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July 1979 60p

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EDITOR
ANGUS ROBERTSON

ASSISTANT EDITOR
NOEL BELL

PRODUCTION EDITOR
DRUSILLA DALRYMPLE

CONSULTANT
HUGH FORD

EDITOR'S PERSONAL ASSISTANT
WENDY SMEETH

ASSISTANT ADVERTISEMENT MANAGER
PHIL GUY

ADVERTISEMENT SECRETARY
MARION MOISER

PUBLISHER
DOUGLAS G. SHUARD

Editorial and Advertising Offices:
LINK HOUSE, DINGWALL AVENUE, CROYDON CR9 2TA, GREAT BRITAIN
Phone: 01-686 2599
International: +44 1 686 2599
Telex: 947709
Telegrams: Aviculture Croydon

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A LINK HOUSE GROUP MAGAZINE

studio sound

AND BROADCAST ENGINEERING

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I was very pleased to note from the sleeve of the latest Supertramp *Breakfast in America* album, that the concert sound engineer (Russel Pope) has his name billed as an integral part of the group, rather than in the small print lost somewhere on the sleeve. Perhaps it is about time that other groups realised that the contribution made by the live sound mixing engineer is an integral part of the performance and thus deserves equal credit to the musicians. Interested, I wrote to all the major record companies in London a few months ago requesting information about the recording studios and engineers producing their current albums. Response was almost nil which perhaps indicates the lack of concern felt by record companies for the people that actually manage to turn an often incoherent sound into a successful record. But recording engineers rarely receive *prominent* credit for their efforts, often just very small print buried among the assistant make-up artists and so on. While doubtless the people involved with cover production, group management (often a euphemism for somebody responsible for delivering the 'artist' in a sober state for the session), and all the other people that might have been involved with the album. Most people buy records because of the sound which is generated by the producer and recording engineer (the role of the latter obviously varies depending upon the competence of the producer), but how often does the recording engineer's name receive the same prominence as the producer? While it must be said that engineers receive more credit now than a few years ago, I'm sure that most will be very pleased if the Supertramp example is followed.

There has been considerable discussion in the press recently about the poor state of records —one device that has been on the market for several years and has gained universal acceptance around the world, is the Keith Monks record cleaning machine. While this is obviously unable to eliminate pressing faults, cleaning discs thoroughly always assists in maintaining quality. Although not a low cost device (several hundred pounds), the cleaning action is very effective—it first douses the disc with a 50/50 solution of distilled water and methylated spirits, and then a vacuum head sucks off both liquid and dirt. A good investment?

Cover of Keith Monks (Audio) microphone stands by Adrian Mott and Ray Hyden

JULY 1979 VOLUME 21 NUMBER 7

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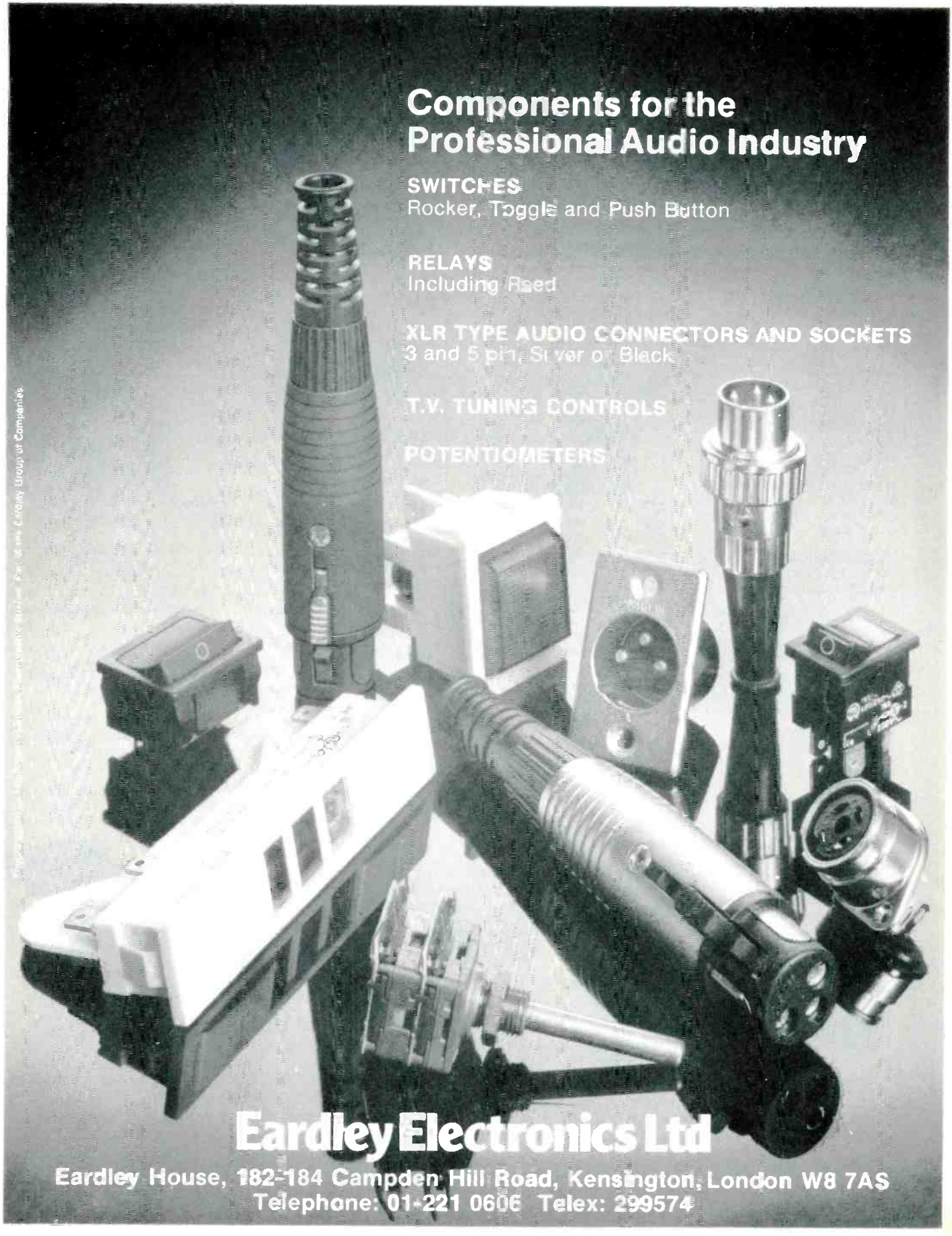

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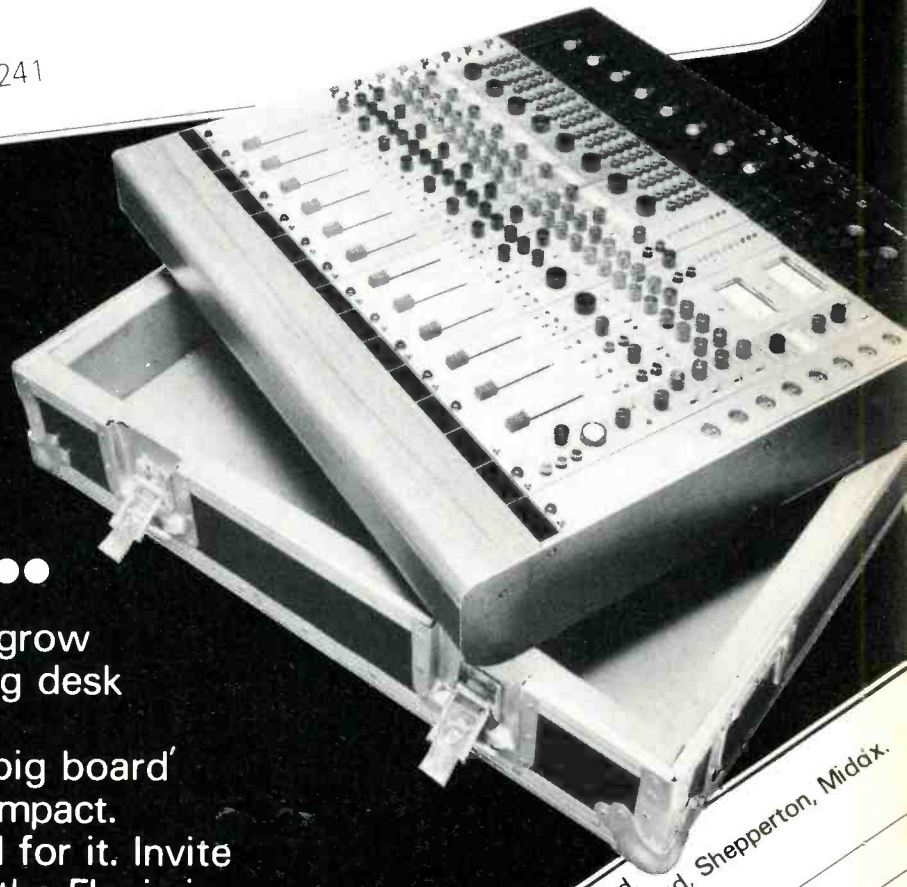

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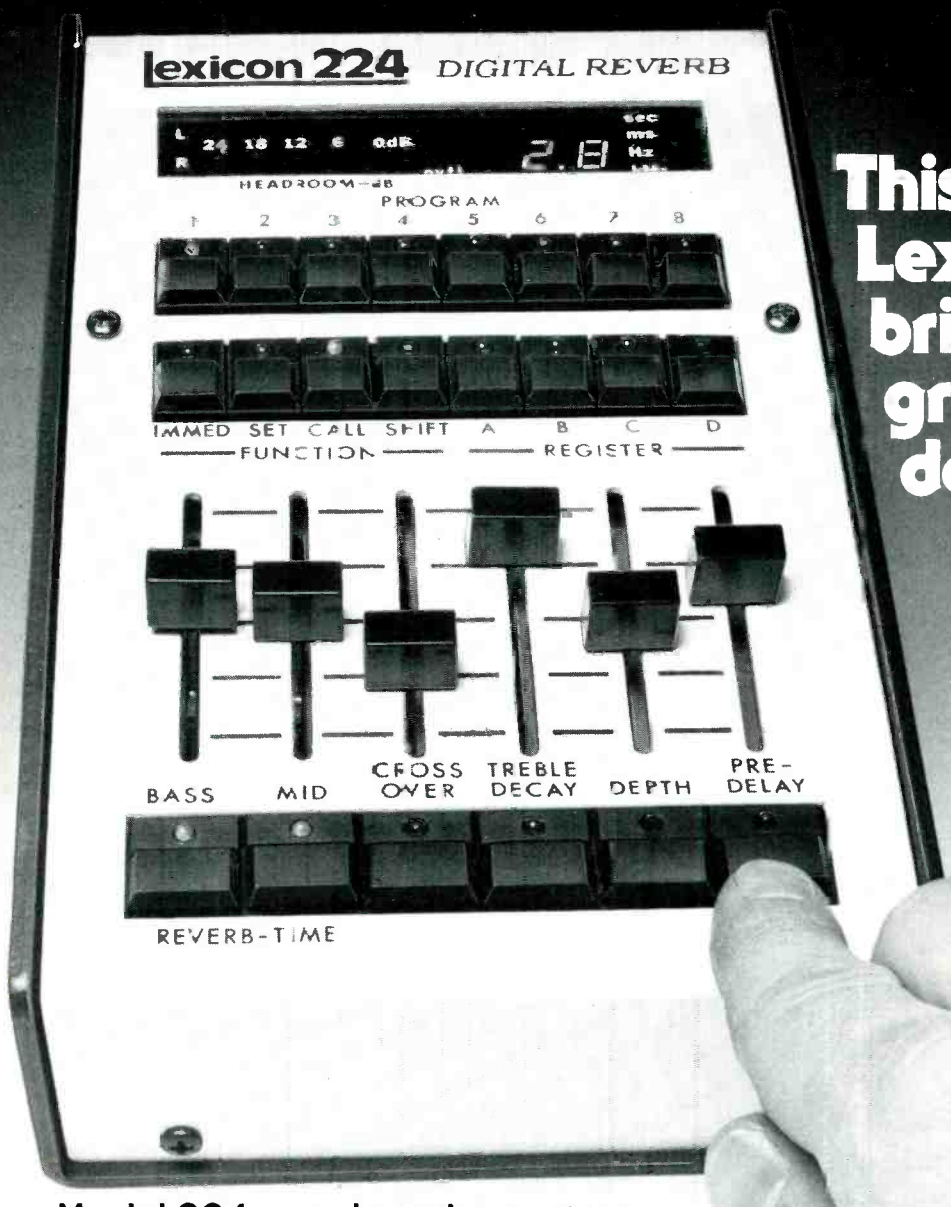

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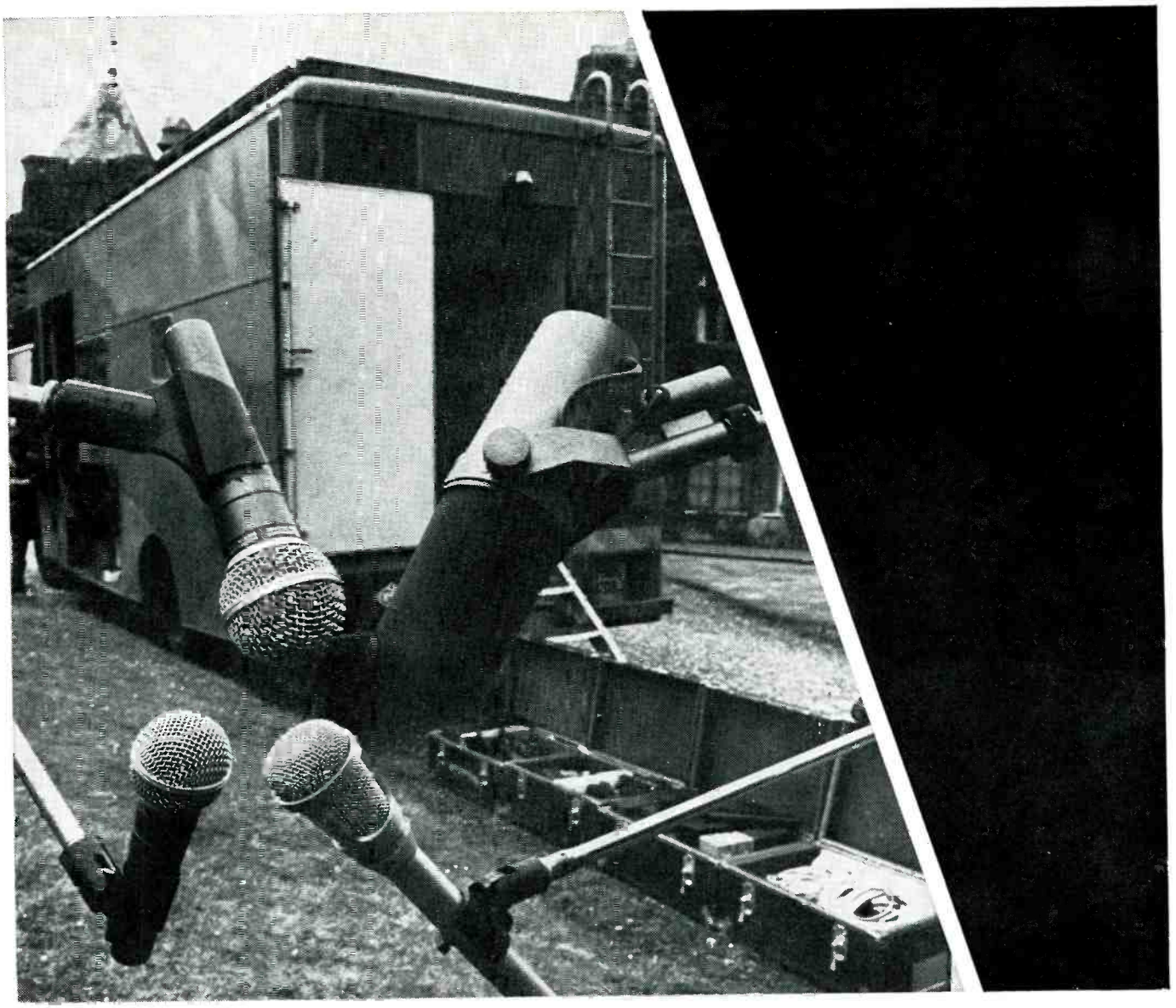

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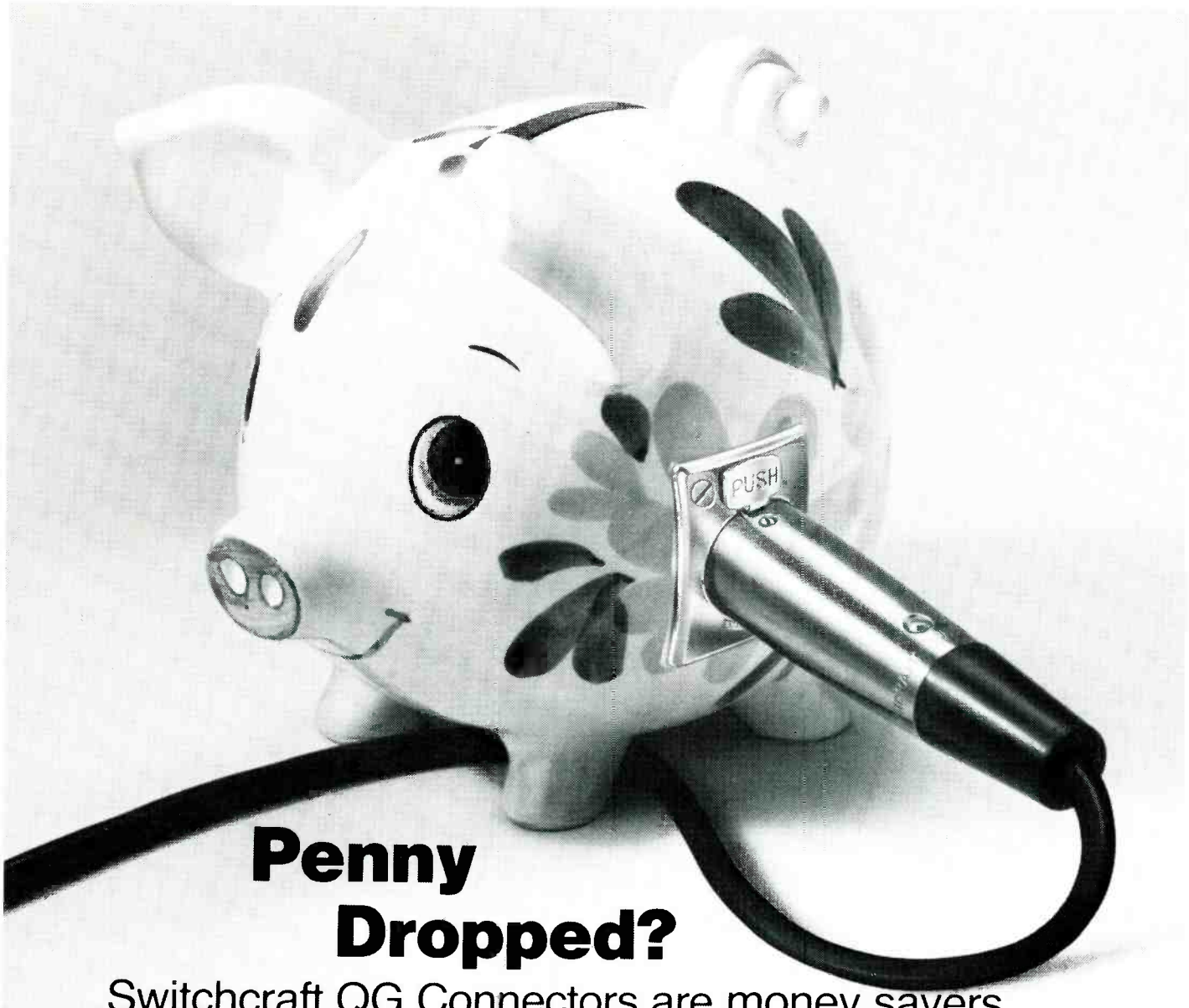

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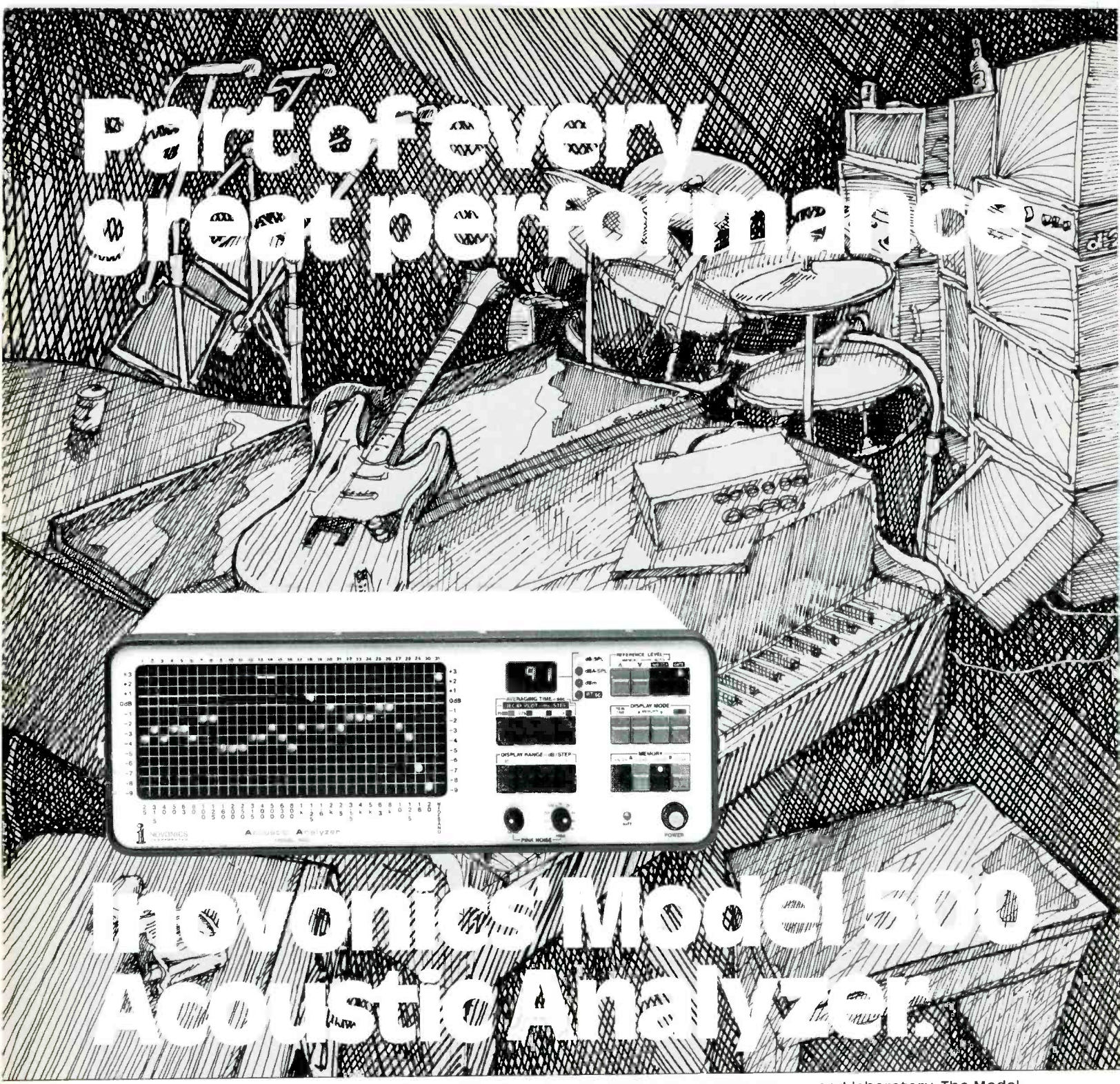

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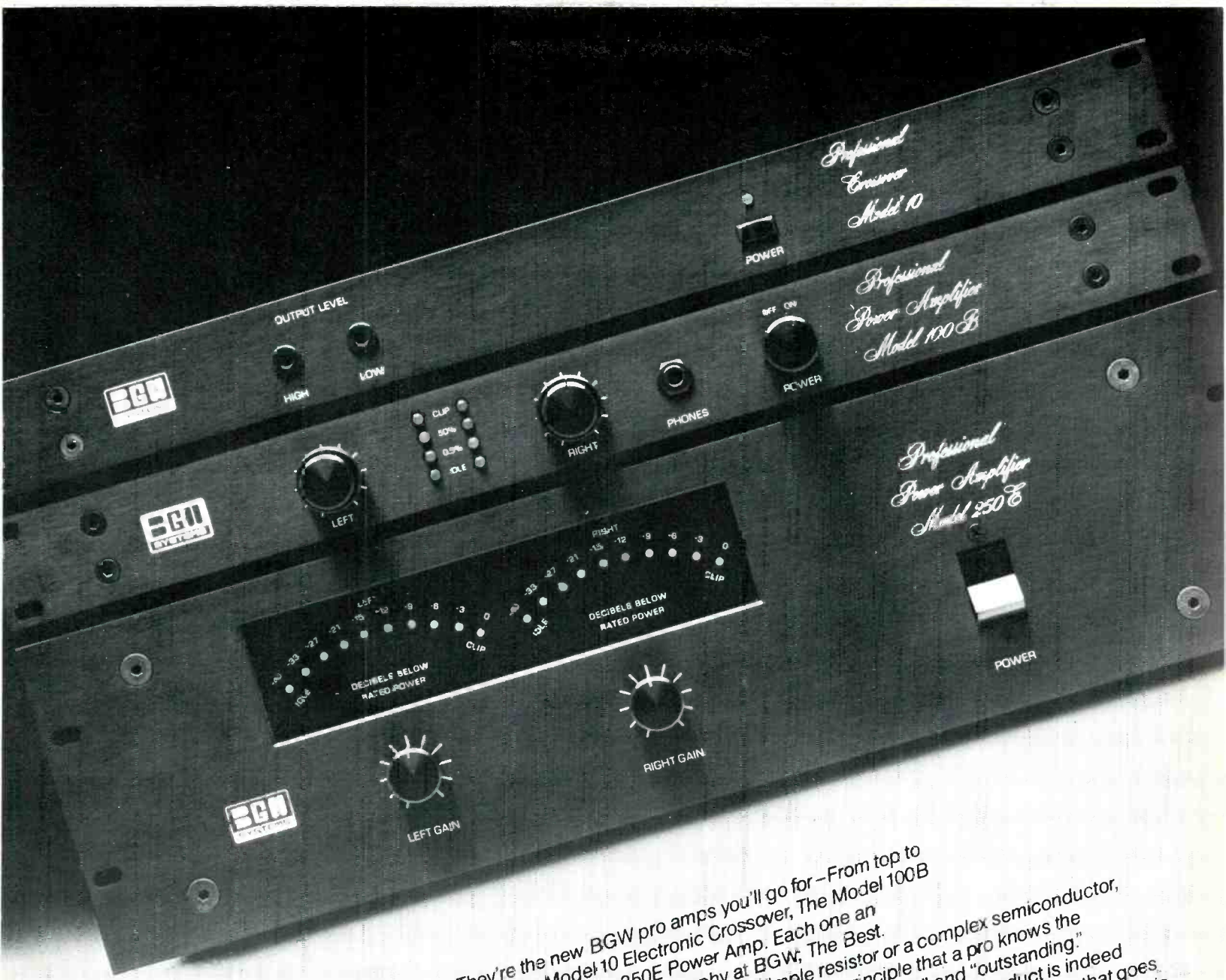

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COURT ACOUSTICS

WHAT IT TAKES TO REALLY HEAR THE TALENT

ATR-100

When you hear recording engineers talk about the "Ampex Sound," they're talking about the sound of transparency. To the limits of technology. Ampex recorders and mastering tape let the production qualities and the sound of the talent come through the recording process intact. Here's a brief review of Ampex professional products for the serious studio...

MM-1200. Lay Down the Ampex Sound

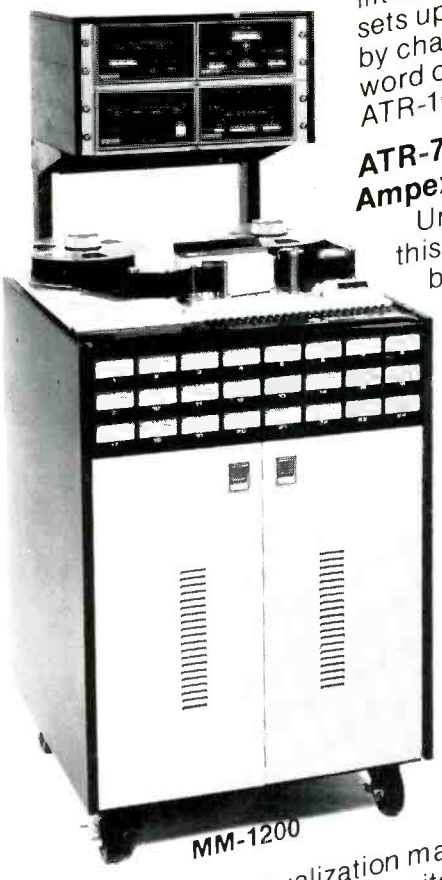
Ampex designed the MM-1200 as a money-making proposition for studio owners. It'll work around the clock as group after group lays down the audio, and then it'll keep right on working as you go back for sweetening, for a vocal, or even for a final mix to a video production (with the addition of a video layback head). Quick-change heads make the MM-1200 even more useful—you can go back and forth between 8, 16 and 24 channels, and switch from one-inch to two-inch tape as easily as a clarinet player changes reeds.

ATR-100. Mix Down the Ampex Sound

This modular one-two-or-four-track machine is the ultimate analog audio tape recorder. In every specification, electrical or mechanical, it **is** the state of the art. Tape handling superiority comes from a unique closed-loop triple servo system that protects your valuable masters. Convenience features begin with the wide-open

Grand Mast

component placement for easy maintenance, and go all the way to a compact lift-out remote control that sets up all functions, channel by channel. And for the last word on reliability, talk to an ATR-100 user.



MM-1200

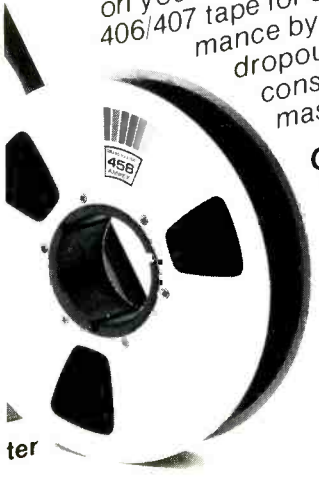
ATR-700. Carry Around the Ampex Sound

Unsnap the cover of this reel-to-reel portable, plug in the power, and you're ready to work in monaural or stereo. The ATR-700 has a wider dynamic range than you'll find in most other portables, and it has heavy duty switches and connectors to resist the punishment of normal use over many years of constant service.

Switchable equalization makes for fast setup, and full meter monitoring takes the guesswork out of recording and playback. The ATR-700 is a solid money-maker in the studio, too, when you use it for producing and editing commercials.

Grand Master Audio Tape. The Medium for the Ampex Sound

You'll find a reel of Ampex Grand Master audio tape to fit every one of these professional machines. Every width and every length, packed on reels that fit most professional machines in current use. Best of all, you can use both Grand Master or 406/407 without changing the bias setting on your recorders. Use Grand Master or 406/407 tape for state-of-the-art performance by every measure, from dropouts to edge-to-edge consistency. This is the finest mastering tape you can buy.



ter

Golden Reel Awards. The Reward for the Ampex Sound

A Golden Reel is more than just another award. It's a thousand dollars for the charity of your choice, if you earn it. To qualify for a Golden Reel, you must sell a million singles. Or half a million albums. And you must master your hit on Ampex tape. (Which over 70 top recording artists have done over the past two years.) We're proud of the people who win this Ampex award, and we're even prouder when they give it away to a good cause.

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ATR-700

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Ampex Corporation, 401 Broadway, Redwood City, California 94063, 415/367-2011

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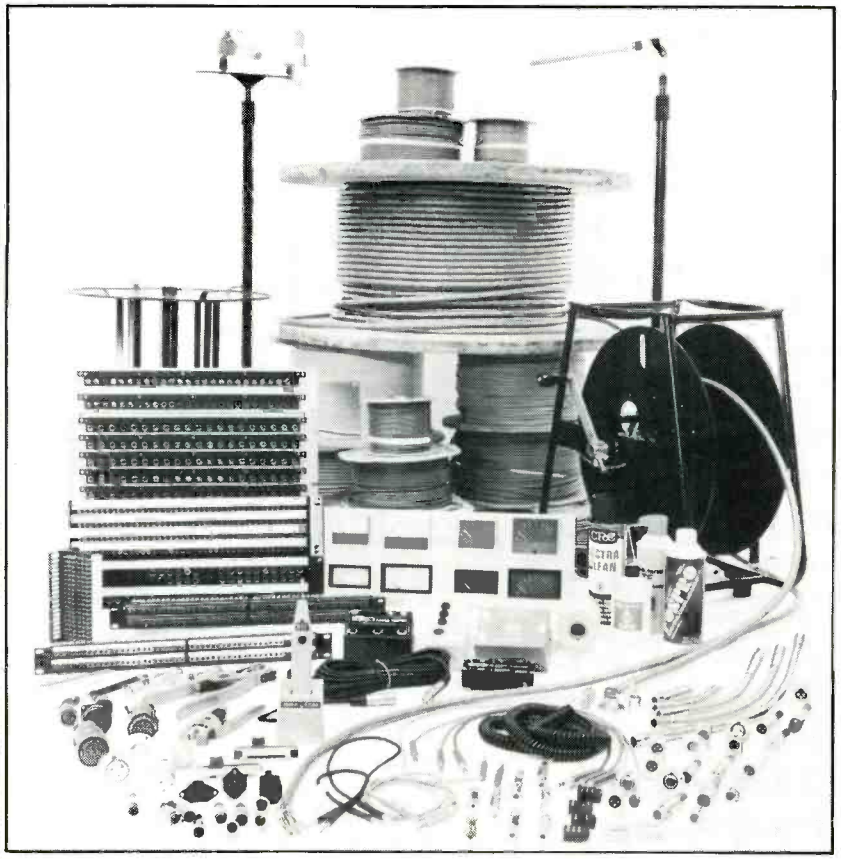

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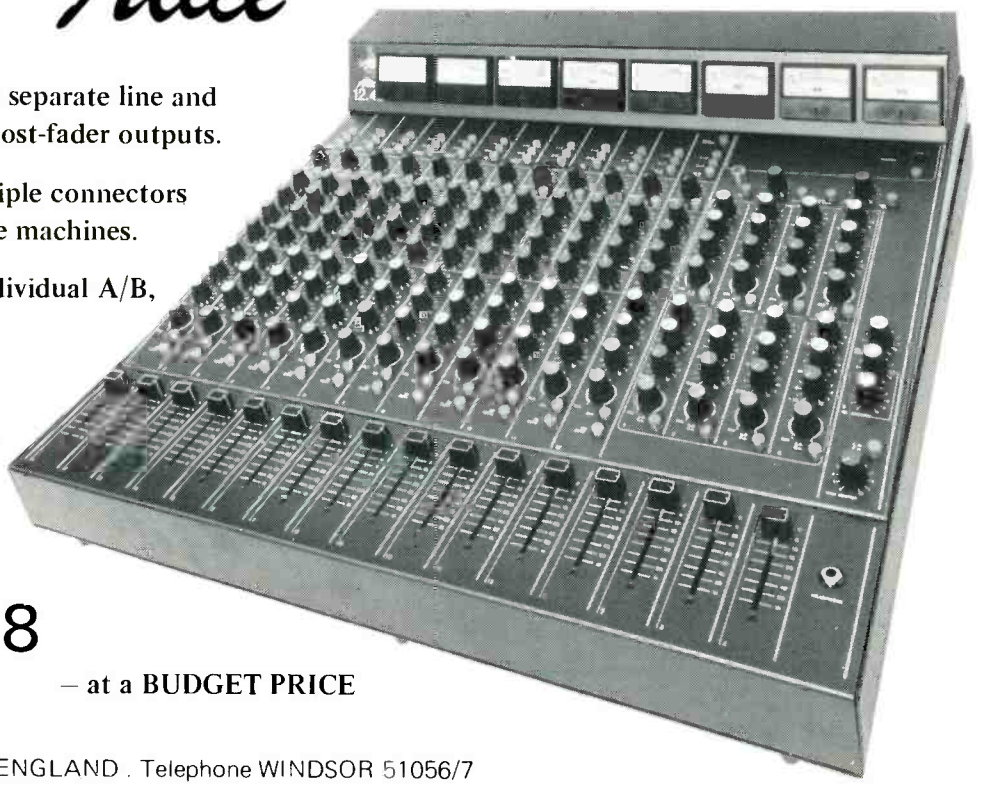

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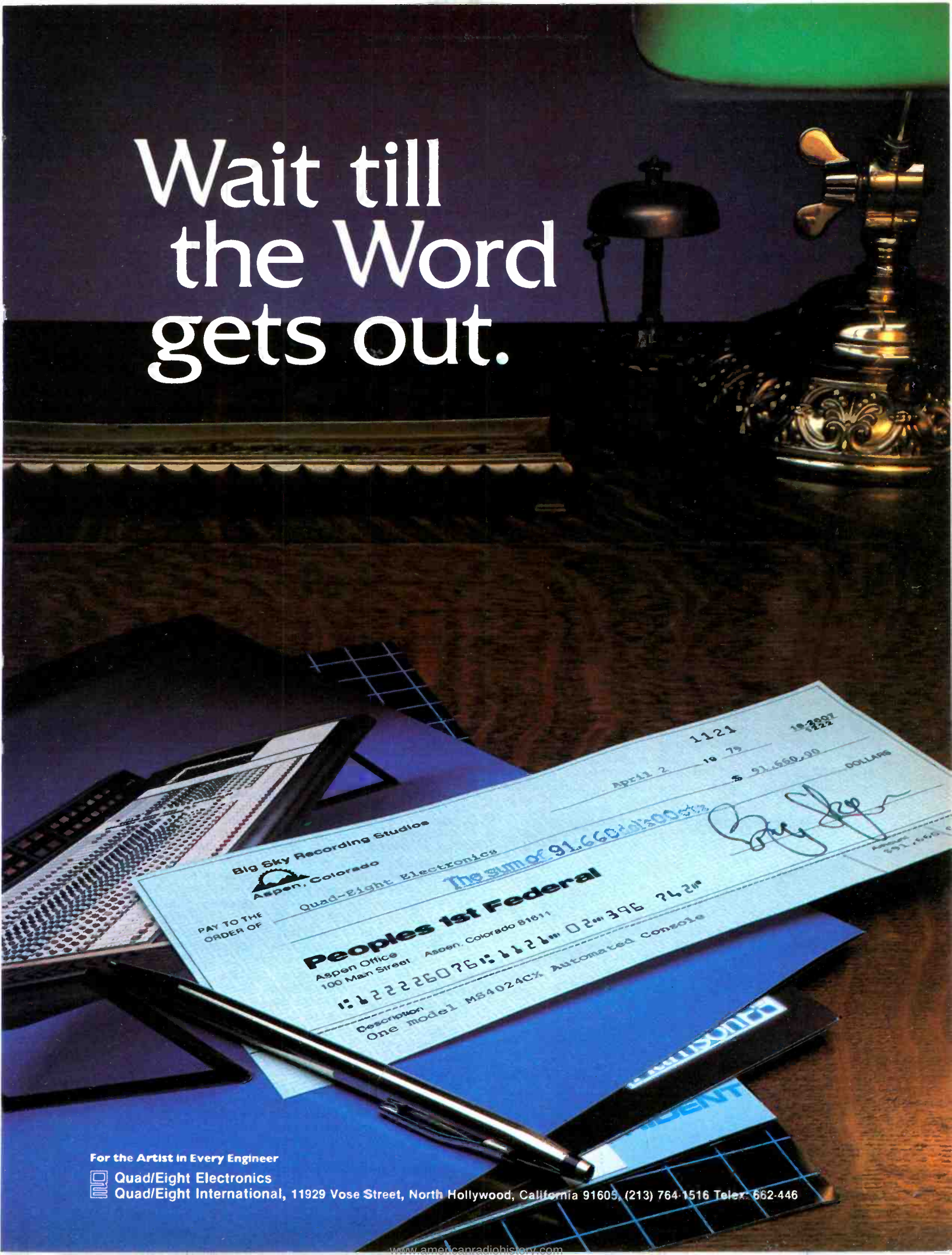

news

Sondor postproduction film equipment

The main concentration of activity for Sondor these days is in the field of postproduction equipment for video and film. A measure of the company's success in this field is that in 1978 Sondor installed dubbing facilities in several European television centres including Radio Bremen, Sudwestfunk Baden-Baden and RTV Ljubljana. (Incidentally, numerous projects in Europe and the Far East are in preparation.) However, what interests us here is news of the company's recent products.

