

studio sound

January 1981 £1

AND BROADCAST ENGINEERING

LINK HOUSE PUBLICATION

Mixing consoles - part 2

MIDAS the professionals' choice

James Guthrie, Robbie Williams and Nigel Taylor with Britannia Row's 106 channels of MIDAS used to mix "THE WALL" concerts by 'Pink Floyd'. Robbie Williams, Britannia Row Director, "On the road, Midas is second to none . . . I can't see us using anything but MIDAS for quite a few years." Britannia Row own and operate over 20 MIDAS consoles, they know that when it comes to reliability, customer acceptance and the all important factor of non-obsolence in a rapidly changing market, MIDAS is a sound investment. Britannia Row are professionals, MIDAS is the professional's choice.



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 A LINK HOUSE
PUBLICATION



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International co-operation

The final session in last year's SPARS (Society of Professional Audio Recording Studios) conference, held just prior to the New York AES in a hotel across the street from the Waldorf, centred around the results of a questionnaire filled in by a number of top US studios on the subject of operating practice in the studio. The informal—and most interesting—discussion covered such things as what tones should appear on a master tape and where, what type and colour of leader should be used, and so on, the aim being not so much to establish US 'standards', but more to present guidelines as to the best ways of making tapes truly interchangeable between studios in North America. Of course, such considerations are very important, but they shouldn't be limited to the United States. As we all know, a great many tapes are worked on in studios all over the globe, and such operating practices would do well to be established internationally, particularly between Europe and the US where recording and cutting are very often split between either side of the Atlantic. And in some areas, users in Europe may have useful comments on practices which could help their US counterparts. For example, over here we seldom encounter paper leader tape, and we're used to the problems of static on plastic leader—a matter for long discussion by the SPARS gathering. Other SPARS comment included recommendations to use peak-reading meters to assist the cutting engineer—but to what standard? In Europe we have been using PPMs and similar devices for years, and standards have already been worked out and are (generally) adhered to. We should obviously get together here, with our American friends, and produce some *international* recommendations. I'd like to see the APRS working with SPARS on this (they may already be doing so, of course), and it may well be worth us at *Studio Sound* including a SPARS-style questionnaire to correlate international opinion. In the meantime, if you have any comments on operating practice in these areas, please let us know, and we'll pass them on. We'd also like to hear from studio organisations all over the world who are interested in these areas.

Studio time is money—to whom?

Somebody came up to me at the New York AES and pressed a brochure into my hand advertising a new studio booking concept (new to New York, that is: the idea has already been launched in London). The idea is that if you need to book studio time in a hurry, you get in touch with these guys, who have a constantly-updated record of recently-cancelled time in contributing studios, time which has been cancelled at short notice and would otherwise be unfilled. By taking such time, you get a good rate, typically 50% of normal, and pay a booking fee to the 'agency'.

On the face of it, there's a good idea in there somewhere. At the very least, you fill otherwise blank time, albeit at a reduced rate (valuable in these depressed times), and if you're *really* lucky, you can charge your original potential client a cancellation fee, and make a good profit even at the half-rate. Record companies and less well-off bands get a good rate if they can move fast enough, and the guy at the agency makes his 10% or whatever. A good deal all round, you might think.

Unfortunately, it may not turn out that way. However well-intentioned such agencies may be, the system is wide open to abuse. A record company could, for example, book some time under an assumed name, cancel out, and book the *same* time at the cheap rate through the agency. Equally, a sly agency could book loads of time in your studio (and everyone else's), under an equally fictitious record company name, cancel it and book it to his clients. You might pick up some of that type of operation via your credit control people, but enough would slip through (especially if you accept small amounts of money up-front as confirmation) to put you into a very bad position. Then, of course, the ultimate course of action for the people using your studio is *only* to book through the agency—you have ridiculous amounts of free time because there simply aren't any bookings any more, and you end up *having* to use the service to get any work. In other words, you've involuntarily cut your rates by half. You go bust, and so does everyone else! Not such a good idea after all. The idea of selling otherwise unbookable time at a cheap rate is a good one in principle, but how do you organise it so that it can't be misused? Your comments? . . .

Richard Elen

Cover of Neve 8108 at EMI Abbey
Road by Adrian Mott

ISSN 0144-5944
JANUARY 1981 VOLUME 23 NUMBER 1

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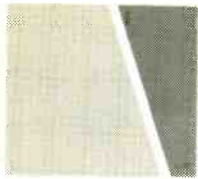
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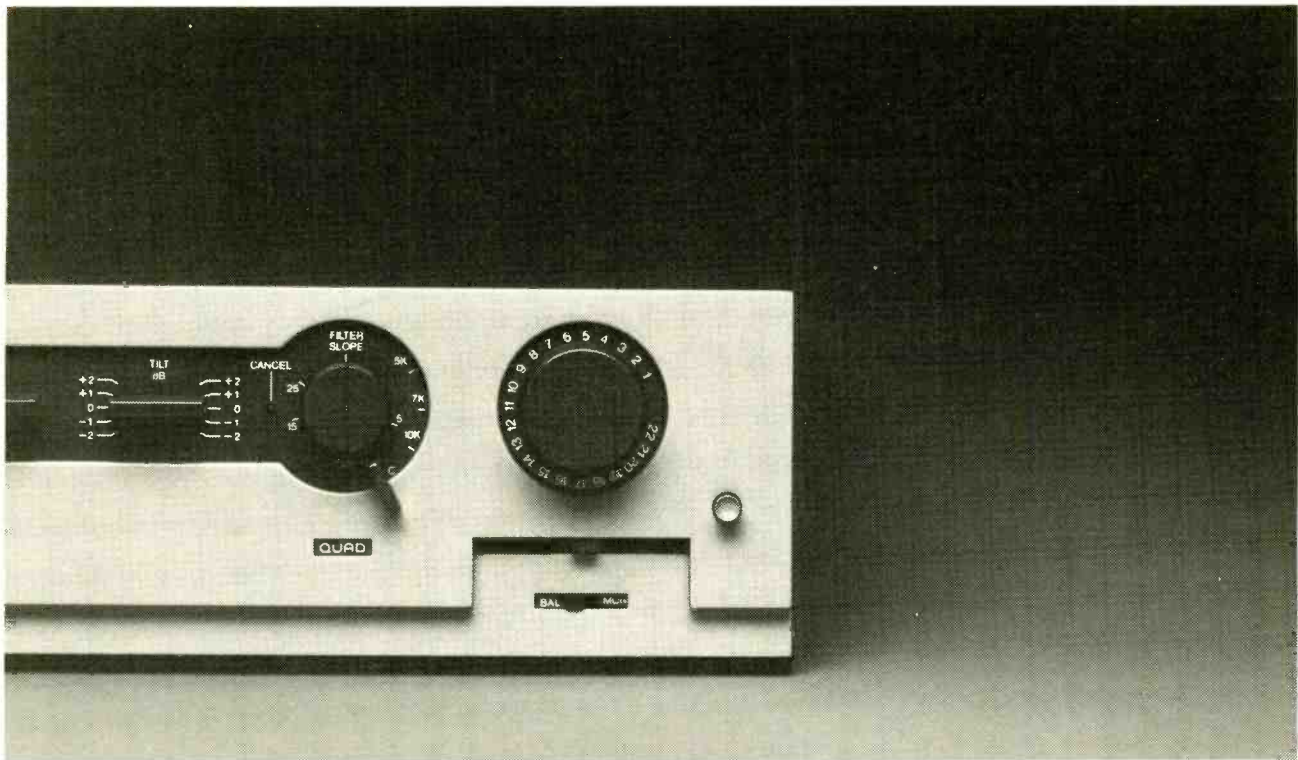
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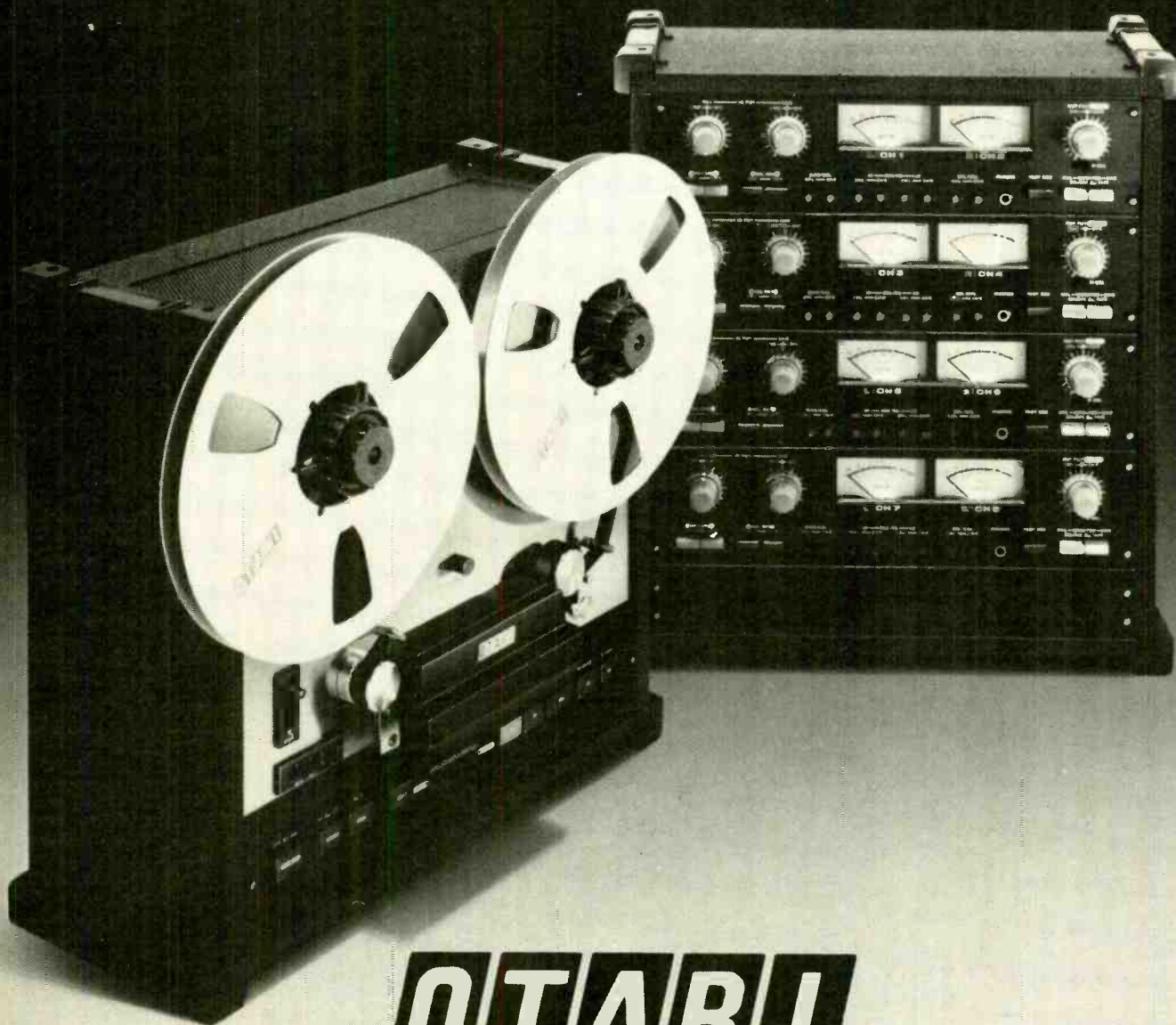
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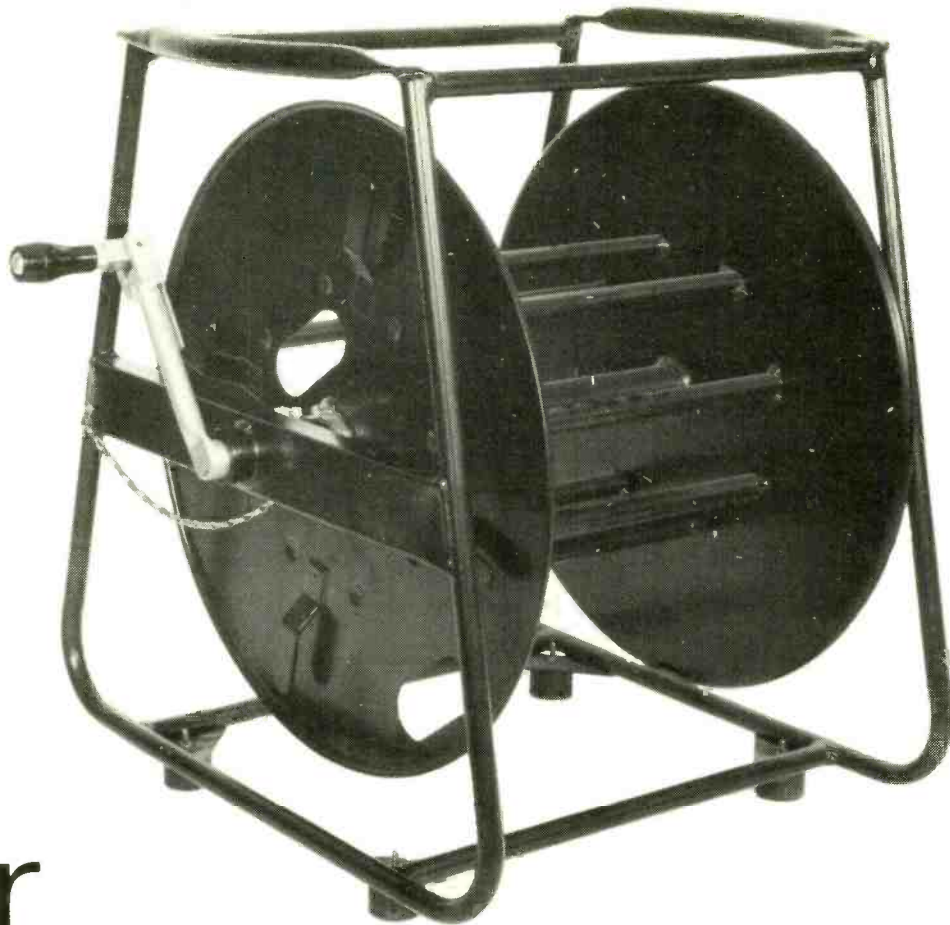


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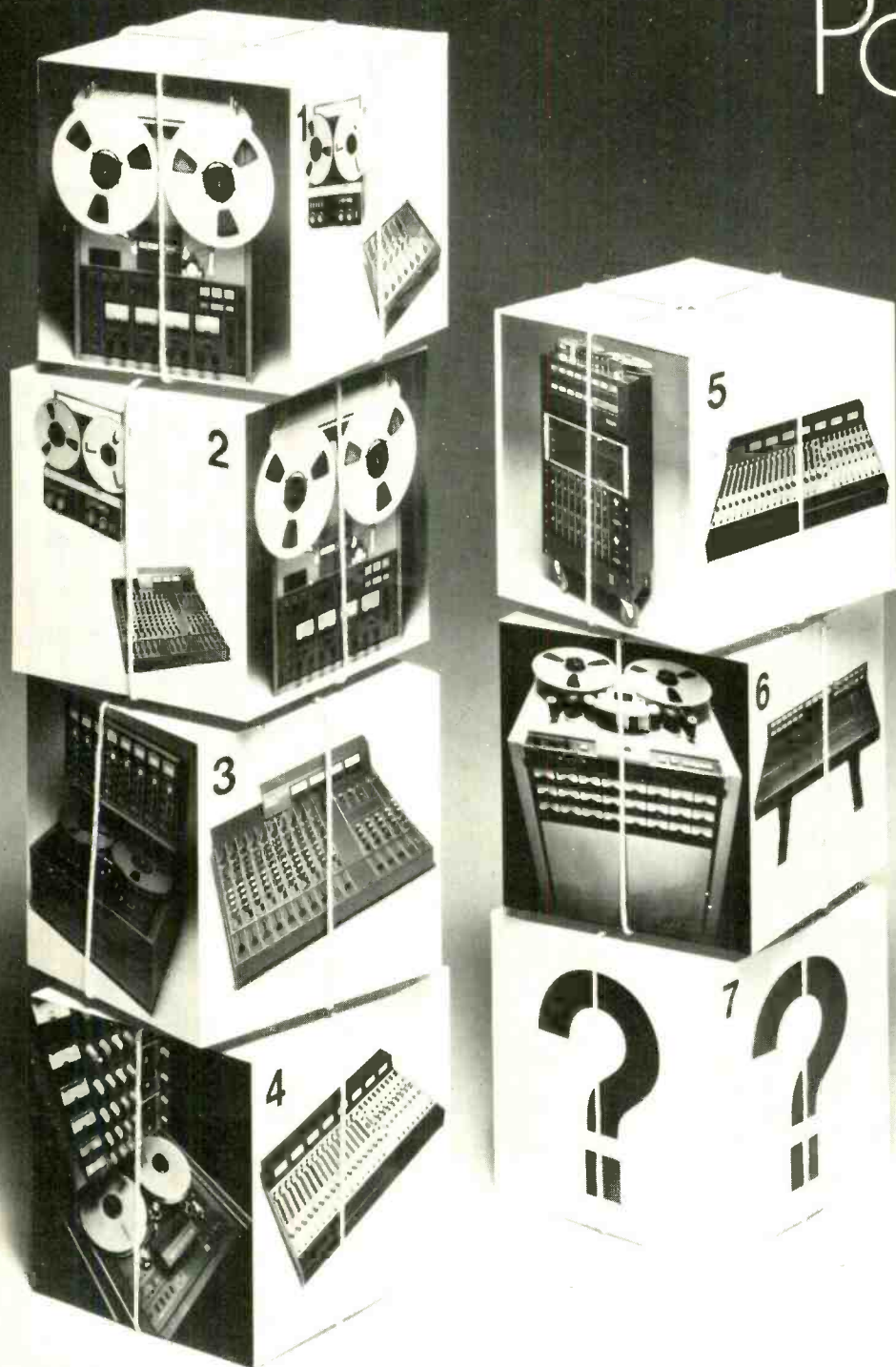
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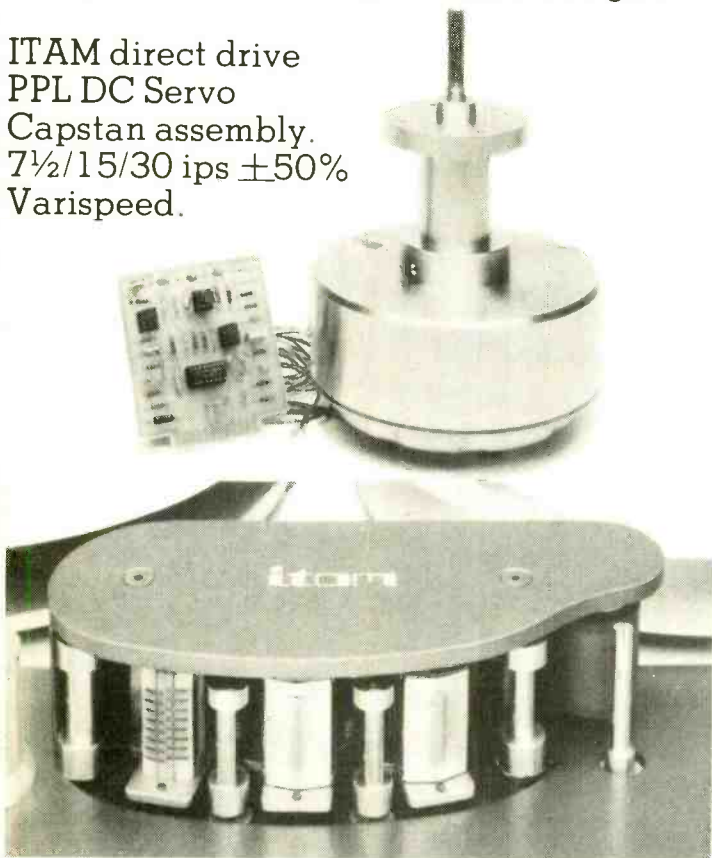
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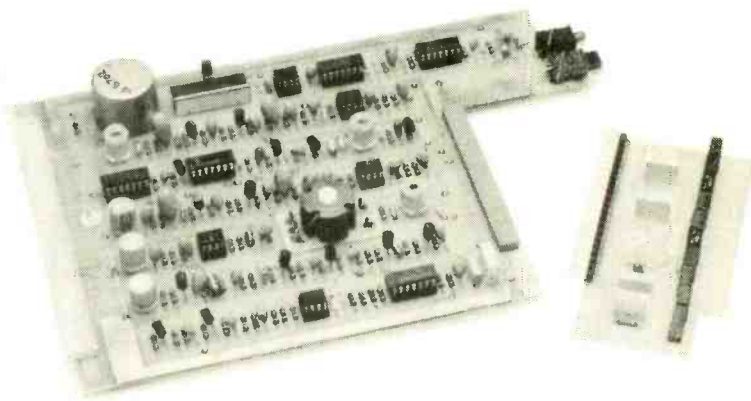


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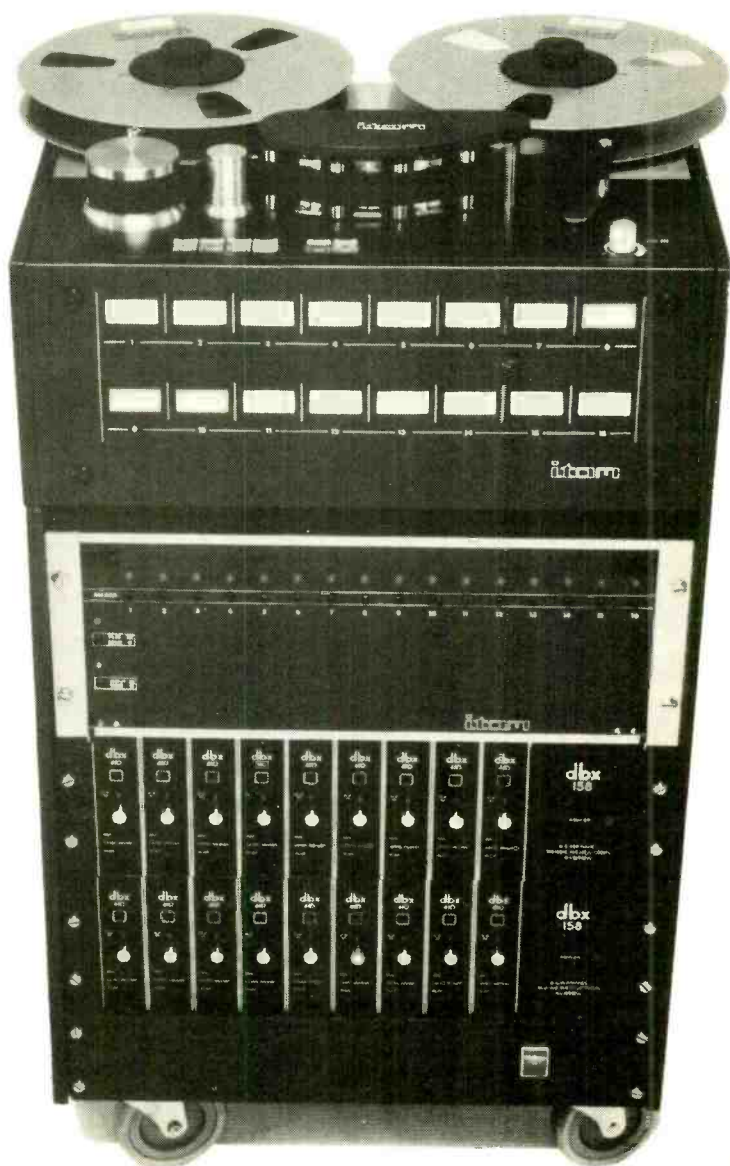
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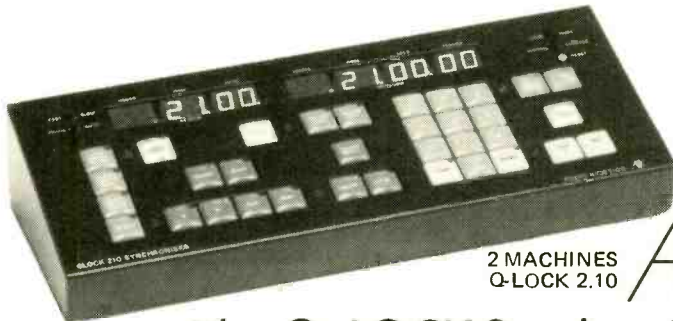
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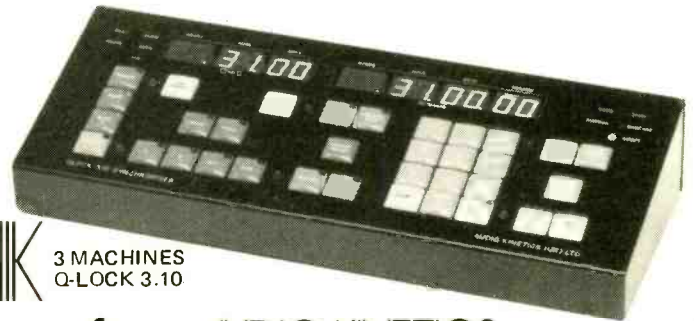
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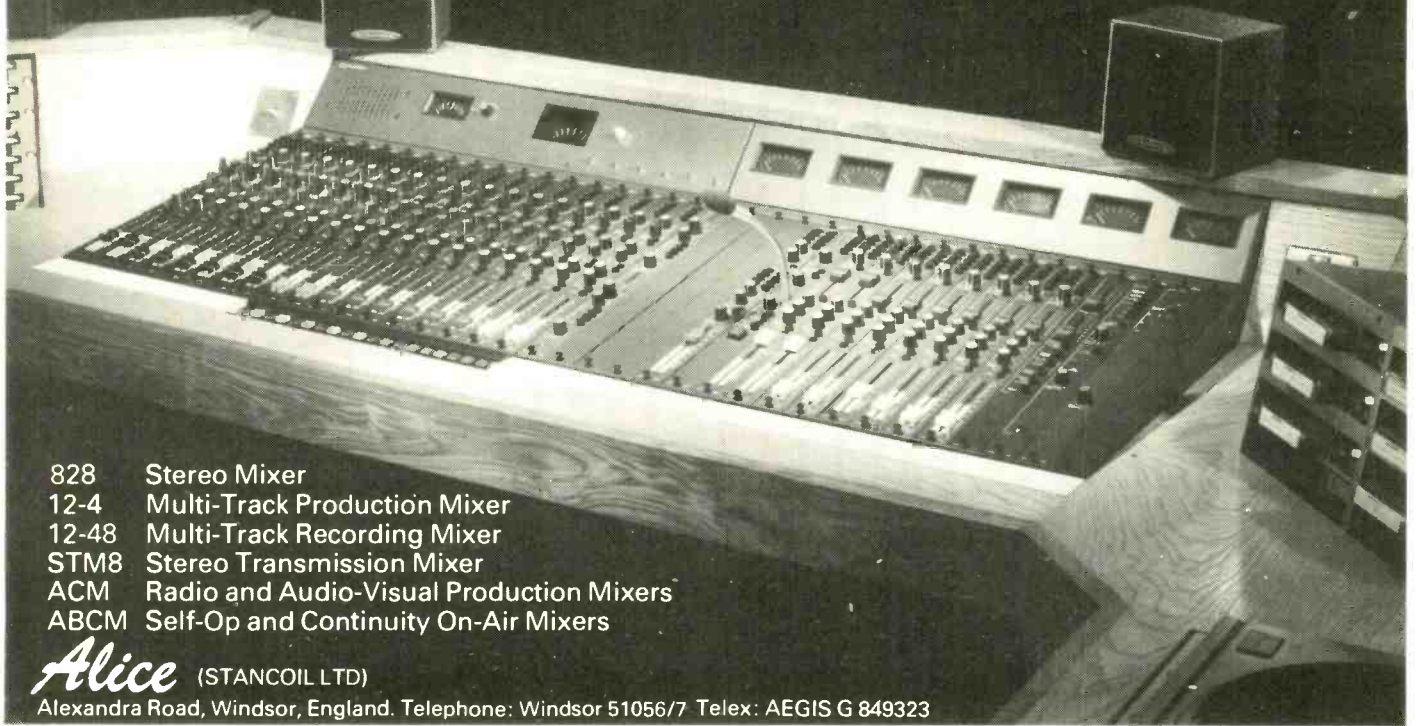
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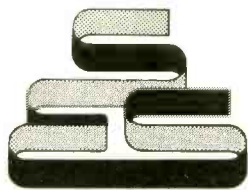
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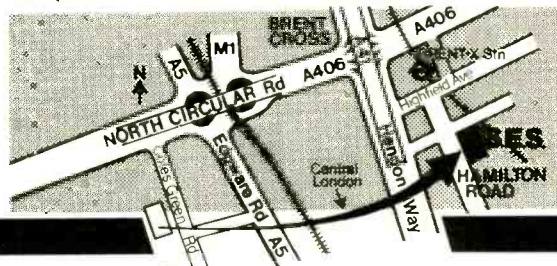
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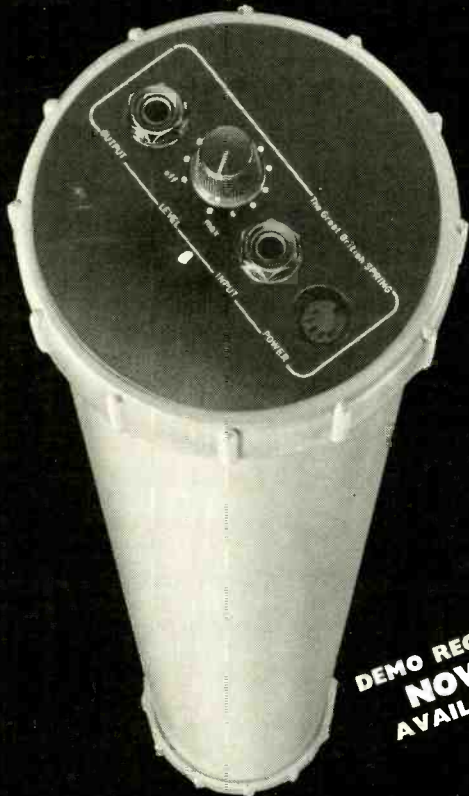
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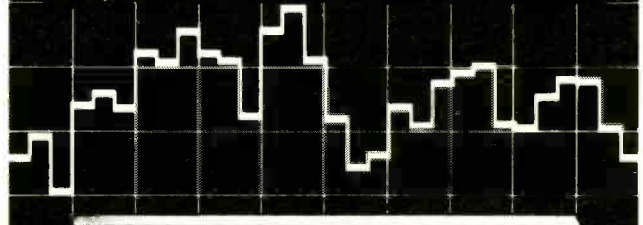
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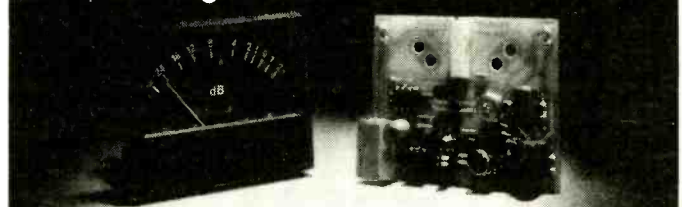
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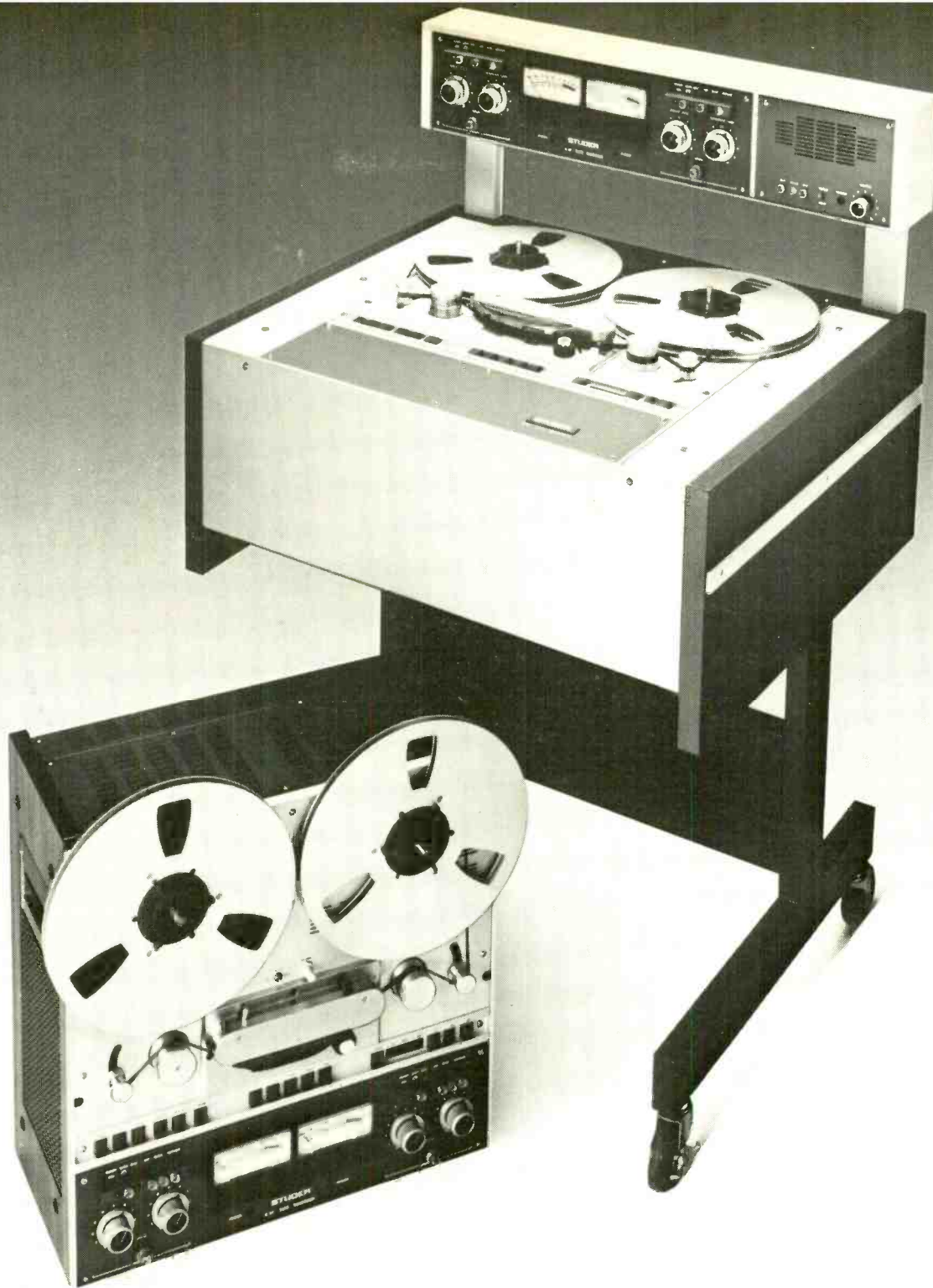
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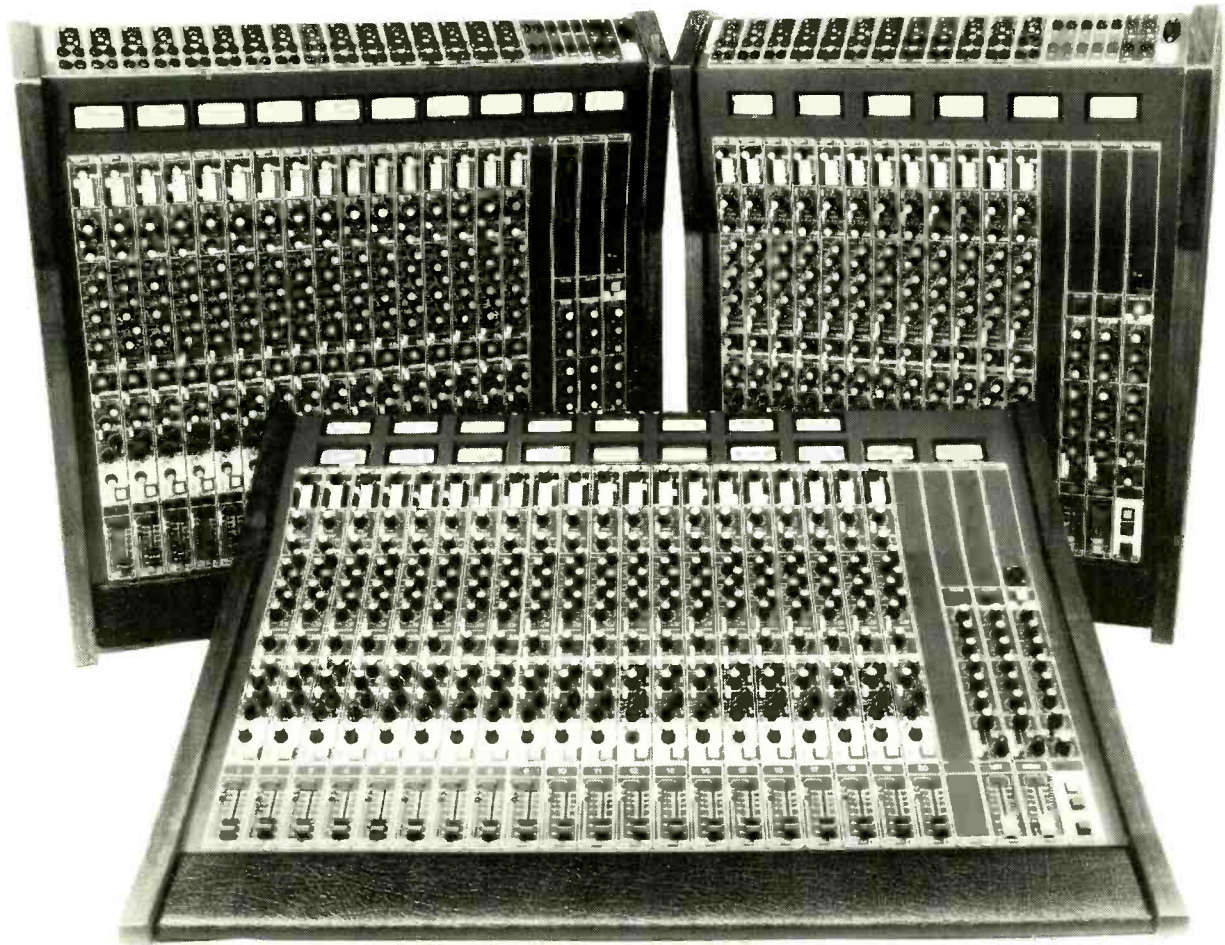
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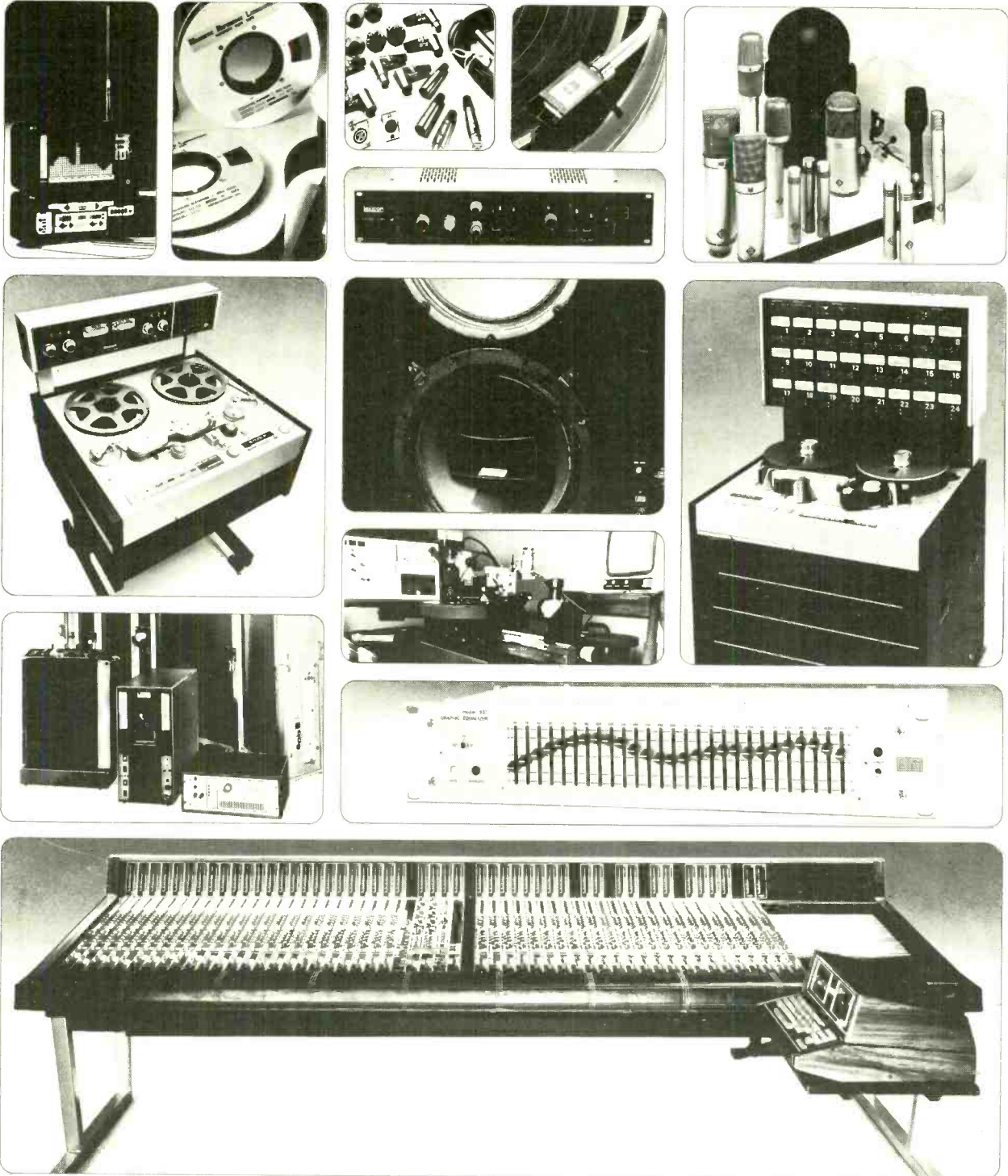
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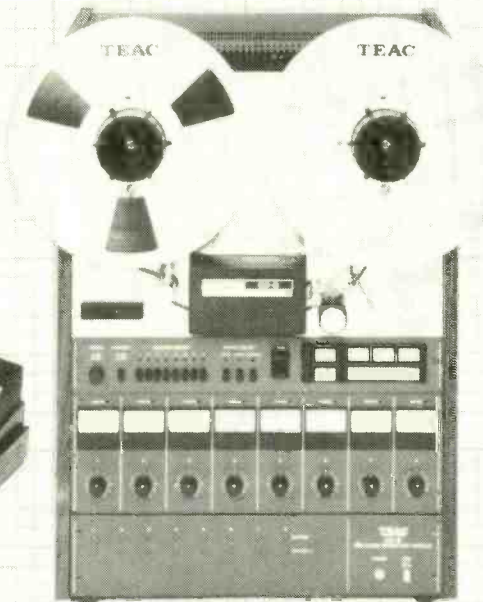
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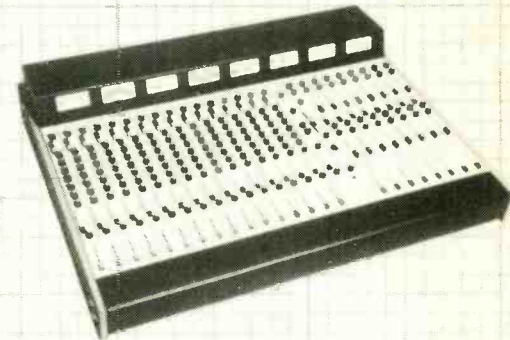
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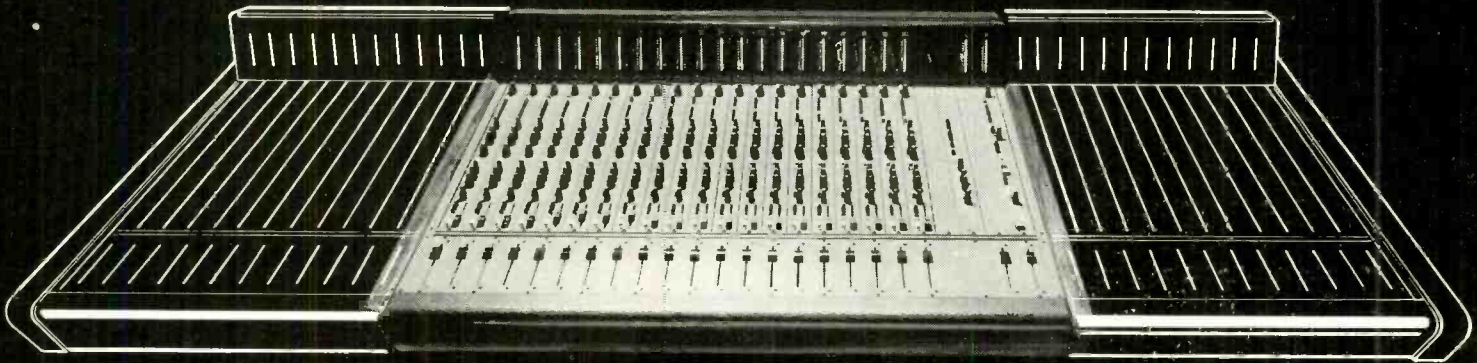
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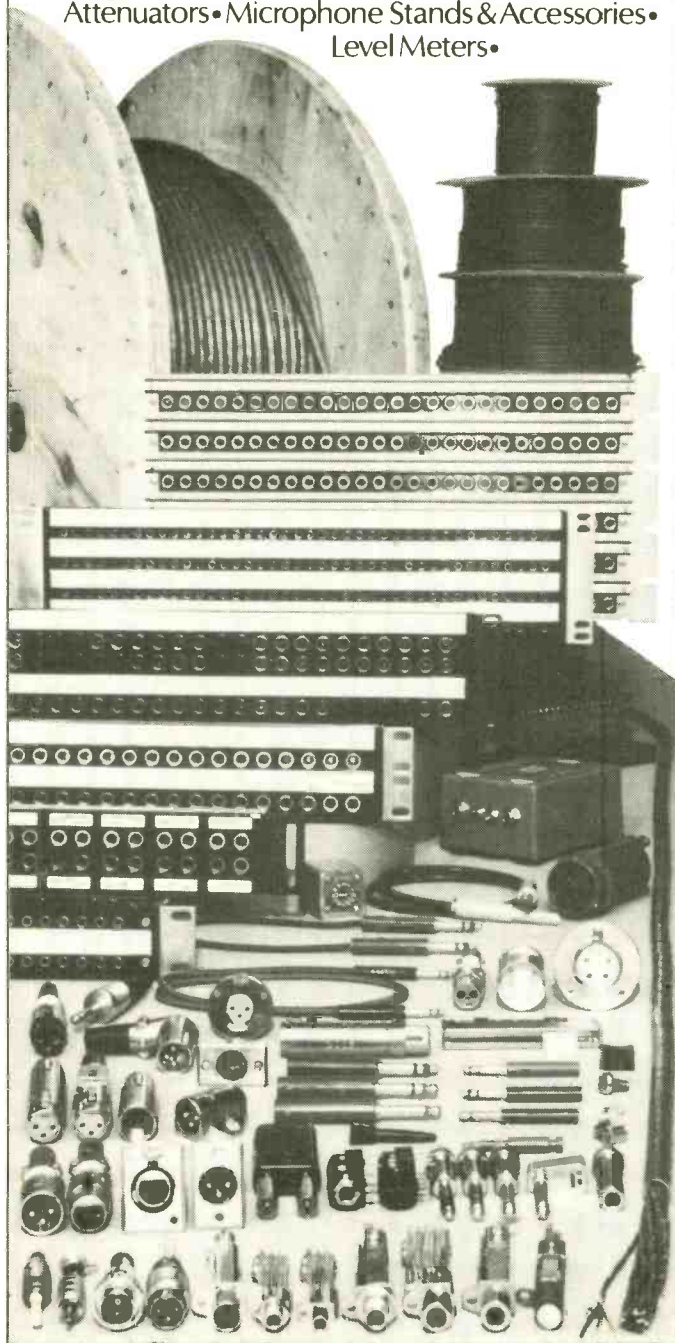
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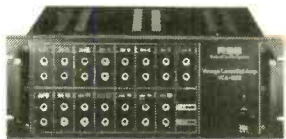
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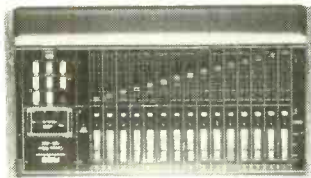
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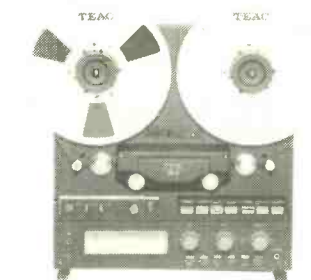
This self contained unit will control up to 15 channels of audio (inputs, outputs or auxiliaries), and stores all the working level information internally or dumps to tape. You can update, override manually and lock up to any tape machine using the internal SMPTE generator/decoder. Many advanced features make sophisticated automation possible for any studio. On demo now or send for details.



