ltd, Cambridge House, Melbourn, Royston SG8 6AU. Tel: (0763) 60776. . . Don Larking Audio Sales' latest brochure detailing packages and equipment available as well as studios for sale. Available from Don Larking Audio Sales, 29 Guildford Street, Luton, Beds. Tel: (0582) 450066.

Fairlight hire

Marquee Electronics has launched a Fairlight *CMI* hire service which includes an experienced programmer, sound library and SMPTE Reading Clock for interfacing.

Fifty thousand note Page R compositional software is included. Marquee Electronics, 90 Wardour St, London W1V 3LE, UK. Tel: 01-439 8421.

Contracts

● Audio+Design Calrec has announced the delivery of *UA8000* music recording consoles to: MTV OY, Helsinki, Finland (36 channels in 48 frame with *MasterMix*); Pioneer Laserdisc, Japan (32 channels in 48 frame) and one to be delivered shortly to Skytthiot, Finland (32 channels in 48 frame with *MasterMix*).
● Crescendo Recorders, Atlanta has completed the renovation of Studio A with

redesigned acoustics and the fitting of modified APL monitor loudspeakers. A new Studio C is also under way specifically for keyboards and synthesiser programming with tie lines to both audio studios.
● ABC the Australian Broadcast Commission, has just ordered a Soundcraft series *1600* console. Soundcraft has also sold their first *TS24* in Australia. A 32-channel version has been purchased by Crawford Productions for film and video work.

Montreux AES

Exhibitor registration for the 1986 80th AES Convention in Montreux March 4 to 7 is currently ahead of forecasts. The AES has called for papers on the usual audio topics: including digital audio recording standards, audio/video interfacing, controversies in today's audio, acoustics and computer science, and tape duplication

techniques. As in Hamburg last spring, daily information for participants will be kept up to date by the *Studio Sound* AES Convention News team which will be distributed free of charge every morning. Convention registration forms and hotel information is currently being mailed out to members.

Custom cabinets

Frazer Wyatt has introduced a flexible custom build service for specialised speaker systems to accommodate the needs of professional users. Geared to PA, bass, sub-bass, backline and monitor systems the service can be utilised for the construction of cabinets to

drawings or details supplied, right through to whole or part of the design being executed by Frazer Wyatt. Further details are available from Rob Fris. **Frazer Wyatt Industries, PO Box 89, Basingstoke, Hants RG21 3JS. Tel: (0256) 27787.**

In brief

Hi-Voltage is a new pro-audio dealer in central Croydon. Located at 53 to 59 High Street, Croydon, Surrey (tel: 01-686 6362), they are open six days a week. . . Vitavox is now offering a complete sound

design, installation and leasing service for equipment supplied by the company. The first complete service was the sound system at the Heybridge Moat House Hotel in Essex.

Address changes

● Pro-bel has moved to new premises at Danehill, Lower Earley, Reading, Berks RG6 4PB, UK. Tel: (0734) 866123.

● Norwegian recording studio Søbstad Lydstudio has moved from Egge, to new premises at Tronstad, 3410 Sylling, Norway.

Stolen Lexicons

Lexicon *224XLs* have been stolen from Sarm West Studios and Easy Studios in London. The units belong to Audio FX and Studio Hire respectively and rewards are offered for

information leading to recovery. Serial no 3914 please contact Audio FX on 01-585 9592; serial no 3963-1944 contact Paul Tattersall on 01-640 8487.

Agencies

● Marcon has been appointed by Aphex Systems to represent them in Texas, Louisiana, Mississippi, Oklahoma and Arkansas. Marcon, 5327 N Central Expressway, Dallas, TX 75205. Tel: (214) 521-4313.
● Siemens has appointed ECS (Northern) Ltd as distributor for electronic components in Scotland and the north of England.
● Valley People has appointed, for the first time, several firms to represent them and these are: Darmstedter Associates, Electro-Acoustic Marketing, Wilson Audio Sales, Bencsik

Associates, Dobbs Stanford Corporation, YoreCo, RM Associates and Radon and Associates.
● Tannoy has appointed a new distributor in Belgium: ASE Pro-Audio, Kon Astridlaan 216, B-2800 Mechelen, Belgium. Tel: (015) 42 11 52.
● Sound Technology is to distribute the following products: Alesis, Ashly Audio, Dod, Aphex, Sundholm and Symetrix. Sound Technology Ltd, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR, UK. Tel: 04626 75675.

DIARY DIARY

People, events, services

SSL digital research confirmed

Solid State Logic managing director Colin Sanders made a number of announcements at a reception during the New York AES Convention concerning future directions for the company. Firstly, administrative, research and training centres will be moved from Stonesfield, Herts, where the company has been based for the last 15 years, to a new site in the nearby town of Woodstock. Early in 1986 they will commence construction of production and test facilities, additional research labs and listening rooms. When the first phase is completed, SSL's international headquarters will comprise over 62,000 ft² with a staff of over 300.

With regard to the future, Colin Sanders confirmed that SSL have been engaged in digital research for several years and that this research will accelerate at the new site.

The goal is an entirely digital SSL studio system "... this is not a product announcement. We are not taking orders for the system, nor can I confirm exactly when it will be available or what it will cost. We are not working to a specific date or price—we are working to a performance specification that will satisfy the most critical listener."

The SSL Digital Studio System will be based on a proprietary 24-bit digital audio processor and incorporate integral audio storage and editing facilities. It was stressed, however, that SSL felt the analogue console would remain the industry standard for a number of years to come. As if by way of proof, SSL announced the sale of the 300th *SL4000E* series console during the show to The Village Recorder in Los Angeles.

Neve sold to Siemens

Neve Electronics' parent company Energy Services & Electronics, now part of Brammer plc, has reached agreement with Siemens AG Austria and Siemens Ltd UK for the transfer of control of Neve Electronics Holdings Ltd to Siemens. The completion date for the deal is expected

before the end of the year. Siemens is committed to the further development of Neve technology in both analogue and digital fields with significant R&D plans in the UK. We understand that major changes in the public face of Neve are unlikely in the immediate future.

Prodigital digital standard

Mitsubishi announced the formation of the Prodi, or PD, stationary head format during the New York AES Convention. They have been joined by Otari and AEG who have jointly developed and fully agreed to the PD format.

The format agreement includes such machines as 32-channel 1 in, 16-channel ½ in and 2-channel ¼ in with splice and electronic editing capability. Also included is mechanical track layout on the

tape, full machine control standards as well as digital port compatibility between the different brand machines.

Mitsubishi have recently introduced the *X850* 32-channel recorder and there will be a new 2-channel machine next year. Otari are planning to show a 32-channel prototype at the Montreux AES with production machines available from mid-summer. AEG plan to show a 2-channel machine in 1987. □

AKG
ACOUSTICS

International Musician comes to some interesting conclusions about the AKG C535 EB ...

Here's an extract from the conclusion of a glowing report on our C535 EB condenser microphone, in a recent International Musician lab test:-

"I am most impressed by this microphone, my favourite to date. It offers the high performance specification demanded for studio applications, with the robust and durable construction features necessary for stage use. The C535 could very well break the long held monopoly of dynamic microphones in fronting rock bands and top solo artists on stage."

Apart from a few abbreviations to fit this ad, that's what the man said and if you want to see the full report which also praises the 'crisp, clean natural sound quality' and 'the immunity from handling noise', clip the coupon and we'll send it to you, together with details of other superb condenser and dynamic microphones used by the world's top artists, studios and broadcast authorities.



Yes I'd like to see the **C535 EB** report, and details of other **AKG** microphones.

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

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

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

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

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

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

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

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

They haven't budged an inch on quality.



OTARI®

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

RATES DIVERSIFICATION AND TOYS

Running a studio in London is not exactly a passport to a fast buck. Some studio owners would be better off if they had stuffed their money under the mattress. But why aren't studios, for the most part, making a reasonable profit? Why are rates so low compared to the capital investment?

Dave Harries, of Air London, part of the Chrysalis group, attributes the industry's inability to charge higher rates to the law of supply and demand. "The reason they're not higher is competition. There was a lot more demand in the '70s through to the '80s because multitrack took off, so albums started getting more technically perfect. Everything had to be right. You had the facility to ensure that every note was musical and that the sound was great. You had more and more tracks to play with and it took longer in the studio. So naturally there's room for more studios. Some of the extra competition was offset by the fact that the facilities grew, right up to 46-track.

"During the time when record sales dropped, a lot of work fell off in the studios and people panicked about empty spaces. Some of them were stupid enough to offer ridiculously low rates on any pretext they could invent just to get their studios filled. Hopefully Air didn't do too much of that, if any."

Surely a studio earning, say, £20 an hour is better than one earning nothing? Dave Harries thinks not. "It would seem a good idea at the time but in the long term it isn't. Someone's got to do the work." Other studio managers agreed, Rodger Bain of CBS Studios: "If a studio's not booked it's very tempting to respond. But

In this article we asked four London studios to comment on three specific topics (hence the title)—perhaps those which more than any others are the major problem areas for recording studios in any location.

Richard Lamont reports

it's a slippery slope and very short sighted. In the long run it's a mistake."

Jill Sinclair of Sarm Studios also agrees but has not forgotten what it feels like to be in a weak position. "It's very hard in a very competitive field to sustain a rate. I haven't always run four studios. I used to run one, a small and obscure studio in the East End of London. I know what it's like to run one studio and nothing else. You don't have a record company to fill it, you don't have producers to fill it, you don't have anything but outside clients. Dead time is awful. So when somebody comes along it's much more tempting.

"It's a much easier position with four studios. You don't have to have all four going to break even. It's a position of strength. So it's easy for me to say 'they shouldn't do it'. I was in that position and I know it's not a nice position to be in. I remember when our rates were something like £65 per hour. A producer came along and offered me £35 per hour. I refused, because once someone has come to the studio and paid that rate, that's all they think that studio is worth. It was very hard to refuse but I did. I know some people now who are bartering like crazy, trying to get silly deals."

Clearly tame clients are a big

help. Sarm has arrangements with Island and Stiff, as well as housing Trevor Horn and ZTT. Air is now part of what is to become the Chrysalis facilities division, along with video house Reseach Recordings. CBS Studios gets a lot of work from CBS Records. But Rodger Bain says they are still more concerned with outside work. "On sessions something like 33% would be CBS, on post-production and mastering something like 70% would be CBS. A lot of CBS work from overseas would come here. Repeat work like disc mastering, tape copying and cassette mastering would automatically come here.

"CBS Records is a customer like anybody else. We have to sell ourselves to CBS Records as if they were any third party customer."

Lansdowne, a single studio, is owned by Adrian Kerridge and his partner Johnny Pearson. Adrian Kerridge regards competition as a good thing, but will not do cheap deals. "I won't enter a Dutch auction and I tell clients that. Remember this—we have getting on for £500,000 worth of equipment down there in my room. Most studios do. I have to recoup a reasonable amount for that investment. I have therefore to base my rate on that investment."

Everyone I spoke to agreed on the importance of high

standards, both general and technical. Dave Harries: "We try to give a really good service, a high level of technical backup and modern machinery that's well maintained. If there's anything slightly wrong with it, it's put right or replaced, it's not left. Head wear? Change the head."

Air has in-house maintenance. Is that a selling point? "I don't know. I think it just helps towards your reputation. You can't put that on an ad. We have maintenance as long as people want it. They don't all go home at 6 o'clock.

"If you are going to maintain that kind of service you've got to maintain the rate. You can go out at a lower rate and chop some of these services. You can chop tape librarians. You can chop all-night security men to look after the telephones. You can chop maintenance men. You can let the heads wear down until the wires show through. But we wouldn't do that. But we've got the problem where we want to maintain that service but we also, because of that, need to maintain a rate. If people start undercutting then it doesn't help the industry because it forces people not to be able to provide the service that the record companies deserve, really. They expect it with the sort of acts that Air gets in."

Adrian Kerridge agrees about providing a total service. "I suppose it's an old saying but we realise here that you're only as good as the last job you did. Whether the coffee was right or whatever: it's the whole concept. The phone should be answered immediately. Don't let it ring and ring. To give another example—we had to call a studio last week to speak to an engineer there. The phone

rang, and a woman picked it up and said, 'There's nobody here, won't be anybody here until 12 o'clock. I'm only the cleaner.' This was at 10.30 in the morning. What do record companies and others want? My organisation is staffed from 9 am until 6 pm. If we've got dates the guys are in at 8 am.

"Unfortunately we have still not learned the lesson in this country that the Americans learned years ago, chasing the dollar as they do, of chasing the business in a very serious manner. I think a lot of studios here don't chase the business in the right way."

Adrian Kerridge, like Dave Harries, regards the maintenance of technical standards as paramount. "If you're going to do a DIY woodworking job, you don't expect to pick up a chisel and find it blunt. You expect to pick it up and use it. You don't go into raptures about how you sharpened it. We're the same here at Lansdowne. When people book our studio, they have the absolute right, with the amount they are paying, to expect the chisels to be sharp.

"In a lot of studios that doesn't happen. People say, 'we put tones on the tape machine and it didn't line up'. It's an oblique point but I think it's important. It all comes back to the question of competition."

Standards should improve as London rates go up. Adrian Kerridge says that the ratecard is coming back up. "The ratecard, five years ago, was out of the window because of the economic situation in the country. Everybody was doing deals. But now the studios that are really busy can usually get the rate they want for the studio in terms of record work.

"You don't necessarily get more business by reducing your rates. You probably get more business by increasing them, by uplifting your professional status—your image. It's a big circle. I've often said I don't believe what other studios are offering in terms of deals. They are mad. Perhaps it's good for us because in three or four years time they won't be around."

Discounts

All four studios questioned said they only did limited discounting. Dave Harries: "The only deals that we would give would be a percentage discount to certain prime customers but usually that's accompanied by a statement that monies are paid within

seven or 14 days of the invoice. It's not general that everybody gets a discount if they pay soon. Obviously you try and go out at your full price. You can't really afford not to. We'd certainly like to put them up."

Jill Sinclair: "We will offer a discount, if asked for, for money up front. We also have an in-house discount for ZTT. We also have a discount for Island acts because it's our sister company: we have an agreement with them. Stiff used to be a sister company and we still have an arrangement with Dave Robinson. Apart from that we're not really interested in discount deals. Obviously you do get people wanting discounts and sometimes, like all businesses, it depends on what the marketplace is like. If business is buoyant you're not going to give any. But I think the most we would ever give is to charge a weekend at a weekday rate: maybe a small percentage discount."

Rodger Bain: "We use a discount procedure here depending on the volume of business. If a customer is bringing a sufficient level of business to us, as an incentive we will be able to offer a discount. We don't automatically give discounts.

"We are not in the business of selling on price. We sell on service. Whatever price is necessary to provide that service is what we will charge. If a customer is not in a position to pay that price then there's nothing we can do about it. We don't cut the service to match the price."

Price rises

As far as increasing the basic rate is concerned, it seems that nearly everyone wants to go up without being the first to do so. Rodger Bain thinks some might be mistaken enough to keep the price the same: "The majority of people I think will increase their price. I don't think anyone

would be rash enough to say, 'right, I'm going to be the one that's going to put my heart in my hands and I'm going to jump in and put my price up by 50%', because we'd all stand up and see what happens to him."

Or her. Funnily enough, Jill Sinclair did put Sarm's rates up and everybody stood up to see what happened. "At the BPI, in March, I sent somebody to say the we would be putting our rate up on April 1st. I was the first to put prices up. Studio One went up to £105 an hour and everybody freaked. But we've had hardly any resistance to it. All our other studios went up to £85 an hour. Most studios are £70 to £75 an hour. I think we are possibly the most expensive studio.

"I thought everybody would follow me but nobody did. The problem is, you go to these APRS meetings and everybody talks and says, 'Oh yes, we'll be following.' But I don't know of another studio that followed our example and tried to get more realistic pricing."

How does she get away with it? "I don't think it's a question of getting away with anything. I think it's a case of fair market value. When I came into the business, desks cost £25,000 to £30,000 and studio rates were £40 to £45 an hour. Now a desk costs £170,000 and studio rates are generally around £75 an hour. So the desk has gone up six times and studio rates haven't even doubled."

Rodger Bain proposes to increase CBS Studios' prices in line with inflation, plus a bit. "Over a period of five years we will have reached a stage where we will not be completely up to the level that we should be but we will have managed to pull back slightly from the loss that studios have suffered over the last 10 to 15 years. So it will be by incremental steps."

Dave Harries suggests a less orthodox route to higher prices. "It's difficult to get them up. You can't have a price-fixing ring, that's illegal. Obviously you can get together in the pub and say 'OK lads, we're all going to go up on 1st December.' That's what we generally try to do! It's one of the main topics of conversation at most APRS meetings but we can't stand there and say, 'everybody—£100 an hour'. Anyway, facilities vary a great deal. Facilities, locations, the standard of the equipment and the sort of service you get varies so much you don't fix a price. You can probably fix a bottom line and you encourage people to stick to their



**"If a small customer comes down to London to get half a dozen tapes copied, he is a paying customer. He's just as important as the Number 1 record."
(Rodger Bain, CBS)**

published rates. Do not go under them and take work away from other people; so that people know, in the open, what the rates are."

If rates do not go up, then it will be much harder for studios to invest in up to date machinery. Rodger Bain explained, "Let's say for discussion's sake that the commercial life of a piece of equipment, as opposed to its technical life, is about five years. You would probably be just about paying off the investment by the time that five years was up. You'd be constantly re-investing and you wouldn't be making any profit on it.

"At the moment it's a dilemma. The customer wants the latest piece of equipment. To offer that equipment you have to sink pretty massive sums of money into upgrading the facilities. In so doing the studio is then committed to heavy recoupment, which is not possible at present rates."

Dave Harries says that record companies have got to look forward to having all-digital recordings, as CD sales grow in importance. "It may not be necessary now but I think it will be in the future. They must expect to pay for the machinery to do it."

Marketing

How do successful studios actually market themselves? Do they actively sell studio time, or do they just open the window and watch the bookings fly in?

Dave Harries: "We don't go out door-to-door selling. We do put ads in the *APRS/Studio Sound* guide. We don't advertise too much unless we've got something specific to say like, 'We've got Number 1 in two different countries.' We might put an ad in to say that."

Rodger Bain says CBS advertises in the conventional way and uses mailshots, "We also have a studio magazine that we send out every quarter called *Hot Wires*, which is probably more orientated towards A&R rather than studio personnel; it's a newsletter about things happening in the studio, with an A&R slant as opposed to a technical slant.

"We do try to get as much editorial coverage as possible to back up the advertising. I think that is probably a more convincing way for us to show what the studio is about. Anybody can put an advert in, all it takes is money. Editorial is something different; apart from telling you something about the studio, the fact that

RATES DIVERSIFICATION AND TOYS

it is editorial tends to lend credence to what is being said. So we try to back up the advertising with as much PR as we can.

"Otherwise, the main marketing tool, I would say, would be the success rate of any studio. Not success rate in terms of how many records you have in the chart, but success rate in terms of satisfied customers. If a small customer from the Midlands comes down to London to get half a dozen tapes copied, he is a paying customer. He's just as important as the Number 1 record. It's your reputation and his satisfaction that is important."

Jill Sinclair: "We don't advertise an awful lot. I don't believe that advertising sells studio time. I think that the only thing that sells studio time is word of mouth and good product. And good personal contact. So instead of advertising, we spend the money on making sure that the staff are excellent, the studios are superb and so on.

"Some studios do advertise but not a lot, because it

doesn't bring in business. What's the point?"

Diversification

A recording studio used to be a place to make records in. Most still are but technology has offered new opportunities in the last few years. Where do London studios stand? Of the four featured here, one had gone into music-to-picture in a big way five years ago and is doing very nicely thank you. Two others have plans to diversify next year—details in a moment.

To what extent is it wise for a studio to diversify? Is there work to be had? Is there a risk of becoming a 'jack of all trades and master of none'?

Adrian Kerridge and his partner Johnny Pearson asked themselves exactly these questions when they bought Lansdowne five years ago. "For us at Lansdowne, and I keep going back to 1980 because it was a watershed, we looked at the whole area of film and video I looked at our history, we're 26 years old now, so we're a very old



**"Now, nearly five years later, it (music-to-picture) was the best move this company ever made."
(Adrian Kerridge, Lansdowne)**

studio, I looked back and I said, 'What did this studio do in the 60s and the 70s?' and I came up with some figures. The figures were very interesting. During those two decades, we'd had records in the charts in most years, of various artists, various types of artist over a very wide range of music. We had gained something like 350 gold, silver and platinum records to our credit as a studio. I didn't think that was too bad. I thought, well, we're still in the record business but what's going to happen in the future?"

"We made a very positive decision to go in for music-to-picture, for video. We managed to work a lot of interfacing together that would automatically start the click track six beats before, two bars or one bar before (the hit point on the picture). So all the composer had to do was to count the clicks and he was in with the picture. It took all the pressure out. We spent a lot of money and three months getting it together and then released it to the world.

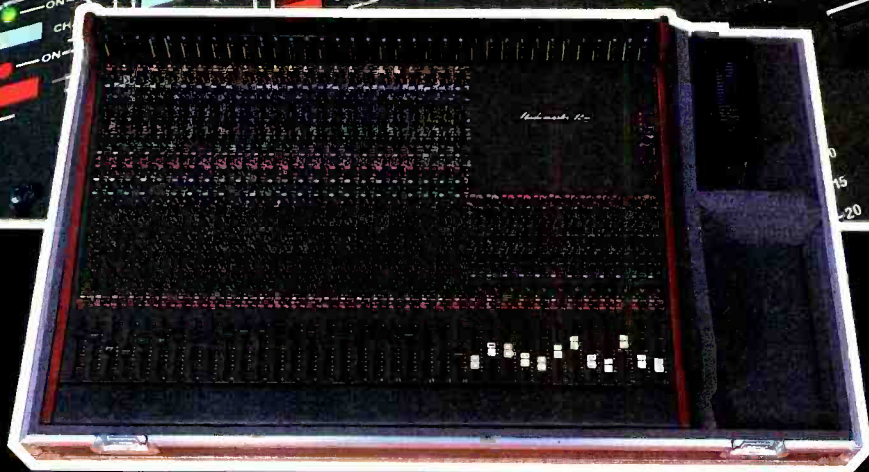
"Not very much happened at all. And I said, 'I think we may have actually, as a record studio, blown it. Perhaps we've got it wrong.' We contacted one or two people and told them what we were doing, we contacted composers and said 'look, we can now do this', and everybody said 'ah yes, very interesting but we don't work that way'. So I said, 'yes, it's new but don't you think it would be easier to work this way?' 'No no, we work with a projector and proper pictures, and conduct the orchestra, and start with a bar going across the screen. That's the way we work,' I said, 'Well, it's very slow isn't it?' 'Yes, it's a bit slow but that's the way we work.' I said, 'Well, how about if you did a music-to-picture session, and it was on U-matic, and it was a one-button operation and we could lock the pictures back to the 24-track by the time you've actually got from the studio floor to the control room, and it's all in sync, and we can get about 10% more music in the can if you want?' 'Don't believe it.' 'How about if we offered that service?' 'Oh, that would be terrific.'

"Now, nearly five years later, it is the majority of our work. It was the best move this company ever made."

Jill Sinclair's company is unlikely to follow the same path. "Putting sound to film is never as lucrative as having a band who are going to be working lockout for months. We have The Firm in at the moment and we had Yes

STUDIOMASTER

12M



SPECIFICATIONS

FREQUENCY RESPONSE: 10Hz - 20kHz +/- 3dB TOTAL HARMONIC DISTORTION: Typically 0.01% @ 1kHz (Input 0dBV Output +4dBV) HUM & NOISE: (20Hz - 20kHz, input termination 150ohms) Equivalent input noise -126dBm. Residual output noise (all faders down) -86dBV. MAXIMUM VOLTAGE GAIN: 88dB. CROSSTALK: Input to input -60dB. DIMENSIONS (LxHxD): Of flight case (incl. wheels): 1551x337x1068mm. Of 24-channel mixer: 1218x207x870mm. Of 32-channel mixer (1 add-on fitted): 1540x207x870mm. WEIGHT: 24-channel 12M in flight case (incl. PSU) 75kg. 32-channel 12M in flight case 85kg. ACCESSORIES: External Power Supply, DC lead, AC lead.

THE STUDIOMASTER 12M MONITOR MIXING CONSOLE

This exciting new mixing console from Studiomaster gives the smaller bands and P.A. companies the opportunities to possess monitoring facilities and sound quality previously beyond their means.

The 12M comes as standard in 24-12 format but the flight case in which it is supplied has provision for a further 8 inputs to be added — so if the time comes when you want to expand your monitoring capabilities, then your 12M can expand with you.

The 12M has too many features to list here, but they are all to achieve the same result: total sound control of a very high standard. In particular, Studiomaster's acclaimed EQ facilities have been expanded up to FOUR bands on the inputs and the output 4-band EQ has FULL-PARAMETRIC mid-bands. The flexibility of this EQ can even render outboard graphics unnecessary.

Studiomaster have positively attacked the problem of feedback with a number of features which will eliminate it at the desk: every input channel has a notch filter which, by turning an infinitely variable rotary control, will cut the feedback frequency with a very narrow "notch" in the frequency response. Also, "Q" control on the output equalisation can be used to create another notch filter effect.

Input and output connections are XLR type. All inputs are electronically balanced, high impedance for minimum interaction with the front-of-house desk. The inputs also have a parallel out socket. The outputs are unbalanced, low impedance with a transformer option for complete ground isolation.

A 12 segment display on every channel, combined with the built in monitor output (for headphone or amplifier listening) allows the monitor engineer to constantly check the mixes he creates. The 12M also has a talkback system which allows him to communicate with the artists on stage, particularly useful during soundchecks.

The 12M is not only electrically superb; the chassis is built with quality materials and careful consideration of the ergonomic aspect has resulted in a logical channel layout which combined with detented rotary controls and 100mm ALPS master faders makes for confident, precise adjustments.

With all these features and versatility though, the 12M is still very affordable. State-of-the-art design has made it possible to offer no-compromise performance at a price which puts it in reach.

For more details, contact:

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before. Those sorts of bands want lockout, seven days a week. You're probably not paying your staff for those seven days a week because they're not paid on the lockout, they're paid on the hours that they do. I don't believe that doing a film is going to be as lucrative as getting a band like that."

Sarm does plan to expand sideways but differently. "We're just about to have a Synclavier in Studio Four, the biggest Synclavier in Europe. We're going to be renting that out as a studio. To have a Synclavier in a studio is a total waste of money, because your Synclavier is probably £1,500 to £2,000 a day, your studio is on top of that and then you've got digital machines. So what we're doing is starting Studio Four, where Trevor (Horn's) Synclavier will be for hire with a programmer—we will supply the programmer—to the outside world at a daily rate, when he's not using it. It's not going to have an SSL desk because with a Synclavier you don't need it. The studio facilities will be minimal, because with the Synclavier's facilities you don't need it, you only need to dump on to tape, digital hopefully. Then it will go through to Studio Three. We will be looking at that very closely and we are moving out so that they can do that."