The new Sondor *MO3A-Libra* utilising the patented 'Libra' system of a combination capstan drive/sprocket drive and allowing easy lacing has been recently introduced. This model has a synchronous speed of up to 30 x normal (750 frames per second), dc-controlled torque motors, sensor controlled clutch, individual loudspeaker monitors for up to three tracks, fast spooling, and 5ms start/stop characteristics. Optional devices include various prelistening facilities and the facility to use 1-10m endless loops. The *MO3A-Libra* is available in console or 19in rack mount versions for 16mm magnetic film, for 35mm/17.5mm magnetic film and as a 16mm filmscanner, and in colour or black/white versions with COMOPT, COMMAG and SEPMAG facilities.

Another recently introduced unit is the *V2/OMA3* 16mm scanning and projection unit which meets the standards for SEPMAG equipment allowing it to be used as a magnetic film recorder/reproducer for dubbing theatres.

Sondor has also introduced the first module in a new electronic programmer system, the *EPS 8000*, which interlocks any number of Sondor dubbing units to an SMPTE code on a VTR or VCR cuetrack. Speed range of the *EPS 8000* ranges from $\frac{1}{4}$ to 50 x normal running speed and offsets of up to 24 hours can be accepted. In addition to the interlocking of magnetic films on the cuetracks, sprocketed film can be interlocked without timecode once the films have been set to the start mark.

Sondor also informs us that all its dubbing machines now have 'selsync' operation as a standard feature together with new noise-free amplifiers.

Sondor, Gewerbezentrum, CH-8702 Zollikon, Zurich, Switzerland. Phone: 01 658090.

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

Sondor MO3-Libra

Sound 79 Exhibition

This year's Sound 79 exhibition was the most ambitious exhibition that the Association of Sound and Communications Engineers have mounted to date. Together with the Association's participation in last year's AES New York Convention, a much more outward looking attitude seems to be surfacing which shows that the Association is more aware of the role it has to play in the PA, theatre, studio, broadcast, manufacturing and end-user fields than perhaps it has done in the past. It was refreshing, therefore, to see that Sound 79 had a larger number of exhibitors than previous exhibitions, with companies from many different parts of the professional sound industry taking part, and that for the first time the Association was holding a series of mini-seminars running concurrently with the exhibition. Whilst on the subject of the seminars it was pleasing to note that these covered a wide range of topics and that the Association's approach was to make them as practical and non-technical as possible. The primary object being to show end-users and equipment installers how to use the available ranges of equipment to the best possible advantage. Interestingly the subject material of the seminars while slanted towards the needs of PA engineers was much more widespread in range than perhaps might have been expected. Subject areas covered for example, included product technology and application, acoustics, communications, audio-visual systems, case studies of particular installations and industry standards, and specialised topics such as the organisational requirements for simultaneous interpretation at conferences and the educational role of the Association.

Turning to the products being displayed at Sound 79, while much of the equipment being shown was for lower-end public address or sound reinforcement usage a number of items caught the eye. A particularly fruitful field was that of microphones. EDC was demonstrating its *Cygnus* lightweight hand held radio mic and receiver system together with its *Minkom* miniaturised system. Not only are these units extremely pleasing to use but the quality of construction is of a high quality. Operating range of the *Cygnus* system at around 300ft should certainly prove adequate for most users, and with a frequency response of 35Hz-15kHz ±3dB, and a signal-to-noise ratio of typically –68dB, and with THD typically less than 0.4%, these units deserve to become better known.

Hayden Laboratories was showing the full range of Sennheiser mics with particular emphasis being given to the *Telemike* system, additions to which we hear are likely in the near future. In addition the Isophon range of loudspeakers were shown by Hayden including the *Panorama 2000* high frequency unit fitted with an integral sound dispersion lens.

Shure celebrated its tenth year of ASCE exhibitions by showing the well-known *Vocal Master* sound system together with the new *SM81* cardioid condenser studio mic which matches rugged reliability to high performance requirements.

AKG concentrated its attention on the new *D222* dynamic mic which utilises a two-way technique with cardioid characteristics, and incorporates a three - step switch for bass cut at –6dB and –12dB. Other items shown included the *CK22 CMS* omnidirectional mic capsule, the wide range of dynamic mics, condenser mics and accessories, and the *BX10* portable reverberation unit.

The Astatic entertainment series of dynamic mics distributed by Stateside Electronics, including cardioid and omnidirectional models, is a range which generally seems to find limited use in this country, however, a quick examination of the models, which are extremely well finished, indicated that it should only be a matter of time before the range finds greater studio use.

Moving on to mixers, Cheshire Communications were showing the Belgian manufactured Marelco *Series 600* modular sound mixing system. This comprises monitor, tone control, phono, mic, and tape modules and is a versatile system offering good performance characteristics. Allen & Heath meanwhile showed its range of sound reinforcement consoles including the new *SR* range for high quality stereo sound requirements, and the *SD12-2* low cost mixer.

Other companies products on show which are well known to the studio and broadcast world included Klark Teknik's range of graphic equalisers, digital delay lines and analogue sound effects units including the new *DN70* digital delay shown at AES Brussels; Audio & Design's range of limiters, equalisers and *SCAMP* package; and MXR's digital delay unit.

Macinnes Laboratories was showing the *S-220* professional

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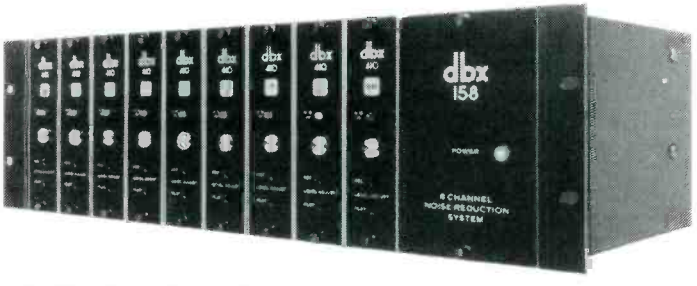
Unbeatable 30 db Noise Reduction.
Total compatibility with DBX Professional studio Noise Reduction equipment.
Modular format. Simplicity of operation.

MODEL 158 - £1,498.00
The 158 is the most comprehensive of the 150 series Noise Reduction Units. It provides eight channels of simultaneous encode and decode, obviating the need for mode switching of the noise reduction unit by operator or machine. The modular construction and inclusion of a spare one channel module within the frame ensure minimum down time and the provision of both molex and phono connectors allows rapid interface.



MODEL RM 155 - £650.00
The RM 155 is an eight channel rack mounting switchable record or play Noise Reduction Unit designed for use with Teac, Otari, Dokorder and other multi track tape machines. It provides more than 30 db of noise reduction at a price which makes this probably the most cost effective unit on the market.

MODEL 155 - £325.00
A free standing switchable 4 channel unit of identical performance to the RM 155 which is easily expandable as the studio grows.

The 150 series units are semi-professional versions of the well established DBX professional noise reduction units. Recordings made on any unit may be decoded by any studio using professional DBX equipment - and vice versa. More than 30 db of noise reduction allows extensive track bouncing without audible build-up of tape noise and DBX's unique and patented circuitry does not require critical matching of encodes (record) and decode (replay) levels, hence reference tones and metering are unnecessary.

For details on the DBX 150 series or any other DBX professional or semi-professional product please contact:-

Scenic Sounds Equipment,
97-99 Dean Street,
London W1V 5RA.
Telephone : 01-734 2812

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Artillerivej 40,
DK-2300 Copenhagen S
Tel : Copenhagen 570 600

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3M France SA,
Mincom Div.,
Boulevard de l'Oise,
95000 Cergy
Tel : Paris 749 0275

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Hastelweg 6,
Eindhoven
Tel : Eindhoven 512 777

Norway
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Tollbugt 7,
Oslo 1
Tel : Oslo 412 996

Sweden
Tal & Ton Musik
& Elektronic AB,
Kungsgatan 5,
411-19 Gothenburg
Tel : Gothenburg 130 216

Spain :
Mike Llewelyn-Jones
AP Postal 8.178
Madrid
Tel : Madrid 637 0752

tone arm for broadcast applications, and intended for use with high compliance cartridges, together with the latest version of their 18/4 PA mixer. Biggest news from Macinnes, however, was the debut of the first Macinnes made power amp, the *900A*. This delivers 180W rms per channel into 8Ω at 1kHz, signal-to-noise ratio −115dB, has THD of less than 0.05% and has input level controls, a signal out indicator, distortion indicator, full circuit protection, mono/stereo switching, and can optionally be fitted with cooling fans. Price of the *900A* is £396 and this alone should make it a very popular unit.

Loudspeaker systems as one would expect were much in evidence at Sound 79. Richard Allan was showing its range of heavy duty loudspeakers and was able to give details of a number of developments. For example, Richard Allan has recently introduced a new die-cast chassis for its 10 and 15-inch models enabling the company to offer a complete range of front or rear mounting drivers on standard fixing centres. Another development is the fitting of all its hi-fi units with high temperature voice-coils, the heavy duty models already having this facility. Turning to future developments Richard Allan is in the process of producing a range of crossover networks with a power handling capacity of 250W. The networks will consist of four two-way networks with 12dB/octave rolloff, crossover frequencies at 500Hz, 800Hz, 3.5kHz and 5kHz, and will be available for 8Ω and 15Ω systems. The company will also be introducing a new model later this year, the *Atlas 18* which as the name implies is an 18-inch drive unit to complement the current range. As for its latest products Richard Allan was showing the *Atlas 15*, 15-inch 250W rms bass driver designed to cover the low frequency region of multiple PA systems and the *HP10B* 45W rms bextrene coned bass/mid range driver.

Eurotronic was showing its large range of loudspeaker chassis units and introduced one new model a 15-inch 100W bass unit. The company also had on display its range of electrical components including potentiometers, fuses and holders, and a wide range of capped collett knobs with dials and skirts.

Delta IV was showing its range of hand-made loudspeaker cabinets including its disco loudspeakers which are available as empty cabinets or completed units. Amongst the new items on show was the *B15* bass bin which is a folded horn cabinet for heavy duty use with a 120W rms front mounted, rear facing speaker unit, and the *SM12*, stage sound monitor fitted with a 75W rms, 12-inch twin cone unit.

Peavey Electronics was exhibiting its range of loudspeaker bins, its *Black Widow* loudspeaker drive units, and its *Model 22* 2-inch compression drivers available for adapting Altec and JBL horn throats. In addition to these Peavey was showing its *PBL* and *PBH* dynamic cardioid mics, its *CS200*, *CS400* and *CS800* power amps; and its *MR-7* and *MC-8* stereo mixers featuring LED overload indicators, pre-monitor send, 4-band eq, and stereo pan on each channel. These last units are very neat and well finished units with good specifications which deserve to be more frequently found.

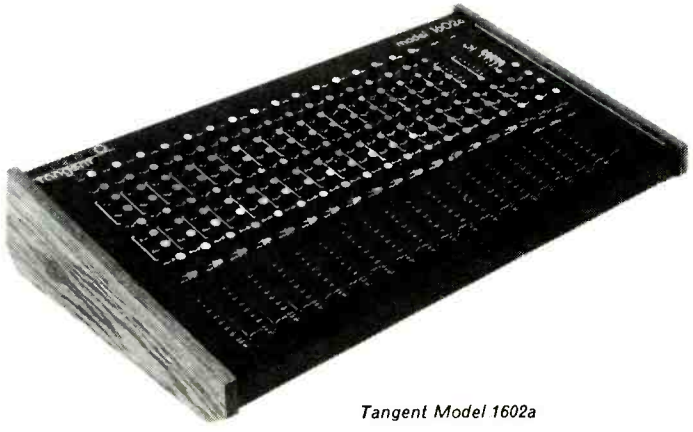
Finally Millbank Electronics was displaying its range of PA equipment including the highly successful *PAC-SYSTEM* and a new range of *MIL Series* amplifiers with 20W, 40W and 60W power outputs.

Sound 79 would appear to mark the beginning of a renaissance in the activities of the ASCE which unfortunately over recent years seemed to be adopting a somewhat low profile. However, the success of this year's ASCE exhibition should augur well for the future. We understand that the ASCE will be taking space at both AES Los Angeles and AES New York this year which is an indication of the renewed vigour that the Association is now showing.

New Tangent console

Tangent Systems has introduced a new moderately priced 16-channel stereo mixing console, *Model 1602a*. The new console which follows the same basic design principles as the *Model 1202* is fully modular and has balanced inputs and outputs, auxiliary inputs, transformerless mic inputs and a phantom power capability as standard facilities. Features of the console include a solo function which allows monitoring of any input or previewing of any group; long throw 100mm slide faders; three sends on each channel (effects, reverb, and monitor); input channel patching; and variable mic preamp gain control over a 40dB range. An internal option on reverb is provision for a 3-spring Accutronics Type 9 chamber. Claimed performance specifications of the *Model 1602a* are—typical noise level −128.5dBV; slew rate, greater than 10V/μs at any stage; and THD less than 0.004% at 1kHz.

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



Tangent Model 1602a

IERE International Conference on Video and Data Recording

The Institution of Electronic and Radio Engineers is to hold an international conference on 'Video and Data Recording' from July 24 to July 27 at the University of Southampton. The conference, which will be the third in the IERE series of conferences on this subject, is aimed at providing a forum for those involved in the recording field. Since the previous conference in 1976 the areas of interest common to video and audio recording have expanded greatly with digital techniques and signal processing making inroads into both audio and video technologies. Similarly the techniques for storage and retrieval of data have undergone considerable transformation as digital methods have come to the fore and reports on recent developments in all aspects of data recording will be a feature of the conference. Forty-five papers will be presented at the conference grouped into six sessions under the headings of: theory of recording processes; magnetic recording techniques and hardware; coding, modulation and signal processing; digital audio and video recording; information and archival storage and retrieval; and new recording techniques. It is intended that working equipment will be demonstrated in a small exhibition alongside the lecture theatre. Full details of the conference are obtainable from: The Conference Registrar, IERE, 99 Gower Street, London WC1E 6AZ, UK.

Feldon appointed Inovonics distributor

Gotham Audio has appointed Feldon Audio Ltd as exclusive UK importer for Inovonics Inc of California. Inovonics manufactures the *Model 500* acoustic analyser that was reviewed in the April and May issues of *Studio Sound*. Two points concerning the review: the Inovonics microphone XLR input socket does in fact have phantom powering fitted as standard, although this fact is not mentioned in the user manual, and the unit is optionally available precalibrated with a *C451* microphone. Cost is expected to be about £1,800.
Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4313.

Wayne-Kerr-Radford

With effect from the middle of February, the Wayne Kerr and Radford ranges of audio measuring equipment are being jointly marketed under Wayne Kerr management. This marketing arrangement will mean that Wayne Kerr's *RA200* frequency response analyser and *ADS1* solid-state digital store will be marketed jointly with the Radford range of audio test measurement equipment, which includes distortion meters, noise meters and other high sensitivity test instrumentation. With the new agreement Radford and Wayne Kerr equipment will continue to be manufactured separately, but Radford instruments will now become part of a new comprehensive range of Wayne-Kerr-Radford audio test instruments.
Wayne Kerr, Wilmot Breeden Electronics Limited, Durban Road, Bognor Regis, West Sussex PO22 9RL, UK.
Phone: 02433 25811.

40 ▶

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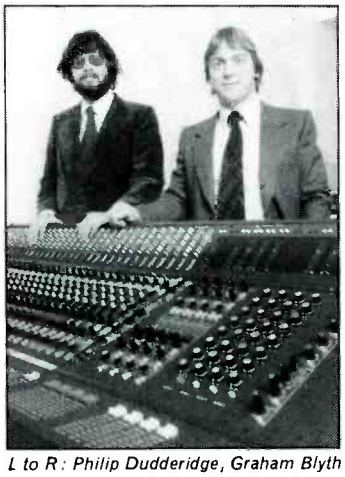
Graveley, Herts., England, (0438) 50113

MXR Professional Products Group

Soundcraft Queen's Award for Export

Soundcraft Electronics Limited has been awarded the Queen's Award for Export 1979. The company which was started only five years ago by Philip Dudderidge and Graham Blyth to design and manufacture specialist, high quality mixing equipment for touring groups has grown from a modest £72,000 turnover in its first year (of which £27,000 was exported) to an expected turnover of £2 million this year (of which 90% will be exported to more than 30 countries). This rapid growth coming from the company's product diversification into the recording studio equipment field. Currently the company employs more than 90 people and has manufacturing facilities covering some 13,000ft² in Clerkenwell, London.



L to R: Philip Dudderidge, Graham Blyth of Soundcraft behind Series 3B

Nagra Oscar

In early April in Hollywood the Academy of Motion Picture Arts and Sciences awarded Stefan Kudelski, president of Kudelski SA, an Oscar for the company's continuing research and development of Nagra production sound recorders. This is not the first time Nagra Kudelski has received Oscar awards as in the last two years the Nagra *4.2 L* and the improved version of this recorder have received Oscar plaques for being the world's best film sound recorders. Interestingly, since 1970 Nagra recorders have been used for the sound recording of every picture which has received an Oscar nomination, whatever the category.

People

● Ken Bray has joined Trident Audio Developments from Cetec International as sales manager.

● David Scott has been appointed sales manager of Atlantex Music.

● Quad-Eight has appointed Ron Bennett director of marketing and Mark Pinske technical sales director.

● Rick Belmont has been named vice-president of marketing and sales by the Protech Audio Corporation.

● John Mordaunt of Pye Business Communications Ltd has been elected president of the Association of Sound and Communication Engineers.

● Declan O'Doherty has been appointed chief engineer of Springfield Sound Studios, Springfield, Ontario, Canada.

News from Studer

Studer informs us that the *A800* multitrack recorder is now in full production and that 20 machines have already been delivered. To date over 100 machines have been ordered. Studer has also announced the introduction of a new modular mixing console, *Model 369*, to complement the existing *Model 169* and *Model 269* series. A first *Model 369* has already been ordered by Radio Transamerica in Brazil. The new console offers 32 inputs, four master outputs with PPM's, six auxiliary outputs, monitoring, talkback, correlator, built-in PFL-speaker and tone generator. Special modules can also be incorporated in accordance with customers specifications.

In the Revox range a number of new items and modified units have been introduced including three new loudspeakers. These are the *BR 320* (50W) and *BR 430* (80W) 2- and 3-way bass reflex loudspeaker systems and the *BX 4100* (200W) phase corrected loudspeaker which utilises eight parallel connected 12cm woofers and separate enclosures for woofers, midrange and tweeter, with their mounting surfaces staggered in depth. Also new is the Revox *Audio Rack* for the *B-Series* music system and a control unit for operating the *B760* digital FM tuner in conjunction with the Stolle *Programmatic Antenna Rotor* (*Type 2031*). The modified units comprise a *MkII* version of the *B750* stereo power amplifier with increased power output (75W into 8Ω continuous sinewave) and new auxiliary input circuit configuration, plus the *B740*, a modified version of the *A740* designed to match the *B-Series*.

Studer International AG, Althardstrasse 150, CH-8105 Regensdorf, Switzerland. Phone: 01 840 29 60. UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091.

Contracts

● MCI has supplied Belgrade Radio with seven *JH-500 Series* consoles, five multitracks and several ¼in machines. In addition Skopje Radio has ordered five special broadcast consoles and 11 assorted multitracks and mastering machines. MCI also has contracts in the pipeline from Novisad Radio, Sarajevo, Hungarian Broadcasting and Finnish Broadcasting.

● Klark-Teknik has received an order for 30 *DN27* graphic equalisers to fully equip Polygram Records' studios in Holland. The company has also recently equipped EMI Studios at Abbey Road, Beacon Radio, and Phonodisc with *DN27*'s.

● Group W has ordered five *MW-50A*, 50kW AM transmitters, three *FM-20*, 20kW FM transmitters, and one *MW-5A*, 5kW AM transmitter plus related accessories from the Harris Corp. The transmitters are going to KDKA Pittsburgh, KYW Philadelphia, KFWB Los Angeles, WOWO Fort Wayne and WINS New York.

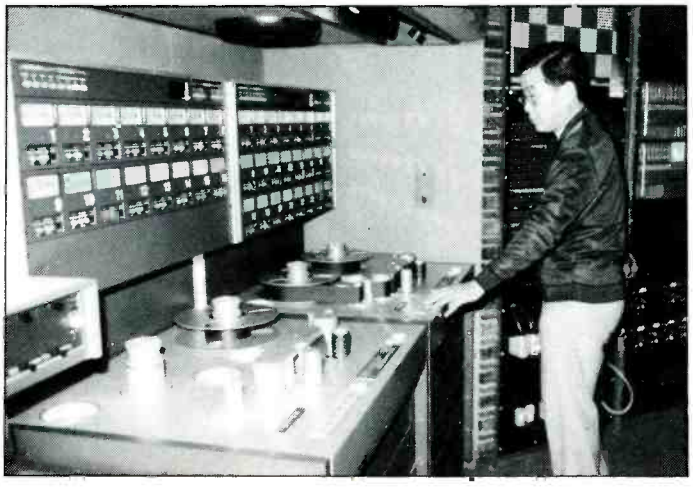
● Studer has delivered equipment for two multitrack recording studios in Peking. Equipment comprises a *Model 189* 18/8 console, a *Model 169* console, an *A80/VU* 8-track recorder with autolocate, two *A80/VU* stereo machines and two *B67* stereo recorders. Studer are also responsible for training and servicing.

Studer/STR has supplied RTBF with two OB-vans based on Mercedes vehicles. The vans are equipped with *Model O89* consoles, two *A80/RC* stereo recorders and two *EMT 930* turntables.

Studer has completed a large turnkey project in Jeddah, Saudi Arabia comprising a new master control room, eight mono studios, three stereo studios, an announcer booth, and two editing rooms. Equipment supplied includes 10 *Model 289* consoles, 24 *A80/RC* stereo tape recorders, several *Model 169* consoles, *A68* power amplifiers, *AX5/4* loudspeakers and studio accessories.

Studer is also to supply the audio equipment for the new Bahrain Radio Station. This will entail equipping a drama studio, music studio, stereo studio, rehearsal studio, recording and editing studio, news studio, short-wave studio, MW-FM continuity studio, FM continuity studio, and a master control room.

Studer A800 in operation at Canyon Studio, Tokyo



Sierra/Hidley

News of Sierra Audio and Tom Hidley's current work is that business is fine. In Japan, Kitty Music has commissioned Sierra/Hidley to design its studios with construction due to commence in June. Staying in the Far East, Cinema Audio (Manila) will be the first studio in the Philippines to sport a Hidley design, whilst in South America an undisclosed client is likely to choose a Hidley design for a new studio project in Rio de Janeiro. Turning to Africa, a complete studio facility is being designed by Sierra/Hidley in West Africa, this being in addition to a studio presently under construction in Togo. As for the USA, Sierra are currently constructing two studios for Fantasy Records in Berkeley; Vidtronics of Los Angeles has commissioned the Sierra/Hidley team to design its new truck; and Soundmixers in New York has commissioned Sierra to redesign its Studio C. ■

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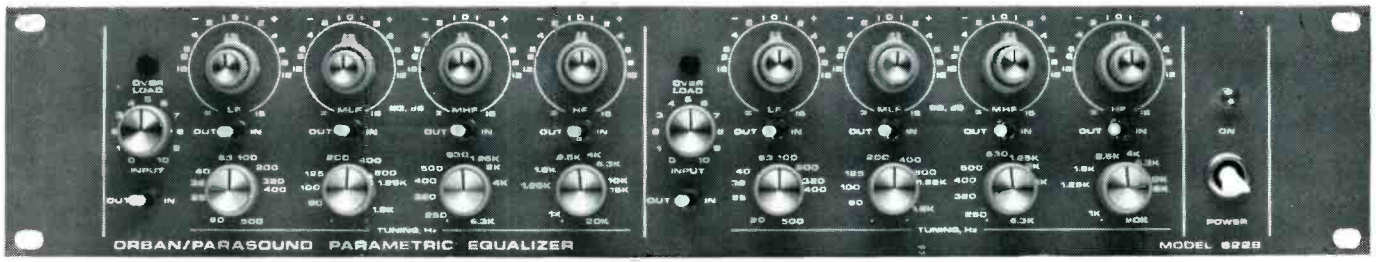

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Scenic Sounds Equipment
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Kungsgatan 5, 411–19 Gothenburg Tel: 130 216

Rhodes, Clavinet, two guitar amps and a bass amp. All these instruments come at no extra charge—a great saving in instrument rentals which can often amount to a sizable proportion of a budget.

The mastering or cutting facilities are on the fifth floor and consist of nine rooms, three have been designed for maximum client/producer comfort providing a living room environment. The other six are strictly functional but all have one thing in common—the CBS *DISComputer*. This is a microcomputer servo system developed at the CBS Technology Center which, it claims, "is capable of putting more modulation into less lacquer space . . . and automatically eliminates common problems such as groove echo, lift-outs and overcuts associated with other lathe systems."

The fourth floor is occupied entirely by remix/editing rooms. On the day I was there most of the rooms were being used by the classical department, and indeed I got the impression that the major part of this floor was devoted to classical editing and remixing, there being only two rooms that could handle 24-track tapes. But this would seem logical for a studio that has to handle an ever expanding classical catalogue—incredible numbers of hours are needed for editing and re-editing in this area—to devote enough space to handle several projects at once. One room, called 408, was of particular interest and was designed to attract remixing time, away from the studios. The console is home brewed but uses API VCA faders in conjunction with the Allison *65K* programmer. Built into the rack are 14 Urei limiters, 16 channels of Kepex and, of course, a full Dolby complement. The console itself features API equalisers, has a 24x32 return assignment matrix and apart from eight submaster groups, also boasts eight VCA groups.

The elevator took us straight from the fourth floor to the second. What happened to the third? Well, the height of Studio B takes up two floors, 14ft high x 50ft long x 35ft wide. It has almost the same area as the big studio they left behind at 799 Seventh Avenue (now A & R Recording's Studio A-1) but falls short in height by a long way. In addition to a drum booth there is a vocal booth and isolated piano area. I like this size of studio—one that allows air around even small groups—and why not? Reasonably dry acoustics but with sufficient volume to have a sound all of its own—a sound that, in the right hands, can be used as though it were an extra unseen instrument.

Once again the instrument complement is impressive—here we have two Steinway B pianos. Celeste, chimes, orchestra bells (glockenspiel) xylophone and two tymps, in addition to the regular rhythm instruments. An interesting echo of the past was a wall full of rotating panels suspended from the ceiling, which I understand could be turned during transmission in the old radio days, with some kind of pneumatic mechanism. The console is of the standard custom built type with API faders and equalisers.

Enough is enough for one day. Having already decided to complete my tour at 30th Street the next day, I thanked Eric for being such an excellent guide, and took my leave.

When mention is made of the large 'label studios', an image of union-inspired demarcation rules usually appears in the mind. I bring this up because firstly we all know how creativity can be bogged down by such rules and secondly because this is no longer true at CBS Records, New York and people in the industry should know this. 'Guest' engineers, as Columbia calls them, are permitted these days and no restrictions are placed on producers who are allowed to help out at the console if necessary. A normal crew on a recording session consists of the recording engineer, assistant, maintenance engineer and studio attendant. It's interesting to note that the assistant is quite likely to be another senior recording engineer in his own right rather than the usual 'tape-op' trainee. Apparently the salary scale evens out after a qualifying period and a surprising situation arises. An engineer who is responsible for the operation of perhaps a quarter of a million dollars worth of equipment, maybe a $100,000 budget album and requires psychological as well as recording expertise, receives the same pay as a person making tape copies all day long!

If I were to compile a list of the most historically prominent recording studios or of studios with the most instantly recognisable sound, surely Columbia 30th Street would be at or near the head of either. 30th Street—that certain sound, a sound impossible to simulate by artificial means—a sound only attainable by putting the musicians in a reverberant room of large volume. And that means all the musicians at the same time with no track layering. Some of the names that come to mind when speaking of 30th Street remind me of records that are now classics—Johnny Mathis, Mitch Miller, Tony Bennett, early Barbra Streisand, original Broadway cast albums of *Sound of Music*, *Camelot*, and perhaps the greatest of them all—*My Fair Lady*.

Stanley Tonkel is an engineer of some 22 years with CBS and remembers being on many of the sessions mentioned above, and having worked with him on a project at Carnegie Hall last December I was happy that he was my guide for 30th Street.

Having spent 10 of my 21 years recording at Abbey Road, I couldn't resist making a comparison between 30th Street and Abbey Road No 1. Especially as we spent so much energy envying, and time trying to copy, that Columbia sound. Just walking into the studio for the first time and feeling the surrounding acoustic environment it is easy to see why we at EMI found it so hard to come even close. Although both studios have almost identical floor areas (100ftx 50ft) EMI's has probably twice the height and therefore twice the volume. However, the initial feeling was of a warm sounding room with a surprisingly shorter reverberation time than I expected. Stanley Tonkel says that the sound we are so familiar with is a combination of the unique echo chambers and the studio acoustics. There are five live chambers and one EMT at this location, but just as important as the echo chambers is that famous tape delay introduced into the send circuit. Although no single person claims responsibility for this innovation of some 20-odd years ago (it having evolved through day-to-day experimentation) the system has become universally copied since.

The adding of artificial reverberation to classical music is generally looked down upon. For this reason Columbia's producers seldom attempt larger than chamber ensembles at 30th Street. Fairly recently a record was made with just the string section of the New York Philharmonic, but normally they would record on location at Manhattan Centre. As far as instruments are concerned, 30th Street boasts, in addition to everything mentioned in 'B' and 'E', two Steinway *D* pianos and a Steinway *B*! But no, repeat no, vocal booths or drum booths—just one gorgeous open space!

And so to lunch. After all the years he'd been working at CBS, Stanley was surprised when I introduced him to a restaurant around the corner on Second Avenue called Harley Street. Yes, you've guessed it—British food—run by an Englishman of the Liverpudlian persuasion called Malcolm Greaves. If any fellow Britishers visiting New York get the urge for Shepherds Pie, Steak and Kidney Pie, Scotch Egg or Fish and Chips, I know of nowhere in New York more authentic than 'Harley Street.'

Columbia's 30th Street Studio

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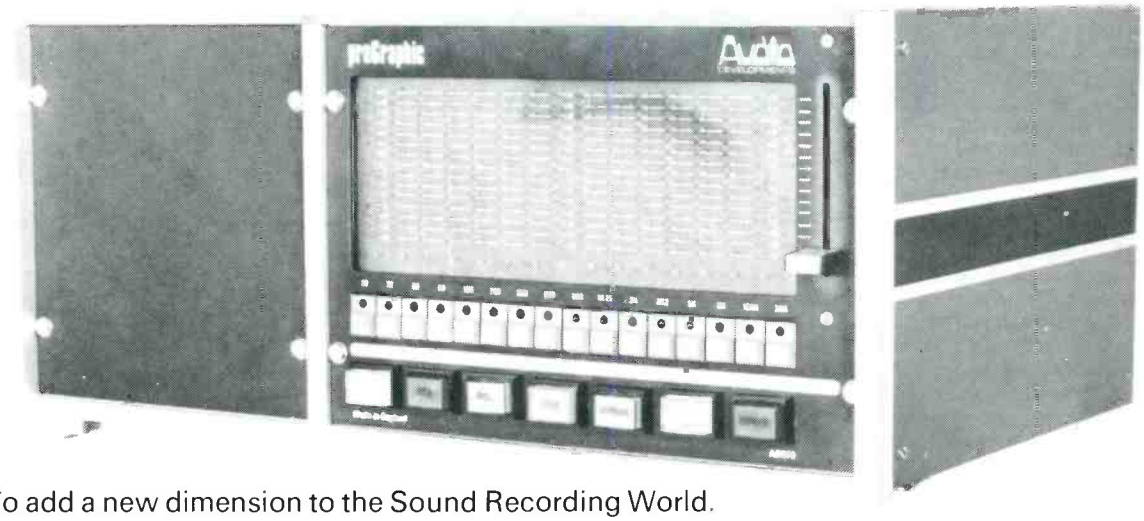

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AAV—Australia

The Australian recording industry is alive and well and nowhere more so than at AAV which is situated just about 3km south of Melbourne's city centre in a bright red painted building. It is one of Australia's largest (certainly the largest in Victoria) sound studios and has first class facilities.

The studio started in 1965 as Bill Armstrong Pty Limited and moved to the current premises in 1973. In 1974, the company was bought by David Syme & Co, a large newspaper and magazine organisation and at the same time video operations were introduced. Although part of a large conglomerate, AAV still possesses the 'personal' touch. The company now has five audio studios, a 4-ton outside broadcast van and a video complex which they claim can handle almost anything. Audio visual presentations are in full colour and multiscreen, and they are virtually a colour TV station without a licence to broadcast. They have a sales and a 24-hour hire operation and the full time staff are five music engineers, four voice-over engineers, and dubbing engineers.

About 60% of the work carried out by the studio is album and film soundtrack recording, the other 40% being advertising jingles for radio, TV and cinema. The studio is well patronised by local artists such as Renee Geyer, Stars and Marcia Hines as well as major international stars such as Cat Stevens (*Another Saturday Night* was recorded at Studio 1) and top Australian group the Little River Band. (Their single, *Reminiscing* was recorded at the Studio 2 and reached No 2 in the US pop charts in 1978). Studio 1 is also used for mixing TV specials for major visiting international acts such as Rod Stewart, Wings and Chicago.

Location work is done by a 24-track bright red mobile recording van which contains the most up-to-date recording facilities. Inside the van are a full 26-input, 24-output Audiotronics console, two 24-track tape machines with Dolby noise reduction, a Phase Linear *700* stereo amplifier and a huge selection of outboard gear to suit any job. There is also a complete range of communication equipment including talkback, cue lights, close-circuit TV and three phase or single power inputs, with all critical voltages stabilised.

AAV's main studio is the 4,000 sq ft No 1, capable of handling a 70-piece orchestra. The new control room is comparable to any other in the world. Local firm Sontron Instruments were consultants and did the acoustic alignment and the design was by Tom Hidley of Eastlake Audio.

AAV-Australia, studio 1 control

AAV claims a major 'first' as far as Australia is concerned in as much as they are the first Australian studio to install a new *4032C* Harrison mixing console. The facility was completed in mid-December 1978. Automation is Harrison Autoset which allows for four dynamic mixes per audio track, plus snap-shot mixes stored on data cartridge.

Other equipment used is an Ampex *MM1200* 24-track machine, an *MSQ1000* EECO synchronising package used extensively for locking up the multitrack to a Sony *U-Matic* VTR for recording to pictures and can also lock two, 24-track machines together. Monitoring is by a Sierra-Hidley quad monitor and Amcron *DC300* power amps are used in the studio.

Studio 1 has probably the most extensive range of outboard gear in Australia which includes a wide range of limiters, compressors, graphic equalisers, EMT and AKG echo facilities, digital delays, Lexicon, Urei, Cooper *Time Cube*, Eventide *Harmonizer*, Marshall *Time Warp* and Kepex *Noise Gates*. There is also an Orban Parasound *Desibiliser*. Noise reduction is by Dolby. The mastering machines are the Ampex *ATR100*, *102* and *104*. Both Studios 1 and 2 use Neumann Electrovoice, AKG, Sennheiser, Sony and Shure microphones.

Studio 1 is mainly used for orchestral (film sound-track etc) and album work as well as for mixing of the already mentioned TV specials. Instruments on hand at no charge are two Pearl drum kits, a Yamaha concert grand piano and a Hammond *B3* organ. There is also no charge for outboard gear.

The smaller Studio 2 is used mainly for pop groups. Equipment includes an Audiotronics 26-input 24-out console, an Ampex *MM1200* 24-track machine, Ampex ATR mono and stereo mastering machines, JBL *4350* monitors. Studios 3, 4 and 5 are involved in voice-over production for TV, radio and cinema commercials. Back up includes a very extensive sound effects library plus mono and stereo dubbing facilities. Equipment in Studio 3 is a 16-track Ampex *1200*. In Studio 4, 8-track Ampex *1200*. Studio 5 is 4-track and uses an *AG440* 4-track machine.

Studio rates for 1 and 2 are $85 per hour which includes the service of an engineer and everything except tape. Up and coming new pop groups can use Studios 1 and 2 for demo tapes for only $50 per hour. Rates for voice-over Studios 3, 4 and 5 are $60 per hour. Tom Giblin, audio manager, (who gave me much of his valuable time in preparing this article) tells me that he feels AAV's future is more and more in elaborate film soundtracks and in concentrating on album work. They are well aware of the need to keep abreast of modern recording techniques and are heavily investing in modernisation. The new Eastlake control room is just one phase of a total upgrade of the audio facilities. In short, AAV is a very active and highly professional studio with facilities of the highest class.

AAV-Australia Pty Ltd, Melbourne, Australia. **Keith Watts**

Eurosonic, Madrid

Spain is not a country widely reported for its recording industry, but nevertheless there are a number of 24-track studios, including the newly completed Eurosonic Studios in Madrid. Built to the standard Eastlake design, the studios look much like many others around the world with Studer and Neve equipment—oddly one sure way of identifying where the geographic region studios are located, is by examination of the console telephone: USA key phones are a give away, as are central European phones with soft, curved lines . . . But back to studios, Eurosonic is managed by Pepe Loeches who originally received his training in sound mixing at Pye Studios in London, then spent some time engineering in Venezuela before returning to Madrid. The console is a Neve 24/24 with Studer *A80* 24-track and 2-track and monitoring is by a quad Eastlake Audio TM3 system. The studio is entered from the control room corridor or from the control room proper by double sliding doors. The space between the doors has been provided with microphone/foldback panels as in other Eastlake studios and can be used as an isolation booth. Standard piano and drum booths are provided and the studio floor area most distant from the control room is an isolation room with hard marble tiled floor and isolating sliding glass doors. The floor level in this area is floated about 8in above the main studio floor to aid vision and decoupled from floor borne transmission. Specifically tuned wall and ceiling trapping is used within the different areas of the studio and the whole area accepts up to 35 musicians.

Eurosonic Studios, Maria Teresa 16, Madrid, Spain. Phone: 246 5373.

Studio G moves and BMS expands

John Gale's Studio G Music Library has recently moved from Wardour Street to 11 Thomas More House, Barbican, London EC2, phone 01-638 0824. Moving into the Studio G premises, as a result of a substantial growth in business, BMS Studio will now find a permanent home at 145 Wardour Street, London W1, phone 01-734 5874. The studio and other facilities previously operated by Studio G will be taken over by BMS after refurbishing and modernisation work has been completed.

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Marcus Music UK

Avid readers of *Studio Sound* will recall that in August of last year we carried a Studio Diary piece on Marcus Music, Sweden. Well, now we turn our attention to Marcus Music, UK and surprise, surprise the studios are not totally unconnected! In fact Marcus Music, UK is the British arm of the Scandinavian recording company Marcus Music AB, owners of the Swedish studio. Eventually Marcus Music will have a large studio complex here in Bayswater, London, including a medium-sized group studio with a floor area of 775sq ft and an orchestral studio of 3,066sq ft equipped with film projection facilities. However, when we visited the complex to meet director and studio manager Chris Lewis only Studio One, the group studio, had been completed and was operational, while the usual difficulties involved in building a large studio complex virtually from scratch with only the basic shell of the building as the starting point, had set back progress on the remainder of the complex.

Housed in the building previously used by CTS in the late 1960's and early 1970's as film and television sound recording studios, Marcus Music and Chris Lewis have ambitious plans for the complex. These include cassette duplication and disc mastering facilities, and various rest, accommodation and reception areas (including a rooftop patio area in anticipation of our scorching British summers!), in addition to the two studios. The exact nature and layout of some of the available areas Chris explained was not finalised as yet, as Marcus is concentrating on making Studios One and Two operational. After all, in a complex of Marcus's size with its large development and equipment costs, the sooner studio hire revenue comes on tap the better. This is not to say, however, that future development costs are dependent upon obtaining revenue for as Chris explained, Marcus Music has worked to a planned investment of capital over an extended period of time, such that at present it has in fact already paid off a considerable part of the development costs.