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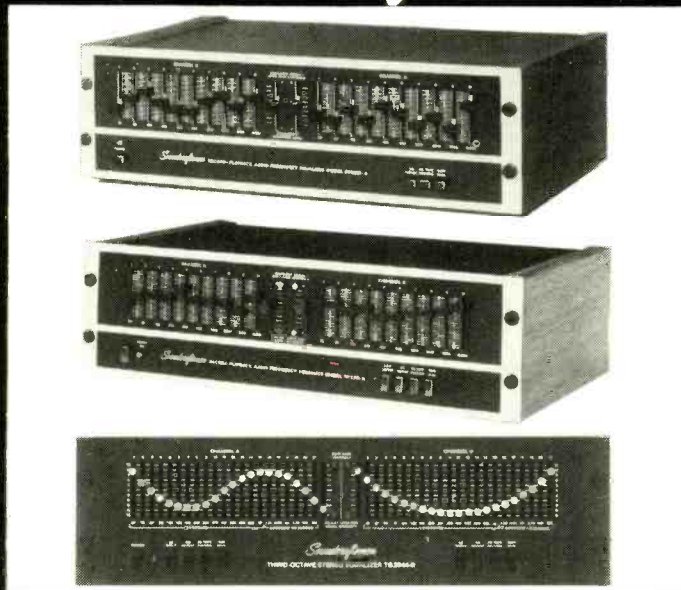
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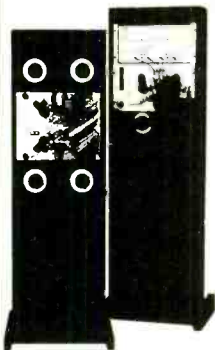
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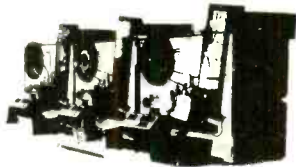
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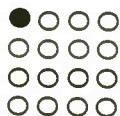
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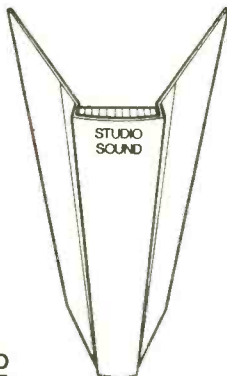
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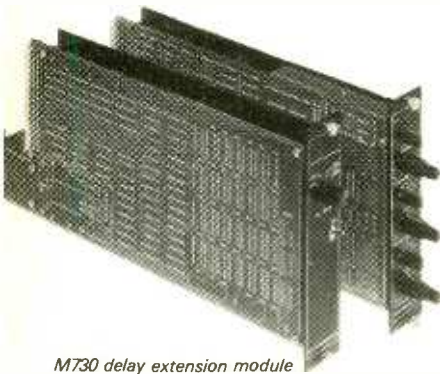
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M730 delay extension module and M750 effects module for the TDU 7000

AKG new products

AKG has added a 48V phantom powering version of its established C414EB mic to its wide range of microphones. This version which is termed the C414EB-P48 is a large diaphragm condenser mic with four polar patterns (cardioid, hypercardioid, omni-directional, and bi-directional) selectable on the mic, with the facility for pre-attenuation and bass attenuation to be chosen. The capsule is housed in all metal housing to exclude interference when used near transmitters, and is finished in black chromium plate to prevent light reflection.

To complement its existing range of reverb units, AKG has introduced a modified version of the BX20, the BX22 which is intended for use on popular music recording. The BX22 utilises the AKG torsional transmission line principle; has a single input and two non-coherent outputs;

and offers a continuously adjustable reverb decay time of between 2 and 4.5s. A feature of the unit is the provision of a built-in limiter to avoid overloading the reverb section.

To extend the facilities of its TDU7000 digital time delay unit, AKG has developed two new modules, the M730 delay extension module and M750 effects module. The M730 comprises 28 16k RAMs complete with addressing logic. The front panel features an on/off switch, plus a rotary switch to select either 200, 400, 600, or 800ms of additional delay time which is added to the time adjusted on the following output modules. Up to 13 M730 modules may be inserted in the TDU7000. The M750 effects module provides for time base modulation of the TDU7000's master clock and in addition to the usual VCO facility provides the following further features. Two independent function generators which are individually adjustable; $\pm 15\%$ continuous adjustment of nominal delay time value; 11 LED read out of modulation frequency and depth; sum, am, fm (SWP) and two EXT-mode functions; and a remote control facility.

AKG GmbH, Brunhildengasse 1, A-1150 Vienna, Austria. Phone: 0222 92.16.47.

UK: AKG Acoustics Ltd, 191 The Vale, London W3 7QS. Phone: 01-749 2042.

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

ILR stations

Applications are being invited by the IBA for the contract to operate an ILR service for the Wrexham and Deeside area. The predicted listeners in the VHF coverage area is 280,000 with a predicted 430,000 medium wave listeners.

The contract for the Ayr area is likely to be offered to Radio Ayrshire Ltd, which is chaired by Mr R D Hunter MBE.

Deltron Price Mystery

Steve Graham Audio have informed us that there were some rather surprising errors in the prices quoted for their Deltron 'XLR-style' connectors. In fact, they aren't the most expensive connectors available. The correct one-off prices are:

Male-chassis plug	2033	£0.85
Female chassis socket	2023	£1.60
Male free plug	2013	£1.05
Female free socket	2003	£1.44

We apologise for giving the wrong impression (you could buy two of each for the prices we quoted!).



Neutrik cable tester

Neutrik has introduced a new cable tester, termed the K-Check. A self contained unit the same diameter as the company's XLR plugs and sockets, it has a test finger at one end and plugs into an XLR male plug on the cable under test at the other. Adaptors are available for connecting the tester to female XLR or 1/4in phono plugs. The tester is powered by a replaceable internal

1980 DEAF Dinner

This year's DEAF Awards and Dinner is to be held at the Royal Garden Hotel, Kensington on Saturday, December 20. As usual this annual charity event will feature a spectacular awards cabaret, together with a sumptuous dinner and a selection of incredible prizes. Tickets for DEAF are priced at £20, with advertising in the DEAF brochure available at a cost of either £100 for a full page or £60 for a half page (A4 size). Further information is available from Gillian Meeson, 6 Frognal Lane, London NW3. Phone: 01-431 1496.

Soundmaster Club mixer

M-jay Electronics has introduced the Soundmaster Club mixer designed for use in small broadcasting studios and high power discos.

Supplied in a main frame 19 x 12 1/4in (wh), five types of module are available to complete the unit: common output monitor and voice-over (to be fitted in all units); stereo magnetic cartridge input; stereo jingle and auxiliary input; and balanced and unbalanced mic input.

Features include full eq and gain controls on all inputs, balanced line outputs and mic inputs with switchable 48V phantom power. The voice-over can be adjusted having variable sensitivity, depth and release time and modifications can be made to stop unwanted sounds triggering the switch.

M-jay Electronics Ltd, 90 Kingsdale Gardens, Drighlington, Bradford BD11 1EZ. Phone: (0532) 852075.

Nady radio mics

Nady Systems has introduced a new look to its VHF hand-held radio mics with the introduction of Electro-Voice 1776 cardioid mic capsules permanently attached to the Nady VHF transmitter. Measuring only 10in with a 1 1/8in diameter, and weighing only 10oz the new mic is available in either a jet black epoxy finish or in brushed aluminium. A feature of the mics is that unlike other radio mics it has a built-in antenna and not an unsightly wire dangling from the mic housing. In addition to the Electro-Voice capsule, Shure SM58 or other popular mic heads can be fitted on request. Nady Systems, 1145 65th Street, Oakland, Cal 94608, USA. Phone: (415) 652-2411.

Terminal blocks for pcbs

H & T Components has introduced the KR range of single-row terminal blocks for flow soldering on to a printed circuit board.

The range is produced in three forms. For standard applications the KRE series offers two to 18 terminations, is end stackable and operates on 280V dc. The KRD series for high density interconnections, is constructed as a dual-row strip of eight terminals each and operates on 250V dc. Three to 18 staggered terminations are available on the KR series which offers higher power handling and operates on 380V dc.

Each block consists of a grey flame-retardant plastic body with culmo tinned brass terminals which incorporate a socket with integral captive screws and solder-tag pcb terminals. All pc terminations are arranged in the standard 5mm grid format.

H & T Components, Crowdy's Hill Estate, Kembrey Street, Swindon, Wilts, SN2 6BN. Phone: 0793 693681-7. Telex: 444166.

Sifam push-on knobs

Sifam has extended its range of push-on control knobs which are based on its precision collet-fixing knobs.

Two new sizes, 11mm and 29mm diameter, have been introduced and there is a new 2-wing 15mm variety. Available in body colours of black, red or grey, the range now includes 11mm, 15mm, 21mm and 29mm diameters with optional extras such as indicating lines and plug-in caps in alternative colours with spot or line markings. Standard fitting is for "D" shaped shafts but fittings for shafts with two parallel flats can be specially supplied as can other shaft diameters.

Sifam Ltd, Woodland Road, Torquay, Devon TQ2 7AY. Phone: 0803 63822. 32 ►

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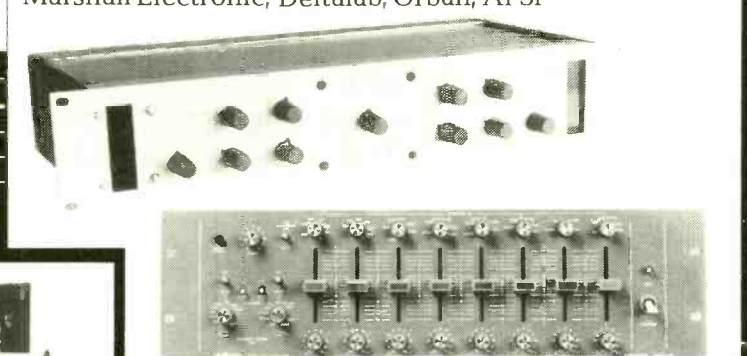


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Obituary

Jacques Levy, chairman of the APRS, died on Friday October 17th aged 68. Jacques will be missed and mourned by his many friends in the audio industry and the world of music.

Jacques Levy is reputed to have stated "I was born with a gramophone needle in my mouth." His father had a bicycle shop in Aldgate, London, where, as was the fashion in those days, gramophones and records were sold and his earliest memories were of the shop and all the paraphernalia of the gramophone sale and repair business. Even at an early age his flair as an entrepreneur involved him in organising gramophone recitals held in a local hall (a sort of early disc jockey) which boosted the shop's sales.

Prior to the outbreak of war in 1939 his brother Morris (with whom he had co-operated) created Oriole Records at 104 Bond Street, London. During the war Jacques Levy served with the Armed Forces as the Army official—one and only—sound recording engineer. Sound from ENSA concerts was recorded live direct on to wax discs using alternatively one of two turntables. There were no retakes and no over-dubbing, and the art was to change machines at a suitable pause. Without any rehearsal this required a nice judgement. At that time, and on security advice, he bore the name 'Leigh' on his identity disc and some



Jacques Levy

of his business acquaintances still know him by that pseudonym.

On the cessation of the hostilities he and his brother created Levy's Sound Studios, at 104 Bond Street, and Oriole Record Co, which processed the copper and nickel work and pressed records, at a well laid out factory in the village of Aston Clinton near Aylesbury.

At a later date the business was sold to CBS and for several years Jacques worked for CBS as a divisional manager eventually leaving to take up the position of managing director of Command Studios.

For over 25 years Jacques was chairman of the Association of Professional Recording Studios. He was instrumental in guiding that

organisation from a small group of amateurs to a unique trade association of which there was until recently no similar organisation worldwide.

He was always interested in education within the industry and was the driving force behind the commissioning of John Borwick's *Sound Recording Practice* and the organisation of courses for studio engineers now held annually at the University of Surrey; as well as, more recently, weekend refresher courses in various aspects all of prime interest to the recording industry.

His interest in the manufacturing side of the recording of music led to the first APRS Exhibition and, at the time of his death, he was involved in the planning of the 14th Exhibition.

Jacques Levy was concerned to export British musical expertise and took the APRS to MIDEM, solely with the idea of encouraging overseas producers to use British studios. Nor did he neglect the manufacturing side of sound recording. He will be remembered for his active part in promoting joint ventures with the Board of Trade in Paris, Brussels and Hamburg.

Jacques Levy was a skilled musician. He played the violin in several orchestras and was always to be seen at the Edinburgh Festival.

Many in the various divisions of the musical and recording world will mourn the death of this enthusiastic and kindly gentleman.

Company takeover

Leonard Wadsworth & Co (Electronics) Ltd, the UK distributor of Belden cable has amalgamated with its sister company Alcris (Plastic Fasteners) Ltd. Alcris is a specialist supplier of a comprehensive range of cable sleeving and accessories including *Megamide*, *Rilgaine* and *Rilfilec* high speed cable sleeving; Lutze PVC cable trunking; and *Conduflex-L* flexible cable conduit. The combined companies will trade under the Wadsworth banner with three divisions handling electronic wire and cable, specialised electronic components, and wire and cable accessories. A full catalogue detailing the company's range of products is available on request. Leonard Wadsworth & Co (Electronics) Ltd, Unit F, Imber Court Trading Estate, Orchard Lane, East Molesey, Surrey KT8 0DA, UK. Phone: 01-398 4288.

Q-Lock to be sold direct

Audio Kinetics (UK) Ltd has terminated its marketing contract with 3M UK Ltd for its 210 and 310 synchronisers. In line with the decision to market its own products, the company has appointed Charlie Day to handle UK sales and from October all UK sales enquiries should be directed to him.

Audio Kinetics (UK) Ltd, Kinetic House, Verulam Road, St Albans AL3 4DH, UK. Phone: 0727 32191. Telex: 299951.

Forthcoming Exhibitions

January 8 to 11
CES (Winter), Las Vegas ((312) 861-1040).

January 23 to 29
Midem 1981, Cannes (Paris (1) 505.14.03).

March 17 to 20
AES 68th Convention, Hamburg ((212) 661-2355).

April 12 to 15
NAB Convention, Las Vegas (Washington (202) 293-3500).

Early May
AES 69th Convention, Los Angeles ((212) 661-2355).

May 30 to June 4
Montreux 12th Exhibition (Montreux 021 61.33.84).

Early June
CES Chicago ((312) 861-1040).

Mid-June
APRS, London (09237 72907).

June 29 to July 3
Film 81, London (01-242 8400).

November 25 to 27
Prosound '81, London (01-340 3291).

November 25 to 28
Tonmeistertagung Convention and Exhibition, Munich (Berlin 030 308 2234).

People

● Orban Associates Inc has appointed Sid Goldstein as marketing and sales manager for professional audio products. Sid was formerly with Parasound Inc.

● Linda Feldman has been appointed to handle marketing for the Filmways Audio Group.

● Klark-Teknik Research has made the following changes to its marketing operation. David Leake takes charge of export sales, Mike Woodward becomes technical sales adviser and Stuart McMillan, previously with Audio and Design Recording, has taken over UK sales.

● Ken Barratt, technical director of Sony Broadcast Ltd has been appointed to the company's board.

Contract

● Elliott Bros has recently completed the installation of equipment at Exeter for Devonair Radio. This is part of an Alice Stancoil turnkey package for the first UK twinned radio station.

● Chilton has received an order for 16 12/4 broadcasting consoles from Radio Nacional De Angola. The consoles are standard QM3-12/4

mixers fitted with cue-speakers. Options fitted include channel bargraph and the new C30 comp/limiter. The value of the order is approximately £100,000 which includes spares and 16 transmitter input and monitor panels which contain a C30 limiter and a 60W amplifier.

● The Montreux Casino in Switzerland, annual venue of the famous International Jazz Festival, has purchased a large PA and stage monitoring system from Electro-Voice. The system includes some 70 loudspeakers and speaker systems, E-V and White equalisers, BGW and Tapco amplifiers, Yamaha and Tapco mixers, and E-V electronic crossover/equaliser and a Klark-Teknik DDL.

Financial

● The Boards of Philips Industries and Superscope Inc have recently signed an agreement whereby Superscope has sold to Philips the majority of its foreign assets, comprising: the ownership of the Marantz trademarks worldwide with the exclusion of Canada and the USA; 100% of Marantz Europe and its subsidiary

companies; 80% of the manufacturing facility of Superscope Taiwan; 43% of Marantz Japan Inc (to be expanded to 50% at a later time); 100% of Marantz Australia; and the selling rights for Marantz products in South America. The Marantz operation will retain its separate identity under the acquisition.

● Ampex has signed an agreement with Signal Companies Inc for the acquisition of Ampex by Signal through an exchange of common stock. While the merger is subject to approval, it is likely that the merger will become operative during January 1981.

Agency

● Don Larking Audio Sales are now acting as worldwide agents for the Webber range of audio test tapes.

Address

● Tandberg Ltd has moved to Unit 1, Revie Road Industrial Estate, Elland Road, Leeds LS 11 8JG, West Yorkshire. Phone: 0532 774844. Telex: 557611. ■

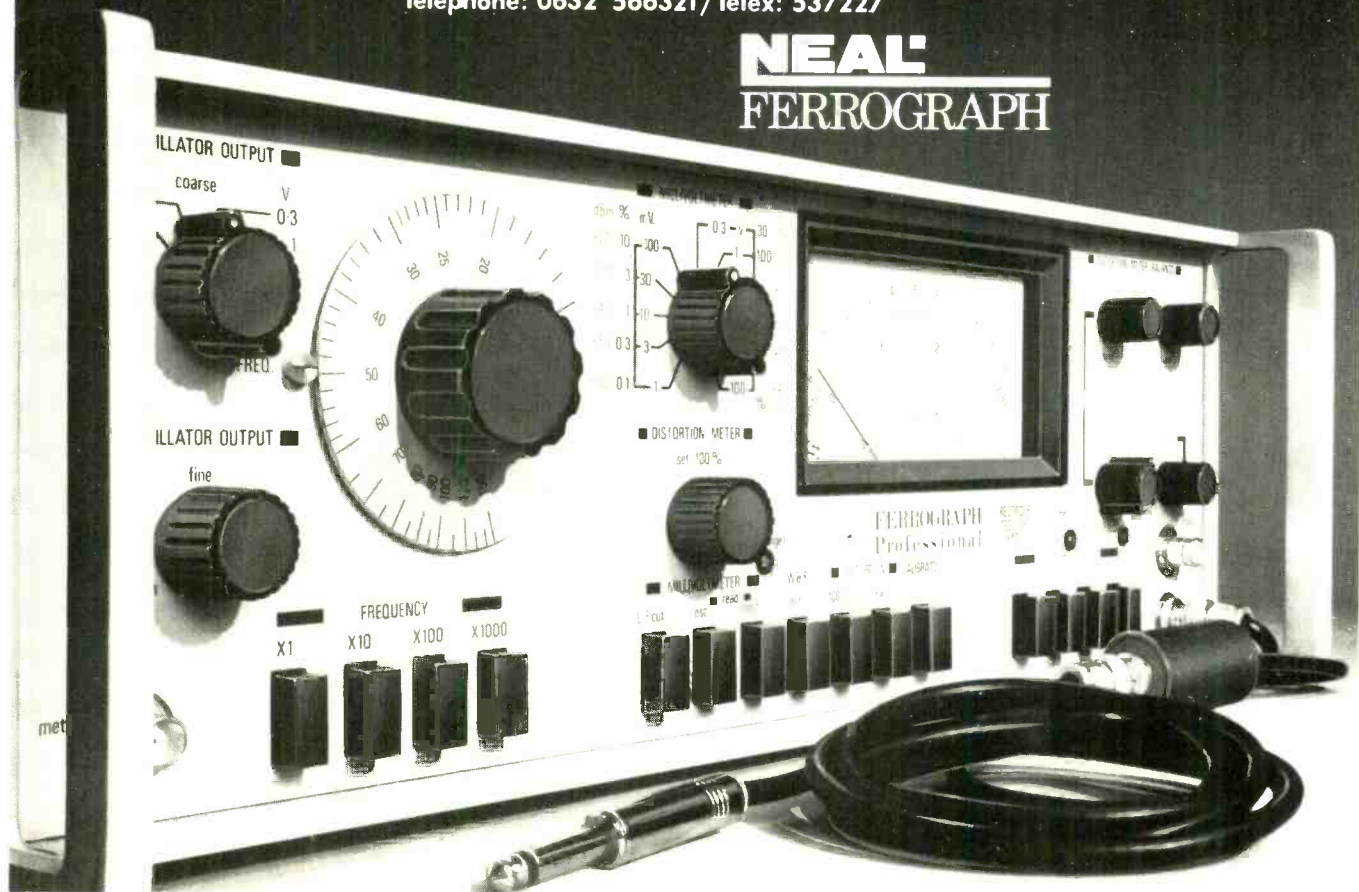
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NEAL
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studio diary

New BBC Dubbing Theatre

The BBC has completed a new multi-role film and videotape dubbing theatre at its Lime Grove television studios. The new theatre will be used mainly for sport and current affairs programmes, and it has been designed to be as flexible as possible enabling it to be used for drama, documentaries and sports programmes.

The new theatre is based on an empty former studio, with a floor space of 3,300sq ft. The focal point is the mixing desk in the main dubbing mixer room, around which are two commentary studios, an effects area, an apparatus room, a monitoring room and a projection room. These are laid out so as to give the operator in charge, the dubbing mixer, eye contact with both studios, the effects area and the apparatus room, as well as having the large projection screen in front of him.

The mixing desk is a Neve 20-channel, 6-group desk which includes several special features. The main section has 10 channel modules and faders on each side of a central script rack. Each channel is only 1½in wide so that the operator can span five faders in each hand. Above each fader is a response selection



The dubbing mixer (left) has a good view of the main projection screen and the two commentary studios, while his assistant drives the 'mini-mixer' effects console.

amplifier unit (RSA) and a switching module. Each of the fader units has access to a Klark-Teknik graphic equaliser, noise gates and a telephone effects unit. The centre area contains two stereo auto faders, time/footage counter controls and 'lo-fi' monitoring.

A separate effects 'mini-mixer' console in the main mixer room, has disc reproducers, two cartridge recorders and two Studer tape recorders routed to it. Each of the Studer tape recorders has its own

BBC-designed synchroniser which is controlled by a microprocessor. Using it, the addresses of 99 effects can be put on to each tape; they can be automatically located then cued manually when needed by the dubbing mixer. Reviews of entries in either the master or slave store are possible without disturbing what is going on at the time.

A BBC modification to the disc reproducers, which use quick-start Technics *SP10 Mk II* turntables, provides variable speed operation

from 20 to 80 rpm, with instant change. It does this whilst maintaining full broadcast quality.

In the apparatus room, there are nine 16mm Perfectone Rapimag Sepmag transporters. The machines, fitted with EBU twin-track heads, are arranged as two 1600m capacity simplex main recorders and six 1000m capacity duplex replay transporters. Two of the replay machines can also be used for recording when required. The sixth machine is normally used for commentary recording or for quadruplex VT transfer but can be used as a seventh replay transport.

With the increasing use of video tape on location, being able to dub on to video tape is a useful facility in the new theatre. In the BBC system the programme material is transferred, together with a continuous time code, from a quadruplex VT machine to a *U-matic*. A BBC-designed interface unit allows the same varispeed control as with film and also translates instructions to the *U-matic* into a language it understands. After the dub is complete the programme is transferred back to quadruplex tape.

Although the new theatre works mainly on 16mm film, it can be used for 35mm dubbing by transferring the 35mm sound on to 16mm Sepmag and its picture on to a *U-matic*.

Walt Disney Studios, California

Although Walt Disney is the home of Disneyland Records, most of the actual recording is done in Nashville where the rates are cheaper than in Los Angeles. The recording facilities at Disney are almost too expensive to tie up for disc recording, but the increasing demand for better soundtrack quality by the industry and the public is resulting in the installation at film studios of equipment more usually associated with the recording industry. Walt Disney for instance, recently installed a Harrison film re-recording console to finish the sound track of the science fiction movie *Black Hole*. The Harrison typifies the growing closeness between the technology of the different arms of the entertainment industry.

Herb Taylor gave me a lightning tour, walking down 'Goofy Avenue' in the incredible heat of the valley we came to Stage B which is used for dialogue and narrative work. 'Looping Technique' is used here, because they do not do enough work to justify ADR, and there is a small recording console. The scoring stage itself is huge with room for up to 60 pieces under its 40 ft high ceiling. The control room begins to look familiar

with its two 16-track machines locked together using SMPTE and providing 30-channel facilities. There is a Quad 8-track that was being busily used for recording the *Black Hole* soundtrack, and there is an 8-track RCA that can run in conjunction with it. Also looking familiar were such units as Eventide digital delay unit, ARP keyboard synthesiser, Orban compressor, etc.

This and the other Disney stages are all tied into the central machine room with its 20 RCA FRTO's, 3 projectors and Dolby equipment. The central patch bay allows patching through to any of the studios and down to the main console, the Harrison in the large theatre auditorium. The large Harrison console is set up with four operator positions. Each operator covers 12 of the 48 inputs and two of the outputs. "It's got automated mixdown, four compressor/limiters, *Auto Graph* graphic equalisation, practically anything you might have in a studio recording console. This was Harrison's first such console, and it has been set-up so that we can add to it later, for instance motion and lighting controls. Delivery time was the deciding factor for us in choosing the Harrison. We had to

finish the *Black Hole* in time, the console was well up to it, and they could deliver and install on time. We already had the music, dialogue and sound effects recorded. The Harrison was for final re-recording for theatre release," says Herb Taylor.

The biggest difference for the staff at Walt Disney working with the Harrison console is the degree of automation, "The levels and the equalisers are all automated. You simply draw a graph of the curve you want and set it on the *Auto Graph*, it's as easy as that. And you can patch in one of the four operator bays for compressors or equalisers without having to bother the other operators. Also the faders can be operated in groups and we can use one master to control the groups."

Dan Guinne of Electro Media Systems who had installed the console and Dave Purple of Harrison gave me some additional details, "We are marketing this type of console for post-production work on films and TV, etc, but with the addition of microphone pre-amps it would make a great recording console. One of the unique features of the console is the microprocessor on every input, over 70 in total."

The microprocessor in question is an Intel *80/85* with memory, input/output, and CPU all on-chip. "The straight-through pin-wiring makes for a great-looking console. There are some programmes with the *80/85* in fact that the manufacturers didn't know were there. And putting the microprocessor in the input module opens up a world of possibilities for integrating functions in a mixing console that just haven't been possible up till now. This particular console has so many features, with ideas from many people contributing to the final design."

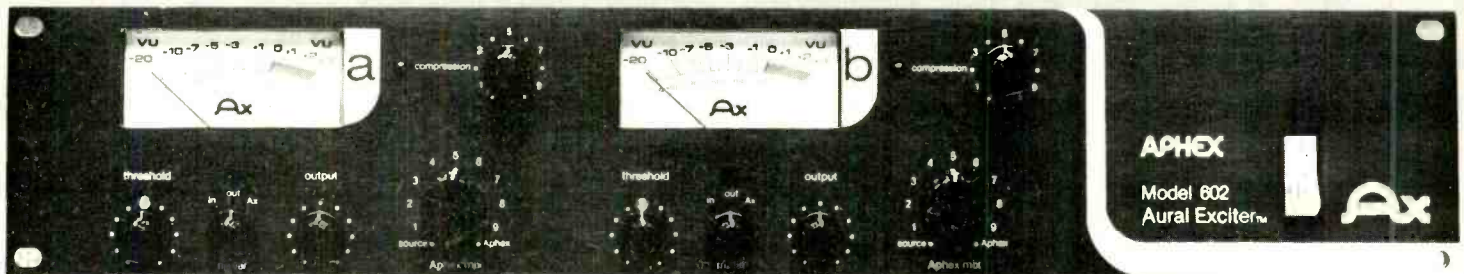
The console was not built specially for Disney, being a stock model. On this console the fader level and group select are automatic, with four-band computerised parametric equalising. Each section switches completely in and out—just the switching not the setting—and there are two AB insert keys for patching in, as well as signal processing devices that can be hinged-in any time. A solo function mutes all other channels except solo.

"The panning section is designed specifically for film work with left, centre and right channels with a divergence control. Bleed-over is

36 ▶

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Walt Disney Studios cont'd

controlled between each channel and is completely adjustable from no bleed to total crossover between loudspeakers. A panning section is available at the press of two-buttons, and it is stereo with Dolby which means it could be used for record mixing."

There are four echo sends with separate level controls on each input section, two selectable line inputs, automation control, phase reverse (also automated) and an input attenuator which allows gain variation in 10dB steps, again this feature is automated. "This means that in a typical film if you want a signal to be in the background, rather than pulling the fader way down, you can use the automated gain facility."

The storage medium for these automated functions is magnetic disk; twin flexibles, double sided, double density, but it is also possible to have an 11M byte hard disk system, all mutually compatible.

Plans for the introduction of a studio version of this disk were "nearly finalised" according to Dave Purple at the time I spoke to him, but no date had been fixed. "A lot depends on the changes that take place in the near future. Someone might come up with a 22M byte storage disk for the same price as the 11M byte disk. Digital technology applications are in such a state of flux in the recording industry. This desk is digitally controlled, but signal inputs or pathways are analogue. A totally digital console will probably come along once things settle down a bit in terms of differing systems."

"Film work, dubbing and so on is another world from audio disc recording. For instance you have sound sources that come from heaven knows where, a production track that is 10dB too low, background noise, etc, and when all is said and done, the soundtrack has to be supportive and not dominant. The picture is the thing and you have to be able to work very quickly. There is a tremendous amount of signal processing technology needed in order to precisely notate the position where replacement dialogue is to be dubbed on the soundtrack. And when those bits are inserted they have to sound the same, so all the levels virtually have to be automated. All those levels, eq's, etc are stored in the data storage section. In the dubbing studio, they also have to get that Academy sound, and conform with their spec's. They run the picture at the Motion Picture Academy. If it sounds good there then it is O.K."

Bill Third
Walt Disney Studios, 500 Sth Buena Vista Blvd, Burbank, Cal 91521, USA. Phone: (213) 845-3141.



Il Mulino's control room (above) and isolation/live room



Il Mulino, Milan

Some studios dream of moving out into the country and away from the bustle and hassle of city life. However, in the case of Il Mulino (The Mill), the opposite is the case. Formerly situated—as the name would suggest—in the Lombardy countryside in an old mill, the studio was flooded out after heavy rains and the decision was made to move into Milan. The present studio is situated on the first floor of a purpose built industrial building in the suburbs of Milan, thus combining ease of access with being near the city centre. The studio has been open for just over two years and was the first Eastlake designed premises in Milan. At the moment one studio is in operation but as the whole floor is at the studio's disposition, plans are afoot to build a second studio of similar size which will again be by Eastlake. At present the recording done is strictly for the home market and interest appears to be gaining among the local rock musicians. Artists who have been in include Berté, Retore, Jannacci and a new group composed of session musicians called Cast.

Access to the studio is by stairs or lift—there is also an industrial lift for the load-in of equipment—and into the large reception area which shows at once that they have room to play

with. The studio itself is in a basic 'L' shape, with the control room forming the corner. The building is not a studio ideal as there are too many structure borne vibrations from the machine shop below, so in order to get sufficient isolation the floating floors consist, amongst other things, of 20in of concrete which accounts for the step up into the studio! The entrance is situated in the live part of the studio which retains a functional looking décor with brick walls and heavy movable drapes. The room can be made either very live or fairly matt and is often used for string sections, brass, etc, or for the times when a livelier feel to the acoustic is required. If maximum brightness is wanted the carpet can also be rolled back to expose the parquet. The second part of the studio—the other leg of the L—is mainly intended for rhythm work and has the drum cage, piano trap and more absorbent acoustics. The two studio areas are interconnecting and can either be open to each other or divided by sliding doors. Microphones are mainly Neumann with a good selection of U87 and U47, KM 84/5/6, as well as some Sennheiser MKE2401 and MD21N with dynamic mics being provided by AKG in the form of D12s, D2000Cs

and D224Es. Headphones for fold-back are all AKG and powered up by Quad amplifiers. There is also a goodly selection of instruments on disposal including grand piano, Fender/Rhodes piano with Fender amplification, keyboards of various shapes, sizes and functions by Eminent, Solina, Hohner, Moog and ARP, Ampeg amplifiers and Slingerland drum kit.

Forming the corner of the L, the control room has access to both studio areas via sliding glass doors, the live area door being on the left side of the control room with the main studio having access between the monitors, meaning quite a lot of glass on the two sides giving good all round vision. The room itself can best be described as compact and whereas working conditions are not at all cramped, it wouldn't do to have too many bodies in there at any time! Work concentrates around a Harrison 3232 console with Autosec automation and a Studer A800 24-track. Other machines include an A80 4-track with interchangeable stereo heads and an A80 stereo with varispeed. Monitoring is Eastlake TM3s and on the day of my visit the amplifiers had literally just been changed to Studer A68 power amps. Just by way of a change, 'domestic' monitoring is by a pair of Visonic speakers! Outboard equipment includes Eventide Harmonizer and Instant Flanger, Orange County stereo compressor/limiter and Sreissor, Audio & Design Vocal Stresser and Gemini compact compressor with further gain reduction from UREI 1176 and LA3A units and Kepexes and Gain Brains. Additional eq is available from two UREI 1/2-octave graphics, UREI 565 filter set and ITI 3-band parametric equalisers. Reverberation and echo effects have recently been expanded to include a Lexicon 224 and EMT Gold Foil which join forces with an AKG BX20, Delta T102 ddl, Roland 201 Space Echo and Orban spring reverb. Noise reduction is provided by 28 channels of Dolby. Judging from the session in progress Il Mulino go for a modern punchy sound with a fairly 'no nonsense' approach and while the overall atmosphere is very pleasant, the rather functional style of décor that has been chosen lends a businesslike atmosphere to things, which is not a bad thing to have.