Dave Harries sees no advantage in Air diversifying: the returns would not justify the investment. "We did consider building a proper post-production suite with all the equipment—monitors, cart machines for sound effects and an events controller. We thought about doing it (five or six years ago) but we couldn't justify the market for it so we gave up.

"What else can you diversify into? Film—as in 35 mm feature films. You need a very big studio because you must be capable of recording big orchestras. The big studios in London that specialise have most of the market. We had full projection facilities at Air but we sold it all off to Anvil/Abbey Road.

"Classical music? Same thing: you need a big room. Jingles? We've got that anyway."

Rodger Bain has modest plans for diversification at CBS. "Next year I'm going to take a hard look at the voiceover facilities. Having three studios, two disc cutting rooms and two cassette mastering rooms we are already able to offer a great range of facilities. We are not

RATES DIVERSIFICATION AND TOYS

**"You can put a mark-up on rented gear, so you do make a very slight profit. And you are not scratching your head every three months deciding which one to buy."
(Dave Harries, Air)**

concentrating simply on making chart records."

T-T-T-Toys

The English may not like music—but they absolutely love the noise it makes. (Sir Thomas Beecham)

If Sir Thomas had been an effects-mad pop producer, he might not have been too popular with Dave Harries. "Toys are the biggest pain in the arse the industry's had to put up with.

"Obviously we would like to buy all the equipment, everything that people would need, and we would like to bolt it in the room so that it would be there when they walk in, they don't have to worry about renting equipment.

"There are disadvantages of doing that from the studio's point of view. In our case at Air, we can't just buy one, we've got to buy four at least. Everything we think of in our budget for toys has got to be ×4. Secondly, if you try to bolt it in, then the other studio that needs an extra one pinches it when that studio's empty, and you end up with

fights on Monday morning because somebody had it on Friday, somebody 'nicked it for a mix on Sunday and he's carrying on this morning and he's got our DDL, what are you going to do about it?' Interchange between our four studios is a problem."

Jill Sinclair says they don't believe in moving things from studio to studio at Sarm. "The only things that we move are the digital machines. Every studio here, except Studio Three, has 48-track, two analogue machines. I hate gear wandering around the building. The gear that is in each studio is in each studio. It's not a case of who got in first in the morning gets the 224X. It's a nonsense. We don't run that way at all."

Dave Harries points out another disadvantage of supplying effects as part of the basic rate. "You've got the added responsibility that if it goes wrong you've got to give them another one if you gave them one in the first place. It's no good going to them and saying, 'Well look, we gave that one, I'm afraid you'll have to rent in the next one.' They won't accept that. So you

**"Some studios will accept £50 an hour but when you work out what you have to pay to hire all the gear it's probably cheaper to come and work here."
(Jill Sinclair, Sarm)**

find yourself forking out £100 a day unnecessarily.

"You can also put a very small mark-up on rented gear, so you do make a very slight profit. And you are not scratching your head every three months deciding which one to buy.

"From a client's viewpoint obviously he would like to see everything free of charge. For certain sessions we've had at Air, the client has paid more in rentals than he has in studio time. It seems surprising to me that people can book a studio and crib about £5 an hour and the odd cab, and yet they'll have another couple of DDLs in at £100 per day each without blinking an eye."

Both Dave Harries and Jill Sinclair expressed a preference for the 'American system', where the hourly studio rate includes no outboard gear. Jill Sinclair: "In America, you have to pay for any bit of gear that you want. It's a nonsense—studios in England are absolutely mad because they've actually cut their own throats.

"I have a certain amount of gear. We have what everybody else has. I try to keep up. I think we have more than the average number of toys. We don't have more than Air—we probably have a similar number to Air, Townhouse and so on. If you don't have a piece of gear that most other studios have, clients are not happy to hire it in. They expect studios to have certain things. When you've got that, if they want something special then they don't mind hiring it in.

"This is one of the reasons that some studios will accept £50 an hour but when you work out what you have to pay to hire all the gear that you want, it's probably cheaper to come and work here."

Adrian Kerridge is sensitive to the price of his toys. "My music came first, my technical area came second and I object to being technically ripped off by some manufacturers. They don't like me for it. I get very outspoken. I say, 'How the hell can you charge that for that? That's ridiculous.' 'Ah well, you know, software development,' and all this sort of rubbish. You open it up and there's nothing in it but a few chips. That's why I admire the new generation of guys that are coming in with toys that are quite reasonably priced. I'm happy to go out and buy them. Rebis do some good things... Bel... Drawmer. Not over the top, not under. That's all we ask as studio owners." □

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Power Plant is one of those 'new' studios with a history as long as your arm. Originally part of the Morgan empire, the building passed into the hands of current owner, producer Robin Millar, back in 1982. Since then it has been altered beyond all recognition. The complete reworking and refurbishing of both studios and the introduction of stylish interior design was crowned recently with the opening of a third studio, The Gallery, on the top floor of the West London house.

The Gallery

The Gallery appears to sit so comfortably that it doesn't really occur to you that perhaps it wasn't the most obvious place to locate it. Munro Associates were called in to design and build to Robin's brief, and Andy Munro admits to slight apprehension when he was shown the prospective site. "We have built the best possible control room and studio out of the top floor of an old building with timber floors which was really designed for living in, not building studios. It is what would normally be considered a hostile environment acoustically speaking."

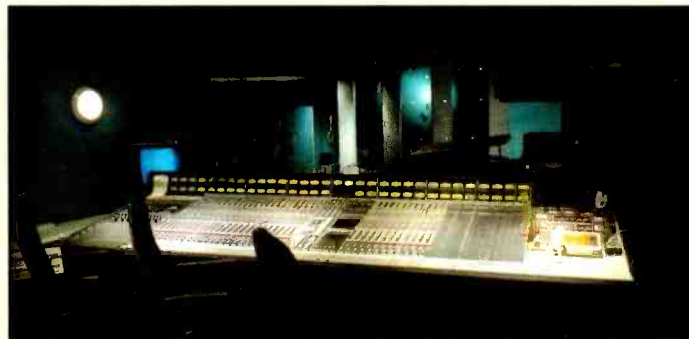
The space was formerly used as maintenance room, plate storage and tape library, and was gutted entirely, including the removal of the roof. Eleven weeks later the studio was finished. The design was the result of conversations between Andy and Robin over a period approaching three years in which Robin described his ideal workroom.

"The room was to be very carefully tuned acoustically, to be very real and very unartificial sounding; totally flat but not in a dead sort of way, in a real way. An artificial, optimum real sounding room.

"It had to have enough room for Fairlights, synthesisers, drum machines, sequencers and everything. And through the colour scheme and lighting we had to create a room that would feel nicer inside than out, which is quite an achievement, especially when the sun is shining!"

Daylight was another important factor—there are two windows in the control room, and two walls of the

Power Plant, London



Control Room 2

recording area are windows looking out across Willesden. But there are also blinds for the night owls who prefer the dark.

"I wanted daylight to keep people in touch with real life. We have two full time restaurant staff here and at 7.30 we have a big dinner which everyone attends, to keep them in touch with a sense of normality. There is nothing more depressing than working in an airtight room for three weeks eating secondhand hamburgers and gradually turning yellow. So I insist that everyone is allowed out of the studio to come and eat. All the rooms which do not have windows in them have CCTV monitors trained on the outside world."

So windows there are, and they have proved to be quite useful in the acoustic ambience as well as the visual impression. The floor is most unusual—the covering is green Astroturf, which is more commonly found on artificial baseball pitches, and which caused Munro Associates to fret, unnecessarily it turned out. The walls are completely covered over in acoustically transparent open weave fabric most of which is blue.

"It's all part of the bright and open feeling. There is grass on the floor and sky on the walls. I figured it was a concept that God got right a long time ago so why should I argue?" explained Robin.

Although obviously built for commercial purposes as well, The Gallery is primarily a place for Robin and therefore contains all his favourite things, like the Harrison *MR3* console which used to be in Studio 2. With its Audio Kinetics *MasterMix*

automation, this console fills all Robin's needs. "I'm a big fan of Harrison, and especially of this *MR3*. There was no way I was parting with my Harrison just because commercial demands state that a lot of people like to use *SSL*. So this room, designed for overdubbing, mixing and general control room work, is a facility for people who prefer the Harrison sound to *SSL*."

Because of the increasing amount of recording taking place in the control room Robin felt the need for a separate machine room, and of course the additional space is appreciated. "This has been very popular. Normally a control room is quite a noisy place, you don't really realise it. And since sometimes you even record vocals in the control room it is essential that the room is as quiet as possible." The machines are all Studer *A80* with Dolby noise reduction. "I use Sony *PCM-1610* and *F-1* as well for mastering. They do sound different. Sometimes $\frac{1}{2}$ in or $\frac{1}{4}$ in is better—it depends on the track. It is just another way of bringing the sound out; it has its own sound and it is not 'nothing' like they say it is, it sounds quite different to what you're putting on. There is no tape hiss or tape compression, but it is definitely quite different."

The outboard equipment is rack-mounted in moveable trolleys on umbilical cords and includes AMS *RMX16* digital reverb, Bel *BD80* 4s digital delay, Drawmer noise gates, EMT *140* stereo valve (tube) plate, UREI, dbx and Pye (valve) compressors.

The monitors are UREI *813Bs*, and were the starting point of the design. Small

monitors are *AR18s*. "They are the only ones that sound right but they aren't made anymore. We have *NS10Ms* but personally I don't use them. Yamahas sound great but that's not what you want. They are too good if you like. *AR18s* sound nice but they are not flattering. The *NS10Ms* have a peculiar middle that reminds me of studio monitors in the past. And people get used to it and that's no good."

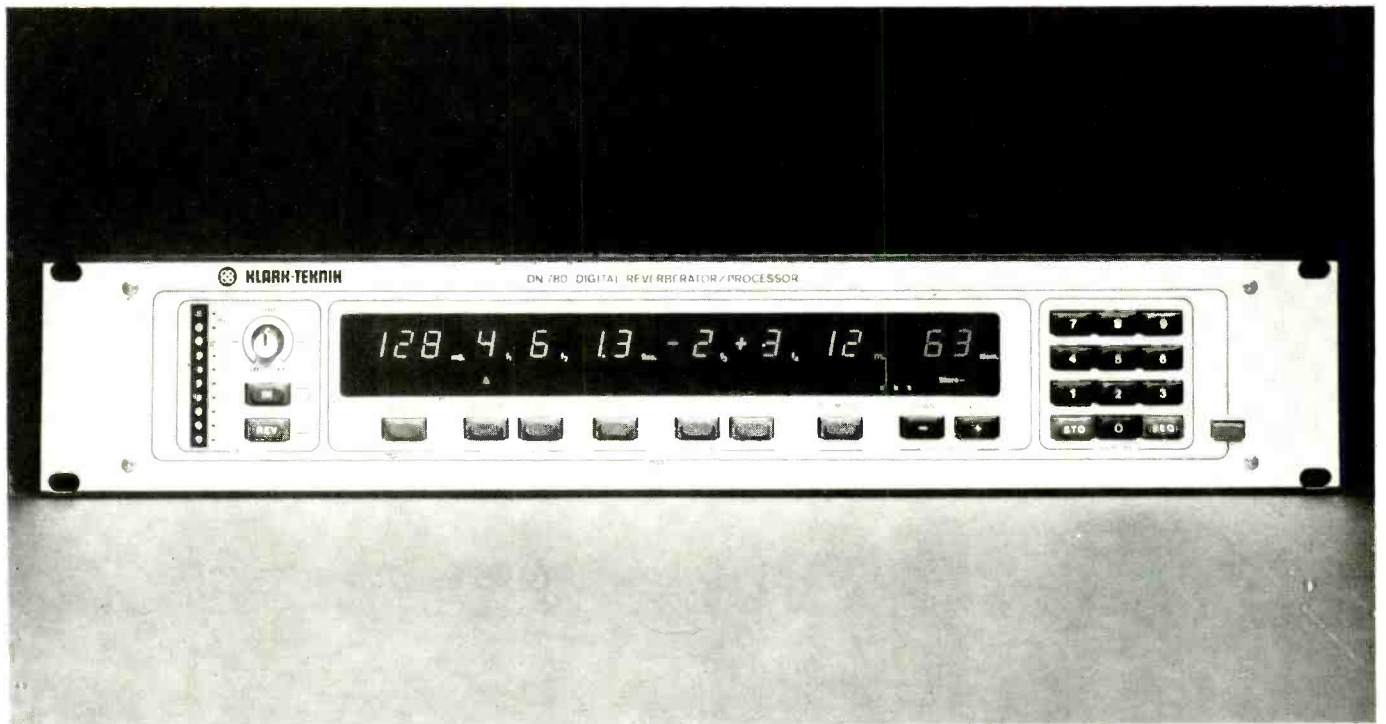
Andy Munro interpreted Robin's need thus: "What Robin didn't want was something like, say an Eastlake room, which tends to absorb everything except the monitors, and Robin interprets that as 'sounding funny'. The Gallery has an acoustic characteristic in its own right while you still hear the bass and treble in the right proportions so that you can mix properly. It is a much more dangerous way of doing things because you rely on the design being exactly right, and if it isn't then it is a disaster.

"If you have a room with a natural acoustic you don't need as much power to get reasonable listening levels. The monitors in Studio Two and The Gallery are driven by a single Studer (*A68*) power amplifier rated at something like 150 W/channel, and it is easily enough because the room is helping the monitoring. When you can use less power like that you get a cleaner less distorted (by the monitors) sound. So you try to produce a living room type environment which is acoustically flat. The room has no EQ, which is one of the design criteria. You should never have to EQ to compensate for the room."

Because of the somewhat awkward location of The Gallery, the first thing they had to do was calculate the weight of the entire structure including all the equipment and ensure that it did not exceed the floor load. A lightweight structure was essential and the timber raft flooring was floated on Neoprene insulation mounts using an interlocking joist system in order to maintain the maximum ceiling height.

The Astroturf which covers the floor, because it has no 'woolly properties', turned out to be rather useful. It does not

Photo: Ralph Denyer



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absorb high frequencies the same way carpet does, rather it diffuses. This proves to be an asset for the 'natural' sound sought: "In fact it worked so well that we designed Studio Two around it." Robin particularly did not want the room to look acoustically treated, which is why everything has been covered over in the blue fabric.

So what is behind it all? Munro: "We use a system of damped resonant bass absorbers as opposed to bass traps which take up 6 in instead of 3 ft—a very significant space saving in small rooms. We wanted to neutralise the acoustics. The room had to remain fairly bright but also fairly well damped at low frequencies. You have to get rid of the standing wave energy by absorbing. Hence you produce a fairly complicated room shape to eliminate any single predominant standing wave. If the shape is right you don't need elaborate absorbers.

"The ceiling is a combination of highly absorbent modules in the proximity of the mixing console and monitors to reduce early reflections. The rear is designed to increase diffusion and ambience of the sound so that the reverb comes from the back of the room and you hear the monitors first, then the room.

"The side walls at the front of the control room are designed to be completely absorbent to eliminate early reflections and the same goes for the front half of the ceiling which contains full range absorbers."

The front wall, incorporating the sliding glass doors through to the studio, is designed around the UREIs. "They work best operating into a hemisphere, so that is how the room is designed and the speakers are set into a brick wall, flush. There are tuned absorbers at the floor and ceiling interfaces. The rear part of the room is designed to absorb low frequencies and diffuse mid and high.

"Because the windows are in the ambient end of the room they have actually become useful, enhancing the ambient sound without affecting what you hear on the monitors.

"Overall we were after a

Power Plant continued



Studio 2



Control Room 3

feeling of light and space. It is a medium sized room which we wanted to appear to be much bigger. Natural light contributed a lot and with the machines in a separate room it is very uncluttered."

The recording area itself, though small, is fairly bright, the sound being created by a lot of glass, diffusive ceiling and the implementation of tuned low frequency absorbers.

Little touches like the ioniser in the middle of the control room and the low voltage lighting schemes are subtle but effective enhancers.

Studio Two

The Gallery is not the only big change that has happened here. The reason why the MR3 was free was that Studio Two was being dramatically rebuilt and re-equipped. Well it had to happen—this is the new SSL facility.

When Robin first took over the premises, this studio contained an old Cadac console and "some junky bits and pieces" which were all discarded and the Harrison came in. Otherwise, the rooms were left pretty much as they

had been found. 1985, however, was the year this all changed. The studio was gutted and everything was totally altered. A larger control room (more than 400 ft²) was created and separate access to the recording area introduced.

Once again the floor is covered over with Astroturf, the walls are covered over with the blue fabric, in fact the studio has been built along very similar lines to The Gallery.

"One thing I hate is the sort of studio design which is vulgarly trying to show off the acoustic treatment. It's the same when people try to do it in their homes, taking the fronts off the speakers because they think it looks impressive—it's horrible. So everything is covered over in this open weave fabric which is acoustically transparent up to about 15 kHz."

There was not enough space here for a separate machine room, so the Otari MTR90 is recessed at the back of the room with Illsonic tiles behind it to absorb all the machine noise. Above this is racking

space for equipment such as the Dolbys, and those it is not necessary to have immediately to hand. The others are mounted in racks which have been built on to either end of the SSL SL4000E console, the patchbay being remoted instead (built by Power Plant engineers).

The SSL with its computer and *Total Recall*, and the Otari MTR90 have been chosen for their popularity and their mutual compatibility.

"This room is designed specifically for outside clients; I won't use it much. It may be because I haven't got used to it yet. I have used SSL a few times and I have been happy enough but was always glad to get back to the Harrisons. The SSLs are extremely macho sounding desks, fairly uncompromising. But the way they are laid out is brilliant; they are the best designed desks for user-friendliness, but I don't think they are the best sounding desk. I have ordered a completely different EQ section for this desk with a better top end and more flexible bottom end with much bigger crossover between the two midranges. Hopefully it will be capable of being much more subtle."

The racks contain AMS RMX16 digital reverb, AMS 3.2 s digital delay, EMT 140 stereo valve plate, Drawmer noise gates, EMT stereo compressor, UREI, dbx and Pye compressors, *Gain Brains*, *Vocal Stressor*, *Scamp* rack, Roland chorus and Eventide flanger.

The chairs, by the way, are Italian designer chairs which are grey to match the console. Very nice.

From the acoustics point of view this room was much more straightforward. All the reasons why you would not choose to build a studio in The Gallery were present in their opposite forms here—solid concrete floor, solid brick walls, it had been a studio anyway. Power Plant wanted the control room to be as large as possible so the front wall was moved out 2 m. In order to create maximum window space between the control room and studio, the monitor housings were built into the window frame so that you look round them into the studio.

STUDIO FILE

STUDIO FILE

Thus the view was widened without compromising the monitor housing—the window, incorporating very thick glass, forms part of the housing.

Munro: "All acoustic treatments here are very similar to those in The Gallery. We wanted to keep the rooms as similar as possible both in acoustic characteristics and in visual concept. The monitoring system is identical, even down to the amp although it is a bigger room, but we wanted to keep exactly the same sound."

The recording area is 24×16½ ft at its narrowest point and is designed to give different types of live sound in different parts of the room. One end is designed to house the piano where the bass is absorbed to separate whilst retaining the mid and high frequencies in order to make it sound natural. The opposite corner is for drums—slightly more ambient with a timber slatting finish (under the blue fabric or course) to diffuse the high frequencies.

Power Plant continued

Along the middle of the back wall are mirrors, mounted vertically at an angle to the wall which have the acoustic effect of a live surface and the visual effect of making the room seem much bigger. In between the mirrors are bass absorbers. The rest of the walls are filled with a variety of tuned bass absorbers and the ceiling is once again, a mixture of tuned absorbers designed to diffuse rather than simply absorb or reflect. The floor is covered with Astroturf.

A nice touch are the Metsec beams from which the lights are hung. When the original ceiling was investigated these were discovered acting as supports. Although no longer fulfilling this purpose in life, they do nevertheless look very effective as a lighting truss.

Studio One

So far we have looked at the top of the house and the bottom, both of which are brand new facilities. In

between, however, there is another facility, the largest and longest established Studio One. When approaching the studio doors I did have vaguely nautical thoughts, mainly triggered off by the porthole nature of the circular window let into the wall.

Most of the wall surfaces in Studio One are covered in big sheets of steel with holes all over and wood behind. The doors, instead of wood, are filled with concrete. "You can just imagine the roar of the sea as they pour through the oil rig doors, can't you?" asked Robin, as he demonstrated with a little charade.

This was the first studio Robin worked on when he originally took over. It was built, by Munro Associates again, to a visual by designer and architect Tersh Jones, whose past projects include the Tate Gallery, and who, it will be seen, has had a great influence on The Power Plant.

The basic shape of the

42×31 ft room was kept the same although separate access to the control room (which is at mezzanine level) was installed, it being necessary previously to saunter through the studio in order to gain access. The concrete floor is covered with a latex screed under a vinyl/aluminium mixture so that it is a half metal half plastic floor.

On the walls, in addition to the steel plates there is some black panelling which houses bass trapping. Underneath the control room the surfaces are half wood, half Rockwool but the natural ambience is due mostly to the extremely high ceiling. The false ceiling stands at 22 ft and then there is a further 14 ft void up to the apex of the sloping (wood one side, glass the other) roof above.

"We recorded *Diamond Life* (Sade) using the studio more than effects to create the sound. The reflections aren't jagged; it is quite live but they don't smash back at you. It's great to stand in the middle

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STUDIO FILE

and sing; very good for heavy rock, very controllable. It gives very good separation without having to put everybody into cubicles. We did a Sade track in here live with effectively everyone playing: drummer, bass, percussion, guitar, vocals, three brass, Fender Rhodes, piano and organ all at the same time, and we could have replaced any one of those instruments without any spill. It is infinitely better than lots of little booths."

The piano is a 6 ft Steinway grand. "It's very good. If you don't believe me listen to *Diamond Life* tracks *Love Affair With life* and *Sally*." There is also a Hammond organ. "It's funny, less and less studios keep Hammonds anymore but lots people come here with their DX7s and they set eyes on this and make straight for it."

The control room of Studio One is now due for a cosmetic facelift to bring it in line with the rest of the building. The Harrison series 24 36-channel console is side on to the control room window which commands a good view down into the studio. "We did all our usual mods in here—taking the transports out of the machines and balancing the inputs, changing the op amps, and changing the op amps on the mixing console, changing the mic lines, modifying the desk so that the monitor pots can become 24 auxiliary sends (we did this on the desk upstairs too) which you can assign anywhere you like so that you can have any number of things on one channel." Monitoring is again on UREI 813s which are mounted on concrete blocks. There is a custom effects rack built on to the end of the desk; "We built our own Dolby racks with the electronics and everything and also our own remote to keep things out of the way."

The tape recorders are a Studer A80 24-track and a B62 stereo machine. The monitors are powered by Studer A68 as in the other two rooms and small monitoring is on AR18S or the Yamaha NS10Ms. Outboard equipment includes EMT 140 stereo echo plate, Yamaha R1000 digital reverb, Bel BD80 8s digital delay, Drawmer noise gates, UREI

Power Plant continued



Power Plant's restaurant

and dbx compressors, AMS phaser, MicMix Dynaflexer, Marshall Time Modulator, UREI 27-band graphic equaliser and Dolby noise reduction.

On the first floor alongside the administrative offices and maintenance workshop there are two further rooms for clients' use. There is a private room with TV, video and stereo: "A place to have an argument or work on songs, whatever." And there is a 'freshening up' room with shower, hair dryer, shaver point, etc, "For sweaty drummers and tired producers and musicians to freshen up."

Decor

On arrival inside the front door you find yourself standing in a vestibule of arches—one of which was there already. A little investigation by Tersh Jones established what the original must have been like in a house of that period, the ceiling was raised and a further four were put in.

The colour scheme in the entire building was planned from the very start. The main Power Plant colour is blue and the rather grand staircase which leads you upward through the house is surrounded with walls which have been painted. The technique employed was very complex and consisted of first painting a base of white and then covering it in blue brushwork.

Downstairs you will eventually end up in the restaurant and bar. This may sound rather grand, but the titles are not inappropriate. Here the brushwork theme is carried on but this time in a

mixture of pink and white and, I think, yellow—but it is difficult to discern exactly how it has been done—in order to create different shades.

The large restaurant has a pink and grey floor, grey tables and chairs and really could not be more unlike a staff canteen. "This room was the most revolting room I've ever seen—like a horrible Northern hotel. There was padded tartan on the walls and Wimpy bar tables and bucket chairs and orange lamps, and a rather grimy parquet floor.

"Pale blue is Power Plant's main colour and is used on the walls of the control rooms, the stairs, the letter heads, the neon light outside, all sorts of things." This consistency definitely leaves its design mark and adds a certain appeal to the complete building.

General management

Robin heads a staff of nine with back up from his wife Ellen on organisation and orientation of the whole company. Jacky Hassell handles studio bookings as well as being Robin's PA; Roy Parsons is head of maintenance with help from new boy Tim; Mike Peeler is Robin's engineer as well as being freelance under the house management company; Ben Rogan is chief engineer and also works with Robin; Pete Brown, having completed his compulsory two years taping is now engineer; Phil Legg is assistant engineer along with newest addition David Anderson.

Kevin and Declan run the restaurant and bar, Kevin being a fully qualified chef and organising the food side, Declan running the bar and the day-to-day book keeping of the catering.

"Everyone uses this place as a meeting place. The staff come in when they are not working and we have birthday parties and everything. There is also a lot of interaction between different bands working in the studios. For instance one band needs a sax player and there is one in the band upstairs, so downstairs borrow him. It happens all the time."

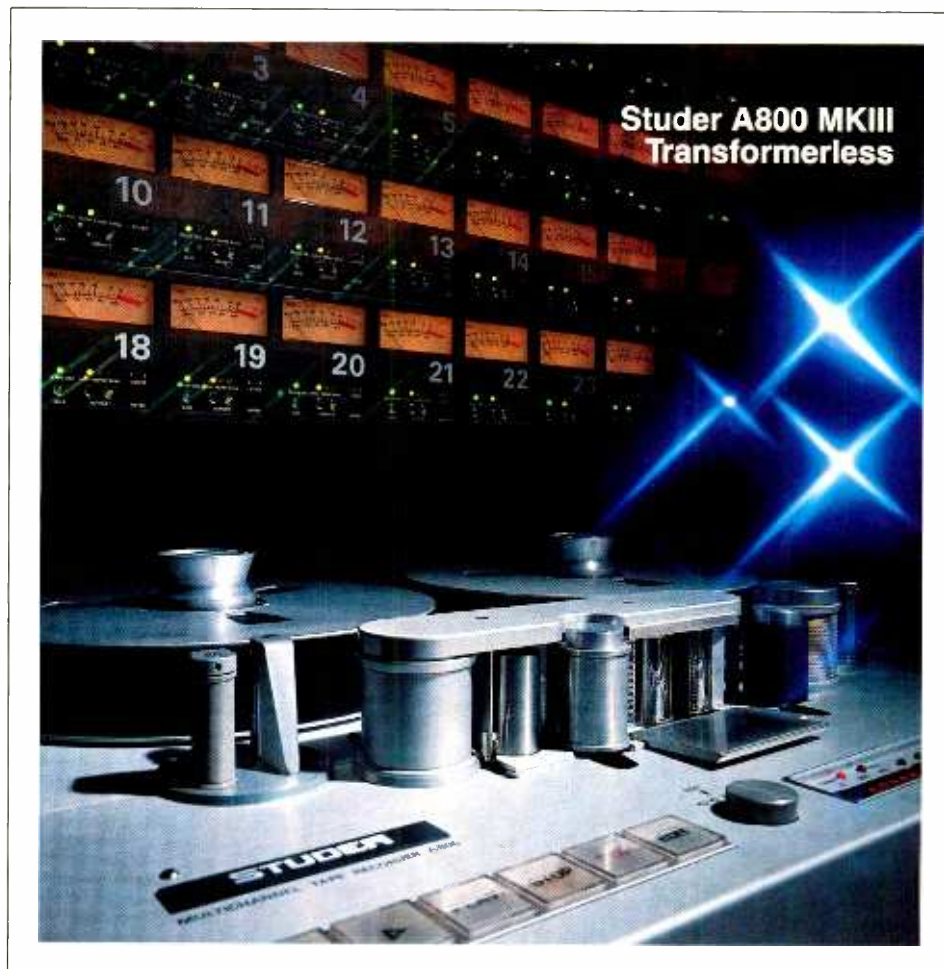
Why does a busy record producer take on the mammoth task of building and running a studio complex?