As already mentioned, at present only Studio One is operational, yet since opening it has been almost solidly booked—in fact in over four months of bookings only three days have remained unbooked, a rather healthy situation considering that the studio has not as yet done any promotional work on its behalf. Turning to the studio itself this has been designed by Swedish acoustic designer Jan Setterberg, who has a considerable number of studio designs to his credit. The studio is fully floated and is finished in burnt wood tongue and groove panelling and hessian, with fawn carpeting, and very tasteful it is too, not to mention acoustically excellent. As for equipment the studio has a Harrison 28/28 console with Allison Research *65k* autoprogrammer and is the first studio in Europe to operate Studer *A800* 24-track equipment. Other tape equipment includes two Studer *A80*'s and a pair of Revoxs. As well as the ubiquitous Auratones the studio uses JBL loudspeakers for stereo foldback in the control room and studio. Ancillary equipment includes own design VCA limiters, Urei *LA4*'s, Orban parametric eq, Dolby *Cat 22* noise reduction modules, digital delays, noise gates, flangers, phaser, mono/stereo synthesiser, Master Room reverb and EMT reverb. Mics in use include models from AKG, Neumann, Shure and PML, whilst headphones are from Pioneer. Incidentally the studio has available a number of musical instruments including a Steinway grand.

Advance information on Studio Two is that it will have a Harrison computerised console with a Studer *TLS 2000* tapelock system providing a 46-track recording facility. Jan Setterberg will again be responsible for acoustic design and equipment will be similar to Studio One. Marcus Music and Chris Lewis have certainly pulled out all the stops with regard to this studio complex. When completed it will be one of the best equipped and integrated complexes in Europe. Once Studio Two comes on stream we will pay a return visit to Marcus Music, UK and report on developments. However, in the meantime we can merely salute what has already been achieved and look forward to the future. Without doubt though this injection of foreign capital into the UK recording scene should certainly provide a few talking points.

Marcus Music (UK), 49-53 Kensington Gardens Square, London W2 4BA. Phone: 01-229 9595.

Noel Bell

Above: *Studio One control room—Mark Wallis at the controls*
Right: *Gonzales drummer. Sergio Castillo, in session at Marcus*

Farmyard Studios, Little Chalfont

June will see the opening of a brand new studio at Little Chalfont in Buckinghamshire, England—Farmyard Studios. Set in what can only be described as idyllic surroundings and soon to boast an indoor swimming pool and tennis courts among its relaxation facilities, Farmyard really offers a fine atmosphere for creative recording. Trevor Morias and Rupert Hine who will be operating the studio spared no expense in fitting it out and have opted for a Trident *TSM* console offering 32 into 24. Both Rupert and Trevor have worked with Trident for many years on both the *A* range and *TSM*, at Trident and Good Earth, and considered it to be the only choice.

The studio will be mastering onto Studer *A80* 24-track with *A80* and *A67* 2-tracks. Rupert Hine who produces many bands including Cafe Jacques, Murray Head and Anthony Phillips (a founder member of Genesis) prefers to work with old and trusted equipment and is currently scouring the country for valve *C28/U67* and *U47* microphones, (which are now changing hands for over £500) and still prefers Astronic graphic equalisers, although he has also ordered the latest Audio Developments programmable graphic equaliser which can be remoted and allows cues to change the graphic setting automatically.

Acoustic design is by Eddie Veale, and the outboard equipment will be located in overhead racking above the console. Farmyard has been operating for many years as a rehearsal studio, and local bands such as Genesis, Yes, Camel and Jethro Tull have all used the studio, sometimes recording tracks via a mobile. So now the 40 x 20ft barn studio is having a permanent control room added. The swimming pool previously mentioned will be heated all the year round by the excess heat from the control room airconditioning unit—how's that for conservation! Although located in the wilds of Buckinghamshire, Farmyard Studios is still on the underground (just) and can be found at: Farmyard Studios, Bent Rose House East, White Lion Road, Little Chalfont, Bucks. Phone: 02404 2912/3773.

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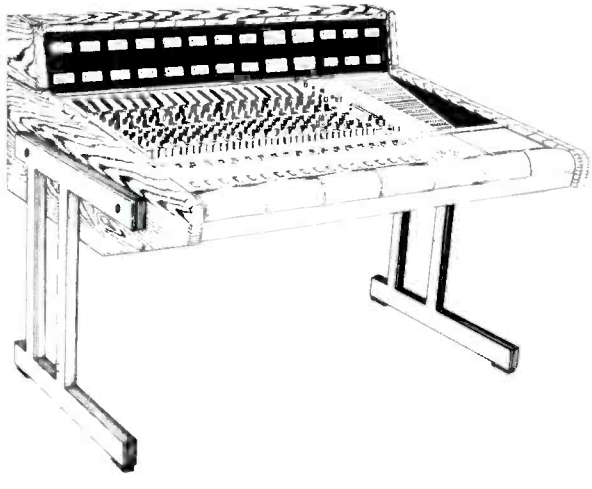

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Digital audio discs

Fig. 1 Actual size Philips Compact disc giving one hour playing time

Over the past five years, a number of the major audio manufacturers have had extensive research programmes aimed at finding a successor to the long playing record. A number of manufacturers have now demonstrated their proposed systems which are further examined in this article.

DEVELOPMENTS in the history of the record appear to progress in 30-year steps. The early wax cylinders were replaced around the turn of the nineteenth century by the first true records made using a wide variety of standards, to be eventually consolidated into the 78rpm disc. In the mid Twenties, the development of thermonic valves revolutionised both the recording and playback processes, but the quality wasn't really up to scratch (so to speak) with a signal-to-noise of around 30dB. Finally, the Fifties saw the evolution of the microgroove record that we know today, which came out in 7in, 10in and 12in versions, the latter providing a maximum of 30 minutes playing time (albeit under optimum modulation level) per side.

But we all know the drawbacks of the long playing record which is somewhat susceptible to mechanical damage, that is if you are lucky enough to purchase an unflawed disc to start with. While the vast majority of the listening public did not notice these flaws in the early years of the long playing disc's introduction, when the quality of replay equipment improved and hi-fi or music centres became the norm, replacing the proverbial record player or gramophone, more and more punters started rejecting their purchases causing considerable problems for the record distributors. To be fair, almost all distributors replace rejects without question, but by far the majority of punters just can't be bothered to change their purchases (myself included) and accept all the scratches, clicks, hisses and so on. The finite signal-to-noise of a long player is currently about 60dB, although there was an attempt a few years ago by dbx to introduce discs encoded with their noise reduction process, that doubled the dynamic range and reduced noise. Unfortunately, unlike Dolby-B encoded *Compact* cassettes which can be replayed on a non-Dolby equipped recorder, dbx encoded discs were totally incompatible, and record companies were reluctant to stock dual inventories and so the idea died rather rapidly.

Above: *Fig. 2 Philips prototype Compact disc player*
Below: *Typical sleeve for Compact disc which folds open with pocket for the disc*

But that brings us to the development that will doubtless be introduced in the early Eighties—digital audio discs that offer signal-to-noise of, from 85dB or better, with considerably reduced likelihood of damage occurring (with some systems at least). The variety of digital discs that have been demonstrated as lab prototypes is very wide, with no less than eight manufacturers showing totally incompatible formats using a variety of different techniques. This article will examine systems from Philips, Sony, Matsushita, JVC and RCA, while other companies include Pioneer (with a system based on the Philips/Magnavox video disc), Hitachi, Nippon Columbia, Mitsubishi, Teac and Toshiba all showed systems at the 1978 Japan Audio Fair. Nothing is yet on the market. All research on digital audio discs

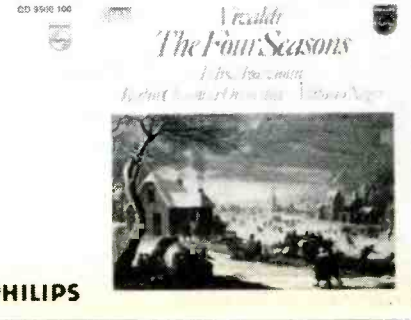


FIG. 3 VARIABLE LENGTH PITS ON PHILIPS COMPACT DISC

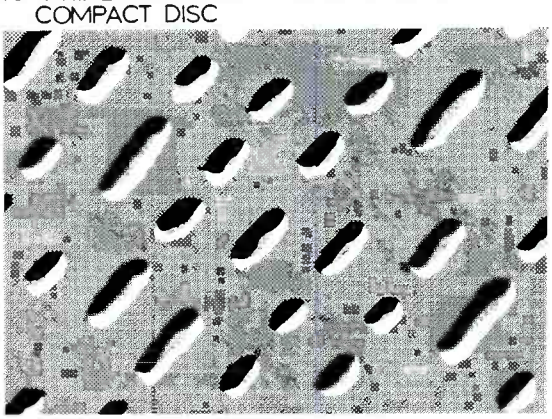


FIG. 4 MODULATED OUTPUT OF THE DETECTION DIODE

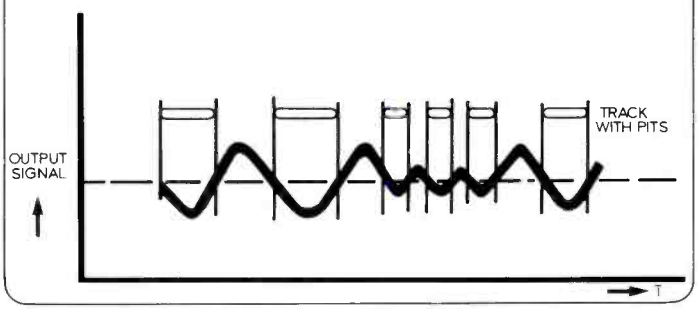
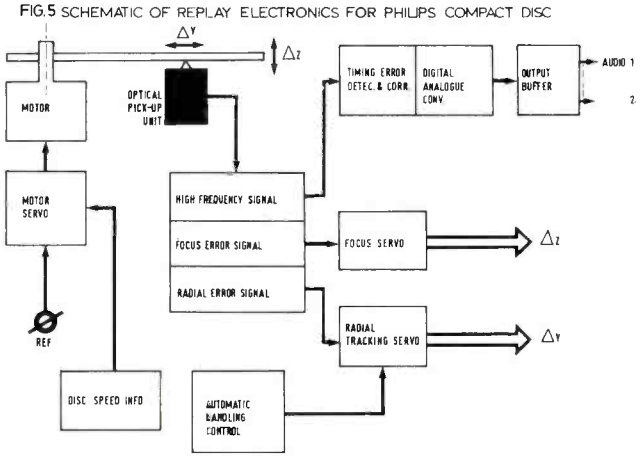


FIG. 5 SCHEMATIC OF REPLAY ELECTRONICS FOR PHILIPS COMPACT DISC



is based on earlier (but still continuing) research into the problems of developing video discs. In some cases the digital audio discs are physically identical to their video disc equivalents, while other manufacturers have taken research a step further developing noncompatible audio discs which invariably offer far greater recording time (or reduced disc diameter) than their video disc equivalents. What is absolutely certain is that only one single digital audio disc format (albeit with possible variations in size like the LP and single) will ever be successfully marketed. The record companies would certainly not stand for multiple disc formats which would involve multiple inventories, but whether the audio and video disc should be compatible is another question.

Before examining the different formats, it would be as well to point out that there are basically three different techniques currently being used for recording digital audio on disc: mechanical (with grooves), capacitance (both with and without conventional grooves) and optical. Obviously the first two require physical contact to be maintained between pick up transducer and disc, while optical systems require no such contact but require use of complex laser technology for both recording and replay. All systems use pulse code modulation recording (which has been thoroughly covered in April 1979 *Studio Sound*), but with a variety of derivatives.

There are currently a number of digital audio recorders on the market, many of which use a PCM conversion box with the actual signals being recorded onto video cassette. While this provides a short term solution, it is a far from elegant engineering solution due to the cost of video cassette recorders, and the natural follow on was to record onto existing video disc formats instead. But using video disc formats immediately brings a number of problems, primarily because the redundancy inherent in recording a digital audio signal impressed upon a video signal means that the playing times are similar to that of the video discs, that is about one hour per side of a 12in disc. But even more important is the fact that there are two different television scanning systems in use for video discs (60 TV fields per second in Japan and USA, and 50 fields per second in Europe) meaning that the disc speed is different for recording the two standards (originally because each disc revolution contained two fields) and would thus make noncompatible digital audio discs for different world markets. While it would in theory be possible to make dual speed players, again this complicates matters.

Another technique being used by most companies is that of constant linear velocity rather than constant rotational speed. Where constant rotational speed is used (as with today's discs), assuming that we are recording a constant speed data stream onto the disc, the bits

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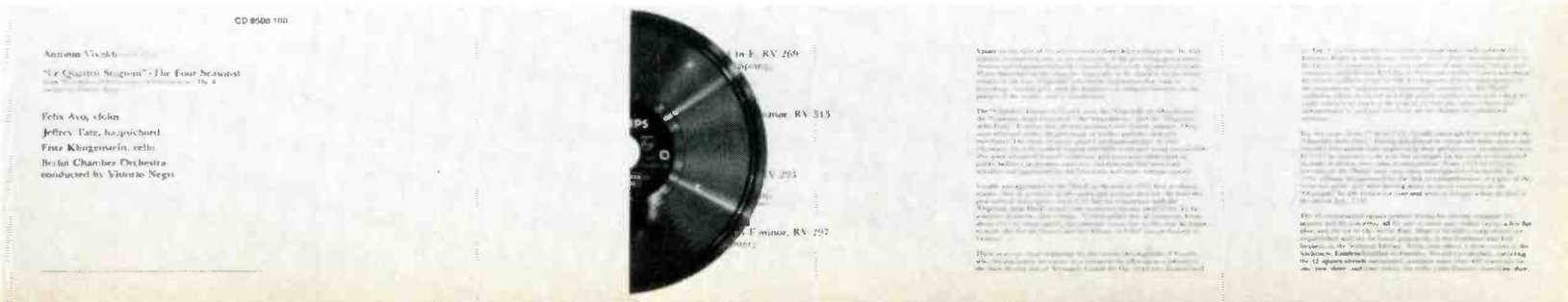

Digital audio discs

will be further apart on the outside of the record due to the larger circumference, and tighter on the inside. So by using a reduced disc speed while replaying outer tracks offers an improved playing time, about double in fact. In practice this is very easily accomplished. The replayed data stream is simply compared against a stable clock oscillator, and the disc drive motor varied in speed until both are identical—with servos it couldn't be easier. Thus the wow and flutter of the replayed recording is totally dependent upon the precision of this oscillator which can be very carefully controlled.

So onto the actual systems that have been shown as early prototypes.

Philips

Philips has the distinction of being the only company that has actually managed to launch a video disc system with the backing of substantial programme material, without which of course there is little point in buying the disc player . . . . A European consortium of Telefunken and Decca did actually launch a mechanical video disc format in Europe in the mid Seventies, but the 10-minute playing restriction and lack of programmes somewhat doomed it to failure. Although Philips initially announced its *Video Long Player* in 1972, it was not until late 1978 that the first handful of machines were sold in Atlanta, followed a few months later by further test marketing in Seattle. But we are still talking about hundreds of players rather than thousands, and full United States marketing (which is under the Magnavox brand) has not yet been announced. Nevertheless, in those areas it is possible to purchase some 200 different programmes varying from shorts at $5.99, to first run feature films at $15.99. But rather than use the 12in diameter video disc directly for digital audio, Philips announced in May 1978 that the *Compact* disc had been developed and this was first shown to the press in March 1979.

The *Compact* disc uses virtually the same technology as the *VLP* video disc, but with the much reduced diameter of 4½in (115mm) still giving one hour's playing time in stereo. While you might wonder why Philips has chosen to aim for such a small diameter disc it is worth remembering that the in-car entertainment market in Europe is estimated to be over $500m per year, and that this little disc, shown life size in **fig 1,** would just fit conveniently into a car 'record player' designed to fit a standard car dash board cutout. So rather than buying records for the home and cassettes for the car, you could use the same *Compact* disc with the additional benefits of high quality reproduction. Quoted specifications for *Compact* disc are in fact 20Hz to 20kHz frequency response, 85dB dynamic range and signal-to-noise, 80dB channel separation, 0.05% distortion (rather than the typical 1% upwards of long players) achieved using 14-bit linear quantisation and a 44.3kHz sampling rate. By the use of 50μs pre-emphasis, 92dB signal-to-noise is obtained. **Fig 2** shows the prototype player, which to be fair did have electronics mounted in a separate rack because Philips sees little point in spending hundreds of thousands of dollars producing beautiful little integrated circuits before some form of standardisation has been agreed. Nevertheless, the player does actually work and all the mechanical components are contained within the casing.

The disc itself is manufactured from PVC with a reflective coating, is 115mm in diameter, 1.1mm thick (single sided), has a rotational speed varying between 500rpm at the inside, to 215rpm at the outside (playing starting from the *inside* of the disc), a tangential velocity of 1.25m/s and a track pitch of 1.66μm. The track is however somewhat different from a conventional disc and consists of a helical track of very shallow pits and non-pits, **fig 3,** which have a constant width of 0.6μm and varying length depending upon the modulation—in comparison a conventional analogue disc has tracks 100μm apart. During recording, a pit digitally represents a '1', and the area between the pits an '0', and the samples recorded during a 60-minute programme total approximately 6 billion bits!

A small laser is used to illuminate the pits, the reflected light being picked up by a photo detector diode which provides an output shown in **fig 4.** The recorded track has DC-free transmission which is necessary for good tracking (otherwise silent passages would mean no pits and nothing to follow) and as mentioned uses 14 bits for each sample with a parity bit, the whole string assembled into a group of 12 words (alternatively left and right information) preceded by a synchronising word which also has bits reserved for text and programme identification. Although the *Compact* disc was demonstrated as a stereo unit, the word structuring is such that four channels can be recorded for surround sound, although the playing time is then reduced to 30 minutes. A digital identification at the beginning of the disc informs the player exactly what it should be replaying. Likewise the sync word spare bits can be used for a visual display of track titles and so on to permit numerical indexing of recorded information.

Fig 5 shows schematically the electronics required for replay of the *Compact* disc. The signal from the optical pick-up unit, which houses the laser and photo diode, is used to provide the eventual analogue output and controls the various servo systems required to regulate disc speed and pick-up location. The optical pick-up, **fig 6,** contains a miniature 2mW solid state aluminium gallium arsenide (AlGaAs) diode laser which is focused into a 1.87μm spot *below* the surface of the disc, **fig 7.** The laser light follows the track striking pits and non-pits alternatively, the beam being diffracted over angles greater than the lens is capable of accepting, so the light is thus modulated by the pits and is split by the half mirror prism and directed at the photo diode, being in fact split into two parts to form spots on different parts of the photodiode which, after processing, provides the radial tracking and focusing error signals (in addition to the information). The main objective is focused by a loudspeaker type coil to compensate for vertical warpage and tracking, while the optical pick-up unit is mounted on a simple radial arm driven by a linear motor, but which

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FIG.6 OPTICAL PICKUP UNIT OF THE PHILIPS COMPACT DISC

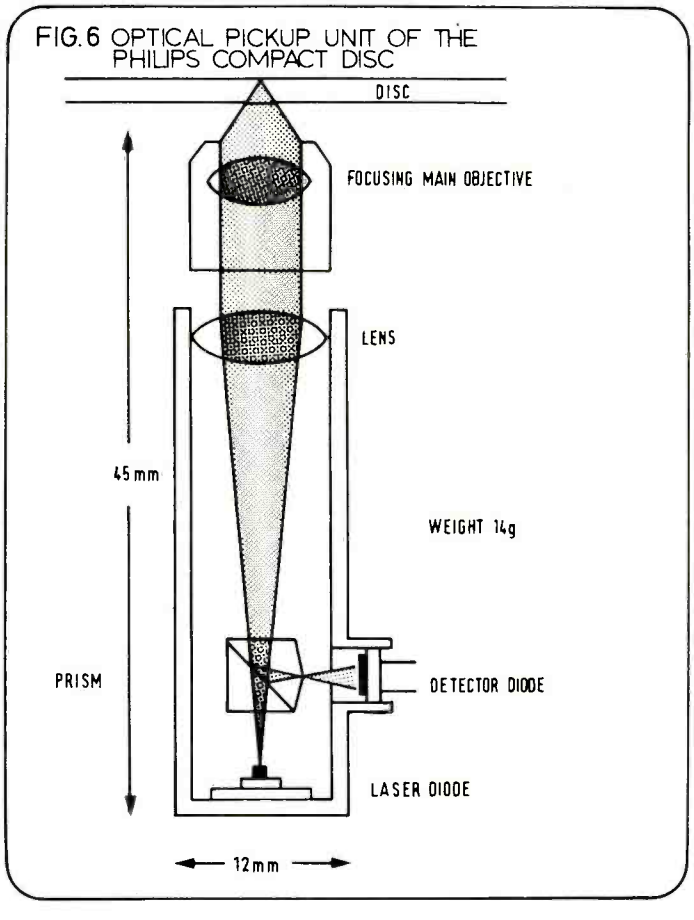
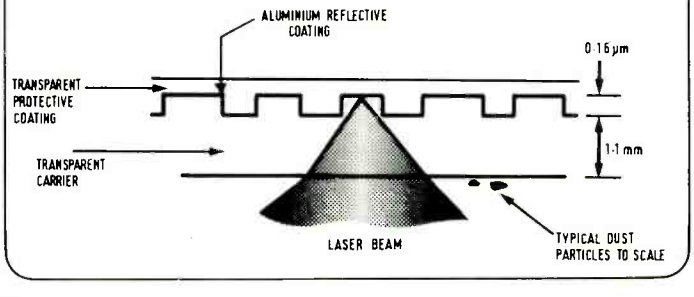
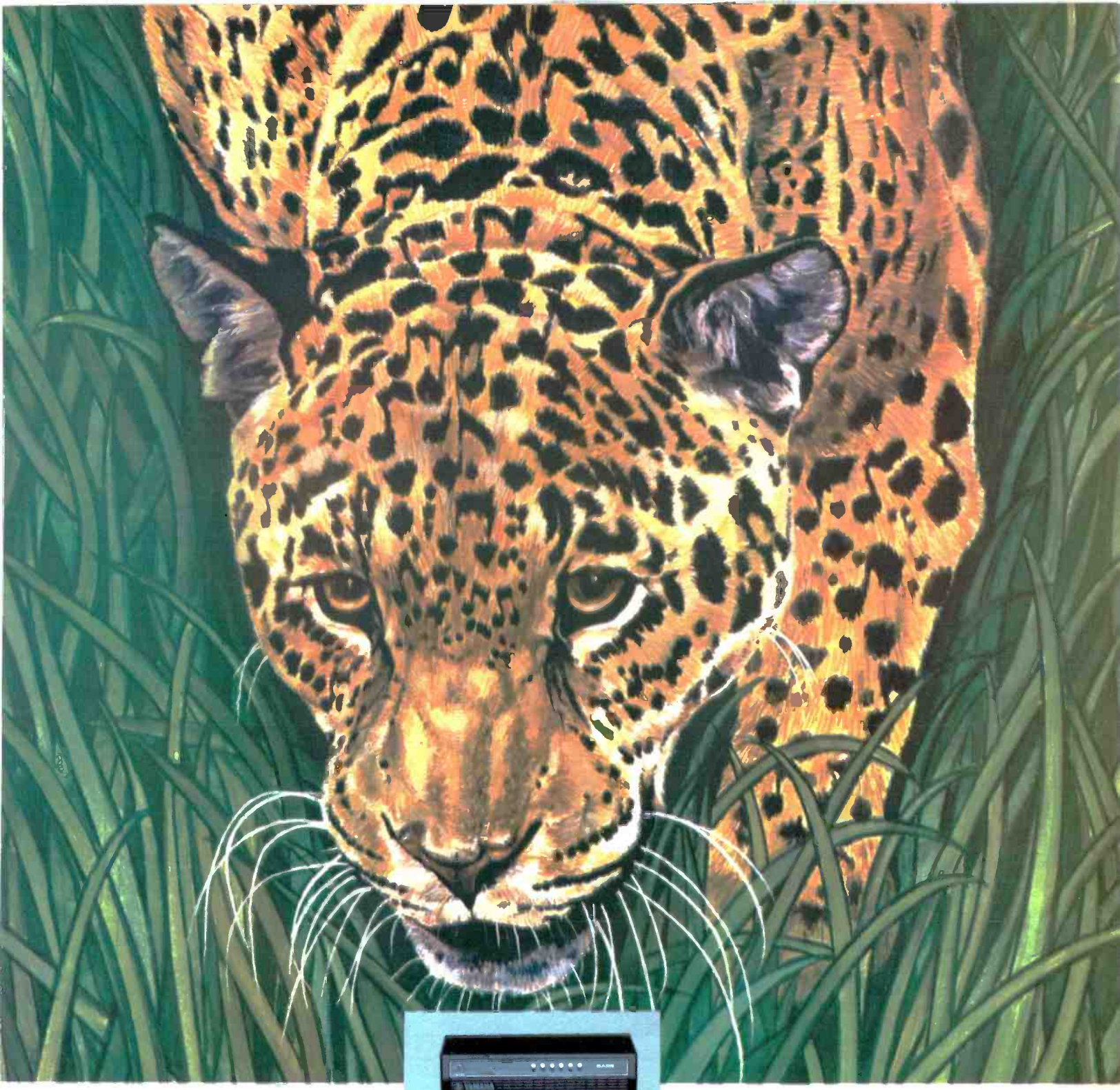


FIG.7 READING MECHANISM OF COMPACT DISC. NOTE THAT THE 1.1mm CARRIER IS THE PART PRESSED, WITH THE TOP COATING APPLIED LATER





A sad fact, proved to be true night after night, is that without proper amplification, good guitarists with expensive instruments will sound bad. The worse the sound, the worse the playing and everyone suffers. It's a waste of good money and talent.

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Digital audio discs

is also extended to the front of the player enabling it to be rapidly moved manually across the disc.

The transparent protective coating prevents fingerprints and dust affecting the pits and since the beam is focused some 1.1mm under the actual disc surface, any such contamination will be out of focus and have little influence (except possibly on modulation level) on the detected signal—dust particles are very small in relation to the diameter of the beam when it passes the disc surface. The whole optical pick-up unit only weighs 14g and estimated laser life is 2,000 hours or 10 years! It really is significant developments in semiconductor solid state lasers that have made the *Compact* disc player possible—one can think of the laser as being an overgrown light emitting diode (LED). In fact the present *VLP* video disc players still use a helium neon gas laser which requires a very complex optical system and is very bulky (and is rumoured to cost Philips rather more than the actual players sell for), but the laser diode will be introduced into the mass market model as soon as possible.

Disc manufacture was only briefly mentioned at the press conference, but the discs are 'cut' using a more powerful laser that 'digs' the pits in a photosensitive layer in realtime which, after developing, leaves a pattern of pits in a glass plate. Via galvanic process stampers, discs are then pressed similarly to ordinary records, except that a dust free atmosphere must be maintained (presumably very expensively) until the disc has its reflective and transparent protective coatings applied.

But developing a product is just the first step in the *Compact* disc programme, and little marketing information is available as yet. Philips hopes it will be introduced during the early Eighties with a 10-year transition between long playing and *Compact* discs, with the LP becoming finally obsolete during the Nineties. A 'liberal licence policy' will be adopted in an attempt to gain the support of other manufacturers, although it is doubtful if Philips will again provide totally free licences as eventually happened with *Compact* cassette in the early Sixties. Although it is obviously impossible to quote prices at this stage, Philips says that disc cost will be similar to that of the LP while player cost will be similar to hi-fi record turntables.

Although not directly applicable to the consumer market, last November Philips demonstrated yet another development of its on-going video disc programme, this time a 'diode laser recorder' which is similar to the video disc unit using a 12in diameter disc, but this one actually provides recording capability onto the disc by using a slightly larger semiconductor laser **fig 8**—with 12mW output power that simply burns holes in a specially prepared disc with a special 300Å thick tellurium based recording layer, while running the laser diode at lower power enables information to be read back identically with the earlier disc systems. Similar focusing and tracking systems are used but with the important difference that tracking would be impossible without some form of a guide and this comprises a spiral groove on the disc 0.6μm wide and 0.06μm deep into which 1 μm diameter holes are burnt.

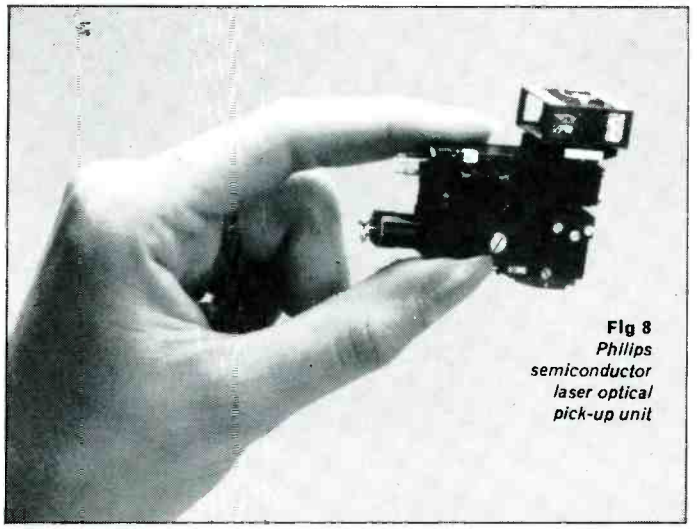

Fig 8 *Philips semiconductor laser optical pick-up unit*

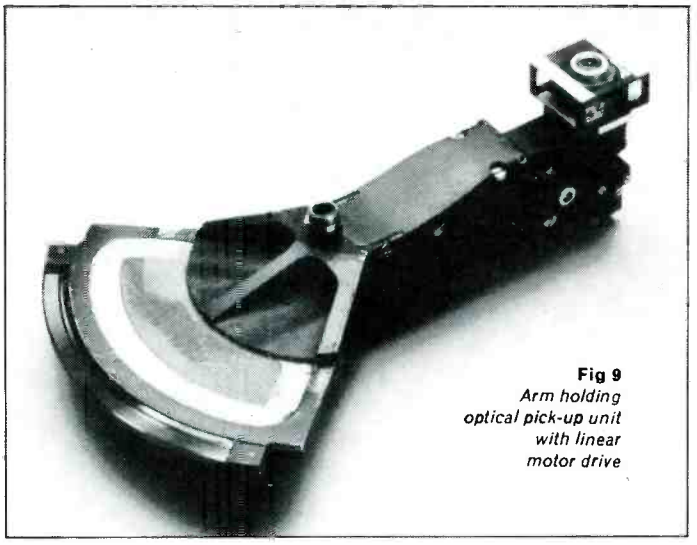

Fig 9 *Arm holding optical pick-up unit with linear motor drive*

Fig 10 *Sony video disc/digital disc player*

The tracks are also preformatted (computer jargon) into 128 sectors per track with 45,000 spiral tracks. 1k of user bits can be written into each sector giving total storage of 5,000,000,000 bits per side of the double-sided disc which has a fixed rotational speed of 150rpm. Writing speed is thus 300k user bits per second although by speeding the disc up it is possible to operate at much higher speeds and up to 6,000,000 user bits per second have been experimentally recorded—improved laser technology is however required for reliable operation, but this is just a question of time. The optical pickup head is mounted on the arm shown in **fig 9** which is driven by a linear motor which provides random access on the disc in only 500ms. This linear motor/diode laser combination will undoubtedly be replacing the existing servo motor mechanical and gas laser mechanism being used in current VLP players. Philips is aiming the diode laser recorder at the computer bulk storage market, and it also includes complex error detection and prevention including a read after write, and write again if corrupted facility. Since pits are being burnt in the disc, obviously it is a one-off system (at least currently) but is nevertheless suited for storing both digital, audio and visual information and could potentially be used as an audio recorder.

But coming back to the *Compact* disc, although the one-hour stereo disc would be ideal for current record company practice of attempting to fill about 40 minutes of an album (often somewhat stretching creativity in the process), their fear is that longer formats will 'have to be filled to capacity' and thus are reluctant to aim for longer than one hour in stereo. On the other hand, many groups produce double albums and operatic and classical works rarely split conveniently. Surround sound, as mentioned earlier, would also reduce playing time to 30 minutes which is certainly too brief. So while I would expect to see the majority of albums distributed on 4½in disc (for the in-car entertainment market), consumer units should be capable of accepting larger diameter discs to provide extended playing time for those musical works that warrant it. My calculations indicate that a 5in disc would give 90 minutes, 6in two hours, 7in three hours and 12in about eight hours. Since most households will probably be pur-

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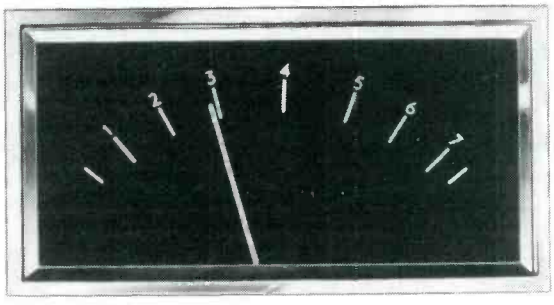

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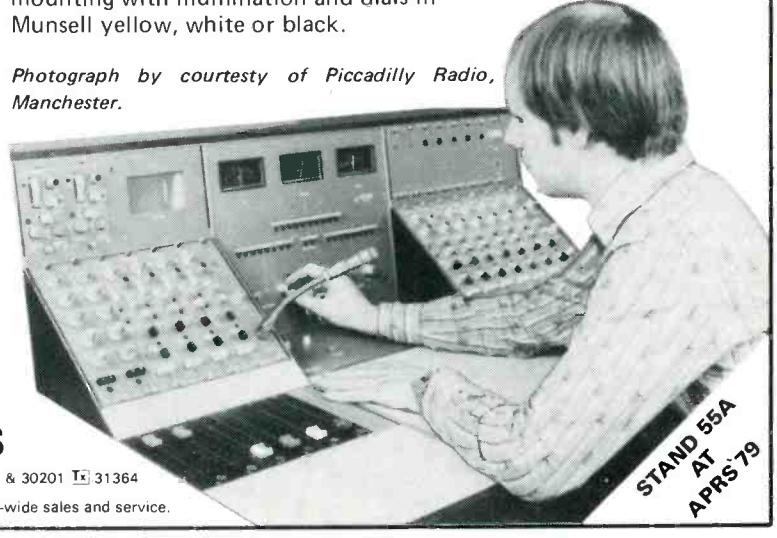

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Digital audio discs

chasing 12in diameter video disc players, such as *VLP*, it should be possible for any of these playing times to be accommodated very simply. Alternatively, Philips believes that laser and technology developments will allow a higher packing density on the same disc thus increasing playing time, and that this will be available before surround sound becomes a significant market.

Sony

Sony has always been foremost in Japan in developments in the consumer electronics business and has developed a variety of video and digital audio disc formats over the past few years. Even the latest system which was recently demonstrated to the press in Japan was announced as not being the final solution and Sony has made it quite clear that it is very interested in co-operation with other manufacturers to produce a standardised format.

Perhaps not surprisingly, Sony is using very similar technology to the Philips VLP video disc, that is a 12in diameter reflective disc played using a gas laser **fig 10**. The principal difference is that the Sony video disc provides one hour per side by running at half the normal revolutions, that is 900rpm instead of 1,800 in 60 field TV countries, while the audio disc is further slowed down to 450rpm, fixed rotational speed—rather than the Philips fixed linear writing speed—and this gives a 2½-hour playing time on a 12in disc. Recording format is pulse code modulation but using a 'run length limited code' system to ensure high density recording. The prototype uses 16-bit encoding with the same sampling rate as Sony's professional 32-track tape recorder offering 95dB dynamic range, but Sony now believes that this quality would not be strictly necessary for a consumer product and this will be reduced to 14 bits still enabling an 85dB dynamic range to be achieved. The Sony system uses a helium neon laser for replay although, like Philips, this would doubtless be replaced by a laser diode when they become sufficiently attractively priced and reliable. The groove pitch is similar to Philips at 1.3μm with a 2.4μm minimum wavelength. Three-position modulation (3PM) code is used for recording with cross interleave correction that uses simple digital delays to generate parity words which are separated from their original bits to provide against corruption.

Mechanically, the prototype digital audio disc system uses a servo driven mirror and lens combination to focus and track the disc with a half mirror to feed the detector. Again, this is likely to change as laser developments progress.

Matsushita

Commonly known under its trade names of National, Panasonic and Technics, Matsushita Electric has also been developing a series of video and audio disc formats, but these differ totally from Philips and Sony in being mechanical, just like the long playing record, **fig 11**. But of course the grooves on the *Visc* video/audio disc are rather finer that those of a 'microgroove' disc—the first *Visc-I* format featured 4.6μm track pitch with 30 minutes playing time per side, the next, *Visc-II* offered 2.3μm (about one fiftieth of a microgroove disc giving one hour's playing time on a 12in diameter disc, while even during the compilation of this article a third format has been announced called *Visc-O-Pac* that now provides 75 minutes per side on a 9in diameter disc, or 30 minutes on a 7in. While the first two *Visc* formats feature a steady rotational speed of 450rpm, *Visc-O-Pac* has followed Philips' lead and gone for a constant linear writing speed which varies between 300 and 700rpm to give the additional playing time. However, some of the potential extra playing time has obviously been sacrificed in the cause of reduced disc diameter.

Fig 11 *Matsushita/Panasonic Visc system*

Fig 12 *JVC/Victor video disc/digital disc player*

But of course being a mechanically played disc with extremely fine grooves, *Visc* is going to be readily susceptible to mechanical damage and dust, as are today's discs. While the first two *Visc* formats were solid PVC pressed discs, *Visc-O-Pac* as its name might suggest has been incorporated within a protective cover from which it is automatically removed in the player. Thus in theory, damage and dust should not be a problem since 'human' hands never touch the disc surface which is played by a diamond stylus with a claimed life of 1,000 hours, the disc having a life of 1,000 plays. But such mechanical video discs are not new, and indeed the only disc ever marketed in Europe was Telefunken / Decca's (Teldec) *TeD* launched, as mentioned earlier, in the mid Seventies in West Germany and Switzerland. The principle used was virtually identical to Matsushita's *Visc* series, but disc diameter was only 8 in with 2.5μm groove pitch and a rotational speed of 1,500rpm, so playing time was restricted to 10 minutes. This, and the lack of suitable programmes available, meant that very few players were ever sold and the format was doomed to death. There were also certain reliability problems with *TeD* discs which were housed in a sleeve, like *Visc-O-Pac*, as the mechanism for extracting them did not always work properly resulting in new holes being indented into the thin plastic from the central spindle. So while discs played very well for

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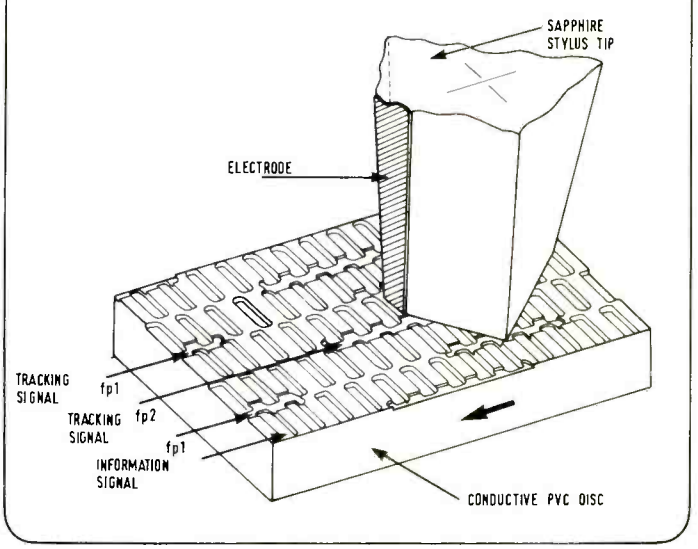
FIG.13 JVC DISC SURFACE WITH STYLUS. THE LONGITUDINAL TRACKING SIGNAL IS NOW LEFT AND RIGHT OF THE INFORMATION TRACK



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Digital audio discs

the first couple of plays, after that they were virtually useless. But perhaps Matsushita has overcome these problems. Like Sony, Matsushita considers that video and digital audio discs should be compatible, and so is using a PCM adaptor to provide digital sound—being sound, this is marketed under the Technics name. Currently, Technics is using a 13-bit quantising system with a sampling frequency of 44.056kHz and a claimed dynamic range of 85dB.