Things were starting to get busy so it was time for me to make a move. Chief engineer Piero Bravin had not been available so my host had been assistant engineer Mauro Cauchi, who also found a good opportunity to practise his English! Terry Nelson Il Mulino Recording Studios, Via San Giovanni Battista de la Salle, 4A, I-20132 Milan, Italy. Phone: (2) 259 16.53.

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The MXR Dual-Fifteen Band and Thirty-One Band equalizers are cost effective electronic signal processors designed to meet the most exacting equalization requirements in a wide range of professional applications.

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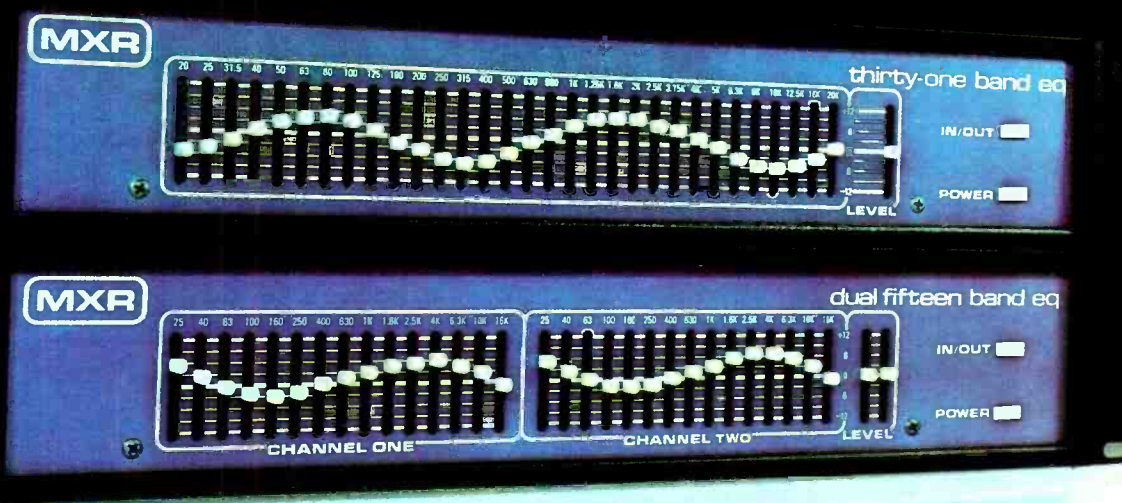
The spacing of frequency bands on ISO centers (2/3 octave in the Dual-Fifteen Band; 1/3 octave in the Thirty-One Band) and a flexible system of controls offer superior accuracy in frequency equalization. Each band can be boosted or cut over a range of ± 12 dB. Clear, readable markings alongside each level control allow

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Inquiry into hyping

It's almost as if the record companies were employing squads of PR men to *degrade* their image. As a disc jockey on the ILR Thames Valley station Radio 210 put it recently, "How on earth can you have sympathy for an industry which cries crisis but continues to over-release pop singles? So much material is released and so much of it is garbage, that radio stations and disc jockeys haven't a hope of listening to every new release." This followed a *Record Mirror* survey which found that, crisis or no crisis, the companies were, and still are, releasing as many as a hundred new singles a week!

This is of course what creates the need for payola and hyping the charts. Despite all the denials an uncomfortably large number of people in the business maintain that some companies are consistently hyping. Once in a while there's a brief scandal when Fleet Street or TV exposes as much of the practice as the laws of libel permit. A few record industry spokesmen then speak and promise investigations, but the matter is never heard of again. As the manager of one of Britain's largest record shops put it to me: "It's like an inquiry into crime conducted by a committee of criminals." The matter has never yet been fully aired in public because those with hard evidence of hyping have the most to lose by standing up to be counted.

Recently the situation has changed. The record companies have been sacking so many people that by the law of averages they have been bound to sack a few people with hard facts on hyping who have nothing to lose by exposing them. This is what triggered the most recent hyping exposé, by the Granada *World in Action* TV team, who got closer than usual to the nitty gritty. *WIA* got so close, in fact, and created so much public interest, that the British Phonographic Industry has now been forced to commit itself to holding an inquiry. More to the point the BPI has committed itself to making the results public.

The inquiry is being held by the BPI Code of Conduct Committee which has the 'power to recommend suspension or expulsion from the BPI'. The committee consists of four people, John Deacon, director general of the BPI, the publisher of *Music Week* magazine, a representative from the Gramophone Record Retailers Committee and a representative of the British Market Research Bureau. All these people have been closely involved with the British record industry for many years and I am not aware that any of them have previously done much to expose the evils of hyping to the great British public.

This prompts an obvious question. Have they not noticed any hyping or have they noticed it but not said anything? Why on earth haven't the BPI invited some impartial outsider on to the committee? This would have added credibility to any 'no grounds for concern' finding.

As promised, the BPI has press released the findings of its Committee of Inquiry on hyping. I can't think why they bothered. Contrary to what anyone reading the BPI release might deduce, it's not an interim report. The five

pages of soft gloss are all the public is going to get.

Although it is confirmed that "there has been widespread infringement of the Code of Conduct" (ie the BPI has had to admit publicly what's been known in the trade for ages) the BPI has decided not to publish the full committee reports. So all we get is the admission that "it was not just WEA that infringed the spirit of the Code of Conduct".

We don't learn who else has been conning the trade and public and perhaps more important, we don't learn who hasn't been conning us. So those companies that have been playing fair don't get any credit for their honesty. What's more, according to the BPI it was "difficult to recommend that any one company should be expelled from the BPI". The implication is inescapable, so many BPI member companies have been hyping the charts that if the BPI were to expel all transgressors there wouldn't be a BPI any more.

This prompts the question; what use is the BPI? Its Code of Conduct has clearly been flagrantly abused. Was it because no-one noticed or no-one cared? Either way it engenders no confidence whatsoever in the BPI as a worthwhile trade body.

Realistically, no committee is likely to find out and publish the real truth about hyping. It's just too easy for hypers to cover their tracks by confused books, muddled returns and so on.

Frankly, no one is usually daft enough to let documentary evidence of their transgressions accumulate in the company books or files.

In Britain, the public will probably never learn the real truth about hyping unless or until an industry boss (perhaps with hopes for a knighthood) is dragged into court and forced to spill the beans under oath in a skin-saving bid.

Easy on the ears

Anyone in the recording business with a long haul flight to endure and a healthy expense account to pay for it, should try to book in as a Royal class (first class) passenger on a KLM Jumbo 747, or if they can wait until after April 1, 1981, they can go Royal class on a KLM DC10.

Why this free publicity for KLM, the Royal Dutch airline? Well, KLM has modified the inflight entertainment system for Royal class passengers on Jumbos and is working next on its DC10s. Instead of those awful, uncomfortable, lo-fi acoustic stethoscopes which long haul passengers must normally wear to hear inflight audio or film soundtracks, KLM is offering all-electronic listening with Sony *MDR-3* headphones. These headphones, which cost £15 a pair in the UK, were originally developed for use with the Sony portable stereo cassette player which is selling like hot cakes around the world under names like Stowaway, Soundabout and Walkman. Although these headphones are ridiculously light (just 40gm) they produce remarkably good sound quality thanks to high flux density samarium cobalt magnets. The bass end is a bit thin but this doesn't really matter with a portable player or on an aircraft where the

sound source is usually either a continuous loop of tape or film soundtrack. There is an upgraded version, the *MDR-5*, which looks similar but has better bass and costs twice the price.) This range of headphones is best described as a mini-Japanese version of the tried and trusted Sennheiser open ear range.

It's an odds on certainty that once KLM have given their first class long haul passengers the taste of comfortable hi-fi listening, other airlines will be forced to dump their lo-fi stethoscopes into the nearest ocean. British Airways, say they are "thinking about headphones". Perhaps eventually they'll be made available for everyone, even including third class passengers such as journalists.

There's only one technical problem still unsolved; how to stop people pinching such an attractive little toy as a pair of Sony *MDR-3s*. In theory people who can afford to travel first class shouldn't need to thieve but, human nature being what it is, you can bet your life they will. KLM have deliberately fitted their headphones with non-standard two prong plugs which mate with special sockets found only in KLM seat rests but it's unlikely that subtleties like this will deter dedicated kleptomaniacs. "That's how they got rich enough to travel first class in the first place," mused a KLM cynic.

Rock deafness

Gradually the pieces of a depressing jigsaw fit together by chance meetings. Every day it becomes clearer that there really will soon be a generation of deaf ex-rock musicians and engineers. The difficulty is that no one in the music business likes to admit that they have a hearing problem because it immediately brands them as an artistic cripple. But once in a while the mask slips.

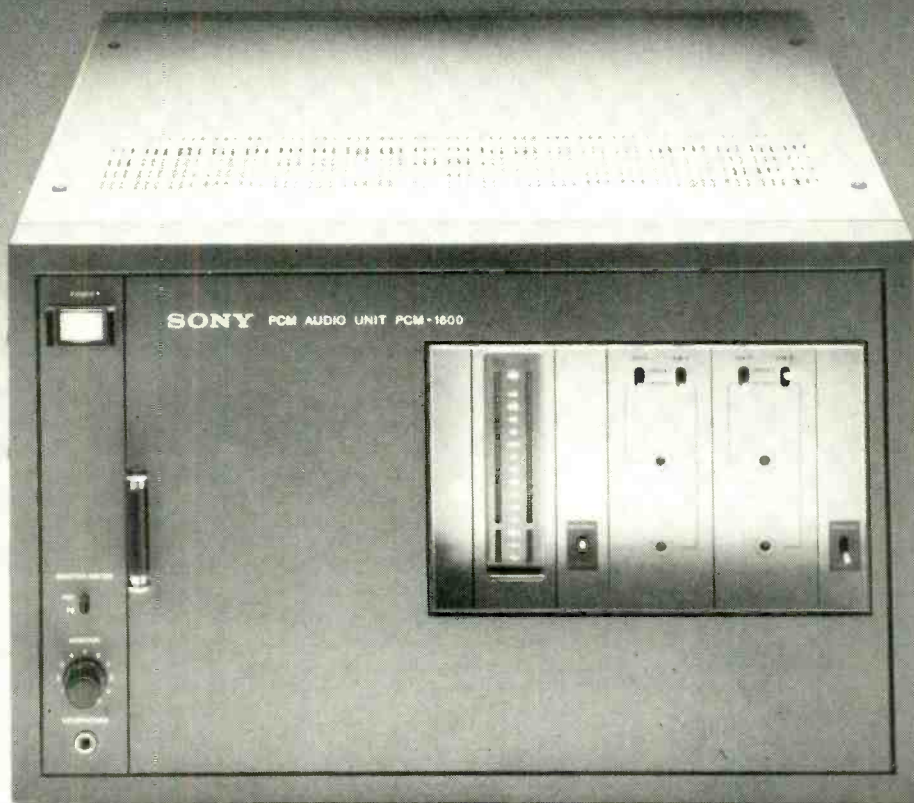
In November 1977 James Johnson in the London *Evening Standard* described Pete Townshend of the Who as "slightly deaf" and unwilling to embark on long tours because of "terrifying earaches". Johnson also quoted Townshend as saying, "I don't need any proof now that rock and roll makes you deaf because I've got the proof on these two flabby bits of skin attached to my head." I wrote a couple of letters to Townshend to check this report for accuracy but never heard back.

A year later the Who were split in California over whether or not to tour. Roger Daltrey wanted to; Townshend didn't and Daltrey was quoted as not understanding why. But recently, on the Thames TV *Telethon*, another piece of the jigsaw fell into place. Star guests took a turn answering telephone calls from viewers pledging money for charity. Roger Daltrey was asked to join in but had to decline because his hearing wasn't good enough.

What we need now is for someone with the respect and security of Townshend or Daltrey to 'come out' through the pages of *Studio Sound* and write or talk factually and honestly about the extent of whatever hearing loss they now suffer. It would be a generous gesture which could only benefit others coming up through the same business. ■

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Once you go through a recording session with the new ATR-124 24-channel recorder by Ampex, you'll want to go through another. Because with each new session you'll discover something new you can do. Things that you can only do with a recorder that's full of features of the future.

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Time on your hands.**

Which means you can use that time to give clients more of what they're paying for—your creative skills. With the ATR-124 microprocessor-based control system, you can pre-program what you want to do ahead of time so you won't waste studio time setting things up. When their time starts, you're ready to record by touching a single recall button.

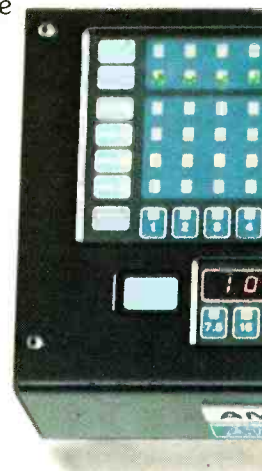
ATR-124 also lets you duplicate a technique you may have used earlier in the session without

having to rethink what you did. Just touch the memory button and it'll all come back to you. ATR-124 lets you rehearse what you've got in mind, without recording it, to make sure what you've got in mind is right. Tape can be manipulated faster which means you'll get the sound you want sooner. And the chance to try something "a little different." All because of the speed and accuracy that ATR-124 puts at your fingertips.

ATR-124 doesn't take away your creativity, it adds to it.

The less time spent setting up, correcting, and redoing, the more time spent creating. And when you add features that help you create to the ones that help you save time, you've got one very potent piece of audio machinery. Take the control panel for instance. It's like nothing you've ever seen. Pushpads linked to a microprocessor give you a new level of creative flexibility. Program a setup, then change it. Then change it back, all with a single fingertip.

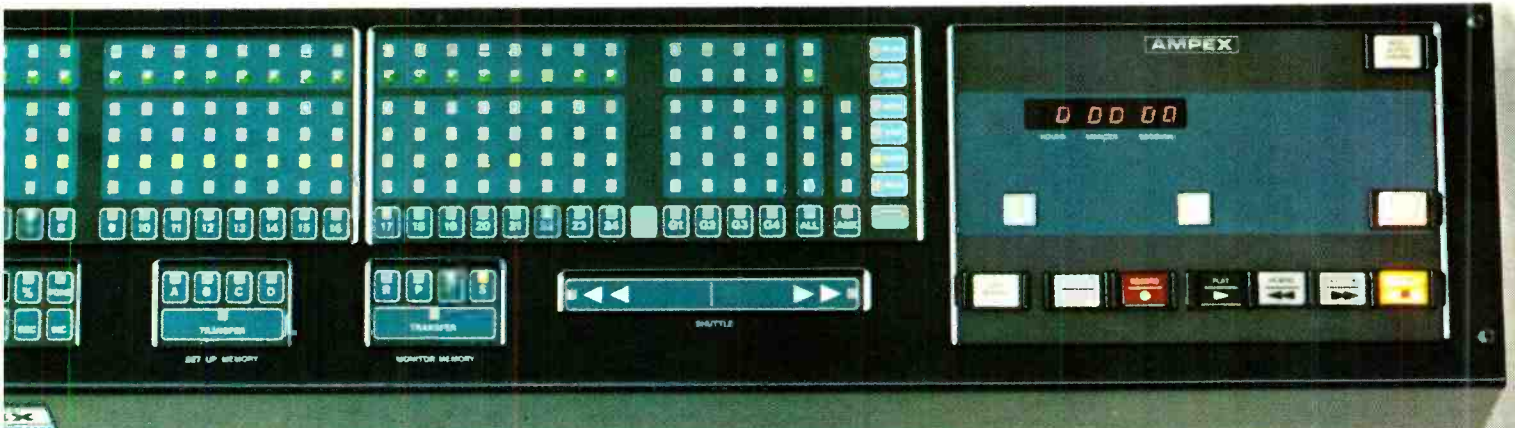
A repeatable, variable speed oscillator for pitch correction and special effects is built in. In addition



from the future: ATR-124.

to the standard output, there is an optional auxiliary output with each channel that enhances flexibility. So don't think that ATR-124 is going to

Memory, and Record Mode diagnostics. The point is this: If you like the ATR-100, you're going to love working with the ATR-124.



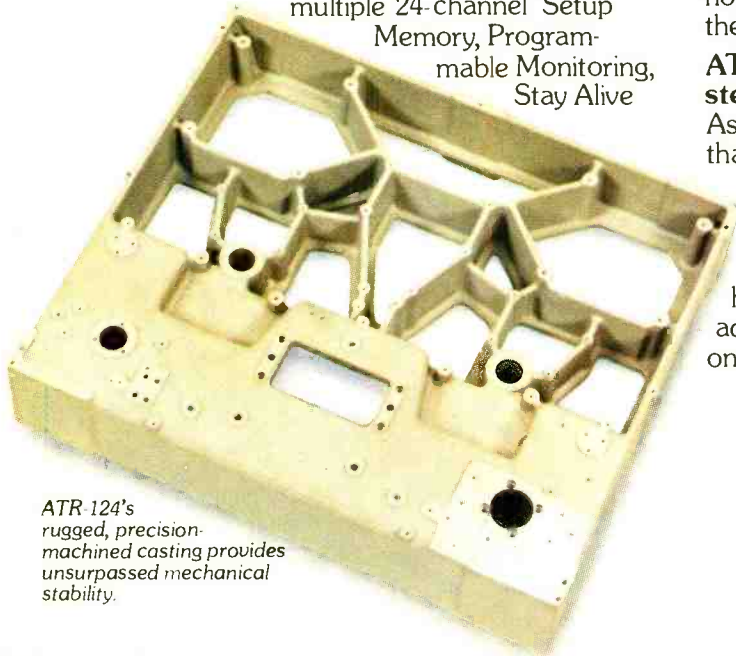
ATR-124's Control Panel. Speed and accuracy at your fingertips.

replace anything that you do. On the contrary, it's going to improve the skills you have, if not help you develop some new ones.

ATR-124 picks up where ATR-100 leaves off.

It's only natural that the people who brought you the ATR-100 should be the ones to bring you something better. ATR-124 offers you 24 channels instead of 4. You also get many new and exclusive features. The kind that have set Ampex apart from the crowd for the last 30 years. Features like balanced, transformerless inputs and outputs; a patented flux gate record head; 16" reel capability; input and output signal bus for setup alignment; membrane switch setup panel; fingertip-operated shuttle speed control; and microprocessor-based synthesized Varispeed -50% to +200% in .1% steps or in 1/4 tone steps. ATR-124 also features microprocessor-based control of Channel Grouping,

multiple 24-channel Setup Memory, Programmable Monitoring, Stay Alive



ATR-124's rugged, precision-machined casting provides unsurpassed mechanical stability.

ATR-124 options.

As impressive as the ATR-124 itself.

With the addition of a built-in Multi-Point Search-To-Cue (MPSTC), you can rehearse edits and control five tape-time actuated events and be compatible with SMPTE time code. Separately controlled auxiliary output amplifiers with each channel provide simultaneous monitoring of normal and sync playback as well as all other monitoring modes. A roll-around remote control unit can also be added to the ATR-124 which contains all control features normally found on the main unit.



ATR-124's Multi-Point Search-To-Cue (MPSTC). Provides 100 cue locations.

ATR-124. Your next step is to experience it firsthand.

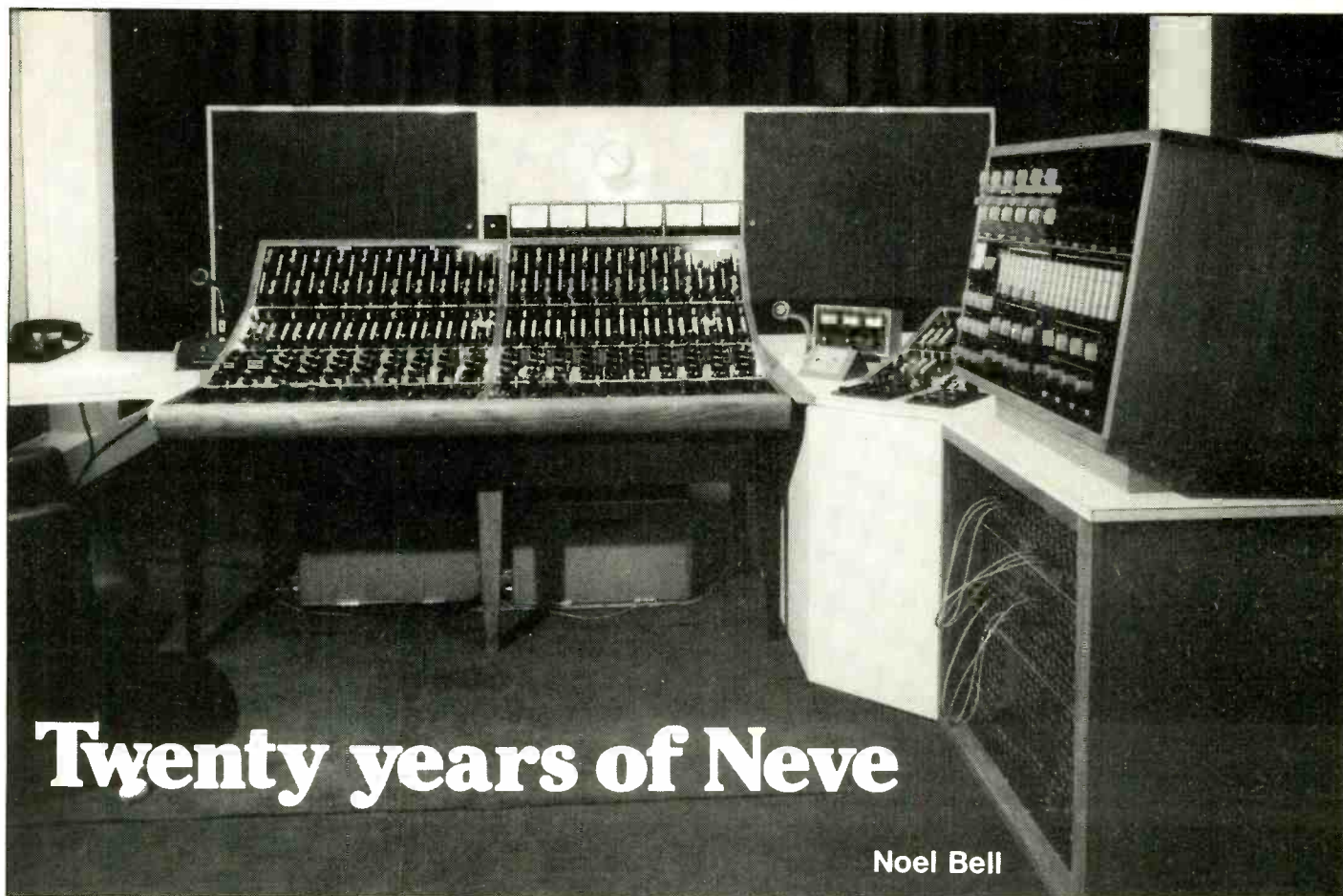
As you scan the points we've covered, remember that you're scanning just a small portion of ATR-124's story. We haven't even begun to discuss the accessibility of key components for easy servicing and minimal downtime, or the features we've built in to give you greatly improved tape handling. To find out more, write to us at the address shown below. We'll send you a brochure on ATR-124, our latest audio effort.

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Twenty years of Neve

Noel Bell

TWENTY years on from its inception as a company, the name Neve has become almost a byword for excellence in the field of the design and production of broadcast and recording consoles. From its early days right up to the present time the company has been at the forefront of the development of the professional recording industry, and as innovators and consolidators of techniques which we now accept as standard the company has many imitators but few equals.

When in 1961 Rupert Neve formed the company and commenced trading, few audio industry pundits could have foreseen the growth of the company to its present size. However, the pundits unlike Rupert Neve did not foresee the market need to provide a specialist engineering service for the then expanding broadcast and recording industry: a service which could advise on and develop sound mixing and control systems for recording studios, an aim and function which the company has steadfastly maintained throughout its history.

However, to return to the early days, the growth of the company was an evolutionary process. The first project undertaken was a single design study for a small London studio (the studio in question is now The Nova Suite). The success of this commission led to further contracts for the design and manufacture of

The New Year sees Neve enter its twentieth year of involvement in the audio industry. As such it seems a suitable time to look back at the company's achievements and development, and to take a closer look at a company which has become almost an institution in the growth of the broadcast and recording industry.

studio equipment for several other studios and as the number of contracts increased so did Rupert Neve's reputation for innovation and quality design and production. At this time production was carried out in Rupert Neve's garage, but this soon proved too small for the number of contracts secured and he had to find larger premises. Rather than move to a small manufacturing unit, he acquired a large house (a former rectory in Little Shelford near Cambridge) which was used as offices and for limited manufacturing. At this time the company received its first export order from Spain (influenced by Rupert Neve's command of the language and regular visits to that country), and this proved to be the first of many overseas orders, including some from Monte Carlo, the Far East and North America. By 1968/69 almost 50% of Neve consoles were exported with a turnover of approximately £360,000. The customer list at that time was impressive, even by today's standards, with over 50 leading organisations in 15 countries being owners of Neve equipment.

A measure of the growth of the company can be seen from the fact that sound mixing consoles of the day featured up to 48 inputs and 24 outputs with typical technical performance being: frequency response flat within 1dB from 20Hz to 20kHz; output noise better than -80dBm over the same range; and distortion at +20dBm being better than 0.075% at 1kHz.

The success and expansion of Neve's activities was based on offering an unstinting consultative service to customers, recognising the individual needs of the user whether in music recording, radio/TV broadcasting or the film industry. It was not surprising therefore that the majority of Neve products were custom designed—an important feature in Neve's business approach to this day.

By 1969 expansion of the company had reached the point where larger production and marketing facilities were required, and in that year Neve moved into a new factory with increased office accommodation in Melbourn near Royston, Hertfordshire which remains the company's

headquarters to this day. The following year Neve also opened a further factory based at Kelso in Scotland which produces electronic modules, these developments being in response to a rapid growth with turnover trebling each year from 1966 to 1969.

Both home and export markets continued to flourish, and in 1971 Neve made a substantial commitment to the North American market by setting up its own USA sales and service subsidiary, Rupert Neve Inc, with its headquarters in Bethel, Connecticut close to the New York State border. Further subsidiary offices were opened in Hollywood and Toronto, Canada as business expanded.

By 1970/71 Neve's experience of customer requirements had enabled a range of *standard* music recording and broadcast consoles to be evolved, these models stemming from the wealth of knowledge and experience gained from custom console design over the previous 10 years. The range of models made available comprised four consoles, these being: the *PSM8/2* transportable 8-input/2-output console; the *BCM2* 10-input/2-output console primarily designed for broadcast operation; the *S16/4 type 8014* 16-input channel/4-output/8-track monitor console; and the *S24/8 type 8016* 24-input channel/8-output/16-track monitor

1966

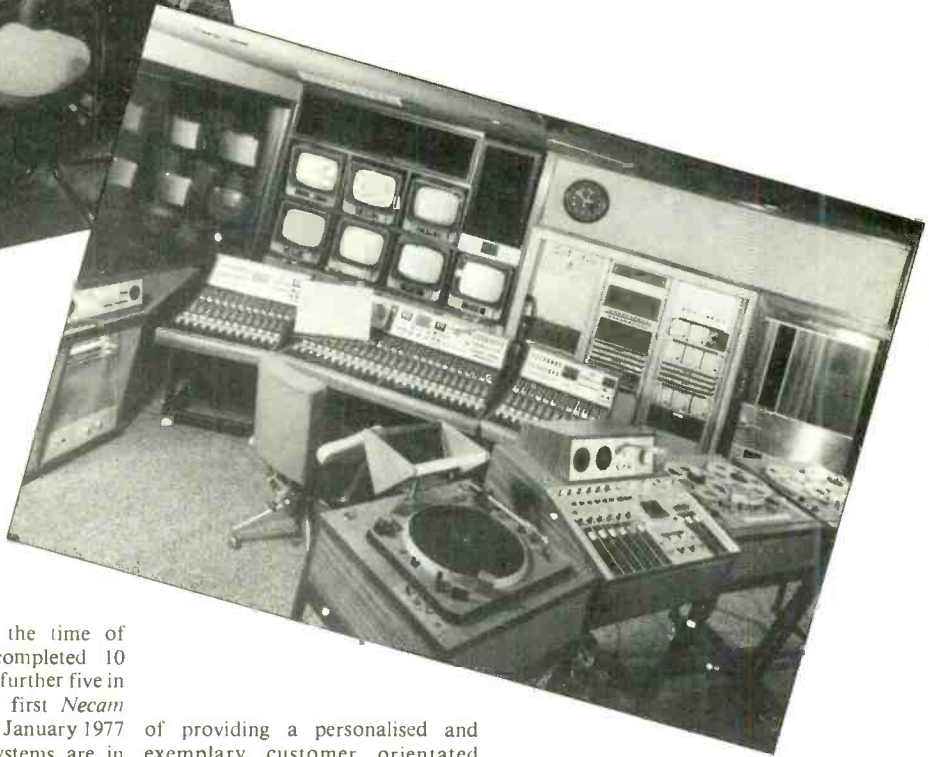
Neve-equipped control room at Philips Records, Marble Arch (opposite)

1969

Control room at Granada Television (left)

1970

Thames Television control room (below)



console. These consoles and later modified versions of them were sold throughout the world and many remain in regular operation today. Such is the quality of these consoles that they and Neve's custom consoles are in the unusual position of great longevity in operation and of being able to command very healthy second-hand values. These factors being an important bonus point of which prospective purchasers of Neve consoles are well aware.

Growth

The rapid growth of Neve's business was not without consequences and in 1973 when Neve was under financial strain 51% of the company's shares were sold to Bonacord (now Energy Services & Electronics Ltd). The acquisition brought valuable financial strength and management skills to Neve at a time when the company was poised for considerable growth. Annual turnover in 1973 was running at well over £1m with more than 50% of production destined for export markets. UK customers then included AIR Studios, Pye, Decca, Philips Records, EMI/MGM, the BBC, Thames Television, Granada Television and many others. Amongst an impressive list of overseas customers were RTE (Eire), CBS (New York), Walt Disney, RCA, Sound City, Caribou Ranch, CBS Sony (Japan), Melodija Studios (USSR), Czechoslovakian Television, Radio Netherlands and many other important customers throughout Europe, Australia, Canada, and North and South America.

Neve's technology and the range of services offered to customers continued to develop and grow with the introduction of the company's Turnkey System service in 1976/77 and the launch of *Necam* (Neve Computer Assisted Mixing System)

also in 1976/77. At the time of writing, Neve had completed 10 turnkey systems with a further five in hand worldwide. The first *Necam* system was installed in January 1977 and today over 50 systems are in operation or on order worldwide.

April 1, 1978 saw the company change its name from Rupert Neve & Co Ltd to Neve Electronics International Ltd, a move which reflected the increasing international status of Neve. Such was the success of the company at this time that a further expansion of production facilities was required and a new 20,000sq ft factory was opened at Melbourn adjacent to the existing company headquarters.

Neve today employs over 400 personnel and has gross sales of around £7-£8m, of which close to 80% is exported. Production is at three factories, two at Melbourn where design, marketing, service, console mainframe and module installation are concentrated; and a third at Kelso which produces console modules. Production is organised on flow-line practice with personnel being involved throughout a product's manufacture. Of the large staff over 80% are employed on design and production. Company philosophy can best be summed up by one phrase—customer service. Whether it be design, production, marketing, or after sales back-up, the customer's requirements are always paramount. This attitude stems not just from the company's early days

of providing a personalised and exemplary customer orientated service, but is also based on a fundamental belief that the company's and its customers' high standards be maintained and that the company's external image of meeting specific (and often specialist) market needs be retained and constantly improved upon. Accordingly, it is not surprising that investment not only in manufacturing plant, but also personnel is geared toward specialist needs. Whether it be the present analogue domain or the prospective delights of digital technology, anyone with any knowledge of the company expects it to be at the forefront of research and development. Whilst design and especially the requirement that its designers be able to fulfil any specialised customer requirement is a fundamental criterion of the company's philosophy, this is not carried to excess. In basic terms it can be said that Neve splits itself into three internally structured parts, but obviously there is considerable overlap between these. Custom design, standard product, and turnkey applications may be the crucial base on which the company operates, but these are not compartmentalised sections of the company which operate exclusive of each other. In fact flexibility and cross fertilisation of ideas and

practices are an important part of Neve's success.

Services

Neve's current range of services covers four basic areas, namely standard music recording consoles; standard radio and television consoles; custom consoles and sound control systems; and turnkey systems.

Top of the range of standard music recording consoles is the *Model 8108* with in-line mixdown, which was introduced in 1979. This console is available with up to 56 inputs including eight fully equipped and equalised rev returns and 48 track outputs. A feature of the console is the microprocessor based central channel/track assignment system with a touch sensitive control panel and four memories allowing instant recall and display of all channel/track routing. Other facilities include simultaneous or switchable VU or peak level bargraph metering and parametric eq and filters which may be switched independently between mixdown and input sections. As with all Neve's latest consoles the *8108* can incorporate VCA faders or the *Necam* system as an alternative to standard faders. To date 20 of these

44 ▶

Neve

consoles have already been delivered or are on order.

For those studios which require a console with a separate mixdown section Neve's top model is the 8098 L-shaped console—a 56-input channel, 48-track model featuring separate 48-track monitoring and full quad panning. Below this model is the 8078 a 40-input channel, 32-track console with separate 32-track monitor mixdown section. Smaller again are the 8068 and 8058 consoles which feature respectively 32-channel, 32-track; or 28-channel, 24-track operation. Finally for recording studios is the 8066 console offering 20 mic/line inputs, 16-track output, and a separate 16-track monitor mixdown section.

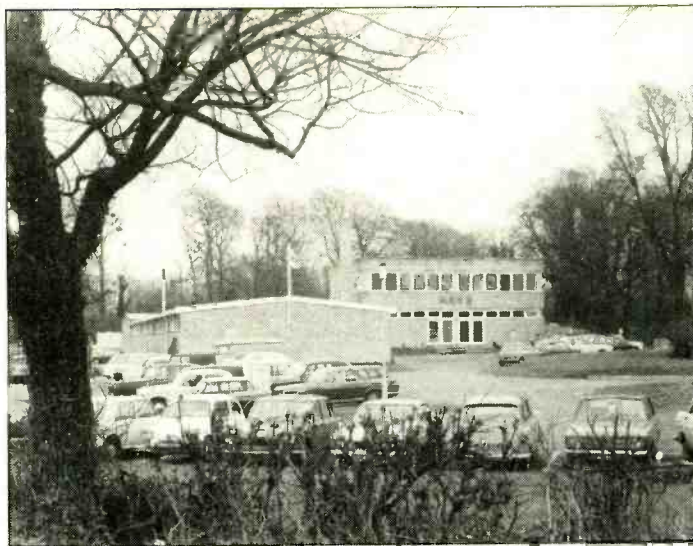
Standard consoles for the radio and television industry comprise five models, with the top model being the 5316. This is available with 24 or 36 input channels each assignable to eight group busses with outputs for 8-track or via a group master switching system to main outputs for broadcast or tape monitor mixing. Next is the 5315, a 12- or 24-input, 4-group console with two main outputs and similar facilities to the 5316. For radio DJ or continuity applications Neve produce the 5402B which accepts up to 12-input modules, these being either mic or high level stereo inputs or a mixture of both. Finally for broadcast use Neve produce the 5422 to 5442 mixers which are suitable for studio or OB usage. Available in a wide range of configurations including portable suitcase units, these are 6- or 8-channel models.

The majority of Neve's standard consoles can be supplied or retro-fitted with a wide range of options. These options ranging from furniture, patchfields, channel amplifiers, correction units, meters, digital clocks, tape remotes, and phantom powering, through to VCA subgrouping and the *Necam* computer aided mixdown system with its servo-driven faders. A further recent addition to this range of options is the *Necam II* computer assisted mixing system for television post-production and film dubbing.

Standard and custom

While standard consoles form a substantial part of the company's production it is a remarkable fact that typically 50% of production is custom built. This might well be unusual for any other company except Neve, but having produced its range of standard consoles essentially from its experience of designing custom consoles, and with its wealth of experience of designing such consoles, for Neve this is not a surprising fact. Having built up an unrivalled expertise in this field the company is

A gleaming example of Neve technology today



Offices and metal shop — a second, larger factory nestles behind the trees

in the fortunate position of being able to fulfil almost any customer requirements for special facilities or features. The company's success in designing and constructing custom audio consoles, programme switchers and talkback systems is evidenced by major contracts from clients such as the BBC, AIR Studios, and CBS Television (New York).

Production of standard consoles and custom consoles does not constitute the sum of the company's production. Neve also produces a range of stand-alone items too. Ancillary units available include rack mounting comp/limiters, rack mounting distribution amp systems, notch filters, background noise suppressors, tele-distort effect units, highpass and lowpass filters, etc.

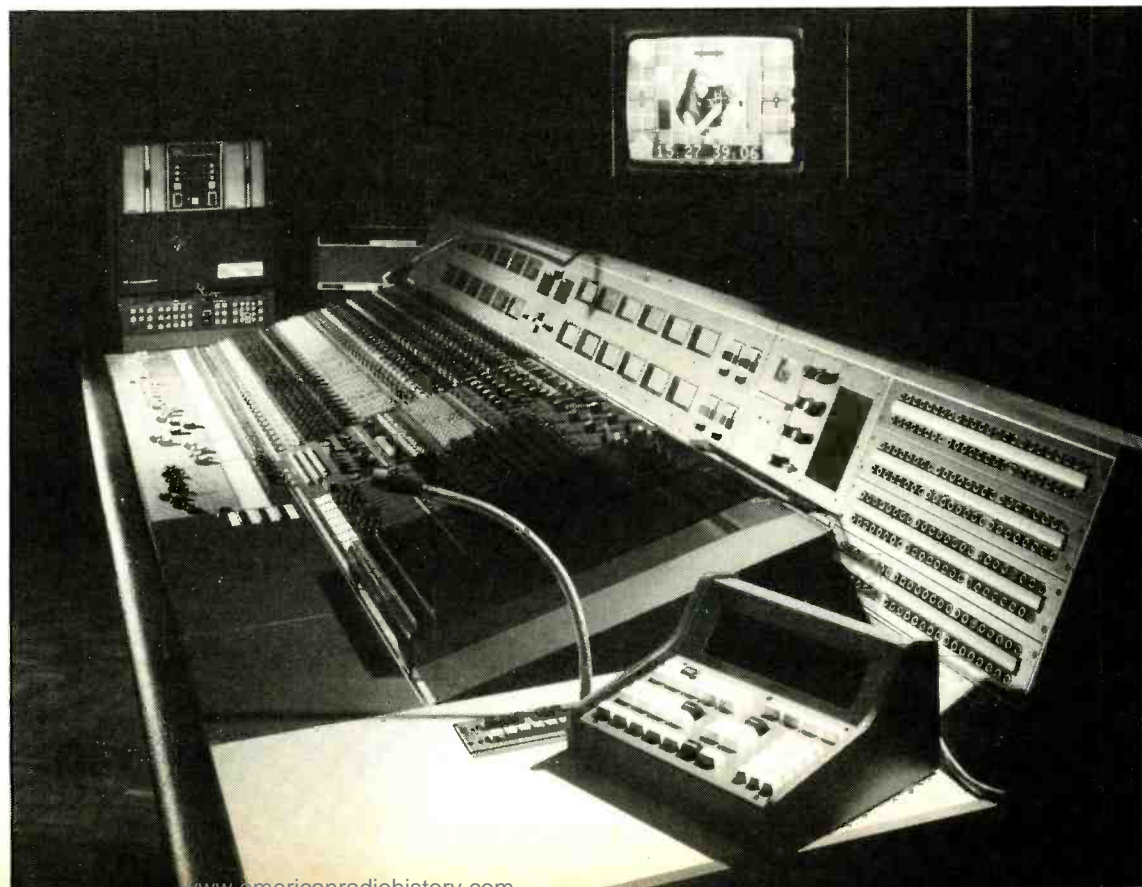
Neve's Turnkey System service as

with its custom design service, draws on the company's in-depth experience of design, construction and installation. As a single supplier the company is able to plan, procure, install and commission complete systems for almost any requirement whether it be national broadcasting, local radio, outside broadcasting, or music recording. Services which the company offer include the definition and procurement of third party items such as OB vehicles, tape machines, sound reinforcement equipment, etc; the design and manufacture of audio consoles, switchers, talkback systems, and ancillary equipment; the specification and supervision of sub-contracted work such as acoustics, lighting, decor, and specialist electrical installation; and the final commissioning of a

complete system. As with the remainder of Neve's services, the company's Turnkey Systems service is available worldwide.

Neve's emphasis on customer service both before and after sales is reflected in the company's policy of backing up its products by an efficient technical service department and spares policy. A comprehensive spares kit is provided with every console enabling routine maintenance to be carried out by the customer. However, for those occasions where more substantial maintenance is required the Neve technical service department provides on-site installation and maintenance throughout the world from its fully equipped base service facilities.

The success of Neve in its 20 years of business since 1961 has seen it grow from a small company to a large organisation operating worldwide. In this period company turnover has grown from £2,800 to between £7 and £8m. Throughout the company's growth the philosophy has remained the same 'recognise customers as artists in their own right, having their own philosophies and techniques of operation which are to be successfully incorporated into Neve equipment'. This attitude remains today and reflects a belief that both today and in the future the name of Neve must be synonymous with quality, reliability, and cost-effectiveness. To a large extent it can be said that Neve as it stands today exists because of this belief. Accordingly, providing the company retains its philosophy, the name of Neve is likely to be with us for a long time yet. ■





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letters

Studio diary

Dear Sir, In the September issue of Studio Sound a reviewer writing in the Studio Diary column stated that in an A/B comparison between a 3M digital system and a Studer A800, he found the wow and flutter performance of the former impressive. Does this therefore suggest that these parameters were audible in the A800? I think this type of comment reflects a severe shortcoming in an otherwise excellent magazine.