"I wanted to come back to the UK and work and I didn't like any of the studios. Of the studios that existed, I didn't think they represented the money that you paid to use them and I couldn't see how I could possibly work in an environment like that. There seemed to be a mismatch between the facilities and the actual users. And they all looked like Holiday Inns or your old school—all drab and brown. I wanted to create an environment you would like to go to even if you were not working. A studio should be relaxed, pleasant, smart and stylish while at the same time being efficient and as well run as an operating theatre. In order to get that you must have very tight control and there is a lot of tension in keeping the place running that efficiently."

"I tried selling double glazing once and it was terrible I couldn't do it. When I got to the third little old lady and started trying to persuade her to part with cash for something that I knew wasn't very good, I thought I'll never be a salesman. But I am Power Plant's best salesman because of all the people who work here. They deserve every break they can get. I have got and have kept a fantastic team of people, and the proof of the pudding is in the eating." □

Janet Angus
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BUSINESS BUSINESS

Barry Fox investigates the facts behind the industry news

Industrial noise

Anyone worried about the effects of loud music on their ears—or the ears of their employees—should think about spending £9 on a new report. It's called *Damage to hearing arising from leisure noise* and was prepared by the Medical Research Council's Institute of Hearing Research at Nottingham University. You can buy it from any Government bookshop, or on order through other book sellers.

The message about hearing damage comes over loud and clear. Working in a noisy factory is more dangerous than going to a pop concert or listening to music through personal stereo headphones for entertainment. But musicians, engineers and disc jockeys who work regularly with loud music, run exactly the same kinds of risks as those who work with noisy machinery. Also, if you value your hearing, be very careful over shooting as a leisure activity. It can cause serious damage in a very short time.

The report was commissioned by the Health and Safety Executive. The HSE is concerned with safety at work but takes an interest where leisure activities are potentially dangerous. At most places

of entertainment, some people are working while others are enjoying themselves. Professor Mark Haggard and his team at the Nottingham IHR, read all the literature they could find, most of which had been published over the last 15 years.

The team found 582 published papers, concerned mainly with pop music which were often useless as scientific evidence. Some researchers have adopted a censorious attitude to music which they obviously do not like. Out of only four papers which the IHR found on personal stereo, two made alarmist remarks without offering any supporting evidence. The others gave no cause for alarm. Clearly Haggard and Co are not intellectual fuddy-duddys and musical snobs. They tried to sift scientific fact from eye-catching fiction and they came up with some interesting observations, as well as broad conclusions.

Reports on sound level of pop concerts vary wildly, suggesting that some researchers have deliberately chosen worst case measurements to prove a point. Volunteers have attended clubs and concerts, wearing dose meters which measure equivalent continuous sound level or Leq. The HSE tries to limit

factory noise to an Leq of 90 dBA for a working 8 hr day. Tests in discos have registered Leq values of anything between 87 dBA and 108 dBA. This means that people could safely stay there either for at least 8 hrs or run a risk to their hearing after only a few minutes!

Beware of these measurements, warns the IHR. Unless you supervise the test, wearers may shout and blow into the dose meters, either to see if they work or as a game. This, and accidental knocks, can make the meters read too high.

Haggard and his team also note that research reports often measure hearing only up to 4 kHz. This is because noise has been assumed to cause a dip in hearing at this frequency. Even when tests go up to 8 kHz, they miss out the 6 kHz band. But those few researchers that did test at 6 kHz found significant dips in the hearing of those who had been subjected to loud sound. The IHR suggests that in future researchers should be sure to test at 6 kHz.

People who shoot guns for sport, or as part of military or cadet training, run a very serious risk. Gun fire produces impulse peaks of well over 150 dB and tests on American hunters have shown up to 60 dB hearing loss; there is more

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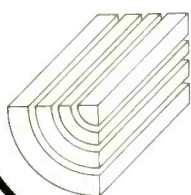
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damage to the forward (right) ear. Clay pigeon throwers are also at risk, so are children with toy guns which can produce peaks of up to 170 dB at the nozzle. Keep away from fireworks, too. Scandinavian papers have reported sound pressure levels from large bangers of over 150 dB. One 20 year old man suffered a 70 dB loss of hearing when a fire cracker exploded close to his ear.

Haggard and his team suggest more research is needed. But, as the HSE says, researchers always suggest more research. "What we have shown," says the HSE, "is that employers in noisy factories can't use the excuse that because their workforce goes out to the disco in the evening, there is no need to limit factory noise. Leisure noise is not significant in terms of industrial noise."

The report makes it clear that industrial noise includes exposure to rock music. "The combined evidence of very high sound levels and significant numbers of musicians with evident hearing damage," says Haggard, "already suggests that rock musicians are greatly at risk."

Even if money for research were available, researching isn't easy. Think about it. One scientist submitted four

chinchillas to 2½ hr of rock music at an average level of 107 dBA. when they 'examined' the unfortunate animals, they found significant numbers of hair cells missing from the cochlea. The gaps corresponded to the frequencies at which the music had peaked.

Video and the Academy curve

An interesting thought from Glen Glenn film sound studios in Hollywood. The cinema film industry knows all about the infamous Academy roll-off. It dates back to 1938. In the early '30s cinemas started cutting their high frequency response to reduce the fried egg hiss from early optical tracks. If the film studios, dubbing engineers boosted the mid and high frequencies to compensate but risked overload clipping.

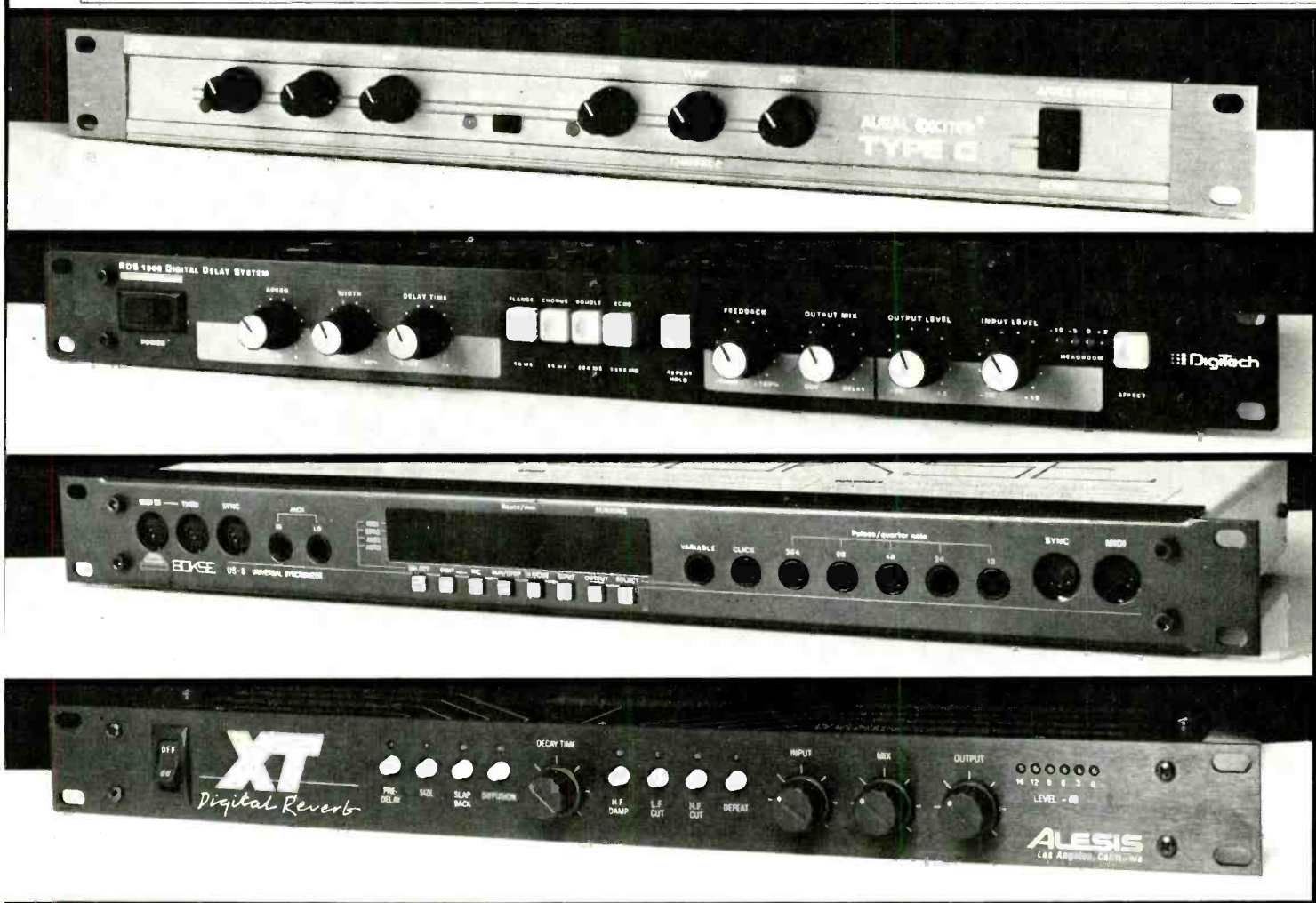
The Academy curve rationalised the roll-off so that at least everyone worked in the same way. The curve starts rolling at under 2 kHz and dips to at least 20 dB at 9 kHz. Dolby film sound restores response, which is potentially flat up to 10 kHz on an optical track.

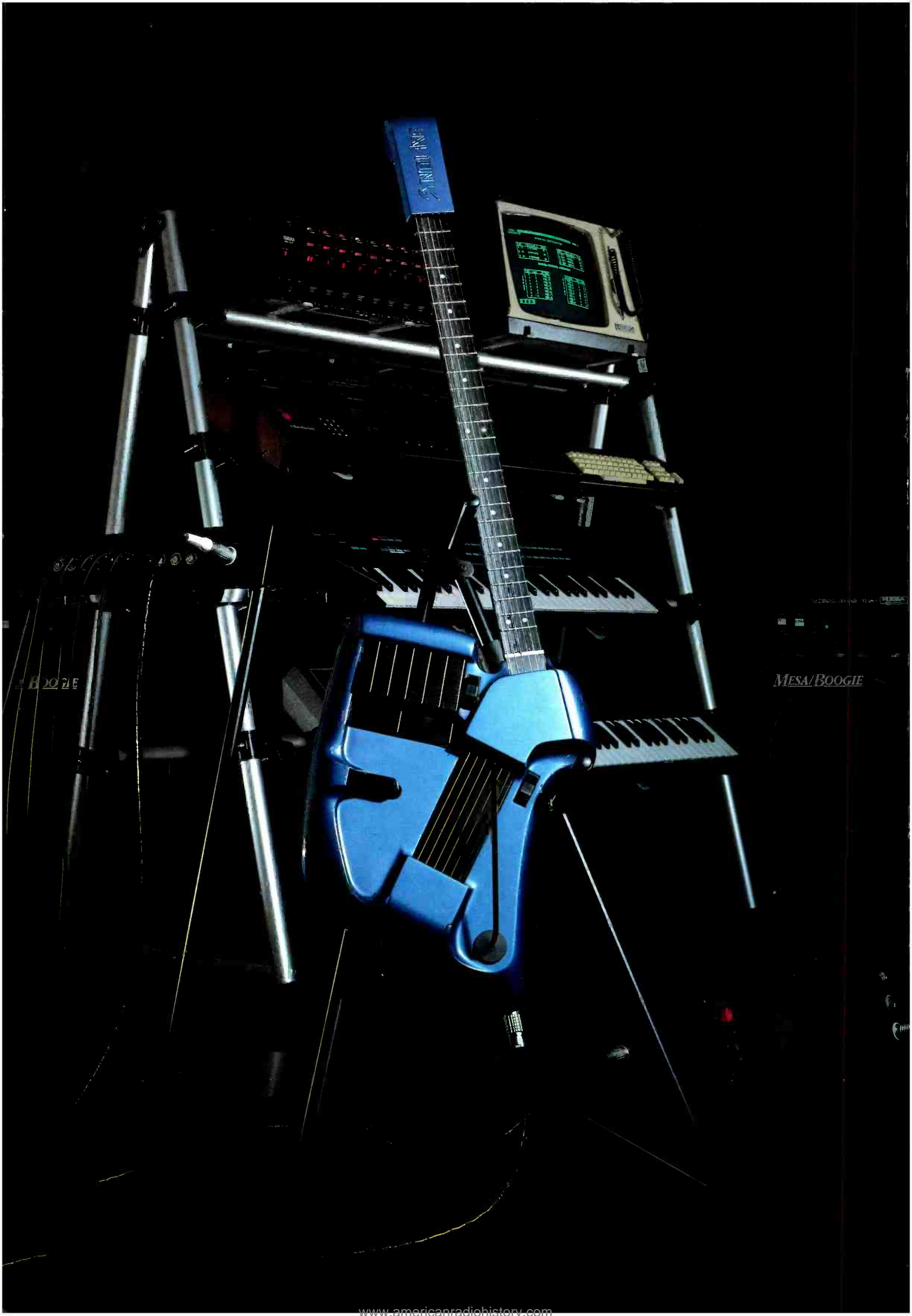
Unfortunately the new generation of

video sound mixers don't all know about the Academy curve.

When an old film is played through an Academy curve projector or monitoring system, it sounds as intended. The source material has been boosted in the mid and high frequency range to compensate for the roll-off. But if that same old film is transferred flat to video tape for domestic release, or transmitted flat from telecine, the sound will contain the artificial HF and presence boost.

So far this hasn't mattered too much because domestic TV sets traditionally have had very poor speakers. But now, with hi-fi video and better sound systems in stereo TV sets, people are going to start noticing a nasty mid-range splash and top end tizz. Exactly the same thing will happen if a video facility house transfers an original Academy-equalised, full coat magnetic track to video tape without Academy roll-off. Once again the video tape will contain the splash and tizz. Unless someone thinks to simulate an Academy roll-off (unlikely with new engineers) the sound will forever afterwards be decidedly unpleasant. If you get any soundtracks which sound odd they may need rolling off at 1.5 kHz and be -20 dB at 9 kHz. □





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It's awesome.'*

ALLAN HOLDSWORTH
GUITARIST MAGAZINE, MAY 1985

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MUSIC PAGE

MUSIC PAGE

Mark Jenkins on synthesis for the studio

Akai MD280 Quick Disk

Akai's *MD280* is a peripheral for the *S612* sampler launched recently. It consists of a drive using the 'Quick Disk' system, and a rack holding 10 disks. Each disk holds one sample on each side; disks can be purchased from Akai, or from Sharp computer dealers.

The *MD280* is connected to the Akai sampler by an integral power lead and multiway communication lead. Loading takes about 5 s and settings from the sampler's looping section are retained unless the start and end point sliders are touched. The sampler itself allows 6-voice polyphonic playing with velocity sensitivity from any MIDI control source.

Assessment

The addition of sound storage and programmable looping to the Akai system makes it infinitely more desirable for studio use. The sampler's frequency response ranges from around 16 kHz (for 1 s) to 2 kHz (for 8 s), so it is possible to create short sampled sounds of acceptable quality.

The production version of the sampler has an auto loop finding function which will create acceptable loops in all but the most complex sounds. An integral LFO makes it possible to create vibrato effects which do not speed up with increased pitch and a lowpass filter can remove some undesirable aliasing effects.

Disk loading speed is acceptable (short enough for stage use, in fact) and many of the sound library disks available through Akai are very impressive. These include orchestral hit, percussion sounds, acoustic and electric guitars, string and wind instruments and sound effects.

Nineteen inch mounting and astonishing reliable MIDI pitch tracking make the Akai sampler/disk drive system desirable for rapid demo work.

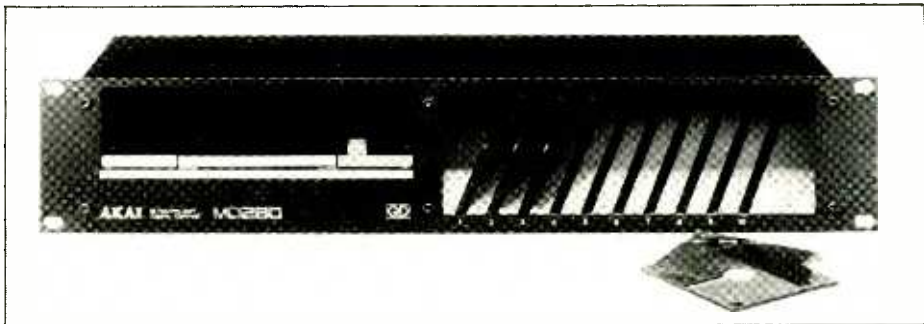
UK: Akai (UK) Ltd, 12 Silver Jubilee Way, Heathrow Haslemere Estate, The Parkway, Hounslow, Middx TW4 6NF. Tel: 01-897 6388.

USA: Akai America Ltd, 800 West Artesia Boulevard, PO Box 6010, Compton, CA 90220. Tel: (213) 537-3880.

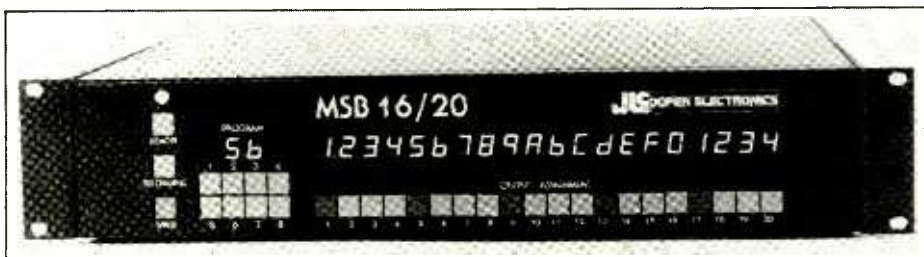
Southworth Total Music system

Southworth Music Systems have released a MIDI-based composition, recording, editing and transcription program for the Apple *MacIntosh* personal computer. According to Southworth, Total Music is the first comprehensive MIDI-compatible music package for the *MacIntosh*. All program functions are completely menu driven and are controllable with the *MacIntosh* mouse.

The new program records and plays



Akai MD280 disk drive for S612 sampler



JL Cooper MIDI switch box 16/20

back up to 128 simultaneous tracks using all 16 MIDI channels. Up to 99 separate tracks, each with 16 channels, can be linked so that compositions can be formed from smaller patterns. The total capacity of the program on a 512k *MacIntosh* is 50,000 notes.

Southworth Music Systems Inc, Box 275 RD 1, Harvard, MA 01451, USA. Tel: (617) 497-7522.

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

JL Cooper MIDI Disk/switchbox

MIDI Disk is described as a 'song store disk drive interface' and uses 3.5 in diskettes. It is used to record MIDI data dumps via a conventional DIN connector cable, and uses 'a proprietary process' to configure diskettes for compatibility with various instruments.

The *MIDI Disk* functions with the Yamaha *DX7*, the Yamaha *QX7*, the Yamaha *RX11* drum machine, the Sequential *Drumtraks* and the JL Cooper *Sound Chest II*. MIDI data dumps are typically 10 to 20 times faster than tape dump and invariably more reliable. The information recorded depends on the capability of the instrument in use; the *SCI Drumtraks*, for instance, could dump all drum patterns and songs, tunings, volumes and tempo changes.

The *MSB16/20* is a processor-controlled MIDI switch box. It has 16 MIDI inputs and 20 MIDI outputs; each output can be programmed to refer to any input using a hex display and 64 complete patches can be stored under battery backup.

The system is particularly suitable for large MIDI setups or those including the Yamaha *TX816* MIDI FM synth module

rack. Patches can be selected from a front panel keypad or via MIDI patch change signals.

The unit's complete configuration can be dumped to and loaded from a master computer which can display each patch in words—for instance 'QX1 Track 2-to-Prophet 600'.

JL Cooper Electronics, 1931 Pontius Avenue, West Los Angeles, CA 90025, USA. Tel: (213) 473-8771.

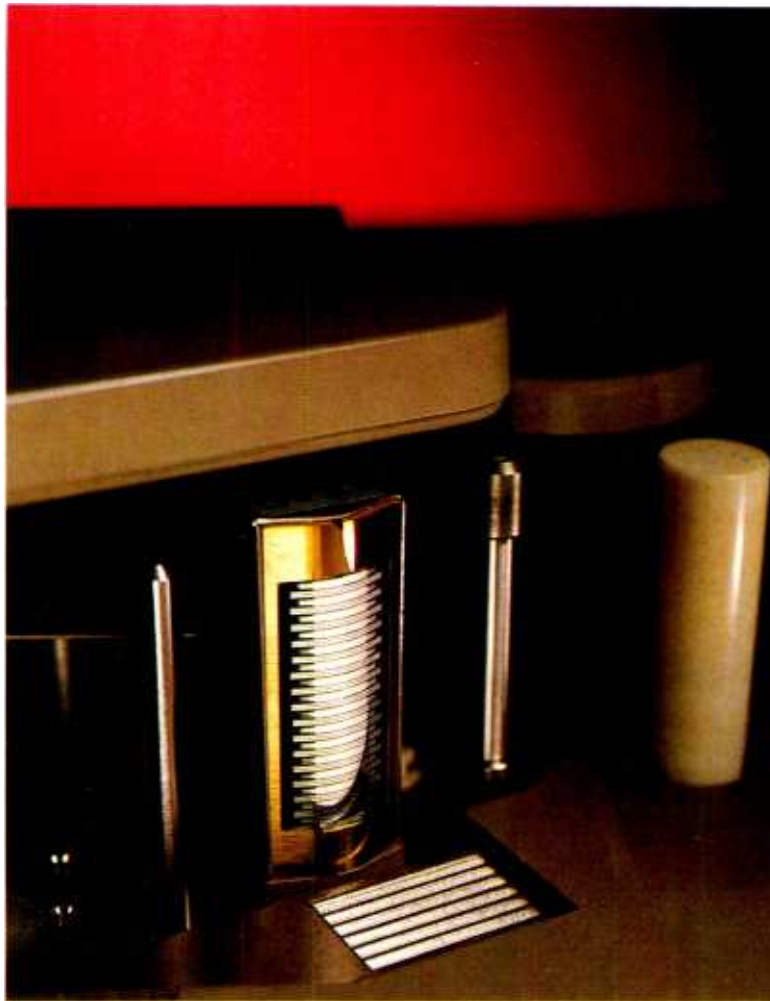
Hinton MIDI packages

Hinton Instruments have several packages available for the *MIDIC* MIDI interface which allow it to control various MIDI instruments and effects from any computer which is fitted with RS232 or which has RS232 as an option.

Either a *MIDIC* interface with compositional software or a battery backup version is available. RS232 cables to the BBC *B*, Apple *MacIntosh*, RML *380/480Z*, Sinclair *Spectrum/QL* and standard RS 232-equipped computers can be supplied.

Professional Effects Interfaces (*MIDIC* units with additional software) for the AMS *DMX 15-80S*, Yamaha *Rev-1* and Yamaha *YDD2600* are also available. These put all settings under MIDI control, in the case of an AMS with Keyboard Interface/Chorus Controller giving a pitch bend range of two octaves from a MIDI keyboard. *REV-1* patches may be selected by MIDI and all parameters may be edited through use of the System exclusive codes; *YDD2600* settings can be remotely controlled.

Hinton Instruments, 168 Abingdon Rd, Oxford OX1 4RA, UK. Tel: 0865 721731. ■



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MIXING CONSOLES THE TOP END

This article surveys the top end of the mixing console market: those manufacturers who are currently producing models in this area in addition to those who have not yet committed themselves to specific models or precise details of their future plans but have confirmed that they are undertaking work in this area. The information for this survey has been drawn from a number of sources which unfortunately proved necessary for us to be as complete as possible. If we have omitted any manufacturers active in these areas we will be happy to carry a follow up piece if they would like to contact us.

Alice: For more detailed information on Alice we would refer you to the article that appeared in our December issue on the *Silk* console. As a company Alice have decided that digitally controlled analogue consoles are the way forward. They manufactured their first DCA console in 1983 after evaluating that direction alongside that of the totally digital console. They concluded that provided the analogue signal path was perfected to the point where no obvious areas of improvement existed, then the more sane customer would choose the DCA route on economic and ergonomic grounds. They also feel that having perfected the analogue signal path then there will be large room for development of the computer systems—both hardware and software for control of those signal paths. They further feel that the digital console is unlikely to become a commercial reality in the next decade as the hardware and techniques are just too expensive. In the meantime a conventional *Silk* console has 24 mic inputs, 60 line inputs, 44 outputs with access to all functions at the same time.

Amek: Amek have recently launched the *APC-1000* (front cover and New Products December issue) and this represents the current most upmarket development. Originally designed as a broadcast console the Assignable Production Console is a very compact design based around a 30 mm channel width. This means that a large number of channels may be fitted within a relatively small frame size. The majority of the switches have been taken off the channels which are controlled by a central assignment panel with a single button on the

In this article Keith Spencer-Allen looks briefly at the manufacturers of large consoles

channel allowing the user to interrogate the assignment display for channel status.

Automation systems can be *MasterMix* or GML. With the GML system a number of further possibilities are gained by interfacing the console with the GML computer including the updating of switching set-ups from the SMPTE synchronisation timecode. There is a further option—a 'Recall' mode allowing the positions of the rotary pots to be recorded as a snapshot. These can then be recalled and displayed by a system of LED bars in a panel under the meter/dynamics bridge allowing the display of previous and present settings of that particular facility on each channel on the console.

The *APC* is due to become available from early 1986.

Amek are currently working in conjunction with GML on a future generation of consoles. The project is still at a fairly early stage although Amek have indicated that fuller details will be announced in early '86.

