

# studio sound

November 1977 50p

AND BROADCAST ENGINEERING

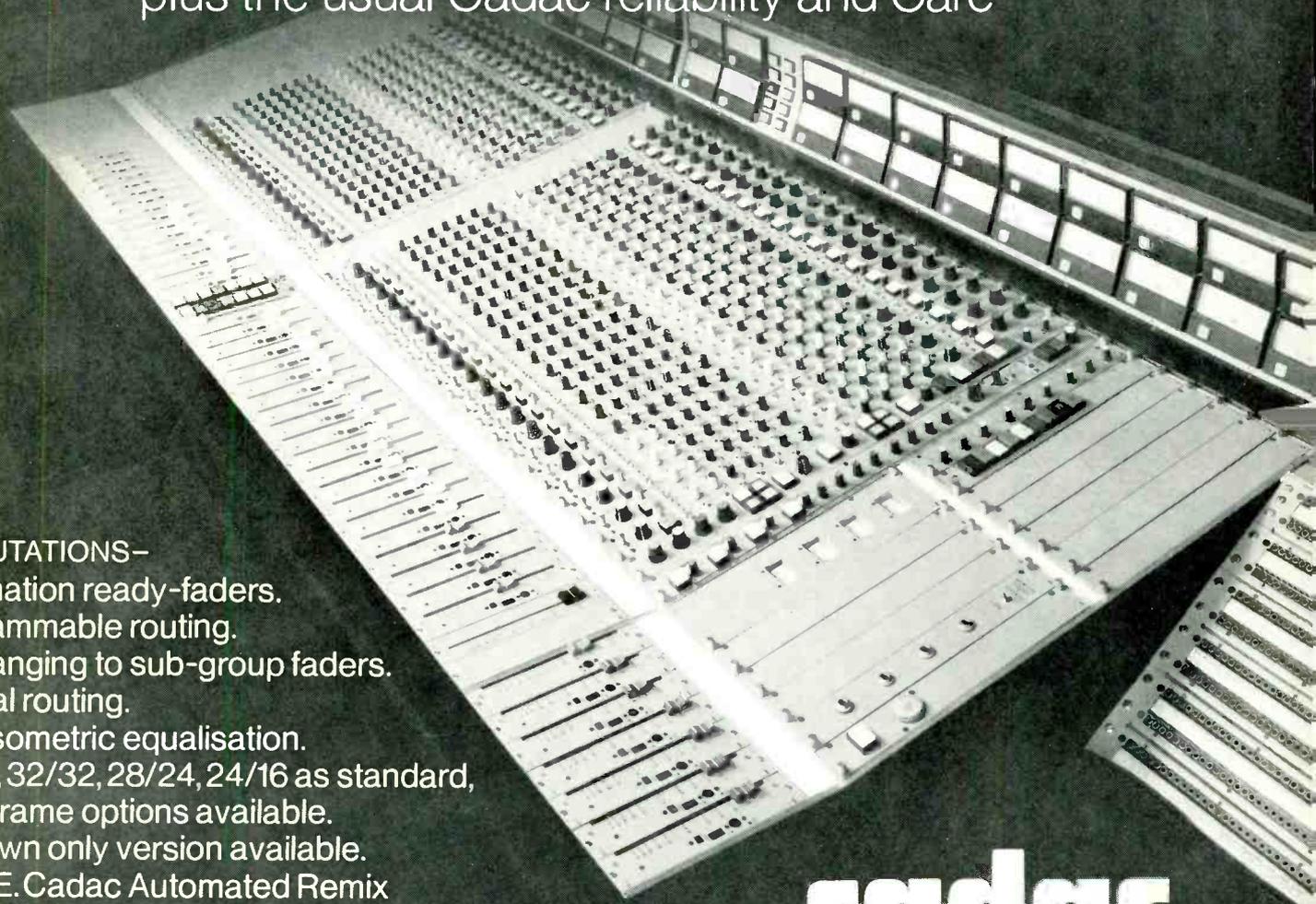


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# studio sound

AND BROADCAST ENGINEERING

## State of the art

■ The studio costs of a recent 3-album set were reputed to be not unadjacent to six figures sterling.

*Studio costs for The House of The Rising Sun left change out of a tenner.*

■ When an automated system somewhere in London refused to co-operate, three people hadn't enough hands, feet or elbows to complete the mix.

*Sergeant Pepper was recorded on four tracks.*

■ A world-famous producer recently implied that if a studio didn't have one of these—pointing to exotic automation—it is behind the times.

*Another quality-conscious producer is using a Nagra (both channels).*

■ One manufacturer has unveiled a 32-track machine using 50 mm tape, and another is waiting in the wings with a similar machine to run on 75 mm tape.