Every month under the heading Studio Diary we are subjected to a blind hero worship of whatever studio is being reviewed. Tiny control rooms become 'cosy', old, out-of-date equipment becomes 'much loved and respected', engineers are inevitably wonderful friendly people and the studio atmosphere relaxed. This is especially true of studios on the other side of the Atlantic of which there seem to be an endless number of 'money-no-object — private swimming pool/restaurant/gymnasium/airport' set-ups.

Come on Studio Sound, risk losing a few friends let's see some critical appraisals in Studio Diary with more information on smaller British studios and less on American Utopias.

Yours faithfully, R A Hodgson, 17 Springcroft Avenue, East Finchley, London N2.

Richard Elen replies: When Noel Bell discussed the performance of the 3M system he was doing a subjective A/B comparison between the 3M system and the A800 — the latter being one of the best analogue multitracks around. Nowhere does he suggest that the wow and flutter performance of the Studer was anything other than good. There are distinct limitations to the practical performance of analogue recorders, and digital systems will no doubt ultimately prove superior, but this does not mean that current analogue equipment is poor or obsolete. Although Studer are currently working on their own digital system, I doubt very much that it will supersede machines like the A800 for a very long time: there will always be a place for analogue recording, I suspect.

I would not agree that Studio Diary consists of 'blind hero worship'. A good studio may have a small control room, and it may well be 'cosy'. Similarly, the definition of 'a good studio' does not include the proviso that all the gear must be right up-to-the-minute, with all the flashing lights and racksful of goodies we see in the ads. State of the art technology does not make a good studio, although, if well-chosen, such gear may make a good studio better. Equally, a good studio should have friendly engineers (I reckon, from experience, that an engineer's job is 10% talent and 90% psychology — if you can't work with people you can't be a good engineer) if it wasn't a nice place to work, clients wouldn't go there, and there wouldn't be a studio to write about. Studios which don't have a 'cosy' control room, a relaxed atmosphere, and friendly engineers, are the ones which will go out of business. Our writers visit studios which have something interesting about them, and write about what they find there. If such studios are generally friendly and relaxed, that says more about how good they are than a long list of state of the art gear.

We are not reviewing studios in Studio Diary: most of our readers either run their own studio or work in places they like, they are not buying time and don't want a critical review. What they do like

to hear about, we discover, are interesting ideas and set-ups in other studios that might help them in their own work. So we write about studios all over the world which have something interesting to show us. We simply don't have the space to concentrate on pulling apart the less successful outfits (we don't have the space for all the good studios we hear of!). We are an international magazine and we aim to give everyone equal coverage, that's why you don't hear too much about small UK studios. Technology and techniques are international, and we can learn to do our jobs better by looking at people working in our business, wherever they happen to be geographically.

Reviews

Dear Sir, As distributors for one of the major British multitrack console manufacturers, we were naturally approached with a request to supply an Amek module for review by Studio Sound. Normally we would rush round with the required goods post haste, but in this instance we have declined the offer of a review. Sceptics might smugly say that this reflects a lack of confidence in the product. Of course this is not the case and this console-orientated edition of Studio Sound seems a good place to make a few points on the conduct of reviews in general.

I think we all recognise that the technical reviews published in Studio Sound set a standard to which most other journals can only aspire. For many products, technical specifications tell most of the story and it is fairly easy to judge whether a device will give subjectively pleasing results simply by perusing the familiar graphs and tables of a Studio Sound review. However, when we move into the realm of consoles and special effects the link between technical data and subjective satisfaction becomes more tenuous. Here there is a real need for complementary 'hands-on' evaluations to accompany technical reviews. After all, most potential studio equipment users really need to know whether the equipment they are contemplating purchasing sounds right and feels right, no matter what the spec may say.

With mixing consoles I think this subjectivity content becomes of paramount importance. Examining a single channel module of any mixer tells us very little about the capability of the mixing system as a whole. Unless we wish to be mean-minded we must concede that, in terms of basic technical specification, all the mixing consoles currently sold to multitrack studios by established manufacturers are adequate in terms of noise, distortion and headroom. Clearly there are large variations in the scale of facilities and value for money between manufacturers. Quite how large these variations are is often not apparent when evaluating a single module; for instance the fact that a channel is VCA-equipped and automation-ready may seem to indicate lavishness to the point of excess on a console not immediately destined for automation, but put that console in a control room and start to use the dc subgrouping which comes as a bonus on an 'automatable' channel and the flexibility this adds to the desk will probably completely change your views of what is and is not lavish. Similarly status switching, patching, monitor selection and processing are all crucial determinants of the usability of a console which cannot be given

meaningful technical appraisal. The ergonomics of a desk can never be appreciated without sitting behind it and attempting to set up a session; this is surely what the reviewer should attempt to do.

A modern console is a carefully integrated system of signal processing, routing, mode switching and subgrouping. Such a system should be reviewed as a whole or not at all. So how about some in-control-room field tests of the showpieces which adorn our palaces of technology?

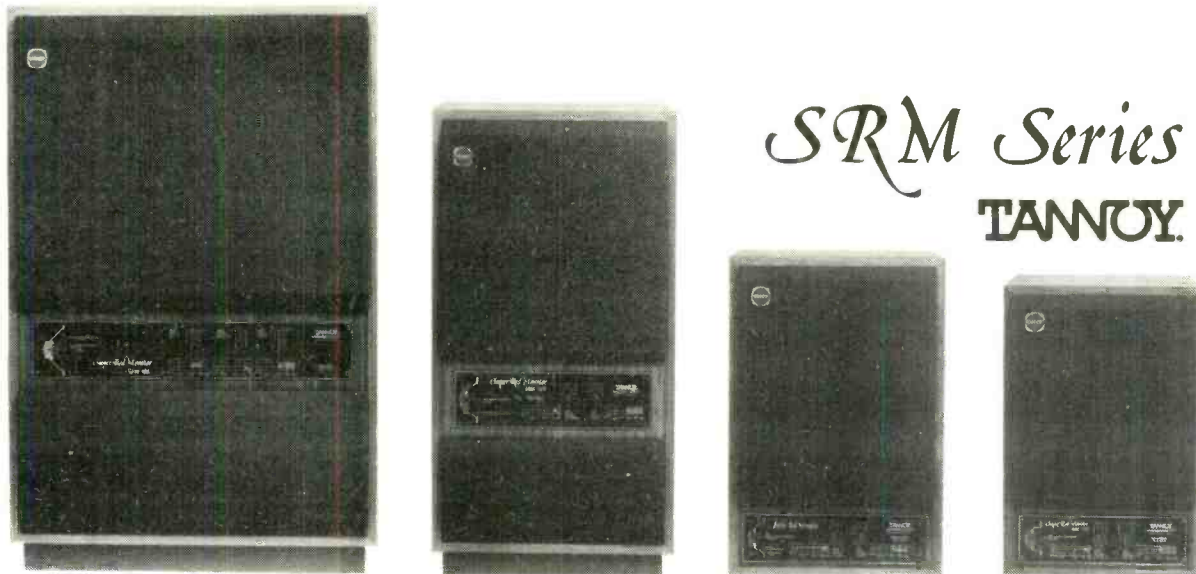
Yours faithfully, David Rivett, Scenic Sounds Equipment Ltd, 97-99 Dean Street, London W1V 5RA.

Richard Elen replies: David Rivett makes several valid points regarding our technical evaluation of mixer modules. While I feel that there is much to be gained from a technical analysis of mixer modules — evaluating the circuits which constitute the main 'guts' of a desk, and how they perform — I would agree that the majority of manufacturers produce console modules which have respectable technical specifications.

Much of the problem in reviewing consoles concerns the operational aspects where apart from the 'sound' and 'feel' of a complete console, there are other points which illustrate that they follow differing design concepts. From a technical aspect, we agree that while a single module may be well-designed, it will not indicate whether the complete desk shows a good rejection of RF (from the taxicab outside?), and whether the crosstalk between the backplane busses is as low as it should be. However, single module tests will give an indication, rightly or wrongly, that if a manufacturer produces a good module he can also make a good box to put it in. Further, even if we take it as read that most manufacturers produce modules (and consoles) to high specifications, the question of layout ergonomics is not resolved simply by looking at layout. There are many factors which must be assessed when laying out a console or module, and some positions which may be ideal ergonomically may lead to particularly inelegant and even disastrous component placing and board designs. Without looking at the entire console and using it, we can't tell how easy it is to use or how much ergonomics have been sacrificed for design criteria (or vice-versa).

This does not mean that our review of modules is fruitless. On the contrary, the technical evaluation supplies an important part of the complete picture. Hugh Ford's reviews give some of the answers: the questions David Rivett refers to have to be answered by using the desk(s) in question in a studio session. We don't intend that Hugh Ford's reviews will give the complete picture, but we suggest that operational experience of the reviewed desks be sought, to supplement Hugh's technical reports. We hope to back up Hugh's module reviews with data on the complete consoles, culled from experience on real studio sessions to be viewed in conjunction, not apart. It is our intention that the concept of 'user reports' become an important feature of Studio Sound. Such 'field tests' and 'user reports' will not be confined to consoles, of course. We intend them to supplement Hugh Ford's technical reviews, accordingly, we would like to invite manufacturers and users to contribute comments on the operational aspects of equipment which our readers will find of interest. ■

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AES 67th Convention, New York—a report

Richard Elen

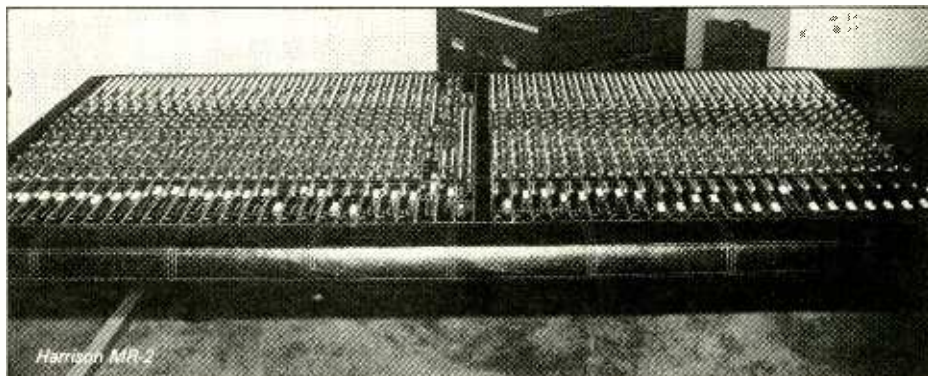
Noel Bell

October 31 to November 3 saw the 67th AES Convention, at New York's Waldorf Astoria. While Noel Bell covered the technical papers and SPARS Conference, Richard Elen visited the exhibition and appraises some of the new products on show. It should be noted that the emphasis in this report is on new products showing for the first time, and we have not mentioned every manufacturer. If any manufacturers' new products have been omitted, we would be grateful if they would let us know in time for the next issue's News section.

Mixing consoles

One of the most impressive new products on show was the *MR-2* console from **Harrison**. This console is designed to offer a comprehensive range of facilities, many developed from the big *MR-1*, but there is a wide range of options available and the console may be ordered specially configured for a particular application. In many ways, it is a cross between a production console and a custom built unit. Each input module contains all the circuitry for one input, one multitrack output, and one monitor channel, as is current practice for 'in-line' consoles, but many of the features are very advanced, notably the new transformerless mic preamp, which exceeds the performance of many conventional mic amps, including Harrison's own transformer-based designs, featuring a common mode rejection of 112dB at 100Hz, at 60dB gain, and a noise factor (unweighted, 20kHz, source impedance = 200Ω) of 1dB at 60dB gain, and 2dB at 40dB gain. Each unit includes a vernier trim with a range of 6 to 65dB gain, phantom-power defeat switch, and a 20dB pad. When set for 6dB gain, the preamp can accept +14dB without the pad, and +34dB level input with the pad in-circuit. The preamp offers an 8kΩ load, and can thus accommodate many instrument inputs without a direct box. Each module also features two line inputs, both of which are electronically balanced. One is a normal multitrack line return, while the other is available for use with the stereo cue send section as an additional remix input or for special applications. An insert patchpoint is provided on each module, operating at either +4 or +6dB as ordered, and features a transformer-coupled line driver. The insert is selectable pre- and post-eq, pre-monitor pot, or 'none of the above' (it says here).

The equaliser section is unusual in that each band is implemented with a separate circuit board: the module can accept up to four such cards, offering superb eq flexibility. The 'hi' and



'low' positions include peaking/shelving select switching. Fully parametric, sweepable and stepped eq sections are available, and the eq subsystem may be switch-selected to be inserted into the main signal, monitor signal path, or neither. Highpass and lowpass parametric filters are also fitted, offering slopes of 12dB/octave, with either rotary or switched-detent controls.

Normal or VCA faders are available for the *MR-2*, the latter interfacing happily with the *Autoset II* automation system. Eight echo sends and one stereo cue send are provided, switchable pre- and post-fader. The cue sends have the added facility that they follow the main mix unless a 'set' button is pushed, which activates their level control. The 'super-mix' function on the *MR-1* is simulated with a jumper matrix which enables the signal from the second line return to the module to be substituted for either the pre or post positions, allowing the cue send to be used as an additional input channel. Multitrack assignment is via a bank of 24 or 12 buttons for 48- and 24-track respectively. Each button has a dual routing function, determined by the status of a 'transfer' button, which selects either the first half of the available tracks or the second half, in the 48-track option, and odd-even tracks in the 24-track variety. Panning is implemented with sine/cos pots between odd and even channels. Phase invert buttons enable the phase of monitor and input signals to be reversed, the main channel taking priority in the case of insert and phase-reverse selection. A new function on the *MR-2* is the 'Sigma Cue' button, which offers a special overdub feature, allowing the feed to the tape machine and the line return to be monitored simultaneously.

The *MR-2* also offers comprehensive mix controls, a full communications module, and a unique modular patchfield structure. Several metering options are available, including Harrison's new CRT colour video display, which offers comprehensive control of the colours and functions of a bargraph screen-metering system, including peak with VU, in which the bars operate as PPMs, with a moving marker on each bar indicating the VU value (or vice versa).

Soundcraft were showing their new *800 Series* consoles for the first time, offering a choice of frame sizes (18/32 inputs) and a number of alternative modules for studio or PA use, the latter offering eight separate mix sends per input channel. Studio versions offer comprehensive monitoring for 8- or 16-track recording. The system features LED bargraph metering, selectable peak/VU, transformerless balanced mic inputs, click-stop rotary controls, and zero level patchpoints.

Sound Workshop presented two new console ranges: the *Series 20* (a development from their *1280* unit), and the *Series 40*, which is based on their successful *1600* series of mixers. The *Series 20* is an eight or 12-input unit in a 12-input frame, featuring high slew-rate ICs throughout, transformerless balanced mic ins, 3-band eq with sweepable mid range, comprehensive communication facilities, LED metering with optional meter bridge featuring backlit VUs, pre- and post-fader inserts, and a +4dBu operating level. The small but sturdy construction of the unit makes it ideal for mobile and remote recording work. The *Series 40* also offers transformerless inputs, with LED level indication, the mic amp utilising the *Trans-Amp LZ* unit from Valley People under exclusive licence. The console features eight send busses, configured as four mono and two stereo. Also fitted is the oddly named 'Mixx' switching system which enables a second line return to be used simultaneously on each input channel. It also creates additional remix pre or post send busses. **ARMS** Automation now includes the 'Super-Group' programs as standard for the *Series 40*, placing all VCA grouping functions under processor control. Rather than using a thumb-wheel for selecting the group number, the processor determines the group automatically, a simple pushbutton enabling the user to see instantly which master fader controls which channels.

CA Audio Systems (Cadac) were showing their latest in-line console, and their digitally controlled attenuator. Of special interest was the *CARE 824*

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AES report

automation system, featuring 824 series automated faders, and the new G469P in/out/monitor module and G470P echo send/return module. These offer up to 48 buss working with sophisticated routing and control functions and feature the MSS (*Master Source Select*) system which offers rapid console setup from a central position with individual overrides. Cadac are currently embarking on a redesign of their modules, these two being the first of a new series. The digitally controlled attenuator system is now fully operational, offering exceptional level adjustment under processor control and utilising Penny & Giles' unique 'grey-code' digital fader track.

Tape machines

Of particular interest in New York were three new products, the JVC Digital Mastering System, DAS Series 90, which includes the BP-90 processor (16-bit linear, 2-channel), AE-90 editing unit, and CD-90 digital audio preview unit; a flat-bed editing version of the Revox B77, the PR99 which also features balanced in/out; and, most interesting of all, the Soundcraft SCM 382/24 24-track recorder. This last unit is remarkably sophisticated for its price, and includes a very versatile control unit with a wide range of functions. The machine offers full control over monitor status of all tracks; defeatable auto mute in stop and wind; safe operation of channel-ready selectors; programmable drop-in subgrouping; overall drop-out and fast drop-in/out from transport switches; specially designed autolocator by Audio Kinetics featuring an ability to catch tape positions 'on the fly', search to any of nine programmable locations, local or absolute zero, tape speed display, dual display readout, and all the other well known functions of the superb Audio Kinetics design; dedicated port for sync equipment, offering TTL compatibility and external capstan control; $\pm 15\%$ varispeed; dedicated noise reduction switching socket; auto selection of line-in monitoring when in sync and record ready but not in play; and many other useful functions, too many to describe here. In addition, the unit is extremely compact. A very impressive piece of equipment.

Also on show at the Studer stand in addition to the PR99 was the new A80 MkIII, which features a number of improvements over the earlier MkII (logically enough) including a re-designed headblock.

On the digital recording front were two Japanese products: the Mitsubishi X-800 32-track Sound Workshop Series 40 console



Soundcraft SCM 382-24 tape recorder

recorder and the Sony DAE-1100 Digital Editing Controller. The Mitsubishi machine should be in production by mid 1981. The recorder on demonstration was operating as an 8-track and the machine uses a novel system of multiplexing and interleaving data across the available channels. This means that you could in fact lose one track in a channel and still recover it via the multiplexing structure, as error correction is applied both along the tape and across the tape channels. The machine operates at 30in/s and uses 1in video tape on an Otari-designed transport.

The current version of the Sony DAE-1100 was first shown—to my knowledge—at IBC earlier in 1980, prototypes having been extensively evaluated over the past few years. Interfacing with U-Matic recorders and the 1600 16-bit linear digital encoding system, the editor is amazingly simple to use: the only fader on the control unit is used for matching levels between the edit sections, and buttons are illuminated when they are to be selected. Editing is simply a matter of locating the correct point on one recorder and 'capturing' 3s of it in memory. This is then listened through as a loop, at full or half speed, until the correct point is located: this is then 'fine tuned' with a large knob in the same way that you'd find your place by twisting the spools on a conventional recorder. You perform the same operations on the take to be edited in: then, simply, the machines roll back in sync and drop in at the right point. The time to

cross from one source to the other is selectable in ms, and a 'preview' function enables you to check the edit before you take it. Very impressive and straightforward to use.

Outboard gear

Ursa Major, manufacturers of the respected Space Station reverb unit, introduced a new digital reverberation ancillary at New York: the 8X32. Packaged in an elegant, compact, rack-mounting case, the 8X32 features comprehensive LED and numerical displays including dynamic indication of the reverb characteristics. The unit contains non-volatile registers, which may be used to store 32 complete reverb setups. In addition, a recalled reverb setting may be modified from the front panel, and re-stored if necessary. The panel controls, when used to create a new reverb pattern, offer numeric LED displays to show the exact settings, and visual confirmation of the adjustments. The first step is to select one of four basic programs, designated Plate I, Plate II, Hall, and Space. Next, the level and delay time of a small group of early reflections is established, followed by setting up the initial delay time and level of the actual reverb phase of the sound. Within each program, in addition, there are 16 possible decay times, with individual control of hf and lf decay (four and three possible values respectively). The device has an 8kHz bandwidth, 80dB dynamic range, and a sampling rate of 20kHz. The 16 decay time values range from 0.2 to 19.9s, and eight steps of early reflection levels are offered, which may be adjusted from 6 to 96ms in 16 steps. This impressive device, which will be available from Spring 1981 at \$5995, also offers input muting and 'reverb clear' functions of momentary operation.

New from Advanced Music Systems is a stereo version of their programmable delay line, the DMX 15-80S, based on their very successful DMX 15-80 unit. It is a true stereo device, offering two independent delay lines which may be set up separately. In addition, it is only a little more expensive than the original version. The innards of this unit are an excellent example of top quality board design, layout and construction.

New from Furman Sound is the LC-2 comp/limiter, featuring an exceptionally straightforward mode of operation. Controls are input level; de-ess, side chain and compress function controls; attack and release controls; compression ratio control (2 to 50:1); a gain reduction LED display; and an output level control. The side chain mode enables the gain reduction signal to be processed externally; in addition, this mode may be used to allow compression control by another signal (eg a voice, for broadcast 'ducking' applications). Interfacing for stereo is featured, along with a programme-adjusted release time, which reduces the release period on transients to avoid pumping effects.

MXR Professional Products Group also introduced a new limiter: called, simply, the Dual Limiter, this unit offers two no-nonsense comp/limiting channels. A special feature of this unit is the 'slope' switch, which interacts with the threshold setting to allow apparent dynamics even though the dynamic range is being controlled. The unit is in fact two separate channels which may be linked for stereo. Each channel has in/out, slope, input, output, attack and release controls plus an LED display. The side chain of each channel is accessible for external control. Also featured is a very rugged internal and external construction, so the unit will be equally at home in the studio or on the road.



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AES report

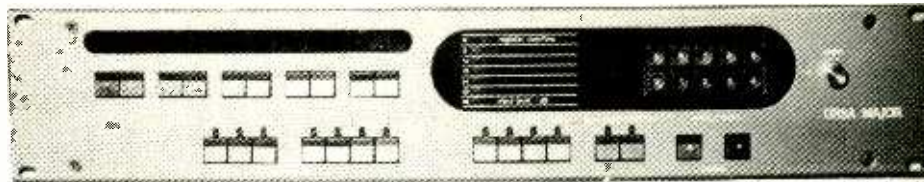
Ashly Audio introduced their new parametric notch filter, the SC-68. This novel unit offers a cut-only equaliser for inserting relatively sharp dips in the frequency spectrum, particularly useful for removing feedback-sensitive signals, resonances, hum or sync signals, and 'hot' notes on musical instruments. Eight individual filters are featured, applied to a common buss. Each filter acts as a frequency dependent resistor, with the resistance dropping to zero at the centre frequency, enabling each band to be operated as a 'nearly infinite cut' (at least 30dB). Individual switching on each channel is offered, and the entire unit may be bypassed to compare the final setting with 'flat'. A special setup system for anti-feedback applications uses a limiter to increase system gain until feedback occurs, then holding the feedback at a controlled low level. The setup level control is then used to give a zero reading on the meter. As notches are applied, the system gain is automatically increased, causing controlled feedback at new frequencies, which may then be notched out in the same manner. As the process continues, the meter indicates increased gain-before-feedback, enabling a precise reduction of feedback without blowing either speakers or ears! The above three products will be available in the UK from Atlantex Music.

Marshall Electronics featured their new *Model 5402 Time Modulator*. This versatile device is the end result of over three years of research and unique circuit design techniques, resulting in a unit that is even more impressive than the original 5002. The unit features two independent 400ms delays with three taps each, assignable to two processing busses, one positive and one negative. Digital control assists in making the device even easier and faster to use, while Marshall's 'Modulated Bias' technology enables long delay times to be generated without compromising the frequency response at long delays, for very little extra cost. The unit offers a remarkable 2000:1 adjustable delay range, from under 200µs; 15kHz bandwidth and 95dB dynamic range at all settings; 72:1 continuous sweep range; programmable locked sweep delay ratios; separate modulation waveform select switch; LFO high and low sweep LEDs; isolated flange and delay sections; headroom indicator offering input, output, and internal feedback level display; independent output level/mix controls for each assigned delay tap; and new circuitry to eliminate unwanted breathing and pumping effects. Altogether an essential addition to your outboard rack.

Orban exhibited an improved version of their *111B* reverb unit: utilising six springs per channel, this compact device features a floating threshold limiter for 'twang' elimination; shelving bass and 'quasi-parametric' mid range eq; and balanced and unbalanced ins and outs, the former utilising high performance transformers.

On the subject of reverb, **Studio Technologies** exhibited their smaller version of the *Ecoplate*; called the *Ecoplate II*, predictably enough, this unit features transformerless I/O and a number of new design factors, reducing both the size and the cost of the device. Meanwhile **Master Room** (Micmix Audio) showed their low cost *XL-210*, which was included with their other products in a unique comparison demonstration which indicated that their devices have a strong edge in terms of smoothness of reverb characteristic.

On show for the first time was **Deltalab's Harmonicomputer**, a comprehensive pitch-



Ursa iMajor 8X3Z

changing effects unit from their *Professional* series. Aimed primarily at the musician, its panel style is uniform with the *DL-4* delay unit which is aimed at the same market. Little advance information was available on the product as it is so new, but we hope to examine one in greater detail when they become available.

Two new products on the digital front, offered by **Lexicon**, created a lot of interest: the *PCM41* digital delay processor is a compact, easy-to-use, low-cost unit incorporating PCM encoding of the delayed audio, giving very low slew-rate distortion over a 20Hz to 16kHz bandwidth. Designed primarily for musical effects, the unit offers ADT, flanging, vibrato, tremolo, arpeggiation, doppler pitch shifting, slap echo, infinite repeat, and many combination effects, and includes an envelope follower and footswitch control capability. The other product, the *1200*, is aimed at the broadcasting market and is designed to alter the running time of programme material without changing the pitch. Working in conjunction with automatic tape machine speed control, the device alters the running time of, say, commercials or movies, to fit a time slot, thereby removing the need to re-record or suffer a pitch change. Quite wide alterations in speed can be introduced without subjective signal or intelligibility degradation, and the unit has already been used very successfully by US broadcasters. A new version of the 224 operating system, *V3*, was also on show, (or rather 'on ear'), offering enhanced ease of use via the 'call' mode, which is in operation on power-up. This enables selection of a desired reverb program with default parameters which may then be user-modified very simply. In addition, the number of registers has been expanded by 32, organised in four banks of eight. Registers within one bank may be called and run with a single keystroke. A non-volatile Memory Expansion Module will save these registers and is power-off protected.

Gotham Audio were showing a new product from **TTM/Fabec**: the *TTM 202B* is a 2-channel noise reduction frame which does for stereo what the *TTM Rack* does for multitrack: it takes telcom, Dolby or dbx cards, and offers electronic balancing on I/O and allows unbalancing without signal degradation. NR switching is via FETs and gold-contact relays. On-board regulation enables the *202B* to be driven from an optional internal PSU or external 24V dc supply rail.

A range of new products were on show in the **dbx** demonstration suite, featuring particularly the *900 Series* modular signal processing system. Two new modules for this system were shown, the *905* parametric eq and the *Flanger+* model *906*. The former offers overlapping control in three bands. Each band may be used as a conventional parametric, with peaking and shelving on each end, or in 'infinite notch' mode for the removal of unwanted signals. Multipoint overload sensing and ± 15 dB range is additionally featured. The *Flanger+* sounds very much like a tape-flanging system in use, and offers 100:1 frequency sweep, a choice of control waveforms, noise modulation and internal/external control signals, delay feedback, phase inversion, dry/effect mixing, and stereo outputs. A very useful module. Also on show were the new *dbx 150*, a low cost, rack-

mounting, stereo, simultaneous encode/decode Type I noise reduction unit for the smaller studio or AV production house, and the *140* broadcast Type II NR unit, offering simultaneous encode/decode and dbx disc replay functions.

Valley People were exhibiting their new *Gain Brain II*, a widely adjustable comp/limiter and ducker for production work. This unit features the well known *EGC101* VCA module and offers vastly improved performance over the original model. Also on show was the *E3* test card and 'anti-dither' analogue I/O card for the *65K Programmer*, which includes the two cards, a new front panel, encode buffer card and test strap in a single upgrade package; plus the *TR-804* rack module system for the *Gain Brain II* and *KepeX II*, with integral PSU module. This unit may be free standing or rack mounted, and racking 'ears' are provided for either a single unit to be mounted or two, side by side.

An intriguing little box was on show at the **Empirical Audio** stand. Appearing under the Sleepy Hollow logo, the *Headroom Horseman* (full marks in the names department) takes a semi-pro or instrument level -10 signal and raises it to professional levels and impedances, +4 or +8dBm. The stereo unit is entirely free of integrated circuits and runs from a 55V supply (why not 48V as in phantom power circuitry, eh?) mounted in a standard power plug. On-board regulation is fitted, and the unit offers Neutrik *XLR*-style sockets and phono for I/O, and has separate left and right level-tweakers to set the gain. The unit not only takes hi-fi and semi-pro signals up to line levels: it also drops them back down the other way. Two units may be rack-mounted. The device will also find application with interfacing between audio gear and VTRs.

Last, but certainly not least, **Audio and Design Recording** were exhibiting their new *Transdynamic* tri-band processor, a stereo unit designed for broadcast and disc-mastering applications. The unit splits the audio into three frequency bands for separate processing via external comp/limiters, and is available in a number of packages including appropriate numbers of *F760*, *Express*, *Easy Rider* or *Scamp SO1* units. It may also be used to drive other makes of comp/limiter. Both 12 and 6dB/octave phase-compensated splitting is available, the former allowing twice the dynamic reduction before band-spread reduces the effective operation. The recombined signal may be further processed through an on-board wideband limiter and constant-current clipper for absolute control. 25, 50 and 75µs pre-emphasis is available, with optional clipper asymmetry for AM transmission. An off-air monitor output enables the unit to be set up in bypass. ADR offer a special installation service on this device, supplying an engineer to set up and optimise the system on installation. The unit also has interesting studio possibilities.

Loudspeakers

New from **JBL** are three speaker units: the *2240H*, *2245H*, and *E155*. In addition, the *4313B* monitor with High Resolution Divider Network and *2360* series bi-radial horns were shown. The *2240H* is a

54 ▶

A whole page of sound advice from ADR.

F690 Music-Voice Ratio Limiter

This is an F 600 Broadcast Limiter fitted with a voice operated threshold switching circuit. In use it gives an accurate method of controlling the voice-music ratios, and prevents over-attenuation of the music level. The F 690 is a stereo unit but can be used in mono with one channel for voice and the other for music voice-over control.

E500 Selective Band Processor

Use it for treating any part of the audio bandwidth. Particularly useful when transferring a recording from tape to disc when treatment of selected troublesome areas of the signal prevent degrading the whole signal. The E 500 can be used with any standard limiters, compressors or expanders that operate at normal time levels and is a stereo unit.

E560 Selective Limiter

A versatile unit which combines three functions; overall programme limiting, selective limiting and parametric equalising. The E 560 combines the notch section of the E 500 and the F 600 Limiter. A monitor switch means that notch areas for limiting are easily defined and the limiter also operates when peaking or notching in the Equaliser mode.

E900 Sweep Equaliser

Instant, uncomplicated audio frequency correction without the fuss of a parametric equaliser. Up to 20 dB of Peak or Dip can be selected and used instantaneously. To prevent unwanted clicks all controls are D.C. decoupled and the front panel lay-out is designed for operational simplicity.

E950 Paragrophic Equaliser

All the functions of a conventional graphic-equaliser combined with the flexibility of parametric equalisation. It can be set up as a straight forward graphic unit in either stereo 6-section format, or a 12-section mono system outputting on the unit's RH output connectors. The E 950 is ideal for both Broadcasting and Recording applications.

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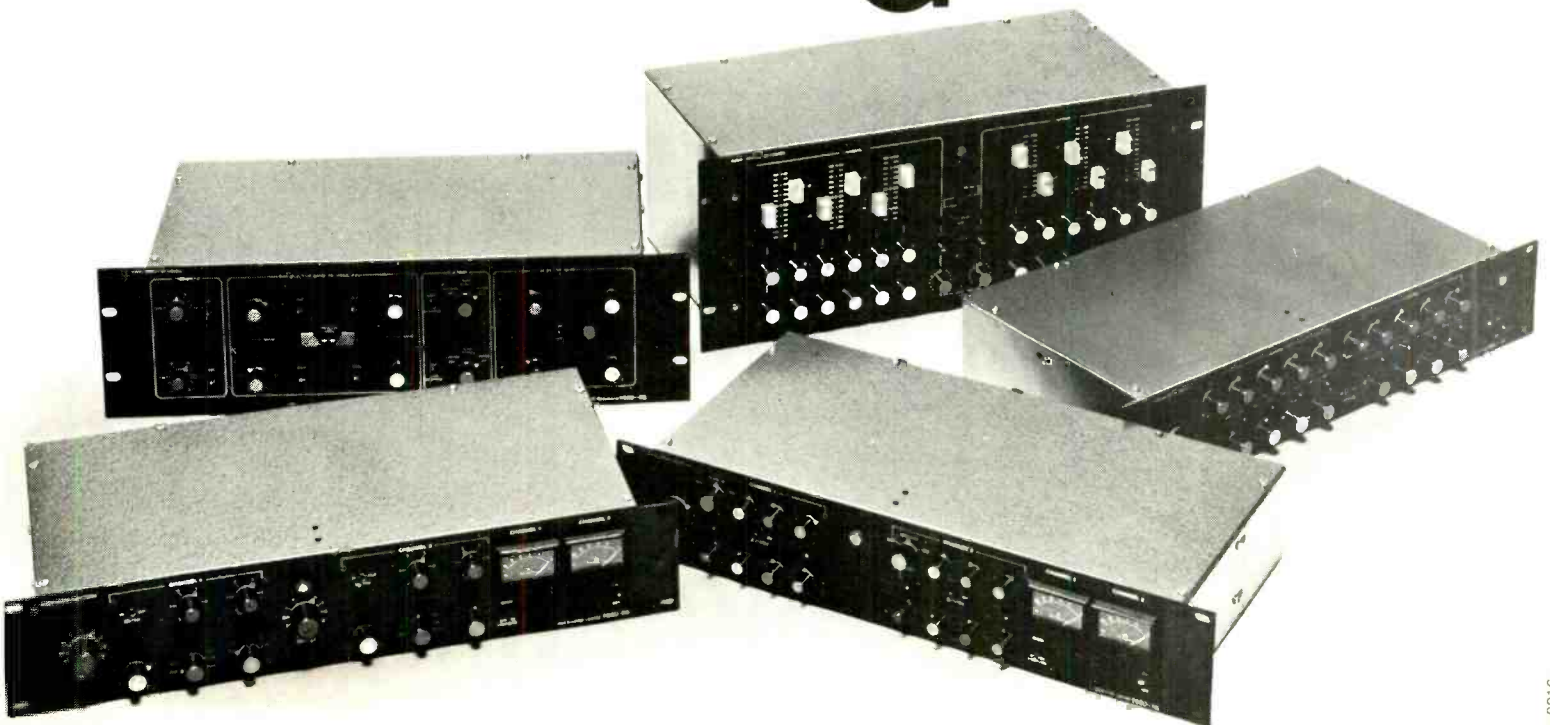
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AES report

low distortion, high power 18in driver of high efficiency, while the 2245H is a companion driver designed for custom studio monitors. The E155 is an 18in driver for electric bass amplification. Particularly impressive was a demonstration system composed of 2360 horns, 2241 drivers and a 2245H as a subwoofer. It was smooth to listen to, and easy on the ears, even at high levels.

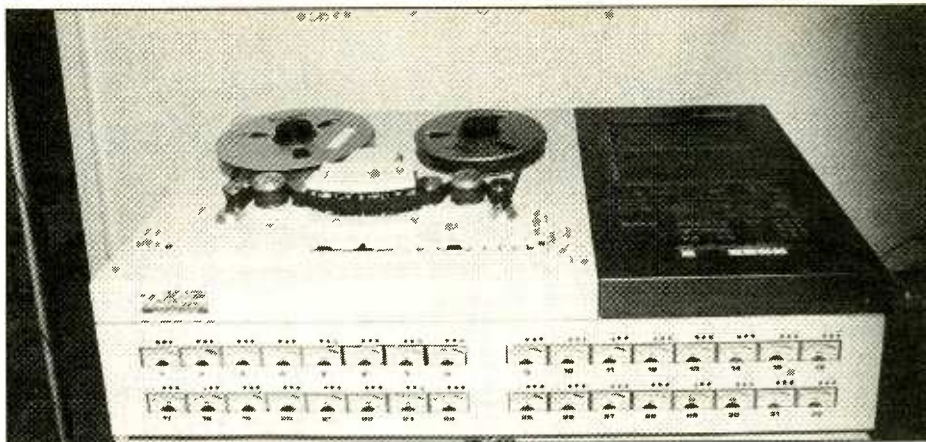
Tannoy unveiled a stunning new speaker system at AES: the *Dreadnought*. This system features three 15in dual concentric drivers in a triangular array with active 3-way crossover. The drive units are specially designed and are specifically set up to be triamped: in the demonstration, they were driven by BGW amps (BGW are the US Tannoy distributors). The system will apparently produce levels up to 135dB SPL (aaagh!) but *cleanly*, and the units, whilst requiring a fair amount of drive for such levels, are remarkably efficient. The system may be retrofitted into Eastlake monitoring setups, and they sound very nice indeed. A product with a very definite successful future.

Musical instruments

A remarkable new drum machine was on show, from Linn Electronics. This unit contains digitally-stored recordings of real drums, which may be 'played' with key pads and stored via an elegant record/overdub system. Twelve drum sounds are featured, each with level controls and independent outputs, plus a metronome for recording purposes, and the machine may also be synced to tape. Accented versions of all the sounds are available, plus the toms may be tuned individually, and the hi-hat may be 'opened' or 'closed' as much as desired. Handclaps, tambourines and other special percussive sounds are also featured in this impressive, if expensive unit which is manufactured and marketed by 360 Systems. Rolls, fills, variable time signatures and editing are also featured. Roland were also showing an interesting drum machine, with certain similarities, although rather less complex (or expensive). This unit enables the user to program a selection of sounds up to 16 beats per pattern. A set of touch-buttons with associated LEDs indicates and selects the beats required, and these are 'played' in real time, the separate sounds being selected with a switch and added in layers. Facilities are offered for moving the position of beats and editing the pattern. Memories are used to store and recall the drum-patterns created.

Fairlight were showing new software for the CMI Computer Musical Instrument. The new programs enable three-dimensional representations of waveform and harmonic structure to be displayed, plus an ability to perform portamento and arpeggiation. Increased keyboard control functions are also available, and a number of other developments in this area are on the way (see our special report on synthesisers for the studio in our February 1981 issue).

Con Brio showed their new ADS 200 digital synthesiser, a distinct development over the prototype shown last year. Based around no less than five 6502 micros, this impressive-looking instrument features 64 to 256 oscillators, graphic sound synthesis with video monitor, and programmed special function keys which illuminate according to which are to be used at any stage of sound-creation. An intriguing piece of software enables the musician to play a piece in real time on the keyboard, and obtain a musical



Mitsubishi X-800 32-track digital tape machine

score with conventional notation on the screen or as a printout as the piece is played. This score is stored and may then be edited.

Convention

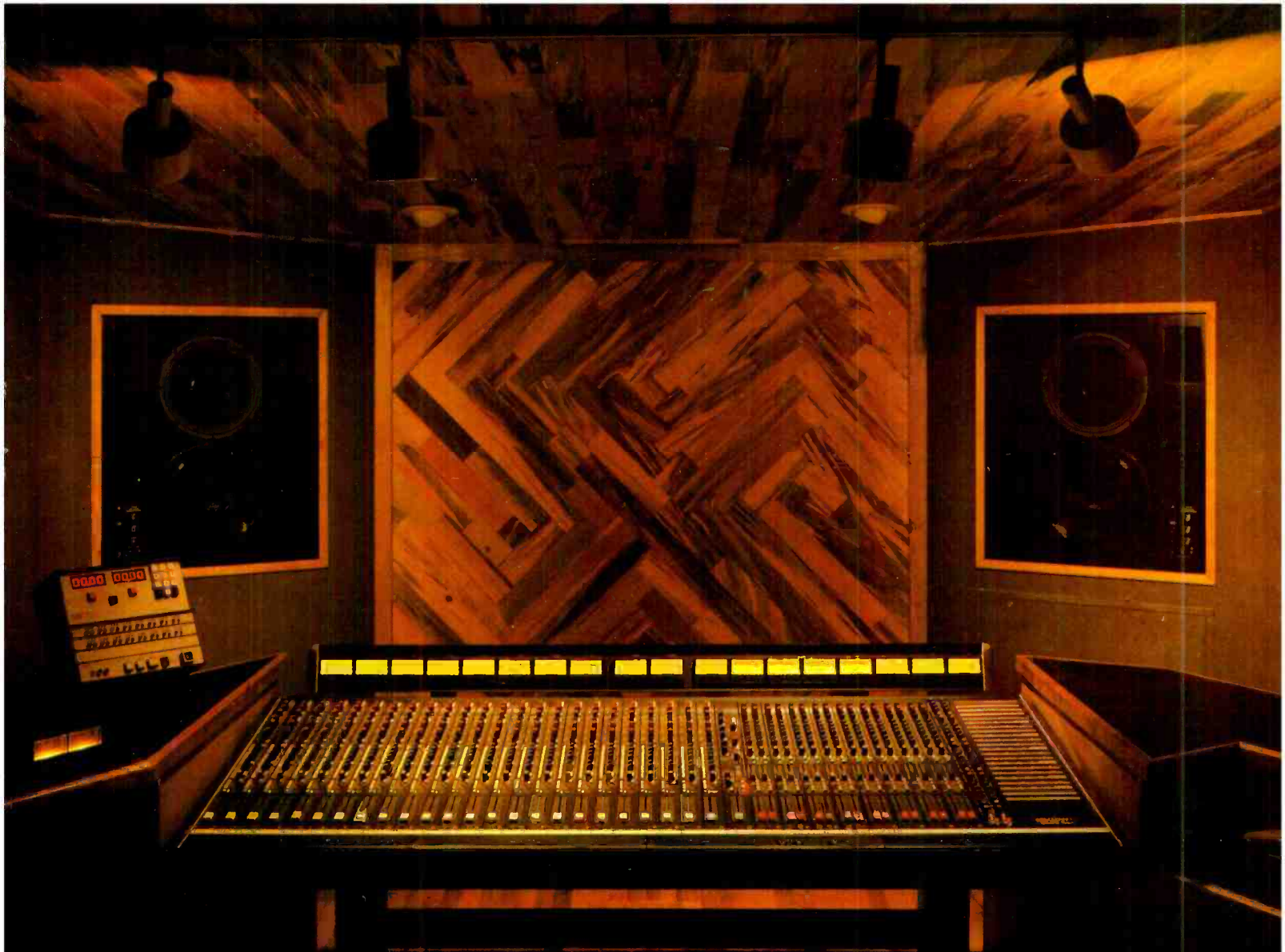
The technical sessions and workshops presented at this year's New York AES Convention as usual covered all aspects of audio engineering with the quality of papers and workshop panel discussions being to the normal high standard. Perhaps it was my imagination but there seemed to be a greater number of papers and workshops to attend than usual which unfortunately led to my beginning to wilt under the wealth of information disseminated. An unfortunate side effect of this plethora of material was that in several instances technical papers and workshops of interest coincided and hence a choice had to be made as to which to attend. Where AES preprints of the affected papers were available I was able to safely attend the affected workshops, however, in a number of instances no preprints were available.