API: The complete line of API (Automated Processes Inc) products was purchased during mid-'85 by a company known as Wolff Associates who announced plans to make API products available again. At the AES New York Convention they were showing a full range of retrofit modules for existing consoles in addition to a number of new modules. Also on show was the basis of a moving fader automation system that would fit straight into the fader racks of existing consoles. Although at present Wolff see the bulk of their business in retrofits and modified units, they have built a number of full API consoles for specific clients at very substantial prices—a fact that does not appear to deter the resolute aficionado of the API sound.

Audix: Audix are a long established console manufacturer although they have generally concentrated on broadcast

systems. The *Audix Assignable Mixing System* is a digitally controlled analogue console where the audio paths have been removed to external racks allowing the size of the control desk to be kept compact. The system is under microprocessor control with solid state memory facilities backed up by floppy disk interfaces for long term data storage. Channel settings are changed by the assignment of a single control panel to each channel in turn. The system is capable of handling up to 100 channels.

Automation allows instantaneous change from one desk set up to another at the touch of a button with all audio functions being memorised including fader positions. Typically Audix say that the system can memorise and implement 20 complete desk settings. Beyond this there is floppy disk interface for long term data storage. The system will become available in Spring 1986.

Calrec: Calrec launched the *UA8000* console about a year ago and since that time five systems have been sold and delivered. The console has possibly the most sophisticated channel facilities available although there are no master studio control functions to turn it into a studio control system in the way other manufacturers have. Channel facilities include a dual input circuit using both transformer and electronic balancing selected by input level; wide range high and low pass filters, both to 1 kHz; 4-band parametric EQ, Q also varying with amplitude; comprehensive dynamics section, etc.

The design has separated the input and output functions—the input section always feeds the track matrix and the monitor section always feeds the main outputs. Each section has VCA control derived from either small or large faders with the automation system written to from the monitor section whichever fader is used. Any input section can also function as a subgroup and return to any track bus.

There are a variety of semi-global switching functions that allow the channel to restore individual channel selections when the master switches are overridden. The console automation system is *MasterMix* as standard.

Calrec have also done a great deal of research into assignable consoles that would use either analogue or digital



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MIXING CONSOLES THE TOP END

signal paths although there appears to be no imminent launch of such a system.

Denon: Denon have recently been far more active in the area of professional audio on an international basis. As a record company, they have been recording digitally using a PCM based system since the early '70s and build the majority of their equipment in-house. Part of their recording mastering system is a digital console designated the *DN-050MD* used for CD mastering as well as small scale classical mixdown. This system is not commercially available although we understand that following a redesign there is a strong possibility it may become so should demand arise. Provisional information indicates features such as the use of any sampling frequency below 48 kHz, direct digital interfacing, the ability to record settings and memorise mixing/mastering procedures and recalling against timecode, full EQ/filtering, compression/limiting/expansion, etc. It does, however, appear that the final design will still remain a small console.

Harrison: One of the major talking points of the New York AES was the Harrison series *10*—christened after the 10th anniversary of the company. There is a detailed description of the console in this month's New Product section so it is unnecessary to repeat it here. If you believe that the future of mixing consoles lies in a more automated and flexible version of the current market leaders, then the series *10* is the logical conclusion to that development.

There are a number of interesting aspects to the approach taken: no VCAs just digitally controlled attenuators; motor driven P&G faders; a virtual design, ie a reconfigurable signal flow architecture; and probably the most interesting aspect, the total dynamic automation of levels, pans, EQ, dynamics and signal routing which are repeatable with accuracy of greater than a single frame. The console can completely reset itself within 60 ms or less than two frames.

The basic theme is central control with local display—a continuation of the basic Harrison philosophy although the design is such that the console will still continue to function as a manual system should the master control system fail. The resulting console is of course expensive and physically large and attracted a great deal of interest during its first public showing. At the time of writing seven units have been sold, three of which we understand are destined for the UK.

Neumann: For the last 18 months Neumann have been showing parts of an automated console system. These include the *ame 591* automated EQ system and the *amr 544* automated fader system.

The *ame 591* uses a central control panel with an EQ module on the channel that only displays the EQ selected at the master panel although does allow switching of the EQ into the channel or monitor path, selection of the EQ for updating and a bypass mode. The EQ is a 3-band system with separate high and low pass filters. There is provision for

the storage of settings and a form of master/slave operation.

The *amr 544* automated fader system uses an LED readout parallel to the fader track to show real level positions and the system incorporates a sub grouping system that allows up to 10 groups to be formed and handled during a mixdown.

Neve: Neve's product line at the top end is clearly divided into the analogue and digital areas. The *DSP* console at CTS has been installed for nearly a year now; the BBC has taken delivery of the *DSP* for its mobile digital truck; Tape One has a small 2-channel processor version in addition to a larger mastering system shortly to go into operation; the British National Sound Archive has a system for archival/transfer and cleaning up old recordings; and there is a large console under construction in Cologne, West Germany. We understand there are a number of other orders pending.

The consoles delivered so far have little in common in the design sense although they use some of the same building blocks such as the EQ and the dynamics section. Neve feel they have learnt a lot from the custom work they have done so far and having proved that it works, are now looking at ways to apply this technology in forms that may be more financially feasible although this will of course be relative.

The analogue side of production has been heavily geared to broadcast clients recently although in the last year a custom multitrack console based upon the *51* series has been gaining a great deal of interest. Systems have been installed at Yellow 2 in the UK as well as AIR London in addition to several in Europe. When fitted with *Necam 96* automation they form an interesting music recording and post production system. The other Neve music recording consoles such as the *8128* are of course still available.

Quad/Eight: Following the acquisition of Quad/Eight by the Digital Entertainments Corporation, a company owned by Mitsubishi Electric Sales America Inc, R&D has been considerably stepped up. Aside from the *Superstar* console which is covered fully in this month's New Products, the *Westar* is now apparently in full production. Available in mainframe sizes of 20, 28, 36, 44 and 52 channels the console is designed so the positioning of the major sections is open to customer choice and may also be reconfigured in the field. The console is an in-line design with 24 mix buses. There is a choice of plug-in transformer or transformerless mic amps with single or dual inputs. The EQ is also plug-in and is available as 4-band parametric, 4-band fixed frequency or 10-band graphic. It will accept the Intelligent Digital Fader and the Compumix IV automation systems of which there are also details in this month's New Products.

SAJE: Not a great deal is known about SAJE outside France although the new range of products and their availability in the UK through Shuttlesound should help to improve that situation. Founded in 1979 by two French engineers, Patrick Aufour and Jean-Francois Jaunatre with extensive background in recorded, live

and broadcast sound.

Product ranges include *Poly* and *Auxy* live sound consoles, the *Racky* rack-mount small mixers, the *Odyssey* and *ULN* studio consoles.

In the context of this article, the *ULN* is the most interesting console, available in two mainframe sizes with max input sizes of 40 and 60 respectively. All versions have 32-track assignment and monitoring, eight aux outputs, 11 VCA subgroups, compressor and noise gate on each channel, a choice of three different channel EQ types. The automation system includes functions called Total Program which allows keyboard selection of three operational modes; Total Reset which returns the console status to zero when another mode is selected and Total Display which is a 16-function channel display which permits the continuous control of the status and functions in operation of each channel.

Solid State Logic: SSL have now sold in excess of 300 *SL 4000E* consoles and the *SL 6000* is also selling in large numbers. The New York AES saw production versions of their *SL 5000M* series Audio Production System designed for broadcast applications—the BBC has ordered four, NBC one and film and video company Toyo Genzoshu of Tokyo have ordered one for use in tape and laser disc mastering. These sales follow a year of 'public development' since the console's first appearance at IBC '84.

The console shown at New York showed how the *SL 5000* architecture allows the broadcaster to customise and standardise as they upgrade their stereo operations. All versions of the console have the basic input and output cassettes and master facilities and these may be arranged to suit the user and augmented by special facilities cassettes to suit specific control room applications. SSL say that operators familiar with one configuration will find it easy to use another version without additional training. The console features assignable routing to as many as 13 stereo outputs with an option for 24 multitrack groups. Routing for the entire console can be made from a central position with all assignments displayed on the relevant channel. There can be up to 10 aux send buses and they may be centrally configured for different feeds or stereo pairs with level and panning. The *SL 5000M* interfaces directly with the SSL studio computer providing data compatibility with the series *E* consoles and provides dynamic mixing memory and manipulation, edit list management and synchronised machine control, dynamically automated EQ for dialogue and FX matching, and comprehensive machine control. We understand that deliveries will begin in early '86.

The AES also saw the confirmation that SSL are involved in digital research—a fact of probably little surprise although it was particularly interesting that they see their direction as developing towards a total studio digital system incorporating mixing, processing, editing and recording capability. No dates for availability were given except that SSL have set themselves performance standards and until these have been reached there will be no talk of orders, availability or specifications.

SSL have published a booklet entitled *The Future of Audio Console Design* establishing a dialogue in the form of a report on analogue and digital design, and listing the possibilities, benefits and disadvantages of various approaches. They feel that in the near future purchasers of mixing consoles will be asked to make decisions that will influence future console development and the aim is to lay out the facts so these decisions are made in a better informed manner freer from 'casual comment and commercial pressures'. It is well worth obtaining a copy of this booklet from SSL as it tackles a concern that we voiced in our December editorial.

Sony/MCI: Sony have introduced a console known as the *MXP-3000* developed at the old MCI Fort Lauderdale factory. Initially there will be two frame sizes—36 and 20 inputs. A modular-type concept has been used and there will be five different types of EQ (two available now) and four mic amp options that may be changed or mixed within the console. A choice of three brands of plug-in VCAs are also offered. The console is described as 'digital ready' and has been designed with this in mind: IC op-amps at critical signal path points have been replaced with hybrid amplifiers; linear-crystal, oxygen-free cable has been used for signal runs. The console is also available with an optional automation system consisting of a processor/disk drive, a CRT monitor/terminal and a wireless remote control. It features a 10 Mbyte fixed hard disk capacity allowing the storage of 60 min of mix data in conjunction with a 1 Mbyte floppy disk system for data back-up or storage.

Soundcraft: The Soundcraft top of the line console is the *TS24*. This has recently been launched in a broadcast form as the *TV24* suited for TV sound. Standard features include fader start on every channel, stereo EQ for the audio subgroups and a fast status control to reconfigure the complete console.

Future console development will be based upon a number of considered approaches. Firstly, they feel that cost, ease of use and maintenance are major factors that are sometimes being overlooked by a technology hungry industry. While acknowledging improved facilities as a necessary development, they believe this should be done bearing the user and the maintenance man in mind. This means that development will include the use of assignable technology not only to improve flexibility but to simplify operational controls. This is seen as a long term development programme while in the shorter term there will be more equipment introduced using solid state switching controllable both locally and from outside sources. This will allow the integration of new automation systems without a major re-design and can also improve system performance.

They have decided not to launch themselves into a major automation system development programme of their own although they do see themselves working closely with manufacturers of automation in this connection.

Soundtracs: At present Soundtracs do not manufacture any consoles that would qualify within the terms of this article.

However there is an extensive development programme in hand although their approach is somewhat different.

Following a study of the economics of a totally digital console they decided that at present it was not viable; digital control of analogue, however, is worthwhile. The *CM400* console is continuing to develop with the automation and peripherals package now up and running. This currently includes automated muting on remix, video sync using SMPTE timecode, external keyboard control programming of the routing and muting, and memory address by SMPTE sync'd signals in one track of the 24 audio tracks. This is the way the Soundtracs see themselves developing—proving technology in a market area they know and developing upwards.

Trident: Trident have mainly concentrated on their lower cost consoles in recent years such as the series 65, 80B and the new 75. Currently they are

undertaking extensive R&D in digital control of analogue for new top end developments. Hopefully more details very soon.

Westec: Westec first showed their *LT3000 Studio System* console at the Hamburg AES Convention in March 1985 where it drew a great deal of interest as a console bearing a great deal of similarity in design and approach to the SSL. Basically the system is supplied in a 32 or 48 channel frame and is laid out as channel modules either side of a central control area which offers master audio controls, machine remotes, keyboards and up to three video monitors. The computer system will control the master tape machine, assist with fader control and muting, control VCA groups, maintain session and track sheets and several other functions. The channel modules contain a full selection of facilities including a dynamic section and an optional digital delay module for each channel. □

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IN PERSPECTIVE

IN PERSPECTIVE

Comment from Martin Polon, our US columnist

Back in the antediluvian past of the 1970s, looking forwards to the technology of the 1980s promised a virtual end to the problems of repair caused by complex electronic equipment. Idiot savant forecasters (present company unfortunately included) buoyed by a barrage of flying euphemisms and misguided promises from electronic development labs, foretold of a 1980s where no piece of electronic equipment would have to die. Whole studios could be saved by replacing circuit boards—with the defective unit placed gently into the circular file.

This promise of 'throwaway' components suggested that there would be no need for that throwback to another time: the repair tech. Identified usually by his (almost never a her) conspicuous lack of belief in the functional powers of cosmetic compounds designed to suppress aromatic body essences from under the arms, the typical recording studio or pro audio repair person would never be in any danger of being identified as a 'Madison Avenue Yuppie' or as a 'Sloane Ranger'. Repair techies thought that Brooks Brothers and Aquascutum were a lawyer's supply house and a retired indian chief — respectively.

The beginning of the 1980s have come and gone and lo and behold the repair techie is still with us. Except now, the techie 'he' may also be a 'she' and drives a Cadillac or a Rover and if his clothes are not from designer racks, they are not from the ready-to-wear shop either. A studio owner recently described his relationship with his 'techie'. "I really think that my doctor is easier to get an appointment with. I mean I have a fellow who pulls boards and sends them out to the console maker. We keep about half again as many boards as we need for the consoles. A sort of continuous rotation process it seems to me. Ah...but the 'techie'...now there's a case. Repairs all of our odd items that don't have pull out parts or self-diagnosis. You know, tape machines and digital items and the like. I used to pay him, full time, one third of what he is charging me now for his 'Repair Consultancy'. A real adjustment has occurred to his status."

The fact is that the 1980s have brought not an era of throwaway studio equipment but an era of scarcity for skilled repair personnel in many parts of the world. The shortage of technically capable repair personnel comes from a number of major changes in how the professional audio business has integrated with progress in electronics. Firstly, the ranks of most professional recording studios has moved at all levels; leaving behind the status of garage or seat of the pants operations. The top studios in Hollywood, London and New York have become virtual audio and video operations centres and can afford to hire the best personnel available.

Who will fix it?

Smaller studios tend to copy the activities of larger studios on whatever scale they can afford. Gone are the days when a kid fresh out of high school would walk in a studio door looking for work and have a soldering iron thrown at him. A few hours in repairing previously unknown erase amplifiers for magnetic film dubbers then yielded the kid the job of assistant chief engineer. That job at a non-union film dubbing and re-recording studio in Hollywood gave him the experience he needed to get started in professional audio. I was that kid and I'm saddened that today that door is closed forever to similar kids.

To be realistic, the nature of the equipment used in studios has changed. Most consoles today are delivered turnkey built, tested and functional. In the 'good old days' when dinosaurs and vacuum tubes roamed the earth, consoles were constructed by each studios' staff, especially at the smaller studios that were the training grounds for countless numbers of studio personnel. Although today's semi-professional home studio marketplace has seen a quantum jump in the number of small studios in use; most of these are based on integral consoles and components that are mass produced. These units offer exceptional value and quality and flexibility but they do not require nor provide any knowledge of audio electronics.

In a similar sense, the presence of electronics parts stores during the 40s, 50s, 60s and into the mid 1970s nurtured several generations of repair technicians. These stores would always encourage all kinds of walk-in retail sales and were staffed by knowledgeable middle-aged men with names like 'Jim' and 'Bob' and 'Frank.' In these 'parts palaces', countless budding audiophobes were able to bring in a still-smoking project that had gone awry and have it diagnosed. The aisles of these electronic emporiums were virtual museums of the devices that had previously only been read about in the dozen or so hobbyist magazines that offered cumulatively at least half a dozen audio construction projects each month. The coming of the 'multi-chip' ended much of this as discrete components disappeared; with them went most of the electronic hobby magazines and the retail parts stores once so common to metropolitan areas. In their place today, we have industrial sales-only electronic wholesalers.

There is little interest in today's marketplace in selling to the neophyte trade. Retail parts sales have become the province of the ubiquitous Radio Shack stores with a limited supply of house-branded parts and sales staffers who often express antipathy to even the mention of their parts stock. Yet it is clear that Radio Shack is providing a

service for without their stock of parts; there would be no electronics retail in any format available in many localities.

Despite the significant factor of increased complexity in studio and professional audio equipment, most schools have also picked up on the glamour elements of the recording and professional audio business. Everyone wants to be the one who produces or mixes the latest Prince record; not the guy or gal who fixed the tape recorder that actually recorded Prince. In the fall of 1985, top producer Nile Rodgers was profiled in more than half of the publications read in the recording industry. When was the last time that anybody came close enough to a 'repair techie' to talk about the weather; let alone to do an interview. In addition, most schools are teaching either short courses on recording technique or degree programmes merging music with recording technology. It is interesting to note that audio courses were taught most often as part of engineering or electronic technology programmes during previous decades. Today, these technology programmes have for the most part unceremoniously given audio education the heave-ho in exchange for computer technology. These technology-based institutions have to justify their enrolments with large numbers of students and also attract scientific research grants. They go where the technology money is.

While the development of music/recording programmes have saved formal audio education at universities and colleges in the 1980s; the shortfall of audio technical types has worsened. Two year graduates of vocational or community colleges or other similar programmes tend to go where the prestige is. Computer or electronic industry jobs generally pay a large premium over entry level wages for audio repair personnel.

Yet skilled maintenance personnel will continue to command a premium with today's digital technology in many locations. One studio owner commented while cradling his four year old daughter on his lap, "I used to think I wanted to send her to college. Now I think if she can fix digital boards and decks she'll make more money than she could as a doctor or lawyer."

A young man actually interested in studio maintenance provides a different perspective. "I need experience. So I need a job to get experience. But I can't get a job until I have experience. I'm caught between a rock and a hard place."

It may be time for the audio industry to stimulate specific training programmes for audio maintenance specialists in analogue and digital technology. The fortuitous coincidences of the past that produced skilled maintenance personnel have 'gone with the wind' in the 1980s. ■

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At Syco, we never stop searching. Our quest for advanced musical instruments has taken us around the world to the most unlikely people and places. Take Sydney, Australia 1979. In a basement we found two young men experimenting with electronic circuitry. They were Fairlight Instruments.

Of the large number of inventions we discovered, few needed closer inspection. Amongst them were E-Mu's E1, the Kurzweil Expander and the Linn 9000.

E-Mu, pioneers in the real sound revolution, unveiled the E1 in 1980. The E1, launched in 1984, has set new standards for sampling keyboards. 17 seconds of sampling time, an eight track SMPTE-based MIDI recorder, eight individual outputs, an optional hard disc, and the

Sound Designer software for the Macintosh represent the requests of professional users.

Kurzweil, concerned from the outset with performance based sampling systems, have recently announced the Expander – identical in function to the 250 but without a keyboard, resulting in considerable savings in size and weight. The sampling rate for the Expander/250 has now been increased to 50 kHz





allowing to reproduce high frequency with superb clarity.

Linn, inventors of the digital drum machine, released the LM-1 in 1980. This was superseded by the Linndrum, still available and in demand as ever. The 9000 is regarded as one of the ultimate composers tools – an integrated 32 track, SMPTE-based MIDI recorder and digital drum system. Both sequences and drum patterns may be saved on the optional 3.5" disc. Transport-type controls, similar to those found on tape recorders, make operation of the instrument familiar and simplistic. The sampling option enables the user to create a library of unique and personal sounds.

Individually, these three instruments have unique qualities which are suited to varying applications. Together, as a system, they embrace the scope of sampling technology and form the major part of a modern composer's studio.

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REJUVENATING TAPE HEADS

It is generally well known that in addition to the exchange of recorded information, the effect of passing magnetic tape across the heads of a recorder is similar to sanding a block of wood with fine sandpaper over a long period of time. Like the wood the surface of the head will gradually be worn away by the action of the passing tape.

The initial effect of this process will be to polish the surface of the head. This will slightly improve high frequency performance although it will depend largely on the condition of the head in the first place. If—as is the case with many modern heads—the surface is already polished to a high degree, then little or no improvement will be detected.

Over a period of time and as the amount of wear increases, the edge of the recording gap can begin to crumble, small voids or deep scratches can appear on the face of the head and eventually the profile will be altered. Metal heads are normally assembled from several different materials, each of which will be of a different hardness, because of this the head will wear unevenly. In particular the soft metal spacers which are located between the tracks will wear more rapidly than the pole pieces which are normally made from a harder material.

Good tape to head contact is essential for maximum signal transfer at high frequencies and any wear will reduce the contact area resulting in a loss of high frequency sensitivity and MOL as shown in Fig 1.

As the head wears it is possible to make up the loss by altering the appropriate record or replay equalisation which will increase the gain of the relevant amplifier at high frequency. However while the frequency response may have been corrected, the noise floor will have increased because of additional amplifier gain and this in turn reduces the dynamic range.

While it may not be possible for us to alter the abrasive qualities of tape, we can minimise the effect it has on the recorder by ensuring that the heads are correctly aligned and the machine is maintained correctly.

It is interesting to note that head wear can reveal much about a recorder and how it has been maintained. This is possible because the abrasion mark formed on the face of the head and caused by the passing tape will show the precise way in which the tape passed across the head. For example in Fig 2 the uneven wear is caused by the zenith of the head being out of adjustment. Once the amount of wear gets to this severe stage, the performance of the two channels will be uneven.

Another type of problem is shown in

Mike Jones looks at the benefits and techniques of relapping heads with assistance from Dave Hill of Tapetek, London

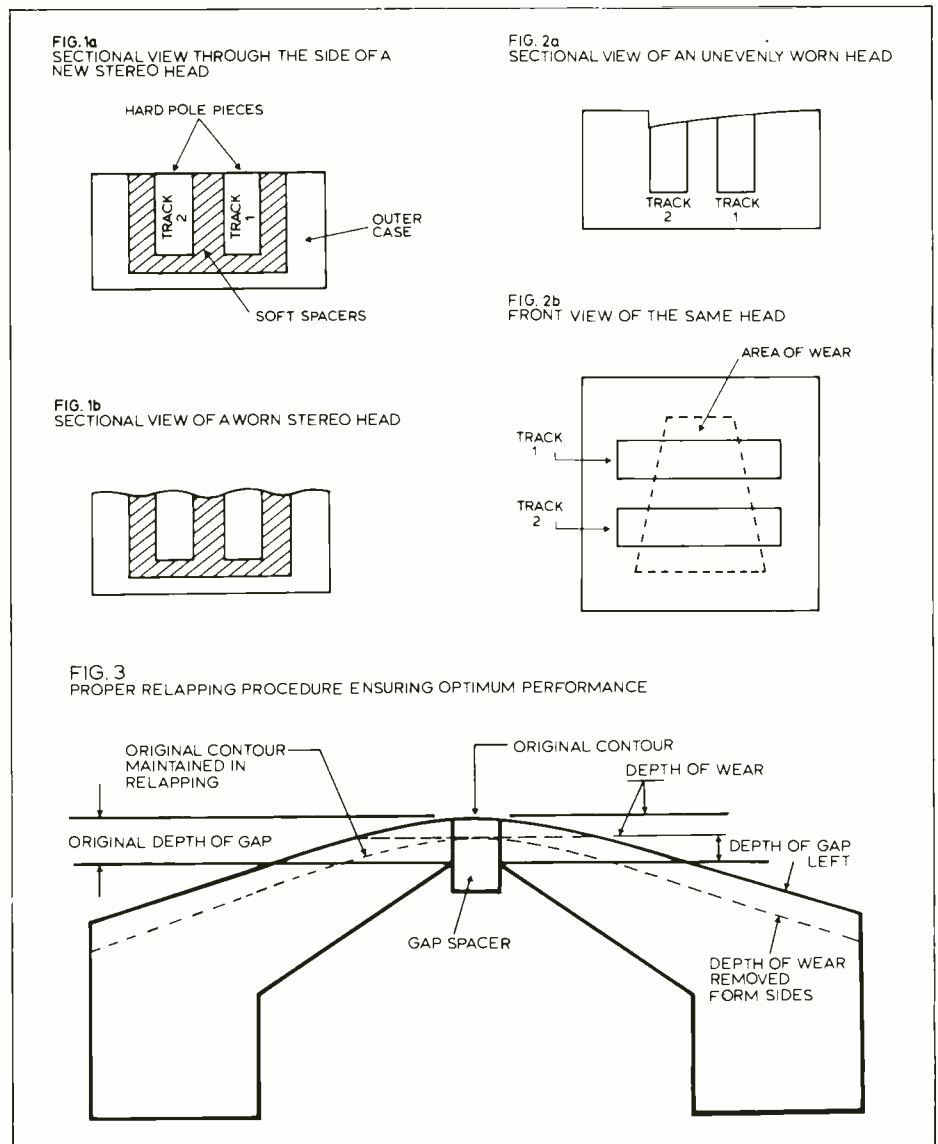
Fig 3 where the horizontal angle of the head is incorrect, thus causing more wear on one side of the gap than the other. Ideally the tape should be in contact with an equal amount of head on either side of the gap.

Whilst metal heads suffer from deep scratches, ferrite and single crystal heads suffer from small voids which suddenly

appear in the surface of the pole pieces as minute sections of the composite material break free from the rest of the structure. Unlike metal, composite heads can crumble along the edge of the gap and along the edges of the pole pieces or the ferrite can fracture.

Fig 4a depicts a microscope picture of a ferrite head showing voids on the surface, deep scratches on the copper spacers and edge collapse of the ferrite material. It is unlikely this head could be repaired. Fig 4b shows a microscope picture of a ferrite head which has been refurbished. Fig 5 shows a microscope picture of fractured head.