On going to press, we hear that Matsushita is apparently abandoning its mechanical Visc system and instead using the JVC capacitise disc—a situation very similar to one with video cassette formats three years ago.

JVC

The Victor Company of Japan announced its *VHD/AHD* high density grooveless, capacitive pick-up video/audio disc to the press in September 1978, **fig 12.** Again, the concept is for a dual purpose video and audio disc with an external PCM adaptor for a digital audio, and a basic design that would be suitable for both consumer and industrial applications.

The *AHD* system is again different in that it operates using a capacitance principle—the disc surface is essentially flat but with two different series of signals recorded side-by-side on the disc in the form of pits, **fig 13.** One series of pits carries the audio and/or video information, while the other provides a tracking signal to enable the sapphire stylus with a flat tip to follow the hidden 'groove'. The PVC disc is conductive and the information is read back from the disc as the capacitance varies between the disc and an electrode on the stylus—one advantage of having a flat stylus is that there is 10 times more contact between tip and disc resulting in longer life. It is also impossible in theory to damage the disc which, unlike the optically read discs, does not require any special coating or protective layer after pressing.

The stylus is mounted at the end of a cantilever pick-up arm with a small magnet at the other end. A single coil is wound around, but not in contact with, the magnet and a pair of vertical coils are mounted on either side of the single coil and in phase opposition to each other, **fig 14,** which enable the tracking error signals derived from the disc to follow the 'groove' precisely, or to be programmed to move the stylus to specific tracks. The JVC *AHD/VHD* disc is 20in in diameter, rotates at a constant speed of 900rpm, has a track pitch of 1.4μm and a playing time of one hour per side of the disc which is estimated to have a life of 10,000 playings, while stylus life is 2,000 hours. JVC is using 14-bit quantisation with a sampling rate of 44.056 kHz giving a dynamic range of 90dB. An optional random access unit will be available which provides a cordless remote control with such facilities as sequential playback of items, programme skip and repeating.

Mastering of the *AHD/VHD* disc uses a smooth, flat glass master disc coated with ordinary photo resist. While rotating at 900rpm, minute laser beams are irradiated onto the disc, **fig 15.** A splitting arrangement allows both the information and tracking pits to be recorded simultaneously onto the glass disc. The resulting relief disc can then be hardened and metallic stampers produced by conventional means.

FIG. 14 JVC TRACKING SYSTEM

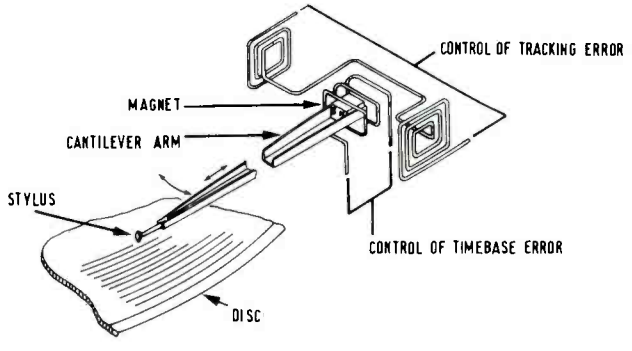

FIG. 15 JVC DISC MASTERING WITH LASER

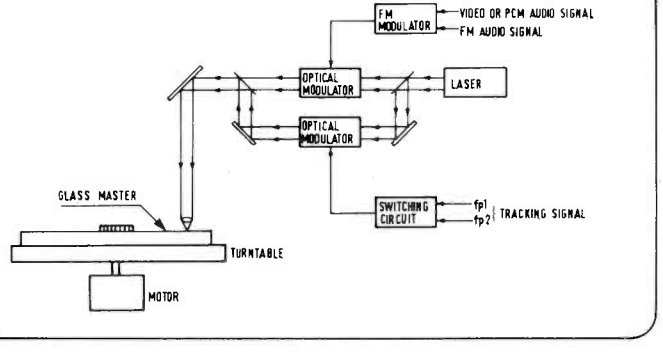

Table 1. Comparison between various digital audio disc formats—as in early 1979

	Signal system			Groove pitch	Speed	Dia	Playing time	Comments
Philips Compact disc	non-contact	optical	non-groove	1.6μm	215-500rpm	4¾in	1 x 1hr	audio only
Philips VLP	non-contact	optical	non-groove	1.6μm	1,500-600rpm	12in	2 x 1hr	video, PCM audio
Sony	non-contact	optical	non-groove	1.3μm	450rpm	12in	1 x 2½hr	audio only, video 900 rpm
Matsushita Visc-II	non-contact	piezo	groove	2.3μm	450rpm	12in	2 x 1hr	video, PCM audio
Matsushita Visc-O-Pac	non-contact	capacitance	groove	2.3μm	300-700rpm	9in	2 x 1½hr	video, PCM audio
JVC VHD/AHD	contact	capacitance	non-groove	1.4μm	900rpm	12in	2 x 1hr	video, PCM audio
RCA Selectavision	contact	capacitance	groove	2.7μm	450rpm	12in	2 x 1hr	video, PCM audio

RCA

RCA in America has developed a capacitance disc system called *Selectavision* which is virtually identical to that of JVC except that the disc has a physical groove which may be followed by a stylus. The 12in disc rotates at half the speed of the JVC system, that is at 450rpm and groove pitch is 2.7μm giving a one-hour playing time. The RCA system also keeps its disc in a protective sleeve. Although the obvious aim of the industry is to standardise on a single digital audio disc format, it has been pointed out that a dual standard JVC/RCA player would be a possibility by changing the stylus assembly and turntable speed. But of course that infers that two different types of discs will be available, which is somewhat unlikely.

Conclusions

Table 1 gives a comparison of the different video/audio disc formats discussed. As mentioned earlier, any video disc (or video cassette for that matter) can record digital PCM audio by the use of an external PCM adaptor, and some manufacturers already have these available including Sony, JVC and Technics, but in the long term this will be an inefficient digital recording technique. Philips is the only company that has actually developed a disc specifically for digital audio and this offers advantages in cost and playing time (or rather reduced disc diameter).

From the record industry's point of view, they would like to see a digital audio disc that can be manufactured in existing pressing plants, rather than necessitate starting from scratch. But then in the long term, starting again might be considerably preferable.

As to which digital audio disc will eventually take us into the Twentyfirst century, is totally impossible to guess at this stage. On a personal basis, I hope it will not be a technological compromise for purely political reasons, but that the disc will be unanimously accepted by all the companies involved without any 'war', as has happened in the video cassette business. Digital multitrack recording has just been introduced in certain recording studios, and will become common during the next five years. Digital processors will convert the 16-bit multitrack formats into 14-bit samples for digital audio discs, and analogue problems will have been totally eliminated from the recording chain. Whether the industry is yet ready for this new technology remains to be seen. ■

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indication, either overlap or non-overlap mode when secondary cue used. The *100 Series* is available as player only, or record/player. The Audi-Cord *A Series* is an intermediate priced cart machine range and the single transport playback machine costs from $649 to $719 depending upon mono/stereo, single or triple tone and includes a replay reminder system with full remote control. Record/playback costs between $1,069 and $1,289, while dual and triple transports (side-by-side) are also available. 50Hz, 115V, is an additional $25.

Australian **Consolidated Electronic Industries** (CEI), which also manufactures the *Cuemaster* cart machine range, introduced its *910 Series* which uses a DC brushless servo motor for reduced power consumption and better wow and flutter, although the *900 Series* with a direct drive synchronous motor is still available. The cart machines use an air-damped full travel solenoid and feature positive A-size cartridge location with triple tape guides to minimise guiding problems. The record/replay units have AB monitoring, auto record interlock, automatic programme erase, separate cue erasure, a claimed signal-to-noise of 54dB in stereo and 0.08% wow and flutter. Various versions are available for replay, record/replay plus a record and monitoring module, all in either mono or stereo.

Upstart is a compact cart machine controller/timer from **Sharepoint Systems Inc** that automatically starts and pre-rolls a turntable or reel-to-reel tape recorder regardless of start-up time, in conjunction with a cart machine during transfers. It noiselessly switches on the audio and digitally times the cartridge while separately timing an intro for instance, and then removes the audio at the end of the programme. Basically, *Upstart* is a programmable timer that allows sequential start of several devices, say once slow starting hi-fi turntables are up to speed, by simply pressing a start button, and allows precise timing of the cart length simultaneously.

Turntables and arms

Disc playing equipment was also prominent among the audio exhibits at NAB, and included **Micro-Trak Corp** (formerly Gray Research) showing its new *Model 303/306* professional tone arms with 12in and 16in reaches respectively, with tracking capability as low as 100mg and with resonances below 10Hz and providing low mass but high compliance. The arms feature a fluid antiskate mechanism with plug-in balancing head, and sapphire jewel bearings for virtually frictionless vertical rotation. Micro-Trak also produces mains powered turntable pre-amplifiers and the *Model 720* and *740* professional turntables with heavy duty synchronous motors giving acceleration in one sixteenth of a turn.

QRK demonstrated the new *Galaxy* turntable which features a DC Hall effect motor with direct digital speed readout on LED display with slip cueing, back cueing, variable speed control of ±10% and start to full speed within one sixteenth of a turn. Rumble is –55dB, wow 0.06% and flutter 0.08%.

Russco introduced a new variable speed turntable, the *Mark V*, which provides digital speed readout and ±10% separately variable speed at both 33 and 45rpm. Claimed wow and flutter is 0.05% with stereo rumble at –57dB. A matching tone arm simply termed the Russco *Tone Arm* was also introduced which is precision machined of rugged aluminium with ball bearing lateral pivots and jewelled vertical pivots, and tracks at 1g or less with built-in stylus pressure scale. Russco also manufactures a range of phono preamps which require separate power supplies.

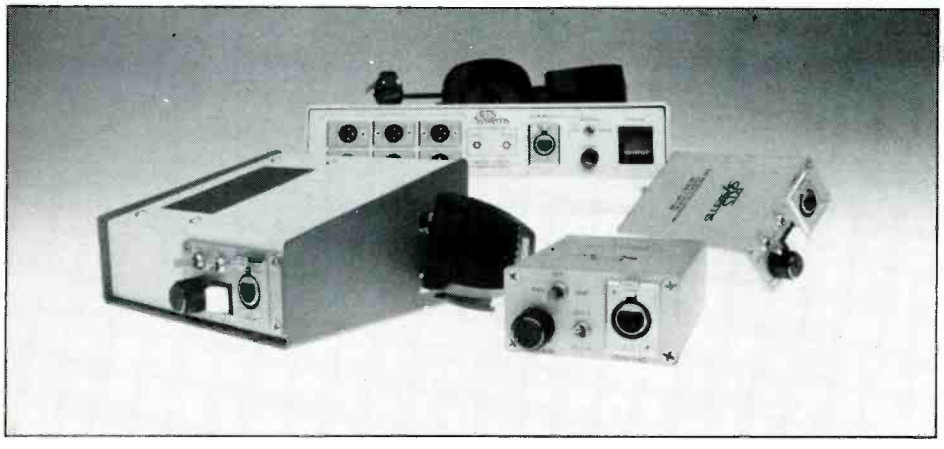
Communication gear

Coherent Communications were showing a rather unusual cordless talkback system called *Q-Aid* that comprises either an earpiece which fits completely inside the ear or a slightly larger version that fits behind the ear with a short tube feeding sound into the ear itself. Neither model has any wires, however, but work on the induction loop principle with a proprietary 3-stage amplifier IC built into the earpiece operated from miniature batteries. The transmitting wire loop driven by a simple audio amplifier is not critical. Battery life of the smaller *Q2* unit is 30 to 40 hours, and the larger *Q1*, which includes a volume control, 120 to 150 hours. Both are moulded in beige high impact plastic and produce a 120dB SPL output into a 2cc cavity. Prices are *Q1* $225 and *Q2* $298. The smaller model should overcome the current problem, at least on British television, of presenters wandering around studios with radio mics, but still with a talkback cable dragging behind and an earpiece halfway down their back!

Telex Communications Inc is well known for its cassette copiers, and also manufactures a range of headphones and headsets with boom mics including the *Heardefender HD* range

64 ▶

Range of TW Systems' intercoms



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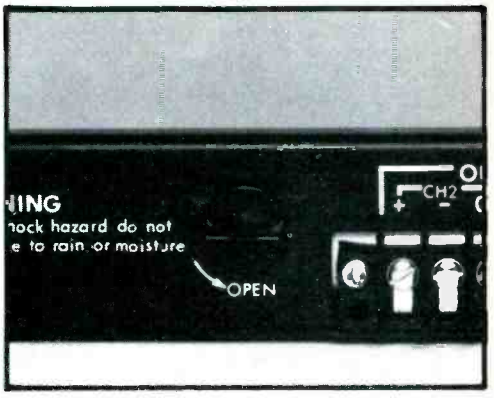
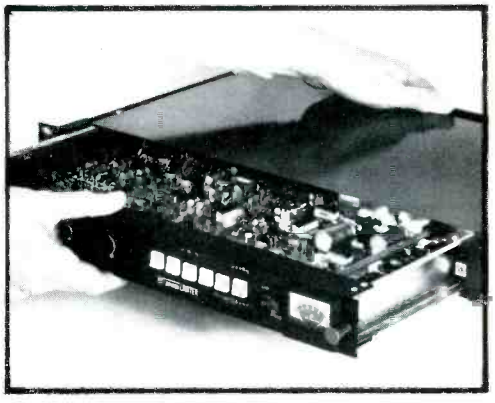


TWIST

PUSH



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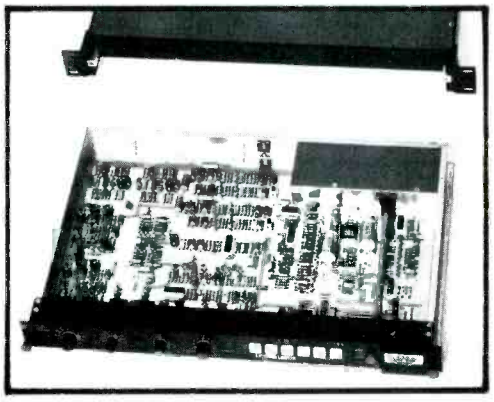

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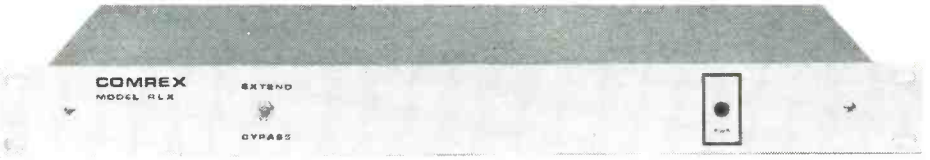
NAB, A REPORT



Above: *Comrex rack mounting extender receiver*

which provide up to 40dB protection against high noise environments, and come in four versions: defenders only, headphone, headphone with noise cancelling dynamic boom mic, headphone with noise cancelling electret mic. Other headsets include the *CS* range which comes with single or double-sided headphones, and carbon or dynamic mics; the *Cameraman's* series which are designed for long-term wear without fatigue, with heavily cushioned earpieces and coiled cords; the *Sportscaster* range which include high quality microphones on three different types of headphone for reporter use; and finally a range of announcers *Earsets* for on-camera use with a range of eartips.

Automated Processes Inc markets what it calls 'The Intelligent Intercom' or the *System 8000 Communicator* which provides simultaneous intercom, programme monitoring, audio signal distribution and interface to standard telephones. It requires only 4-wire cable connection, uses silent crosspoint switching with hands off or press-to-talk selection, continuous status readout, conference calls, provides keypad selection of stations with additional nine keys for direct selection which may be locally programmed and easily updated, and also a central computer interface.

RTS Systems Inc showed a range of *TW* intercom products which operate on a 2-wire basis with a variety of stations including belt packs, rack mount with or without speakers, portable with speaker, wall mounted, console mounted and special types for use within cameras and so on. Either dynamic or powering requiring (carbon or Plantronics super lightweight headsets which are highly recommended by the Editor . . .) can be accommodated, and a variety of interfaces are available for 2-, 3- or 4-wire interfacing with most other intercom and telephone systems. RTS Systems also produces a larger *Model 801 Master Station* which handles six separate channels of intercom, monitor mute switch, slate mic switch, 2- or 4-wire interfacing, and many other facilities. A small in-line microphone amplifier with 23 to 56dB gain and built-in limiter and XLR connectors, and a new 4-input compact microphone mixer complete RTS Systems' product line-up.

Radio Mics

There was considerable coverage of radio microphones at **NAB** and **Sony** launched a UHF system operating in the 947MHz to 952MHz band which thus allows very compact antennae and minimises interference problems, allowing a minimum of six channels to operate simultaneously. Sony also has a wide range of VHF/UHF systems with rack mounting receivers.

RF Technology Inc was showing a range of diversity radio mic systems operating in the 950MHz band with very compact and well constructed transmitter and receiver.

Above: *Comrex portable extender transmitter*

Both HM Electronics, Comrex and Swintek were demonstrating their various radio mic systems, together with the British-made Artech system from Coherent Communications—all are fully covered in the radio microphone survey elsewhere in this issue.

Signal processing and monitoring

Comrex, in Massachusetts, manufactures a range of 'low frequency extenders' which shift an audio input up in the frequency spectrum by 250Hz so that when transmitted over a limited bandwidth circuit such as a telephone line, the bass response is retained rather than being cut-off at around 300Hz as on a normal circuit. At the receiving end, the signal is then shifted back down to its original frequency. Since the received signal is frequency shifted, low frequency interference on the transmission circuit, such as hum, is also eliminated. Although the Comrex system would normally have a top frequency limit of 2½ to 3kHz, this can be almost doubled to say 5kHz, which is perfectly adequate for most speech, by replaying a taped report at half speed over the Comrex treated phone line; decoded and the recording then replayed at normal speed—thus allowing music circuit quality over switched telephone circuits at a fraction of the cost. And often telephone companies can supply a telephone circuit at only a few hours notice, but a music circuit requires days. Although direct connection to the line would be preferable, an acoustic coupler can be used. Price of the rack mounting transmitter and receiver is $1,050 each, while a portable battery-operated transmitter is available for $1,200. It might be of interest to know that the BBC uses a Comrex extender between its New York and Washington offices.

Amber introduced the *Model 3500* distortion test set which is ultra compact with a high degree of performance for around $1,500. It includes an oscillator ranging from 10Hz to 20kHz with 0.003% distortion, to 50kHz with 0.05% and to 100kHz with 0.1%, while the analyser has a +40dBV to −30dBV distortion range, to −60dBV level, and to −120dBV narrow band, and it includes high and lowpass

66 ▶

The 1980's are brought one step nearer by the introduction of the MTR-90. This new sophisticated design is based on accumulated technology and innovation which have been the hallmark of Otari for over 15 years.

The new-generation tape transport incorporates a pinch-roller-free direct drive capstan with phase-locked-loop dc-servo circuitry. Tape speeds are 15/30 ips with ±20% stepless varispeed and a digital percentage readout. Features include full dc-servo on supply and take-up motors for constant tape tension, automatic switching between input/sync/reproduce electronics with gapless punch-in/punch-out. And a sliding tape-speed controller, built-in digital timer, auto/manual motor-driven head shields plus 40-ohm balanced output, to name but a few. It comes with the latest electronics featuring a single plug-in card per channel.

The MTR-90 is also available in a 16-track frame, and a 16-track prewired for 24 which can be upgraded to a 24-track machine simply and economically. For the full story, get in contact with your nearest Otari distributor.

OTARI

Japan: Otari Electric Co., Ltd.,
4-29-18 Minami Ogikubo, Suginami-ku, Tokyo 167.
Phone: (03) 333-9631

U.S.A: Otari Corporation,
981 Industrial Road, San Carlos, California 94070.
Phone: (415) 593-1648

Announcing the new 24-track designed for 1980's. Otari MTR-90.

business

ADRIAN HOPE

Sony digital discs

HAVING stuck my neck out here, there and everywhere by arguing that Philips' proposal for a *Compact* disc of 4½in (115mm) with one hour of stereo and half an hour of 4-channel coded surround sound is inadequate for a new format to take us through into the 21st century (presumably I'll never see the inside of Eindhoven again), I was fascinated to learn Sony's views on the subject. Pioneer has of course already adopted an optical system virtually the same as Philips and Sony has been working on something as near as dammit the same. But unfortunately as near as dammit is not near enough when it comes to standardisation.

Sony, however, recently surprised a possé of European journalists in Tokyo by announcing that the company is, after all, 'flexible' on the standardisation issue. To set the scene: Sony has already proposed a half-hour of video recording per disc side by running the optical video disc past the laser tracking head at a constant rotational speed of 1500 rpm (depending on country) and this conforms with Philips' own half-hour proposal. But whereas Philips proposes squeezing one hour of video out of each side of the disc by varying the rotational speed to keep the linear or tangential tracking velocity constant, Sony has proposed keeping the speed constant but reducing it by half. As there should be no real problem in providing a player to cope with all three types of discs (the Philips video disc players already cope automatically with both of their own types) this obviously isn't a stumbling block.

The main stumbling block was until recently the Sony contention that digital audio discs should be the same size as video discs (12in) as opposed to the 4½in suggested by Philips, and that the digital coding standard should be 16-bit as opposed to the 14-bit code opted for by Philips for the Compact Disc. But now Sony says that its demonstration of two and a half hours of stereo recorded in 16-bit code on a 12in disc (running at a fixed rotational speed of 450 rpm) was merely a "test of possible recording density". It was not, it says, a firm proposal for standardisation. Perhaps a 6in disc, says Sony, would be the ideal size. And probably, they concede, a 14-bit code is perfectly adequate for domestic reproduction. This narrows the gap between the Philips and Sony proposals very considerably. Very few people dispute that a 14-bit code is more than adequate for domestic use and what's a little matter of 2in disc diameter between company friends?

It looks then as if we might, just might, end up with an optical disc standard hierarchy along the following lines. On the one hand we have a range of 12in optical video discs all playable on one and the same player and varying only in playing time and the availability or otherwise of special features such as freeze frame facility. On the other hand we have a digital audio disc of something between 4½in and 6in in diameter, with a 14-bit code and rotational speed independent of TV standard frame rate and thus playable with a suitable decoder anywhere in the world. Ideally the digital audio disc would be playable either on a video player or a digital audio player or a combined video and audio player. This hierarchy would give us something closely resembling the current situation with record players routinely capable of reproducing 45rpm discs and 33⅓rpm discs of different sizes.

Incidentally Sony laid on a fascinating digital demonstration in Tokyo. The Masaru Imada jazz quartet was booked to play a small concert in the Sony Auditorium and every one of the score of visiting journalists was provided with (sadly, only on loan) an NTSC *Betamax* video cassette recorder and *PCM1* digital converter. While Suzuki Tomoo of CBS-Sony mixed the 12-mic setup using a Quad-Eight board, everyone present had their own chance to make a master tape in PCM. Actually and paradoxically, the whole exercise was self defeating. The very real advantage of the *PCM1* and video recorder combination is that it provides a safe and cheap means for record companies to send master quality tapes around the world. When a PCM video cassette is copied there is no loss of audio quality, so the digital dub is as good as the digital master. A string of 2- or even 3-hour 'masters' can thus be sent round the world in packages each no larger than a paperback book and with no loss of quality. If the Imada quartet had been recorded on a single PCM unit, the cassette could have been copied a couple of dozen times without any loss of quality. But it would have been far less fun, of course. By the way, does anyone have an NTSC *Betamax* and *PCM1* kicking around, because I'd love to hear how my recording of the Imada quartet turned out?

Bootlegging and piracy

ALMOST EVERY music biz trade paper now carries at least one item on how much the record companies are losing due to bootlegging, piracy, and unauthorised home taping of borrowed recordings. Estimates usually centre around £75 million a year lost on home taping alone! Quite how you evaluate a loss you never had in the first place is unsure, because there is no guarantee that those who made unauthorised recordings would otherwise have paid full price for authorised recordings. But let it pass. The record and music publishing companies, as represented by the BPI and MCPS, continually get publicity for their efforts at curbing what is without doubt a parasitic drain on the industry. But for an outsider with a jaundiced eye it is very hard to take these efforts too seriously.

First and foremost nonsense is the BPI's continual, and continually publicised, hunt for an electronic spoiler system to make commercial recordings immune from unauthorised copying. The idea of putting a spoiler such as an inaudibly high frequency tone on the recording, to beat with the tape recorder bias, and thereby produce an audible whistle after copying, is as old as the hills and as dead as a duck. Apart from all other considerations most domestic gramophones wouldn't track the tone, or it would be filtered off by the connecting leads or Dolby multiple filter, incorporated in the tape recorder. Even if a system were devised that wasn't automatically defeated in some way, its appearance on the market would be promptly followed by the appearance of anti-spoiler gadgetry. Recently the BPI paid over £10,000 to the Wolfson Unit of Southampton University to exhume and reresearch the dead spoiler duck. Predictably the results proved yet again what most competent engineers could have told the BPI in the first place—namely that the duck is indeed dead. But while the publicity continues the BPI continues to receive unsolicited dead end spoiler ideas. More importantly, the non-technical executives of record companies cling to the dream that one day, someone, somewhere will invent them a foolproof spoiler system. While there is still this dream to cling to, they shun the one foolproof anticopy weapon at their disposal—keeping the price of the commercial product low enough to make unauthorised copying not worth the effort. The BPI keeps the vicious circle closed by declining to tell what Wolfson vainly researched for its £10,000. But I'm promised that at the next BPI council meeting a decision will be taken on whether to make the Wolfson report public. Watch this space. Meanwhile CBS fails to issue the Bob Dylan *In Japan* double album so that it is available in the UK only on import at £15 or more a time. This adds up to an open incentive to piracy. Rod Stewart is suing WEA for charging too much for his record and Jonathan King's 10p single was banned from the BPI charts.

In the meantime, anyone who really wants to make money out of piracy has very little to worry about. In the November 1978 issue of *Studio Sound* I reported on a London street market where pirate tapes of commercial recordings are openly on sale. Some four months after the publication of that item (on which I heard nothing from the BPI or MCPS) I made a return trip to the same market and found exactly the same stall, in the same place, selling exactly the same cassettes plus a few more besides. You can now for instance buy copies of Wilde Rock promotion cassettes complete with their original 'not to be sold' labels. Only one thing has changed. The stall is now selling cassettes for 50p a time, 25p cheaper than last year. It's all very open. Why should they care, the BPI and MCPS obviously don't!

NOW HEAR THIS

The ideal tape for the professional

BASF LH tapes are famous for their quality, consistency and reliability. That's why major recording studios like Pye rely totally on them.

Such a tape is SPR50LHL, the latest development by BASF for studio use. A low noise, high output tape with exceptionally LOW PRINT THROUGH characteristics, a signal to noise ratio of up to 70dB (weighted according to DIN 45633) and conductive matt backing which resists static build-up and ensures excellent winding properties.

New BASF Chromdioxid Super cassette

There's no better reflection of BASF's leadership in tape technology than the introduction of Chromdioxid Super cassettes. They are the first compact cassettes to genuinely equal the performance of open-reel tapes, offering a 6dB increase in dynamic range at very high frequencies and a 2dB improvement over all others at 333Hz.

Chromdioxid Super cassettes extend the utilisable frequency spectrum by considerably improving the MOL in the 10KHz to 20KHz range – which is crucial to capturing the full harmonic effects.

BASF Chromdioxid Super cassettes benefit from BASF's unique SM (Security Mechanism), and are available in C60 and C90 lengths.

New BASF ferro super LH1 cassette

This new cassette is especially designed to achieve the highest quality of sound reproduction from Japanese cassette recorders. Its optimum operating point has been scientifically calculated to match the mid bias setting of all Japanese cassette decks.

See BASF on Stand 38/39 at APRS.

BASF United Kingdom Limited, Haddon House, 2-4 Fitzroy Street, London W1P 5AD Tel: 01-637 8971.

SPOT-ON SOUND

BASF

L to R: *Comrex 450DS, Audio Ltd 174-8, HM Electronics WM152, case and parts*

Survey: radio microphones

This is the first time that *Studio Sound* has published a comprehensive radio microphone survey, and we are somewhat amazed at the wide variety of systems available. Please bear in mind when reading this survey that extensive regulations govern the use of radio microphones, and equipment must be generally officially approved by a quasi governmental body before its use is permitted in most countries. Unfortunately, each country has its own ideas about the bands within which radio mics are permitted to operate, although broadcasters are permitted to use their own broadcast TV channels for radio mics.

The only frequency band allowed in Great Britain is 174-175MHz, while Europe tends to use frequencies around 30MHz, and the USA also uses 450-470MHz and 900-950MHz. Transmitter power in Britain is limited to 10mW, while 500mW is not uncommon (power supply allowing) in the States.

ARTECH (Great Britain)

USA: Coherent Communications, 13733 Glenoaks Blvd, Sylmar, Cal 91342.
Phone: (213) 362-2566.

Transmitter

Type: available as pocket pack or handheld with either Shure *SM-58* or electret omni elements.
Audio input: —33dB to —60dB (45mV to 0.78mV), 150 to 600Ω.
Limiter: variable compression over 35dB range.
Audio connector: 4-pin Fischer 'quick-loc', for standard dynamic mics, positive ground power for electrets, and power for Neumann *70* series, Sennheiser *—05, —15, —35* and certain Schoeps mics.
FM deviation: normally 25kHz, can be reduced.
Spurious emissions: at least 40dB below carrier, typically 48dB.
RF power output: 50mW into 50Ω, high power units 500mW.
Antenna: strong highly flexible cable terminated in submin connector.
Battery: single or dual versions, *PP3* type, Mallory *MN1604*, single battery model 12-15 hours, dual 30-33 hours.
Dimensions: single battery pocket model 102 x 60 x 21mm, 270g; dual battery model 102 x 85 x 21mm, 298g; handheld model 241mm long, 30mm diameter, 440g (only one battery).
Construction: 2-piece brass with integral shield between audio and RF circuitry, battery in separate sealed compartment, case clad in black epoxy finish.
Prices: VHF single $495, dual $520, high power single $575, dual $595, UHF single $575, dual $595, handheld with Shure *SM58* element $635, with omni electret element $575.

Receiver

Type: available as battery operated portable with optional mains power supply, or rack mounting cards for mainframes with built-in mains power supplies.
Audio outputs: mic level 150Ω balanced, line unbal 50Ω +10dB, phones will drive 50Ω.
Connectors: mic XLR, line out with DC power input Lemo 4-pin Quick-Loc.
RF sensitivity: 1.5μV for 20dB S/N, 5μV for 40dB.
Adjacent channel rejection: 85dB.
Image and spurious response: 85dB.
Antenna: 50 to 75Ω, F&E (UHF) socket, numerous antennae.
Indicators: signal field strength meter, battery meter.
Power: six internal AA (MN1500) giving 40 hours, nicads or external 9V 50mA.
Construction: brass case with black epoxy finish.
Dimensions: portable 125 x 180 x 25mm, 880g, rack 480 x 134mm.
Prices: portable VHF internal batteries $695, UHF $775. VHF rack mount card $695 each, frame for six cards with power supply $300, for eight cards less power supply $225. Power supply for portable receivers $25, for large rack $85.

Overall system specification

Frequency response (20dB below limiting): 80Hz to 20kHz ±2dB, includes 6dB/octave roll-off at 60Hz to remove wind and rumble.
S/N: 64dB unweighted, 66dB A-weighted.
Harmonic distortion: 1kHz typically 0.5%, 100Hz to 20kHz 1%.
Pre and de-emphasis: 50μs.
Carrier frequency range: VHF 120MHz to 240MHz, UHF 400MHz to 470MHz.
Frequency stability: 0.005%.

Mini-Mic

This is a professional subminiature electret condenser mic measuring 11.7 x 8.38 x 8.28mm, noise 26dB SPL, output impedance 3kΩ unbal (bal available), audio sensitivity 60dB below 1V rms per μ/bar, battery 1.1V to 20V DC, available with a multitude of connectors to match Swintek, Vega, Artech and Micron radio mics, and most other standards.
Price: from $128 depending upon connectors.

AUDIO (Great Britain)

Audio Ltd, 26 Wendell Road, London W12 9RT.
Phone: 01-743 1518/4352.
USA: Murray Rosenblum Sound Associates Inc, 21-36 33rd Road, Long Island City, New York 11106. Agents in Italy, New Zealand, South Africa, Sweden and West Germany.

RMS5 system

Frequency response: not specified.
Distortion: 1%.
Pre and de-emphasis: 50μs.
Carrier frequency: 70MHz to 200MHz.
Stability: ±10kHz at 175MHz.

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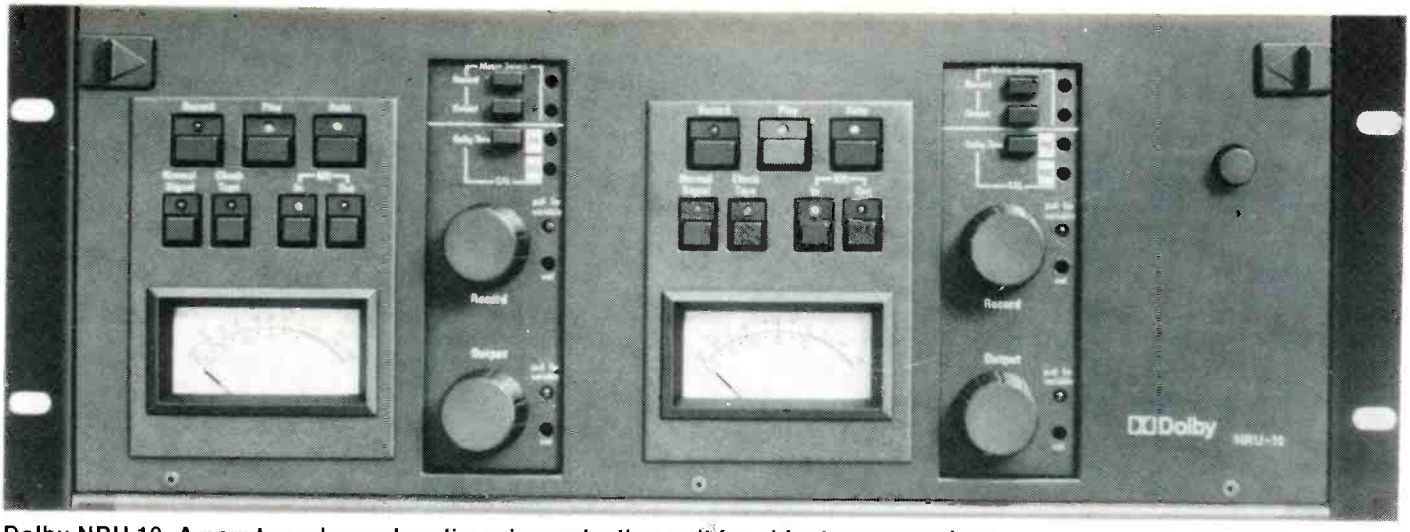

Dolby NRU 10. A new two-channel audio noise reduction unit for videotape recorders.

With the Dolby system, the sound can match the picture.

Today's television viewers are more aware of good sound than ever before. Many have grown up with high quality sound reproduction as part of their lives. As a result, broadcasters are paying more attention than ever before to television sound. Today, television sound is often first recorded on the best professional audio equipment, and distribution and transmission channels are capable of handling high quality audio signals.

However, there remains a major barrier in the way of broadcasters striving to improve television audio: VTR soundtracks. The better the rest of the studio and distribution chain becomes, the more the noise from the audio tracks of VTRs limits the ultimate television audio fidelity. The audio signal-to-noise ratio of 2″ quad machines is typically worse than 50 dB, while the specs for the new generation 1″ machines are typically 52-56 dB. That kind of performance is not as good as many consumer audio tape recorders, and unless improved, may always keep television sound from matching the high fidelity colour picture.

Dolby noise reduction is the proven way to break through the noise barrier. It provides 10 dB of noise reduction (rising to 15 dB at 9 kHz and above), without audible degradation of the original signal. It reduces hiss, hum, rumble, print-through, the noise build-up from re-recording – *all* noise not part of the original signal. Just as important, Dolby noise reduction can lead to significantly reduced distortion: it permits lower, less-distorted record levels than those generally used now in the attempt to override the high noise of VTR audio tracks.

Dolby noise reduction has become universally accepted for quality audio tape recording, both professional and consumer. It is already used by several broadcasting organizations to improve the audio quality of VTRs. Just ask any professional recording engineer about the benefits of the Dolby system, or contact us for full technical information. Let us help you in your efforts to provide television sound which matches the television picture.

Visit Dolby Laboratories at Stand 17-19, APRS, 20-22 June 1979.

Dolby

Dolby Laboratories Inc

'Dolby' and the double-D symbol are trade marks of Dolby Laboratories

346 Clapham Road, London SW9 Telephone 01-720 1111 Telex 919109

731 Sansome Street, San Francisco CA 94111 Telephone (415) 392-0300 Telex 34409

SURVEY: RADIO MICROPHONES

Audio Ltd cont'd

AU18/RMS5H transmitters
Type: *AU18* pocket transmitter, *RMS5H* handheld with cardioid or omni electret elements.
Audio input: suitable for moving coil or electret mics, 30 and 600Ω.
Connector: locking Preh.
FM deviation: 35kHz.
RF power output: from 1mW to 20mW.
Antenna: flexible.
Battery: *PP3*.
Dimensions: pocket 118 x 59 x 22mm, 270g; handheld 260mm length 30mm diameter, 450g.
Prices: *AU18* £110, *RMS5H* £155.

RMS5 receiver
Type: battery-operated receiver.
Audio output: mic level 30Ω.
Connector: Preh.
RF sensitivity: 5μV for 40dB S/N.
Antenna: 75Ω coax.
Power: 9V *PP9*.
Dimensions: 255 x 155 x 64mm, 1.6kg.
Price: £155.

RMS8 series
Frequency response: 100Hz to 15kHz ±2dB.
Distortion: 1%.
Pre and de-emphasis: 50μs.
Carrier frequency range: 70 to 200MHz, UHF system available between 400 and 500MHz.
Frequency stability: ±5kHz.

AU18/RMS8H transmitters
Type: *AU18* pocket transmitter, *RMS8H* handheld transmitter with omni or Shure *SM58* cardioid element.
Specification otherwise similar to *AU18/RMS5H*.
Prices: pocket £110, with Lemo socket and on/off £125, handheld cardioid £190.
Optional high power transmitter in 140 x 66 x 22mm case, with two *PP3*s allows up to 100mW, with separate 12V power supply and without space for internal batteries up to 500mW is possible.
Price: £140.

RMS8 receiver series
Type: battery-powered receiver.
Audio output: mic level 30 to 150Ω, headphone 1mW/600Ω.
Connector: Preh, headphones on jack.
RF sensitivity: 5μV for 40dB S/N.
Antenna: 75Ω, various antenna available.
Indicators: tuning, RF level and battery meters.

Comrex radio transmitter, left and radio receiver, right

Power: six *HP7*/Mallory *MN1500* batteries.
Dimensions: 180 x 125 x 25mm, 880g.
Prices: £255. *RMS8/5* is a 2-channel version of the above.

RMS8a
This is an updated version of the *RMS8* with headphone level control, Lemo socket for external powering and aux out, and XLR audio out.
Price: £280.

RMS8M
Mains powered receiver with XLR audio, headphone output and RF level meter.
Price: £300.

RMS8T
Twin-channel receiver.
Price: £395.

TR58
Subminiature electret microphone 13.3 x 7.6 x 4.5mm, operating voltage 1 to 1.5V, available with optional powering adaptor enabling it to be used with ordinary tape recorders.
Price: £55; £95 with adaptor.

BEYER (West Germany)

Beyer Dynamic, PO Box 1320, D-7100 Heilbronn, West Germany.
Phone: 07131 82348. Telex: 0728771.
UK: Beyer Dynamic (GB) Ltd, 1 Clair Road, Haywards Heath, Sussex RH16 3DP.
Phone: 0444 51003/4.
USA: Hammond Industries Inc, 155 Michael Drive, Syosset, NY 11791.
Phone: (516) 364-1900. Telex: 961396.