Among the full programme of workshops several were of interest. Probably that which stimulated the greatest interest being devoted to the topic of digital editing. Here the majority of manufacturers (Soundstream being the exception as editing has to take place on the company's computer in Salt Lake City) demonstrated their digital editing techniques and a panel of experienced users gave details of their operational experience to date. Systems demonstrated included the 3M system, the JVC and Sony systems using video tape recorders, and the Mitsubishi X-80 system. The first three of these all utilise electronic digital editing, while the latter edits by a conventional physical tape splice, all the systems being incompatible with each other. As demonstrated all the systems made inaudible edits, however, it appeared and was confirmed by the panel that electronic digital editing took longer to accomplish than conventional analogue editing. In view of this it was rather intriguing to see the Mitsubishi tape splice being carried out by a white gloved operator (the white gloves are to avoid tape handling which causes drop-outs) in a fraction of the time taken for the electronic edits. However, there are disadvantages to the Mitsubishi system in that if an incorrect splice is made a further physical splice is required. Accordingly, for safeguarding reasons Mitsubishi recommend the use of two X-80 tape machines, so that before editing a digital copy tape can be made from the digital master, with editing being carried out on the copy tape while the original master is retained in case of damage to the recording. The electronic digital editing systems do not have this possible disadvantage and a fascinating pointer to the future was discussed when the idea of being

able to edit individual tracks in a multichannel digital machine at different edit points was floated. This potential feature illustrating the greater editing flexibility available with electronic editing.

Although for technical reasons explained above, it was impossible to demonstrate the Soundstream system a full description of the operation of the system was given by Jay Zachs of RCA who has made several digital recordings with the Philadelphia Orchestra and Chicago Symphony Orchestra using the system. Although the Soundstream system has up to now been able to record only as either 2-track or 4-track, a recent development has been the introduction of an 8-track recorder, and Mr Zachs stated that he was shortly to edit an 8-track tape at Salt Lake City, this edited tape then to be mixed down to 2-track using *Necam*. Further news of the Soundstream system is that the New Year will see the introduction of new software and hardware with the provision of triple density disks and instantaneous access memory. In addition to this Soundstream intend overcoming the disadvantage of having to travel to Salt Lake City for editing by opening new editing centres. These new centres will be on the East and West coast of the USA, London, and West Germany, and it is hoped that these will all come into operation during 1981.

Among the further eight workshop sessions held in New York it was interesting to note that several were devoted to topics which gave users, manufacturers and suppliers the opportunity to discuss mutual problems and potential developments collectively. This series of what might be termed interface sessions are a useful extension to the AES' already comprehensive technical sessions, and from those I attended seemed particularly appreciated by the end users, ie engineers. Among these 'interface' workshop sessions those devoted to multitrack tape recorder maintenance and high speed tape duplication were particularly useful. The first comprised a double session where manufacturers displayed multitrack machines and discussed the recommended procedures for alignment, trouble-shooting, and preventive maintenance with end users. The second was intended to prompt dialogue between tape duplicators and manufacturers and comprised a discussion of such items as duplication standards, quality control, magnetic heads and tape. Other notable workshop sessions included a panel discussion of the role of the private recording studio in the future of the music and recording industry; a comprehensive session on mic techniques; and for students and potential students an educational fair where comprehensive details of courses were available.



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Brandon Wade's Crosstown Recording, Kalamazoo, Michigan.

AES report

month's issue of *Studio Sound*. The second paper from Matsushita, Japan, (AES preprint No 1701) described a digital audio mixer with 8 inputs, 2 line outputs, and 4 echo send outputs, developed using digital signal processing techniques which can be applied to level control, and 2- and 8-channel mixing simultaneously in realtime. All inputs and outputs are digital data composed of 16-bit linear quantisation. Full details of the method used and practical applications are described in the paper.

Finally, two papers were presented describing digital tape recorders. The first from Mitsubishi (AES preprint No 1690) described the performance and structure of the Mitsubishi X-800 multitrack digital recorder which was debuted at the Convention. This recorder has a 1in, 30in/s pinch roller free tape transport and employs a semi-separate code format providing not only high error correctability but also smooth punch-in and punch-out. The semi-separate code format in particular is interesting as the RSC code can correct almost all of two long burst errors, such that even with a drop-out on one track the RSC code can correct errors on the track and also random errors or burst errors on another track. The other paper dealing with digital tape recording was a paper from Sony (AES preprint No 1677) which described a format for a stationary head digital audio recorder covering a wide range of applications. This format can encompass a number of channels ranging from two (1/4in tape) to 48 (1in tape). Nominal speeds of the recorder are 30, 15, and 7 1/2 in/s, with the number of tracks being assigned to each channel being either one, two, or four depending on the tape speed chosen, while the basic electronic boards used are the same at any speed. A new strong error correcting system termed a cross-interleave code has been adopted for this Sony format in order to give protection from dust, scratches, and fingerprints, as well as smooth punch-in/out and tape splice editing.

SPARS Conference

The day prior to the start of the AES Convention saw SPARS (the Society of Professional Audio Recording Studios) hold its third audio recording conference. Split into three sessions the conference covered three subject areas, these being studio marketing techniques; technical downtime; and engineering practices.

The first session covered the means of ensuring that studios were busy and productive and consisted of a panel discussion of marketing techniques. Subjects covered included the value

of public relations exercises, the utilisation of advertising, and the multitude of business generating sales techniques which studios can employ. This latter topic was particularly instructive with techniques ranging from the employment of sales personnel; the joint promotion with radio stations of concerts which are recorded in-house or broadcast live; the various means of generating studio business from existing clients such as formulating recording projects in conjunction with artists, or helping to fix up record company and production deals; the need for diversification, i.e. involvement with audio visual and audio sweetening projects as well as conventional recording projects; and most importantly the requirement to ensure that a studio's clients were satisfied customers.

While many of the above techniques are standard studio marketing practices the opportunity given by SPARS for discussion of this topic stimulated reappraisal of how studios go about generating business. Murray Allen, the seminar chairman, neatly summed up the value of the discussion when he stated that the aim of the seminar was to stimulate studio owners and managers to re-examine their marketing techniques. He did not feel that the seminar or its conclusions should be used as a blueprint for studio marketing, but believed that many of the ideas and techniques mentioned could be used in whole or adapted to the particular needs of individual studios. Finally, Murray Allen stated that as far as he was concerned the more successfully studios marketed and ran themselves the better it was for the recording industry, since competition was something which should be actively encouraged as a means of ensuring service and business standards remain at a high level.

Technical downtime has always been one of the bugbears of the studio industry. Accordingly, it was interesting to hear the views of the panel and audience on this subject in SPARS' second seminar. Most of the usual problems reared their ugly heads with the question of maintenance and the desire to give quality uninterrupted service being the paramount topics of discussion. As usual there were no easy answers to the questions posed, but the general consensus of opinion pointed to an acknowledgement of the importance of this subject. Perhaps the most important aspect to come out of the panel discussion was an awareness that technical downtime should be kept to a minimum. It was felt that not only should this be done to ensure studio profitability, and to avoid disruption of sessions, but also to maintain the quality of service offered by a studio. Methods of ensuring that technical downtime was limited to the minimum were varied, but

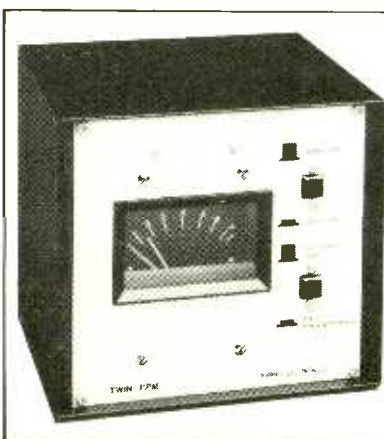
the provision of regular scheduled maintenance of equipment was felt to be the primary consideration.

The final SPARS seminar entitled Good Engineering Practices was probably the most stimulating of the topics covered. Under the chairmanship of Guy Costa, a panel including representatives from all aspects of the recording industry, addressed themselves to such problems as tape machine alignment, the provision of test tones on masters, etc. The discussion being primarily orientated as a presentation of (and commentary on) the preliminary results obtained from a comprehensive SPARS study of recommended audio recording practices. This SPARS study comprised a survey of almost 70 questions sent to member studios which was designed to elucidate information about the studio's working practices.

A summary of the questions and replies, together with editorial comment appears in the November issue of the American magazine *dB*. The results of the survey and the panel discussion pointed to the fact that although no de facto standards exist, the day-to-day working practices of the SPARS member studios were very similar in most areas, and in the main conformed to the ideal. In view of this conclusion it is likely that a SPARS working group will be formed to discuss in detail the subject areas involved, with the eventual aim being the formulation of an official SPARS standard for studio working practices covering such items as test tones, operating level, azimuth, leader tape, noise reduction, and SMPTE time code.

The final result of the SPARS deliberations will, they hope, be a set of standards allowing master tapes to be easily interchangeable between studios, each of these studios operating with a common set of alignment and working practice standards. One potential problem area with this intention is the problem of the internationalism of the recording industry. It may well turn out that a SPARS standard would be differently structured to the working practices operated by studios in the UK, Europe and the remainder of the world. However, if for example the APRS in the UK and international standards bodies were involved in the SPARS deliberations, it may well prove possible to formulate operating practices which are totally international, are recommended by all the participating bodies, and which are actually adhered to by studios throughout the world.

Now well into its second year, SPARS has come a long way since its inception. Its first conference held at last year's New York AES Convention proved to be a successful event and this year's offering was to my mind even better. As a trade organisation SPARS has rapidly established itself as an influential body, responsive not only to the needs of its members, but also to those of equipment manufacturers and suppliers, and other outside bodies. Perhaps the only criticism that could be levelled at the organisation is that its membership criteria are too exclusive. There has been much internal debate within SPARS on this particular question, however, it was interesting to note that at its most recent general meeting a proposal that a major expansion of membership be embarked upon was unanimously approved. The exact nature of how membership should be expanded has still to be decided, but it is probable that some form of associate category will be devised. Coinciding with this move, SPARS have also asked Jules Malamud, founder and executive director for 17 years of NARM to lead the organisation's expansion, and he has agreed to oversee this task. ■



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Part 5 ~ Signal Switching

SIGNAL routing within the channel and other areas of the system is a prickly problem that has always been an area of much discontent for designers, especially since the advent of in-line consoles and projected function programmability. There are the old standard belt and-and-braces answers—relay systems—but these have lost, justifiably, a lot of appeal in the light of current technological advances.

Unless they are of the dizzyingly expensive miniature IC package variety, relays tend to be big, heavy, eventually unreliable, mechanically noisy and a nuisance to implement electronically, demanding support circuitry such as back-emf protection diodes and drive transistors for a realistically operable system. The coils, being inductive in nature draw a surprisingly large instantaneous 'on' current and release an equally surprisingly large amount of back-emf energy upon deactivation. Both of these—through mutual-inductance coupling, dubious common ground paths (even as far back as the master ground termination in separated supply systems), twitchy power supplies and even (it has been known) mechanical microphonic effects—tend to impinge themselves on audio signal paths as clicks, splats and other assorted bumps in the night. Of course it's possible to have silent relay switching, but after designing in separate ground un-related power supplies of considerable 'heft', spatially separated the relays from the audio, preferably on another card, worked out the drive interfaces and liberally sprinkled the whole issue with diodes, resistors and

capacitors to tame the transients, you'll wish you'd taken up making telephone exchanges instead.

Certain routing applications do implicitly require relays, and their lack of concern about the amount of dc and either common-mode or differential signals of absurd quantities that may accompany the audio in balanced networks. Such circumstances are to be found anywhere a telephone line is.

Primarily, then, this is almost specifically a broadcasters' problem, where many external high-quality sources appear down 'phone lines and are routed before hitting either the station's internal distribution amplifier system or even a desk line input directly. 'Outside Source Selection', as it's called, does not—fortunately—have the same splat-elimination constraints as intra-console switching, since the signal is nearly always of high level, balanced, is riding with at least a little dc which will unavoidably click upon switching, but most importantly the selector is very unlikely to be switched whilst actually on-air. The BBC argue otherwise, but even *they* admit to not having an answer to the noticeable resultant clicks.

So, what are the alternatives to relays?

Electronic switching

The basic outline characteristics for an audio switch are simply that it has an infinite 'off' impedance and zero 'on' impedance, and that its control be isolated from the through path. In the real world, of course, some leeway has to be given, but fortunately not much in these basics, but more in subtleties.

Transistors are out, despite their high on-off impedance ratios, because they are essentially unidirectional in current flow, and the control port (the base) is actually half of the signal path as well.

Field effect transistors have been and still are used extensively for switching. They again have a high on/off ratio, the control port (the gate) is of extremely high impedance and well isolated from the signal path, but the gate on/ off voltage levels are a bit awkward for interfacing with logic control signals. It is bidirectional, its channel path being essentially just a voltage-controlled resistor, but the 'on' resistance tends to vary a bit with the varying audio voltage across it (auto-modulation) hence distortion in the more basic FET switching configurations can be a problem.

Closely related to FETs are MOSFETs, a different chemical structure and physical construction, but of essentially similar characteristics with the pleasant exceptions that the gate is of even higher impedance and better isolated, the control voltage swing required also being easier to deal with. Complementary MOSFET elements (CMOS), connected back-to-back to form virtually ideal bidirectional analogue transmission gates are nowadays manufactured in all manner of variations and packages by IC manufacturers. Early versions of CMOS transmission gates had some rather untoward vices. They were 'raw' CMOS elements and one of their main attributes, the extremely high impedances in their 'off' states and of their control ports, made them liable to destruction by

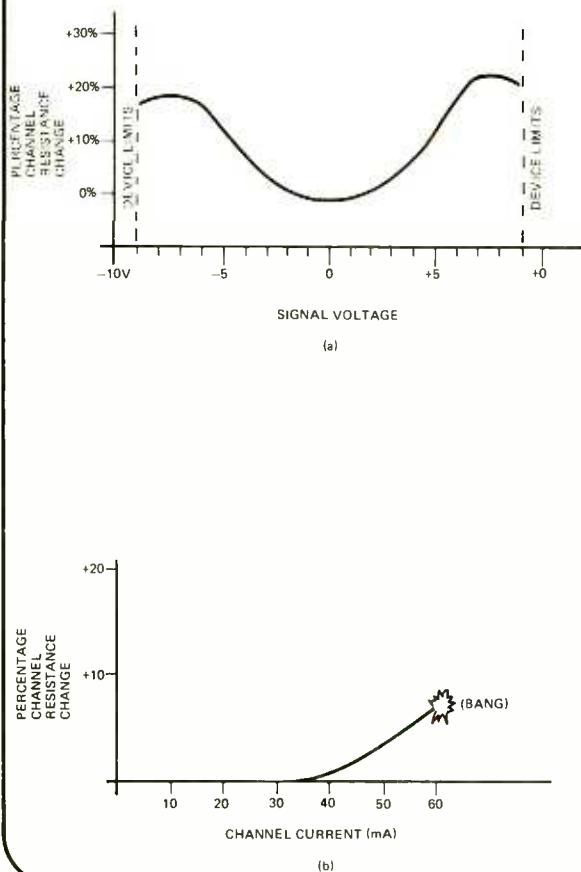
fairly everyday amounts of static electricity—cleaning the IC pins by rubbing them on a nylon pullover sleeve was just not on. Also, they tended to latch up easily should any of the MOS junctions inadvertently get reverse-biased into conduction. Most current devices are now gate-protected to prevent static-blating, and the worst that happens with the audio signal exceeding the switch rail voltage by a small amount now is that the switch 'breaks over', not resulting in the terminal consequences it once did.

Perhaps the best-known and most-used switch of this kind is the *4016* (and its brother the *4066*, which is identical but for a lower 'on' resistance). It is a 14-pin dil package containing four independently-controllable CMOS transmission gates. Each gate can pass up to the IC's rail voltage (typically 18V) into a load impedance of down to 1k Ω at a rated distortion of about 0.4% in the most basic of switching formats. Obviously both the distortion figure and the headroom availability of 18dB above 0.775V (for 18V supply) are both woefully inadequate by today's expected console standards. Another less obvious pitfall is the decreasing switch isolation at high frequencies due to leakage capacitance.

CMOS characteristics

Fig 27a gives a typical representation of the variation of a CMOS transmission gate's 'on' resistance with signal voltage applied to the gate. This variation in resistance is of course the source of the distortion. If we could restrict the signal voltage to within that nice (linearish) bit in the

FIG. 27 TYPICAL C-MOS TRANSMISSION GATE ON-RESISTANCE CHARACTERISTICS



middle . . . or better still virtually eliminate the signal voltage altogether . . .

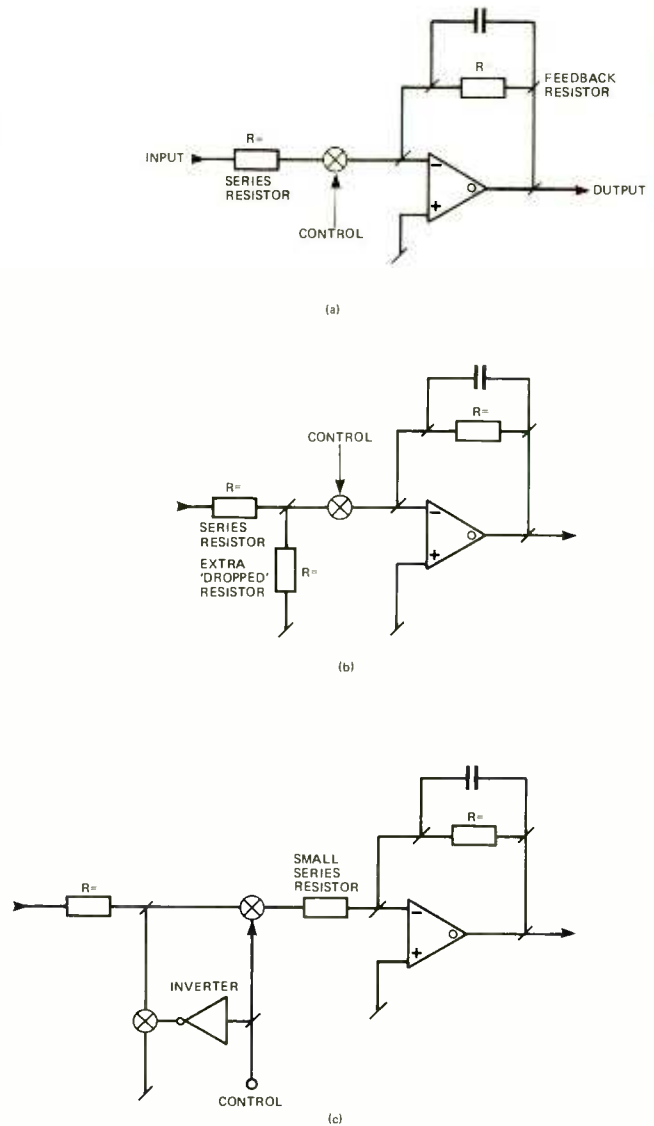
Placing the switching element right up against a virtual earth point as in **fig 28a** achieves this signal voltage elimination, the switch now behaving as a two state resistor almost perfectly. When closed, the 'on' resistance variation (which will be small anyway because of the very low voltage swing across it) will be effectively swamped by the (relatively) much larger series resistance. When open, the 'off' resistance extends the total series resistance to a value approaching infinity. In practice, the on/off ratio is not really adequate. Capacitance across printed circuit tracks and in the device encapsulation itself, combined with common-ground current and other essentially flat-response crosstalk mechanisms result in a cross-switch leakage characteristic ultimately rising 6dB/octave against frequency. Also, despite the fact that the distortion problem is now resolved, there still remains a headroom problem when the switch is open. If the source voltage presented to the series resistor exceeds that of the CMOS gates' supply rails, the gate will

'break over', turning on for that excessive portion of the input waveform.

Dropping a resistor equal in value to that of the series resistor from the junction of that resistor and the gate to ground (**fig 28b**) is a working approach. The maximum signal that can be present across the gate when 'off' is now half that previously, which is usually more than enough to prevent break-over. This 6dB loss is magically made up for in the 'on' mode because the signal's source resistance into the virtual earth amplifier is now halved (series resistance effectively in parallel with the dropped resistor). Incidentally, the crosstalk improves as a consequence by almost 6dB also, but—swings and roundabouts—the noise output from the amplifier is degraded by 6dB since we're asking it to provide that much gain. For many practical purposes, this switching configuration, with its performance as defined, is quite adequate. For instance, the noise and crosstalk characteristics are a good order of magnitude superior to any analogue multitrack recorder, so this element could be a good choice for a track assignment routing matrix.

A refinement of this element—in

FIG. 28 SWITCHING ARRANGEMENTS USING C-MOS TRANSMISSION GATES



fact really an extension of the same principle—is shown in **fig 28c**. Here, a second analogue transmission gate replaces the dropped resistor, and is driven through an inverter from the control line for the original gate, arranging for it to be 'on' when the other is 'off' and vice-versa. When the original gate is 'on' there is very little potential across either of the gates, and similarly, when the second gate is 'on', since it is tying the series resistor to ground, crosstalk is dramatically improved, since when the element is 'off', any signal present at the series resistor faces the double attenuation of the series resistor into the 'on' second gate followed by the 'off' original gate into the virtual earth input of the amp. In the elements' 'on' mode, there is no input attenuation, hence

no gain and no extra noise contribution from the amp. The only limitation now to this switching elements' cross-switch leakage characteristic is pc card layout and grounding arrangements. Given a good home this element is virtually unmeasurable. It does, however, have one naughty quirk that may preclude its use in some places. Unless a great deal of bother is gone to to arrange complementary on/off switching timing for the two gates, they are both momentarily partially 'on' together during a switching transition. This, for an instant, ties the virtual earth amp input to ground via the quite low 'half-on' impedances of the two 'seriesed' gates. This creates an instantaneous burst of extremely high gain in the

Mixing console

amp which shows as a transient of noise, or worse still, as a 'splat' if any dc offset is present at the virtual earth point. It can be minimised, or at least the extent of the transient defined, by a small value resistor in series with the input (fig 28c). This will, of course, increase the signal voltage across the gates and hence increase the distortion, so a compromise has to be struck to suit the given application. However, excessive distortion should not be a problem.

In order to reduce the thermal noise contribution to the circuit noise performance, the resistances involved in switching should be as low as practically possible, consistent with device limitations and the ground current arrangements. The feedback resistor around the virtual-earth stage is limited by the op-amp's output drive capability, bearing in

mind it has to drive its load, too! Fig 27b demonstrates a typical CMOS switching element's channel resistance variation with through current—it behaves quite nicely and linearly until about 40mA, which actually compares more than favourably with the output drive current capability of an op-amp. As a rule of thumb then, the resistors used around analogue gate switching circuits can be as low as 2.2kΩ.

A practical matrix

The 4000 series of CMOS devices—which are very commonly used—have one important feature at odds with general mixer technology—their maximum supply voltages. The earlier 4000 'A' series were limited to 15V total (as compared to the 36V total used in this particular console design) whilst the more recent buffered 'B' series can stand 18V, with a bit more at a squeeze (Who said that!?). Whilst this is immaterial, given the virtual-earth switching technique, it is a pain

having to provide for and derive a differential $\pm 5V$ supply either centrally or on each card in addition to the main differential 18V rails. Many IC manufacturers however, notably Siliconix and Harris, produce analogue switching packages not only capable of running directly off the full mixer rail voltage, but also in switching configurations that can be directly and usefully applied to our purposes (despite the fact that they were designed for something else completely). Fig 29 shows one mixer channel's worth of a digitally-assigned 32-track routing matrix, designed around a pair of Harris H1506A 16-way multiplexers.

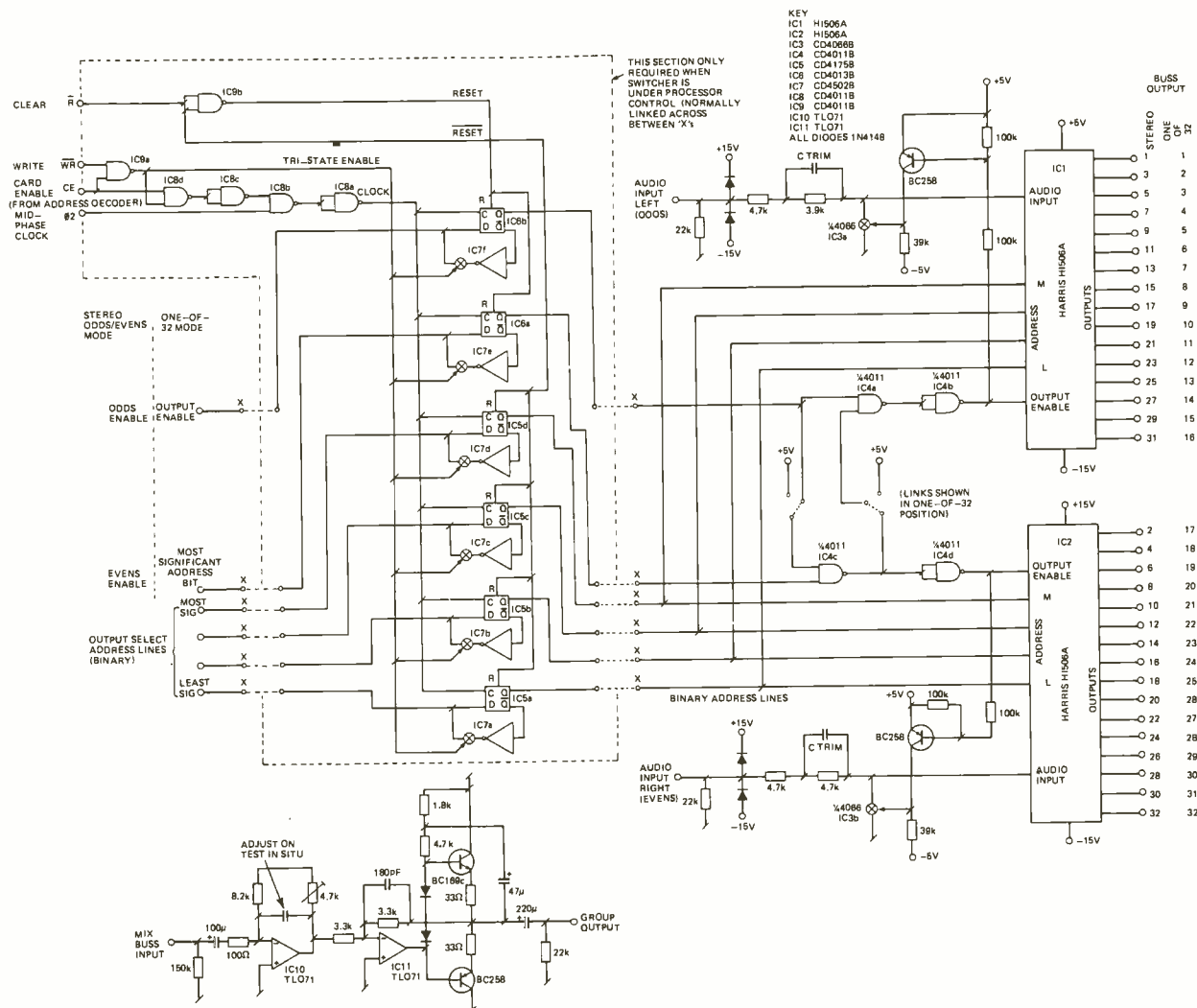
The 506A contains sixteen analogue transmission gates tied to one common 'output' (which we will cross out and pencil in 'input' instead). Each of the free ends of the gates do not pass go, and go directly to a mix buss each. They all share a common series source resistor via the input port. Since only one of these gates can be open at a time—the one

corresponding to the binary 4-bit address code on the address inputs—there is no possibility of two or more busses being inadvertently shorted together. The device manufacturers proudly point out the 'break-before-make' delay in switching, meaning that a newly selected gate waits until the previous one has de-latched, so there isn't even a momentary switching short.

Crosstalk with this configuration (which you will notice is a variation between figs 28a and c is extremely good. Again there is the double attenuation of the series resistor into the 'on' gate (some 20dB to start with) followed by any 'off' gate into any of the other virtually zero impedance mixing busses. A slightly more critical crosstalk situation could exist when all the gates are turned 'off' (by tying the 506's enable low (pin 18)) since the first set of attenuation no longer exists. This is why external switching elements (IC3a and IC3b) are arranged to tie

64 ▶

FIG. 29 PROCESSOR CONTROLLABLE MATRIX ROUTING CARD



F.W.O. Bauch Limited
49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ
Telephone 01-953 0091 Telex 27502

MR-2

MR-2 delivers more usable console for the money. Efficient design has reduced the labor and material content, while improving features, signal handling, and reliability.

MR-2 offers a full range of options and features, allowing you to specialize your console to your functional and budgeting needs.

MR-2 expansion frames and module update kits continue to keep your console matched to your future needs.

Resale prices of Harrison-designed-and-built consoles demonstrate that MR-2 will continue to protect you even at trade-in.

More Usable Console for the Money?

Somehow that sounds like cheating—as though you could get something for nothing. NOT SO!!

The secret is to eliminate things that cost money but do not add any function or "quality" to the console.

The console designers at Harrison Systems have identified many traditional inefficiencies and have eliminated these in the design of MR-2.

Printed-circuit boards have been made smaller (thus, less expensive) through the use of double-sided artwork and a more meticulous, time-consuming design process.

Almost all hand-wiring in the frame has been eliminated. Mother-board-mounted multi-pin connectors are used for inputs and outputs.

Seldom-used features (like Quad) have been eliminated and replaced with more desirable and useful features.

Module width has been reduced to 40.6 mm (1.6"), thus reducing metal-work cost for a given console size.

In other words, every small detail of the MR-2 design has been critically optimized for efficiency. This efficiency does not mean, however, a reduction in signal-handling quality or reliability. In fact, just the opposite is true.

A radical new multiple-ground system is at work to even further reduce induced noise.

Modern "dielectrically isolated" switches are used for all logically controlled switch functions.

Patch points now operate full line level (+4 dBu or +6 dBu) and are isolated and balanced.

These are only a few of the reasons that allow us to confidently say that MR-2 is the most efficient, cost-effective console ever offered by anyone to the industry.

We think you will agree and make it your choice as well.

 **Harrison**
NOW MORE THAN EVER



Mixing console

the end junction of the series resistor and the 506 inputs to ground whenever the enable lines are low.

Crosstalk is now completely down to the interconnections to this card, power supply decoupling, solid and correct ground paths but mostly to inductive and buss/earth/buss eddy-current coupling between the virtual earth busses themselves: yet another design area where performance is completely determined by mechanical considerations...

The same switching card may be configured—merely by changing two wire links—in two different routing formats. The first enables a stereo pair of signals (say the planned outputs of a channel) to be routed to adjacent pairs of outputs, ie 1 and 2, 7 and 8, 27 and 28, etc, where the odd numbers represent 'left' and the evens 'right'. Either odds or evens may be accessed singly by suitable feeds to the 'odds enable' and 'evens enable' control inputs. Quite obviously these also facilitate disabling (turning off completely) the routing.

A 4-bit binary control buss selects which pair of the possible 16 pairs may be accessed, so these six control lines are all that need to be extended to the channel module where simple switchery performs all routing requirements.

When the aforementioned wiring links are made in the fashion shown in fig 29 the card becomes configured as a one-source-into-32 destination switcher, necessitating some control function changes. 'Evens enable' becomes the additional highest significant bit of the destination address code (five bits are needed for 32 combinations) whilst 'odds enable' turns into the switcher's enable/disable control. (The benefit, in both modes, of disabling the switcher when not actually in use is that it removes the feed totally from the destination busses, therefore not impairing their performance at all, whilst not disturbing a pre-selected routing set up on the address lines.)

With the same signal applied to both the audio inputs, it is now possible to access any one of the 32 busses.

Processor control

The seemingly great mass of logic circuitry enclosed in the dotted lines allows the card to be controlled by a computer or central processing unit (CPU). All it really is, is six flip-flops acting as memory elements (so that the card can remember what the CPU has told it to do) and six tri-state buffers that, on request, tell the CPU what the card is actually doing. These little chunks of memory both save the CPU having to store the information

TABLE 1
PROCESSOR I/O LINES DEDICATION

CPU I/O	1	CARD ADDRESS	—least significant bit (LSB) (Seven binary bits allow up to 128 matrix routing cards to be separately addressed)
	2	CARD ADDRESS	
	3	CARD ADDRESS	
	4	CARD ADDRESS	
	5	CARD ADDRESS	
	6	CARD ADDRESS	
	7	CARD ADDRESS	
	8	R RESET or CLEAR	—most significant bit (MSB) (When this bit is down, all memory is cleared)
CPU I/O	9	W WRITE	(This bit down allows data on lines 11-16 to be stuffed into memory)
	10	φ2 MID-PHASE CLOCK	(Clock pulse delayed slightly to allow data and address to settle before enabling the memory)
	11	DATA	} Matrix card, output or selection
	12	DATA	
	13	DATA	
	14	DATA	
	15	DATA	
	16	DATA	

somewhere else and also act as a very useful diagnostic aid to help find out what isn't doing what, where and why—something that anyone who has played with computers or large logic systems will immediately realise the value of!

For ordinary direct operation, this logic would be left off the card and linked across (between the 'x's on the diagram). The gaggle of NAND gates in the top left hand corner merely organises the CPU buss information to fire the appropriate clock, enables and resets to the memory elements.

CMOS 4000 series logic operating at 5V is not the fastest logic family in existence and would probably prove too slow for most recent microprocessor CPUs. This is not a problem in reality since the practical way of dealing with this would be to hang the entire switching matrix logic system off a bunch of the CPU input/output lines, masquerading as a local address/data/control buss system.

A nice convenient 16 I/O lines are required (two lots of eight—handy

for micros) and these are formatted in Table 1. Being software controlled, the I/O lines may be timed a little more gently than the hardware-determined processor busses.

A separate address decoder card takes however many of the card-address bits are required (5 for 32, 6 for 64, 7 for 128) and generates the decoded feeds for the 'card enable' (CE) on each matrix card.

Audio path

Enough of this digital junk. If you've survived without migraine, in the bottom left-hand corner of fig 29, hide a good old-fashioned analogue mix amp and line amp which are the group output stages for the channel to which the particular matrix card is relevant. Where else to put them except on the matrix card where they can't get any closer to the busses?

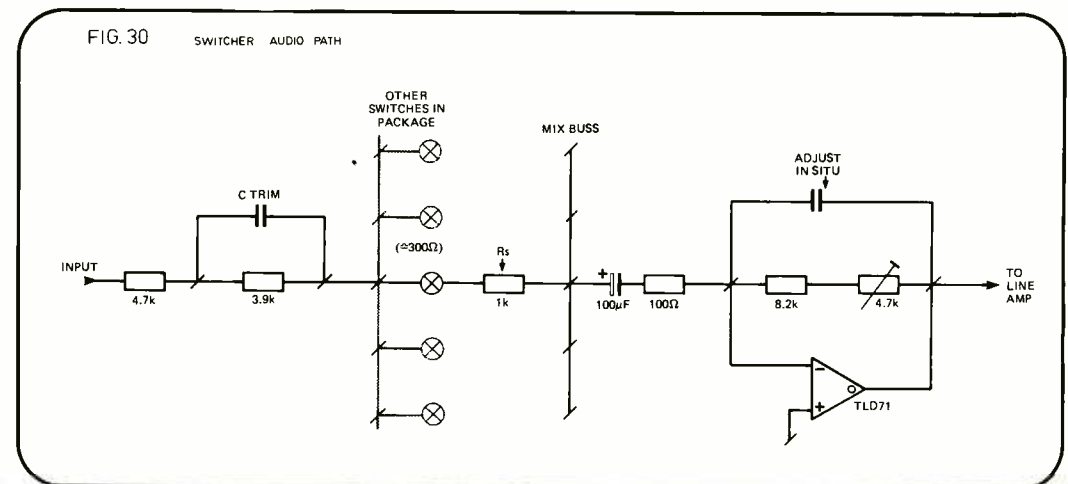
The mix buss input is tied on the back of the edge-connector to the buss it is responsible for—this ensures card replaceability and redundancy.

Note! No values are attributed to the feedback capacitor around the mix amp, since this not only has to compensate for the amp's own tendency to oscillation but for the added irritation to this of the buss impedance—an unknown until actual construction. Similarly, astute circuitophiles will note a 'bodgette' in the form of a capacitor across part of the switcher's input series resistance. This provides a variable hf 'kick' which can be of assistance in sorting out frequency and phase response quirks in particularly horrid buss systems—this is fortunately very rarely needed and is provided 'just in case'.

Fig 30 shows the audio path through the switcher, devoid of frills. The mystery 1k resistor, Rs, which does not appear on fig 29, is internal to the H1506A, appearing on each of the switches 'inputs'. Although a minor nuisance in this application (it means the MOSFETs are not actually switching a 'zero' impedance) they are part of the device's internal protection against, principally, static electricity. A worthwhile sacrifice. Harris do make an unprotected version, the H1506, with all the switching elements exposed (which would mean that the device's 'on' impedance would be down to the 300-odd ohms of the element as opposed to the 1.3k-ish of the H1506A) but the use of an expensive unprotected IC on a plug-in card such as this has a very high cringe-factor.

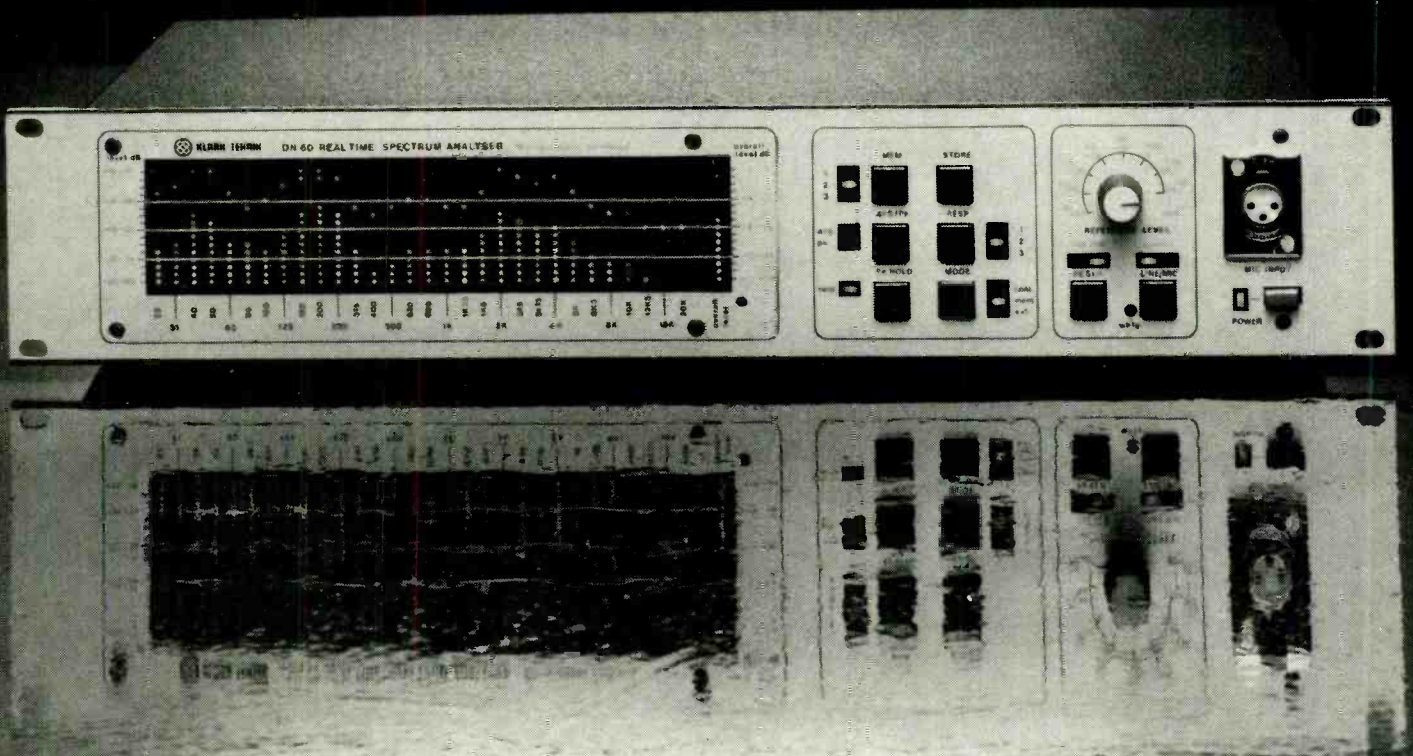
The total source impedance before the buss is around 9.9k, which with the addition of the 100Ω buffering resistor becomes 10k before the virtual-earth input of the mix amp. A gain trim 4.7kΩ resistor in series with 8.2kΩ gives a gain determining feedback resistor swing of approx 8.2kΩ to 12.9kΩ, corresponding to a tweak swing of -1.7dB to 2.2dB.