*Ditto.*

Where the hell are we—musically?

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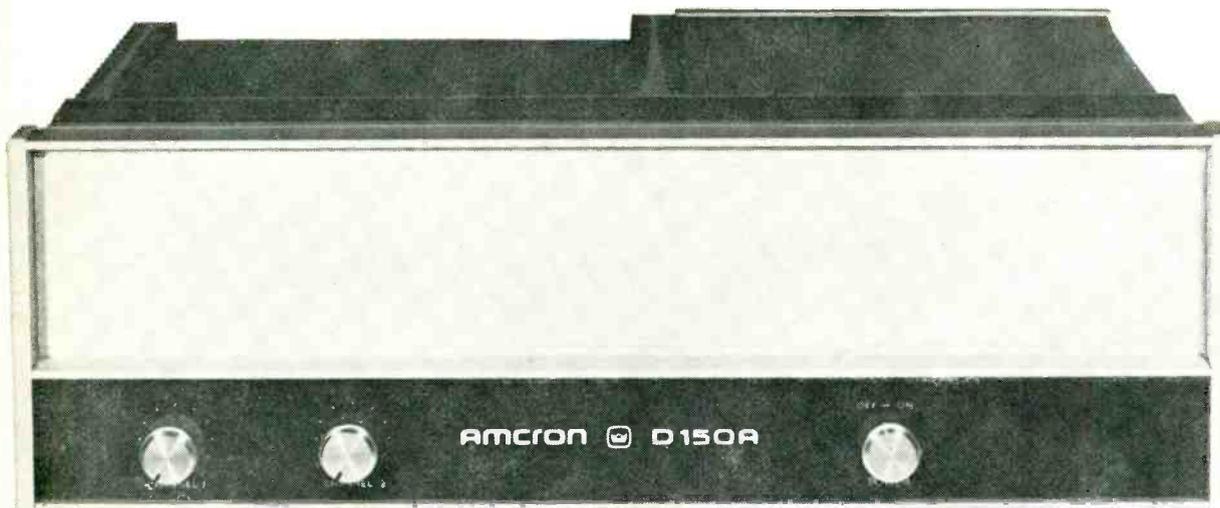
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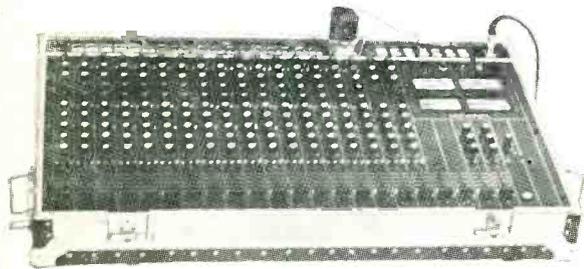
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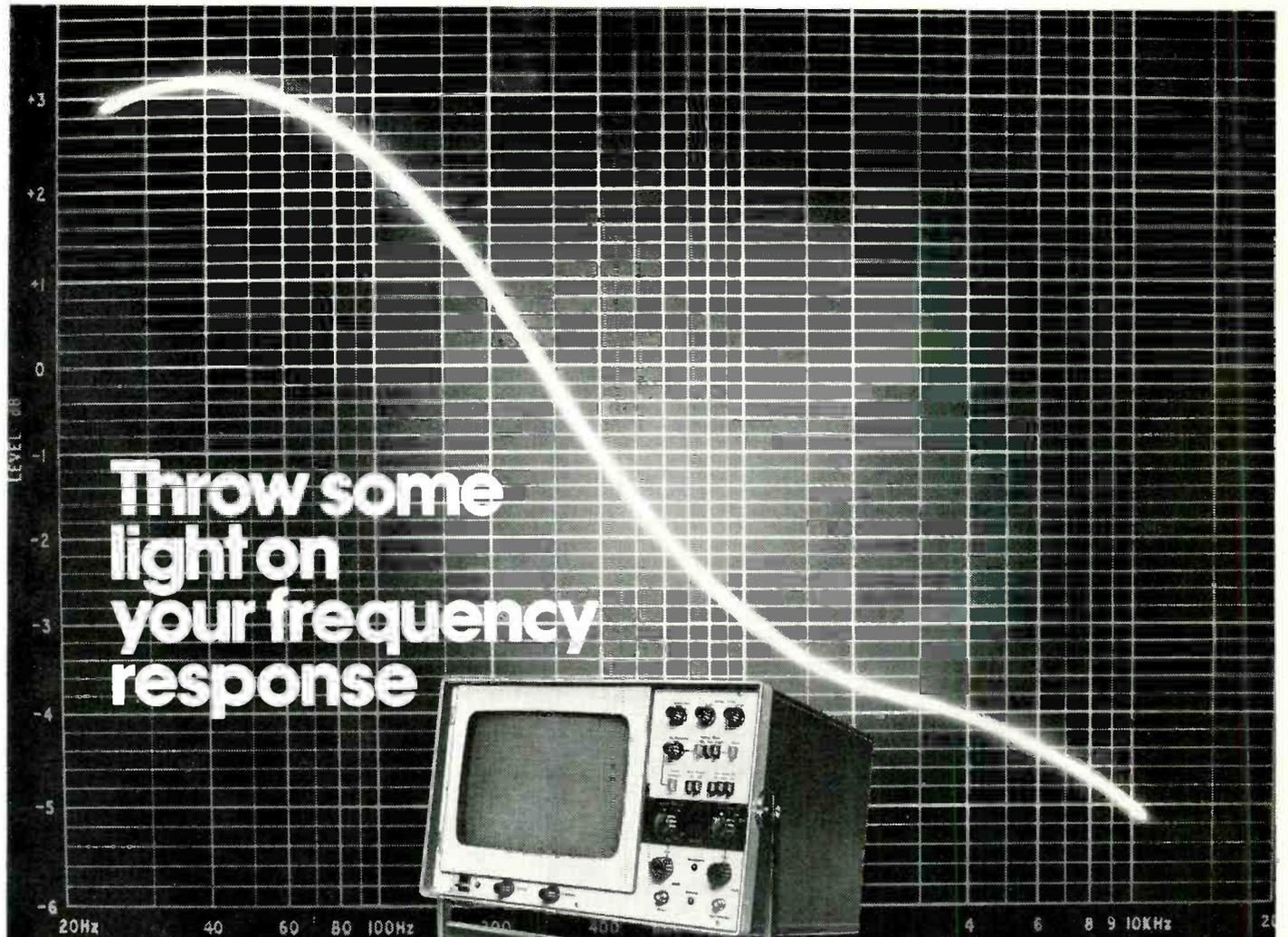