TS73/TS83/SM84
Type: *TS73* pocket transmitters, *TS83* with built-in limiter, *SM84* handheld radio microphone with exchangeable heads.
Operating frequencies: 1 or 2 channels between 26MHz and 46MHz.
RF output power: available in 1mW or 10mW.
Power: 2 9V batteries, 15 hours life, one only in handheld, 7 hours life.
Dimensions: pocket 105 x 67 x 25mm, 200g, handheld 170 x 50 x 41mm, 300g.
Prices: on application.

TE20
Type: portable receiver, battery operated.
Frequencies: up to 3 channels between 26 and 46MHz.
Power: 2 9V batteries, 20 hours life.
Dimensions: 140 x 85 x 30mm, 280g.
Price: on application.

NE75/NE84
Type: mains/battery receivers for up to three channels, built-in monitor loudspeaker, 9V battery, diversity connections on *NE84*.
Prices: on application.

COMREX (USA)

PO Box 269, 60 Union Avenue, Sudbury, Mass 01776, USA.
Phone: (617) 443-8811. Telex: 710-347 1049.

450RA/TA system
Type: pocket UHF transmitter with identically sized pocket receiver designed to be mounted on a camera.
Frequency range: 450 to 451MHz, 455 to 456MHz.
Transmitter input: any low imp mic.
RF output power: 150mW.
Receiver sensitivity: 1μV.
Power: both have nicads, optional extra nicad pack for extended operation and optional mains power supply.
Dimensions: each 76 x 127 x 25mm.
Prices: *450TA* pocket transmitter $550, *450RA* pocket receiver $550, aux battery pack $75, mains power supply $175.

450DS diversity system
Type: diversity receiver mounted in rugged 'Haliburton' luggage type case. Includes two *450RA* receivers, a diversity combiner, a monitor amplifier and speaker, and an internal power supply enabling the system to be operated from AC power or Internal nicads. Case also holds *450TA* pocket transmitter and *HHT-1KA* handheld transmitter.
Price: $1,950 receiver and case only.

HHT-1KA transmitter
Type: handheld transmitter with built-in electret mic, with dual automatic modulation control. 1W output.
Dimensions: 220 x 44 x 38mm, 554g.
Price: $950.

CTA/CTB Cue Transmitter
Type: rack mounting 1W transmitter, 26.1 to 26.48MHz *CTA*, and 161.625 to 161.775MHz *CTB*. Includes ducking limiter operating on line level, 6kHz bandwidth.
Price: $750.

CRA Cue Receiver
Type: pocket-sized cue receiver with high level headphone output of 600mW into 8Ω, antenna operates from earphone cable, battery 9V Mallory *MN1604*, size 75 x 125 x 25mm, 50 to 550MHz or 26.1 to 26.48MHz.
Price: with squelch $550, without $395.

EDC (GB)

EDC, Elkom Design Ltd, 29a West Street, Wareham, Dorset BH20 4JS.
Phone: 09295 6050/6061.

Cygnus transmitters CTXP/CTXH
Type: available as pocket *CTXP* or handheld with cardioid electret (omni to order) *CTXH*.
Audio input: matches any 200Ω, low imp or 2kΩ electret.
Limiter: 30dB range with typically less than 1% distortion.
Audio connector: 4-pin connector.
FM deviation: ±75kHz.
RF output power: 10mW, higher output power available for export.
Antenna: 9cm helical or 46cm free hanging.
Battery: 6.5V from nicad (4 hours) or Mercury cell (50 hours).
Indicators: approx 15 mins operating time after LED extinguishes.
Dimensions: pocket transmitter 111 x 45 x 19.5mm, 128g; handheld 215mm x 20mm diameter, 199g.
Construction: pocket moulded plastic, handheld gold plated.
Price: £164.09 with mic, nicad, aerials, pouch and charging lead; handheld £169.75.

Cygnus receivers CRX and CRX/A
Type: mains or external battery operated, numerical channel and status indicator, *CRX/A* simplified panel version with only on/off on front.
Audio outputs: mic level 30 to 300Ω balanced, line bal or unbal.
Connectors: 7-pin DIN.
RF sensitivity: 5μV gives 50dB S/N.
Adjacent channel rejection: 80dB.
Antenna: 15cm helical, or external dipole.
Indicators: meter reading battery, signal strength or audio output.
Power: mains or external 12 to 24V.
Construction: compact two tone blue box with front panel.
Dimensions: 209 x 52 x 150mm, 1.25kg.
Price: *CRX* £253.83, *CRX/A* £217.08.

Overall system specification
Frequency response: 35Hz to 15kHz —3dB points.
S/N: 64dB, typically 68dB.
Harmonic distortion: less than 0.04%.
Pre and de-emphasis: 50μs.
Carrier frequency range: UK 174-175MHz band, Europe 37.1MHz standard, or 27-60MHz band, to order 150-200MHz band.

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SURVEY: RADIO MICROPHONES

EDC cont'd

System prices: including carrying cases handheld system with standard receiver £432.04, pocket system with standard receiver £426.30, handheld with /A receiver £389.98, pocket with /A receiver £388.70.

PARX/9
In-line aerial preamplifier providing 10dB increase in sensitivity, built-in *PP3*, standard coax sockets.
Price: £58.63.

Minkom
Type: transmitter and receiver are each pocket sized in plastic cases. Specification very similar to *Cygnus* but receiver same as transmitter with 0dB into 8Ω output, 6 hours operation from nicad.
Prices: transmitter £201.40, single channel receiver £233.25, dual channel £239.55.

Supernova
Type: new handheld transmitter with cardioid Shure *R97* element with built-in pop filter, rechargeable battery giving 8 hours operation, aerial mounted within case so no external antenna necessary. Further information when it becomes available.

EDCOR (USA)
16782 Hale Avenue, Irvine, Cal 92714, USA.
Phone: (714) 556-2740. Telex: 685557.

PM1/PM5 transmitter
Type: pocket transmitter with belt clip, available as *PM1 Interviewer* with built-in mic or *PM1 Demonstrator* with attached dynamic external mic, *PM5* handheld with dynamic cardioid element.
Operating frequency: 30-50MHz.
Frequency response: 50Hz to 14kHz.
RF output power: 200mW.
FM modulation: 40kHz deviation.
Battery: *PM1* 9V alkaline 4 hours, mercury 18 hours.
Dimensions: *PM1* 31 x 70 x 98mm, 310g.
Price: on application.

ST-3B/ST-3B2
Type: mains or DC powered receiver in cabinet case, *ST-3M2* has two channels.
Audio output: up to 5V for driving hi imp, 100mV for lo imp.
Connectors: audio XLR.
RF sensitivity: 2μV for 20dB quieting.
S/N: 55dB.
Power: mains or 12V.
Indicators: field strength meter.
Dimensions: 75 x 185 x 254mm, 1.3kg.
Prices: on application.

PR1
Type: personal mini pocket receiver with belt clip, basic specification as above, but 500mW into 8Ω output for headphones, battery operation from 9V alkaline, 4 hours life.
Price: on application.

ST-3B Diversity Receiving System
Specification similar to *ST-3B* but with two receivers, two antennae and a diversity switch.

HME (USA)
HM Electronics Inc, 6151 Fairmount Avenue, San Diego, Cal 92120, USA.
Phone: (714) 280-6050.

WM222/WM225A transmitters
Type: Body Pac pocket transmitters, *WM222* has dynamic expansion providing wide dynamic range but requiring expansion receiver; *WM225A* has soft compression plus adjustable non-clipping limiter.
Audio input: low imp dynamic or electret mics, switchable bias, positive ground, *WM222* —52dBm, *WM225A* —65dBm.
Connectors: locking 'microplugs'.
RF power output: 50mW nominal, *WM225A* switchable 50/100mW.
Spurious emissions and harmonics: —40dB.
Battery: 9V alkaline, 8 hours life; 4 hours for 100mW.
Dimensions: 102 x 64 x 20mm, 142g without battery.
Price: *WM222* $773, *WM225A* $653.

WM250/WM252 transmitters
Type: handheld transmitters, *WM250* similar to *WM222* specs, *WM252* similar to *WM225A* specs, but both with either Shure *SM57* or *SM58* elements.
Dimensions: 267 x 30mm diameter, 450g.
Prices: *WM250* $728, *WM252* $863 with either element.

WM122/WM125
Type: mains or externally powered receivers, *WM122* with dynamic expansion capability, *WM125* straight.
Audio outputs: line level bal 600Ω (0dBm), mic level bal 200Ω (—52dBm), monitor 1V into 50Ω.
Connectors: XLR audio, jack monitor.
RF sensitivity: 1μV for 30dB quieting.
Antenna: 50Ω, external dipole or whip.
Indicators: meter for VU, RF or battery.
Power: mains, external battery packs giving from 2 to 70 hours, or 10 to 30V.
Dimensions: 146 x 76 x 178mm, 1.13kg.
Prices: *WM122* $1,115, *WM125* $983.

WM152/WM155
Specifications basically similar to *WM122/WM125*, but *Flat Pac* receivers with 2 or 4 9V batteries, or external 10 to 30V.
Dimensions: 146 x 39 x 178mm, 900g.
Prices: *WM152* $1,103, *WM155* $923.

WM309
Executive receiver, specification similar to *WM125* but simplified controls and outputs, mains only.
Price: $443.

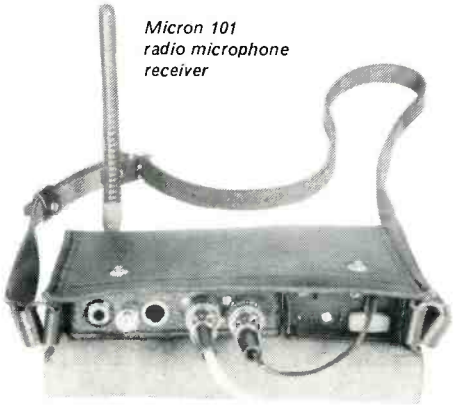
AD5/AD10 Diversity Systems
Passive diversity systems that combine the outputs of three antennae into one receiver, while *AD10* also provides four outputs.
Prices: *AD5* $491, *AD10* $606, both complete with antennae and cables.

Overall system specification
Frequency response: 100Hz to 15kHz ±2dB.
S/N: 60dB on standard system, 95dB on dynamic expansion system.
Distortion: 1%.
Carrier frequency range: 150MHz to 174MHz, or TV versions 174 to 216MHz.

HME produces a wide number of systems composed of the above transmitters and receivers, with road-cases and other accessories.

MARTI (USA)
Marti Electronics Inc, PO Box 661, 1501 N Main, Cleburne, Texas 76031.
Phone: (817) 645-9163.

Marti Electronics manufactures a range of rack and freestanding wideband transmitters and receivers providing broadcast quality for links and reverse talkback purposes. Range includes 8W 950MHz model, and 1W and 40W versions in 150 to 172MHz band, and 0.7W and 25W versions in 450-470MHz band.



Micron 101 radio microphone receiver

MICRON (Great Britain)
Audio Engineering Ltd, 33 Endell Street, London WC2H 9BA.
Phone: 01-836 9373.
Hire: Better Sound Ltd, 33 Endell Street, London WC2H 9BA.
Phone: 01-836 0033.

Micron 100 series transmitter
Type: available as *101* with one 9V battery, or *102* with larger case and 2 9V batteries, pocket packs.
Audio input and connector: uses 8-pin Lemo connector which can directly accept (depending upon links and wiring), 200Ω dynamic (—74dB), dynamic via 20dB pad 2kΩ (—54dB), powered for Sennheiser *—04, —05, —15* series mics via pad, powered for Sony *ECM50* 5kΩ unbal, 0dBm line level, AKG *CE10*.
Limiter: 45dB range, 25ms/10dB attack, 10dB/s recovery short term, 10dB/20s long term.
FM deviation: ±75kHz max, normally 22kHz at limiter threshold.
RF power output: 10mW or 30mW.
Antenna: flexible cable.
Battery: *101* one *PP3* (2 hours), *MN1604* (12-15 hours); *102* 2 *PP3* (6-9 hours), *MN1604* (30 hours).
Dimensions: *101* 93 x 62 x 22mm, 235g; *102* 120 x 62 x 22mm, 290g.
Construction: lightweight stainless steel cases.
Prices: *101* £308.40, *102* £313.76.

MR1/MR2 receivers
Type: *MR1* mobile receiver with external power and leather case, and *MR2* mains powered receiver in diecast case with monitor loudspeaker.
Audio output: —51dB into 50Ω.
Audio connector: *MR1* 3-pin Preh, *MR2* XLR, jack monitor.
RF sensitivity: 2μV, 20μV gives 50dB S/N.
Adjacent channel rejection: 80dB.
Image rejection: 60dB.
Antenna: helical or dipole.
Indicators: multi LEDs indicating battery volts, tuning, signal strength and *transmitter* battery status. A simple table gives quantitative values for various LED combinations.
Dimensions: *MR1* 120 x 95 x 32mm, 445g; *MR2* 185 x 115 x 55mm, 1.22kg.
Power: *MR1* 12V DC from battery pack or recorder, *MR2* mains.
Prices: *MR1* £309.75, *MR2* £354.16.

Overall system specification
Frequency response: 50Hz to 16kHz.
S/N: 500μV signal strength 55dB with receiver at max AF, 70dB when AF gain —20dB.
Distortion: 0.4%.
Pre and de-emphasis: 50μs.
Carrier frequencies: 30-50MHz, 100-200MHz, 400-500MHz.
Frequency stability: 0.005%.

MDU1 Diversity System
Type: a diversity switch that takes the output of two standard receivers (which already includes signal strength information) and selects the audio output of the highest level receiver. If both are equal, the outputs are summed.
Price: £230.

Audio Engineering intends to introduce a range of rack mounting receivers in the near future which will include dual receiver with diversity types, and an aerial distribution amplifier allowing a single aerial to feed several receivers.

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"The original A77 had set a standard by which I have judged other domestic and semi-professional recorders for many years. It is now clear that the new B77 sets a new standard not easily surpassed at its price"

Angus McKenzie (March 1978)

REVOX

For the full story contact F.W.O. Bauch Ltd., 49 Theobald St., Boreham Wood, Herts. WD6 4RZ

SURVEY: RADIO MICROPHONES

RESLO (Great Britain)

Reslosound Ltd, Eagle Road, Rye, East Sussex TN31 7NB.
Phone: 07973 3959. Telex: 95447.

TXT
Type: pocket transmitter.
Audio input: mic level 200Ω on Preh 5-pin socket.
FM deviation: ±75kHz.
Frequency response: 50Hz to 14kHz.
Harmonic distortion: 1%.
RF output power: 10mW.
Operating frequency: 174.8MHz.
Antenna: free hanging wire.
Batteries: 9V alkaline *MN1604* 2-3 hours, silver zinc rechargeable 10 hours.
Dimensions: 57 x 38 x 83mm.
Price: £137.86.

RXA
Type: mains powered case receiver.
Audio output: mic level 30Ω bal, and 400mV hi imp.
RF sensitivity: mute at 5μV.
Antenna: telescopic aerial, 75Ω BNC socket.
Power: mains.
Dimensions: 203 x 127 x 51mm.
Price: £171.68.

Cabaret
A complete radio microphone system using hand-held transmitter with dynamic ball-top element, and receiver built into custom case, telescopic aerial built into lid, mains powered.
Price: complete £413.54.

RF (USA)

RF Technology Inc, 54 Wilton Road, Westport, Conn 06880, USA.
Phone: (203) 226-9511.

Transmitter
Type: pocket pack transmitter.
Audio input: —40dBm to —60dBm, 3kΩ unbal, will power electrets.
Limiter: 20dB soft.
Frequency response: 50Hz to 10kHz ±1dB, —3dB at 15kHz.
FM deviation: ±50kHz.
Carrier frequency range: 947-952MHz, other to order.
Spurious emissions: —40dB.
RF power output: 50mW, optional 500mW amp/battery pack.
Antenna: flexible cord.
Battery: 5 hours life.
Dimensions: 76 x 20 x 137mm, 355g.
Price: on application.

RM100 series diversity receivers
Type: *RM100* 5-channel in rack, *RM101* 1-channel pocket pack or strapped to recorder, *RM102* 1-channel in metal case, *RM104* 2-channel in metal case. All with main and diversity receivers.
Audio output: *RM100* line + 8dBm 150Ω bal, —50dB 150Ω bal. *RM101* —50dBm 150Ω.
RF sensitivity: not stated.
Power: *RM100* mains, *RM101* 12V, nicad or AA; *RM102* 12V, mains or nicads; *RM104* 12V or 9 internal D cells.
Dimensions: *RM101* 100 x 33 x 140mm, 650g; *RM102/4* 230 x 310 x 50mm.
Prices: on application.

SENNHEISER (West Germany)

Sennheiser Electronic, D-3002 Wedemark 2, West Germany.
Phone: 05130 8011. Telex: 0924623.
UK: Hayden Laboratories Ltd, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW.
Phone: 02813 88447. Telex: 849469.

SK1010 transmitter
Type: pocket pack transmitter that also includes removable mic elements and has optional neck noose. Omni or cardioid elements.
Audio input: 8-pin connector with 1mW input for 40kHz swing.
Limiter: 26dB range.
Carrier frequency bands: 30-45MHz, 140-174MHz.
RF output power: 10mW or 100mW.
Antenna: flexible.
Battery: 9V, 8 to 48 hours life depending upon type.
Dimensions: 150 x 46 x 24mm, 226g.
Price: £311, mic element omni £27, cardioid £40.

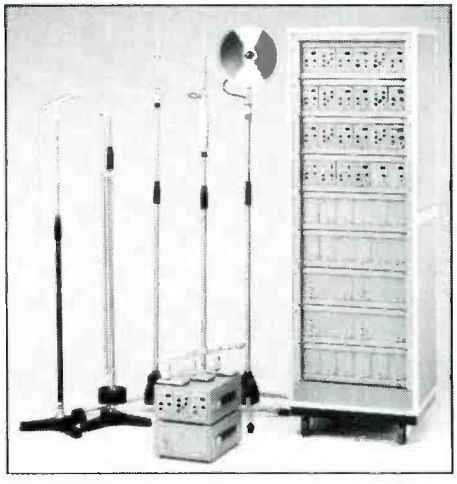
EM1010 receiver
Type: cabinet mounted receiver, built-in monitor loudspeaker.
Audio outputs: 1.55V, 200Ω.
Connector: DIN.
RF sensitivity: 2μV, 10μV gives 50dB S/N, 50μV gives 65dB.
Indicators: meter for field strength, audio and battery.
Power: mains, twin 9V batteries, or 12-21V.
Dimensions: 294 x 172 x 97mm.
Price: £327.

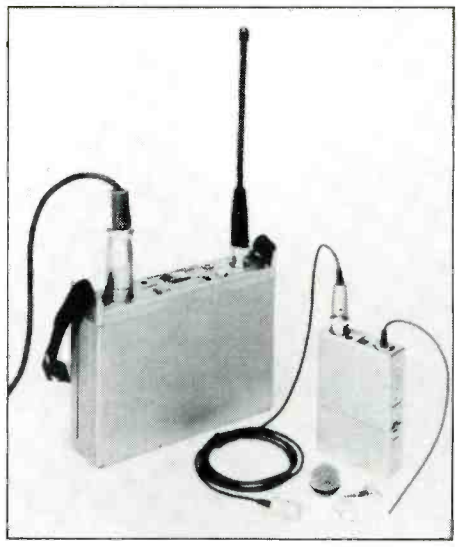
Sennheiser also has systems operating in the 72-76MHz, 25-110MHz and 40-44MHz bands.

SONY (Japan)

USA: Sony Industries, 9 West 57th Street, New York, NY 10019.
Phone: (212) 371-5800.
UK: Sony UK Ltd, 134 Regent Street, London W1.
Phone: 01-439 3874. Telex: 266371.

New VHF/UHF wireless mic system for broadcast use from Sony





Sony's WRR-27 UHF tuner and WRT-27 UHF transmitter

WRT42/WRT57/WRT27 transmitters
Type: *WRT42* VHF handheld, *WRT57* UHF handheld, *WRT27* UHF pocket pack. Handheld have cardioid electret elements.
Audio input: *WRT27* 4kΩ suitable for *ECM50* mic. Also dynamic mics.
Connector: 4-pin.
Frequency bands: VHF 40-47MHz, UHF 470-488MHz, 900-950MHz.
FM deviation: VHF 2kHz, UHF 2.4kHz.
RF power output: 30mW, available for any national standard.
Antenna: flexible wire.
Battery: 9V mercury cell, VHF model 3 hours, UHF 2 to 5 hours.
Dimensions: handheld 171 long x 20mm diameter, pocket 59 x 20 x 82mm.
Price: on application.

WRR52/WRR57/WRR27
Type: *WRR52* VHF module mount, *WRR57* UHF module mount, *WRR27* portable, shoulder slung.
RF sensitivity: muting level —30dB, S/N 55dB with 60dB RF input.
Frequency response: 100 to 15kHz.
Audio output: —20dBm 600Ω, portable —64dBm 600Ω.
Power: DC 24V, portable, 9V battery.
Dimensions: 68 x 89 x 205mm, portable 148 x 35 x 106mm, 800g.
Prices: on application.

Sony also produces diversity units for separate receivers and tuner base and portable base units.

SWINTEK (USA)

Swintek Enterprises Inc, 1180 Aster Avenue, Unit J, Sunnydale, Cal 94086, USA.
Phone: (408) 249-5994.

WMS111 series transmitters
Type: *TH* handheld with Shure *SM57* or *SM58* elements, *TS* pocket pack, *T* pocket pack.
Audio input: —54dB 50-250Ω or hi imp for electret, positive or negative phantom bias, matches *ECM50*, *CE10*, *MiniMic*, *EVO85* etc.
Connector: min phone with locking collar.
FM deviation: 10kHz deviation.
Frequency band: 150-220MHz.
Frequency stability: 0.0015%.
Audio frequency response: 30Hz to 10kHz ±2dB.
S/N: 70dB.
Spurious radiation: —40dB.
RF power output: 50mW *TS/T*, 20mW *TH*.
Antenna: 18in flexible lead, optional 4in stud on *TH*.
Battery: 9V *MN1604*, 10 hours life.
Dimensions: *TS/T* 95 x 57 x 22mm, 140g; *TS* 216 long x 32mm dia, 420g.

82 ▶

The amazing 32-track Telefunken 'magnetophon' 15A. A new dimension in studio recording technology.

Available in 8, 16, 24 and 32-track format.

TELEFUNKEN

AEG-TELEFUNKEN
Tape Recorder Division
Postfach 2154,
D-7750 Konstanz West Germany.
Telephone: (7531) 86 2460.
Telex: 733233

Hayden Laboratories Limited,
Hayden House, Churchfield Road,
Chalfont St. Peter, Bucks SL9 9EW.
Telephone: Gerrards Cross 88447.
Telex: 849469.

HAYDEN
Exclusive UK Agent

SURVEY: MIC STANDS AND BOOMS

Eagle cont'd

Holland: Eagle International Electronics BV, Ridderkerkstratt 15, Rotterdam-Lombardijen.
Phone: 198 661.

FS2/FSB2
Adjustable stands with two sections, max height 1.4m, snap fit legs, 32cm each.
Price: £14.50, *FSB2* with boom 84cm £19.75.

FS268/BA132
Adjustable stand with extra long detachable legs and speedlock adjustment.
Price: £24.95, *BA132* is 70cm boom arm £16.70.

PRO range
Range of interchangeable parts enabling a variety of stands to be constructed. Basic parts as follows: *S1N* 28cm short stem £4.65, *S2N* telescopic stem 80-150cm £11.30, *S3N* collapsible tripod base with folding legs £11.75, *S4N* boom arm with counterweight, length 79cm £10.70, *S5N* similar boom but 102cm long £12.15, *S6N* swanneck extension for stems and booms £6.90.

KEITH MONKS (UK)

Keith Monks (Audio) Ltd, 26-28 Reading Road South, Fleet, Hampshire GU13 9QL.
Phone: 02514 20568. Telex: 858606.
USA: Keith Monks (USA) Inc, 652 Glenbrook Road, Stamford, Conn 06906.
Phone: (203) 348-4969.

MS/M and BA/M
Heavy duty mic stands of medium weight, height 98-180cm, three 35cm long screw legs, 4.3kg weight, available in chrome, or plastic finish in red, black, light blue, white, yellow, metallic grey. *BA/M* boom/arm also in chrome or colour.
Prices: *MS/M* stand £22.40, *BA/M* boom £12.50.

MS/S and BA/S
Light weight mic stands, height 96-117cm, three/screw legs, weight 2.72kg. Chrome or black plastic finish. Boom arm *BA/S*.
Prices: *MS/S* £14.30, *BA/S* £9.40.

MS/L and BA/L
Heavy duty floor stand forming the base for the *Studio* series, four screw legs, *MS/L14* 35cm long, *MS/L22* 56cm long, height 114-213cm. *BA/L42* boom arm has 0.9kg counterbalance weight, 98-121cm reach, *BAL/72* boom arm has 1.8kg weight, reach 170-210cm. *EXT/1* allows the *BA/L* booms to be lengthened by 91cm and can be stowed inside boom when not in use.
Prices: *MS/L/14* £29.70, *MS/L/22* £34.40, *BA/L/42* £16.90, *BA/L/72* £25.20, *EXT/1* £7.85.

MS/W
Studio stand with wheels, reinforced base assembly, with a spread of 80cm, includes four chromed screws with rubber suction cups which enable the stand to be locked in position. Takes both *BA/L* booms, height 118-208cm.
Price: £60.90.

MS/CT/2
Chrome floor stand with 5kg cast base, height 96-117cm, weight 6.57kg.
Price: £23.20.

MS/LM and MS/LCT/2
Low floor stand, similar to *MS/M* and *MS/LC/2* respectively, but only 50-91cm height range.
Price: £20.20 and £20.80.

MS/F/2
Folding floor stand, height 71-183cm, three folding legs, weight 3.5kg.
Price: £23.90.

DB/1, DB/2 and CF/1
Drum boom arms which attach to *MS/CT* or *MS/M* stands giving 360° coverage in a 71cm length from the clamp, *DB/1* 53-96cm, *DB/2* 91-168cm. *CF* is a 180cm ceiling or wall mounting fitting to which the *DB/* clamps may be attached, this freeing the studio floor of stands and cables.
Prices: *DB1* £12.50, *DB/2* £15.80, *CF* £33.50.

BS/1/B and BS/2/B
Banqueting stands for table or floor use, with telescopic tube that can be angled at an angle or upright, *BS/1/B* height 30-53cm, 2.15kg, *BS/3/B* height 43-81cm, 3.75kg.
Prices: *BS/1/B* £16, *BS/2/B* £20.60.

MS/PA/C
Toggle stand with telescopic upright that provides 180° vertical coverage, four screw legs, 132-215cm height, 6.12kg.
Price: £29.90.
Keith Monks also manufactures a wide range of clamps, stereo bars, spring grip clamps, table stands, goosenecks, and 18 thread adaptors.

NEUMANN/DANNER (West Germany)

George Neumann GmbH, 1 Berlin 61, Charlottenstrasse 3, West Germany.
Phone: 251 4091. Telex: 184595.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham-wood, Herts WD4 R2.
Phone: 01-953 0091. Telex: 27502.
USA: Gotham Audio Corp, 741 Washington Street, New York NY10014.
Phone: (212) 741-7411. Telex: 129269.

M31
Basic stand with solid base, height 110-180cm.
Price: £47.27.

M32
Collapsible tripod leg stand, height 90-180cm.
Price: £76.15

M35/G35
Substantial stand, 8.5kg, maximum height 5m, minimum 1.4m, tripod legs.
Price: £239, *G35* boom arm 2.5m long £206.

M184
Substantial stand with solid wheeled base, 4.5m height, 60kg, with boom.
Price: £695.

M272 series
Series of stands with solid circular base, height 1.2-2m, and with built-in wired connector for mic, available in five types to fit most Neumann microphones.
Prices: £288-£298.

MFS3I series
Series of mic stands with built-in connector on gooseneck.
Price: about £97.35.

MA
Fishpole with minimum 1.25m length, maximum 3.75m, weight 0.55kg, swivel mic holder.
Price: £132.68.

Neumann also produces goosenecks, stand adaptors, and elastic suspension units.

P & N (Great Britain)

The Peter & Nicholas Engineering Co Ltd, Tonteg Road, Treforest Industrial Estate, Pontypridd, Mid Glamorgan CF37 5UA.
Phone: 044385 2453.

102 series
Heavy duty microphone stands which can be used with long or short boom, height 87-156cm, *S* screw leg base 3.9kg, *F* folding leg base 3.8kg, *R* round solid base 4.1kg.
Prices: *102S* £18.30, *102F* £19.85, *102R* £17.45. *CT102* has curved top section and adaptor for second microphone, *CT102S* £22.55, *CT102F* £24.05.

119 series
Low level microphone stand with curved boom arm providing 151cm maximum vertical extension, *S* screw leg base, *F* folding base.
Price: *119S* £25.55, *119F* £26.90.

167
Economy stand, lightweight, screw height adjustment, push in legs, height 83.9-157.5cm, 1.8kg.
Price: £11.40.

138PB/139
Stand with polypropylene base which receives three push-in tubular legs, and has vertical holes for leg storage, height 81-150cm, weight 2.15kg.
Price: £12.95, *139* with boom arm £22.

162F
Fixed vertical stand with boom arm, height 103-175cm, weight 5.3kg, heavy duty folding leg base.
Price: £28.45.

118R
Low level stand with boom arm length 49.5-82.3cm, 20cm diameter round base.
Price: £17.95.
P & N also have available a range of table stands, separate stand components, hifi speaker and disco stands, music and conductors' stands, and accessories.

SENNHEISER (West Germany)

Sennheiser Electronic, 3002 Bissendorf, Hannover, West Germany.
Phone: 05130 8011.
UK: Hayden Laboratories Ltd, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW.
Phone: 02813 88447. Telex: 849469.
USA: Sennheiser Electronic Corp (NY), 10 West 37th Street, New York, NY 10018.
Phone: (212) 239-0190. Telex: 421608.

MZS142
Lightweight floor stand, height 41-138cm, collapsible.
Price: £11.20.

MZS144
Floor stand with rubber tipped detachable legs, height 84-158cm.
Price: £15.

MZS210
Deluxe floor stand, heavy duty with antivibration mounts in legs, height 84-158cm.
Price: £27.20.

MZS211
Boom arm for mic stand extension 84cm.
Price: £9.80.

MZB415
Fishpole which telescopes to 115cm, and extends to 4m with a swivel mount, weight 640g.
Price: on application.

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"THE GAUSS HIGH SPEED TAPE DUPLICATING EQUIPMENT WE PUT TO WORK IN 1968 IS STILL WORKING, THREE SHIFTS."

Richard P. Blinn, Director,
Studio Operations & Electronic Development
Capitol Records

"Gauss high speed tape duplicating technology was originally developed right in this department at Capitol in the late 60's. And, the first ten machines are still in full operation at our Jacksonville, Illinois facility. In fact, they're working three shifts a day. They're even better machines than they were in 1968...because we've continually upgraded them with new innovations from Gauss and our own engineers. Today, they're performing at the leading edge of the technology. If they weren't, Capitol would find something better."

At Gauss, we engineer the quality in. Modularly. Solid state. That way, as we improve the technology, you can upgrade your equipment. We're engineers building for engineers. Gauss 10 MHz Bias System assures you lower noise and distortion. Wow/flutter is less than 0.05% RMS. And that's just the beginning of our engineering story.

Name your format. 2-track, 4-track, 8-track, cassette, or, reel-to-reel. Gauss delivers. And, you can change formats in less than 10 minutes. What's more, you can choose between 32:1 or 64:1 duplicating with the flip of a switch.

Here's the acid test: Ask anyone who owns a Gauss high speed tape reproduction system what they think of their system. They'll tell you that Gauss engineering means high productivity, highest-quality sound reproduction and maximum reliability. If those are your criteria, we think you'll choose Gauss.

gauss
by Cetec

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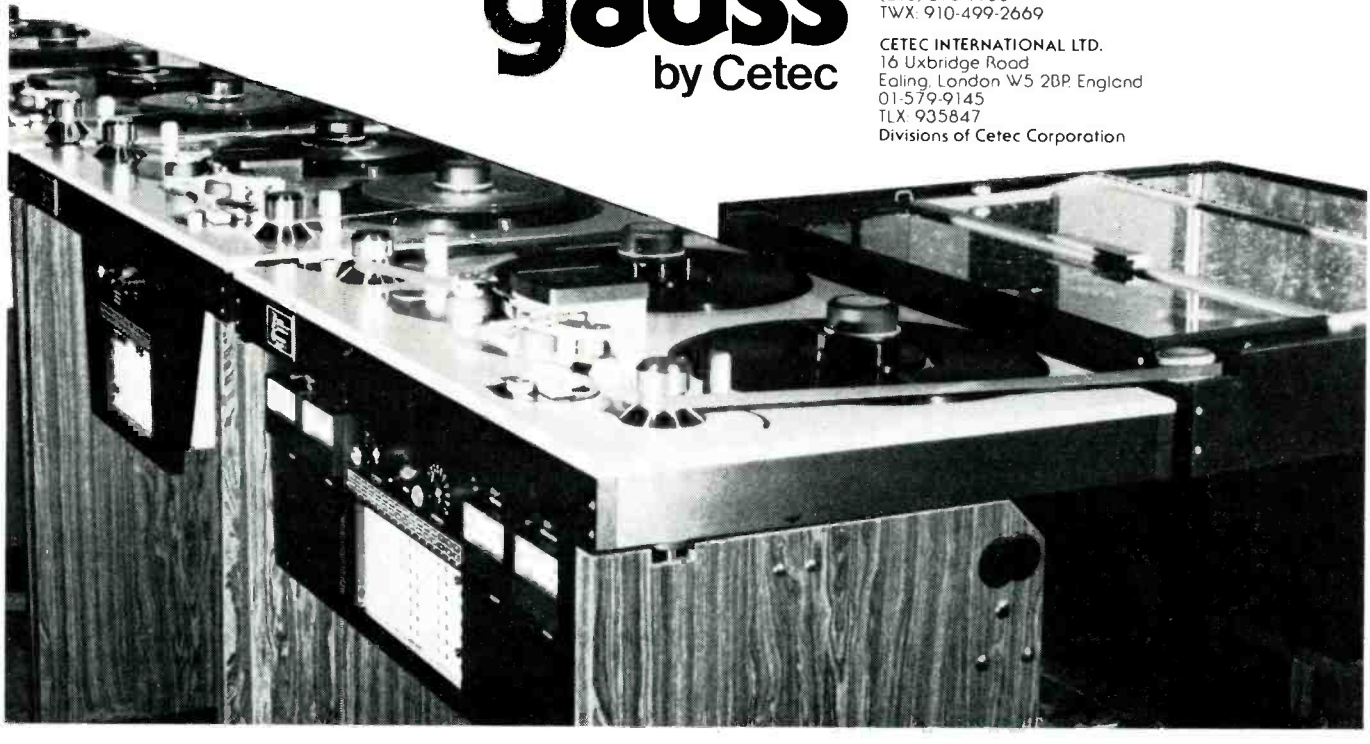


SURVEY: RADIO MICROPHONES

Construction: heavy aluminium case for *TS/T*, brass cylinder *TS*.

WMS111 series receivers
Type: portable receivers with a variety of powering and monitoring arrangements.
Audio output: mic level —30dBV on balanced XLR 50-250Ω, high level unbal on jack 600Ω, line level and headset unbal 6dBV 100Ω jack.
Adjacent channel rejection: 70dB.
RF sensitivity: 0.25μs for 12dB SINAD, 70dB S/N.
Antenna: 50-75Ω.
Indicators: DC-5C/RAC-THR/RAC/H all LED monitors, RAC/DC4 meter.
Power: all 12-24DC, *DC5C* eight AA batteries, *RAC* mains.

All models available with optional *dB-S* companding system to give 80dB S/N.

Mark 1L-SM57
System comprising *WMS111TH* handheld transmitter with *SM57* element, *WMS111RAC-THR* receiver, nicads and case.
Price: $895, *dB-S* $1,050.

Mark 2L-50A
System comprising *WMS111TS* pocket transmitter and *WMS111RAC* receiver and case.
Price: $830, *dB-S* $985, UHF and *dB-S* $1,050.

Mark III-50A
System comprising *WMS111T* pocket transmitter and *WMS111DC-5C* receiver, and case.
Price: $750, *dB-S* $995, other versions available.

Mark IV-50A
System comprising *WMS111TS* pocket transmitter, *WMS111RAC/DC4* receiver and case.
Price: $1,030, *dB-S* $1,250.

Range of Swintek equipment

Mark V-SM58
System comprising handheld *WMS111TH* transmitter with Shure *SM58* element, *WMS111DC-4-THR* receiver, nicads and case.
Price: $1,095, *dB-S* $1,315.

Mark VI-50A
System comprising pocket *WMS111TS* transmitter and large pocket *WMS111H* receiver with case.
Price: $865, *dB-S* $1,060.

Swintek has a wide range of antenna options and amps.

VEGA (USA)
Vega, division of Cetec Corp, PO Box 5348-El Monte, Cal 91731, USA.
Phone: (213) 442-0782. Telex: 910-587 3539.

77B/54/88 transmitters
Type: *77B* is pocket transmitter with circuitry sealed in compartment separate from battery, *54* is hand-held transmitter with built-in mic element. Transmitter power is 50mW, frequency range 150 to 216MHz. *88* is pocket pack with built-in mic.
Prices: *54* $656, *77B* $585, *88* $358.

58/63 receivers
Type: *58* standard receiver, *63* diversity receiver. Response 40Hz to 15kHz, multi-function metering, mains or 12V power.
Prices: *58* $865, *63* $1,949.

66/67 receivers
Type: similar to *58/63* but portable, battery powered from four 9V batteries.
Price: *66* $749, *67* $1,649.

89 receiver
Type: mains powered receiver for *88* transmitter, 70Hz to 12kHz.
Price: $413.

Vega has a wide range of accessories and aerials.

SURVEY: MIC STANDS AND BOOMS

SHURE (USA)
Shure Brothers Inc, 22 Hartrey Avenue, Evanston, Ill 60204, USA.
Phone: (312) 866-2200.
UK: Shure Electronics Ltd, Eccleston Road, Maidstone ME15 6AU.
Phone: 0622 59881. Telex: 96121.

MS10C/BB44
Regular floor stand, positive ring lock, adjusts 89-160cm height, weighted circular 25cm diameter base.
Price: £14, *BB44* baby boom 78cm reach, £10.

MS20
Heavy duty floor stand, rubber feet and decoupling, 94-168cm range, base 30cm diameter.
Price: £22.

Shure also produces a wide range of microphone holders, windshields, table stands and mounts.

SONY (Japan)
Sony Corporation, PO Box 10, Tokyo Airport, Tokyo, Japan.
Phone: 448 221.
UK: Sony (UK) Ltd, 134 Regent Street, London W1R 6DJ.
Phone: 01-439 3874.
USA: Sony Corporation of America, 9 West 54th Street, New York, NY 10019.
Phone: (212) 371-5800.

B-401N
Boom floor stand, folding legs, two sections 85-145cm height range, boom 82cm reach, weight 3.9kg.
Price: on application.

VALAN (UK)
Valan Electrics, 1034 Yardley Wood Road, Warstock, Birmingham B14 4BW.
Phone: 021-474 2229.

Range of goosenecks and microphone mounting bars.

WYNDCLIFF (UK)
Walter Luther Ltd, 41 Branchester Lane, Purley, Surrey CR2 1HJ.
Phone: 01-668 3448.

HD1
Double extension stand complete with roller castors, heavy duty, height 117-260cm, folded length 94cm, weight 4.4kg.
Price: £35.

HD2
Single extension, otherwise similar to *HD1*.
Price: £32.50.

Combi-Major
Lightweight boom stand, height 147cm, boom arm 40cm, weight 1.59kg.
Price: £25, boom *4/4* £12.80.

FH/85 fishpole
Fishpole with minimum length of 128cm, maximum 239cm, weight 0.675kg, variety of mounts.
Price: £20.

Wyndcliff produces a range of head accessories for these stands.