The line amp is quite unremarkable, being a simple beefed-up inverting amplifier—necessary to maintain the absolute input/output phase relationship.



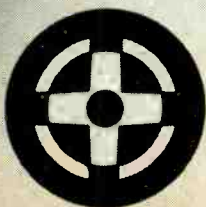
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Japan Continental Far East, Tokyo. Tel: 81-3-583-8451 South Africa Leephy (Pty) Ltd., Johannesburg 2092. Tel: 010-48-3821 Spain Neotecnica S.A.E., Madrid. Tel: 34-1-242-09-00
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Survey: mixing

consoles N-Z



Peavey Mark 2 MC-12

NEOTEK (USA)

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

Series I

Fully modular range of recording consoles with 16, 24 and 32 input channels and 4 or 8 output busses. Version with 12 busses available known as the *Theater System* in addition to custom versions with different channel configurations. Features transformerless design throughout with mic/line gain and switching, 3-band eq with mid range parametric having high/low Q, variable highpass filter, peaking LED, 2 echo send, 2 cue send with pre/post switching, solo, pan, conductive plastic faders and VU meters.

Price: from \$6,200 to \$12,950.

Series II

Similar to *Series I* in the configurations available and in design but more comprehensive eq with two parametric midrange bands having switchable Q, parametric lowband switchable from one octave peak/dip to tunable highpass filter and parametric highband switchable from peaking to shelving responses.

Price: from \$7,400 to \$15,350.

Series III

Range of multitrack recording consoles available in 16-, 24- and 32-track versions. The design features in-line monitoring and FET switching with master logic control, 4-band parametric eq, stereo and mono solo, group muting and in-place solo from master logic, light column peak/VU metering, full monitoring functions and patch bay. Wide range of options available.

Price: from \$15,245.

Series IV

Range of multitrack recording consoles similar to the *Series III* but with additional features including 6 auxiliary sends switched by console status, with each of the buss masters having 2-band eq, solo, mute and level indication, a master mute function, split eq capability enabling equalisation of monitor and recording channel at same time.

Price: on application.

Automation

All Neotek consoles may be fitted with Allison or MCI automation either to order or as a retrofit. This is achieved by removing the faders which on all consoles are mounted separately to the channel modules.

NEPTUNE (USA)

Neptune Electronics Inc, 934 NE 25th Avenue, Portland, Oregon 97232, USA.

Phone: (503) 232-4445.

UK: Court Acoustics, 35/39 Britannia Row, London N1 8QH.

Phone: 01-359 0956.

410P

4-channel mixer with high/low impedance inputs and integral 100W power amp and reverb. Bass and treble eq with effects send on each channel and master controls.

610P

As the 410P but has 6 input channels and the addition of a 5-band graphic equaliser.

611

6-input mono mixer with balanced or unbalanced inputs, monitor and effects sends with built in reverb, master controls with output patching on each channel. Free standing or rack mounting option.

821

8-channel stereo general purpose console with balanced low impedance mic inputs and line input, 3-band eq, monitor and effects sends, effects return with pan, separate input preamp, built in reverb with master controls, LED output meters with VU response, choice of balanced or unbalanced outputs. Free standing or rack mounting options.

1420

14-channel stereo console similar to 821 but with two effects sends, solo, pan control, two master sends and returns with panning, integral 5W headphone amp with headphone solo switching.

NEUMANN (West Germany)

Georg Neumann GmbH, 1 Berlin 61, Charlottenstrasse 3, West Germany.

Phone: 030 251 4091. Telex: 184595.

UK: F W O Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ.

Phone: 01-953 0091. Telex: 27502.

Range of modules that can be assembled into mixing console to provide exact requirements. Includes mic amp, equaliser, dual booster amp, dual buss amp in O and P ranges as well as stereo/mono faders, peak level indicators, VU meters, overload indicators, talkback amp, limiter amp, test oscillator, electronic switching, power supplies, phantom powering and a variety of modules for special purposes. A standard design housing is available as are custom designs.

NEVE (UK)

Neve Electronics International Ltd, Cambridge House, Melbourn, Royston, Herts SG8 6AU.

Phone: 0763 60776. Telex: 81381.

USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, Conn 06801.

Phone: (203) 744-6230. Telex: 969638.

8108

Multitrack recording and mixdown console with maximum of 56 input channels and 48-track capability, microprocessor controlled routing, interrogation system for display of routing, bargraph metering with VU/PPM response, VCA sub-grouping as standard, 4-band parametric eq with high/lowpass parametric filters and 6 auxiliary sends.

5315

Range of consoles for TV and radio production and 4-track sound recording. Fully modular design with 12 or 24 inputs assignable to four subgroups or two main outputs with four auxiliary sends. Choice of two equalisers, phantom powering, metering and other options.

5316

Broadcast/recording consoles with 24 or 36 input channels routable to eight buss outputs for 8-track recording or to a stereo main output. Auxiliary and solo outputs may be fed from channels and groups. With the auxiliary routing unit, two PA outputs can be fed. Choice of two equalisers and a wide range of options. Suitable for studio or vehicle installation.

542

Compact suitcase portable 8/2 mixing console with full eq on each channel. Two VU meters standard option for PPM, XLR connectors, internal nicad batteries for several hours' operation. Rack mounting version available.

5452/5462

Mixing consoles intended for location or studio broadcast use where more channels than the eight on the 542 are required. Both units are 16-channel 2-group with one main out and use the same channels as the 542 and a similar monitor panel. The 5452 is 'Drop Thro' in design while the 5462 is for table top operation.

Necam

A minicomputer based automated mixing system which may be used with existing or new consoles and provides operation of faders and associated mute circuits in its basic form. Full remote control and locate facilities are provided for the multitrack tape recorder and the console uses servo controlled faders with plastic tracks which enable manual override to be performed. The audio tape has SMPTE timecode recorded on one track with a special wide bandwidth head amp to enable this to be read at high winding speeds. Up to 999 points of the tape may be 'labelled' for use in automated runs. A small control unit with 16 instruction keys, a numeric keypad and a 32 character alphanumeric display provides full instruction for the computer. Two floppy discs are used to store data.

A new form of Necam is now available known as Necam 'II' for post-production suites.

PACIFIC RECORDERS (USA)

Pacific Recorders and Engineering Corp, 11100 Roselle St, San Diego, Cal 92121, USA.

Phone: (714) 453-3255. Telex: 695008.

BMX

Compact broadcast console with choice of main-frame size. Fully modular with mic and line input modules offering choice of A or B inputs, routing to program or audition stereo busses, P & G faders and channel on/off switching that commands CMOS logic for tape or turntable control. The line modules are stereo switchable mono or half stereo. Other modules include control room monitor, studio monitor/talkback and remote line selector modules. VU meters are standard but PPMs are optional.

Other features are standard including automatic starting of the digital timer linked with designated inputs being turned on. An additional range of equipment is available to interface with ancillary equipment.

PANASONIC (Japan)

USA: Panasonic Professional Audio Division, Matsushita Electric Corporation of America, One Panasonic Way, Secaucus, New Jersey 07194.

Phone: (201) 348-7000. Telex: 710-992 8996.

UK: National Panasonic Ltd., 308-318 Bath Road, Slough SL3 6JB.

Phone: 0753 34522. Telex: 847652.

Model WR-130

Portable 8/2 mixer designed for variety of broadcast applications. Each channel features input level select with channels 1-4 having disc input, high and low shelving eq, pre-mix level, pan, peak level LED and the fader. The output section has high and low eq, auxiliary inputs, echo send and returns, headphone facilities, VU metering and high impedance auxiliary output as well as main line level out.

PARTRIDGE (UK)

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

Phone: 03745 3256.

Range of mixers for various scale operations in broadcast and recording between 5/1 and 2/4/8 formats. Wide range of possible designs and con-

Survey

figurations based on a modular system incorporating all types of inputs, ie mic, disc, line, etc, with eq, foldback, pan, PFL, subgroup and routing facilities also ducking, comp/limiter and metering.

Mini Mixer

5-channel mini mixer in 5/1 or 10/2 format. Meter switchable, single bass/treble and gain controls.

PEAVEY (USA)

Peavey Electronics Corp, 711A Street, Meridan, Mississippi 39301, USA.
Phone: (601) 483-3565.

UK: Peavey Electronics (UK) Ltd, Unit 8, New Road, Ridgewood, Uckfield, Sussex TN22 5SX.
Phone: 0825 5566. Telex: 957098.

Mark 2 Series MC8/12/16/24

Stereo mixers with eight, 12, 16 and 24 channels respectively, LED overload indicator and 4-band eq on each channel, stereo pan, LED ladder on main and sum (40dB range), stereo headphones, balanced inputs and outputs, on XLR, line and breaks on jacks.

MR-7

Similar to above but rack mountable with transit case and only seven channels.

MR-600

Rack mounting 6-channel mono mixer for sound reinforcement. Each channel features input attenuation, monitor send, high and low eq, effects send, high and low impedance inputs and fader. Master section contains high and low eq effects and auxiliary level controls, output level and reverb controls.

600 Stereo

Similar to the MR-600 but a stereo format with the addition of pan controls and housed in a console.

1201/801

Sound reinforcement mixers featuring XLR connectors, two pre monitor sends, 3-band eq, post effects send, choice of high/low level and impedance inputs, PFL, input gain and channel faders. LED metering of main and monitor output groups.

PERFECTONE (Switzerland)

Produits Perfectone SA, Ringstrasse 3, Portmoos, CH-2560 Nidau/Bienne, Switzerland.
Phone: 032 51.12.12. Telex: 34383.

UK: Future Film Developments, 36/38 Lexington Street, London W1V 3LE.
Phone: 01-437 1892. Telex: 21624.

NT 4101/NT 6101

Portable mixers with 4 or 6 channels respectively containing fader, mute, mic/line select, switchable input attenuator, 3-band eq, XLR input and reverb mini-jack break point. The master module contains output fader, test oscillator, talkback mic and switch, headphone level, on/off/battery select and VU or peak meter. The mixer may be powered by mains, dry cells or rechargeable nickel cadmium batteries.

PLUS 30 (France)

Plus 30, 37 Rue des Annelets, 75019 Paris, France.
Phone: (1)202.21.02.

Modular mixer

Modular mixing console with combined input/output modules offering high, mid and low eq, high-pass filter, mic/line inputs, cue and echo sends, complex monitoring including panning. P & G faders, echo return modules, general module with communication and oscillator, remote tape starts etc.

PRIMROSE (UK)

Primrose Electronics Ltd, Reddings, Kirby On Bain, Woodhall Spa, Lincs.
Phone: 0526 52950.

Primrose do not currently manufacture any off-the-shelf mixers but are geared to custom building in a variety of formats such as the PEL202. Primrose can also manufacture recording consoles and have

so far completed mixers ranging from a simple 5/1 for TV editing to a 20/8 for multitrack recording.



PEL 202

Modular PA mixer with 3 stereo groups and comprehensive metering and monitoring facilities. Choice of mono mic/line, stereo line or quad line input modules with full 4-band eq, echo, foldback, PFL, PFL level indicators and P & G faders. Flight case version has built in echo system. LED level meters with PPM response. May be built with up to 30 interchangeable input channels.

PROGRESSIVE (UK)

Progressive Electronic Products Ltd, 83 Leonard Street, London EC2A 4RB, UK.
Phone: 01-729 5411.

Modules

Manufacturers of console modules available in various forms, from basic CM-1 (mic/line inputs, 3-band eq, four aux sends, PFL, 2/8 outputs) to CM10 in-line module (mic/line I/Ps, 4-band parametric eq, high/lowpass filters, phantom power, six aux sends, two inserts, solo and PFL, 2/32 O/P); GM-1 group module: two echo returns, A/B monitor switching, external VU and fader; GM-7B includes LED metering; VEM-1 virtual earth mixing module, LHD-1 headphone driver. Full range of mic preamps, mixer, etc, cards available. Two year guarantee. Further data in December 1978 *Studio Sound* review or on request.

Prices: CM-1 £70.26, GM-1 £57.46, GM-7B £78.52, CM-10, £450 approx, VEM-1 £4.95, LHD-1 £7.15. (PSU, metering, faders, cabinet extra).

PROTECH (USA)

ProTech Audio Corp, PO Box 638, Lake Ronkonkoma, NY 11779, USA.
Phone: (516) 473-5979.

Integra 3

Large range of PC card modules for assembly into a wide variety of mixing consoles.

ICBM Series

Range of modules for assembly into modular broadcast mixers. Completed ICBM mixers can also be supplied in assembled or kit form.

FPC Series

Range of portable consoles for sound mixing and recording from 8/4 to 16/8 with custom variations available.

3000 Series

Broadcast consoles ranging from 5-channel mono with dual outputs to 12-channel stereo with dual stereo outputs. Uses the Integra 3 series of modules. Includes built in 10W monitor amps, cue speaker, talkback and headphones facilities, VU meters with optional peak indicators, remote starts, cue light control and provision for limiter/compressors on each channel.

Television Audio Consoles

Range of consoles that can be varied to requirements from 16 input channels to 32 plus with large choice of options. Features choice of 4 inputs/channel, three submaster channels with VU metering, two program output channels with VU metering, two monitor output channels, headphone facilities, talkback to two studios and cue channel with built-in speaker.

PYE (UK)

Pye TVT Ltd, Coldhams Lane, Cambridge CB1 3JU, UK.
Phone: 0223 45115. Telex: 81103.

SM8

Eight input channels selectable from three input channels: mono mic/line, stereo disc or stereo high level. Channels include sensitivity, PFL, foldback, pan. P & G faders standard. Custom version with switching for up to 48 sources. Talkback may be

used externally if required. Eq ± 8 dB at 3/5/8kHz and 60/120/240Hz and ± 10 dB at 0.7/2.4/4kHz. Fader backstop switches accessible for cue or machine start. Mono output from normal two groups working. Wide range monitoring and flexible switching, with interlock or talkback.

SM12

Compact 12/4 portable/studio/OB mixer based on narrow 30mm modules. Channels include: mic/line; pan between predetermined groups; eq ± 15 dB at 30/60/120/240Hz, 0.5/1/1.4/2.4/4/7kHz and 2/3/5/7/10/15kHz; three subgroups pre/post each feeding one of two busses; phase; Comprehensive group and channel monitoring. Master and appropriate return controls for echo and aux. Comprehensive talkback.

QRK (USA)

QRK Electronic Products Inc, 1568 North Sierra Vista, Fresno, Cal 93703, USA.
Phone: (209) 251 4213.

Omega Audio Console

Broadcast console featuring digital switching, IC control of stereo signal channels to ensure minimal tracking error, switchable metering, digital clock and elapsed timer, remote start switching and RFI protection. Each input channel has four inputs with LED indication and programmable gain selection.

BroadKaster

Small 4/1 remote broadcasting mixer with two inputs per channel and three mono or stereo outputs for program, PA output and headphones. The input modules are plug-in to allow selection of high or low type. The headphone output has a 10W amp output. All the electronics are on removable boards for ease of servicing. VU metering.

QUAD/EIGHT (USA)

Quad/Eight Electronics, 11929 Vose Street, North Hollywood, California 91605, USA.
Phone: (213) 764-1516. Telex: 662446.

UK: Audio Kinetics (UK) Ltd, Verulam Road, St Albans AL3 4DH.
Phone: 0727 32191.

Pacifica

Modular mixer using combined input/output modules configured with 16, 24, 36 inputs, eight mixing busses and stereo mixdown and monitoring capability. Two independent cue mixing circuits are provided together with four separate aux sends. Console is transformerless except for mic input, programme, foldback and echo outputs. Modules include input/output, input/master mix, echo send/return control room monitor, studio monitor, communications modules.

Brentwood/Coronado

VCA designed multitrack recording mixdown console with six subgroup masters assignable independently from each input. The consoles accommodate 24 or 36 inputs and have 24 mixing busses with quad down and monitoring capability (in-line). Otherwise similar to Pacifica.

Compumix III

Automation system that can be updated from conventional data storage on multitrack tape or the more versatile floppy disc memory.

QUANTUM (USA)

Quantum Audio Labs Inc, 1905 Riverside Drive, Glendale, California 91201, USA.
Phone: (213) 841 0970.

QM-8B and QM-12B

Compact consoles with 8/4 and 12/4 configurations and separate 8- or 16-track monitor section. It includes two aux sends and returns, solo, VU metering etc.

QM-128 and QM-168

Compact consoles with 12/8 and 16/8 configurations, four aux sends, solo, mute, panning, separate 8- or 16-track monitor section.

QA-1010

Professional recording console with up to 24 inputs and eight or 16 main busses with separate stereo busses. Channel outputs may be taken direct to recorder for 24-track operation. Each channel features 3-band parametric with boost/cut, frequency and Q on front panel. Full VU metering for up to 24 channels, five independent mixes, complete input/output modules. 70 ▶

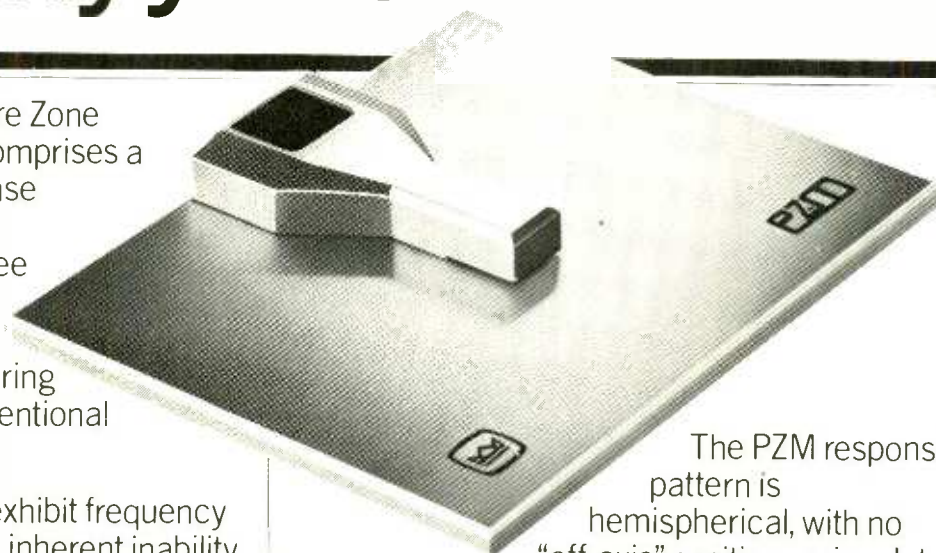
Can you afford to ignore the most significant development in microphone technology of the last fifty years?

The revolutionary Pressure Zone Microphone (PZM™) family comprises a range of hemispherical response microphones which give a transparently natural sound, free from non-linear characteristics – such as proximity effect and comb filtering – that are exhibited by all conventional microphones.

Traditional microphones exhibit frequency response anomalies, due to an inherent inability to satisfactorily combine direct and reflected signals, thus leading to phase-induced amplitude cancellations and reinforcements, or comb filtering.

Amcron PZMicrophones™ eliminate this effect because they detect sound by means of a new process. This takes advantage of the fact that, as a sound wave approaches a boundary (such as a wall, table or floor), there is formed at this boundary a pressure field four or five mm. deep, within which the direct signal and its reflection from the boundary remain in phase and add coherently.

The Amcron PZM places a small pressure transducer inside the primary boundary pressure zone, facing the boundary. This prevents any direct signal reaching the microphone, thus eliminating the possibility of phase-induced interference and providing a significant improvement in signal quality.



The PZM response pattern is hemispherical, with no “off-axis” position: gain related to distance will change, but not tonal quality. The PZM responds accurately to up to 150 db spl, yet hears a whispered conversation in an ordinary room at ten metres.

Engineers are finding that the PZM continually suggests new miking techniques. And that in many applications fewer PZM's are required than traditional microphones. In fact, the PZM is changing ideas about how a microphone should look, sound, and be used. Don't you think that it's time you got in on the act, and gave the PZM a listen?

Details of available models, prices, and suggestions for applications are obtainable from the sole UK importers and distributors, HHB Hire and Sales, Unit F, New Crescent Works, Nicoll Road, London NW10 9AX. Tel: 01-961 3295. Telex: 923393.



AMCRON

PZM and PZMicrophone are registered trade marks of Crown International

Survey

QM-8P and QM-12P

8- and 12-channel production mixers with choice of modules to give 3-band eq, up to 25 inputs, 4 output busses, cue sends, remote starts and 4 independent monitors, VU metering etc.

Gamma-A

Multi-purpose recording console expandable to 32 inputs, eight main busses and four effects sends with VU metering, 3-band equaliser, solo, highpass filters, in-line monitoring etc. Several options available including automation.

RAC (UK)

Rugby Automation Consultants, 220 Alwyn Road, Rugby CV22 7RA, UK.
Phone: 0788 810367.

Specialists in manufacture of smaller custom mixers, majority less than 16-channel input. Many sold to hospital radio networks requiring simple mixer but with relatively specialised facilities.

As well as standard studio console arrangement build may be sloping-front or rack mounting. Circuits available separately as plug-in modules, with a range of 38, with application in studios, hospital radio, schools, colleges.

RAINDIRK (UK)

Raindirk Ltd, 33A Bridge Street, Downham Market, Norfolk, UK.

Phone: 03663 2165/3617. Telex: 817737.

USA: Audicon Marketing Group, 1200 Beechwood Avenue, Nashville, Tennessee.

Phone: (615) 256 6900. Telex: 554494.

USA: ACI Filmways, 7138 Santa Monica Blvd., Hollywood, Cal 90046.

Phone: (213) 851 7172.

Modular free standing and rack mounting mixers. Custom manufacture or standard line for OB and in house programme preparation.

OB 8/2

8/2 mixer with extra input channels as required. Free standing or 48cm rack mounting, balanced throughout, VUs or PPMs. P & G plastic conductive faders. Channels include mic/line select, phase reverse and mic attenuate, eq treble, sweep mid eq 400-10kHz and bass, highpass filter - 12dB/octave at 30, 60, 120, 180, and 270Hz. PFL and cue send. Parallel outputs available from group outputs plus 1 into 4 dist amp.

RM61

Six input single output rack mounting mixer, six line inputs, two mic inputs, P & G 1520 faders, PPM, PFL and channel cut, monitor loudspeaker and associated limiter and equaliser.

TVL

10 input line level TV/radio editing mixer ± 8 dB line variation, P & G faders, PFL, channel cut, PPM meter and monitor loudspeaker.

Mini 4 Group

Low cost mixer of basic 10/4 format or custom design portable, desk or floor mounting, maximum 24/4 with 8-track monitoring.

Series III

Manufactured in console format in either standard or deluxe offering 18 to 40 input channels, 8-, 10-, 24- or 32-track monitoring with eight main output groups and a further master remix stereo group output. The master remix groups are accessible from both input channels and normal main group outputs for submixing. A routing module enables the eight main groups to be switched to any tape input 9 to 16, 24 or 32 as applicable.

Britannia

Available in main frame sizes 24, 32, and 40 input/output channels. The in/out channel module contains the mic and line input stages with a choice of 2 line inputs, monitor circuits, P & G faders throughout. Routing module is 24 pushbutton as standard but 32 as option. Separate mic and line input level controls. 4-band parametric eq switchable between line and monitor channel. Adjustable high- and lowpass filters, four cue sends, VU metering with full flexible monitoring facilities.

RAMKO (USA)

Ramko Research Inc, 11355 Folsom Blvd, Rancho Cordova, California 95670, USA.
Phone: (916) 635-3600.

Range of single channel (SC) and dual channel (DC) mixers. All units: height 20cm, with horizontal LED meters and touch pad controls, lighted, on all input, solo and mute and selection switches — no moving contacts. All solid state switching; self contained monitor and cue amps; mono mix outlet on all stereo consoles; cue on all channels; mute select via plug-in jumper wires. Inputs selectable: high/low level, 250 Ω balanced or 100k Ω balanced bridging.

Price: (numbers indicate channel content): SC-5M \$898; DC-5M \$1,138; DC-5MS \$1,495; DC-8M \$1,750; DC-8MS \$2,298. Two year guarantee on parts and labour (1978).

Also DC-12 and DC-38 consoles.

REBIS (UK)

Rebis Audio, Kinver Street, Stourbridge, West Midlands DY8 6AB, UK.
Phone: 0384 71865.

Custom built mixing consoles but also offer a standard mainframe accepting up to 28 input modules with 16 output groups and up to 32-track monitoring, metering by LEDs. Input module accepts line and mic inputs with switched attenuator, aux pre/post with two or four aux sends, two fully parametric eq sections, 16 routing switches and P & G faders. Group module has three aux sends and subgrouping facility with three aux sends. Master module includes oscillator, monitoring facilities, talkback, etc. Ancillary module duplicates monitor and talkback function switches. Options include channel overload LEDs, group peak LEDs, comp/limiters, de-essers, delay, etc, in existing mixer rack space.
Price: for basic 24/16/16 £8,000.

RSD (UK)

Recording Studio Design, Faircharm Trading Estate, Chaul End Lane, Leagrave, Luton, Beds, UK.
Phone: 0525 570621. Telex: 825612.

USA: Studiomaster Inc., 1365C Dynamics, Anaheim, Cal. 92806.

12/2

Principally live sound mixer with each channel containing 30dB pad, mic gain, low impedance XLR inputs, 3-band eq with the mid and low ranges parametric, a foldback and an echo send, pan, pre-fade monitor and fader. The master panel contains separate left and right outputs, master cue send with echo return phones out and VU metering. Expander units are available to extend the number of input channels in panels of four.
Price: £536.83.

12/2B, 16/4, 16/8

Basic layout similar to 12/2 but with extra facilities making them suitable for recording as well as live sound. Additions include overload LED, two echo sends, routing on the four and eight buss versions with more comprehensive monitoring and master controls.
Price: from £743.16.

20/8 Monitor

Similar layout to 12/2B, etc, but no echo send, pan, cue send or fader. The level fed to each output is adjusted by eight rotary controls. The master output section features a fader, pre-fade monitor button, VU meter, identical 3-band eq to the input channel, on each output channel. There is a separate meter for pre-fade monitor. Intended for live use.
Price: £1,799.50.

RSD (Canada)

Richmond Sound Design Ltd, 1234 West 6th Ave, Vancouver, BC, Canada.
Phone: (604) 736-7207. Telex: 0454667.

USA: Listec Television Equipment Corp, 39 Cain Drive, Plainview, NY 11803.

Phone: (516) 694-8963. Telex: 640470.

M82 Series

Large range of mixers available in many permutations for broadcasting (M82-B Series), recording/reinforcement (M82-III/A/C, etc) and M82-I musicians mixer. There are a variety of mainframe sizes for the various models from 4-channel to 24-channel using extender modules. Other

facilities include stereo, group and direct outputs with VCA subgrouping and level control.

88, 816, 1224

Range of theatre mixers in 8- or 12-channel sizes. The 88 has eight output channels with faders, tone controls and VU metering on each. Illuminated 8/8 switching matrix, XLR-type input/output connectors. 816 has three stereo line inputs and two adjustable inputs with eq, five master presets for automatic panning and 16 output channels. Capability for conversion to computer memory. 1224 has 12 input channels — four adjustable level controls and two quadraphonic line inputs, automatic panning, 12 output presets with eq, 24 output channels and other features similar to the 816.

Automation

Modular automation system for theatre sound control that can be expanded according to budget with no major changes. Basic package consists of standard two scene Memory Pack console with 32 control lines each of which can be set to any of 100 voltage settings in each of 11 cues and a 19in card frame for 16 VCA-2 modules. Each module contains two VC audio amps each of which is controlled by a separate Memory Pack control line. The card frame is wired to form an audio matrix with four inputs being mixed in unlimited combinations to eight individual output channels.

RTS (USA)

RTS Systems Inc, 1100 West Chestnut Street, Burbank, California 91506, USA.

Phone: (213) 843-7022. Telex: 662404.

UK: Future Film Developments, 36/38 Lexington Street, London W1V 3LE.

Phone: 01-437 1892. Telex: 21624.

HPM-41

Designed for variety of professional applications such as film or sound location recording or to augment larger console facilities. Four low impedance mic inputs with three position pads on channels 1 & 2 with line position on 3 & 4, three position highpass filter limiter circuit with on/off and phase reverse on each channel. Additional high level unbalanced input. Mono output at a choice of four levels on three connectors. Other features include tone oscillator, peak indicator LED, illuminated VU with range selection, headphone amp, battery test, phantom powering switchable, ac powered or battery.

SAIT (Belgium)

Sait Electronics, 66 Chaussée de Ruisbroek, B-1190 Brussels, Belgium.

Phone: 023 76.20.30. Telex: 21601.

UK: Sait Electronics London, Wireless House, 31 River Road, Barking, Essex IG11 0BX.

Phone: 01-594 5642. Telex: 897576.

USA: Sait Inc, 33 Rector Street, New York, NY 10006.
Phone: (212) 422 6690. Telex: 222411.

Sait manufacture a range of mixers for most applications — *ESM 601, 802, 1202* and *S19* for theatre and remote recording. The *3S* and *S90* are comprehensive modular multitrack recording desks for broadcast, TV, film and sound studios. Many formats are available and the desks can be built with future expansion. Possible features available can include quadraphony, alternative routing, simultaneous multitrack and live sound capability. Custom building available.

SAJE (France)

SAJE SA., 5 Rue Solferino, 92100 Boulogne, Billancourt, France.
Phone: 609.15.54.

CSM 6

A console suitable for broadcast, multitrack recording and live sound and available in sizes from four to 40 inputs with two to eight outputs. There are three types of input module offered to cover the different applications and the rest of the desk can be assembled from other modules to provide the facilities required. Many options available including VU metering and custom designed modules.

SATT (Sweden)

SATT Elektronik AB, Tellusborgsvagen 90-94, PO Box 32006, S-12611, Stockholm, Sweden.
Phone: 08 81.01.00. Telex: 10884.

Incredible...

the "Acoustic Chamber Synthesizer"™



the XL-305
by

*Master
Room*™

- Totally new design approach
- The sound of a live acoustic chamber
- Natural sound, even on percussion
- Self-contained rack mount unit
- Full two-channel stereo

The Master Room XL-305 is a totally new design approach in reverberation technology. For the first time, the qualities and properties of a live acoustic chamber are available in a rack mount unit at an affordable price. There is a natural sound on percussion, as well as voices and all other musical instruments. This quality has not been obtainable from other compact reverberation devices. The XL-305 exhibits no unwanted side effects; it's as natural as a live chamber itself.

To hear this new advancement in reverberation, see your professional audio dealer and ask for a demonstration of this exciting new unit. Hear the XL-305 "Acoustic Chamber Synthesizer" for yourself, and you too will agree... It's INCREDIBLE.



Scenic Sounds Equipment,
97-99 Dean Street,
London W1V 5RA
Telephone: 01-734 2812/3/4/5
Telex: 27 939 SCENIC G

France **3M France SA, Mincom Div.** Boulevard de l'Oise, 95000 Cergy Tel: Paris 749 0275
Germany **Audiolive** Kyffhauserstrasse 10A 5 Köln 1 Tel: Köln 230910
Holland **Pieter Bollen Geluidstechniek** Hastelweg 6, Eindhoven Tel: Eindhoven 512 777
Sweden **Tal & Ton Musik & Electronic AB** Kungsgatan 5, 411-19 Gothenburg Tel: Gothenburg 130 216
Norway **Siv Ing Benum AS** Skovvn 22, Oslo 2 Tel: Oslo 565 753

Survey

SAM82

8/2 portable mixing console with balanced mic inputs on XLRs, switched gain, phantom powering, phase reverse, lowpass, low and high eq, output selector, panning, two aux outputs, linear fader, cue. Includes talkback output, insert facilities, option for battery operation, carrying case, built-in test tone generator.

Price: basic Sw Cr 19,000 (1978).

SELA (Sweden)

Svenska Elektronik-Apparater AB, Box 6018, S-12206 Enskede, Sweden.
Phone: 08/94 02 70.

Range of mixers for film industry and Nagra recorders.

2880BT

4-channel mixer designed specifically for use with Nagra portable tape recorders from which it obtains power. Each channel accepts wide range of balanced mics and provides dialogue filter, lf and hf in each channel, rotary faders, line outputs which may be used for cans.

2880ST

8-input portable mixer with two groups, balanced input with phantom powering, highpass filter, lf and hf equaliser, auxiliary send (or echo), two returns into groups, line-up oscillator, two PPMs power supply which also powers Nagra and phantom mics.

2880-IS

Minimixer for professional applications, six mic inputs which will operate directly from Nagra recorders, balanced inputs, phantom powering, roll over filter.

45-00

Small portable mixer available in 4-, 8- or 12-channel sizes with 2 output groups. Balanced transformerless inputs, phantom power, phase switch, mic/line switch, input level control, echo send, highpass filter, 2-band eq, pan and fader. Outputs balanced or unbalanced, headphones output and PPM metering.

SENNHEISER (West Germany)

Sennheiser Electronic, 3002 Bissendorf/Hann, West Germany.

Phone: (05130) 8011. Telex: 0924623.

UK: Hayden Laboratories Ltd, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW.
Phone: 02813 88447.

M101

Portable mono mixer with four channels designed for use with Nagra or similar. Battery powered from twin 9V batteries, each channel with bass cut, equaliser on output, tone generator, VU meter.

SHURE (USA)

Shure Brothers Inc., 222 Hartrey Avenue, Evanston, Illinois 60204, USA. Phone: (312) 328-9000. Telex: 724381.

UK: Shure Electronics Ltd, Eccleston Road, Maidstone ME15 6AU.
Phone: 0622-59881. Telex: 96121.

M67-2E

4/1 mixer with XLR connectors, rotary level controls, lowpass filter in each channel, VU meter, option battery headphone output, balanced inputs.
Price: £147.06.

M677

Six input accessory for M67-2E.
Price: £134.52.

M68FCE

Four mics plus one auxiliary. XLR connectors, rotary level controls, optional battery pack.
Price: £95.10.

SR109-2E

8-channel mono mixer designed for 48cm rack mounting with high and low eq on each channel, rotary faders, built-in tone oscillator, XLR connectors.
Price: £507.30.

SIEMENS (West Germany)

Siemens Aktiengesellschaft, D-7500 Karlsruhe 21, West Germany.

Phone: 0721 595-2428. Telex: 782851.

UK: Siemens Ltd, Siemens House, Windmill Road, Sunbury-on-Thames, Middlesex TW16 7HS.
Phone: 09327 85691. Telex: 8951091.

C4

Compact modular mixing system for variety of applications expandable up to 40 channels with two, four, six or eight master outputs and 2 or 4 auxiliary master outputs, a pre-fade monitoring point as well as stereo monitoring, XLR sockets, pre- and post-fade insertion points, monitor buss with solo facility, equaliser on each input module switchable pre- and post-fade.

C8

Intended for a wide variety of applications, the standard C8 model is a 24/4 or 24/8 and intended for permanent installation or OB use. Eight of the input channels may be replaced by stereo modules. Each channel contains balanced mic and line inputs, 3-band eq with highpass filter, insertion point. Other facilities include bargraph metering, four balanced master outputs with limiters, equalisers for special effects, wide selection of outputs at differing levels, cue lights and remotes, etc.

Sitral C

Console system offering up to 48 input channels, 1-24 groups, 2-8 auxiliary channels and two or four master channels. Completely free routing. Monitor mixing and dynamic storage of the level control movements.

SIMMON (UK)

Paul Simmon Ltd, 2 Market Street, Halifax, West Yorkshire, UK.

Phone: 0422 57442/52240.

GEN-2

Location mixer for use with Nagra recorders. XLR inputs, A - B power as standard and 'T' powering to special order. Three mic inputs and one line input with low voltage phantom powering on each mic input. Switchable low frequency roll-off on each channel.

Price: £364.

SOLID STATE LOGIC (UK)

Solid State Logic Ltd, Stonesfield, Oxford, UK.

Phone: 099389 324/444. Telex: 837400.

USA: Washington Musicworks Inc, 3421 M Street NW, Washington, DC 20007.
Phone: (202) 333-1500. Telex: 440519.

SL4000 series

Automated, computer controlled recording console claimed to be one of the most expensive in the world. Includes full distributed logic control of major console states, comp/limiter/expander/noise gate on each channel, in addition to master quad compressor on the output buss, on each channel 14-control parametric eq with 4 bands, two fully parametric filters, overload indicators on each module monitoring at three separate points, two independent subgrouping systems, eight VCA subgroups using separate faders, one-button drop-in system, pre-timed automatic fader adjustable from 1-60s, multiway connectors. Options for computer system providing level memory, timing autolocation, editing and record keeping, 200-step plasma display meters with peak hold facility, additional patch rows, extra producers table, precision phasemeter. The console uses combined input/output modules with six aux sends and the console is available in 32, 40 and 48 module mainframes with options for VU, PPM and plasma metering.

Price: 32-channel plasma metering £61,805/\$133,408, 40-channel £73,275/\$157,600, 48-channel £86,605/\$185,700. SSL computer £16,000/\$32,000.

SOLIDYNE (Argentina)

Solidyne SRL, Tres de Febrero 3254, 1429 Buenos Aires, Argentina.

Phone: 701-8622.

Series 1000

Compact broadcast and TV sound consoles. Available in eight, 10 or 12 input channels with the largest offering 32 programme inputs; four phono-inputs, 16 mic, four tape and eight external lines. Choice of modules, FET mic programming, touch panel routing, graphic equalisation and metering.

Series 2000

Modular multitrack recording console. Solid state switching. Group faders are dc-controlled electronic attenuators with low distortion and 110dB dynamic range. Level of attenuation shown on LED display. LED metering with VU or PPM responses. Real time spectrum analyser as standard with ten octaves and peak memory. Phase meter and pan controls with LED display. Channel equalisation 5-band peak or shelving with comp/limiters.

Series 601

Easy to operate broadcast consoles. Includes lights and speaker muting for two or three studios. Modular construction throughout. Photo resistive attenuators optional. The 6-channel 601 is expandable to eight and 12 channels by addition of lateral expansion unit. Includes two monitor amplifiers of 10W.

Series 3000

For recording studios, theatres and sound reinforcement. Each channel features a 5-control equaliser and comp/limiter. Modules with straight line faders of 1.5dB steps.

401-C1

Portable 4-channel console with integrated IC circuitry. Battery operated, mic and built in amp.

SONETEC (France)

Sonetec, 21 Avenue du Fort, F-92120 Montrouge, France.

Phone: 654.07.07. Telex: 202347.

CM 1243, CM 1843, CM 3264

Range of modular recording and sound reinforcement consoles of 12/4, 18/4 and 32/6 with three auxiliary sends and a fourth on the 32in. 3-band eq, attenuator, phase reversal, pan, conductive plastic faders and VU metering. Test oscillator and integral stereo 50W monitor amp. CM 3264 has VCA subgrouping facilities.

CM 2044

Modular 20-channel mixer with four output busses and six VCA subgroups and other VCA control features, two echo sends and three echo returns with full eq on each. Eq is all 3-band \pm 12dB at 60Hz to 6kHz with mid range parametric of 700Hz to 7kHz.

CM 804

Compact portable 8/4 mixer using same modules as CM 2044 with XLR sockets. VU metering.



B6000 Series

SONIFEX (UK)

Sonifex Sound Equipment, 15 College Street, Irthlingborough, Wellingborough, Northants NN9 5TU.

Phone: 0933 650700.

B1000

6-channel monophonic transportable mixer with flat scale fader, PFL, lf and hf eq, echo send, gain, switched mic/line, balanced inputs and outputs at XLR connectors, comprehensive metering, switched, headphone monitor jack.

B2000

10-channels each with flat scale fader, hf, mid and lf eq, echo send, foldback, group panning, channel cut switched mic/line with gain control. Balanced inputs and outputs at XLR connectors, two groups with independent monitor outputs, echo send output, foldback output, echo return input. Two VU or PPM switched to inputs or outputs selectively. Headphone monitoring through meter select switch to phone jack.