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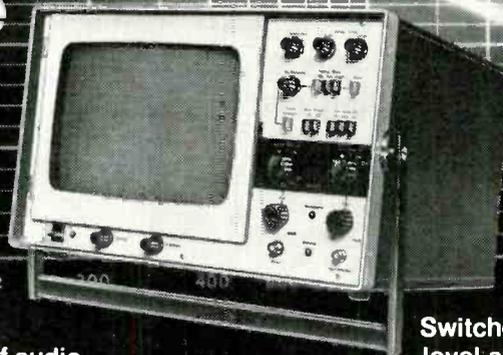
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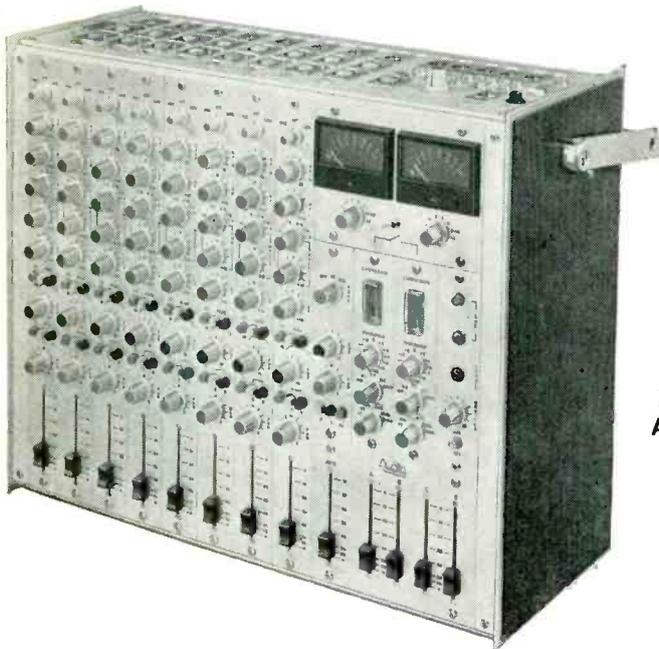
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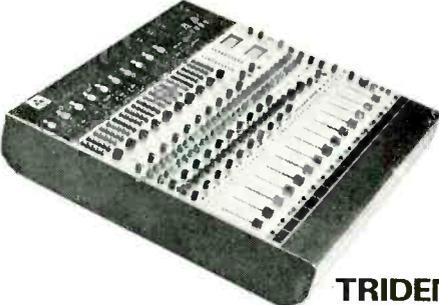
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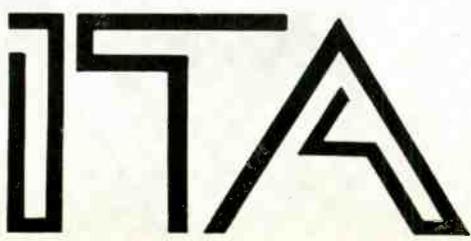