The point at which heads are removed from service will depend on the application and required performance but once they have been removed because of physical wear, as opposed to electrical failure, then they can either be



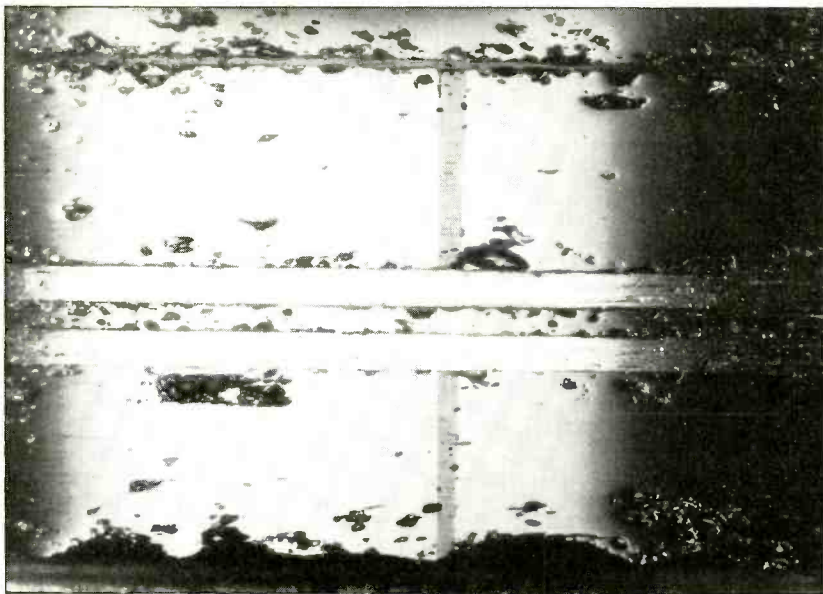


FIG 4a Microscope picture of ferrite head with voids on the surface, crumbling of the ferrite (edge collapse) and a severely worn gap—definitely beyond repair. Gap dimensions should be similar to Fig 4b

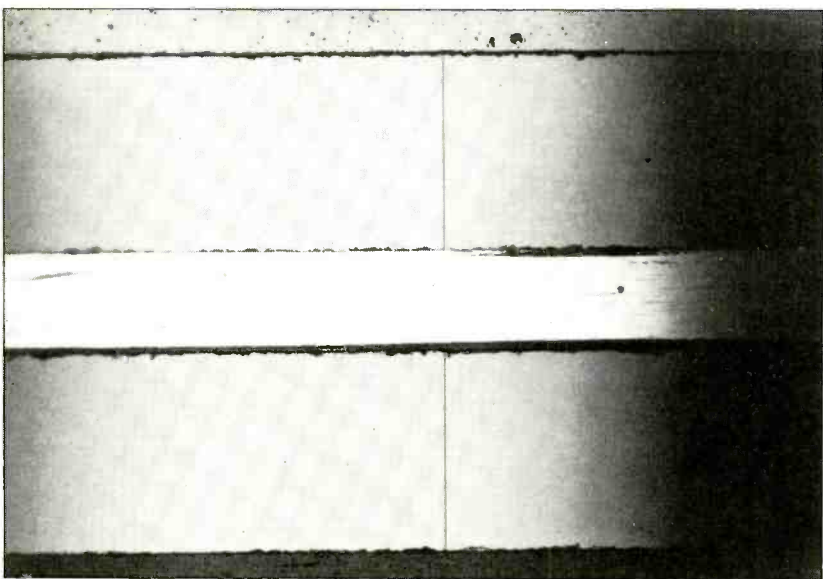


FIG 4b Microscope picture of ferrite head after refurbishment

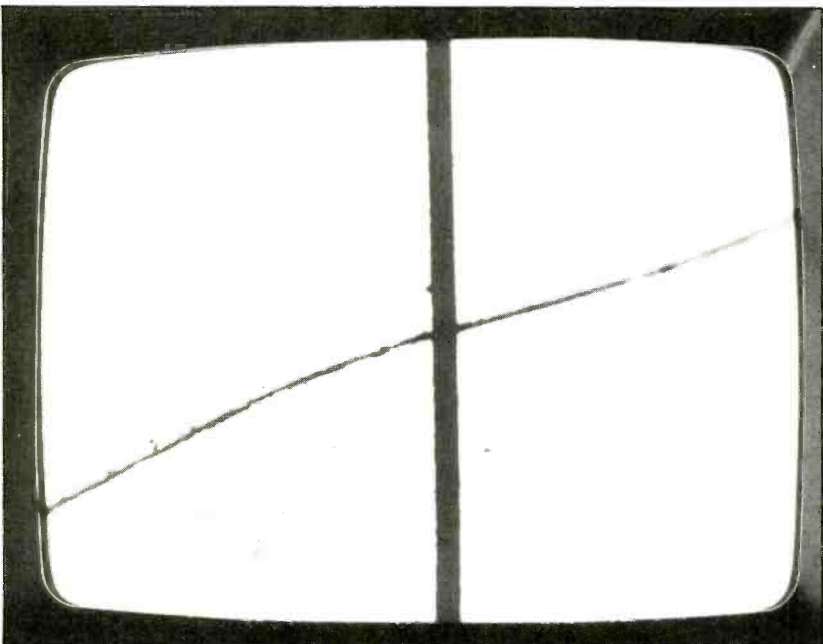


FIG 5 TV picture showing a fracture across the centre of the gap

refurbished or replaced.

Now while there can be no doubt that there is a point at which all heads have to be replaced, the majority of them can be successfully restored to full specification for a fraction of the cost of new heads. The trick—if there is one—is to repair them before they become excessively worn. By lapping them at an early stage the minimum amount of material is removed, thus prolonging active life.

To the uninitiated, repairing or relapping magnetic heads looks deceptively simple all you require is a flat surface, some lapping paste and away you go. Unfortunately, as many have found to their cost, magnetic heads are far more delicate than they would appear and they can be easily damaged by a heavy or inexperienced hand. So in addition to a substantial investment in microscopes and other measuring equipment the success of lapping, depends to a great extent, on the skill of the person carrying out the lapping operation.

How should it be done? At Tapetek the following evaluation and repair procedure is carried out on a variety of heads ranging from 2-channel stereo versions to expensive multitrack heads and some high speed duplicating heads which are also costly to replace.

When a faulty head arrives it is cleaned, measured in a variety of ways and then refurbished.

The inductance of each head coil is measured using an automatic inductance bridge. The readings obtained are checked against the manufacturer's specifications to ensure that the head remains in tolerance once it has been repaired and for it to perform as well as a new head.

Virtual DC resistance is measured using a 100 Hz signal to avoid magnetising the head.

The overall thickness of the head is measured across several points with a digital micrometer to determine the amount of material that has been removed by previous repairs and to act as the reference point for a second set of measurements that are carried out after the head has been relapped.

The width of the gap is carefully measured using a sophisticated electronic measuring eyepiece fitted to an Olympus metallurgical microscope. At the same time the condition of the head is assessed visually.

The profile of the head is accurately measured by projecting its image on to an optical comparator which is checked against the head manufacturer's specifications.

All the results are carefully recorded so they can be referred to later, and the condition of the heads before and after they have been repaired can be conveyed to the customer.

After deciding if the head can be repaired it is lapped in several stages, each one using a finer grade of abrasive films. This removes the majority of surface blemishes and restores the gap to its original pristine condition.

As the work progresses it is constantly monitored with a microscope and the

thickness of the head measured to ensure that it is being lapped evenly.

The final stage of the lapping process is to use a very fine grade of special lapping film which will give the head a mirror-like finish.

Finally all the parameters of the head are measured again to ensure that the head is still within the manufacturer's tolerances and the results are added to the report which is then sent to the customer with the repaired head.

For those heads that need to be reprofiled a coarser grade of abrasive film is used during the initial stages of lapping so the correct contour can be restored to the front of the head. Once this has been achieved the lapping process is carried out as before.

The essence of good lapping is care and patience for this is one job that cannot, or rather should not, be hurried. Care when the measurements are taken, care during the lapping process itself and care while monitoring progress, always aiming to remove the minimum amount of material from the surface of the head in order to achieve the desired result.

While there are several methods of lapping in current use the method preferred by Tape Tek is the one used by Saki Magnetics in California where Dave Hill was trained. Basically the various grades of lapping film are placed on a granite surface block, which has an extremely flat surface and special lubricants are used to increase the efficiency of the lapping process and to wash away debris.

The way in which the magnetic head is held during the lapping operation is vitally important for if the head is to be lapped evenly the downward pressure must be equal along its length and although the surface plate helps to a degree, considerable dexterity is required.

Alternative methods of lapping use diamond lapping paste on glass or metal plates but one of the problems associated with this method is that the plate is ground away at the same time as the head thus making the plate uneven. Although this problem is virtually eliminated with lapping film, a granite surface block was chosen by Tape Tek because it is very flat, extremely hard and has a high resistance to wear.

To carry out all the measurements efficiently a large sum of money was invested in providing a new laboratory fitted with a range of precision measuring and visual inspection equipment which allows a fine degree of control to be applied during the lapping operation. The inventory includes an auto ranging inductance bridge, two Olympus metallurgical microscopes, a shadowmask and several different types of micrometers—the majority of which have digital readouts—plus several jigs and an air conditioning unit.

The microscopes can be fitted with a variety of lenses and eyepieces to produce magnifications ranging from 25x to 1500x. A monochrome television camera and monitor is fitted to one microscope to reduce eye strain. This instrument has also a special eyepiece which has a precision micrometer built

REJUVENATING TAPE HEADS

into it which can measure to an accuracy of 0.00001 in or 0.1 micron.

The optical comparator which is used for profile measurements is fitted with a micrometer-driven, travelling table with 2 in (50 mm) of movement on the X and Y axis. Additionally the screen is fitted with a precision measuring system which can be used to measure the shape and various angles of the profile.

The digital micrometers are easier to use than the more traditional barrel type and are capable of measuring on a relative basis with the minimum of effort. This is particularly important as the majority of customers like to know how much material has been removed from the surface of the head during the lapping process and how much life is left.

Talking of life, the point at which a head can no longer be repaired is dependent on several factors the majority of which can be summed up as follows: electrical breakdown, ie where the coil is open circuit; if the inductance of the coils has moved outside of the tolerances laid down by the manufacturer; structural breakdown of the material from which the head is made; and finally if the head

has already been relapped too many times and is worn out.

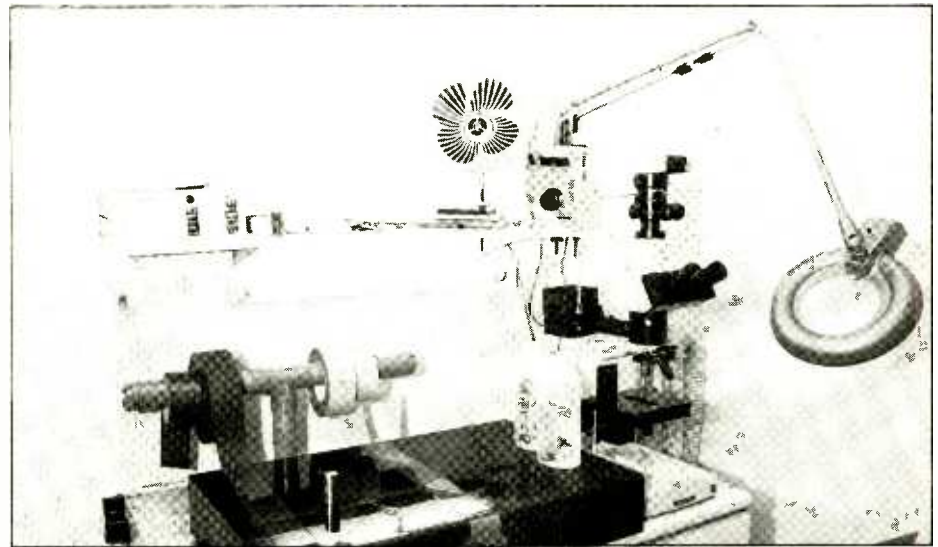
The number of times a head can be refurbished will depend on its design, the application, the original gap depth, how many times it has been previously relapped and how much material was removed on each occasion. But given that the wear on the head is not too severe and by carefully controlling the lapping process the life of a head can be extended several times beyond that which would be normally expected.

Are relapped heads as good as new ones, and are they cost effective? This depends on the state of the head in the first place of course. Although it is true to say that after lapping, the electrical performance of the head will alter, this will be insignificant when compared to the gain in performance due to the improved tape head contact. Other benefits could be a reduction in tape wear and in the amount of oxide that rough heads can scrape from the tape.

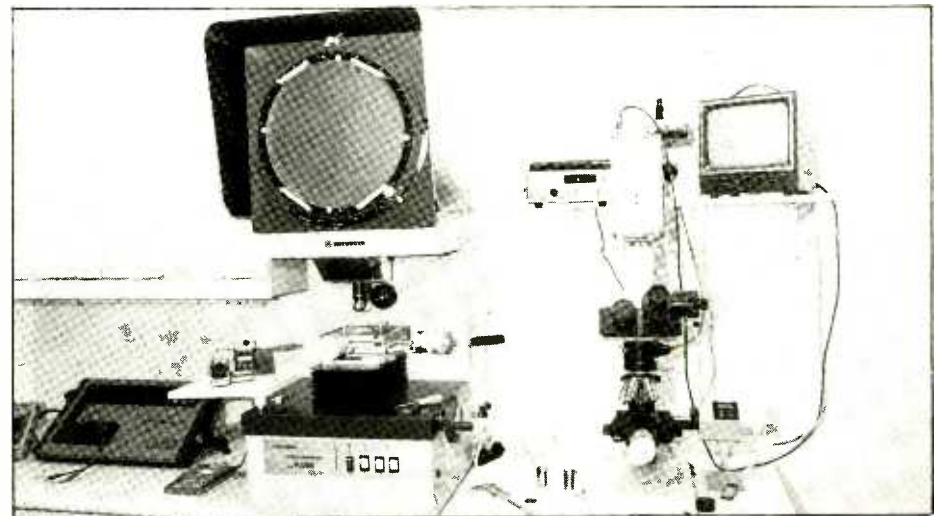
As to the cost, judge for yourself by comparing the price of a new head with the cost of having it repaired and then you decide whether to reduce your operating costs in this way. □

Acknowledgement: We would like to thank Tapetek for their help in compiling this article. Tapetek, 44a Brighton Road, London N16 8EG. Tel: 01-254 5203.

Granite surface block plus lapping film and microscope



General view of measuring equipment showing inductance bridge, optical comparator and microscope fitted with TV camera and digital Filar gauge for precision measurement



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REVIEW REVIEW

Carl A Snape reports on the practical aspects of two cassette machines

NAKAMICHI MR-1



The *MR-1* is the first of a number of professional cassette decks Nakamichi plan to release. It is a discrete 3-head recorder similar in outward appearance to the Nakamichi *BX-300* discrete head domestic machine.

Although the *MR-1* can be used as a 'stand alone' unit, a detachable 19 in rack mounting kit is supplied as a standard accessory. Optional accessories available include the *RM-200* remote control and the *DM-10* head demagnetiser.

The front panel being 9 mm thick is quite substantial and provides good support for the cassette recorder once rack-mounted. The main on/off switch is positioned in the top left corner of the front panel. Indication that the unit is powered up is provided by the illuminated tape counter and a small green LED mounted in the stop button.

Below the power switch is a 3-position (play/off/rec) timer switch, a rotary headphone level control and a ¼ in headphone jack socket. Moving along towards the right are the transport controls. There are six functions logically arranged in pairs: each pair of functions sitting at either end of a large bar that moves with a see-saw action according to which function you select. At the top are the rewind and fast forward controls, in the middle section stop and play and below these pause and record. Stop, play and pause functions are indicated by small green LEDs mounted behind the appropriate switch, a red LED is used for record. A fixed panel below the transport controls contains a pair of +4 dBm balanced ¼ in jack sockets replacing the dual speed master fader found on the *BX-300*.

Sitting next to the transport section is the eject button, tape counter, zero reset, memory stop on/off and front/rear line input selector. The cassette compartment occupies the centre part of the front panel and to its right are the peak level meters. These read from -20 to +10 dB on a linear 2 dB per LED scale which gives a total of 16 segments for each channel. Above the meters are two red LEDs which indicate whether or not Dolby *B* or *C* is in use.

A single stereo output fader and twin record level faders are arranged vertically between the main switching section on the right and the meters to the left. The slider knobs run in channels below the level of the front panel and can usefully be aligned either with the top panel markings or to reference lines located in the base of the channel.

The switching section occupies the far right of the front panel. Two pushbuttons are used for noise reduction: one selecting the internal Dolby circuits or an external noise reduction unit (this can be bypassed if no noise reduction is required by using the special jumper plugs supplied) and the other pushbutton selecting Dolby *B* or *C*. Also in this section is the source/tape switch (a small

red LED indicates the tape position); EQ selector (120 μ s and 70 μ s); subsonic filter switch; a rotary $\pm 6\%$ pitch control for playback only (equivalent to a semitone shift) and three pushbuttons for selecting normal (IEC Type I), high (IEC Type II) and metal (IEC Type IV).

The rear panel contains eight pairs of connections in addition to an 8-pin remote socket and the on/off switch for the MPX filter. Unbalanced -10 dBV inputs and outputs are made via ¼ in jack sockets. Additionally there are balanced *XLR*-type connectors for use with inputs and outputs at +4 dBm (1.228 V) with nominal 600 Ω loads. Male (*XLR*) connectors are used for the inputs and female (*XLR*) connectors for the outputs. Also on the rear panel are four pairs of RCA phono sockets for use with an external noise reduction system. As supplied these connectors are fitted with jumper plugs to provide a 'no noise reduction' option on the front panel.

With the *MR-1* most of what you are paying for you don't see. This includes the tape transport system which features dual capstan drive but rather than having two identical capstans each is a different diameter (the capstans rotate at different speeds to make up the difference). This prevents any common resonance building up. Nakamichi call this their Asymmetrical Dual-Capstan Diffused-Resonance concept.

The transport system uses three separate motors: one for the cam system (which replaces all the usual solenoids and linkages), one to drive the reels and one to drive the capstans. The latter is a new direct drive motor and is used in conjunction with a wide-band FG (frequency generator) servo and a 160-segment sensor which is claimed to

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REVIEW

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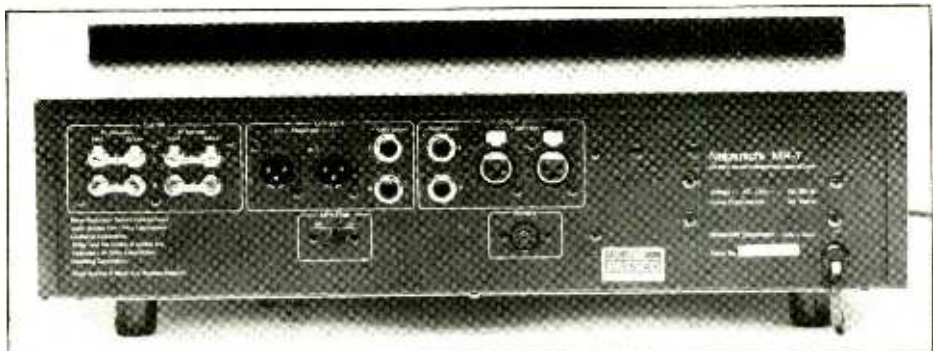
Whereas most cassette deck manufacturers make use of the tape manufacturer's pressure pads, Nakamichi incorporate a device that holds the pressure pad *away* from the heads relying on correct tape tension and an accurate tape path for good tape-to-head contact. This removes the possibility of additional tape skew, scrape flutter and modulation noise being introduced by the pressure pad. Also of course by removing the pressure pad from the tape path it is much easier to incorporate three discrete heads.

A lot of work has gone into the Nakamichi heads with special attention being paid to the playback-head core in order to eliminate any contour effects. Extended high frequency response has also been an important consideration and the heads are designed to use the full potential of metal tape's higher saturation levels and extended frequency response. Nakamichi in fact, with Dolby C, claim a virtual 'ruler-flat' response to 20 kHz at 0 dB which is a considerable improvement on the traditional -20 dB references usually quoted for cassette decks.

Considerable attention has been paid to the internal electronics. The balanced inputs are designed to meet professional standards and are capable of accepting high levels (+20 dBm according to the specifications). This, however, can be a double-edged sword and it is well worth bearing in mind that although the Nakamichi is quite capable of handling these levels, other replay machines may not be and you could get complaints, from producers for example, that your tape copies sound distorted and blurred. This can also be a real problem with Dolby B tapes recorded at very high levels and replayed on unaligned domestic machines. Use within the studio or between other Nakamichi machines shouldn't, however, present any problems.

Only Japanese cassette tapes are recommended by Nakamichi in their owner's manual. These include normal, high and metal types from Fuji, Maxell, TDK and of course Nakamichi. The review machine was set up for Maxell MX (metal); TDK SA-X (high) and TDK AD (normal), and these were the main tapes used during the review.

Replay quality from the MR-1 was very good indeed particularly with respect to low frequencies. Using a variety of material including real-time cassettes duplicated directly from 30 in/s 1/2 in masters and monitoring the sound via the unbalanced outputs directly into Stax Professional Lambda/SRM-1 Mk2 electrostatic headphones an enormous amount of detail was revealed. Tape levels on occasions were extremely high (the cassettes had been duplicated using Nakamichi machines!) yet the MR-1 took



Nakamichi MR-1 rear panel

it all in its stride providing a sense of stability and effortlessness rarely found in other cassette recorders. When recording the story was much the same, however some odd operational idiosyncrasies did come to light.

The two record level faders for example are not that easy to operate smoothly. If there is a knack to it, I never found it. Setting a basic level is easy and straightforward. It is also easy to make smooth fades but for some reason if you want to move the faders smoothly in tandem up or down 1 or 2 dB the action itself becomes very stiff and jerky. Also it was very inconvenient not having the cassette compartment illuminated. It is virtually impossible to see how much tape is left even in a reasonably lit room and resorting to shining a torch into the cassette compartment hardly seems very professional. If it is simply a question of cost I'm sure most people would gladly trade the MPX filter for a bulb in the cassette compartment.

The Nakamichi metering system is best described as adequate but a bit spartan. The general ballistics were fine but the use of 16 equally-spaced LEDs separated by a fairly large (relatively) area of black plastic did not inspire a lot of confidence. With the 2 dB scaling and the lack of visual continuity there was a sense that the display tended to 'appear here' then pop up somewhere else rather than act as a single continuous rising and falling display. Also the fact that all the LEDs are red and the peak levels were not always displayed at full brightness makes it difficult to monitor levels accurately unless you are standing immediately in front of the display.

Opinions may vary on this point but I would have liked all the calibrate pots accessible on the front panel with screwdriver adjustment. This would help keep the 'knob twiddlers' at bay and allow the maintenance department easy access (using the console's oscillator or via an external test set patched into the front panel jack sockets) without having to remove the unit from the rack, probably disconnect the line inputs and outputs, undo the cover and then replace everything when finished. What will take 30 or 40 min to get sorted out—

because a producer wants to use his favourite brand of cassette tape, for example—could be done in five, with a lot less worrying about downtime and the 'who's going to be paying for this?' syndrome.

A 12 dB/octave subsonic filter, which comes in at 18 Hz, is provided on the front panel. The filter itself has little if no effect on the audio programme. Low frequency vibrations, however, particularly from turntables and other sources, can modulate the audio programme and are also wasteful of amplifier power on replay. This is therefore a useful addition even though the benefits may not be immediately obvious or applicable.

Much the same could be said to apply to the pitch control. It won't be needed every time you use the cassette deck but on occasions the facility could be useful. The pitch control has no effect during recording; it is simply a replay only facility.

In order to get the best performance from the machine the instruction manual suggests cleaning the heads and the tape path after every 10 hours of use (50 hours for demagnetising). Given the dimensions of the tracks and the record/playback gaps this is probably good advice and should be considered as a regular part of the operating procedure. At the end of the day one of the things you are paying for is the extended high frequency response and reduced wow and flutter and it doesn't make sense to throw these virtues away by poor maintenance.

One of the features of the MR-1 which should be more widely adopted is the 'one-touch' record facility. On the Nakamichi it is a particularly elegant arrangement as all the relevant controls fall immediately to hand. Conventionally one either has to push both Record and Play together or Pause then Play and Record. With the MR-1 it is a one-finger, two-step operation. Whenever the Record button is hit, Pause is automatically engaged. To go into record all you need to do is simply hit Play. On paper this sounds a little contradictory but in practice it works very well. Perhaps a flashing mode for the Record LED in

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order to provide an additional status warning could be included but otherwise the arrangement is excellent.

Throughout the tests the machine performed extremely well. Once a cassette had been loaded into the tape compartment and the door closed the transport system would take up any slack. Interestingly during play or rewind some tapes sounded acoustically more noisy than I had expected. This didn't appear to affect the recording quality but it was a curious phenomenon nevertheless.

With the Memory Stop and the counter

reset button the machine would wind back to say -0002 then gently move on to 0000. The system isn't entirely foolproof but a good deal more reliable than most. Rewind time for a typical C-60 was 73 s.

Throughout the review period the Nakamichi *MR-1* proved itself to be a rugged, well built and thoroughly professional machine yet I must say in all fairness that I've never really understood why the Japanese feel that professional products for some reason need to be black—in fact I can't imagine a worse colour scheme. Most control

rooms are designed to be fairly relaxed places these days with relatively subdued lighting, especially away from the console and yet the *MR-1* has a black fascia, with black pushbuttons that disappear down black holes! The equipment may look attractive in the brochure but in use it is all too easy to not notice the EQ setting or the tape type selected. At a live concert or in the theatre where there would be even less light available the margin for error would be even greater. A slight re-think in this department and the *MR-1* could truly be used with confidence. □



AIWA AD-F990

The Aiwa *AD-F990* is a 3-head stereo cassette recorder equipped with an extensive range of automated features. The unit is designed to accept a wide variety of tapes and features, among other things, an interesting automatic lineup system. The *990* has been available for some time and still remains, even in the latest range of cassette decks, their top model. The 'new' *990* and the earlier version although slightly different cosmetically are to all intents and purposes the same machine.

At first glance it certainly looks different from a conventional cassette deck, the front panel being largely taken up by an extensive display panel with the majority of controls laying horizontally on a 28 mm (1 1/8 in) 'ledge' which sits at the base of the deck and runs along its full width. First

impressions may suggest it is removable but in fact this is not so as it forms an integral part of the base.

The far left section of the vertical front panel contains the Power On/Off switch and the Eject button. Below these is a 3-position timer switch (Play/Off/Record) with the Play position also providing a repeat play facility. There is also a 1/4 in jack socket for headphone listening. On the far right are the only other two controls on the vertical panel: Output Level and Rec Balance. The remainder of the front panel contains the cassette loading compartment and the display system.

The 'ledge' is divided into three distinct areas with controls grouped

UK: Aiwa (UK) Ltd, 163 Dukes Road, London W3 0SY.

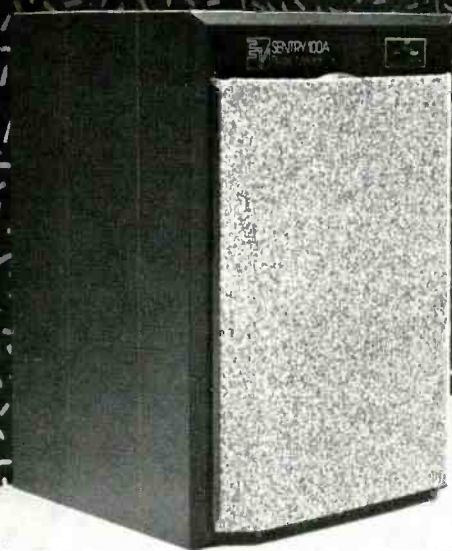
USA: Aiwa America Inc, 35 Oxford Drive, Moonachie, NJ 07074.

according to function. The first section immediately below the cassette compartment contains the conventional transport controls (Stop, Pause, Rewind, Play, F Forward and Record). Only Pause, Play and Record are provided with indicator lights, these being respectively miniature yellow, green and red LEDs which sit in countersunk holes within the actual switches.

The *990* bristles with automated features and the remaining two sections of the 'ledge' provide access to the various systems. The centre section contains various search and display options. These are activated by a row of five tiny blue buttons labelled respectively: 0000 Reset; Replay/Stop; Memory Rewind; Counter/Tape Time and Tape Length. The current status of each switch position is indicated on the display panel.