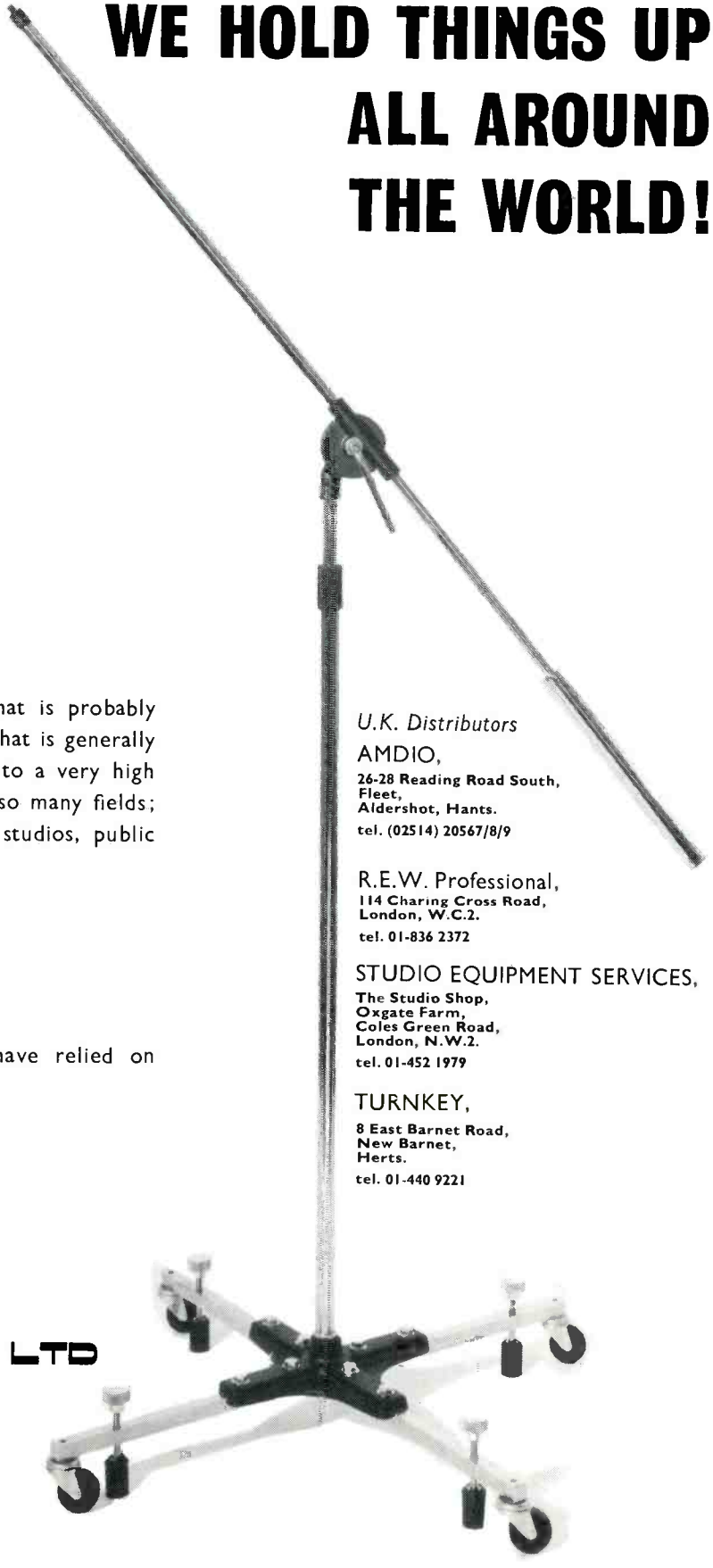
KEITH MONKS (AUDIO) LTD

WE HOLD THINGS UP ALL AROUND THE WORLD!

Today, everyone gets used to things being held up. In a studio, the only 'hold up' that is welcomed is a microphone on a good stand! When you use KEITH MONKS stands, you can set them and forget them! The versatile design, together with a very wide range, means that KEITH MONKS stands deal with those difficult jobs as easily as the simple ones.

KEITH MONKS (AUDIO) LIMITED produce what is probably the most complete range of microphone stands that is generally available, the world over. Designed and made to a very high technical standard, they are readily accepted in so many fields; international radio and television, major sound studios, public address systems, local radio and many more.

Find out for yourself why so many people have relied on KEITH MONKS STANDS for so long.



U.K. Distributors

AMDIO,
26-28 Reading Road South, Fleet, Aldershot, Hants.
tel. (02514) 20567/8/9

R.E.W. Professional,
114 Charing Cross Road, London, W.C.2.
tel. 01-836 2372

STUDIO EQUIPMENT SERVICES,
The Studio Shop, Oxgate Farm, Coles Green Road, London, N.W.2.
tel. 01-452 1979

TURNKEY,
8 East Barnet Road, New Barnet, Herts.
tel. 01-440 9221

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APRS Exhibition, a preview

Alice
12-48 mixer

The 12th annual exhibition of the Association of Professional Recording Studios will be held at its traditional venue, the Connaught Rooms, Great Queen Street, Kingsway, London WC2, from Wednesday June 20 to Friday June 22. Opening hours are from 1000-1800 (Wednesday and Thursday) and 1000-1700 (Friday). Over 90 companies will be showing their products, with an estimated value of over £2.5 million.

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●**Alice (Stancoil):** two new mixers—the *12-48* semi-modular 12-input, 4-group mixer with 8-track monitoring designed for low-budget studios; and the *STM 8* portable production/transmission mixer. The *12-48* is the first in a new range of medium-budget mixers for studio and mobile use. All models will have in-built oscillator and full talkback facilities, multitrack monitoring with echo and sync foldback, stereo mixdown with monitoring, direct channel outputs, channel and group inserts, and a choice of faders. Also on display will be an Alice *Custom Modular* 20-8-16 console with matrix routing and the *828* portable stereo mixer. ●**Amek:** modules and desks from the various ranges of consoles including the *X Series*, a low cost system intended for small configurations, the *M1000* concert sound reinforcement console; the *M2000* multitrack console; and the *M3000*, VCA-assisted 32-track recording console. ●**Audix:** new console package for ILR stations comprising a complete on-air wrap-around console designed for operator/announcer usage based on the *MXT 1000* range and equipped for mono/stereo monitoring. Also on display the complete *MXT 1000* range together with units from associate company **Barkway Electronics,** comprising a broadcast intercom system and an OB unit equipped with Audix equipment on a Range Rover chassis. ● **Agfa-Gevaert:** complete range of audio tapes for broadcasting and studio mastering applications, including the *PEM 468* studio mastering tape, the *PEM 526* mastering tape for bin loops, bulk cassette tapes, and a new range of audio cassettes. ●**AKG Acoustics:** full range of products including dynamic and condenser mics, accessories, *BX10*, *BX15*, and *BX20* reverberation units, headphones and stereo pick-up cartridges. New models include the *C535EB* cardioid condenser mic with integral pre-attenuator and filter switch; the *D222EB* 2-way cardioid dynamic system; the *CK22* omnidirectional *CMS* capsule and *CK4* figure-of-eight *CMS* capsule; the *C424* quadraphonic cardioid mic; and the *C34* and *C422* FET stereo condenser mics. ●**Audio Kinetics:** first demonstration of the new *QLOCK 210* SMPTE synchroniser designed

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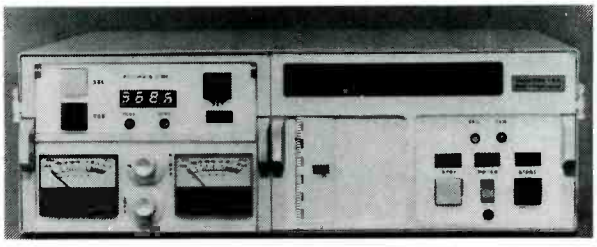
MODEL 126 CARTRIDGE MACHINE



Stereo Record/Reproducer with Recorded Time Indication
(other models available)

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- ★ MEETS IBA, NAB, IEC CARTRIDGE SPECIFICATIONS
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NEW PROFESSIONAL SCULLY 250

£1650 Stereo Rec/Rep

For Studio and Broadcast use.

Features:

2-track, quarter track, full track, half track, ¼″ (6.35mm)

Tape Speeds	7.5 and 15 in/s or 3.75 and 7.5 in/s		
Signal-to-Noise Ratio:	**Full Track**	**Stereo Two Track**	**Half Track**
15 in/s	70 dB	66 dB	66 dB
7.5 in/s	70 dB	66 dB	66 dB
Distortion	(250 nWb/m): less than 0.7%		
Erase Efficiency	Greater than 70 dB at 1 kHz.		
Control Logic	TTL with motion sensing protection		

Models available up to one inch 8 track

ALL ON DISPLAY AT STAND 116 APRS

- ★ Full Range of QRK Turntables and tone arms
- ★ Gray/micro-trak 303 tone arm
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- ★ Nortronics recorder care products

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Direct DC Drive Servo

Full Servo Loop Speed Control

- ★ Instant Start
- ★ Variable Speed Control
- ★ Back Cue (no motor drag)
- ★ Direct Speed Read Out Led
- ★ Slip Cueing
- ★ Remote Start Stop

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for easy operation of audio/audio or audio/video machine combinations. Forty-eight track recording is facilitated by the splitting of the master and slave record functions. SMPTE frame accurate record drop in and out memories are provided together with a comprehensive EBU/SMPTE time code generator. Other features include full Audio Kinetics locate programs, instant replay, single frame trim of all memories, preroll, etc. The established *XT-24 Intelocator* will also be demonstrated, with (by popular demand) an obscene message entry available for illegal depression of the control buttons. Also on display, examples of the company's range of acoustic screens and an example of the **Quad-Eight** range of consoles featuring *Compumix 111* automation. ●**Ampex:** *MM-1200* multitrack recorder; *ATR-700* and *ATR-100* recorders; plus Ampex audio mastering tapes, cassettes and cartridges. ●**Audio Developments:** *AD070* programmable graphic equaliser; a new frequency recorder with hard copy plotting; and a new small portable mixer. ●**Audio & Design:** units from the company's range of signal processing systems, including the *F600* and *F690* limiters, the *E900* parametric sweep equaliser, the *E500/560* band selectors, the *E950-RS* paragraphic switchable equaliser, the *F760X* compex limiter, the *F769X Vocal Stressor*, and the *Scamp* system. ●**Allen & Heath:** complete range of recording and sound reinforcement equipment with particular emphasis on the *SYNCON* 16/24-track 'in-line' console for medium-budget studios. An *SR Series* live sound console will be shown for the first time in a 28-input configuration. The *AHB* 8-track package system which has been updated by the introduction of the *Series 3* modular recording console and a full function remote control unit will be on demonstration. ●**Amity Shroeder:** two new products—a triple stack cartridge machine and a line of console mounted multitrack tape recorders. The triple stack cartridge machine utilises three 12.7mm thick machined aluminium deck plates in a vertical line, all driven from a common 12mm shaft extended from a 'Papst' servo capstan motor. Heads are Nortronics, and all electronic assemblies are on plug-in printed circuit boards. The multitrack recorders are based on the company's 1in and 2in tape transports and are available in 8/16/24-track configurations. The machines include metal console mounting, VU meter penthouse, modular electronics, transformer balanced outputs, XLR input/output connectors and comprehensive remote control facilities, all included as standard. Also on display the company's wide tape transports and broadcast cartridge machines. ●**Atlantex Music:** units from the MXR range including the 31-band and dual 15-band graphic equalisers; the flanger-doubler; the digital delay and the new MXR *Harmoniser*. Also on display the complete range of **Sescom** direct injection boxes, in-line transformers, mic splitters, mic combiners, audio modules, cable testers, mic line drives and mic attenuators. ●**Avcom Systems:** complete range of high speed 'in-cassette' duplicating equipment and broadcast standard cartridge equipment from **Telex Communications**, together with a range of special purpose headphones and intercoms. ●**B & K Laboratories:** units from the Bruel & Kjaer ranges of portable and laboratory instrumentation equipment will be shown and numerous measurement applications will be demonstrated. ●**FWO Bauch:** a wide range of equipment from several manufacturers including **Studer** *A800* multitrack tape recorder, *069* portable broadcast console and *269* portable mixing console; the **EMT** digital message storage unit; **Urei** *567* PA processing system, *927* digital delay line, *950* ambient noise controlled amplifier, and *813* 'time aligned' studio monitor system; and the **Neumann** *U89* and *USM69* condenser mics. ●**Beyer Dynamic:** full range of mics, headphones, and accessories, plus the **Dynacord** range of PA equipment. New range of modular studio condenser mics comprising amplifier module and various mic capsules *Models MC711/MC712, MC713/MC714, MC 715*, and short shot gun capsule *MC716* and long shot gun capsule *MC717*. ●**Broadcast Audio:** *Spotmaster* range of tape cartridge equipment and studio accessories and the new *Series 2100* direct drive cartridge machines. The *Series 2100* accept A/B/C size cartridges, have two cue tones (1kHz and 150Hz) as standard, mono/stereo switching, direct drive transport, modular construction, new phase lok IV head assembly, low voltage air damped solenoid, and ¼in aluminium deck. ●**BASF**: full range of professional tapes, cassettes and magnetic film including calibration and test tapes, plus the company's new *Ferro LH* ¼in tape which is replacing the *LH Hi-Fi* and *Ferro Super LH* tapes. ●**Bulgin Electronics Soundex:** *Unimixer* range of small audio mixers; *Series 1300* 4-channel mono/stereo mic line mixer; *Series 1400* 6-channel mono/stereo mixer; free standing PPM's and various power supplies. ●**Crowmay:** economically priced loop bin high speed cassette duplication system. ●**Calrec:** *Soundfield* mic system and the company's range of studio condenser mics. ●**Cetec International: Gauss** tape duplication system together with the **Gauss** range of loudspeakers. ●**Court Acoustics: BGW** range of power amplifiers; and the company's range of loudspeakers and ancillary electro-acoustic equipment. ● **Communication Accessories:** custom-built and standard ¼in and bantam studio patch panels with 20/24/26/48 jacks per row for 19in rack mounting. Also on display coaxial video patch panels, pcb jacks, coaxial, 316 type and bantam patch cards, terminal blocks and studio XLR type connectors. ●**Canford Audio:** automatic XLR and PO cable tester; specially designed hexagonal, absorbent surfaced studio '*Acoustic*' tables; and the **Rondson** range of loudspeakers designed for broadcast editing cubicles and newsroom usage. ●**CB Electronics:** new series of multitrack tape electronics available as a comprehensive system. The system features three eq's, phase correction, solo, slate input, silent and gap-less drop in/out, noise reduction switching using *Cat22* or Telcom cards, noise gates, master biasing control, and remote switching of monitoring, etc. Also on display the full range of *Susan Blue* DI boxes. ●**Dolby Laboratories:** full range of professional noise reduction equipment for studio and film applications and the new *NRU10* for VTR soundtracks. ●**EMS:** *Vocoder 2000* and modular *Vocoder* Sytsem plus the company's range of synthesisers and modules. ●**Eardley Electronics:** full range of **Neutrik** 3- and 5-pin XLR connectors, panel mounted sockets and modular range of connectors; **Marquardt** range

MXR flanger/doubler shown by Atlantex

Audio Kinetics QLOCK 210 synchroniser

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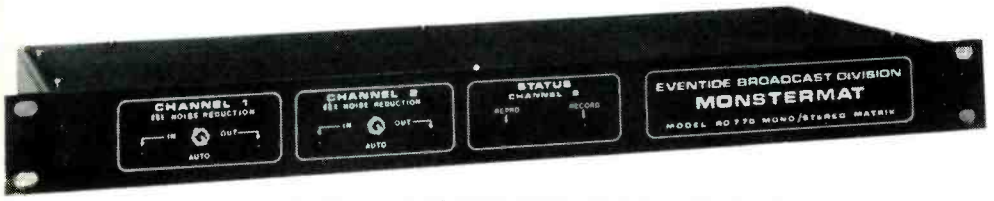

Eventide Clockworks Model RD-770 Monstermat shown by Feldon

of rocker, toggle and push-button switches and keyboard assemblies; and the **Preh** DIN plug and socket range together with faders, indent potentiometers and presets. ●**EMI Tape:** range of professional and duplicating audio tapes together with domestic audio tapes, cassettes and accessories. Particular emphasis will be given to the recently introduced *862* high output, low noise mastering tape which is available in a full range of tape widths. ●**Electro-Voice:** full range of dynamic and condenser mics, monitor loudspeaker systems, component loudspeakers, and accessories. ●**Future Film Developments:** comprehensive range of cables, cords, connectors, jackfields, wiring aids and associated components, plus a wide range of audio accessories. On demonstration the *DNR Series* portable stereo Dolby 'A' system. ●**Feldon Audio:** first APRS showing of the **Ursa Major** *Space Station SST-282* digital delay/reverberation processor; full range of **Ortofon** professional disc cutting equipment; the **Inovonics** *Model 500* acoustic analyser; and the **Eventide Clockworks** range including the new *Monstermat Model RD770* mono/stereo broadcast matrix unit. ●**Fitch Tape Mechanisms:** redesigned *T200* range of NAB playback and record units in mono and stereo versions. ●**Fraser Peacock Associates:** details of the company's cassette duplication service plus the **Wollensak** range of cassette duplicators. ●**Formula Sound:** *S19G* 2-channel ½-octave, 19-band graphic equaliser and *SG19A* equaliser/analyser. The *SG19A* features dual LED display, internal pink noise generator and mic pre-amp. ●**Harman Audio:** complete range of **Teac/Tascam** units including several new products—*A3440* 4-channel simul-sync machine with ±5% pitch control and fully flexible headphone monitoring; the *RX9* dbx noise reduction unit; and the *Tascam 35-2* 2-track mastering machine with inbuilt dbx. Also on display the **JBL** range of loudspeakers. ●**Hayden Laboratories:** products from the **Telefunken** range including the *M15A* 32-track recorder; products from the **Nagra** range; and products from the **Sennheiser** range including the *Telemike* system and the new *MD431* mic, plus a working demonstration of the Sennheiser Infra-red sound transmission system. ●**H/H Electronics:** new MOS FET power amplifiers, the *S500D* power amplifier, the *TPA Series D* single-channel power amplifiers, the *Stereo 12* and *Stereo 16* sound control mixers, and a new range of loudspeakers. ●**ITAM:** the new *Model 1610* compact 16-track recorder with remote for all functions, dynamic braking and varispeed; new 20 x 8 mixer with full 16-track monitoring facilities; *Model 806* 8-track recorder; 10 × 4 and 8 × 2 mixers; plus ancillary equipment including a graphic equaliser, stereo comp/limiter and a

H/H Electronics Stereo 16 sound mixer

newly developed plate echo unit. In addition the **Otari** range including the *MX5050B* compact stereo recorder, the *DP4050* reel to cassette copier, and the recently introduced *MTR90* multitrack recorder. Also on display a wide range of stereo and 4-channel recorders from **Revox, Teac** and **Ampex**. ●**ICM Cassettes:** *C-Zero* cassettes, the *DO-2000* dropout checker, the *ICM 7804* wind tester which checks the mechanical functions of one to 12 cassettes automatically, and the *C-Box* cassette packing and storage system. ●**John Page: Stellavox** range of portable recorders and mixers including the *SP8* stereo/mono recorder which now features as standard, powering for 12V AB mics and 12V or 48V phantom mics, together with 10dB step attenuators. A stereo ganging accessory for the *SP8*'s gain controls is also now available. ●**Jacques Levy:** range of recording blanks for mastering and playback, plus capps and micropoint mastering styli for disc cutter heads. ●**James Yorke:** details of the company's complete, high quality cassette production service. ●**Keith Monks Audio:** range of mic stands, phase testers, impedance testers, mic. splitter boxes and cable drums. Also on display the company's semi-professional record cleaning machine and *LSI-8* monitor loudspeaker with inbuilt 10W amplifier. ●**Klark-Teknik Research:** *DN70* digital time processor; *DN71* digital controller; *DN34* and *DN36* analogue time processors; the company's range of graphic equalisers; and the new *Statik Acoustic* range comprising graphic equaliser, electronic crossover, reverberation system, and sound effects unit. ●**Lockwood & Co:** representative range of the company's monitoring loudspeakers. ●**Lee Engineering: Audi-Cord** cartridge machine; **Audiopak** *AA-2* and *AA-3* cartridges; *Microtrack* tone arms; and **QRK** *12C* and *Custom II* desks, and **Galaxy** direct drive turntable. ●**Lennard Developments:** complete range of **Woelke** wow and flutter meters and wave analysers, plus the Woelke range of tape heads. ●**Lyrec:** *Model TR532* multitrack recorder with the recently introduced *TPC* microprocessor controlled tape position controller and *ATC* audio and tape controller. Also on display the *System P-2000* cassette duplication system. ●**Leevers-Rich:** two new versions of the *Proline 2000TC* and *Proline 1000* ¼in professional recorders—a pilot tone version of the *2000TC* and the new *Proline 1000* logger recorder. Also on display the *LR70* and *LR71* bulk erasers, the *LR72* tape head demagnetiser, and the *LR73* studio digital clock. ●**Magnetic Tapes:** examples from the

New Teac A3440

range of **Chilton** sound mixing consoles. ●**Macinnes Laboratories:** full range of **Amcron** power amplifiers and ancillary equipment, plus the company's *S-220* professional tone arm and the new Macinnes *900A* power amplifier. ●**3M:** full range of *Scotch* professional audio tapes and cassettes, plus *Mincom M79* 16/24-track tape recorders and associated locators and synchronisers, and **Wollensak** cassette duplicators and cassette transports. ●**Midas Audio:** new version of the *PR System* sound mixing console with several new facilities including in-place solo, bargraph metering to DIN and Nordic specifications and additional monitoring facilities for 16/24-track applications. The range of 20 standard modules and

90 ▶

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APRS EXHIBITION, A PREVIEW

Itam
Model 1610

modular mainframe concept provides many console format variations to cater for 4/8-track recording, AV productions, theatre and high quality sound reinforcement applications. A VCA controlled console system for sophisticated stage productions will also be on display. ●**Malcolm Hill Associates:** new *K Series* of modular consoles together with the full range of *DX* amplifiers — eight power amplifiers ranging in power from 100W to 850W, including the *KX400* tri-amp and the *QX50* modular 4 x 100W foldback amplifier. ●**Mosses & Mitchell:** range of jacks and jackfields including the new *440* range of miniature jack sockets with palladium contacts. Details of the company's custom jackfields will also be available. ●**Maglink:** tape synchronisation and control system with a new revised control unit adding new functions and simplifying operation. The control unit is opto-isolated for remote usage. Also on display the all-speed EBU/SMPTE-to-Maglink interface; the Maglink code reader which enables the Maglink time code to be displayed from any source without requiring the Maglink synchroniser; the Maglink code generator; the Minimag reader for use with the Minimag synchroniser; and the Maglink sprocket code generator. ●**MCI:** range of recording/remixing consoles and tape recorders including the *JH-600 Series* of automated consoles and the broadcast version of the *Autolock*, SMPTE/EBU generator/reader/synchroniser. Also on display the AMS digital delay unit. ●**NEAL-Ferrograph:** *NEAL* cassette decks, plus *Ferrograph* tape recorders and test equipment. ●**Neve:** introduction of the new *Model 8108* advanced software controlled console which dispenses with conventional frame wiring and utilises sophisticated mother board construction instead. The *Model 8108* can be supplied with up to 56 input channels each incorporating a new fully parametric equaliser, filter, and up to 48 outputs. The microprocessor controlled signal routing is via a touch sensitive central assignment panel which includes enter and recall facilities to any of four integral memory stores. Complex console assignment patterns can be transferred from memory to console at the touch of a button and in addition a unique integration system gives instant readout of channel and track configurations. ●**Publison:** *DHM 89 B2* stereo digital audio computer; *DHM 83B* quasi stereo option for the the *DHM 81 B2;* the *ECL20A* dual comp/limiter/expander/noise gate; and the *CL20C* dual comp/limiter. ●**Pentagon:** *Tri-Master Editor Series* copier which will duplicate any combination of reel and cassette copies simultaneously. Also the new *Model C-8* high speed cartridge copier. ●**Philip Drake Electronics:** range of broadcast standard equipment including a dual audio distribution amplifier. ●**Penny & Giles:** complete range of faders in various configurations plus the *QCP1 Series* quadraphonic joystick controller. ●**Pyral Magnetics:** launch of the new range of *CJ90* studio tapes available in ¼in, ½in, 1in, and 2in widths and lengths up to 2400ft. The tapes are claimed to have a higher output level throughout the audio range and an improved signal-to-noise level. Also on display a new range of cassette tape. ●**Professional Tapes:** cassette labeller capable of labelling 300 cassettes per hour without any form of power. The system uses a special chemical fluid which converts the plastic surface layer of the cassette into a thin coating of adhesive. In addition endless cassettes, *Marathon* broadcast cartridges, custom cassettes, and professional blank cassettes. ●**Racal-Zonal:** range of audio tapes and cassettes, including the low noise *888* music mastering and multitrack tapes; the *666* tapes;

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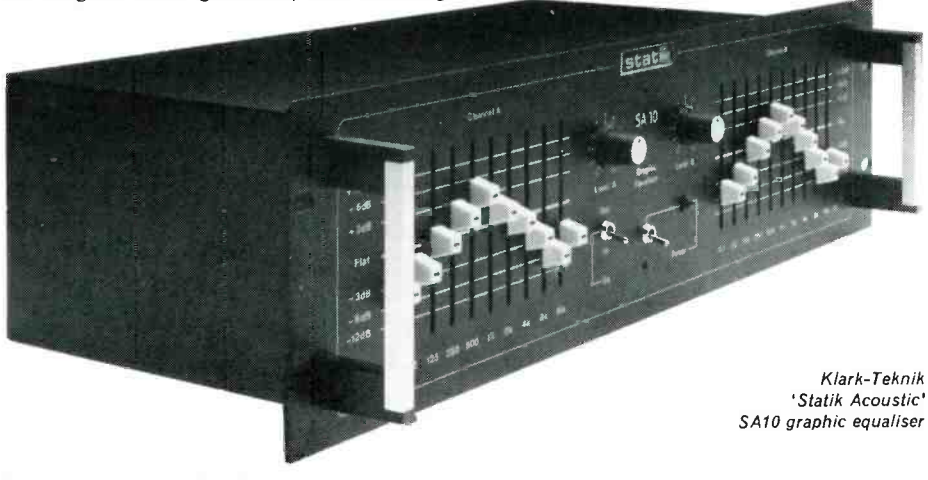
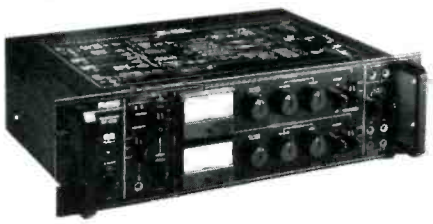


Klark-Teknik
'Statik Acoustic'
SA10 graphic equaliser

RSS ROLAND'S NEW STUDIO SYSTEMS SERIES

The PH-830 Stereo Phase Shifter provides an internal sweep oscillator with three waveform options for different phase effects and an LED for visual indication of the sweep frequency.



The RV-800 Stereo Reverberation Unit incorporates an optional compressor to increase headroom and allow reverberation effects to be added to low level signals.

Stereo graphic equalizer with 11 bands per channel at one octave intervals, Slectable control range.

Graphic equalizer with 21 bands at 1/2 octave intervals. The level controls have a selectable range of ± 3dB, ± 6dB, or ± 2dB.

Roland brings state-of-the-art studio quality sound to the professional comsumer at an affordable price. The RSS Series is a totally new line of Rack Mount Signal Processing Components.
It includes components for stereo reverb, stereo phasing, stereo and mono graphic equalisation.
These are just the first of a wide range of signal processors from Roland.

The RSS Series interfaces with the largest most diversified line of electronic musical equipment inthe world . . . . . ROLAND!

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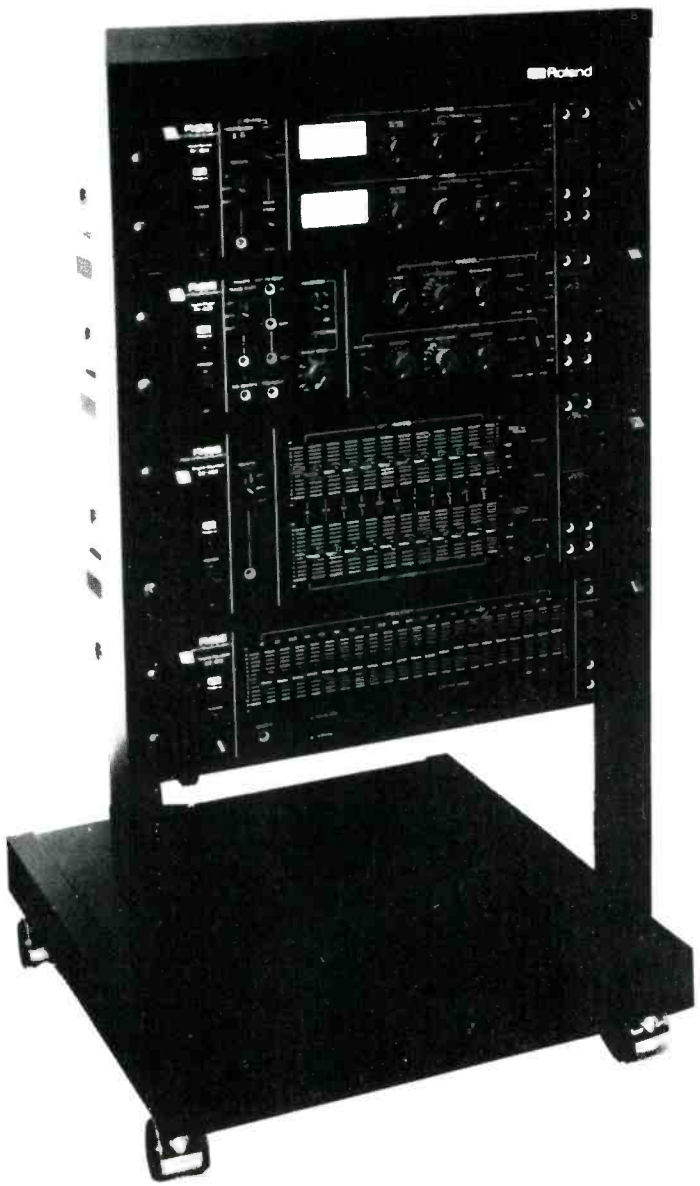

reviews

EDC Cygnus radio microphone

MANUFACTURER'S SPECIFICATION

GENERAL SYSTEM SPECIFICATION

The system consists of one receiver, one hand or pocket transmitter with lavalier microphone, aerials and leads, in a carrying case.

Operating frequencies: UK four channels in the 174MHz to 175MHz band. Alternative European 37.1MHz standard or 27MHz to 60MHz band. To order 150MHz to 200MHz.

Frequency response: 35Hz to 15kHz (−3dB points).

Signal-to-noise ratio: better than 64dB (typically 68dB).

Total harmonic distortion: typically less than 0.4%.

Modulation: full ±75kHz deviation.

Operating temperature: +10°C to +40°C.

System range: typically 300ft (100m) dependent upon location.

TRANSMITTER SPECIFICATIONS

RF output power: 10mW (UK PO limit), higher power for export.

Frequency stability: ±0.01%, +10°C to +40°C.

Deviation: ±75kHz wide band with 50μs pre-emphasis.

Power supply: 6.5V DC from rechargeable cell or *TR135N* mercury cell.

Operating time: 4 hours (approximately) from rechargeable cell or 50 hours (approximately) from mercury cell.

Battery charging: from receiver—high speed boost giving 15% operating time in 2 minutes charge.

Battery indicator: approximately 15 minutes operating time after indicator extinguishes.

Compressor characteristic: 30dB range with typically less than 1% distortion.

Radiated spurious emissions: typically better than −50dB.

Aerials: hand transmitter—90mm helical or 460mm free hanging; pocket transmitter—90mm helical or 460mm free hanging. An external plug-in dipole may also be used.

Microphones: hand-held transmitter—high quality built-in cardioid as standard, omnidirectional version available to order. Pocket transmitter—inputs to suit any 200Ω, low impedance or 2kΩ electret.

Cases: hand-held transmitter—tubular non-slip, gold plated. Pocket transmitter—moulded plastic.

Case dimensions: hand-held transmitter 215mm long x 20mm diameter. Pocket transmitter 111 long x 45 wide x 19.5mm deep.

Assembled weight, with rechargeable cell: hand transmitter 199g. Pocket transmitter 128g.

RECEIVER SPECIFICATIONS

Frequency stability: less than 0.005%.

Deviation: ±75kHz with 50μs pre-emphasis.

Signal-to-noise ratio: typically 50dB at 5μV.

Adjacent channel rejection: (±450kHz) greater than 80dB.

Automatic squelch: with sensitivity control at front panel.

High speed charging facility: pushbutton activated recharge for transmitter, 0 to 15% in 2 minutes.

Aerial: standard 150mm helical or external 75Ω dipole.

Audio output: from a 7-pin DIN socket giving fully variable outputs. Microphone level 30 to 200Ω balanced, 600Ω balanced, 0dB 600Ω unbalanced and 260mV into 47kΩ load.

Multi-purpose meter: reads battery supply state, signal strength and audio output level.

Programmed display: 7-segment display indicating system condition.

Case: compact 2-tone blue.

Case dimensions: 209 x 52 x 150mm deep.

Assembled weight: 1.25kg.

Price: from £388.70, £426.30 as reviewed.

Manufacturer: EDC, 29a West Street, Wareham, Dorset, UK.

THE EDC 'Cygnus' system comprises a transmitter and receiver supplied in a cutout foam-lined 'Custom' briefcase together with a lavalier mic, a wire antenna for the transmitter and a helical antenna for the receiver. Additionally supplied are a mains lead with an IEC plug and a signal output lead for the receiver.

The transmitter, with integral microphone, may be either a hand held unit or a pocket transmitter as supplied for review. The latter which tips the scales at just under 100g, without the mic, takes the form of a small plastic case, the side of which can be removed with a small coin giving access to the 6.5V rechargeable battery or alternatively mercury cell. The battery is recharged through a rather lumpy coaxial connector in the base of the transmitter which is connected via a special cable to the receiver — this is normally mains powered but may be battery operated from a 12 to 24V DC external source. At the top of the transmitter is a 4-pin Lemo connector for the microphone, a miniature Belling Lee coaxial antenna connector and an on/off slide switch which cannot be operated by accident. There are also two miniature red LED indicators, one is the battery condition indicator which is illuminated until approximately 15 minutes operating time remains and the other LED is illuminated when the audio signal compressor is activated. A microphone gain control is fitted internally and is operated by a small screwdriver inserted through the side of the transmitter.

The receiver is housed in a lightweight metal case with sensible rubber feet. It has three sockets to the rear, ie the IEC mains power input with its adjacent properly identified fuse, a rather flimsy miniature jack socket alongside, providing power when using a battery, and a 7-pin DIN socket which gives four alternative signal output configurations which are: a low level output intended for feeding balanced 30-200Ω mic inputs, a further balanced output intended for 600Ω mic input; and two high level outputs, one with 600Ω impedance and the other with a high impedance at a lower output level.

The final feature of the exterior is the battery charging arrangement for the transmitter battery, the charging lead is plugged into a small socket on the receiver's front panel, adjacent to a red LED indicator and a push-button. Connecting the receiver to the transmitter without pressing the pushbutton charges the transmitter's battery at a slow rate of 17mA requiring a 12-hour charge. But if the push-button is depressed a boost charge is activated such that the battery is boosted to about 15% of its capacity in a controlled time of two minutes—a useful feature.

On the front of the receiver a meter operates in conjunction with a 4-position rotary switch indicating power supply level, carrier level or the level of the demodulated audio signal in addition to switching the receiver off, but not the power supply.

Two 270° potentiometers provide adjustment of 'squelch' (muting) level and the audio output level whilst a 7-segment indicator performs a

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number of functions. Firstly, when mains power is on, the decimal point of the indicator is illuminated. Secondly, when the supply is switched on one segment of the indicator is illuminated and thirdly when a carrier is received a number is illuminated corresponding to the channel number to which the receiver is tuned.

The receiver's antenna is connected by a Belling Lee coaxial connector through the top of the receiver, it being possible to use a remote antenna in lieu of the helical one supplied. However, it is not of course possible to stack receivers with the aerial socket in this position.

Within the receiver is the toroidal mains transformer with an adjacent printed circuit board, housing the power supply and its regulator, the receiver itself being on a second and larger board and two small ancillary boards housing other functions. The boards are of glass fibre and components are identified (though not clearly), but the layout of the boards is not impressive and there are a few components which have clearly been added as an afterthought. Also the standard of soldering and layout leaves something to be desired.

The receiver performance

Radio frequency limiting occurred at 4μV input at 174.1MHz to which the receiver was accurately tuned with no indication of significant drift during the measurements. At this input level noise related to full carrier deviation of ±75kHz at 1kHz was as **Table 1.**

TABLE 1

Band limited 20Hz to 20kHz rms	−51dB
A-weighted rms	−53.5dBA
CCIR weighted rms	−44.5dB
CCIR weighted quasi-peak	−40dB

The carrier indicator, part of the 7-segment display, illuminated with less than 1μV carrier input with the meter set to read the carrier level giving about 20% full scale deflection with 10μV input and increasing its reading until full scale deflection corresponded to 10mV carrier input.

The squelch or muting control had a useful range of muting between 1μV and 6.3μV carrier input levels with the adjacent channel rejection at ±75kHz was found to be as **Table 2.**

Checking the receiver's frequency response in relation to the specified 50μs de-emphasis characteristic, which the manufacturer stipulates, showed that significant errors existed in the frequency response as shown in **fig 1.**

As far as distortion is concerned, this was measured at both ±75kHz and ±25kHz deviation with 1kHz modulation. At both levels the second harmonic distortion was below 0.1% with the third harmonic predominating and being sensitive to the precise carrier frequency tuning and in the order of 1%.

TABLE 2

Band limited 20Hz to 20kHz rms	−69dB
A-weighted rms	−77dB
CCIR weighted rms	−69.5dB
CCIR weighted quasi-peak	−65.5dB

Intermodulation distortion to the CCIF twin tone method at ±25kHz carrier deviation was in terms of the second order difference frequency, about 0.5% with the third order products being less than 0.05%, all the above performance figures being obtained at the high level output.

All outputs have their level controlled by the front panel output level control which also effects the meter when monitoring audio level, full scale deflection of the meter corresponding to −10dBm output when loaded with 600Ω at the high level output which had a maximum open circuit output level of 1.55V from a source impedance of 557Ω.

The second high level output had a maximum output level of 0.775V with a source impedance of 23.4kΩ and both high level outputs had an undesirable amount of DC present to the extent of +6V and +3V respectively for the two outputs.

The remaining two outputs intended for feeding into microphone inputs are transformer coupled, the 600Ω output having a maximum output level of −8dB reference 0.775V from a source impedance of 1,800Ω and the lower level output a maximum level of −21dB reference 0.775V from a source impedance of 120Ω.

External powering from a 12V source required only 100mA increasing to 105mA when the input voltage was raised to the maximum specified of +25V. Naturally, transmitter battery charging requires more current as the normal charging rate was found to be 17mA with the high speed boost charge increasing this to 700mA for the 2-minute period.

The transmitter receiver performance

The transmitter frequency at 20°C was found to be about 174.13MHz drifting 0.002% from switch-on. The frequency also depended upon whether the transmitter was hand held, there being a drift of 0.01% depending upon the transmitter's location. Raising the temperature to 42°C raised the transmitter frequency by

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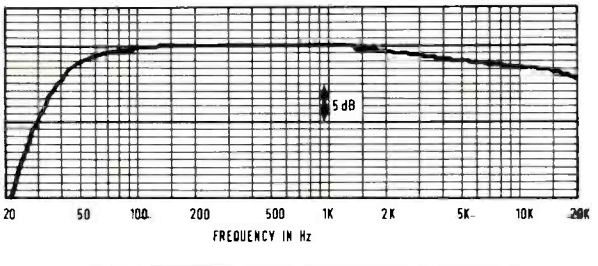
FIG.1
EDC CYGNUS RECEIVER
FREQUENCY RESPONSE



Parametric Equaliser

A very versatile instrument for getting sounds just right. It's modular and directly retrofits APSI 550.

EQ is peak or shelf.

Filter is high or low pass, tunable.

Bandwidth is 20Hz to 20kHz.