B6000 Series

Eight or 16 channels six group mixer with 10 or 20 switched inputs, 3-band eq, echo send and foldback mix, mic/line switch. Balanced XLR connectors, VU



**It's not only in love
that the french show
great taste...**

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**3M
ESPANA, S.A.**
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MADRID 27
Telf. (91) 742.00.12

PLUS 30
37, rue des Annelets - 75019 Paris
Tél. : 202.21.02 - 202.58.69

Survey

meters, head-phone amp, jackfield access.

Sonifex also manufacture dubbing consoles.

SONY (Japan)

Sony Corporation, 7-35 Kitashinagawa, 6-chome, Shinagawa-ku, Tokyo, 141 Japan.

Phone: 03 448 2111. Telex: 22262.

USA: Sony Corp of America, 9 West 57th Street, New York 10019.

Phone: (212) 371 5800.

UK: Sony (UK) Ltd, Pyrene House, Sunbury-on-Thames, Middlesex.

Phone: 09327 89581/87644. Telex: 266371.

MX-5

Passive monophonic mixer. Three input channels for mic or line use with mic inputs taking precedence. Equipped with preset indicators for each input level control.

MX-7

Stereo passive mixer equivalent to two MX-5 mixers in one box. Six input channels of which two can be bridged across both stereo outputs or shut off.

MX-670

Active mixer powered by batteries or external power supply. Six input channels for mics but only two of these may be used for line level inputs with the remaining inputs having phono inputs. Other facilities include VU meters, headphone outputs, output level fader, 440Hz calibration tone and connections for cascading mixers.

SOUNDCRAFT (UK)

Soundcraft Electronics Ltd, 5 Great Sutton Street, London EC1V 0BX, UK.

Phone: 01-251 3631. Telex: 21198.

USA: Soundcraft North America, PO Box 2023, Kalamazoo, Michigan 49003.

Phone: (616) 382-6300. Telex: 224408.

Series 1S

Non modular portable system designed primarily for PA market but also used by broadcasters. Available in 12, 16 and 20 inputs built into rugged aluminium flight case with all connectors brought out on front panel (both XLR and multipin), 4-band eq with two mid sweep, two aux sends, full communication and monitoring facilities.

Price: £1,400 to £2,100/\$3,460 to \$5,400.

Series 400

Series 400 are modular mixers available in 18- and 26-channel frame formats with four subgroup and separate stereo mix groups complete with 8-track recorder interface and monitoring. Designed to fulfil the needs of the larger PA operator and the 4/8-track studio market. Includes P & G faders, LED bargraph metering and phantom powering.

Price: £2,650 to £3,950/\$8,738 to \$12,200.

Series 3B

Fully modular studio console for 16-, 24- or 32-track applications. Features include a proprietary transformerless mic amp with almost theoretically low noise level, sweepable 4-band eq, high- and lowpass filters, eight aux busses, mono and stereo solo. Metering is by a 24-segment VU/PPM LED ladder display with two column display. Now available automation ready with Allison 65K system.

Price: 24/24 £13,245/\$42,038; 32/32 £16,215/\$51,333 (non automated).

Series 1624

Multitrack recording console with two frame sizes, 24/16 and 16/16. Transformerless mic amps, 3-position solo, 4-band eq with two mid range parametrics, six cue sends, master muting, P & G faders. Output modules contain monitor controls with 3-band eq and cue sends. VU metering.

Price: 16/16 £7,500/\$24,350; 24/16 £9,500/\$30,740 (less optional 8 track monitor).

SOUND WORKSHOP (USA)

Sound Workshop Professional Audio Products Inc, 1324 Motor Parkway, Hauppauge, New York 11787, USA.

Phone: (516) 582 6210.

UK Trad Electronic Sales Ltd, 149b St Albans Road, Watford, Hertfordshire WD2 5BB, UK.

Phone: 0923 47988. Telex: 262741.

Soundcraft 400



Series 1600

Available in 20, 28 and 36 input mainframes ready for automation. Series 1600 includes either transformer or Trans-Amp transformerless mic amps, standard 3-band eq or optional 3-band parametric, lowpass filter, P & G faders, balanced mic/line inputs, transformer balanced track outputs, independent control room and studio sections, four send busses with exclusive input source matrix and master assign matrix, optional VCA grouping package, optional ARMS automation (compatible with MCI JH50).

Price: 20/16 \$19,000; 28/24 \$25,500; 36/32 \$32,200.

Series 30

Multitrack recording consoles available in four mainframe sizes 12, 20, 28 and 36. In-line design with full monitoring and output facilities and eight output busses. Transformerless mic inputs, LED metering with VU response, 3-band eq available in two options, full monitoring and talkback facilities and phantom powering. Options include VCA sub-grouping and ARMS automation.

Price: 16/16 \$6,815 to 36/24 \$21,220 (with full standard alternative options).

SPECTRA SONICS

Spectra Sonics, 770 Wall Avenue, Ogden, Utah 84404, USA.

Phone: (801) 392-7531.

UK (modules and components): Sun Recording Services, 34-36 Crown Street, Reading, Berkshire. Phone: 0734 595647.

Custom and standard consoles for recording and broadcast purposes. Various configurations available based on modules including the following: oscillator with octave select frequencies, gain; high/lowpass filter 40/70/100Hz and 10/12.5/15kHz; electronic filter with various standard frequencies; power amp; simple mic program eq at 100Hz and 7kHz; mic/program eq ± 12 dB at 50/100/200Hz and 2.5/5/10kHz; rotary and joystick quad pan; rack mounting and console face comp/limiters variable 1.1:1 to 100:1, attack 0.1 μ s to 1.2ms, release limiter 0.09 μ s, compressor 50ms to greater than 10s.

1024-24, 1026-26, 1032-32

Available with 12 to 32 group outputs based on input module including line/mic switch, input attenuate, PFL, monitor submix route, two foldback, eq at low/mid/high, 4/5 frequencies in each band, shelf curves at 50Hz and 10kHz switchable. Usual program assign and monitor select facilities.

Model 1100

Line/mic mixer for use in disco, sound reinforcement, broadcast, etc. 19in rack mounting format. Six inputs and mono output with separate mono mix. XLR connectors. High and low equaliser ± 20 dB at 20Hz and 20kHz. VU meter.

SPHERE (USA)

Sphere Electronics, 20201-A Prairie Ave, Chatsworth, California 91311, USA.

Phone: (213) 349-4747.

Standard and custom mixers for various applications including recording and broadcasting.

Alpha Series

Consoles designed primarily for radio and TV broadcast production. Alpha B is stereo broadcast console, Alpha T for TV, Alpha I and II are portable, with full facilities in small format for smaller stereo and quad recording situations. Features include long throw faders, solo, mic/line selection, switchable pad, echo send and return, cue mix, pan, quad output option, TB, slate option, monitor, oscillator. Consoles also available custom for sound reinforcement. Optional extra module is 900 graphic in channel fitting, nine frequencies.

Eclipse C

Automated consoles using Allison 65K programmer. Facilities include nine selectable VCA groups, three programmable programme mutes, echo send and return mutes, switchable insert point, three pannable stereo sends, and four mono sends available for echo, cue, effects or

whatever, quad pan and track odd/even pan. Modular construction offers five interchangeable equalisers, including two 3-knob, two graphics and a 4-knob parametric.

STELLAVOX (Switzerland)

Stellavox, CH-2068 Hauterive, Neuchatel, Switzerland.

Phone: 038.33.42.33. Telex: 35380.

UK: Future Film Developments, 36/38 Lexington Street, London W1V 3LE.

Phone: 01-437 1892. Telex: 21624.

USA: ADB Alanco, 6630 Tailor Road, Box 108, Blacklick (Columbus), Ohio.

AMI 48

Five inputs for 12V AB or phantom powered capacitor mic, 48V capacitor mic, dynamic mic. XLR or Preh connectors. Bass roll-off, bass/treble lift/cut, pan, 20dB pad each input. PFL, individual post-fade outputs. Switchable stereo compressor on two channels, limiters with LED indication on each input. Stereo limiters with LED indication on master group outputs. 880Hz line up oscillator. Two illuminated PPM meters. 8 x 21 x 27cm, weight 4.3kg.

Price: £2,182, with limiter £2,846.

STRAND SOUND (UK)

Rank Audio Visual Ltd, PO Box 51, Great West Road, Brentford, Middlesex TW8 9HR.

Phone: 01-568 9222. Telex: 27976.

North America: Strand Century Ltd, 6334 Viscount Road, Malton, Ontario, Canada.

System 1 Mixer

16/4 basic (maximum 32 modules), balanced mic inputs, unbalanced line input, high, mid and lf eq, two aux sends, panning, PFL, slide fader, VU or LED PPM metering, power amp modules, tape start/stop module, cue lights, talkback module, unusual bright red finish.

Price: basic less amps etc £2,350/\$7,000.

System 2 Mixer

Similar to above but additionally with variable mf eq, 3 aux sends, up to five routing switches, LED peak indicators, P & G faders, various options, multipin connectors.

Price: £9,300/\$36,000.

STUDER (Switzerland)

Studer International AG, CH-5430 Wettingen, Switzerland.

Phone: 056 2687 35. Telex: 53682.

UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ.

Phone: 01-953 0091. Telex: 27502.

USA: Studer Revox America Inc, 1819 Broadway, Nashville, Tennessee 37203.

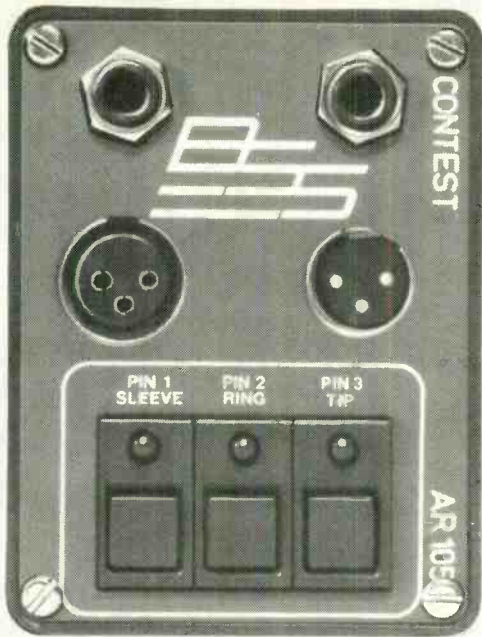
Phone: (615) 329 9576.

089 MkII

Intended for mobile and truck working as well as static studio operation. 12 input channels each with: line/mic/oscillator switching; phase; fine and coarse attenuator; variable Hz high- and lowpass filters; 80Hz ± 8 dB, 8kHz ± 8 dB, 0.4/0.7/1.2/3.9/6.8kHz ± 9 dB; two or four aux subgroups; mute. Also: filter modules, combination high/lowpass with variable frequency and roll-off; stereo reverb similar channel module; and comp/limiter ganged for stereo, variable compression and release, compression meter indication. Monitor selection all groups, subgroups and returns; talkback. Two sub-masters for reinsertion. Two PPMs, VU available if required. Break points on rear mounted jack bay.

169

Portable mixer with same dimensions as A67 tape recorder, and 12 modules which may be arranged 11/1, 10/2 or 8/4, switched gain, low cut, low, mid



The Problem Solvers.

Two innovative accessories at realistic prices, from the same company as the MCS200 crossover. A high performance active direct injection box, battery or earth isolated phantom powered, for all direct injection techniques and a useful leads tester with top mounted connectors which allow leads to be supported during repair.

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Also available in the UK through: Turnkey, Buzz Music and Audio Reinforcement Services.



Brooke Siren Systems, 92 Colney Hatch Lane, London N10. Tel: 01-444 7892. Telex: 912881 BSSAUDIO

Available, ex-stock, from: Turnkey 01-444 9221; Buzz Music, Hereford 55961
H.H.B. Hire & Sales, 01-961 3295; Audio Reinforcement Services, 01-341 1506

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Actual size

Eardley Electronics Ltd

Eardley House 182/184 Campden Hill Road Kensington London W8 7AS
Telephone: 01-221 0606 Telex: 299574

Survey

(variable) and high eq, panning, solo/mute, two aux outputs, various monitoring facilities, VU or PPM metering.

269
Similar to above but max 18 modules to 17/1, 16/2, 14/4.

189
Designed for permanent and portable applications with 18 input channels, four echo sends, 16 master outputs, two foldback outputs, 16 meters — peak or VU, 16 monitor mixing channels. Quad mixing facilities.

389
Modular console providing 32 input channels, four echo sends, four echo outputs per input unit, four to 16 masters, four foldback outputs, up to 20 peak indicators, monitor mix channels, remix switching, remote control and additional equipment available.

069
Portable broadcast console housed in a suitcase. Five input, two output with eq, test oscillator, full talkback, monitoring, level metering, telephone interface and universal power supply.

TAB (West Germany)
Tonographie Apparatebau, V Willisen GmbH & Co, PO Box 130534, Kleine Klotzbahn 27-29, D-5600 Wuppertal 1, West Germany.
Phone: 0202 447452. Telex: 8591742.

T30
The T30 series are modular mixers that can be constructed around a number of differing mainframe sizes from a wide selection of modules to form a console suitable for the intended application. Special film dubbing versions available as are special modules to order. Special feature of the T30 system is the small size of the modules — only 30mm wide and this allows even complex mixers to be fitted into small OB vans.

TANGENT (USA)
Tangent Musical Engineering, 2810 South 24th Street, Phoenix, Arizona 85034, USA.
Phone: (602) 267-0653.

Model 3216
Professional recording console in either 24 or 32 channel mainframes with 16 output busses plus direct from input modules. FET switching electronically restructures input/output module function blocks. Parametric eq on each channel, two echo and two aux busses, full monitoring capabilities, LED metering arrays.

Series 4
Consoles for sound reinforcement or 8-track recording in two mainframe sizes of 20 or 12 inputs. Transformerless mic amps, peak LEDs, 3-band eq with mid range peak/dip and high and low shelving, three cue sends, six buss outputs, PFL, LED metering, direct outputs from each channel and phantom powering.
Price: from \$2,800.

ax Series
Four mainframe sizes, 8, 12, 16, 24 inputs, for recording or sound reinforcement. Channel facilities include peak LED, gain control, high and low eq shelving type with mid range peak/dip, three cue sends, pan and solo. Switchable phantom power. Full monitoring facilities.
Price: from \$1,200.

TAPCO (USA)
EV-TAPCO, Division of Gulton Industries, 3810 148th Avenue NE, Redmond, Washington 98052, USA.
Phone: (206) 883 3510. Telex: 4492594.
UK: Electro-Voice (Gulton Europe) Ltd, Maple Works, Old Shoreham Road, Hove, Sussex BN3 7EY.
Phone: 0273 778401. Telex: 87680.

6000 Series
Range of PA or musical instrument mixers of six or eight inputs with mono outputs and 19in rack mounting format. Facilities vary but include balanced and unbalanced operation, eq, VU

metering, reverb, rumble filters, XLR and jack inputs, effects buss and optional expander units.

8201, 6201, 6200
Range of 6- or 8-channel into two similar to 6000 Series but extra facilities including pan controls and phantom powering.

Series 72
Available in 12-, 16- and 24-channel formats all with stereo or mono outputs. Channel features mic/line switching, gain control, three cue sends, three knob eq, illuminated VU meters, phantom power and panned mono master group. Internal headphone amp. Fully modular construction with XLR and jack sockets.

C-12/C-8E
12/4/2/1 format mixer expandable to 36 input channels with stereo or mono sub/groups, 3-band eq with mid range parametric, solo on inputs, sends and masters. Overload LED on all channels, VU metering, three sends, two panned effects returns, mic/line switching and phantom powering.

TEAC/TASCAM
Teac Corp of America, 7733 Telegraph Road, Montebello, California 90640, USA.
Phone: (213) 726-0303.
UK: Harman UK, St John's Road, Tylers Green, High Wycombe, Bucks HP10 8HR.
Phone: 049481 5331.

Model 1
Basic 8/2 line level mixer for monitor mixing etc.

Model 2A
Basic 6/4 mixer with mic/line inputs, high and low eq, pan and four busses with single master fader, jack and phono sockets.

Model 3
Basic 8/4 mixer with mic, phono, line inputs, 2-band eq with switchable frequencies, pan and four busses with single master fader with stereo 8-channel submixer with pan on each channel, XLR balanced inputs on six inputs, eight direct outputs.



Model 5
Basically similar to Model 3 but with cue and echo sends, solo, overload indicator, four separate submasters, master module, optional talkback module, direct outputs for multitrack, eight XLR mic inputs.

Model 15
24/8 mixer with 16-track monitoring and direct outputs on each input. Includes 4-band equaliser, two 8 x 2 submixes, modular construction, comprehensive monitoring.

TECNICOBEL (France)
Tecnibel 8 Rue de La Croix-Matre, BP26, F-91122 Palaiseau Cedex, France.
Phone: 920 80 39. Telex: 692543.

CARL 50
Broadcast console with one man operation as the design criteria. Master and preview output busses. 11 input channels and automatic or manual gain control on master outputs, wide selection of inputs with telephone interface.

RB60
Recording and broadcast console for medium and large installations. Fully modular and can be expanded in input channels (up to 42) groups, and auxiliary sends. Full monitoring and talkback facilities with options for a multitrack monitor mix and possible automation.

CX40
Sound reinforcement and special effects console for theatre use. 16 input channel with 16 outputs, four output busses, five cue sends and returns, master group VCA level control and routing matrix.

RS 50
Fully modular multitrack recording console with 3-band eq, highpass filters, four auxiliary sends, pan and fully comprehensive monitoring, returns and talkback, etc.

TOA (Japan)
Toa Electric Company Ltd, Kobe, Japan.
USA: TOA Electronics Inc, 1023 Grandview Drive, San Francisco, Cal 94080.
Phone: (415) 588 2538. Telex: 331332.

RX-5, RX-6
8/2 and 12/2 mixers both with two monitor outputs in a portable design. Balanced high and low impedance inputs, 2-band eq on channels and 3-band on master outputs, peak LEDs, phantom powering, cue send, facilities for cascading mixers, echo send and returns, headphone monitoring with two VU on RX-5 and four LED meters on RX-6.

TORSEEM (Norway)
Tore Seem A/S, Kirkeveien 71, N-1344 Haslum, Norway.
Phone: (02) 53 39 75.

SEESAM
Broadcast/recording console for medium and large size installations. From 24- to more than 40-channel. Each channel has VCA, eight aux sends, 4-band parametric eq with high- and lowband peaking/shelving, highpass filter, compressor, expander, gate, solo and PPM LED meter. Completely free grouping by microcomputer controlled solid state switching as well as dc grouping. Computer also controls signalling system, memories for often used set-ups and automated mixdown.

SEEMIX
Simplified version of the SEESAM system, without compressor/expander/gate and with only six aux outputs in the channel. 24 to 32 channels, eight dc groups, prewired for optional automated mixdown.

Series of all-round broadcasting consoles
Ranging from 12 to 18 channels, two echo return channels, four aux output channels, stereo and mono output channels, external filter/compressor bank, jack panel, optional extensive talkback and communication system with LB and CB telephones and telephone hybrids for recording of telephone conversations.

TSM 12-2/4
12-channel for OB vans and small broadcast studios, two echo return channels, two output and four aux output channels, external filters/compressors, talkback, two stereo PPM bargraph instruments.

UKM-1
One-man studio mixer, two VCA-controlled mic channels, three line inputs, one telephone hybrid channel. Talkback, remote control unit in studio.

PLUTO 3/1
Lightweight, battery operated, 3-channel mixer for OB use. Built-in mic for communication with reporters and studio. 48V phantom feeding of mics. May be carried in belt or with shoulder strap. XLR connectors.

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

In-line recording consoles of 12/4, 16/8 and 20/16 capacity. Channel contains routing, pan, separate mic and line gain, two line positions, 3-band parametric eq switchable to monitor, four aux sends, solo, peak reading LEDs on faders, VU metering. Full master controls with talkback and monitor feeds, etc.
Price: 12/4 £1,950; 16/8 £2,485; 20/16 £3,029.

TRIDENT (UK)
Trident Audio Developments Ltd, PO Box 38, Studios Road, Shepperton, Middlesex WW17 0QD, UK.
Phone: 09328 60241. Telex: 8813982.

The Strong, Silent, Types.

Atlantex products are built for a tough, professional life. They are well-designed and made with the finest components for clean, noise-free circuitry.

Ashly audio processing units represent the technology of the future. The well-designed, easy-to-use layout allows precision control over the audible spectrum. Shown is the SC-50 peak limiter compressor. Other 19" Ashly units are parametric equalisers, electronic crossovers, pre-amp/processors.

Sescom, the world's finest audio interfacing units, are renowned for high quality products, combined with ruggedness and reliability. The wide range of models includes D.I. boxes, audio transformers, cable testers, and many more useful studio accessories.



The Furman range includes mono and stereo parametric equalisers with pre-amps, tunable crossover/bandpass filter, and (shown here) the neat reverb system with limiter and equaliser. The simple layout and wide range of control gives full scope for creative engineering at a price which gives great value for money.

Built to the highest standard, Whirlwind leads are made with top quality Belden cable, with Switchcraft and ADC connectors. Available from 1' patch cords to 24-input multicores, they are sturdily constructed to give years of trouble-free service.

Atlantex

Write or phone for illustrated catalogues.

Atlantex Music Ltd., 34 Bancroft, Hitchin, Herts SG5 1LA.
Telephone 0462 31511 Telex 826967

Survey

USA: Studio Maintenance Services, 12438 Magnolia Blvd, North Hollywood, Cal 91607. Phone: (213) 877 3311. Telex: 674901.

TSM series

Modular console series using separate monitoring available in various configurations, 32/24 and 40/8 versions having been recently delivered. A new generation of integrated circuit is used throughout with solid state relays and Jensen transformers throughout. Input modules include four bands of graphic parametric eq with swept high and low pass filters, six aux sends, sends one and two being controlled by faders for echo send. Separate quad and stereo output busses with full monitoring allow instantaneous remixing leaving all multitrack routing and monitoring intact — in this mode the separate multitrack monitor mixer can be used as extra line inputs providing 60 and 76 remixing capabilities (including four echo returns). All monitoring channels include eq, aux send and panning, and feature a fader reverse button which interchanges the functions of track monitor fader with main plastic output group faders. Full fader automation as option.

Fleximix

Modular system whose configuration can be rapidly altered. Systems built up using four basic modules: input, submaster, left/right master and auxiliary. These may be contained in 15 or eight module mainframes which can be rigidly or flexibly coupled, or mounted in flight cases. Optional modules include stereo limiter/compressor, input line balancing, output line balancing. Other options include a meter overbridge and P & G conductive plastic faders.

Series 80

Available in standard 32/24 mainframe and utilises low noise op amps and solid state relays throughout. Contains many of the TSM features such as modular jackfield use of the remix buss as extra channels during mixdown, giving up to 60 lines. Five aux sends with two in pannable stereo. 4-band eq with two fully parametric mid ranges and selectable 2-position high and low setting. Highpass filter and 24-track routing. Automation available as standard or retrofit using Allison system.

TURNER (UK)

Turner Electronic Industries Ltd, 175 Uxbridge Road, London W7 3TH, UK. Phone: 01-567 8472.

TPM 24/8/2

Modular PA sound control desk. Comprises 24 channels, four stereo subgroups, stereo master and stereo 5-band crossover. Selectable inputs of balanced mic or unbalanced line input. Variable sensitivity, 3-band eq with shelving high and low and peak/dip mid range. Two pre/post echo sends, pan, PFL and fader. Full eq on echo send masters and returns have own pan control. Full talkback facilities and monitoring with VU metering. There are other modules available for different uses including separate stereo master output to drive second system or tape recorder. Extra foldback sends, additional monitoring facilities. P & G faders and XLR sockets.

TWEED (UK)

Tweed Audio Electronics, Rosewood Industrial Estate, Kelso, Roxburghshire, UK. Phone: 05732 2983. Telex: 727633.

Offers a custom building service as well as a standard range of consoles.

BC82

Small portable console in flight case for mains or battery operation. Offers eight input channels with eq, two auxiliary and stereo master outputs.

12/2-4 Portable

12 channels with choice of 2- or 4-track configuration specially designed for mobile use being compact with wide range of facilities.

M124

Standard design available with 12 inputs (16 optional) with two foldback, two echo sends and four group outputs. Solo/PFL/cue outputs available. The routing unit offers most advanced

and comprehensive switching system. All channels can be remotely operated. All in/out XLR sockets balanced. Portable.

M16

16 input channels with choice of two equalisers, 16-track output, 16 auxiliary outputs, PFL, and solo outputs. A comprehensive jackfield is standard facility. Monitoring on every channel with separate mixdown system. The number of input channels can be expanded to 24 if required. Designed for multitrack recording.

M24

24 input channels with choice of equalisers, 24-track output, eight auxiliary outputs, PFL and solo outputs. Monitoring on all channels with separate mixdown system. The number of input channels can be expanded to 44 if required.

B243/B244 Broadcast

22 channels are wired up for stereo and mono operation. Any channel can be plugged into any position. B243 has a script space useful for on-air operation, with central facilities panel. B244 offers conventional mixer design with end table. Both offer jackfield as standard facility. Choice of nine input modules, three for mic input, three for mono line and three for stereo line. Large illuminated switches are used for start stop facility. Choice of fader start available on all channels with separate switch. All channels can be operated remotely in any combination. Overload indicators are fitted on all channels as standard.

B163/B164 Broadcast

Same specifications as B243/B244 but number of input channels limited to 14. The patch panel is located on the back panel to reduce the size of the console to fit smaller studios.

B245/B165 Broadcast

Comprehensive facilities for production studio. Choice of two equalisers with mic/line input and a number of routing units are available to suit customer requirements. 24 input channels can be fitted in these frames with 4-track output and remix facilities. Space is available for ancillary modules and future expansion. Stereo channels cannot be fitted in these frames.

UREI (USA)

United Recording Electronics Industries, 8460 San Fernando Road, Sun Valley, Cal 91352, USA. Phone: (213) 767 1000. Telex: 651389. UK: FWO Bauch Ltd, 49 Theobald Road, Boreham Wood, Hertfordshire WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

MOD One

Series of broadcast consoles of modular construction that can be tailored to exact requirements by selection of modules giving mono, stereo or quad outputs. Up to 10 input modules selected from four different types giving maximum of 30 inputs, silent action switches for all on-air functions, conductive plastic faders, automatic muting of monitor and cue speaker, VU metering and built-in headphone amp.

WARD-BECK (Canada)

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

T1202

Portable modular mixer with 12 input channels, P & G faders and VU meters.

790637

Modular TV audio control console.

Model M2484

24/8 broadcast console. Facilities include two reverb return channels, eight submasters, which act as multitrack outputs 1-8, eight direct outputs which act as multitrack outputs 9-16, four programme master busses, two reverb send busses, four foldback busses, one PA buss, one PFL, one solo, 18-channel mix down selection, two control room monitor outputs, two studio monitor outputs.

WESTREX (USA)

Westrex, 2629 West Olive Avenue, Burbank, Cal 91505, USA.

Phone: (213) 846 3394. Telex: 698254.

UK: Westrex Co Ltd, 152 Coles Green Road, London NW2 7HE.

Phone: 01-452 5401. Telex 923003.

ST3000

Various input/output combinations according to customer requirements. Modular construction. Typical channel includes: ST3009 combining panel, with p/b bussing selection; ST3003 channel control panel with pre/post echo send/foldback selector, send gain cue pushbutton and overload indicator; ST3001 input amp, mic/line indicator, gain, 120Hz high pass in/out, phase, fine gain; ST3002 eq unit, three boost/cut zones at 50Hz, 0.7/1.0/1.4/2.8/3.5/4.2/5.6kHz and 15kHz; ST3010 fader with slider and bottom of travel microswitch. ST3001 input amp takes mic between -70 and -20dB and line between -10 and +20dB steps.

ST3050

Compact mixer for small studio or location work. Available with up to eight input channels and 1/2 groups out. Modules similar or identical ST3000, illuminated PPM or VU metering; all components 'fully tropicalised'.

YAMAHA (Japan)

Nippon Gakki Co Ltd, Hamamatsu, Japan.

USA: Yamaha International Corp, PO Box 6600, Buena Park, Cal 90622.

Phone: (714) 522 9384.

UK: Ban Electromusic, 89/97 St. John Street, London EC1M 4AB.

Phone: 01-253 9410.

PM170/180

6-channel, stereo output mixers with panning, high and low eq, highpass filter and VU metering. PM170 features jack connectors while PM180 has XLRs.

PM-430, PM-700, PM-210

Portable mixers of 8- and 12-channel capacity. The models have varying numbers of facilities but include auxiliary mono and stereo inputs, double programme outputs, 2- or 3-band eq, pan, cue, monitor sends, sensitivity select and channel and master faders.

PM1000 series

16, 24 and 32 into four portable or studio mixer for recording or quality PA applications. Comprehensive eq and subgrouping, faders on all channels and groups, talkback, pan, input select, etc. Metering VU on all groups, additional small VU on two echo subgroups.

PM2000 series

Modular PA and recording consoles of 24- and 32-channels into eight output groups. Channel includes phase reverse, phantom power, pan, 4-band eq, highpass filter, two echo sends and four foldback, peak LED, mute, and post eq PFL. Full monitoring, talkback and VU metering.

EM120

Sound reinforcement mixer with six channels, one aux phono stereo input, and three aux mono inputs. Main input channels have high and low eq and aux send outputs. Channels may be switched left, right or both.

EM150

More versatile 6/2 with panpots and reverb/echo sends on each channel. Subgroup inputs, spring line reverb, monitor send and overall 7-band graphic eq with 24dB swing. Twin 75W rms output stages and VU meters.

Also models EM200 and EM300.

ZOOT HORN (UK)

Zoot Horn Sound Equipment, 31 Station Road, London SE25 5AH, UK. Phone: 01-653 6018/8483.

Modular Series

Offered in recording studio and public address options to custom requirements. Sound reinforcement/public address options include, switchable and continuously variable eq turnover frequencies, high/lowpass filters, integral limiters, up to four foldback subgroups, quad pan. The recording studio options include bell/shelf curves variable slope filters, multitrack output, VU/PPM metering and patch bays. Adaptable to broadcast and multitrack applications. ■



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REVIEWS

Syncon B

MANUFACTURER'S SPECIFICATION

Inputs: microphones balanced, input impedance 1k Ω (1.5k Ω with pad), 48V phantom-powered. Maximum channel gain 80dB. Lines unbalanced, input impedance > 10k Ω .

Frequency response: mic input to channel output, 20Hz - 1dB, 20kHz - 0.5dB, ref 1kHz. Line input to channel output, 20Hz - 0.5dB, 20kHz - 0.5dB, ref 1kHz.

Noise performance: all measurements to DIN audio 20Hz to 20kHz standard. Mic equivalent input noise, within 2.5dB of theoretical limit < -127dBm (200 Ω source). Channel output noise, line input routed at 0dB gain, -91dB ref 0VU. Stereo remix group noise, 20 inputs and 20 groups routed, -82dB ref 0VU.

Distortion: line or mic input to channel output below clipping typically 0.005%, at 1kHz, total harmonic distortion. Mic input with 50dB gain, below clipping, 100Hz < 0.04%, 1kHz < 0.008%, 10kHz < 0.015% total harmonic distortion. Line or mic input to channel output below clipping, intermodulation distortion < 0.015% (SMPTÉ).

Output capability: maximum output level +22dB ref 0.775V into 600 Ω or more, 20Hz to 20kHz.

Normal operating level: +4dB ref 0.775V = 0VU.

Crosstalk: interchannel separation > -60dB at 10kHz, typically -80dB. L-R separation (stereo remix group) > 60dB 100Hz to 10kHz.

Slew rate: all line inputs to outputs 13V/ μ s typical. Transformer input's performance is a function of preamp bandwidth - 3dB at 60kHz.

Shipping weight: crated with legs and PSU, B24 120kg (approx 265lb), B36 175kg (approx 386lb), B48 250kg (approx 551lb).

Price: £4,049 as reviewed.

Manufacturer: Allen and Heath Brenell Ltd, Pembroke House, Campsbourne Road, London N8, UK.

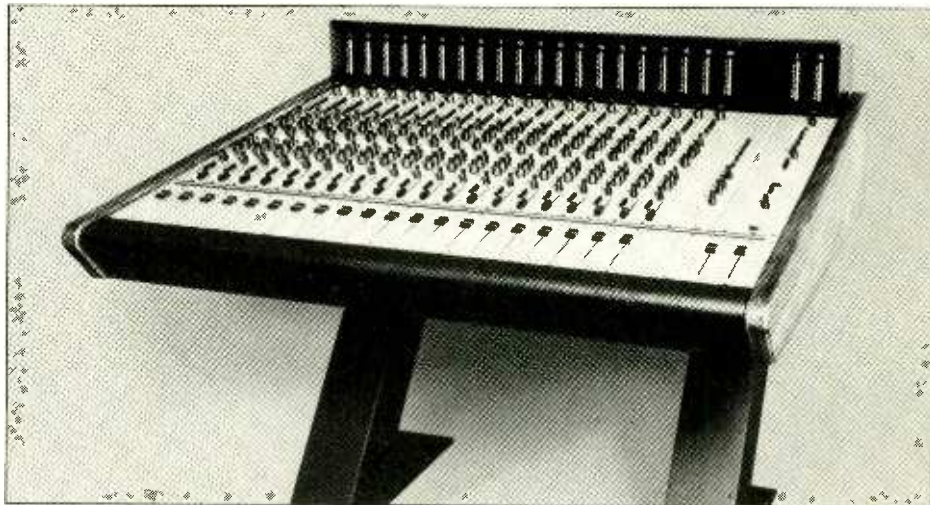
THE SYNCON mixer being reviewed took the form of a unit comprising eight input/output modules, an auxiliary master module and a master output/monitor module. All the modules are the same length and plug into the mainframe via a mother board in the base of the mainframe with all input/output connections being direct to pin connectors at the rear of the plug-in modules. Whilst the use of pin connectors clearly saves cost, proper XLR-type connectors at least for the mic inputs would have been a distinct advantage.

The power supplies for the mixer form a separate unit which may be mounted into a 19in rack and connects to the mixer via a plug-in cable.

Returning to the mixer the eight I/O modules are mounted to the left followed by the auxiliary master module and the master output/monitor module. Good quality Penny and Giles faders are fitted below the input/output modules and the master output/monitor module, but again there has been some cheese paring of the cost by fitting the faders with cheap pin connectors.

Metering is by means of step type LED meters mounted vertically at the rear of the input/output modules and the master output module, the meter having 2dB increments from +6dB to -10dB with further LEDs at -15dB and -20dB plus an overload LED at the top: the + LEDs being coloured red with the remainder being yellow. These LED-type meters all form part of their adjacent modules but are mounted on separate pcbs which plug into the modules.

The form of the modules is a single pcb onto which a printed plug is bolted and soldered to provide the connections to the mother board. It was pleasing to note that all integrated circuits were socketed and very clear circuits were provided for servicing, the boards being uncrowded.



Mechanically the standard of construction was clearly decided with cost in mind, the modules and various other parts being secured by self tapping screws fitting into spire nuts and other mechanical parts being fixed with 'pop' rivets. Where nuts and bolts were used, several were not properly tightened and the manufacturer should take more care in this direction.

The overall finish of the mixer was pleasant with wooden sides and beige front panels with yellow identifications but it is felt that more liberal use of coloured controls would simplify the operation.

Input/output modules

Mounted at the top of the I/O modules are the input controls which select the input from either the transformer balanced mic input or the unbalanced line input. Separate coaxial gain controls are fitted - the inner controlling the mic input and the outer the line input with a push-button switch selecting the desired input. In addition, there is a phase reverse switch for the mic input and a 20dB pad switch.

Both inputs feed the same amplifier which then feeds a pre-eq insertion point at the rear of the input module. This may of course be linked by a pin connector when its use is not desired.

Following this insertion point there is a switchable low cut filter followed by the equalisers which may be bypassed. The equalisers consist of three sections, low and mid-frequency with a nominal \pm 12dB cut/boost and continuously variable frequency, and high frequency again with a nominal \pm 12dB range at switched frequencies of 10kHz or 15kHz. A reasonable frequency overlap is provided with the range of the lf equaliser being 30Hz to 300Hz and that of the mf equaliser 250Hz to 6kHz. (Manufacturer please note that the panel should be identified kHz not KHz).

When in the input module mode the signal is then passed to the channel fader and thence to the post-fade amplifier and to the mixing buss assignment switches via a panpot also feeding auxiliary output busses 3 and 4 via level controls which can be switched to pre-fade, the potentiometer controls for auxiliary busses 1 and 2 always being pre-fade. The pre-fade signal also feeds a red peak overload LED near the input controls and the pre-fade listen buss.

In the sub-master mode the signal from the appropriate routing buss is fed to the channel fader after the equalisers with the aforementioned

features being retained.

Within the monitoring section the channel output, tape sync input or the effects input can be selected and fed to the monitoring system which starts with the level metering. The signal can then be panned between the auxiliary busses 1/2 and 3/4, fed to the pre-fade listen mixing buss and panned to the stereo monitor/remix busses.

Auxiliary master module

This module accepts the input from the four auxiliary mix busses and buffers the signals before coming to four individual level control potentiometers with the signals again buffered before being fed to the output matrix. Interlocked push-button switches then route any combination of the auxiliary buss signals or the pre-fade listen buss signal to the auxiliary outputs A, B, C and D.

These outputs may be used to drive effects units, headphones, etc, with outputs A and B being monophonic and outputs C and D being stereophonic pairs.

Master output/monitor module

This module performs a number of functions. Firstly it accepts the outputs from the stereo remix buss and feeds this via an insertion point to the two master faders and thence to the stereo group output for a master recorder and also to the control room monitoring selection.

The latter also allows the monitor to be fed from one of three pairs of 2-track replay inputs or from the pre-fade listen buss - the selected inputs being fed to the twin monitor meters and thence to the single monitor level control. This is followed by mute and dim facilities. Also the control room monitors can be switched to the left or right channels or to mono with provision being made for two pairs of control room monitors only one pair being capable of being used at one time.

The feed to the stereo studio monitors is normally derived from the control room monitor feed before the control room level controls and the pre-fade listen input with the feed to the studio monitors having its separate level control and an on/off switch. Alternatively the studio monitors can be fed from talkback.

Talkback is derived from a microphone located underneath the module's front panel with a volume control affecting the overall talkback level. Alternatively a test oscillator can be routed to the talkback circuits at fixed level with a choice of frequencies of 60Hz, 1kHz, 10kHz or 15kHz.



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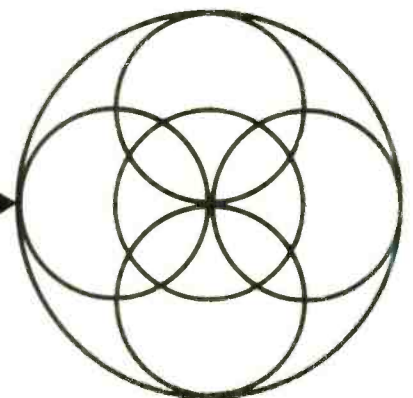
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reviews

The talkback/oscillator output is then fed to the talkback destination selector switches which can route the signal to any combination of the four auxiliary mixing busses, the stereo mixing busses, slate and, of course, the studio monitors.

The remaining feature of this module is the red illuminated 'solo enable' pushbutton which feeds dc to all the input/output modules. This dc level passes via the individual channel solo buttons to a FET switch in the post-fade amplifiers.

Power supply

This comprises a light chassis with Lambda regulated supplies for the +24V and the $\pm 16V$ supplies for the audio electronics and a separate +48V unit for the phantom mic supplies. The latter can be disabled by removing a line from the rear of any individual I/O module.

At the rear of the power supply an 8-way connector feeds dc to the desk with the mains input being by means of a standard IEC connector. At the front panel a power indicator lamp and a properly identified mains power fuse are fitted, however there is no on/off switch.

Inputs and outputs

All signal outputs were of low impedance, being derived from the outputs of operational amplifiers generally with a dc blocking capacitor of $47\mu F$ and in some cases a 22Ω series resistor. All outputs are therefore capable of driving any sensible load.

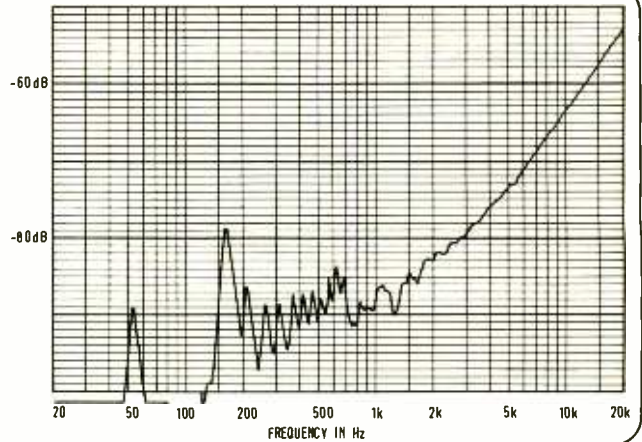
Examination of the fixed level inputs, such as insertion point returns, showed that they were all of high impedance and protected against the presence of dc on the inputs. Interfacing should, therefore, never present any problems.

Turning to the unbalanced line input the input impedance varied mildly with the gain setting, being $10.4k\Omega$ at maximum gain and increasing to $15.7k\Omega$ at minimum gain. The input could handle in excess of +22dBm without input clipping and switching between the line and mic inputs had little effect upon the input impedance whilst completely isolating crosstalk from the line input into the mic input.