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REVIEW REVIEW

are the Music Sensor/Intro Play, Monitor/Tape and the Data Operation start/reset switches. The Music Sensor/Intro Play enables the user to automatically locate blank sections of tape between songs. In the Intro Play mode the machine not only locates the blank section but will run on and play the first 8 s or so of the next track. This facility can be used in either direction (forward or rewind).

The Digital Automatic Tape Adaption system—DATA for short—provides automatic tape type sensing and calibration. This enables a wide variety of different tapes to be used. The basic logic of the system is shown in Fig 1. In the first instance the machine generates a 400 Hz signal to provide a record/playback check. This establishes that the recording sensitivity is set to the

optimum level and that the playback output is above a minimum level. This is then followed by 400 Hz and 10 kHz test signals which are used to set the bias in order to provide a flat frequency response. Recording sensitivity is checked with a 400 Hz tone at -17 VU and when the playback level matches the test signal level equalisation is checked with a 13 kHz signal. When all four adjustments are complete the machine automatically rewinds the tape. BIAS, CAL and EQ legends are indicated on the display panel as the system runs through the series of tests.

Extensive Dolby facilities are provided including Dolby *HX Pro* (a single-ended, record only process designed to improve the high frequency response by automatically varying the bias according to programme content) and Dolby *B* and

C noise reduction systems. An automatic Dolby sensing system during playback is also included but it is limited to sensing tapes recorded on the machine as it requires a low frequency identification tone to be inserted on to tape during the recording. During the tests it was possible to record a mixture of Dolby *B*, *C* and non-Dolby tracks on the same cassette. On playback the system worked without error.

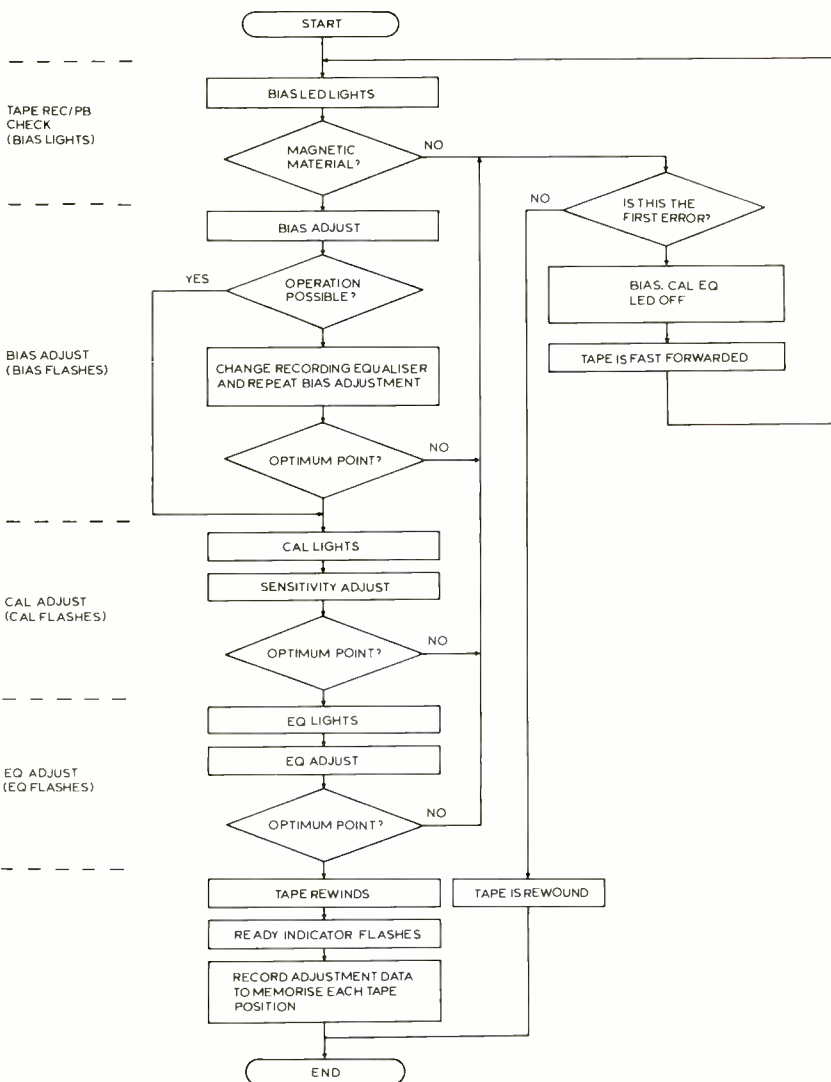
The centre section has five Dolby switches: Manual and Automatic, Dolby off, Dolby *B* and Dolby *C*. Use of *B*, *C* and the automatic sensing mode are indicated on the display panel.

The third and final section contains the record level functions. Two touch sensitive switches adjust the level, one up and one down and a third switch provides an automatic level mode. This does not act in any way like a limiter but simply allows the machine to measure peak levels and then select the optimum recording level appropriate to the tape type being used. It is of course necessary to run the programme (or at least the highest recorded levels) in order for the machine to accomplish this. The relative level of the 'faders' (whether set manually or by the automatic system) can be seen displayed above the peak meters as a series of large red segments numbered Min 0, 1-9 and Max 10. These segments turn on or off according to any level changes made.

External connections to the 990 are made at the rear of the machine. A pair of RCA-type phono connectors are provided for the left and right inputs and outputs and two ¼ in jack sockets for microphones (200 Ω-10 kΩ). Whenever a jack is inserted into the microphone inputs these automatically take precedence over the line inputs. Their are no provisions on the machine for separate mic/line switching. Also on the rear panel is an 8-pin remote control socket and an On/Off switch for the MPX filter. Although to my knowledge no rack-mounting kit is available, if you are considering mounting the 990 in the rack bear in mind that there are ventilation holes in the top of the case and the unit does get warm if the air cannot circulate effectively.

Despite the apparent complexity of all the systems the 990 is an easy machine to get on with. Tapes are loaded via a smoothly damped door into the vertical cassette compartment and whenever the machine is switched on an automatic demagnetising circuit is energised. All bias, EQ and replay level settings are stored in the 990—one particular tape formulation for each tape type, ie Normal, Chrome and Metal. If you need to use a different brand of tape or are setting up the machine for the first time all the relevant information will need to be entered into the machine's memory. This is done automatically using the DATA system and takes about 16 s. If

FIG 1 AIWA AD-F990 SYSTEM LOGIC



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during the test the machine sensed the leader tape it wound on a little then restarted. Indication of the various stages of the setting up procedure is shown on the display panel. As each test is underway the appropriate display LED flashes and when the LED stays on this indicates that the information has been stored in the memory. At the end of the line-up procedure all the calibrate LEDs switch off and the Ready light comes on. If the machine cannot set any of the parameters the appropriate LED will continue to flash and the machine will make a second attempt. If the readings are still unsatisfactory the machine will set itself to a pre-determined 'average' setting for that particular tape type.

During the review period a wide variety of different tapes were tried (BASF, Maxell, Sony, TDK and That's). Only one caused any problems, a custom chrome duplicating tape in a 'ferric' shell with no Chrome identification holes. Naturally the machine read this as a ferric tape and on replay applied the wrong equalisation. The 990 has no provisions for manually adjusting any of the setting either during record or playback: you are at the entire mercy of the machine. For the majority of brand-name tapes this should not present any problems but custom loaded tapes should be double checked. The 990 does not analyse the tape type, it simply recognises the identification holes on the top edge of the cassette shell.

All things considered the metering system is very good for a domestic machine. Aiwa are to be congratulated on such a clear display. The meters appear to consist of 72 individual segments. This is somewhat of an illusion, however, because the segments are not lit individually as you might expect but in blocks of four. It is a very clever trick especially as the last *individual* segment of the block reading the highest peak level remains on providing a 5 s peak hold facility during record and playback. One's initial reaction is to feel cheated but the meters give good visual resolution with discrete 1 dB indications all the way from -4 to +6 and provide 2 dB increments at +8, +10 and -6, -8, and -10.

Peak recording levels for different tape types are indicated below the meters by large illuminated rectangular segments. These correspond to +2 to +4 for Normal tape, +4 to +6 for Chrome and +6 to +10 for Metal. Because of the 'expanded' scale and the large warning segments it is possible to check peak recording levels at quite some distance from the machine—a very useful feature if you want to rack mount the unit and adjust levels at the console.

Adjusting levels is the weakest area of the 990. Whereas many of the automated features have been used to good effect the Aiwa touch sensitive record level

controls do not provide the right kind of user interface. It takes approximately 5 s to fade completely from -15 (6 s from 0). For the domestic user this may be quite satisfactory but during the tests there were a number of occasions when a faster fade was needed. Unfortunately unless you use an external fader there is no way of doing this. Also according to the instruction manual pressing the touch sensitive faders provides a 2 dB change in level. In fact on the review machine it was possible to make smaller changes—around 1 dB (according to the 990 meters) between -8 and +10. In spite of this you still had to be very careful during recording at which point you introduced a level change as the discrete level change could be quite audible if it didn't coincide with the natural dynamics of the music. All level changes affect both channels equally. A separate, manually operated balance control is provided to correct for any channel imbalance. Interestingly Aiwa make a slightly cheaper model—the 770—which as far as I can tell offers, virtually all the features of the 990 but is provided with a manual, horizontally located record level fader.

Sound quality was extremely good particularly with cheaper tapes which seemed to benefit quite substantially from the Dolby HX processing. With TDK MA-R the overall quality was very impressive and high levels of high frequency information could be recorded. Tapes made on the 990 and then replayed on other machines including in-car systems and portable players sounded much better than tapes made with an earlier non-HX Pro Aiwa (6900 Mk2). In addition to a better sense of dynamics, the tapes sounded cleaner and more detailed.

Although not of paramount importance to the recording engineer, some of the music play facilities could be quite useful to the producer and/or musician. The repeat playing of one side of the cassette is probably of little professional interest. Likewise the MS (Music Search), which enables the user to play a particular track then automatically run on to the next recording if you lose interest, is of limited appeal. The Intro Play and Memory Repeat are, however, quite interesting.

With the Intro Play facility you can run through a whole side either forwards or backwards and providing there is at least 4 s of silence between tracks the machine will slow down, stop, play the first 8 s of the track then automatically move on to the next track, play the first 8 s and so on till it gets to the end of the tape. The system works very well despite the fact that occasionally it may start a fraction early or clip the first couple of notes of the recording. If you have 'lost' a particular number or want to know exactly what you have on a particular

cassette this must be one of the quickest and most efficient ways of finding the answer.

Memory Repeat is another useful feature. This can be used to play a whole song or just a couple of bars. To set up the replay all you have to do is set the start at 0000 (press one blue button) and press Memory Repeat (another blue button) at the point you want it to stop. When Rewind is pressed the machine will return to 0000 and carry on replaying the memory section until told to stop. Musicians trying to work out what it was they played on their demo tape, engineers trying to identify a particular effect or sampling a particular sound or even arrangers could all benefit from this facility.

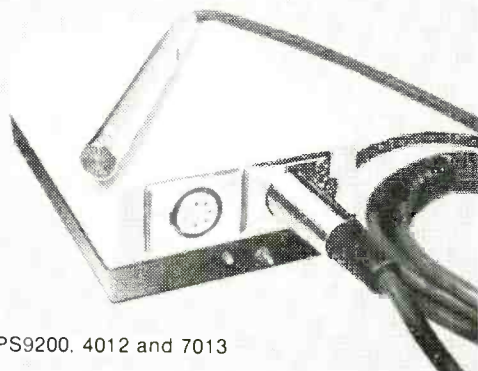
Overall the 990 gave a good account of itself although there are one or two general criticisms. The machine has a 'go to 0000' facility but it wasn't terribly accurate and I certainly wouldn't recommend going straight into record using it. In addition to a linear counter there is also a tape remaining indicator which is provided as an optional display. This is used in conjunction with the Tape Length selector which can be switched between 60/46; 90, 120 and 46L (large hub). Unfortunately it can only be used as a very rough guide.

The manufacturer specifies a maximum error of 2 min at the beginning of the tape and 20 s at the end for a C-46 and a C-60 (3 min and 20 s for C-90s). Using a standard C-46 the review machine showed 23 min 08 s of recording time (there was actually 24 min 28 s) at the start of the tape and the counter indicated that there was no further recording time available some 17 s before the end of the tape. Incidentally if you use the large hub setting for standard C-46s there will be at least 6 min of tape left after the counter has stopped. Rewind time was excellent at 57 s (C-60).

Over the years Aiwa machines have been used in a number of studios and although basically a domestic machine it is nevertheless capable of making good recordings. I would imagine that the external remote control socket could be adapted for small real-time duplicating applications, ie controlling all machines from one master panel and the recording quality would certainly be quite acceptable. There are some nice touches such as the automatic switching from Source to Tape when you go into record (with manual over-ride) and there are some less versatile features such as feeding the headphones via the line output pots rather than via a separate level control but all things considered I've enjoyed using the machine. It perhaps, needs to be treated with a little more respect than usual—some of the controls don't look too robust—but apart from that the 990 appears to be up to Aiwa's usual high standards. □

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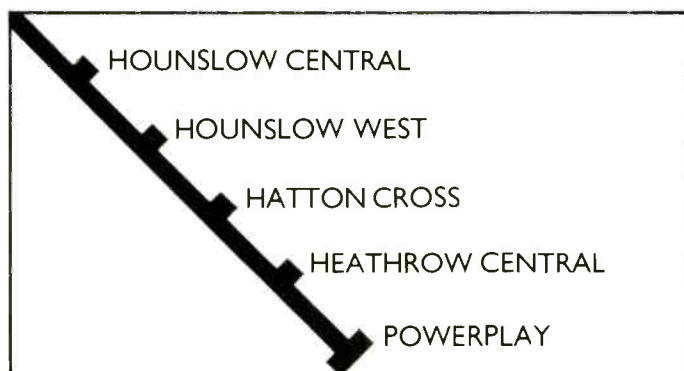
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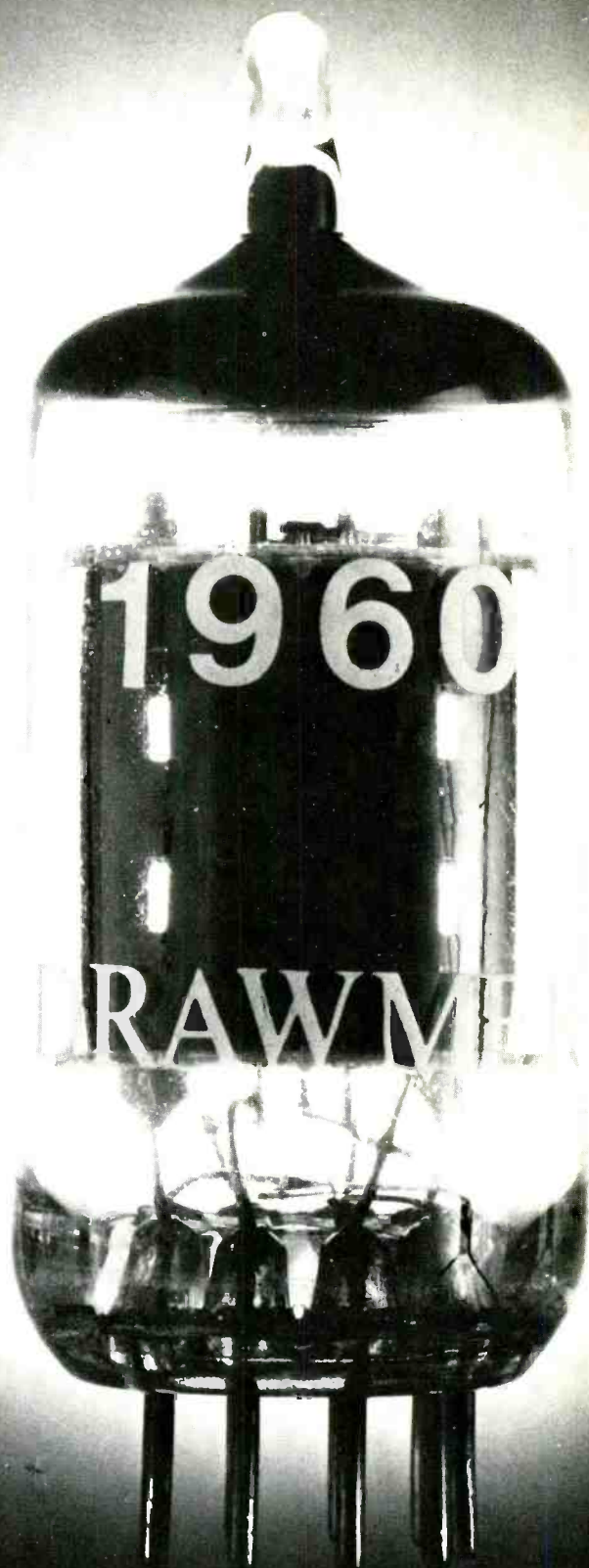
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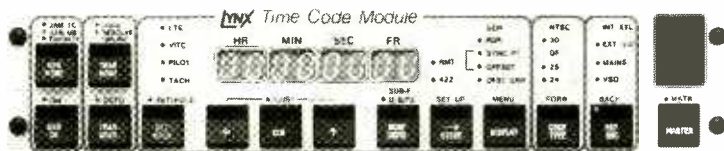
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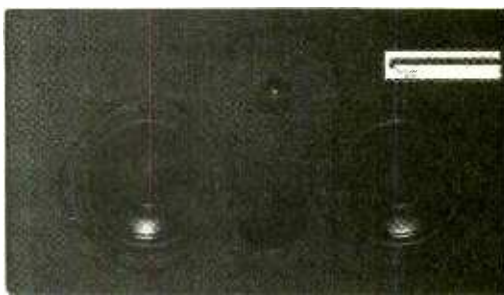
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REVIEW REVIEW

A technical report by Hugh Ford



RANE PE15 PARAMETRIC EQUALISER

The Rane PE15 is a five section parametric equaliser configured in a 19 in rack-mounting steel case 1U in height. The complete unit is finished in charcoal grey, inside and outside, with off-white panel markings. To the rear,

power is applied by a fixed cable (which was incorrectly colour coded for the UK) with the electronically balanced audio input and output being available at paralleled XLR connectors and 1/4 in jack sockets.

At the front the power on/off rocker

switch is to the left with a yellow power on LED. An undesirable feature is that the power switch is in the secondary of the mains transformer, and permanently connected to the mains via an internal 100 mA fuse.

To the right a pushbutton switch

FIG.1
RANE PE15
COMMON MODE REJECTION

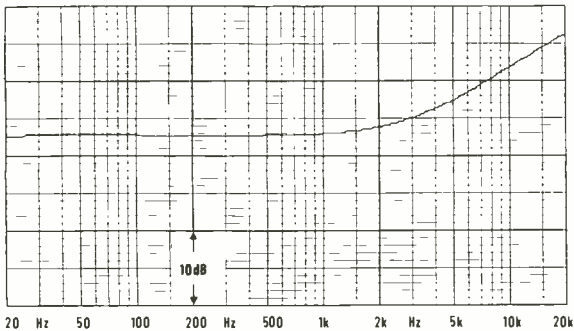
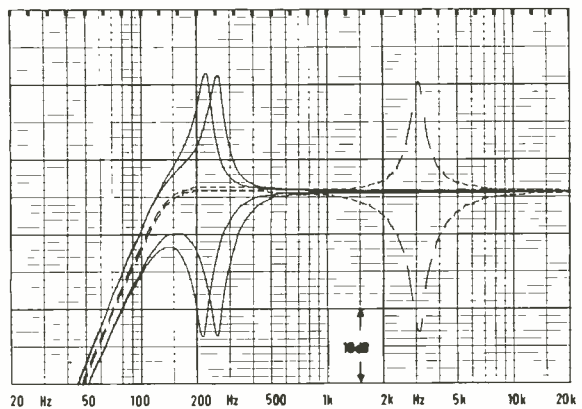


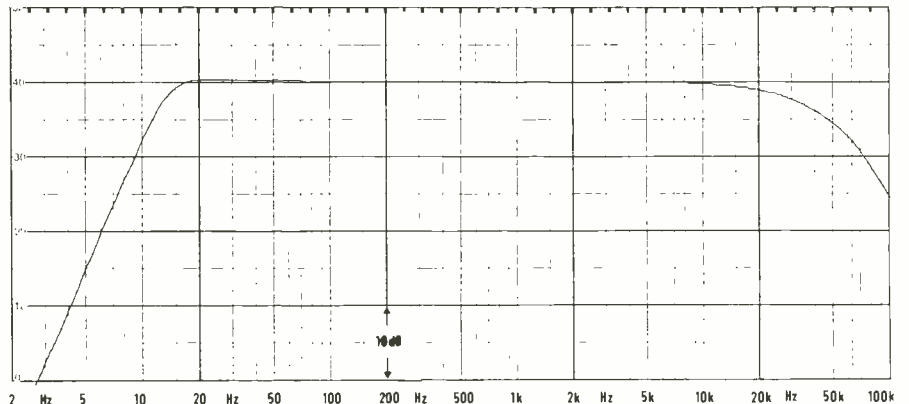
FIG.3
RANE PE15
LF FREQUENCY CONTROL
BW: 15
F=20, 65, 300
MULTIPLY FREQUENCY SCALE BY 0.1



MANUFACTURER'S SPECIFICATION

Frequency response: 20 Hz to 20 kHz ± 1 dB.
Total harmonic distortion: less than 0.02%, 20 Hz to 20 kHz, +4 dBm.
Intermodulation distortion: less than 0.009% at +4 dBm output.
Signal to noise ratio unweighted 20 kHz bandwidth: boost/cuts centred, unity gain 108 dB below +20 dBm, 92 dB below +4 dBm. Boost/cuts centred, maximum gain 105 dB below +20 dBm, 89 dB below +4 dBm. Boost/cuts maximum, maximum gain 89 dB below +20 dBm.
Gain: -infinity to +20 dB.
Maximum input level: +20 dBm.
Input impedance: 20 k Ω .
Maximum output level: +20 dBm into 600 Ω .
Output impedance: 100 Ω .
Frequency ranges: band 1—20 Hz to 300 Hz. Band 2—60 Hz to 1 kHz. Band 3—150 Hz to 2.5 kHz. Band 4—450 Hz to 8 kHz. Band 5—1 kHz to 20 kHz.
Power supply: 120/240 VAC 50/60 Hz operation.
Dimensions: 1 3/4 x 19 x 5 1/2 in (hwd).
Weight: 5 lb net.
Manufacturer: Rane Corporation, 6510 216th SW Mountlake Terrace, WA 98043, USA.
UK: Music Lab Sales, 72/74 Eversholt Street, London NW1 1BY.

FIG.2
RANE PE15
FREQUENCY RESPONSE



REVIEW

REVIEW

provides an audio bypass which is hard wired and completely disconnects the electronics whilst illuminating a red warning LED. There follows the master level potentiometer located after the input stage which is associated with a green signal present LED which illuminates with inputs exceeding -20 dBm.

A further red LED is illuminated 4 dB before overload in the input to or the output from the equaliser stages but after the input stage which could be overloaded without any indication.

Each of the five equaliser stages has four controls and one red LED which is illuminated when the locking bypass pushbutton switch is operated—this switch simply disconnects the input to the equaliser as the equaliser sections operate in parallel with their outputs being summed.

A fairly large knob operates the section level control with a detented unity gain point and a -20 dB/+15 dB range with calibrations at -20/-12/-4/+3/+9 and +15 dB. Rather fiddly small knobs control the centre frequency and the bandwidth which can be set between 0.15/octave and 1.5/octave for the low frequency section or between 0.03/octave and 1.5/octave for the other sections.

In the case of the low and high frequency equalisers, pulling out the bandwidth control modifies the sections to have a shelving characteristic rather than a peaking characteristic—one of these knobs was not properly secured and could be easily pulled off.

Each of the frequency controls has five calibration points with the low and high frequency shelving/peaking sections covering 20 Hz to 300 Hz and 1 kHz to 20 kHz. The three remaining peaking sections cover the frequencies 60 Hz to 1 kHz, 150 Hz to 2.5 kHz and 450 Hz to 8 kHz.

Within the unit all the electronics are mounted on to a single good quality printed circuit board with an uncluttered layout. Whilst the components are not identified, the instruction manual has a good layout diagram and full circuits in addition to full operating instructions which are all well written.

No pre-set controls are included and about half the integrated circuits are socketed.

The replacement of any parts is straightforward and the overall presentation of the unit is very good.

Input and output connections

The electronically balanced input could handle up to +21.7 dBm into an impedance of 21.7 k Ω with the reasonable common mode rejection performance shown in Fig 1. With the output unloaded the maximum gain to the electronically balanced output was

26.02 dB with the output being capable of delivering +27.0 dB.7V unloaded or +20.0 dBm into 600 Ω .

The output stages which present a source impedance of 100 Ω in each leg are not in fact a true balanced configuration but simply two stages providing antiphase outputs. Inserting the equaliser stages when set to unity gain had no significant effect on the overall gain.

Frequency response

The overall frequency response was the

same with or without the equalisers in circuit, the flat response within the audio band can be seen in Fig 2 which shows a well defined pass band.

All equaliser sections were examined for the accuracy and linearity of the frequency controls, and with the exception of the low frequency equaliser were found to have good accuracy and control laws.

In the case of the low frequency equaliser, Fig 3 shows the very poor control law when set to the low limit at 20 Hz, the mid-point calibrated as 65 Hz and the high limit of 200 Hz. It is

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REVIEW REVIEW

suspected that this is not a design fault but is caused by the fitting of a potentiometer with the incorrect law.

The effect of the bandwidth control on all but the low frequency equaliser was similar with Fig 4 taken from the high frequency equaliser set to 3.5 kHz being typical for the extreme and mid settings. The same plots for the low frequency equaliser shown in Fig 5 demonstrate a similar wide band performance but, as is correct, a minimum 0.15/octave bandwidth compared with the 0.3/octave minimum bandwidth of the other equalisers.

In the shelving modes of the high and low frequency equalisers the bandwidth control is disconnected with the frequency control being active with its

calibrations having little meaning. Fig 6 shows the wide range of the HF shelving equaliser together with its mid-point performance. A similar plot for the low frequency equaliser is shown in Fig 7 and indicates a wide range but again its frequency control is faulty.

No significant interaction was found between the controls in individual equalisers with the separate equaliser sections being completely separated and operable in any combination without interactions.

Noise and distortion

Noise in the output is likely to confuse users as switching the equaliser sections in/out has little effect upon noise due to

the fact that all the equaliser controls affect the noise irrespective of the equalisers being switched into circuit.

The best noise performance is obtained with the cut/boost controls set to their mid-points (no equalisation) which effectively removes the equalisers from circuit. In these circumstances the output noise depends upon the master gain setting as shown in Table 1.

The available dynamic range may be obtained by adding the maximum output level of +26 dBm to the figures in Table 1 or Table 2 which shows the output noise with all equaliser sections set to maximum cut or boost with the bandwidth and frequency controls centred and the master gain at maximum.