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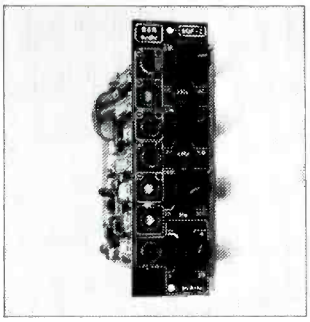
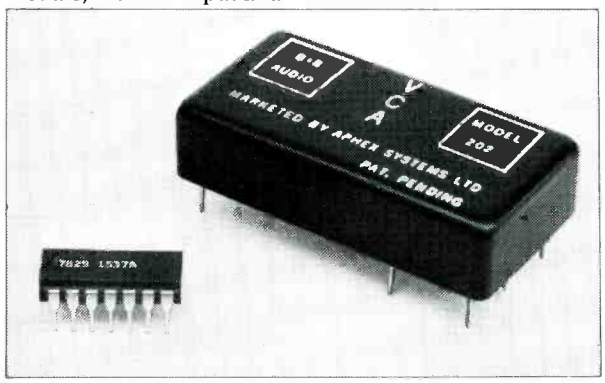


Input	High level	+ 30dBm (max) at 34KΩ
	Low level	+ 20dBm (max) at 11KΩ
Output	High level	+ 30dBm with − 93dBm noise
	Low level	+ 20dBm with − 103dBm noise
Frequency response	EQ & filters out	10Hz to 20kHz, ± 0.1dB
	EQ & filters in	20 Hz to 20kHz, − 1dB
Distortion	Harmonic & IM	< 0.1%
Transient response	Slew rate	> 10V/sec.
Power		± 12V to ± 18V at 75mA

Voltage Controlled Attenuator

The first high quality VCA in the professional audio market.

It's available in chip form for OEM, or in a complete module, with full input and output facilities for direct fitting to any automated console with existing VCA's. However, we can design a VCA package to fit any other manufacture.



Band width	Module	DC to 200kHz; ± 0.1dB
	Chip	DC to 50MHz; ± 0.1dB
THD	+ 10dBm input	0.004% (20Hz to 20kHz)
IMD	− 14dBm input	0.03%
Noise	Unity gain	− 90dBV; ± 1dB
Modulation noise		6.5dB
Overshoot & ringing		None
Slew rate		> 10V/μ sec.
Input impedance		20KΩ
Input level		+ 20dBV
Gain		0dB (+ 15dB available on special order in module form)
Attenuation	Module	> 94dB; 20Hz to 20kHz
	Chip	> 100dB; 20Hz to 20kHz
Control voltage		Can be scaled as needed
DC shift	Vs Attenuation	≤ 5mV
Power		Regulated ± 15V at + 25, −33mA

Grouping and Automation System

With this system, you can now add semi-automation to your console at a fraction of the cost of a new one. Adaptable logic and extensive matrix grouping make up to ten 24-channel presets available.

And since the unit is portable, it can be moved from one studio to another in minutes, for the most efficient use of studio time.

It's expandable from 8 channels and it's just as useful for PA grouping as studio mixdown.

For MCI equipment, a compatible automation package is available.

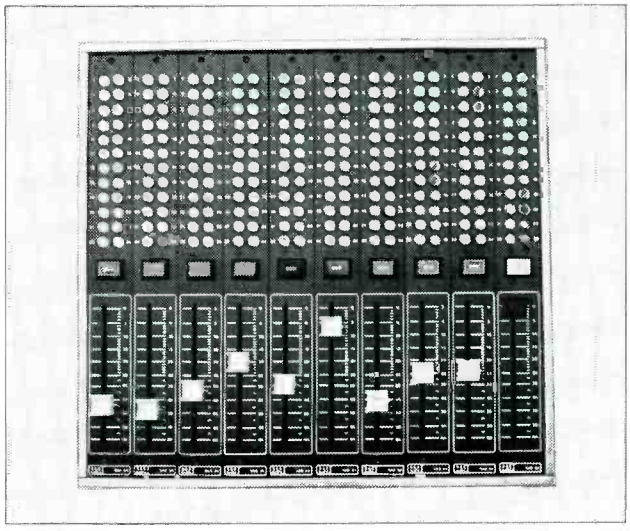
Our own Voltage Controlled Attenuators (VCA) are used throughout, whose high quality assure minimal sound degradation.

Maximum output is + 24dBm.

The system comes in two parts – control console and VCA case.

The control console has group control modules, each containing grouping switches, mute switch and fader, and a master control module with master fader.

The VCA case is self powered and houses the appropriate number of VCA cards and all the input/output XLR connectors.



Aphex

The Aphex Aural Exciter

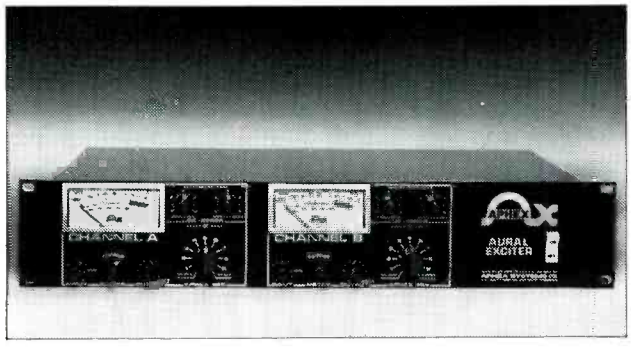
One of the most exciting signal processors to have been invented.

It brings sound to life and makes it louder, without any actual change in level.

It does it by introducing phase information in the form of a series of minute delays whose magnitude depends on frequency.

The formula by which the Aphex device selectively processes the audio signal has been arrived at after considerable research into the mechanisms of the ear. In particular as to how it receives complex phase information relating to the actual location of a sound source.

Aphex sounds amazing on most instruments, including the human voice.



Aphex
Audio Systems (UK) Ltd
35 Britannia Row
London N1 8QH
Telephone: 01-359 5275
Telex: 268279 Britro G.

APHEX

0.01% which is to specification, as was the power output at a measured 12mW into 75Ω.

Investigating the maximum transmitter deviation showed that the internal limiter acted at 3dB over the nominal ±75kHz deviation and I can't say that I am particularly happy about the performance of the limiter. **Fig 2** shows a 10ms toneburst driving the limiter into 10dB of limiting superimposed on a continuous 400Hz tone at the threshold of limiting, severe distortion being apparent when limiting and the recovery being rather 'untidy'. It was further noted that sinewave harmonic distortion rose to alarming proportions with the limiter in action.

The microphone input levels for the onset of limiting depend upon the setting of the internal preset sensitivity control and upon the positioning of a link in the microphone Lemo plug which provides two sensitivities, the maximum sensitivities and overload margins being shown in **Table 3.**

Clearly the above performance isn't all it should be, but the input impedance of 1,000Ω at 1kHz is satisfactory and the limiting LED illuminated at the appropriate levels.

The mic input also provides a polarisation voltage for some microphones, this being 3.56V in the form of a phantom supply when measured using balancing resistors of a high value.

The overall transmitter/receiver frequency response and also the second and third harmonic distortion at 10dB below limiting is shown in **fig 3** which shows a rather unsatisfactory frequency response, with an undesirably high level of second harmonic distortion. (It should be noted that the distortion plot is not corrected for the frequency response errors.)

Checking the intermodulation distortion to the CCIF twin tone method centred at 1kHz and at 10kHz at both 10dB and 20dB below the threshold of limiting gave the results in **Table 4.**

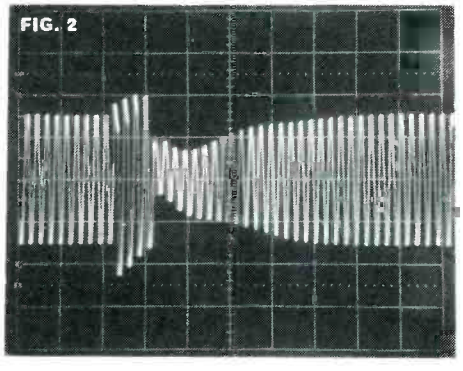
TABLE 3

Threshold of limiting at low gain	8mV
Threshold of limiting at high gain	1mV
Onset of severe distortion at low gain	150mV
Onset of severe distortion at high gain	20mV

TABLE 4

	1kHz	10kHz
10dB below limiting		
second order difference frequency	1%	5%
third order difference frequency	0.03%	0.05%
20 dB below limiting		
second order difference frequency	0.3%	1.5%
third order difference frequency		about 0.03%

FIG. 2



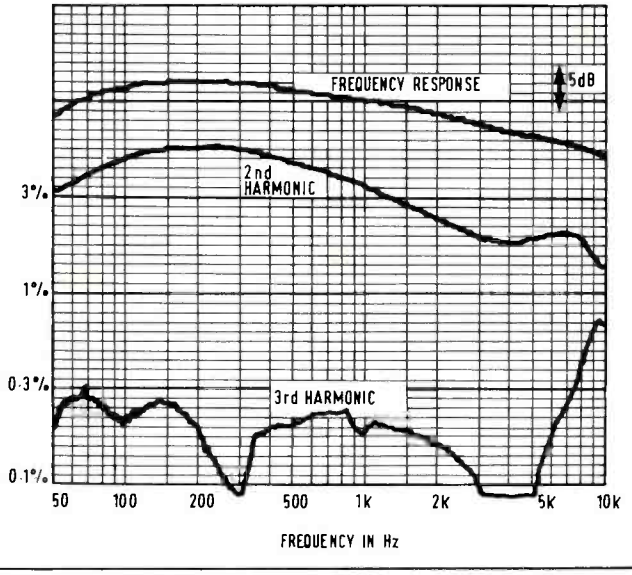
The final check was the audio frequency noise performance of the transmitter and this performance was found to be very good, only deteriorating the receiver's performance by a maximum of 2dB even at maximum audio gain.

Summary

This is not a cheap piece of equipment and the measured results demonstrate quite clearly why radio microphones are frequently unpopular as high quality sound sources.

Hugh Ford

FIG.3
EDC CYGNUS
FREQUENCY
RESPONSE AND
HARMONIC
DISTORTION



AKG acoustics

A Microphone for Every Recording Situation!

The C422 is a new stereo condenser microphone and was developed from the well known C24, whilst the C424 was designed as a quadrophonic condenser microphone for making 4-channel recordings.
The C422 has two twin diaphragm systems, which allows each channel's polar response to be electronically adjusted with the remote control unit S42E. It is suitable for MS and XY stereo technique and the upper capsule can be rotated through 180° for selection of the base angle in any recording situation.
To enable the engineer to see the position of each capsule at a glance, even from a distance, we have mounted an LED on the front grille of each capsule.
In the top of the housing of the C424 are two elastically suspended twin diaphragm capsules, of which the upper one is also rotatable for selection of the base angle between front left/rear right and front right/rear left. Each channel is colour coded.
The pre-amplifiers in both microphones are located in the housing and should be phantom powered with 9–52 V, according to DIN 45 596. (In case of C422 via the audio connections on the S42E.)

ADV 263/E

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reviews

Klark-Teknik DN 34 analogue time processor

MANUFACTURER'S SPECIFICATION

Frequency response (per section): 6ms delays 30Hz to 15kHz ±1dB reducing to +1dB −4dB at 26ms.
THD: typically 0.2% at 1kHz, maximum 0.5% at 1kHz at 2dB below maximum level.
Dynamic range: 90dB (95dB typical).
Maximum delay time: 53ms (26.5ms per channel).
Doppler (continuous time sweep) range: 70:1 (over six octaves).
Flange notch cancel: 90dB.
Input impedance: electronically balanced or unbalanced) 20kΩ nominal.
Output impedance: electronically balanced less than 30Ω to drive 600Ω load.
Nominal input level: +4dBm.
Output level: +4dBm to +18dBm, adjustable.
External control voltage: ±5V bipolar.
Price: £790.
Manufacturer: Klark-Teknik Research Ltd, MOS Industrial Site, Summerfield, Kidderminster, Worcestershire, UK.

THE Klark-Teknik analogue time processor is a most versatile single channel delay device with all the internal mixing facilities required for double or triple tracking, flanging of various sorts, pitch shifting and many other effects.

Fig 1 shows a very basic block diagram of the unit without showing all the facilities which will be described later. The input which is an XLR connector to the rear of the standard 19in rack-mounted frame is an electronically balanced and high impedance input. From the input section, the signal can pass direct to the output via direct/delayed signal panpot and an adder. The adder, together with the panpot, allows either the input signal or the delayed signal or a mixture to be fed to the low impedance output which can be unbalanced or electronically balanced. Balancing transformers are available at extra cost.

There are two separate delay circuits, 'delay A' and 'delay B' which can be switched to be either in series or effectively in parallel with their outputs and fed to an A/B panpot which sends delayed signals to the unit's output via the 'direct/delayed signal' panpot. The final signal routing is the feedback control which feeds the combined delayed signals back to the input signal adder.

The amount of delay from each channel is governed by a control voltage input providing individual delays up to 26.5ms or 53ms with the delays connected in series. Each delay control voltage has its own 'depth' control which influences the amount by which the delay time is modulated. The modulating signal is derived from a time control (a front panel potentiometer) used for setting the centre of the delay sweep or for manually sweeping the delay time. The normal sweep signal comes from a voltage controlled oscillator and the frequency can be varied manually by a front panel potentiometer with a switch giving the choice of either square, triangle or exponential output waveform. A second switch provides an 'off' position and also allows an external waveform to provide the delay sweep waveform.

As stated earlier, this description is only showing the basic block diagram of the analogue time processor and some information on the clean front panel layout will fill in some important features which have not been mentioned. From left to right the front panel is identified in logical blocks of controls, input and level section, signal panpots and output, delay configuration, delay time sweeping and finally power. The use of coloured control knobs and liberal but not crowded identifications simplifies operation.

The input section contains the input level control and the feedback control, the combined signal being fed to the level indicator which consists of five LED indicators. The top one of these, coloured red, indicates maximum level with the remaining four green indicators arranged in 5dB steps below maximum level. From the level indicator the audio signal is compressed and fed through a lowpass filter before being fed to the analogue delay circuits.

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FIG.1 DN 34 BASIC BLOCK DIAGRAM

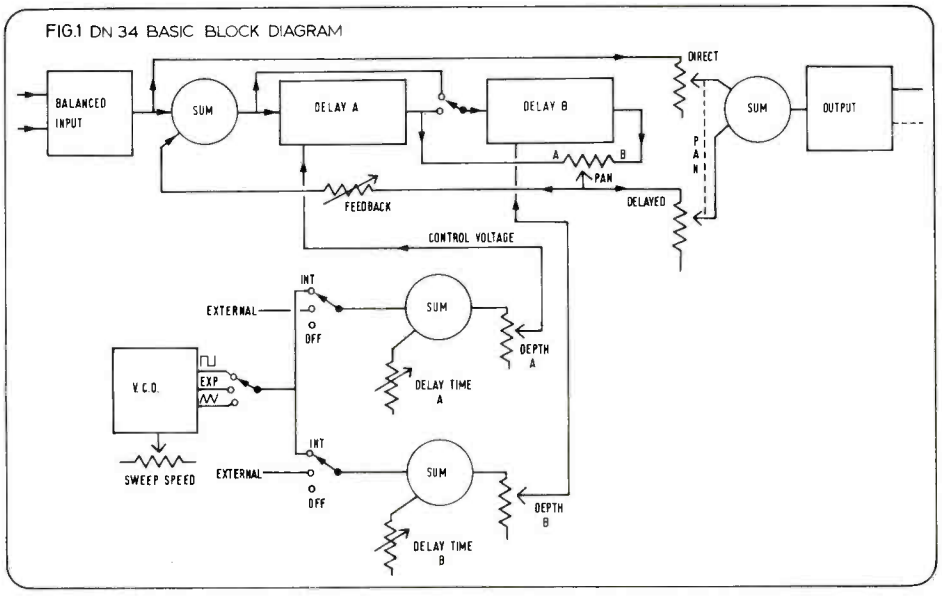
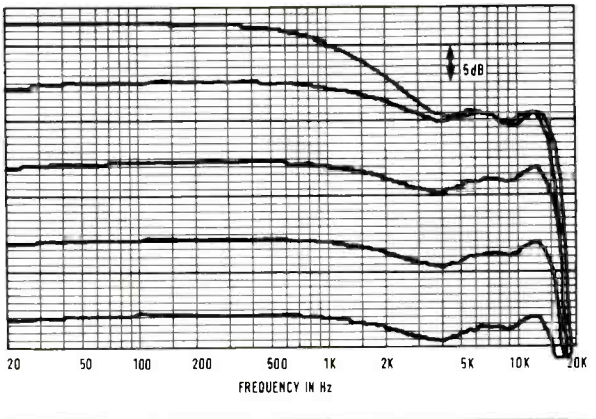


FIG.2
DN 34 DELAYED CHANNEL MINIMUM DELAY SERIES



not your average delay line

cue communications Ltd.

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In addition pre-emphasis is applied to the extent of 8dB at 10kHz to reduce noise in the delay sections.

The signal panpot and output section has two panpots for mixing direct and delayed signals and two delay section outputs. In addition there are switches, for reversing the phase of the audio signal in either delay section, for putting the delay sections in series or parallel, and calibrating the output level control from +4 to +18dBm.

Operation of the delay channels is achieved by two potentiometers which set the depth of delay modulation and another two potentiometers to set the delay time centre. The latter each have two adjacent LED indicators which are illuminated when the combination of the manual delay time setting and the sweep signal, drive the delay times to either minimum or maximum limits. Each delay channel has a 3-position toggle switch for selecting the sweep source as either internal, external or off. A further toggle switch permits the phase of the sweep signal to delay channels to be reversed.

The delay time sweeping section of the front panel contains only two controls, a potentiometer for setting the sweep frequency and a 3-position toggle switch for selecting the sweep waveform as square, triangle or exponential.

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FIG. 3
DN 34 DELAYED CHANNEL MAXIMUM DELAY SERIES

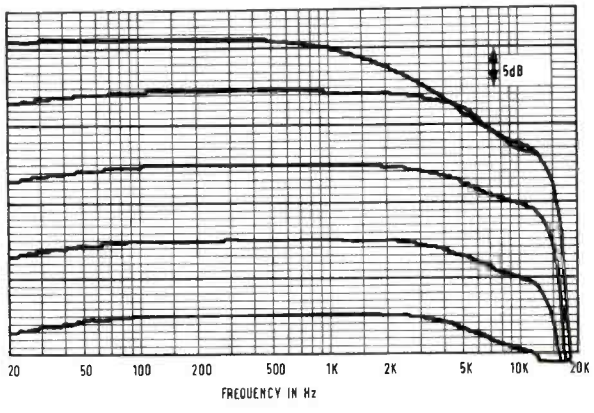
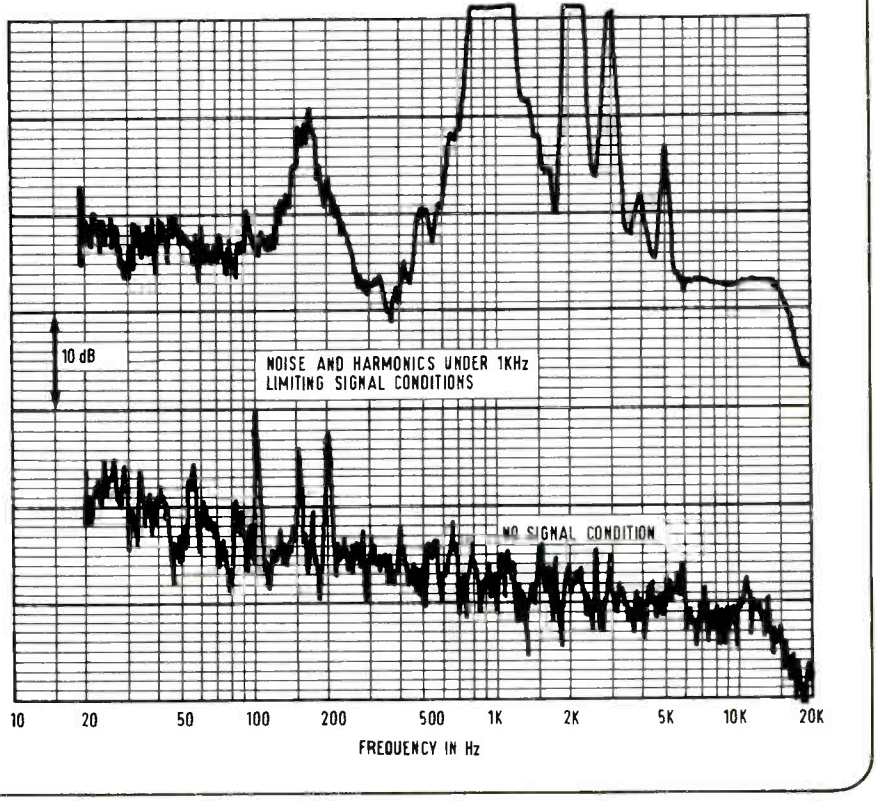
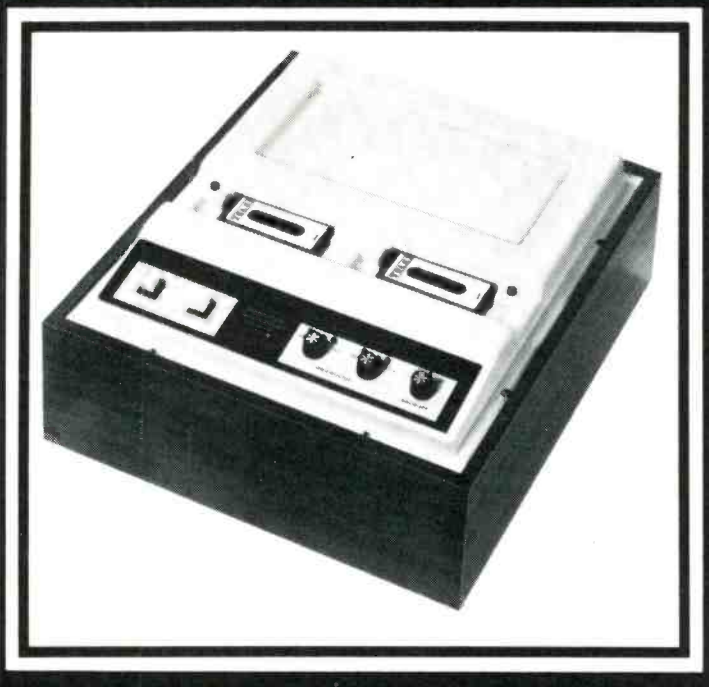


FIG. 4 DN 34 NOISE PERFORMANCE, BOTH GRAPHS ON SAME VERTICAL AXIS

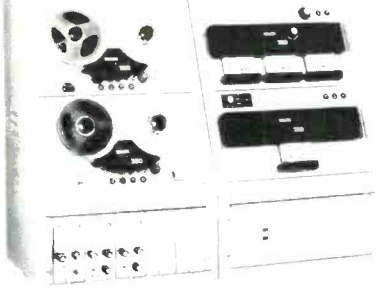


A high speed stereo cassette copier for £940



The TELEX cassette copier IV duplicates a stereo cassette at 12 times normal speed, accurately and reliably.
With simple 2 button control, individual track selection, a bias switch for ferric or chrome tapes, and a frequency response of 40 to 10KHz, the copier IV is exceptional value.

(Specifications: 20 ips operation, 40-10,000Hz frequency response, 45dB crosstalk rejection at 1KHz, 45dB S/N ratio, automatic rewind and automatic erase, cassette fault sensing.)



TELEX 300 SERIES DUPLICATOR.

TELEX MC CART MACHINE.

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TELEX manufacture a range of cassette copiers, tape duplicators, NAB broadcast cart machines, industrial tape transports & communications headsets. For full product information contact ►

► Avcom Systems Limited,
P.O. Box 755,
London, W12 7HS
Tel: 01-749 2201
Telex: 986691AVC.

Finally there is the power on/off switch and its adjacent red LED power indicator.

At the rear of the unit is a standard IEC power connector with a nearby power fuse (properly identified) and signal XLR connectors with a 6-pin DIN connector, permitting external modulation of the delay times of the two separate channels and also providing a secondary unbalanced audio output.

All front panel controls within the unit are mounted onto a glass fibre printed circuit board which houses a few other components, the main circuitry and power supplies being mounted onto a single large board which covers the base of the unit. All components are identified clearly for servicing in conjunction with a good operation and maintenance manual. In addition all integrated circuits are mounted in sockets, preset potentiometers are sealed and access to all components is excellent with adequate test points provided.

Frequency response and noise

Whilst the frequency response of the direct signal is independent of the control settings and flat to within +0, −0.5dB from 20Hz to 20kHz, the performance of the delayed channel depends upon the delay time in use and the input level. As is to be expected, frequency response errors double when the two delayed channels are operated in series.

Figs 2 and **3** show the performance with the two delay channels in series (and therefore being a worst case condition), indicating that at lower input levels and short delay times, the frequency response per delay channel is within +0, −2dB up to 15kHz reducing to approximately +0, −4dB at the maximum delay time of 26ms. I consider such a performance perfectly adequate for an effects unit of this type as the amount of pre-emphasis has the effect of limiting the frequency response at high levels only.

As far as noise performance is concerned, bearing in mind the use of compression and expansion, it is necessary to consider both the static and dynamic noise performance because noise varies with the signal level and spectrum. In the static (no signal) case the noise at the output, referred to the onset of limiting at 1kHz, was found to be as **Table 1.**

TABLE 1	MAXIMUM OUTPUT GAIN	MINIMUM OUTPUT GAIN
Output level at limiting	+17dBm	+3.5dBm
Noise in direct channel		
A-weighted rms	−90.5dB	−90.5dB
CCIR weighted rms	−81.5dB	−81.5dB
CCIR weighted quasi-peak	−77.0dB	−77.0dB
Noise in delayed channel −delays in series		
A-weighted rms	−88.5dB	−88.5dB
CCIR weighted rms	−79.5dB	−79.5dB
CCIR weighted quasi-peak	−75.0dB	−75.5dB

Table 1 demonstrates a particularly good

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FIG.5
DN 34 HARMONIC DISTORTION, WORST CHANNEL

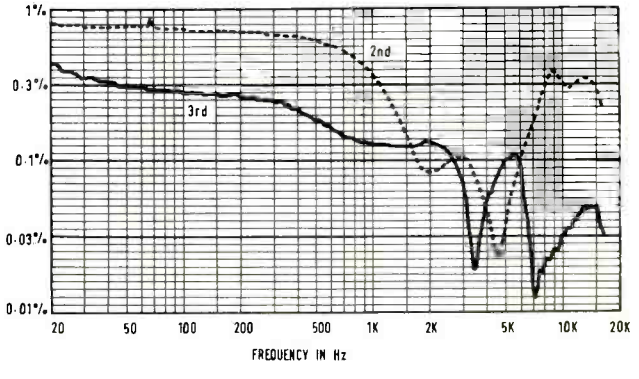
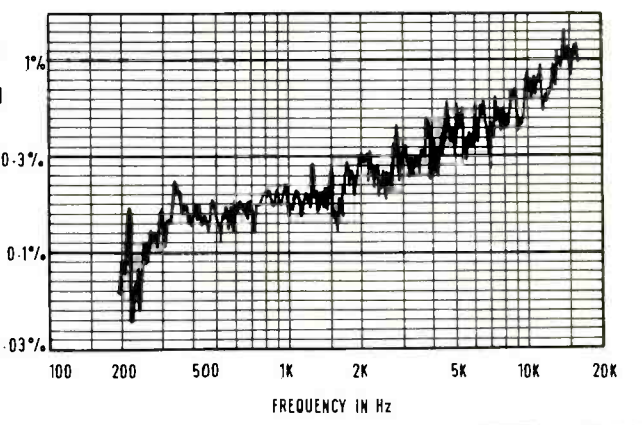


FIG.6
DN 34 CCIF TWIN TONE INTERMODULATION DISTORTION



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noise performance for this type of device in the no-signal condition but a comparison of the noise under signal conditions with these figures shows a degree of noise breathing which is frequency dependent. **Fig 4** shows a spectrum analysis of the no-signal noise together with the noise and harmonics under signal conditions where a 1kHz tone has been applied at limiting level. This figure shows a 25/30dB increase in noise; however, this is rather a stringent test for this particular delay system, which is split band and has a crossover point about 1.5kHz with separate high and low frequency time constants. In spite of this potential degree of noise pumping the dynamic range remains quite respectable and in few subjective tests was it possible to hear any noise pumping.

Distortion

In the direct channel the harmonic distortion at any level to +18dBm output, at maximum gain was less than 0.03% second or third harmonic up to a fundamental of 10kHz. Above this the distortion rose to a maximum of 0.3% third harmonic at 20kHz—a generally satisfactory situation.

In the delayed channel the distortion performance varied widely, according to delay settings etc, with a bad situation being shown in **fig 5**, and typical performances exhibiting about 10dB less distortion at frequencies below 1kHz. Similar variations were noted with CCIF twin tone intermodulation distortion, **fig 6** showing a typical performance which like harmonic distortion is perfectly adequate for an effects device of this type.

As far as the limiter and compress/expand performance is concerned, this proved to be remarkably good with the minimum of overshoot, as can be seen in **fig 7** showing a 20ms burst of 1kHz tone, driving the unit 10dB above the overload indicator and being delayed by the maximum through the two delay channels in series. It can be seen that the overshoot occupies only a single cycle.

The application of a similar toneburst in the presence of a continuous lower level tone shows the steady recovery of the limiter in **fig 8** and in no circumstances was it found possible to produce clicks or other undesirable distortions.

Since this review was written, the time constants have been changed. Listening tests on the modified version showed a significant improvement in noise breathing.

Inputs and outputs

The balanced input was found to have an adequately high input impedance of 20.7kΩ with a maximum sensitivity of −5dBm for the illumination of the overload indicator with the capability of accepting in excess of +23dBm before the onset of input overload—a satisfactory situation. Similarly the output was adequate with a very low output impedance and a maximum drive capability of +21.9dBm.

While the common mode rejection was not very good at the input, being 37dB over the spectrum 20Hz to 15kHz, this feature no doubt can be improved by the use of the optional input transformers. Where a balanced output is required this is simply achieved by inserting an extra integrated circuit which is provided within the unit and removing a soldered wire link.

The output level control provides a gain range of +9dB to +22.5dB with the input at maximum sensitivity, the input level control is the full range type.

The level display was found to be relatively fast acting, with the overload indicator taking a 3ms burst at clipping point to become illuminated—illumination at maximum input gain occurring at −5dBm input and clipping at +5dBm input. The four lower level green LED level indicators illuminated at −10dBm, −14.5dBm, −19.4dBm and −23.7dBm and were always within 0.6dB of nominal calibration.

The delay mechanism

Measurement of the available delay times showed that for both channels the maximum and minimum delay times were 26.7ms and 0.4ms respectively with a mid point setting of 7ms, thus providing delays between 0.8ms and 53.4ms in the series mode.

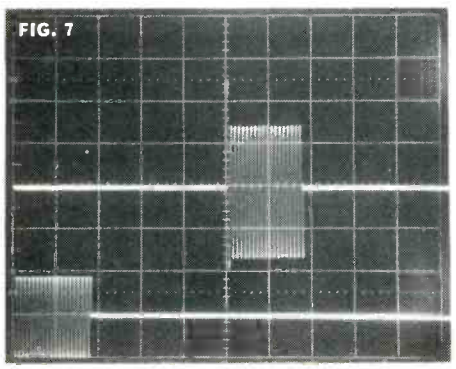
The repetition rate of the internal delay time sweep oscillator was found to be variable over a very wide range from 70ms right up to 25s thus giving a wide range of effects.

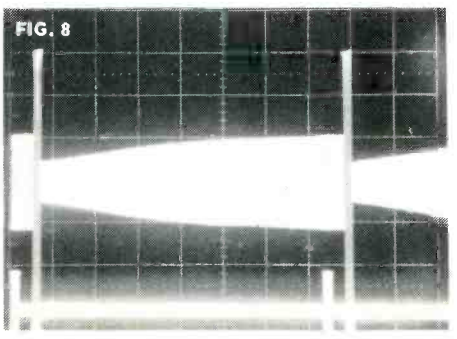
Summary

This is a remarkably versatile effects unit which proved to be great fun and furthermore simple to use considering the versatility of the internal mixing mechanisms.

For its price and technical performance it is far better than many competitive units. It is well conceived and produced with servicing clearly borne in mind and has inputs and outputs which will readily interface with both professional and semi-professional equipment.

Hugh Ford





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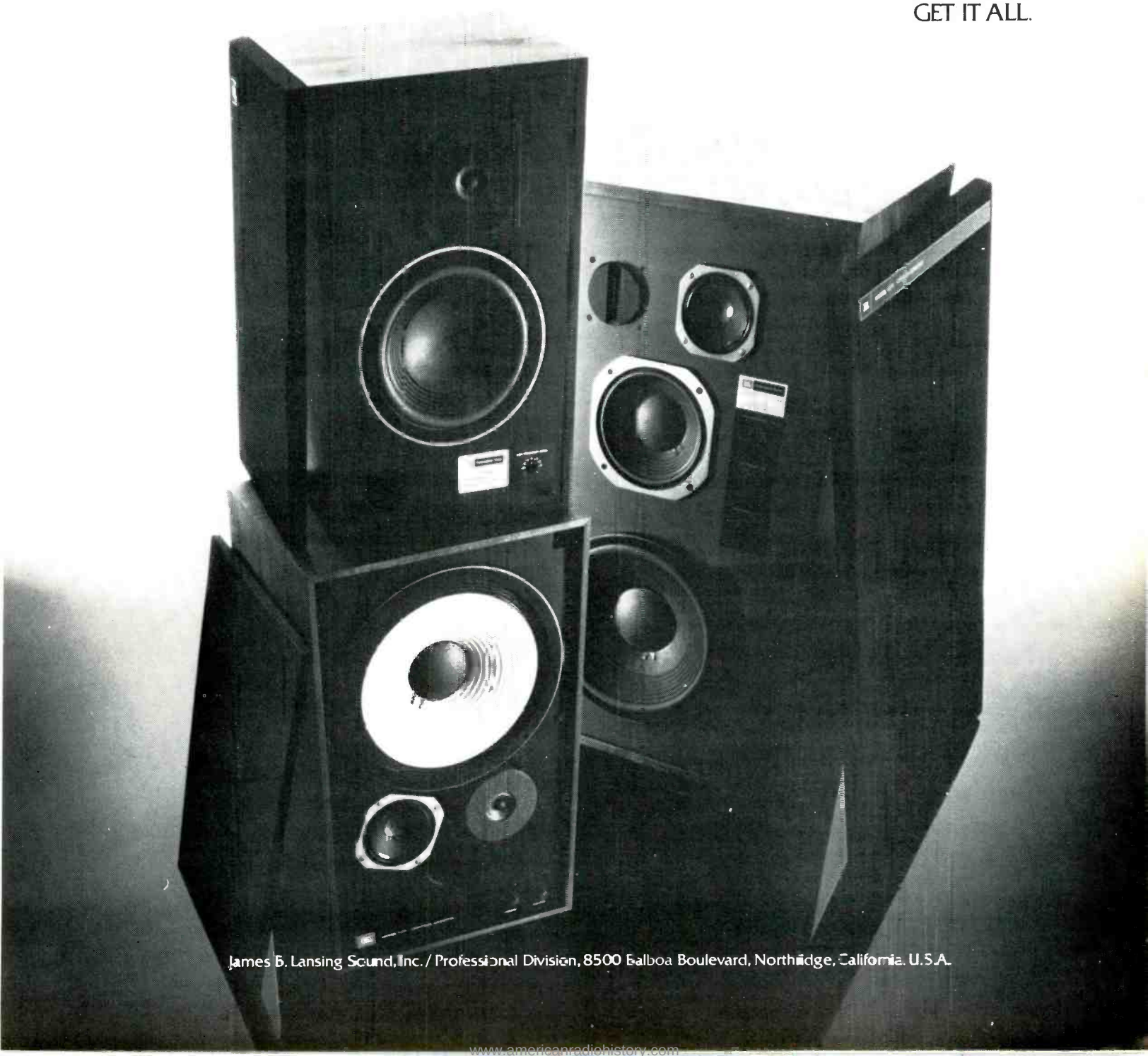


James B. Lansing Sound, Inc. / Professional Division, 8500 Balboa Boulevard, Northridge, California. U.S.A.

reviews

AMS DMX 15-80 digital delay line

MANUFACTURER'S SPECIFICATION

Input impedance: 10kΩ, electronically balanced.
Input sensitivity: −10dBV (ref 0.775V).
Maximum gain available: 20dB.
Output impedance: 150Ω, symmetrical, electronically balanced.
Maximum output level: +24dBV.
Maximum number of outputs: 2, independent.
Distortion: better than 0.1% at 1kHz.
Dynamic range: greater than 90dB.
Frequency response: 20Hz to 18kHz, −3dB.
Maximum delay available: 1.024 seconds, full bandwidth.
VCO control: variable, 0.05 to 20Hz.
Frequency shift available: 0 to 20%, continuously variable.
Computer control: time entry by numeric keypad, 9 memory locations for pre-selected delays, 7-segment digital readout of selected delay time.
Height: 2U (3½in/90mm).
Width: designed for 19in rack mounting. 17in (432mm) behind front panel.
Depth: 10in (254mm) behind front panel.
Weight: 7kg.
Input connector: XLR-3-31 (female).
Output connector: XLR-3-32 (male).
Power connector: standard IEC.
Power requirements: 110/220/240V AC, internally adjustable.
Power consumption: 30VA maximum.
Price: basic unit with 102ms delay £2295. Extra 102ms delay cards £130. Second output card £270.
Manufacturer: Advanced Music Systems, Burnley, Lancashire.
UK: Cue Communications Limited, 54-56 Stanhope Street, London NW1.

IN ITS basic form the Advanced Music Systems' *DMX 15-80* is a digital delay with a single audio input and output, both electronically balanced and with a maximum delay capability of 102.5ms. However, further delay cards in the form of digital random access memories may be added, to a total of 10 cards giving a maximum delay of 1.024s. Additionally a plug-in second delayed output, the delay time of which is independent of the other output, but both of which can have their delays selected in steps of 1ms up to the maximum available from the memory. These facilities as far as the audio signal is concerned are shown in **fig 1** which represents a simplified block diagram of the complete audio path.

It can be seen that the balanced audio input is first unbalanced and fed through an anti-aliasing filter to remove any high frequency signals which would cause spurious outputs. This is followed by the input level control after which the signal splits, being added to the 'output 1' stage where it can be mixed in any proportion with the delayed signal. The other branch passes to an adder which allows the delayed signal to be fed back to the input from 'output 1' in or out of phase; in addition this signal fed back, is passed through a variable highpass filter and a feedback amplitude control.

The original and desired proportion of the fed back signal, is then passed to a sample and hold circuit which generates a digital exponent signal of two bits for range-switching and passes the remainder of the signal to a 12-bit A/D converter, thus feeding a 14-bit data word to the data highway. Attached to this highway are the one or two output stages consisting of D/A converters, balanced output stages and also the expandable store.

The memory, or store, consists of up to 10 plug-in circuit boards each of which provides storage up to 4,096 words of 14 bits in the form of random access memories with a 25μs sampling rate — the complete unit normally being tied to a sampling rate of 40kHz. However, in order to provide time modulation effects the A/D converter can be switched from its normal crystal reference to a voltage controlled oscillator reference which may be swept from a very low frequency up to a nominal 20Hz with an adjustable depth of modulation.

Delay times for each channel and for special effects are set by a front panel keyboard which in conjunction with a microcomputer, digitally stores up to nine sets of conditions, any of which may be recalled into operation by two keystrokes on the keyboard, a digital display in conjunction with LED indicators showing the current status of the unit. The microcomputer directly controls the expandable main memory which functions with the memory control to produce timing pulses for the A/D converter and for strobing the D/A converters so that digital data is fed to and from the 14-bit data highway at the correct times.

Further functions shown in **fig 2** are the pitch shifter processor and the reverberation processor which were not available at the time of this review; however, it is only fair to mention these important forthcoming facilities which take the form of plug-in circuit boards.

The pitch change unit, or harmoniser, will contain a high speed 16-bit microprocessor which will permit a pitch change to be dialled into the unit from the keyboard as a percentage to three decimal places, or in terms of absolute pitch shift. It is claimed that the time jumping effects of other pitch changers do not exist, as compatible memory locations are selected during pitch changing.