Investigating the balanced mic inputs showed them to have a constant input impedance with the gain setting. The impedance (which is adequately high) was found to be $1.15k\Omega$ without the 20dB pad in circuit or $1.59k\Omega$ with the pad in circuit. The maximum input level which could be handled was found to be -5dBm without the pad which offered 21dB attenuation and thus a maximum input capability of +16dBm.

As shown in fig 1 the common mode rejection of the mic input was excellent, being in excess of 100dB at power line frequencies. With the channel fader set to zero (leaving a further 10dB of gain available) the gain of the input/output modules

FIG.1
SYNCON B CMR
AT MIC INPUT



was found to be 5dB for the line inputs and 66dB for the mic input with the panpot central.

Checking the performance of the 'peak' red overload LEDs in the input/output modules showed that these became illuminated at 3dB below clipping with steady state signals and that their performance on transient signals was fast enough to avoid clipping provided that sufficient low or mid-frequency energy was present in the input.

The output drive capability of all modules was found to be +22dB reference 0.775V at frequencies up to 20kHz above which the available level dropped.

Noise

Measuring the noise performance of the mic inputs shunted with 200Ω showed the performance to be very good with the noise over an effective 20kHz noise bandwidth being within 2dB of the theoretical minimum ie 2dB noise factor at maximum gain.

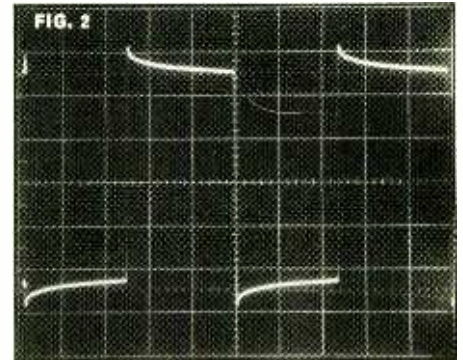
Using the line input with modules set to unity gain the channel output noise was found to be -91dBm A-weighted or -78.5dBm CCIR weighted using a quasi-peak meter.

Noise in the stereo remix output with all eight channels open at unity gain from the line inputs was found to be -82.5dBm A-weighted or -70dBm CCIR weighted using a quasi-peak meter — overall a good performance.

Distortion

The application of a 1kHz squarewave to the mic inputs produced the waveform shown in fig 2 at the channel module's output, it being observed that overshoot was minimal with no sign of ringing — very good for a transformer coupled input.

The harmonic distortion of the I/O modules was measured from the mic input to the channel



output at maximum gain. The results at +10dBm output are shown in fig 3. These good results were repeated at lower I/O levels with little change in the individual distortion products.

Attempts to measure the intermodulation distortion, again using the mic input, revealed that distortion to the CCIF twin tone method was less than 0.01% at frequencies up to 20kHz.

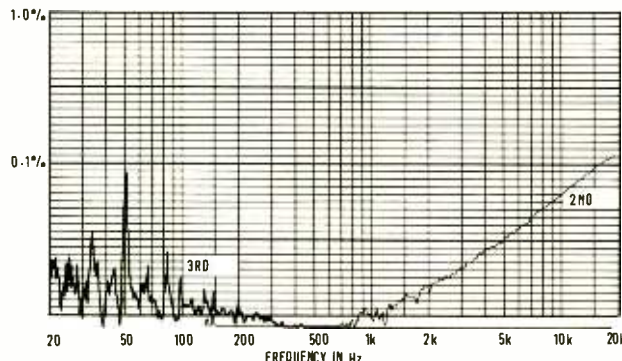
Frequency response, equalisers and filters

Measurement of the frequency response of an I/O module from the mic input to the channel output showed that this was within $\pm 1dB$ from 20Hz to 20kHz with the equalisers either out of circuit or in action at their zero cut/boost settings — the overall response from 2Hz to 200kHz being shown in fig 4 which illustrates a sensible roll-off at high and low frequencies.

The performance of the switched lf filter is shown in fig 5 which shows that its -3dB point is at around 120Hz with an attenuation of 12dB/octave. Whilst I approve of the rate of attenuation I feel that the turnover frequency is far too high. The same figure shows the performance of the hf equaliser when switched to the 15kHz setting with the variable control at its extremes of cut/boost and at mid positions. Whilst the control law permits reasonably fine setting I feel that the extreme settings allow unusable degrees of cut/boost. The same comment applies with the equaliser switched to its 10kHz setting as shown in fig 6 which illustrates an available boost in excess of 20dB at 15kHz — who on earth would use that?

Also shown in fig 6 is the extreme performance of the lf equaliser when set to its frequency limits of 30Hz and 300Hz, things being sensible here with a $\pm 13dB$ range. Similarly the cut/boost range of the mf equaliser as shown in fig 7 is sensible but, as can be seen, the law of the

FIG.3
SYNCON B HARMONIC
DISTORTION OF
I/O MODULES



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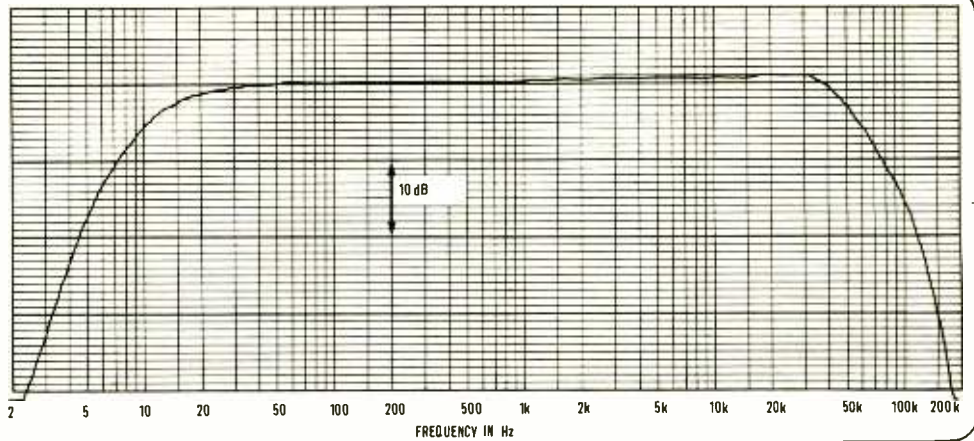


UK Distributors

Feldon Audio Ltd.,

126 Great Portland Street, London W.1. Tel: 01-580 4314. Telex: London 28668.

FIG. 4
SYNCON B MIC I/P
FREQUENCY RESPONSE



frequency control could well be improved as the first half of the available rotation shifted the frequency from 250Hz to 500Hz and the second half of the rotation shifted the frequency from 500Hz to 6kHz.

Other matters

The degree of signal isolation provided by the channel faders was found to be 85dB at 1kHz with the channel on/off switches giving up to 90dB isolation depending upon the channel fader position — it being peculiar that the isolation was worse at the minimum gain setting.

Left/right separation of the stereo group output was found to be in excess of 65dB above 500Hz falling to 61dB at low frequencies with the interchannel separation approaching 80dB.

Checking the metering showed that 0dB indication corresponded to an operating level of +4dB with the meter increments being accurate and the upper unidentified meter element becoming illuminated at +8dB above zero indication. The time for the meter indication to rise to a steady state indication was found to be approximately 150ms with a fall time of 200ms — thus having some similarity to a VU meter, but faster response. As with a VU meter the rectifier characteristic was found to be of the average law.

Summary

The *Syncon B* mixing system provides a most versatile desk but operation is complicated by the versatility — of course a price has to be paid for the very flexible system.

In most respects the performance was found to be very good for a mixer of this class, with only minor criticisms being raised so far as the performance was concerned. It was, however, felt that operation could be simplified by the more liberal use of colour for controls and possibly sections of the module's front panels.

The fact that the channel faders are separate from the I/O modules means that automation of the faders can be readily added at any time and it was a pleasure to find very good quality faders in a desk of this class.

However, as the desk has been very much designed with cost in mind there are a number of compromises. Some of these are the lightweight mechanical construction with the liberal use of self tapping screws and the lack of conventional audio connectors. The latter feature means that all the pin connections have to be disconnected if a module is to be removed for servicing. It was also noted that no cable grips are provided and it is felt that connections could easily be accidentally removed.

Overall the desk proved to be a good performer at a good price which inevitably means some compromises in construction. **Hugh Ford**

FIG. 5
SYNCON B LF FILTER
AND HF EQ AT 15kHz

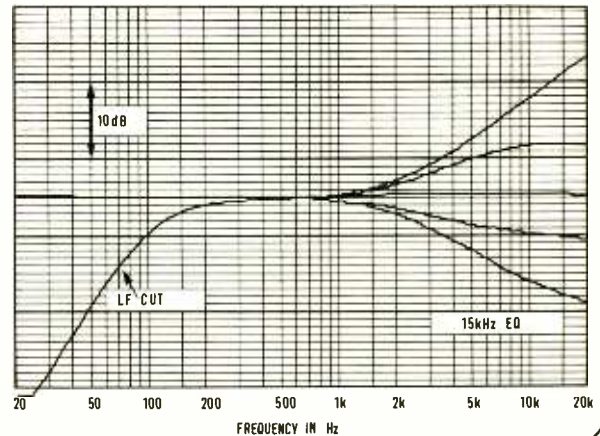


FIG. 6
SYNCON B LF AND HF
EQ AT 10kHz

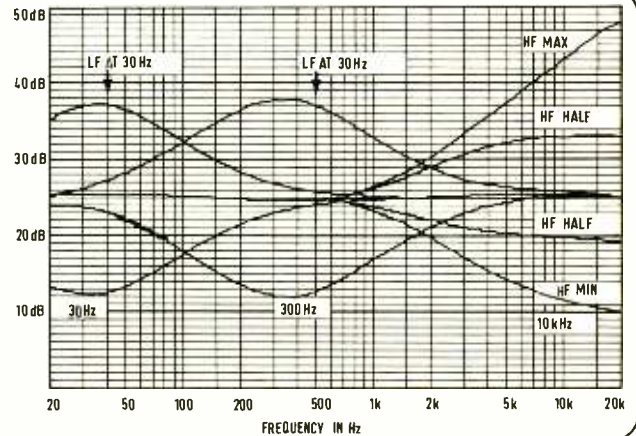
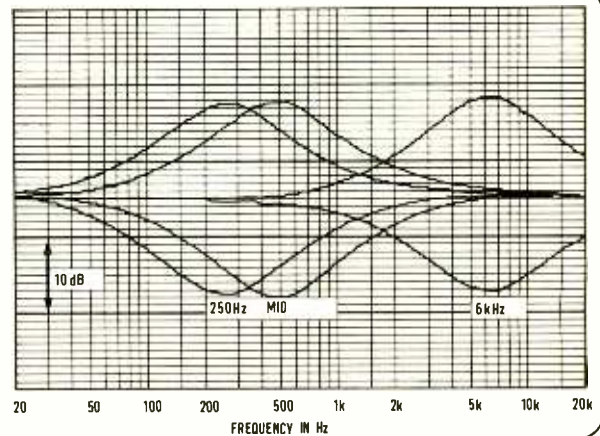
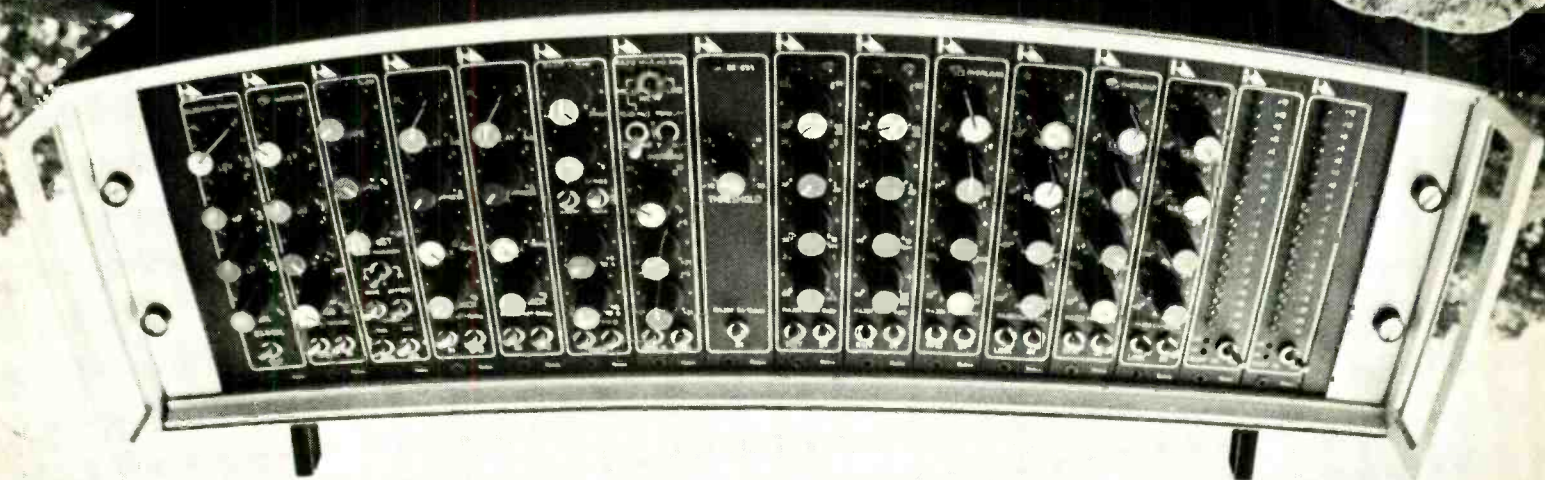


FIG. 7
SYNCON B MF EQ



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REVIEWS



Trident Series 80

MANUFACTURER'S SPECIFICATION

Impedances: mic input 1.2k Ω transformer balanced (48V phantom power standard). Line inputs 20k Ω electronically balanced. Group outputs less than 50 Ω unbalanced (transformer balanced as an option). All other outputs less than 50 Ω unbalanced.

Maximum levels: mic input +10dBV at 50Hz, +24dBV at 1kHz, +23dBV at 10kHz. Line input +24dBV at all frequencies.

Distortion: mic input 0.3% at +10dBV 40Hz, 0.006% at +20dBV 1kHz, 0.02% at +20dBV 10kHz. Line input 0.01% at +20dBV 40Hz, 0.006% at +20dBV 1kHz, 0.015% at +20dBV 10kHz. Group output 0.05% at +20dBV 40Hz, 0.006% at +20dBV

1kHz, 0.01% at 20dBV 10kHz.

Noise: mic input -124dBm reference 600 Ω 20Hz to 20kHz. Group output typically -80dBm 20Hz to 20kHz. Line input routed to one group, all faders set for unity. Monitor buss -86dBm 20Hz to 20kHz. Stereo buss -86dBm 20Hz to 20kHz.

Frequency response: mic \pm 0.5dB 20Hz to 20kHz. Line -0.2dB at 20Hz to 20kHz.

Crosstalk: group to group better than -75dBm (all faders set for unity) 20Hz to 15kHz.

Price: input module £260. Typical console 16-16-24 £19,330.

Manufacturer: Trident Audio Developments Limited, Shepperton Studio Centre, Squires Bridge Road, Shepperton, Middlesex TW17 0QD, UK.

THIS INPUT module is normally part of the Trident *Series 80* mixing console which is available in either 16- or 24-track formats. The other modules which make up this console are an echo return and communication module, an auxiliary module and a monitor module.

The echo return and communications module consists of four separate and identical echo return sections and a communications section with the latter permitting communications with the studio or talkback via the auxiliary busses. Each echo section has a level control, a pan control and 50Hz plus 10kHz fixed frequency equalisers with a \pm 15dB range. After fade or prefade monitoring is fitted together with a mute button and a switched send to auxiliary busses 4/5 for foldback.

The auxiliary module is divided into five sections: auxiliary master sends consisting of five level controls and five solo buttons; test oscillator; studio playback; monitoring; and a small section containing the prefade listen master level control and the auto mute master which mutes all channels switched to auto mute.

The oscillator section provides frequencies from 20Hz to 20kHz in a 2:5:7:10:15:20 sequence by means of a 6-position rotary switch and three decade pushbuttons with a potentiometer type level control and a 'slate' button. Below the oscillator section is the studio playback section which allows playback from various sources by means of interlocked buttons, the section includes a single level control and a mute button. The final section of the auxiliary module selects the control room source and includes a button for checking the monophonic compatibility.

Finally, the monitor module has four identical sections, one for each track in a full console. Each section has a track level control and a pan control for panning the track across the studio monitors. Five auxiliary sends have their individual level controls and may be selected to either pre- or

FIG. 1
TRIDENT SERIES 80
2ND AND 3RD
HARMONIC
DISTORTION FROM
MIC INPUT

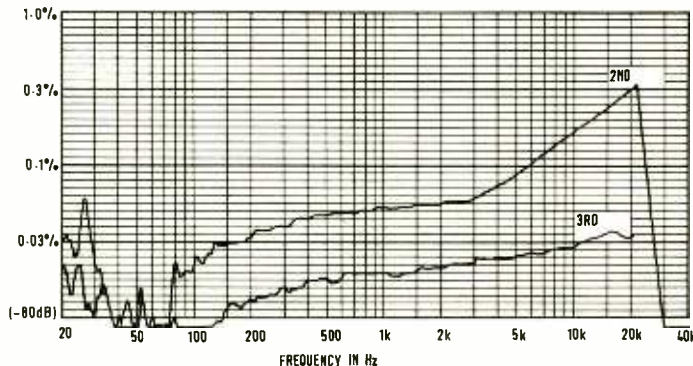
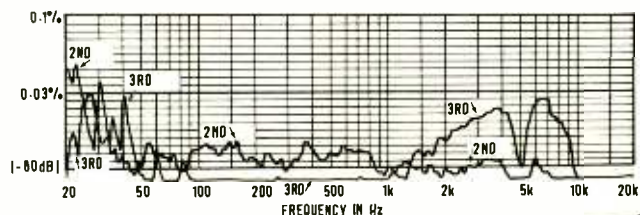
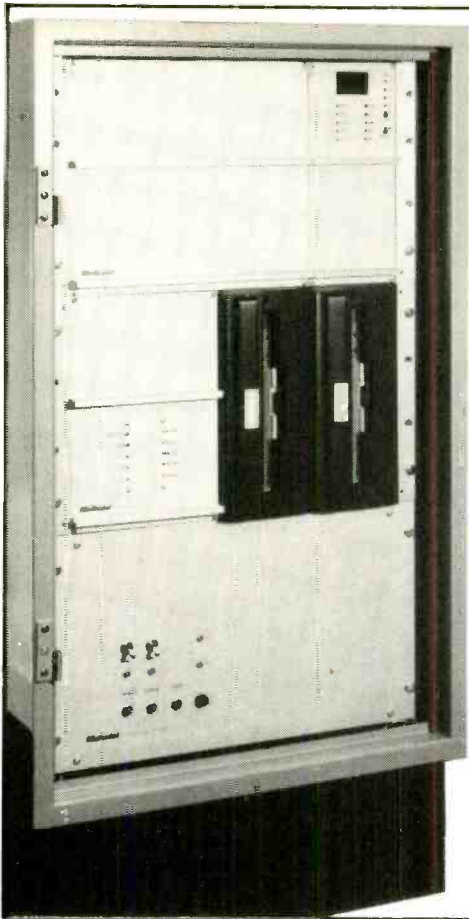


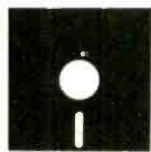
FIG. 2
TRIDENT SERIES 80
2ND AND 3RD ORDER
INTERMODULATION
DISTORTION





GT800 Automated Automation

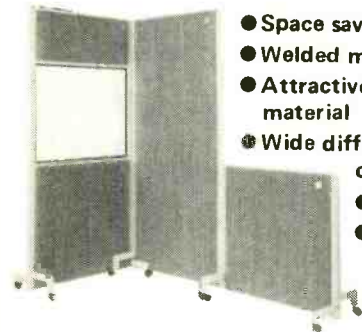
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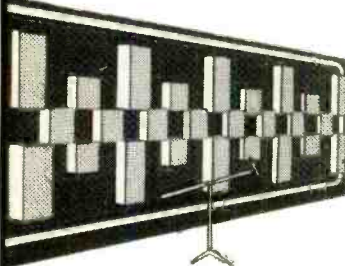
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Patch cords, which are available in any length, terminated at each end with a tip, ring and sleeve brass $\frac{1}{4}$ in jack plug to British Post Office No 316. Inspection of the terminations showed that first-class workmanship was used in the three 2ft long samples supplied. Each conductor had an eye crimped to its end, the eye being screwed to the connections within the jack sockets. The actual length of free cable was exactly 2ft.

Type PC901 audio patch cord

Except for the use of Switchcraft type TT-253 0.175in miniature jack plugs, these patch cords are identical to the type PC801. Again the standard of construction was excellent with the screen and earth wires being crimped to the jack plugs and crimped eyes being used for the audio lines. The leads were exactly to their nominal length and the standard of workmanship was beyond reproach.

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postfade. Each section may monitor either the mixer or from tape with the metering being directed in accordance with a button on the auxiliary module.

This much abbreviated description of the other modules will assist in understanding some features of the input module which is the subject of this review. Starting at the top of the input module there are 24 routing buss selector buttons with the odd numbered busses having green and the even numbered channels red 'blinking eye' type switches which are particularly easy to see. In addition there is a switch for selecting the stereo remix buss and its pan control which may be switched in or out of action by an adjacent locking pushbutton.

Proceeding down the panel there is the input section equipped with red knobs. The mic or auxiliary inputs each have their own calibrated level control with the input source being selected by a red pushbutton and a phase reverse switch being fitted such that it affects both the balanced mic input and the electronically balanced line input.

Following the input section there is a comprehensive equaliser section which may be switched in or out of circuit by a pushbutton with an adjacent red warning LED indicator. Irrespective of this switch the 50Hz lowpass filter may be inserted by a pushbutton. The four equaliser cut/boost potentiometers have mechanisms detented at the zero gain point with the available cut or boost for each section being ± 15 dB. High and low frequency equalisers are fitted with each having a choice of two frequencies selected by a pushbutton, the frequencies being 12kHz or 8kHz for the hf section and 60Hz or 120Hz for lf. The two remaining equalisers have overlapping variable frequency controls with one reaching from 100Hz to 1.5kHz and the other from 1kHz to 15kHz.

Further down the panel are the five auxiliary sends each of which may be switched to pre- or postfade by means of a pushbutton. Sends 1, 2 and 3 are monophonic with auxiliaries 4/5 being a stereo send equipped with a pan potentiometer in addition to the individual level controls. At the bottom of the panel is the channel mute switch with a red warning LED indicator, a solo button, an after/pre-fade listen switch and an auto mute button which works in conjunction with the master auto mute button on the auxiliary module.

Overall, identification of the front panel controls is excellent. The panel is uncrowded and very easy to operate in view of the clear grouping of the controls and the sensible, but not disturbing, use of coloured controls. The form of construction is an alloy black anodised front panel having white markings attached to a single pcb which has clear white component identifications.

Virtually all front panel controls are supported by the pcb, thus almost eliminating any hand wiring with the mic input transformer being mounted in a hole in the pcb and having a nearby 48V phantom power on/off switch. A separate pcb is used for half the routing switches with the review sample having a small further board for what appeared to be a modification.

All integrated circuits are socketed to ease maintenance with good quality components being used throughout. An excellent handbook contains module descriptions plus block diagrams, circuits and parts lists.

Noise

The noise of the mic preamp was measured at maximum gain over an effective noise bandwidth of 20kHz (ie using a lowpass filter attenuating at

6dB/octave above 15.7kHz). With the mic input shunted by 200 Ω the noise referred to the input was found to be -122.5 dBm and to change very little with a change of resistance. This means that whilst the noise factor is good in relation to 600 Ω it can certainly be easily bettered when related to 200 Ω . However, one great advantage of the mic input section of this module is that no attenuating pad is needed and this fact offers a better noise performance with a high output mic than would be obtained with inputs using the common 20dB pad.

So far as the balanced line input was concerned the noise performance was good with the 20kHz effective noise bandwidth rms noise being 90 \blacktriangleright

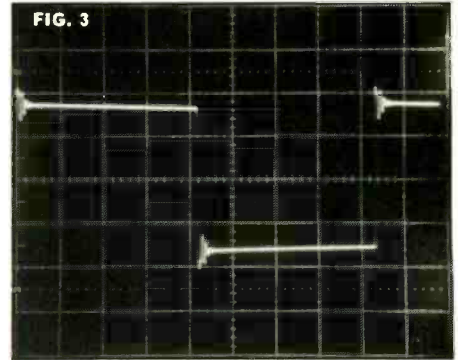
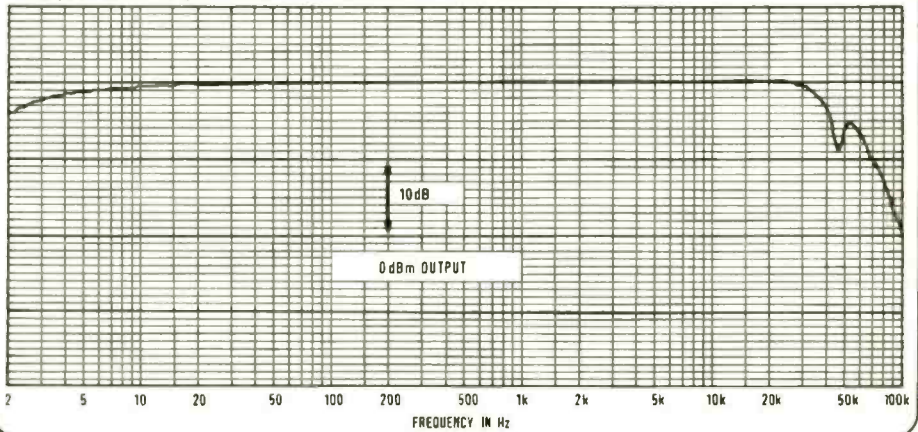


FIG. 4 TRIDENT SERIES 80 OVERALL FREQUENCY RESPONSE



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-97.5dBm referred to the input.

Checking the crosstalk across the mute facility showed that this was negligible as was the crosstalk between the line and mic inputs.

Distortion

Both harmonic distortion and intermodulation distortion to the CCIF twin tone method using two tones separated by 70Hz were checked from the mic input to the direct output. The second and third harmonic distortion at maximum gain with +20dBm output with the equalisers in circuit is shown in fig 1. At lower I/O levels and lower gain both harmonics dropped in percentage. For instance, at +10dBm output at maximum gain the harmonic distortion was less than 0.01% below 1kHz with the third harmonic rising to 0.03% at 15kHz where the less offensive second harmonic rose to 0.1%.

At all levels the CCIF intermodulation distortion remained at extremely low levels, the second and third order intermodulation distortion at +10dBm output and maximum channel gain being shown in fig 2 which shows that from 20Hz to 20kHz the intermodulation products remained below 0.03%.

The application of a fast 1kHz squarewave to the mic input produces the waveform shown in fig 3 at the direct output, showing that whilst the frequency response is flat there is a degree of ringing. The insertion of the equalisers into circuit set to the flat position produced a slight increase in this ringing.

Checking distortion products at various other control settings showed that the measurements presented here are, so far as can be seen, worst case conditions.

Frequency response, equalisers and filters

The overall frequency response from the mic input to the direct output is shown in fig 4 with the equalisers out of circuit, it being seen that the frequency response is very flat up to 30kHz above which it falls in a satisfactory manner. The insertion of the equalisers in their 'flat' setting using the detents on the potentiometers made a negligible difference to the response.

Checking the performance of the lf highpass filter which is not affected by the equaliser in/out switch, revealed that its -3dB point was at 100Hz with a rate of attenuation of 6dB/octave (see fig 5). Personally I feel that the turnover frequency is on the high side and that a more rapid rate of attenuation would be desirable.

Remembering that the hf and lf equalisers each have two switch selected frequencies the performance of these equalisers is shown in fig 5 showing 120Hz to 12kHz, and fig 6 showing 60Hz to 8kHz. In both cases the extreme settings are shown plus the performance with the equaliser potentiometers at their halfway positions. From this it is clear that both equalisers produce a well controlled shelf with a good mechanical linearity.

The two remaining equalisers are of the parametric type and have a variable cut/boost plus a variable frequency setting. At maximum cut/boost the frequency range of the lower frequency equaliser is seen in fig 7 showing the extreme frequency settings and the mechanical mid position with the front panel frequency calibrations, it can be seen that the latter are accurate and that the control law is good. Similarly the performance of the higher frequency equaliser is shown in fig 8 at its extreme settings of 1kHz and 15kHz together with its mid point setting at 7.5kHz, it is again clear that the performance is good.

Using the higher frequency equaliser set to

7.5kHz the law of the cut/boost control at seven equally spaced positions in its rotation is plotted in fig 9 from which it can be seen that the control, like the others, has an excellent law.

Overall the equalisation section offers a very good performance with sensible controls which are 'delicate' in their operation, I would, however, like to see the lf filter modified.

Inputs and outputs

The maximum gain from the mic input to the direct output was found to be 65dB at which the maximum mic input was -36dBm for the onset of clipping at 1kHz. With the mic gain at minimum the input could handle an extraordinary +22dBm at 1kHz.

Measuring the input impedance at the mic input showed that this varied considerably with the gain setting, being 935Ω at maximum gain, 1,777Ω at mid gain setting (25dB) or 2,900Ω at minimum

gain. Whilst it is felt that this large variation is undesirable the impedance remains satisfactory for a 200Ω or less mic.

The common mode rejection at the transformer coupled mic input is shown in fig 10 which shows that it is excellent at power line frequencies. The direct output was found to be capable of delivering +23.5dBm loaded into 600Ω from a low source impedance in the order of 7Ω.

With the exception of the buss outputs which have 8,200Ω series resistors, the other outputs were of low impedance with the inputs being of high impedance, so the module should not present any problems with interfacing outboard equipment via the insert points.

Other matters

As is common the pan control (which can be switched out of circuit) gives 3dB attenuation to

FIG. 5
TRIDENT SERIES 80
HF AND LF
EQUALISERS

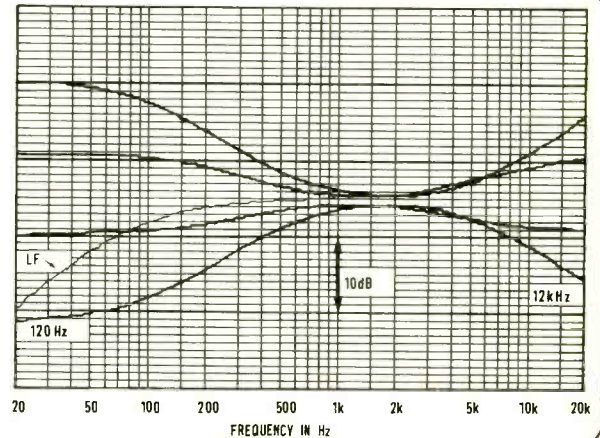


FIG. 6
TRIDENT SERIES 80
HF AND LF
EQUALISERS

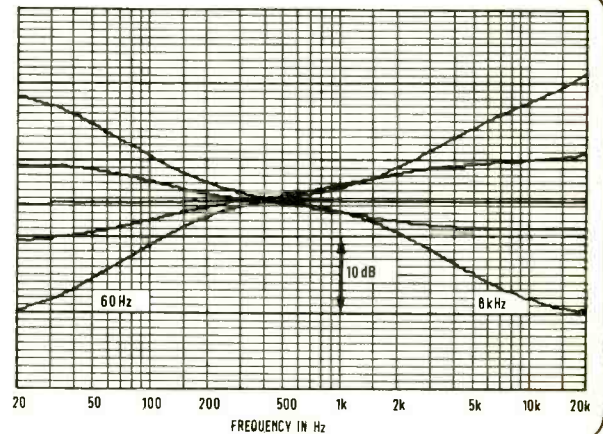
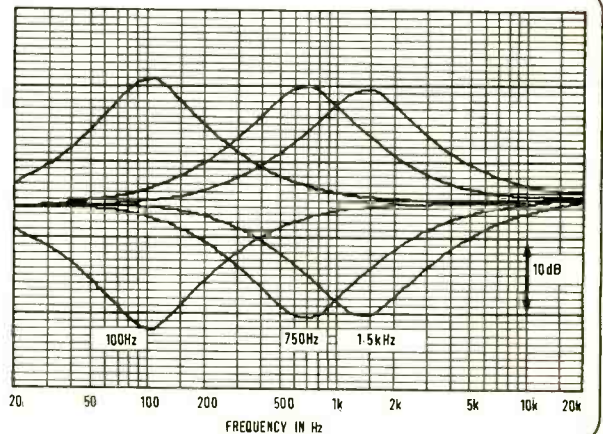


FIG. 7
TRIDENT SERIES 80
LF EQ FREQUENCY RANGE

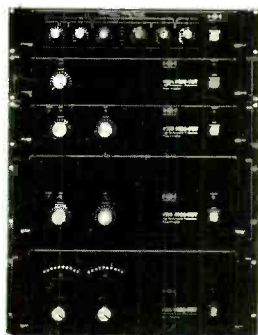




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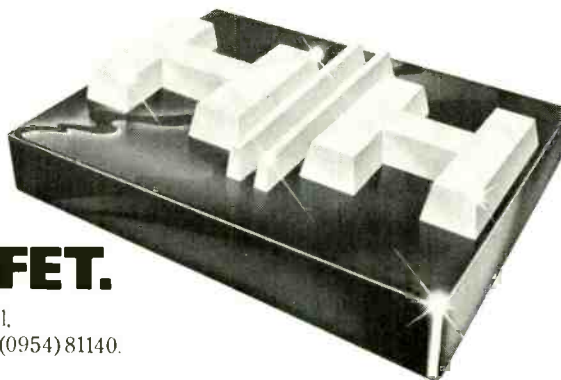


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reviews

both channels when it is switched into circuit. It follows that at its extreme positions there is 3dB gain available in one channel with the other channel being completely cut off.

The auto mute facility was found to give in excess of 90dB isolation up to 20kHz with the local mute function providing about 10dB less isolation.

Measurement of the isolation between the mixing busses is not so meaningful for the single module but measurements gave a worst case isolation at 1kHz of 70dB.

Summary

This is a very well made module with clearly laid out facilities which should prove excellent in operation. The subtle use of coloured controls

together with the sensible grouping of controls gives a pleasing and practical layout. The input section of the module is unusual in that no mic attenuator pad is fitted with the gain control giving a very wide range. This is achieved by the use of a tandem gain control which operates on two input amps in series, however, this system proved to be rather noisy with low impedance, low output, mics.

Overall the eq section was very versatile without having an excessive range and with all controls having a very good law permitting fine adjustment of the equalisation.

Finally, Trident have done a good job with the manual for the Series 80 console and this should save much time when maintenance is required.

Hugh Ford

FIG. 8
TRIDENT SERIES 80
HIGHER FREQUENCY EQ

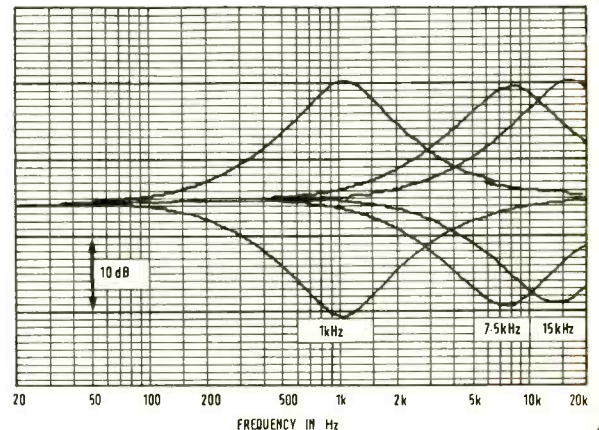


FIG. 9
TRIDENT SERIES 80
CUT/BOOST CONTROL LAW

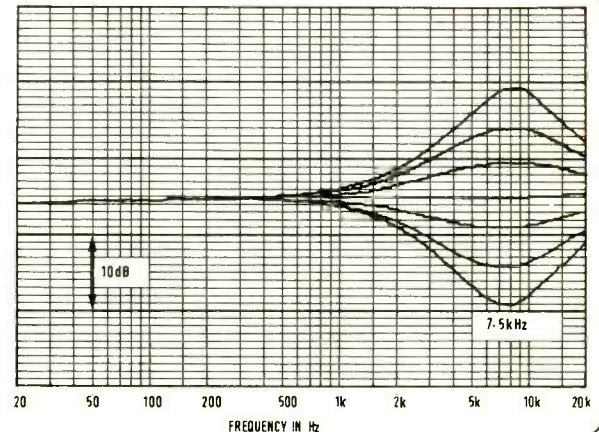
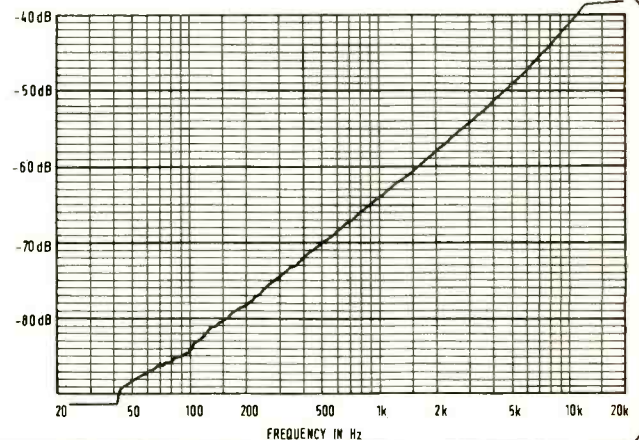


FIG. 10
TRIDENT SERIES 80
CMR AT MIC INPUT





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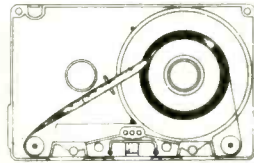
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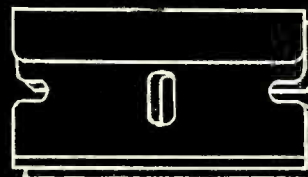
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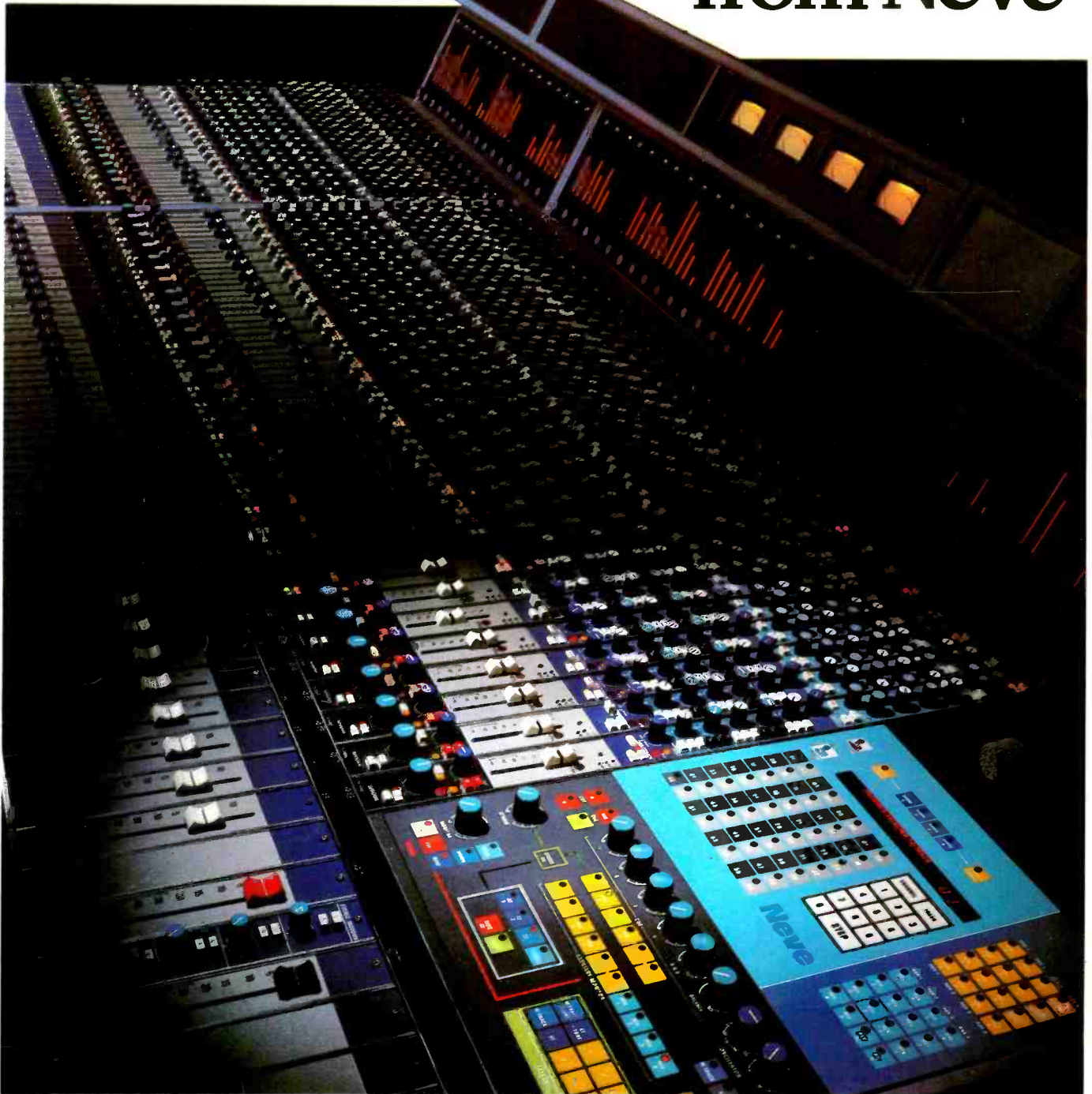
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