TABLE 1

Measurement method	Max gain	Output noise	
		-20 dB	Min gain
22 Hz to 22 kHz RMS	-75.2 dBm	-78.0 dBm	-80.8 dBm
A weighted RMS	-78.6 dBm	-80.6 dBm	-84.0 dBm
CCIR weighted RMS	-69.0 dBm	-71.0 dBm	-75.0 dBm
CCIR weighted quasi-peak	-65.0 dBm	-67.0 dBm	-70.5 dBm
CCIR/ARM ref 2 kHz	-76.0 dBm	-78.0 dBm	-82.0 dBm

TABLE 2

Measurement method	Output noise	
	Max boost	Max cut
22 Hz to 22 kHz RMS	-64.0 dBm	-71.5 dBm
A weighted RMS	-65.5 dBm	-76.8 dBm
CCIR weighted RMS	-56.0 dBm	-73.8 dBm
CCIR weighted quasi-peak	-52.0 dBm	-69.5 dBm
CCIR/ARM ref 2 kHz	-62.5 dBm	-81.0 dBm

FIG. 4
RANE PE15
HF BANDWIDTH CONTROL
F=3.5kHz
MULTIPLY FREQUENCY SCALE BY 10

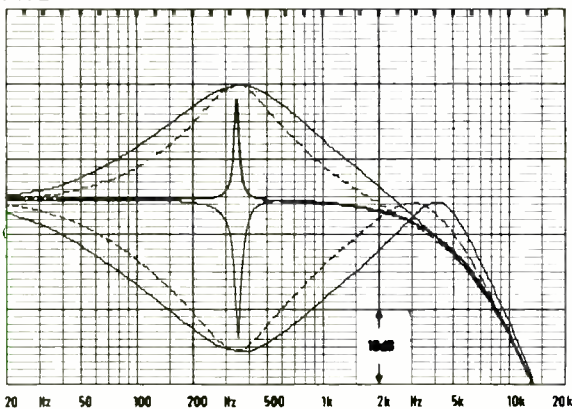


FIG. 5
RANE PE15
LF BANDWIDTH CONTROL
AT 0.15, 1 AND 1.5 AT 200Hz
MULTIPLY FREQUENCY SCALE BY 0.1

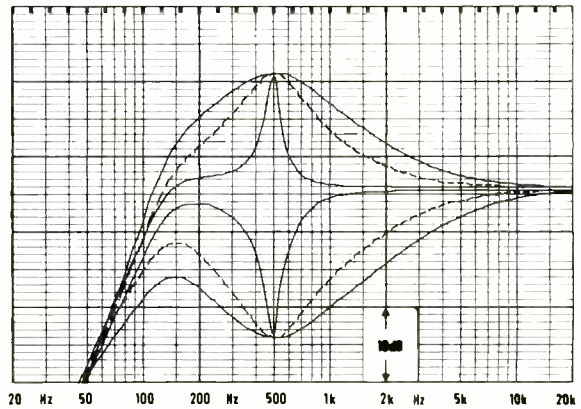


FIG. 6
RANE PE15
HF SHELVING
1kHz, 3.5kHz AND 20kHz
MULTIPLY FREQUENCY SCALE BY 10

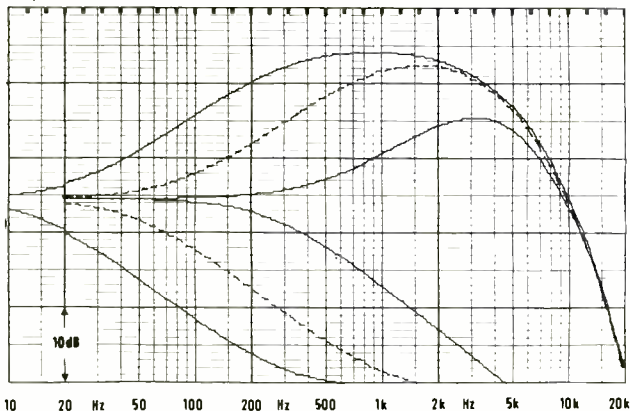
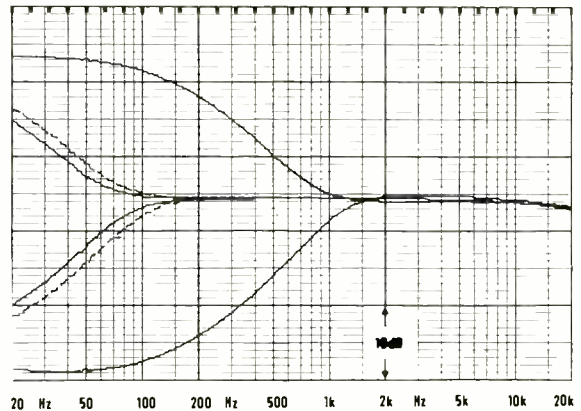


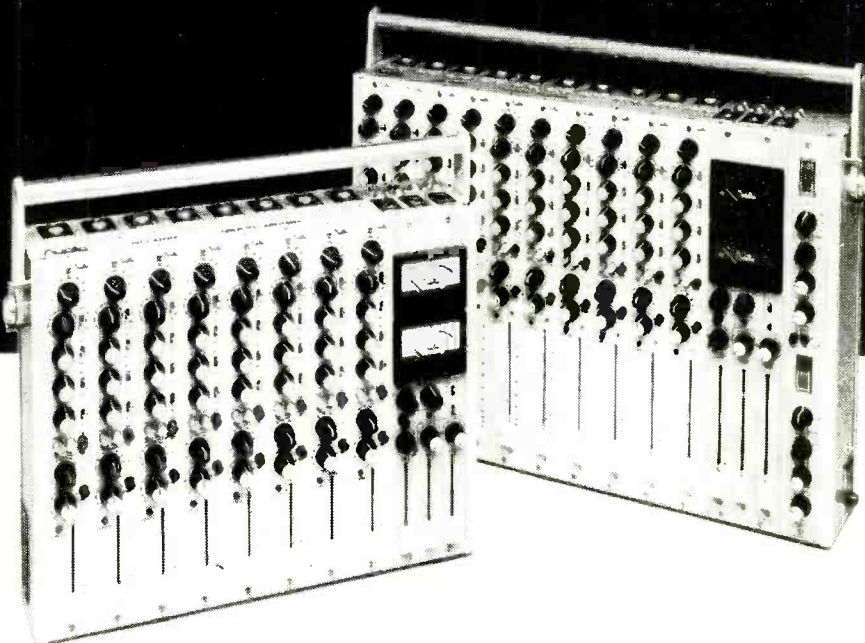
FIG. 7
RANE PE15
LF EQUALISER SHELVING



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REVIEW REVIEW

FIG. 8
RANE PE15
HARMONIC DISTORTION
+20 dBm OUTPUT
MAXIMUM GAIN

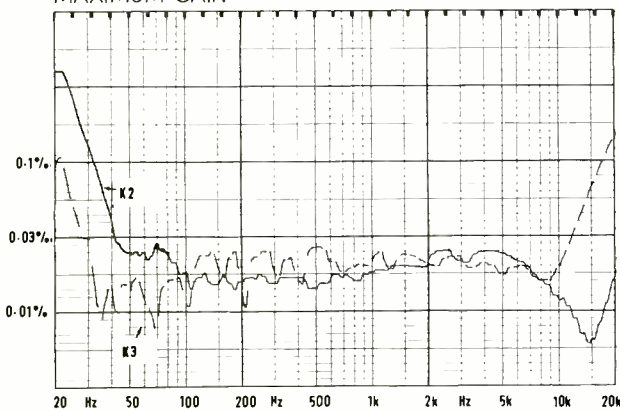
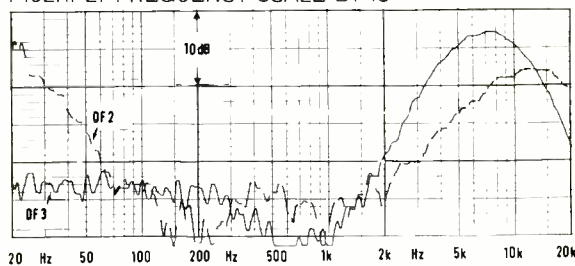


FIG. 9
RANE PE15
IM DISTORTION
AT +10dBm
MULTIPLY FREQUENCY SCALE BY 10



In practice the noise performance of the system is very complex, in particular switching the high frequency equaliser to bypass can in some circumstances produce a substantial increase in output noise—rather confusing. I suspect that this is because the input to the equaliser section is open circuited in the bypass mode.

It was also noticeable that certain settings of the low frequency and mid-low frequency equalisers could introduce a small amount of power line hum in the output.

Second and third harmonic distortion in the direct mode at +20 dBm output and maximum gain is shown in Fig 8 and is generally below 0.02% but rises at very low and very high frequencies. This was found to be a function of output level irrespective of gain with the increase in distortion at high frequencies disappearing at +10 dBm output.

Intermodulation distortion to the CCIF twin tone method using tones separated by 70 Hz under similar conditions at +10 dBm peak equivalent output is shown in Fig 9 to be below 0.01% at high audio frequencies and generally to be to a good standard. As expected the intermodulation distortion increased at higher levels.

Distortion with the equalisers in action was investigated at a number of spot frequencies and at various levels. In all cases the change in distortion with the equalisers in circuit was minimal under any conditions or cut/boost or bandwidth.

Other matters

The green signal present LED operated at -22 dBm input taking 300 ms to indicate signals at this level—a satisfactory arrangement with the red peak warning LED operating 4.5 dB below clipping and requiring a 500 μ s overload to be visible. The latter operated on the input to and output from

the equalisers but did not indicate any input overload conditions. Operation of all controls, including switches, was silent with no unwanted clicks even when power was switched on/off.

Summary

The review sample had two faults which can only be regarded as poor quality control: an incorrect law potentiometer is suspected in the low frequency equaliser and the low frequency peak/shelf knob was not properly secured.

Having said this, the PE15 is a

versatile parametric equaliser with the ability to combine sections to produce large and narrow notches in addition to acting as a wide band unit.

Generally the measured performance was very good as was the subjective effect of the equaliser, however, the bypass functions of the sections may cause considerable confusion because they disconnect the inputs to the sections leaving the output to add noise to the main equaliser output. Finally the standard of construction is very good and maintenance easy. Also the user's manual is clearly written. □

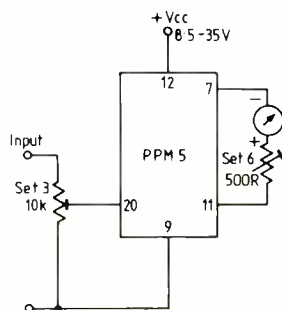
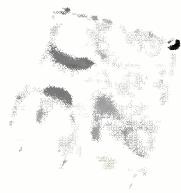
Manufacturer's comment

Regarding the quality control problems encountered by Mr Ford on the model PE 15 parametric equaliser, we want your readers to understand that this is entirely atypical of Rane products. All employees of Rane Corporation take a great deal of pride in manufacturing a product to the highest of standards, and were appalled at Mr Ford's findings. Immediately upon learning of the error, all suspect inventory (raw, in-progress, and finished) was checked, and no further instances were discovered; all

factory service records were checked to see if there was any history of this happening before and none could be found. As awkward as it may sound, we are convinced that one mis-stuffed potentiometer slipped past our quality control people and, of course, it went straight to Mr Ford for review. A sort of 'Murphy-of-the-Year' affair. All test procedures have been revised to prevent any re-occurrence.

The loose knob is another mystery as we had three pull-tests designed into the test procedures—we now have four.

PPM5



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The Aphex Aural Exciter® Type C

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



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

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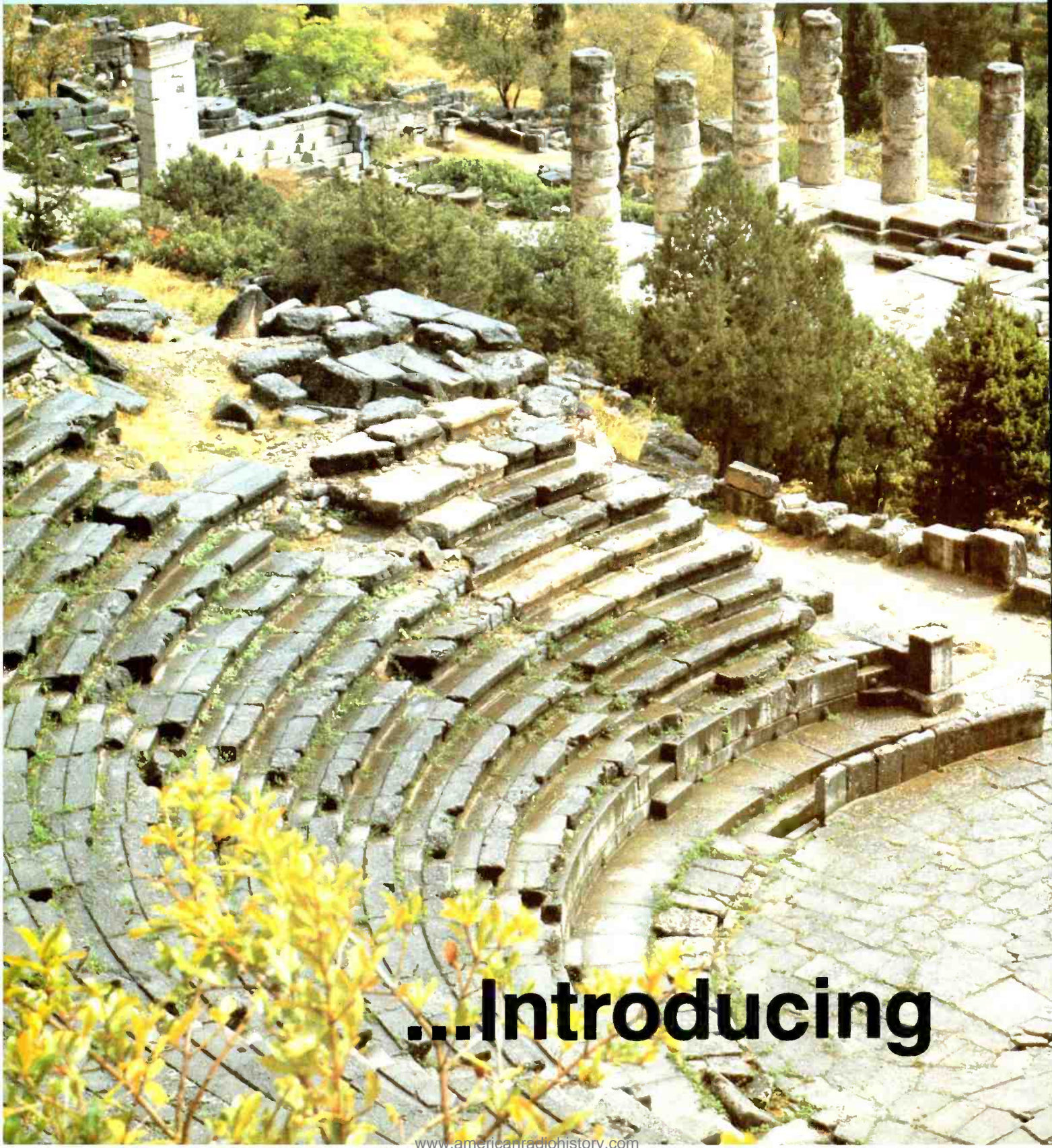
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A PERFECT ACOUSTIC ARENA.
SINCE EARLY TIMES
MAN HAS STRIVEN TO FIND THE
PERFECT SOUND



...Introducing

Music, an art expressing the complete range of human emotions, an art creating an emotional response in the listener. But what of the technical aspects of this art? The techniques required to transmit this music to the listener are also of the utmost importance, a point given foremost attention by Matsushita in their RAMSA range of professional audio equipment.

Matsushita's 30 years of experience in research and development of professional audio systems is being currently applied in Japan's National Opera House and many other halls and auditoriums, both large and small, throughout the world.

Pro-Sound By **Panasonic**

An aerial photograph showing the extensive ruins of an ancient stone structure, possibly a theater or amphitheater, nestled in a lush, green, hilly landscape. The ruins consist of numerous rectangular stone blocks and walls, some of which are still standing in rows, while others are scattered on the ground. The surrounding area is densely populated with trees and shrubs, creating a natural backdrop for the archaeological site.

RAMSA
for professionals

WHO ARE MATSUSHITA ?

Innovation is the lifeblood of our business.

The only certainty in the electronics industry is constant and rapid progress – in technology, products and production facilities.

As Japan's leading consumer electronics group, Matsushita

Electric is dedicated to do more than just keep pace with this fast moving industry. We intend to set the pace with a steady stream of innovative technology and new products derived thereof.

Our present and future need is to make certain that our products and production facilities stand at the

cutting edge of technology today and tomorrow. At the same time our management philosophy dictates that R&D should be directed towards the benefit of mankind.

Matsushita Electric operates a streamlined R&D facility consisting of 22 principal research labs including the Central Research Laboratory. There are also many other R&D centres and facilities, including one for each manufacturing division.

R&D expenditure in our last fiscal year reached US\$820 million, which represents 4.2% of our total sales. The Matsushita group presently holds over 56,000 patents.

All our research activities are interconnected across a broad spectrum, with enhancement of the quality of life and protection of the environment through electronics as their unifying theme.

The Central Research Laboratory, Osaka, Japan



WHAT IS RAMSA ?

From basic research to production technology. Matsushita's professional audio system.

RAMSA along with **Panasonic** and **Technics** is a brand name of Matsushita Electric.

RAMSA stands for Research into Audio, Music and Sound Acoustics. The concept of RAMSA research and

development is to produce a complete range of professional products from microphones through to speaker enclosures and with the use of the latest technology, achieve the highest quality of sound and performance.

Over the past ten years, the type of performances given in ordinary halls has undergone considerable changes. The proportion of musical performances has increased

dramatically, and pop music and jazz concerts in these halls are now as common as in large theatres. Music itself has undergone great changes in terms of the use of electronic musical instruments and recorded tapes, etc. These trends require new answers to questions of hall design and function. Particularly in the case of rock and roll music, the use of electronic musical instruments, and the electronic generation of new sounds has led to a movement towards 'sound creation' rather than just simple 'play back' of sound.

To the listener, broadcasts and recordings created with the high level technology of the professional must produce the same sound image as in the original concert setting. Professional audio systems have, therefore, developed from the previous equipment in which sound from musical instruments was simply volume compensated, to the current systems supporting the functions and performance required for positive creation of sound.

RAMSA in concert



WS-A200E



129 dBs of Maximum sound pressure level

- Acoustic efficiency
- High quality living sound
- Moulded resin enclosure

TECHNICAL SPECIFICATIONS

Speakers:	12" low frequency cone driver, TB horn high frequency driver (60° x 40°)
Enclosure:	2-way Bass Reflex
Power Handling Capacity:	Continuous program 250W, RMS 125W*
Impedance:	8 ohms
Frequency Response:	70Hz to 20,000Hz
Sound Pressure Level:	98dB at 1m, 1W on axis
Peak Sound Pressure Level:	129dB (equivalent to 1.2kW input)**
Crossover Frequency:	2,500Hz
Dimensions:	557 (H) x 395 (W) x 273 (D)mm
Weight:	Approx. 16.5kg

*Effective power measured as specified by American Standard EIA (Electronic Industries Association) RS-426-A (1980).

**Maximum sound pressure level, measured by inputting the test signal as defined above to an amplifier without letting the signal pass the clipping circuit. (MIC to speaker = 1m)

RESEARCH AND DEVELOPMENT

Matsushita's in-depth and diverse research answers the needs of the age. From basic audio technology and research and development on equipment and systems, to testing and engineering of professional audio systems for the future, Matsushita's expertise and experience counts.

Matsushita Communication's



Computer simulation of the acoustic characteristics of auditoriums

research and development activities are in close cooperation with the Matsushita Group's Acoustic Research Laboratories. These laboratories are equipped with large echo proof chambers, studios, listening rooms, and computers for accurate measurement and analysis by skilled personnel.



Recording studio

Recent research at the Acoustic Research Laboratories involves the use of computers to simulate acoustic characteristics of halls etc. The results of this research are being incorporated into the design of equipment, systems, and architectural design of auditoriums.



Echo proof sound chamber

MATERIALS AND COMPONENTS

Since the performance of equipment and systems is greatly influenced by material and components, Matsushita is directing considerable efforts to research and development in this field. A notable example is research related to the type of material used in the cones of speakers, the shape of the cone itself, the material used in the diaphragm, and the shape of the edge.

Recent research which has found application, is the development of a titanium diaphragm with superb

resistance to high input levels together with excellent characteristics in the high frequency ranges. Other developments include the use of the



Holography analysis on Rhombic edge

superb heat dissipating characteristics of magnetic ferro fluids in a voice coil, a unique rhombic edge for diaphragm which increases rigidity and reduces harmonic vibrations, a 'Curepress' treated mixer fader which emits almost no noise and withstands frequent operation cycles with an absolute minimum of wear, and a plastic conductive fader using a unique production process developed by Matsushita.

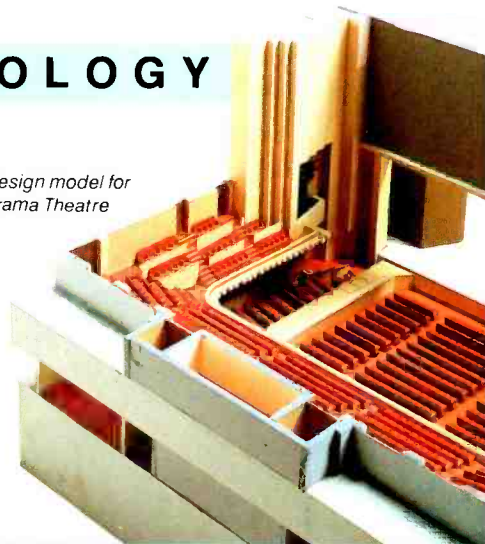
PRODUCTION TECHNOLOGY

Matsushita quality control technology shows itself in the reliability of its professional audio systems. This technology is applied on the production and inspection lines in order to improve product quality and raise production efficiency. The use of high level production technology includes the introduction of automated inspection systems to guarantee product standardization and improve reliability. Stringent and accurate testing and checking is ensured by the use of computers for performance testing.



Mixer production line

Design model for Drama Theatre



WS-A70E



Compact but powerful, with quality sound

- Automatic loudness control
- Built in thermal protection
- Magnetic shielding

TECHNICAL SPECIFICATIONS

Speakers:	8" low frequency cone driver, TB horn, 120° x 120°, and high frequency compression driver
Enclosure:	2-way Bass Reflex
Power Handling Capacity:	Continuous program 160W, RMS 80W*
Impedance:	8 ohms
Frequency Response:	50-18,000Hz
Sound Pressure Level:	87dB at 1m, 1W on axis
Crossover Frequency:	2kHz
Dimensions:	422 (W) x 262 (H) x 233 (D)mm
Weight:	Approx. 6.5kg

*Effective power measured as specified by American Standard EIA (Electronic Industries Association) RS-426-A (1980).

OLYMPIAN SOUND



Los Angeles Memorial Coliseum

One colossal event of the 1984 Olympics was the sound system installation, and it was approached and conquered with gold-medal performance for modern sound technology.

Athletes were not the only ones to reach new performance dimensions at the Olympics this year. The audio installation was one of the largest in history. Approximately 900 speakers, 250 microphones, 215 power amplifiers, 57 mixing boards and 19 miles of cable were orchestrated in two dozen locations across a long stretch of Southern California.

In early 1983, the Los Angeles Olympic Organizing Committee (LAOOC) knew there would already be plenty of complexities in the sound system without adding to them the problems inherent to any medley of equipment supplied by several manufacturers. They decided to work with a single supplier. The supplier would have to be the manufacturer of the whole range of equipment, from mics to mixers to amps to speakers,

and would also need the engineering and scientific expertise to devise sound systems of unprecedented proportions.

RAMSA selected

The committee accepted preliminary proposals from several manufacturers for the prestigious position of sound supplier for the 1984 Summer Olympics. RAMSA was awarded the contract.

A myriad of venues

The task definitely called for considerable knowledge and experience. The venues ranged from the 1000-foot-long Coliseum to a 3/4-mile-long lakeside to a swimming pool that needed synchronized airborne and under-water sound. Roving sound systems had to be capable of playing several national anthems at dozens of locations. Sound would have to be broadcast at various distances — from inside gymnasiums to outdoor stadiums, fields and even a marina harbour. The resulting equipment list would include

thousands of items that would be shipped to venues in articulated lorries — four of them to be exact.

Almost all of the event sites needed three separate sound systems. In total, there were 20 systems for spectators, 26 for press interviews, 10 for athletic call-up announcements and 19 portable conference systems.

The Coliseum question

The spectator sound system at the Coliseum had to be both impressive and technologically advanced. The 25-year-old existing system was considered completely inadequate for the 1000-person choir backed by a full band and no fewer than 84 piano players, all at one end of the stadium.

Making the audio portion of the Olympics match the athletic excellence was indeed a great challenge. As in the world of sports, hard work, concentration and innovation are also the keys to a gold-medal performance in the world of sound.

WM-V001/2/3



Outstanding frequency response and directivity

- Tonal balance over wide frequency range
- Floating suspension
- Light weight, high rigidity diaphragm
- 3-stage output impedance

SPECIFICATIONS	WM-V001	WM-V002	WM-V003
Type:	Dynamic	Dynamic	Dynamic
Sensitivity:	81 ± 3dB (100Ω) 79 ± 3dB (150Ω) 76 ± 3dB (250Ω) (0dB = 1V/μbar, 1kHz)	- 81 ± 3dB (100Ω) - 79 ± 3dB (150Ω) - 73 ± 3dB (600Ω) (0dB = 1V/μbar, 1kHz)	- 74dB ± 3dB (0dB = 1V/μbar, 1kHz)
Frequency Response:	50 - 15,000Hz	50 - 15,000Hz	60 - 14,000Hz
Polar Pattern:	Unidirectional	Unidirectional	Unidirectional
Output Impedance:	250Ω ± 20% 150Ω ± 25% 100Ω ± 25% (1kHz)	600Ω ± 25% 150Ω ± 25% 100Ω ± 25% (1kHz)	600Ω ± 30% (1kHz)
Ambient Temperature:	- 10 C - + 50 C	- 10 C - + 50 C	- 10 C - + 50 C
Mounting Screw:	3/8" and 5/8"	3/8" and 5/8"	3/8" and 5/8"
Dimensions:	∅52 (max dia) × 169.5 (length) mm	∅48 (max dia) × 177 (length) mm	∅48 (max dia) × 174 (length) mm
Weight:	310g	320g	290g

PRO COMMENT...

...monitor WS - A70E

I tested the units in a studio control room with a variety of programme material and have to admit that I was generally impressed. They sound like near-field monitors to me, despite the visual suggestion of a PA cabinet.

Having replaced my Auratones with Ramsa monitors, I was immediately aware of an increase in level - SPL is actually quoted at 87dB at 1 watt, 1 metre.