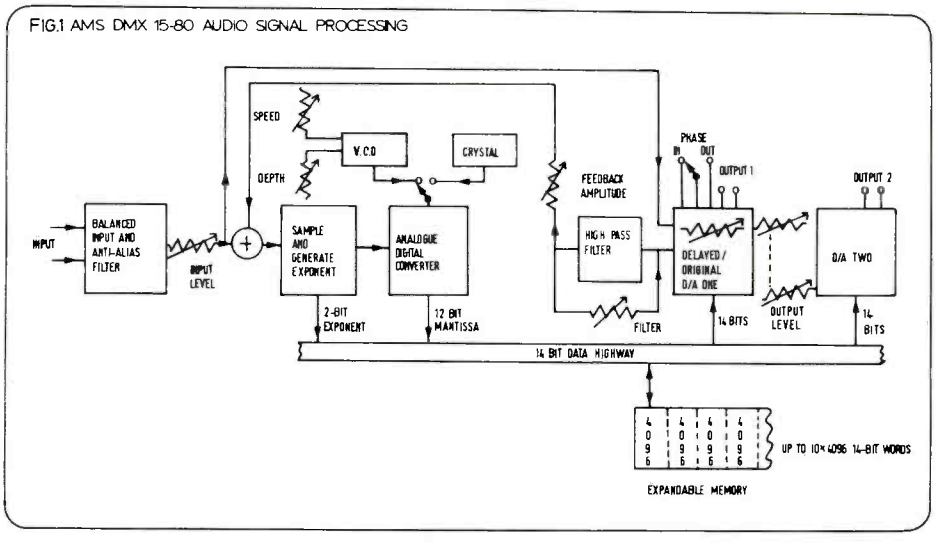
The reverberation processor card will allow one of nine reverberation programmes to be selected by the keyboard in addition to the prereverberation delay — selectable from the keyboard up to one second, with the feedback control being used to control reverberation time.

The practical embodiment of the unit is a standard chassis intended for mounting in a 19in rack 3½in high. At the rear is a large heatsink, the XLR input and output connectors together with the IEC standard power connector, and the metric mains fuse which was not identified in value or type. The main chassis and front panel is of solid alloy but the top, bottom and sides are bolted steel painted panels.

The controls on the black anodised front panel are clearly identified in silver. From left to right the controls are: the input and output level, the latter being ganged for the two outputs, together with three level indicator LEDs. These are from top to bottom coloured

110 ▶

FIG.1 AMS DMX 15-80 AUDIO SIGNAL PROCESSING



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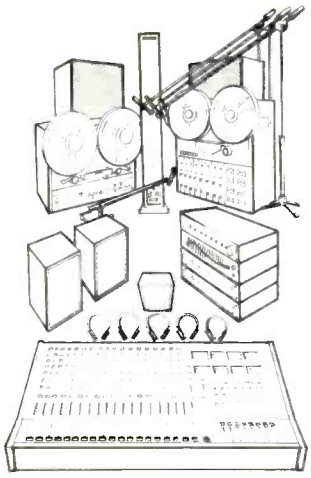

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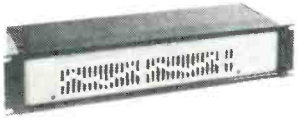

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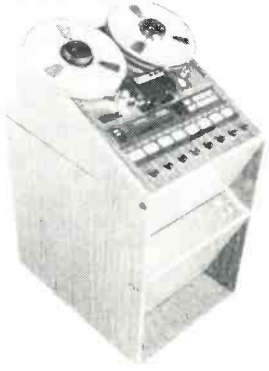

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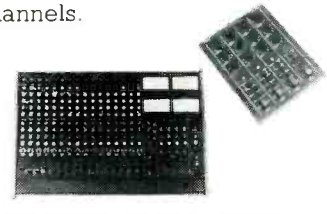

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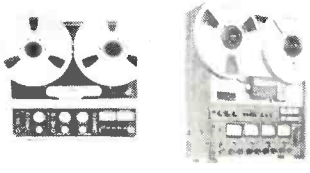

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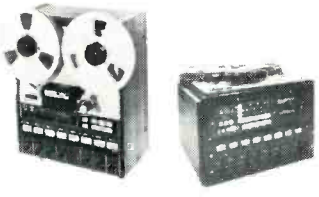

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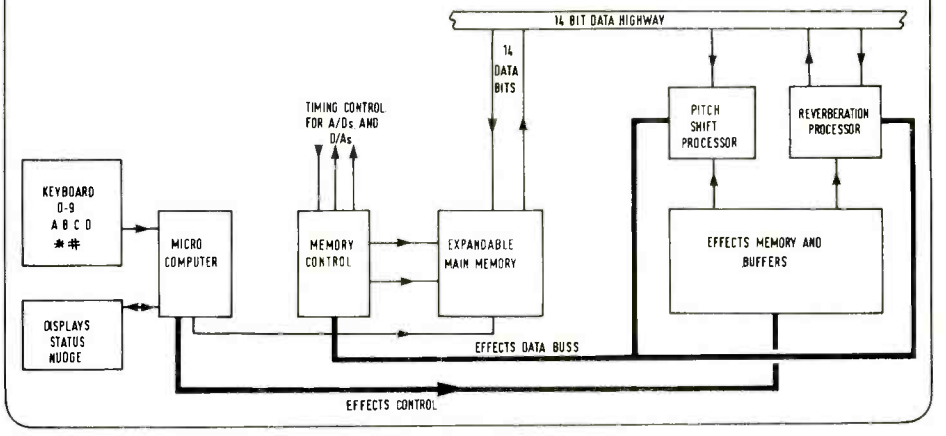
red, amber and green and represent fast sense and hold displays with the red being about 6dB below clipping and the lower indicators at 6dB intervals below the red indicator—a very clear and sensible display.

Then the voltage controlled oscillator speed and depth potentiometer controls, with an amber LED which flashes according to the frequency of oscillation, the option of crystal control or VCO selected by a toggle switch under the digital display further to the right. Next the delay/original mixing section for output 1 only. This is simply a toggle switch for selecting the delayed output only or delayed output plus the original input, a potentiometer controlling the mixture and a green LED is illuminated when the mixture condition is selected by the toggle switch.

The feedback section is next with potentiometers for controlling the amount of feedback and the highpass filter, which operates from the delayed output 1 with a toggle switch reversing the feedback phase as desired. There is also a normal/lock-in control toggle switch. The lock-in position retains the contents of the memory without adding any further input and recycles the memory such that its contents are continuously repeated at the outputs. This means that with a full-size memory up to 1.024s of audio can be continuously repeated. Not only may this recycled audio be pitch changed by means of the VCO, but also when using output 1, the recycled audio can be mixed with the current input audio in any proportion.

The 4-decimal digit display is after the above section, and below it is the crystal/VCO toggle switch with associated red and green LED indicators above. Similar LED indicators to the right of the display are illuminated when either of the 'nudge' buttons under the display are used. These buttons allow the delay time of either output channel to be continuously changed at a rate of about 1ms per second realtime—'nudging' about zero delay time produces good flanging effects. Immediately under the display, are three further LED indicators identified as 'a', 'b' and 'c' and respectively coloured amber, green and red.

FIG.2 AMS DMX 15-80 DATA CONTROL AND SPECIAL EFFECTS



These operate in conjunction with the keyboard to indicate which function the keyboard is performing in the sense that 'a' is illuminated when the delay output 1 is being altered, 'b' is illuminated for delay output 2 and 'c' is illuminated when the future pitch change or reverberation processors are being addressed.

The keyboard follows and consists of 16 buttons similar to the pushbuttons used by good quality pocket calculators with the characters being zero through nine, A, B, C, D, * (star) and ♯ (hash).

The function of buttons A and B is to select one of the two audio output channels 1 or 2 and to display the current delay setting of the selected channel. Key C will cause the display of either the reverberation programme selected or the pitch change ratio of the channel selected by buttons A or B. Zero to nine are used to key-in the desired delay time of effects settings into the display, but this data is not entered into the functions previously selected by A, B or C until the hash key is pressed—the A, B and when appropriate C LED indicators flash until the hash key is pressed.

If an error is made in the entry the star key may be used to clear the display if a pitch change function is not fitted, in which case the star key functions as a decimal point in the pitch change ratio setting. Illogical operation of the controls such as setting an unavailable delay time causes the decimal display to show 'Err' for error.

Lastly, key D is used to select one of the nine available stores, each of which contains a complete set of data for the two output channels. The unit automatically starts with store 1 selected together with channel A. In operation the desired delay is keyed into the display, LED indicator A flashes until the data is entered with the hash button. Channel B is then selected and the procedure repeated.

In order to enter times into further stores you press D, followed by the required store number, say 8, whereupon the display shows 'Str 8'. Data is then entered by the above procedure with buttons A and B and the numerals.

Once the desired delay times have been entered into the stores the operational delay is set by simply pressing button D followed by the store number, whereupon the delay time is immediately set and the store number displayed. The operational delay time may then be read by pressing A or B for channels 1 or 2 as required. Operation of the nudge buttons with the selected store causes the delay time of the selected channel (A or B) to be displayed in milliseconds and this to be counted up or down depending on whether the nudge-up or nudge-down button is used. At the same time the contents of the selected store is updated.

And last of all the power switch and indicator, with a reset button underneath for clearing the digital system. Whilst the operation of the unit may at first sight appear to be complicated, it takes little time to get used to the controls and the sequences of operation; furthermore, the clear identification of the audio controls and the use of coloured LED indicators makes 'reading' the selected modes of operation very quick.

The standard of construction within the unit is impeccable. The base is covered with a mother board which houses few components other than the stabilised power supplies and good quality connectors for the electronics, the complete unit being cooled by a very quiet miniature rotary fan.

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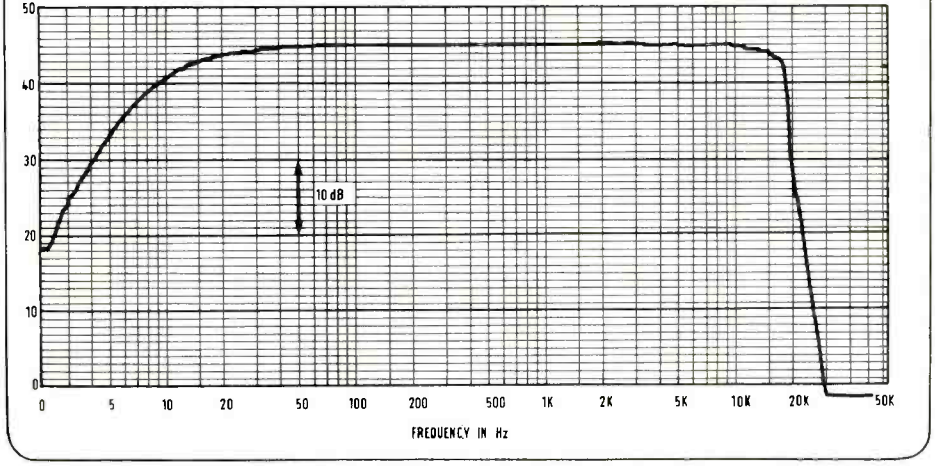
FIG.3 AMS DMX 15-80 OVERALL FREQUENCY RESPONSE IN PURE DELAY MODE



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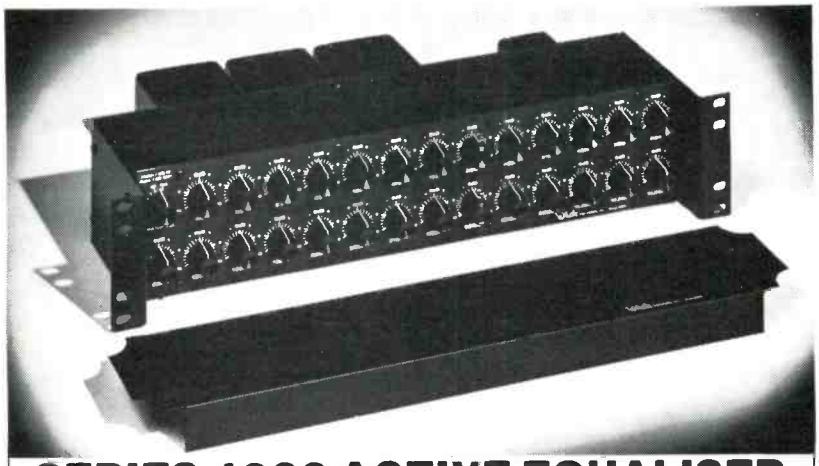

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Component quality is first class as are the printed circuit boards and overall construction. In addition potential maintenance problems have clearly been borne in mind as multiple plug-in printed circuit boards are used and where appropriate ribbon cables and connectors.

Frequency response and noise

The overall frequency response of the unit in the pure delay mode is shown in **fig 3** which demonstrates that the response is effectively flat up to 18kHz above which there is the proper sharp fall associated with the anti-aliasing filter. Unlike many analogue delay units the frequency response is completely independent of the delay time setting and the response of both output channels was identical.

Examination of the frequency response of the feedback path and its filter using gating techniques in conjunction with tone bursts produced **fig 4** which shows the full range of the highpass filter control on the front panel. While this control offers a very wide range it was found that the first 100° or so of the controls rotation had little effect, with the result that the remainder of the rotation gave a rather coarse adjustment.

Spectrum analysis of noise in the outputs showed that other than the sampling frequency and its harmonics, no other spurious tones were present in the output; the sampling frequency of 39.98kHz and its second, third and fourth harmonics were at a very low level in the order of 110dB below full output.

As no companding, variable pre-emphasis or other similar techniques are used, there was no sign of any form of noise breathing so often associated with delay devices, and noise in the output remained constant irrespective of the presence or absence of a wanted signal. However, it was found that the noise performance varied with the input gain setting but did not vary with the input source impedance, the onset of clipping referred to noise being as **Table 1.**

TABLE 1	MINIMUM INPUT GAIN	MAXIMUM INPUT GAIN
22Hz to 22kHz rms band limited	91dB	85dB
A-weighted rms	92dBA	86dBA
CCIR-weighted rms	82dB	76dB
CCIR-weighted quasi-peak	78dB	72dB

By any delay unit standard this represents a most excellent performance in conjunction with an unusually wide bandwidth, with both output channels having a virtually identical dynamic range.

Distortion

The onset of severe distortion was found to occur with the input signal at 1kHz 7.7dB above the onset of illumination of the red overload level indicator with the amber and green indicators being extinguished at 6dB intervals below the red indicator. As the indicators have a very fast attack time, such that they are readily seen with a single cycle of 10kHz at the appropriate level, together with a hold circuit, it is felt that perhaps the 7.7dB margin is unnecessarily large. However this is a very good form of level indicator for a digital device which inherently distorts violently upon overload.

Checking the harmonic distortion performance showed that distortion was at its maximum around the illumination of the red overload indicator, but as can be seen from **fig 5** with the second and third harmonic distortions at this worst case level, the performance is excellent.

Similarly, as is shown in **fig 6,** the intermodulation distortion to the CCIF twin-tone method is to an unusually high standard, at frequencies up to 5kHz above which it rises but certainly not to unreasonable levels.

Input and outputs

The electronically balanced input was found to have a common mode rejection ratio of approximately 48dB over the audio frequency band with a maximum input capability of 10V (+20dBm). At maximum input gain only 0.29V (−8.5dBm) was required to illuminate the red overload indicator LED, the maximum overall gain being 20dB.

The input impedance was found to be constant with gain settings at sensible values of 20kΩ balanced or 10kΩ for each leg in the unbalanced mode. Similarly the output impedance was 300Ω balanced or 150Ω for each leg, both outputs being effectively identical.

Other matters

The available range of delay was found to be from 380μs in the zero delay time setting up to 1024.66ms at the maximum setting with the digital display giving accurate indications in 1ms steps while the practical steps, when using the 'nudge buttons', were 100μs increments. When the unit is switched from crystal to VCO the centre delay falls from 1024ms to 877ms, providing an appropriate delay sweep range for the VCO.

Sweep speed adjustment was over a very wide range from a maximum of 26Hz down to a virtually imperceptible sweep speed. In general the variable controls may be operated noiselessly 'on line' but operation of most switches introduces a degree of clicks.

Summary

Without doubt the standard of construction is, to say the least, outstanding and this must be one of the best performing delay units on the market with an excellent static performance and an equally excellent dynamic performance —the shortcoming of so many units.

In operation the unit is versatile as it stands, although I look forward to the availability of the reverberation processor and the pitch shift processor (harmoniser). **Hugh Ford**

FIG. 4
AMS DMX 15-80 FEEDBACK PATH RESPONSE RANGE

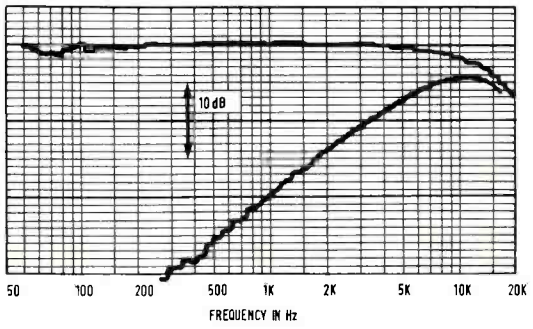


FIG. 5
AMS DMX 15-80 HARMONIC DISTORTION

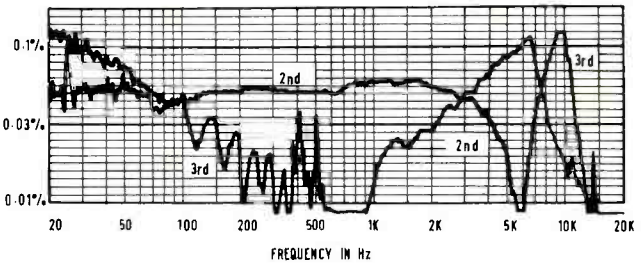
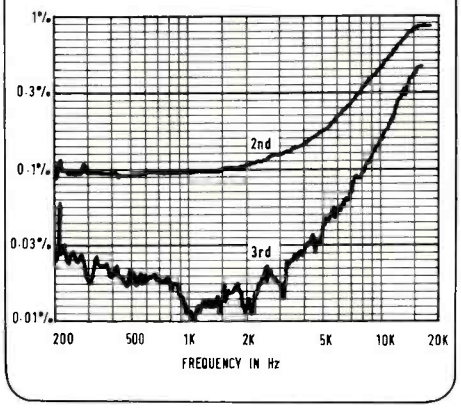
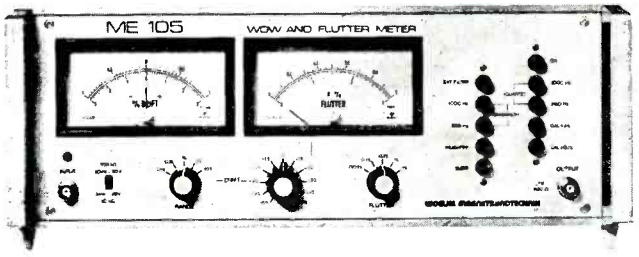
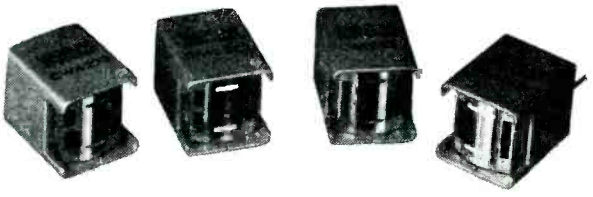


FIG. 6 AMS DMX 15-80 CCIF INTERMODULATION DISTORTION







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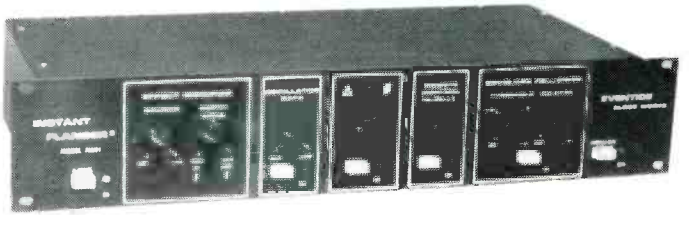

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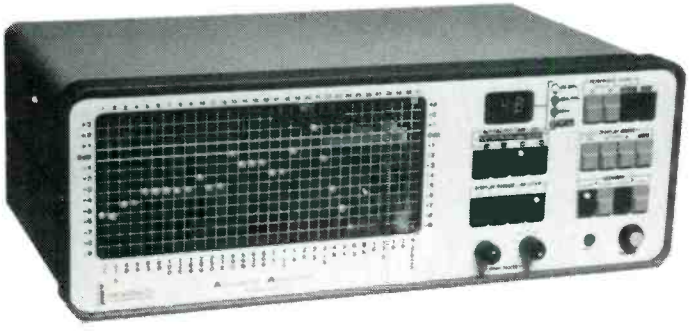

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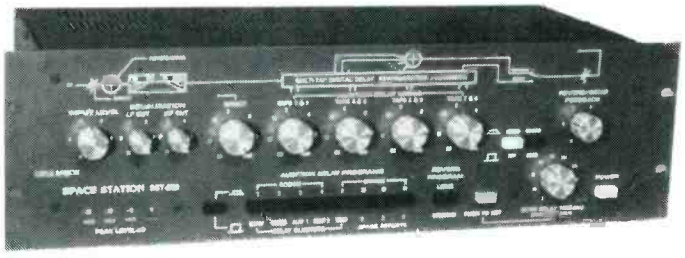
As reviewed in April Studio Sound the Inovonics is a ⅓rd octave real time analyzer including gated pink noise source, reverberation time analyzer, two memories, autoranging or manual operation and a host of other facilities.

ORTOFON DISC CUTTING EQUIPMENT

The complete range of disc cutting equipment including **GO 741** cutting amplifier, **DSS 732** stereo cutter **CPS 741** four channel correction amplifier, DSS 732 stereo cutter head etc.

For further information contact
Dave, Bernadette, Mike, Alison, John.



URSA MAJOR SPACE STATION SST282

The Space Station is a complete processing centre providing comprehensive reverberation, multi tap delay, repeat echo and a multitude of other effects.

FELDON HIRE EQUIPMENT

We carry an extensive range of hire equipment – contact us with your requirements.

EVENTIDE – full range
EMS – vocoder
MARSHALL – time modulator
DOLBY – 361s
JBL – various monitors
URSA MAJOR – space station
EMT – 240 gold foil
QUAD 8 – 6 into 2 mixer
INOVONICS – acoustic analyzer
CROWN – DC300A
QUAD – 303
EA – 100W stereo
SURVIVAL – stereo panner
UREI – graphic eqs.
AUDIO + DESIGN – limiters, stressers, scamp etc.
KEPEX
GAIN BRAIN
ADI – octave analyzer.

Bring your voucher to the APRS exhibition for a free peep at 'What the Butler saw'.

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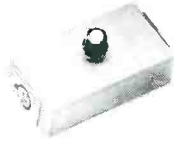
SEE US AT STAND 115-117 APRS

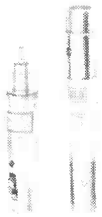
The Sescom range of mike splitters and combiners, incorporating a new generation of transformers, is capable of taking higher input levels and passing phantom power to the mikes.

Microphone splitters and combiners

In-line transformers and accessories

The Sescom series of audio transformers, filters and related devices are designed to be simply fitted in the line between two units.





Cable tester

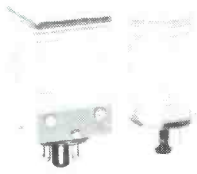
This strong, die-cast unit is designed for use in the field, when reliability is essential. Simply plug in your XLR 3-pin male to female cable, or 3-core jack to jack, and the three red lights will enable you to quickly pin-point breaks or shorts in any part of the plugs.

Direct injection boxes

The Sescom range of DI boxes is probably the most used by recording studios and PA companies throughout America and the UK.
Featuring professional quality with rugged construction, they are designed to be used with any modern electronic instrument, and all models have low-impedance balanced output.

Sescom leads...others follow

Sescom twin core microphone extention cords, available in 5, 25, 25 (thin), and 100 foot lengths, are made from high quality rubber type cable with XLR 3 pin audio connectors.
Shown is the 25T thin belden lead.



Audio modules

Sescom audio modules are designed for easy fitting and servicing, operating from a single power supply and shielded to prevent hum pick-up.
All these units plug into standard 8 or 11 pin plugs.

Make ends meet with

SESCOM

Quality Engineered Sound Products

Distributed by

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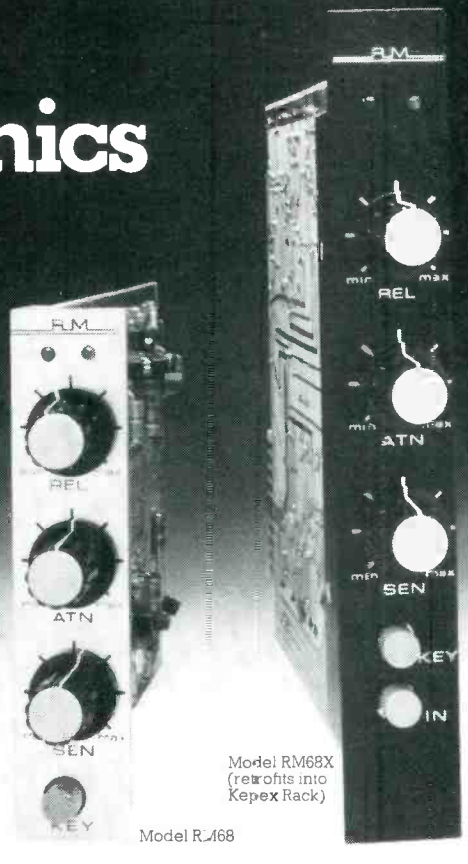
- ★ LED Indication of Non-Gating/ Gating Operation



Model RM68X (retrofits into Kepex Rack)

Model RM68

Sole UK Distributors:

Scenic Sounds Equipment,
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London W1V 5RA
Telephone: 01-734 2812/3/4/5

Lake Audio APS,
Artillerivej 40,
DK-2300 Copenhagen S
Tel: Copenhagen 570 600

Mike Llewelyn-Jones,
AP Postal 8.178
Madrid
Tel: Madrid 637 0752

3M France SA, Mincom Div.,
Boulevard de l'Oise,
95000 Cercy
Tel: Paris 749 0275

Audiotron
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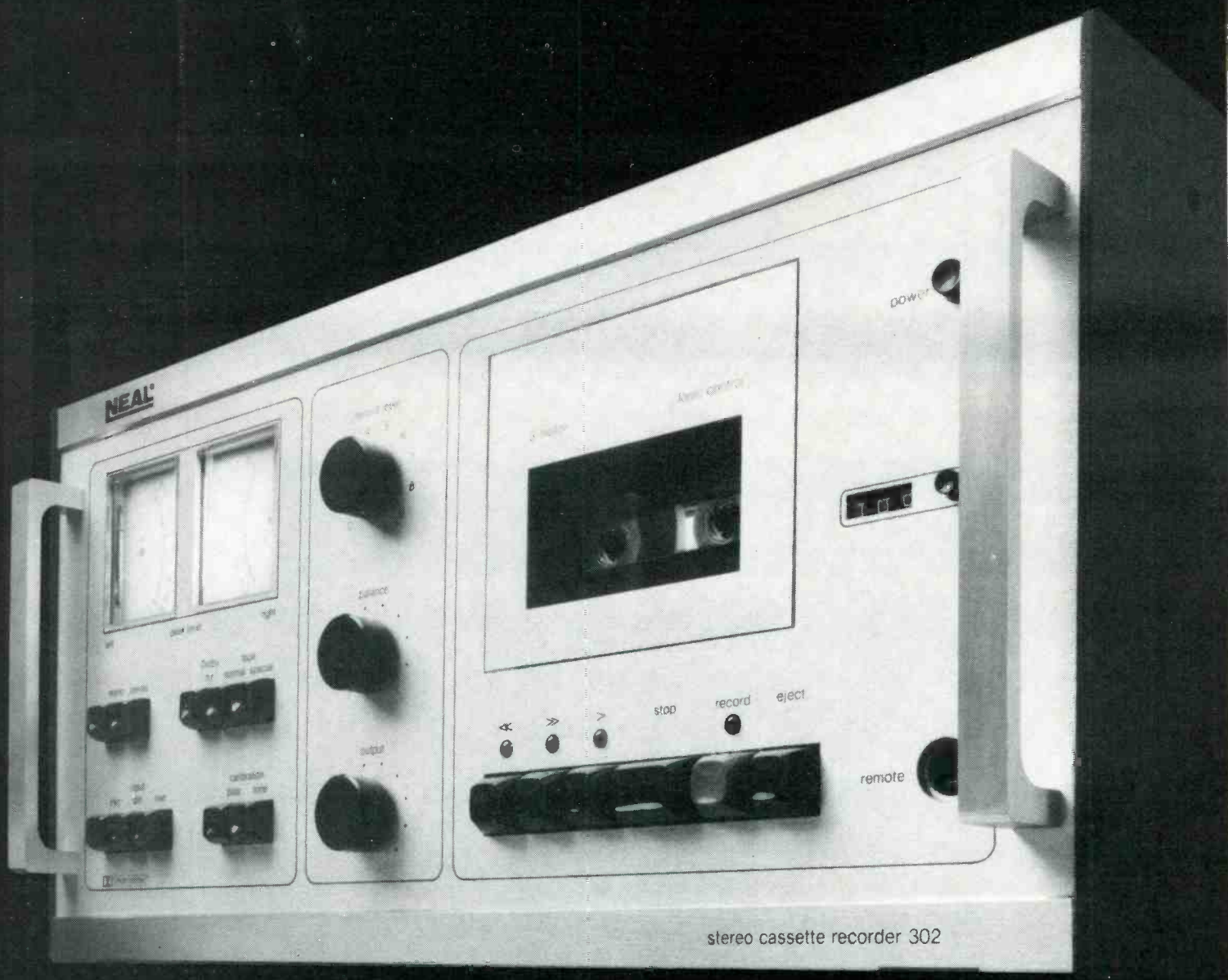
Oslo 1
Tel: Oslo 417 535

A.R.C. SPRL,
Rue Th. Decuyper 134,
1200 Bruxelles
Tel: Bruxelles 771 3063

S.E.D.,
Rue Bara Straat 146,
1070 Bruxelles
Tel: Bruxelles 552 7064

Pieter Bollen Geluidstechnik,
Hastelweg 6,
Eindhoven
Tel: Eindhoven 512 777

NEAL
FERROGRAPH



stereo cassette recorder 302

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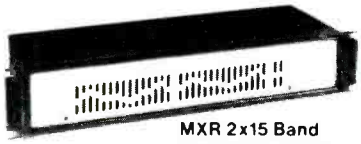
Telephone: South Shields (0632) 566321 · Telex: 537227



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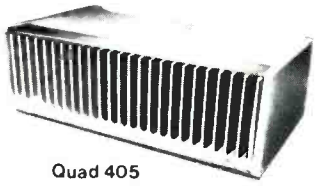
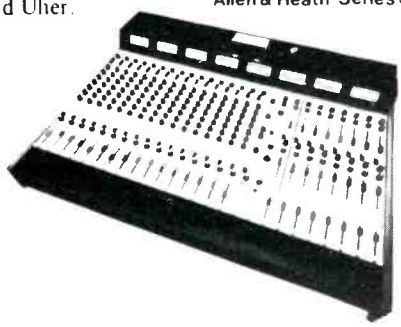


Quad 405

Allen & Heath Series 3



Revox B77

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Coles Green Road, London NW2 7EY
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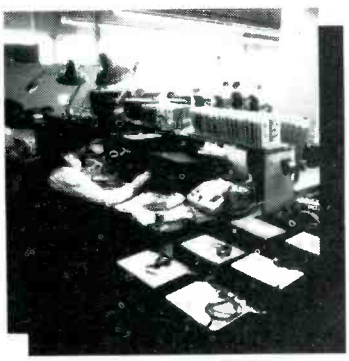

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Germany:
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Telephone: Augsburg (0821) 518 251
Telex: 53790
USA:
1640 5th Street Santa Monica California 90401
Telephone: (213) 393-0014

Sound International

SOUND INTERNATIONAL forms a link between professional musicmakers and those recording sound. The focus is on news from both sides of the recording fence, providing musicians, studio engineers, and home recordists with a monthly point of reference on the music scene.

The magazine reports the international news of people and events and reviews the latest in recording equipment and musical instruments. Also scheduled are regular articles on technique and problem solving together with behind-the-scenes look at events in the big studios and concerts.

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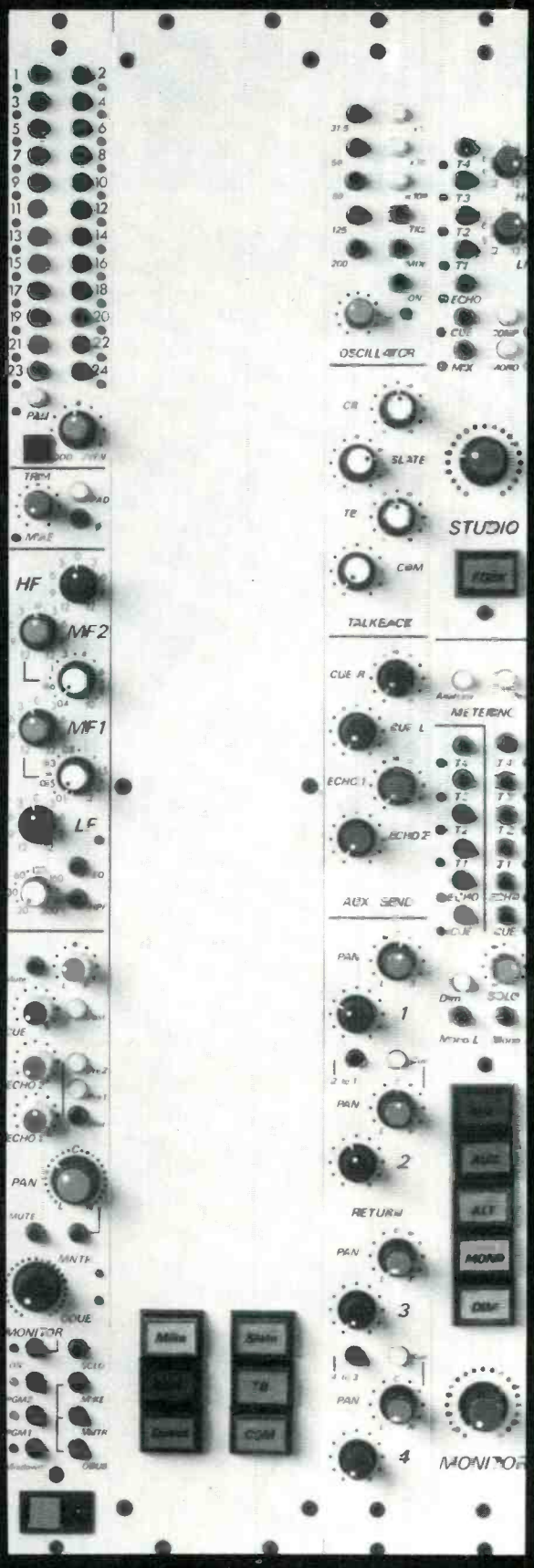

PLUS 30

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FRANCE

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Note: Advertisement copy must be clearly printed in block capitals or typewritten.
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★**Radio Production Studios** for Commercials, Voice-Overs, A.V. Soundtracks, Audio Promotions. D.I.Y. or complete service. Mark Stevens Productions Limited. 01-485 8087. L

★**Fanfare Records.** Tape-disc pressings, demo's, masters, any quantity. Studio/mobile Neumann disc cutter. S.A.E. brochure. 1 Broomfield Close, Rydes Hill, Guildford. Tel. 0483 61684. X

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★**Teac-Tascam.** Sales, Service and Hire. The Playback Studio. 01-267 6752/3. H
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★**8-Track Recording System complete.** Comprises Brenell mini 8 1in. 8-track recorder, Allen & Heath 16 into 8 mod 11 mixing desk (with 16-track replay facility). Can be viewed still in use at Telecomms Studios, Portsmouth. Offers around £3,750 invited. Contact Mike Devereux, Telecomms Studios, 189 London Road, North End, Portsmouth. Tel. (0705) 60036. G

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★**Teac A3340S, A3440.** In stock now. The Playback Studio. 01-267 6752/3. H

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WANTED

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★**Nagra or Nagra IS** wanted. Keith Rodgerson, 6 Bradville Gardens, Long Ashton, Bristol. Tel. Long Ashton 3273. G

★**Wanted. One copy of 'Acoustics of Studios & Auditoria',** by V. S. Mankovsky, 1071 Focal Press, London. Francis Daniel, 201 West 89th Street, New York, N.Y. 10024, U.S.A. G

★**16-track recorder and mixing desk** such as Studer, Neve, etc. Contact Mike Devereux, Telecomms Studios, Portsmouth (0705) 60036. G

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★**Trident Fleximix stereo limiter compressor.** Excellent condition. £175 plus VAT. 01-668 3457. G

★**Twenty 10½in. NAB reels 1in. tape** (used). Offers, or exchange for quantity new 10½in. NAB reels any ¼in. professional tape. Phone 0217075545. G

★**Three AKG D 160 microphones,** condition as new, £45 each or offers. 63 Fulbourn Road, Cherry Hinton, Cambridge. Tel. 0223 42129. G

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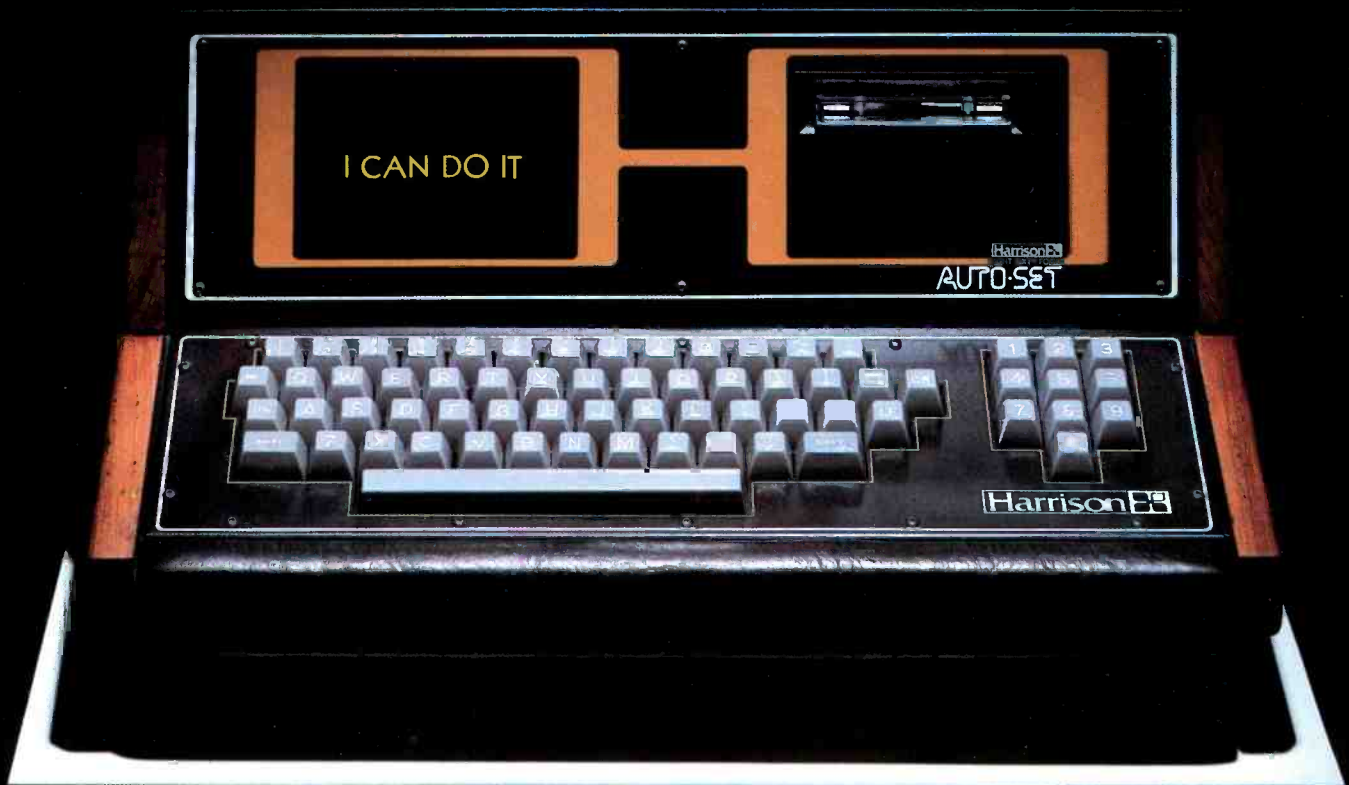

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