The response was generally fast, with no trace of the hangover on bass drum, normally associated with inadequate cabinet or voice design.

...monitor WS - A70E

In general, I liked the sound of these monitors... Sensitivity and power handling were fine and the transient response was particularly good.

...microphones WM - V001/2/3

I certainly feel that these microphones, while being unpretentious, are nevertheless well designed and engineered, and should certainly be used if they were in my collection.

...microphones WM - V001/2/3

The response of the microphones on tom toms was good, quite punchy and also warm, with no hint of a metallic upper mid sometimes caused by some 'presence effect' microphones. I then tried the V003 on bass guitar and I was so pleased that I committed it straight to tape without any equalisation. The song has yet to be mixed but I don't think the sound will need to be changed drastically. The bass response was extremely good and compares very favourably with certain older, but well established microphones.

Panasonic Technics

The driving force behind RAMSA in the U.K.

Panasonic U.K. Ltd., is a part of Matsushita Electric, the worlds largest manufacturer of consumer electronics, employing some 150,000 people worldwide.

With its headquarters based in Slough, Berkshire, products are distributed nationwide from centres in Hinckley, Normanton and Livingston in Scotland. Fast, efficient distribution and service, has positioned Panasonic as one of the countries leading consumer electronics groups, since coming to the U.K. in 1972.

To add to this, computer sales and marketing has ensured that Panasonic will give the right background and expertise to launch RAMSA as a major force in the complex world of professional sound in the U.K.

To learn more about RAMSA and what it can do for you, clip the coupon below and send it to us.



Headquarters of Panasonic UK Limited



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RAMSA
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for professionals

We place emphasis on total, integrated performance and quality in all areas of audio engineering. From sound input to sound delivery.



Each component is designed in terms of its place in the entire system. At the same time, the overall system serves to elicit the best performance from every individual part. At RAMSA, the interrelationship of every part of the whole, and the whole of every part is of the foremost importance.

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Telex: 847652.

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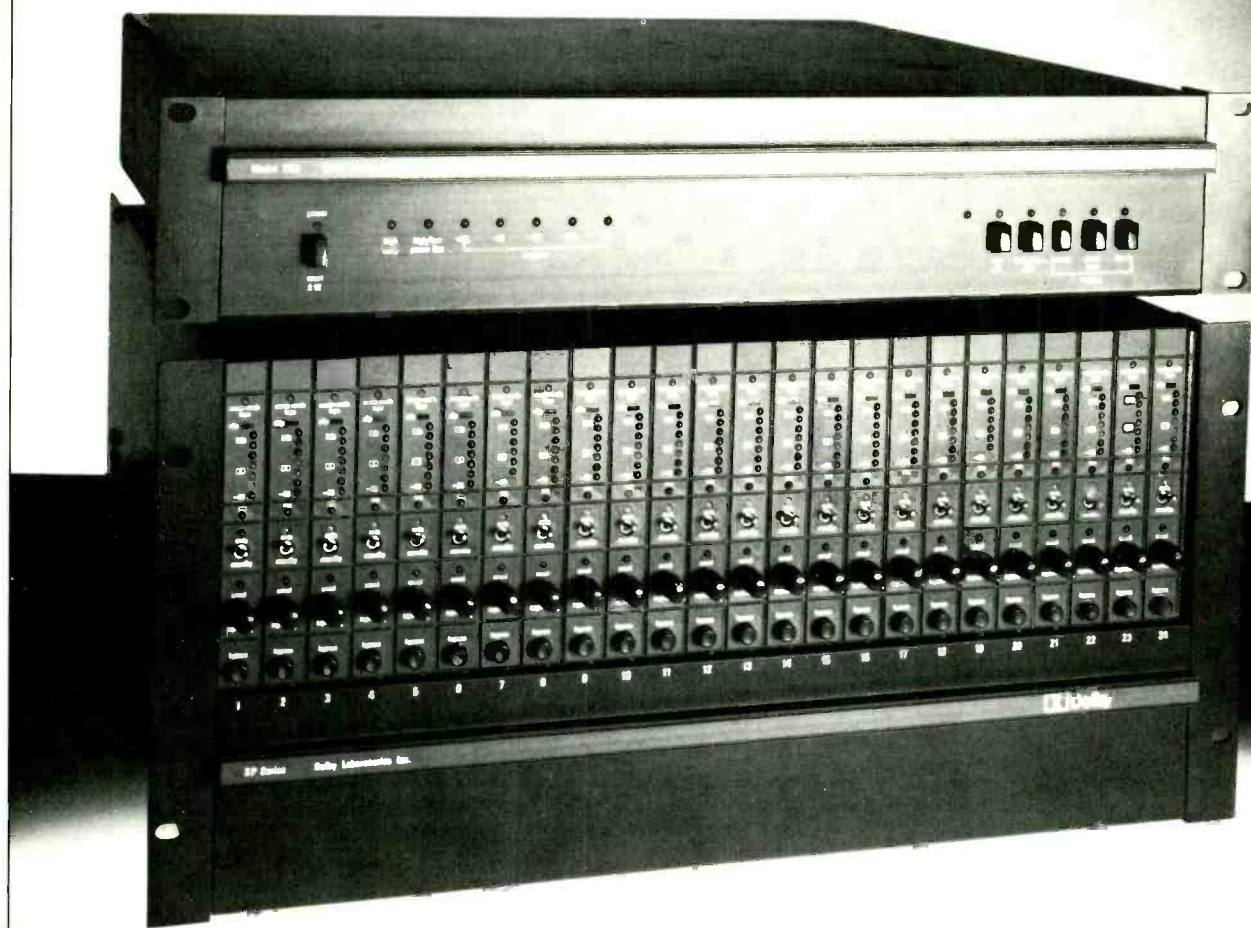
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The Dolby XP Series Professional Cost-effective

NEW



XP Series Multi-track record or playback.

The Dolby XP Series contains up to 24 channels of Dolby A-type noise reduction in 12¼" of rack space, including power supply. The XP Series utilizes an on-board, integrated noise reduction circuit instead of the interchangeable Cat. No. 22 modules used in the SP Series, providing the same A-type noise reduction at a price over 20% lower.

Each XP noise reduction channel consists of a plug-in Cat. No. 331 module which contains the Dolby A-type noise reduction circuitry, precision input and output amplifiers with low distortion, controls, and an accurate LED calibration display. The separate, regulated PS3 power supply, designed for rack mounting directly above the noise reduction unit chassis,

contains fan cooling and electronically-controlled output protection.

The XP Series includes "uncal" controls, permitting convenient resetting of Dolby level for playback of and punch-in on tapes from studios with different Dolby level standards. The user can select the option of "hard-wired" or electronically-buffered bypass of individual channels or all channels simultaneously. The XP offers discrete FET switching for reliable, noise-free routing of audio signals. For convenience of wiring and for stability, a new detachable multi-channel connector plate is used, with tie bar for the cable form.

Dolby noise reduction is a mainstay of professional multi-track recording in studios throughout the world for

music, film, broadcast, television, and videotape production. Over 90,000 channels are now in use world-wide. The benefits of Dolby A-type — improved signal-to-noise ratio, lower distortion, and reduced cross-talk and print-through — are achieved with a minimum of signal processing and with resultant high signal integrity.

DD Dolby®

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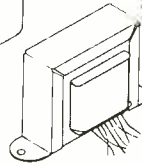
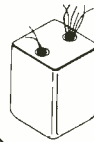
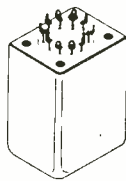
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JE-16A
2 kHz Square Wave

INPUT TRANSFORMERS AND SPECIAL TYPES

Model	Application	Impedance Ratio Pri:Sec	Turns Ratio Pri:Sec	20Hz Max Input Level ¹	Typical THD Below Saturation (%) 20 Hz/1 kHz	Frequency Response (dB ref. 1 kHz) 20 Hz/20 kHz	Band-Width ² -3 dB @ (kHz)	20 kHz Phase Response (degrees)	Over-Shoot (%)	Noise Figure (dB)	Magnetic Shield ³ (dB)	Number of Faraday ⁴ Shields	Package ⁵	PRICES		
														1-19	100-249	1000

MICROPHONE INPUT

† JE-16-A JE-16-B	Mic in for 990 opamp	150-600	1:2	+8	0.036/0.003	-0.08/-0.05	230	-8	<1	1.7	-30	1	A=1 B=2	65.25 71.73	43.59 47.92	30.07 33.06
JE-13K7-A JE-13K7-B	Mic in for 990 or I.C.	150-3750	1:5	+8	0.036/0.003	-0.09/-0.21	85	-19	<2	2.3	-30	1	A=1 B=2	65.25 71.73	43.59 47.92	30.07 33.06
JE-115K-E	Mic in for I.C. opamp	150-15 K	1:10	-6	0.170/0.010	-0.50/+0.10	115	-5	<7	1.5	-30	1	3	44.84	29.95	23.39

LINE INPUT

JE-11P-9	Line in	15 K-15 K	1:1	+26	0.025/0.003	-0.03/-0.30	52	-28	<3		-30	1	1	105.75	70.65	48.74
JE-11P-1	Line in	15 K-15 K	1:1	+17	0.045/0.003	-0.03/-0.25	85	-23	<1		-30	1	3	42.69	28.53	22.27
JE-6110K-B JE-6110K-BB	Line in bridging	36 K-2200 (10 K-600)	4:1	+24	0.005/0.002	-0.02/-0.09	125	-12	<1		-30	1	B=1 BB=2	63.98 74.05	42.75 49.47	31.37 34.13
JE-10KB-C	Line in bridging	30 K-1800 (10 K-600)	4:1	+19	0.033/0.003	-0.11/-0.08	160	-9	<2		-30	1	3	43.45	29.03	20.03
JE-11SSP-8M	Line in / repeat coil	600/150-600/150	1:1 split	+22	0.035/0.003	-0.03/-0.00	120	-9	<3.5		-30	1	4	168.39	112.50	77.61
JE-11SSP-6M	Line in / repeat coil	600/150-600/150	1:1 split	+17	0.035/0.003	-0.25/-0.00	160	-5	<3		-30	1	5	85.11	56.86	39.23

SPECIAL TYPES

JE-MB-C	2-way ³ mic split	150-150	1:1	+1	0.050/0.003	-0.16/-0.13	100	-12	<1		-30	2	3	36.22	24.21	18.89
JE-MB-D	3-way ³ mic split	150-150-150	1:1:1	+2	0.044/0.003	-0.14/-0.16	100	-12	<1		-30	3	3	63.35	42.32	33.04
JE-MB-E	4-way ³ mic split	150-150-150-150	1:1:1:1	+10	0.050/0.002	-0.10/-1.00	40	-18	<1		-30	4	1	98.99	66.13	45.62
JE-DB-E	Direct box for guitar	20K-150	12:1	+19	0.096/0.005	-0.20/-0.20	80	-18	<1		-30	2	6	45.46	30.38	23.71

- (dBu) Max input level = 1% THD; dBu = dBv ref. 0.775 V
- With recommended secondary termination
- Specifications shown are for max. number of secondaries terminated in 1000 ohm (typical mic preamp)
- Separate lead supplied for case and for each faraday shield
- Except as noted, above transformers are cased in 80% nickel mu-metal cans with wire leads.

PACKAGE DIMENSIONS:

W	L	H
1 = 1 3/16" Diam.		× 1 3/16"
2 = 1 3/16" × 1 3/16"		× 1 3/16"
3 = 1 1/8" Diam.		× 1 1/8"
4 = 1 1/2" × 1 3/4"		2 1/2" w/ solder terminals
5 = 1 5/8" Diam.		× 1 3/4"
6 = 1 1/8" Diam.		× 1 5/16"

NICKEL CORE OUTPUT TRANSFORMERS⁶

Model	Construction	Nominal Impedance Ratio Pri:Sec	Turns Ratio Pri:Sec	20 Hz Max Output Level ⁷ across (n) windings (dBu)	600 Ω Load Loss (dB)	DC Resistance per Winding	Typical THD Below Saturation (%) 20 Hz/1 kHz	Frequency Response (dB ref. 1 kHz) 20 Hz/20 kHz	Band-Width -3 dB @ (kHz)	20 kHz Phase Response (degrees)	Over-Shoot (%)	Package	PRICES			
													1-19	100-249	1000	
* JE-11-BMCF	Bifilar 80% nickel	600-600	1:1	+26	1	-1.1	40 Ω	0.002/0.002	-0.02/-0.00	>10MHz	-0.0	<1 ⁹	7	65.36	43.66	30.12
* JE-11-DMCF	Bifilar 80% nickel	600-600	1:1	+21	1	-1.0	38 Ω	0.004/0.002	-0.02/-0.00	>10MHz	-0.0	<1 ⁹	8	48.74	32.56	22.46
JE-123-BLCF	Quadfililar	600-600 150-600	1:1 1:2	+32	2	-1.1	20 Ω	0.041/0.003	-0.02/-0.01	>450 170	-1.9 -4.0	<1 ⁸	7	64.57	37.71	26.02
* JE-11SS-DLCF	Bifilar split/split	600-600 150-600	1:1 1:2	+27	2	-1.0	19 Ω	0.065/0.003	-0.02/-0.01	>10MHz 245	-0.0 -2.5	<1 ⁸	8	46.38	30.98	21.37
* JE-11-ELCF	Bifilar	600-600	1:1	+23.5	1	-1.1	40 Ω	0.088/0.003	-0.03/-0.00	>10MHz	-0.0	<1 ⁹	9	30.21	20.18	13.93
* JE-11-FLCF	Bifilar	600-600	1:1	+20.4	1	-1.6	58 Ω	0.114/0.003	+0.03/-0.00	>10MHz	-0.0	<1 ⁹	10	23.66	15.81	10.91
JE-112-LCF	Quadfililar	600-600 150-600	1:1 1:2	+20.4	2	-1.6	29 Ω	0.114/0.003	-0.03/-0.01	>450 205	-1.2 -3.2	<1 ⁸	10	26.68	17.82	13.08
JE-123-ALCF	Quadfililar	66.7-600	1:3	+26.5	3	-1.3	8 Ω	0.125/0.003	-0.04/+0.06	190	-4.6	<6 ⁸	8	44.09	29.45	20.32
JE-11S-LCF	Bifilar w/ split pri.	600-600 150-600	1:1 1:2	+30	1 (sec)	-1.7	63 Ω	0.058/0.002	-0.02/+0.01 -0.02/-0.05	>10MHz 155	+1.1 ±4.1	<1 ⁸	8	44.09	29.45	20.32

- Multifilar construction has no faraday shield: cannot be used as input transformer. All specifications are for 0 Ω source, 600 Ω load.
- Max output level = 1% THD; dBu = dBv ref. 0.775 V
- Source amplifier -3 dB @ 100 kHz
- Source amplifier -3 dB @ 200 kHz
- Output transformers are horizontal channel frame type with wire leads, vertical channel frames available. PC types available.

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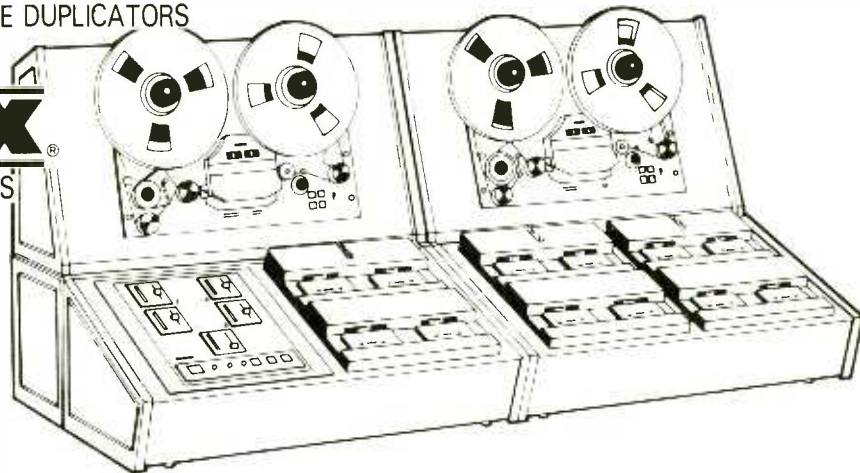
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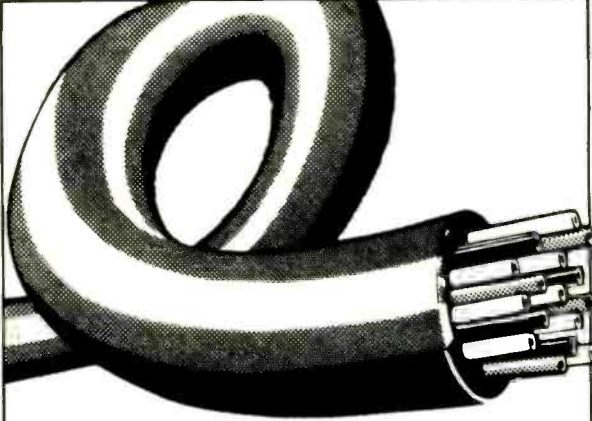
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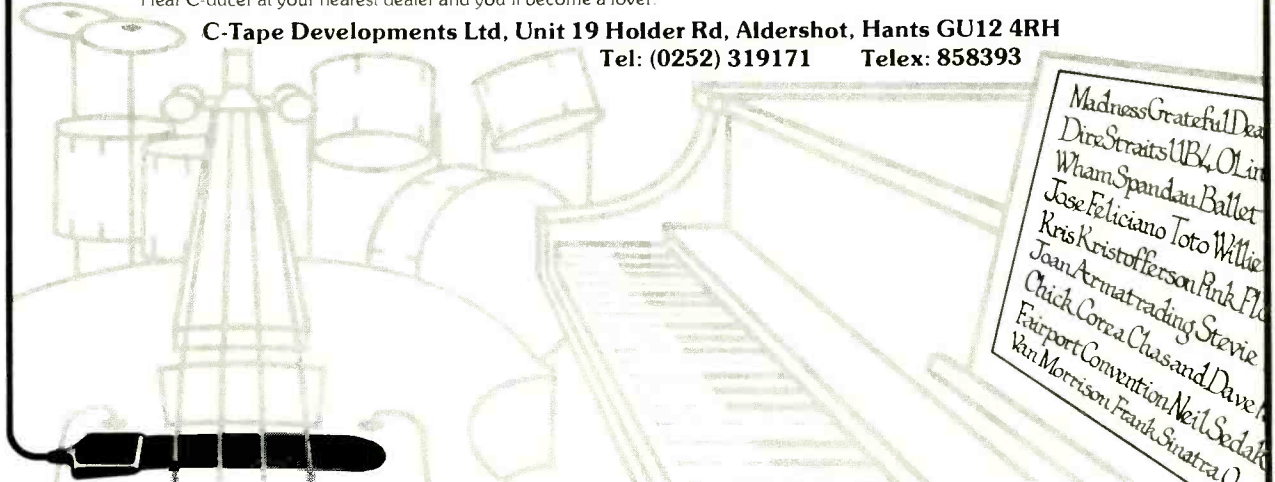
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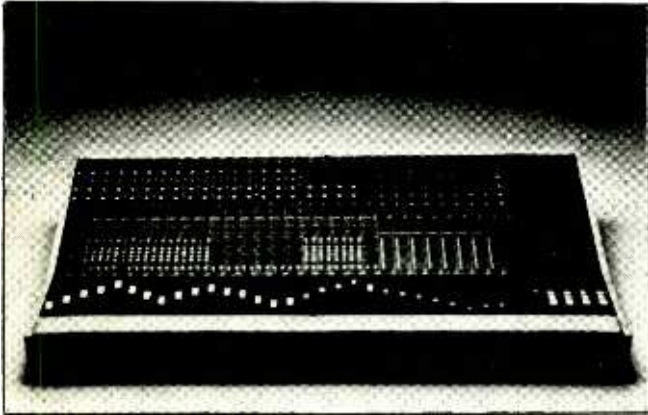


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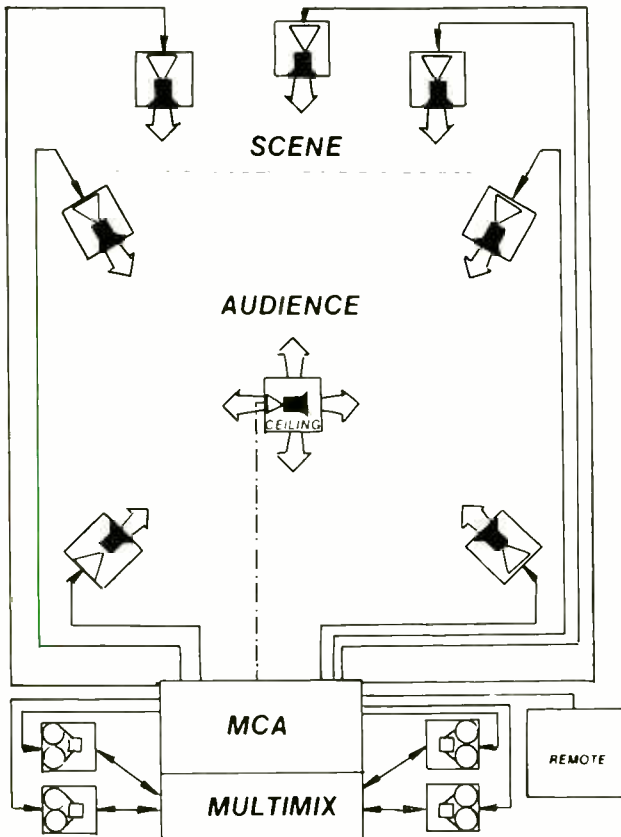
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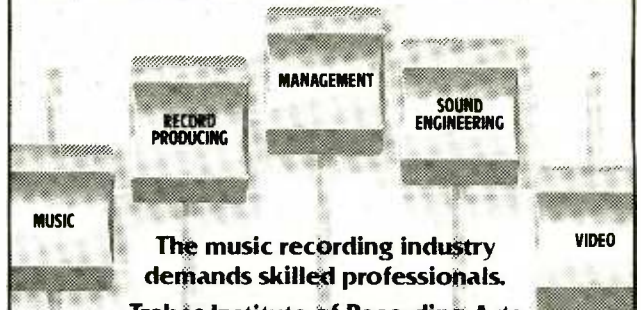
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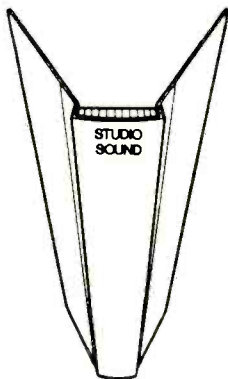
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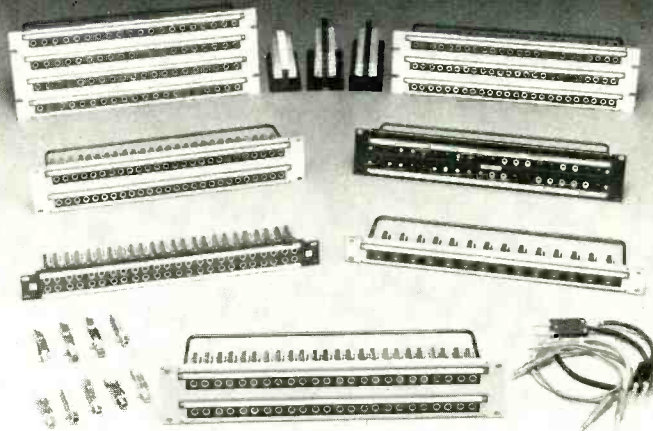


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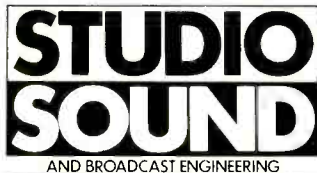
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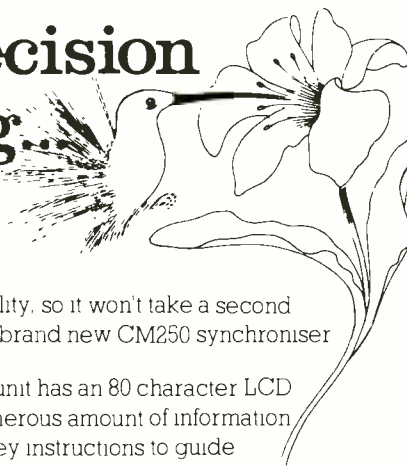
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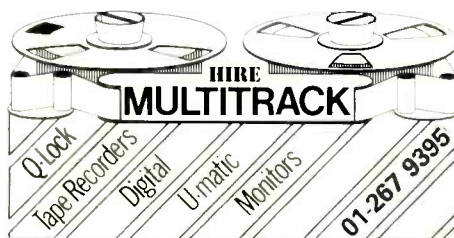
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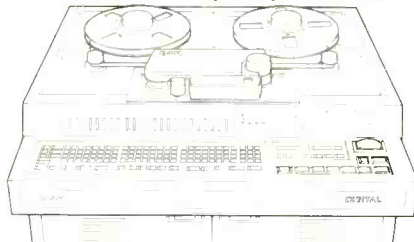
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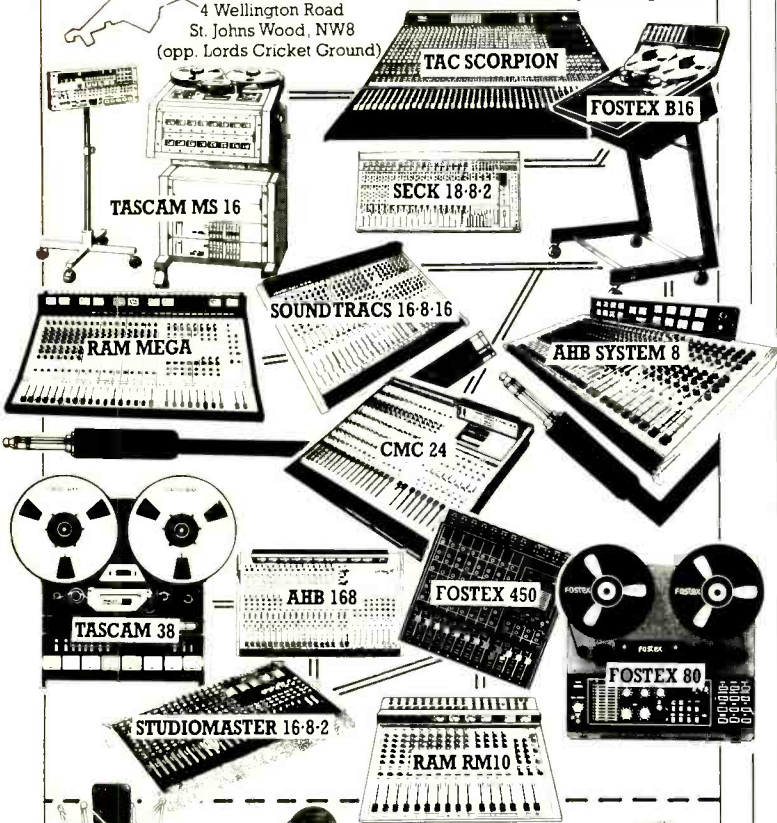
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