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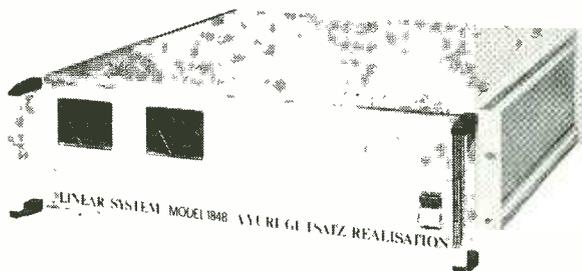
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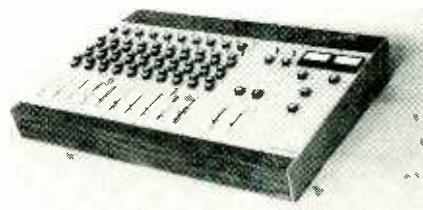
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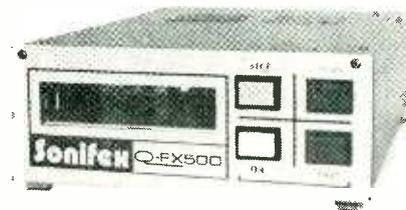
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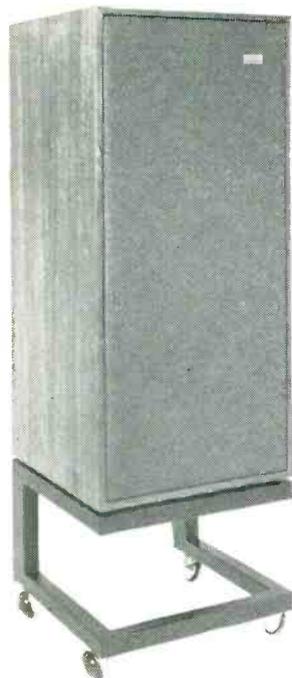
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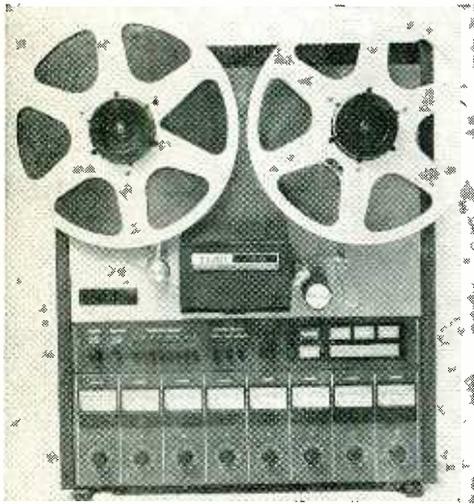
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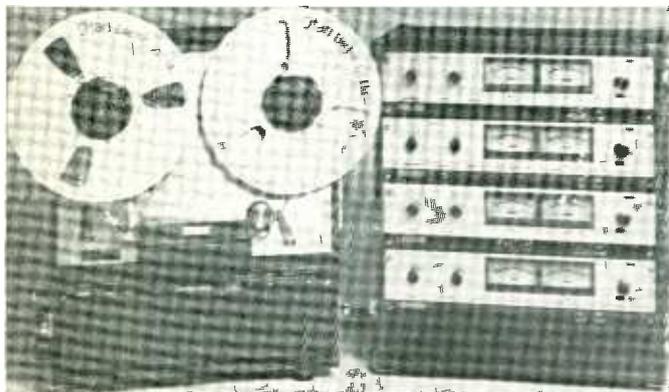
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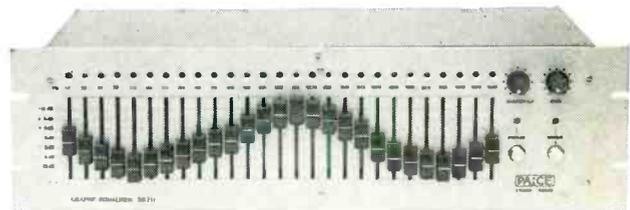
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### PERFORMANCE

|                                    |  |
|------------------------------------|--|
| GAIN                               | up to 40 dB                                    |
| CENTRE FREQUENCY ACCURACY          | Better than 5%                                 |
| MAXIMUM OUTPUT                     | 10.5V RMS $\nabla$ (+22 dBm) into 600 $\Omega$ |
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| TOTAL HARMONIC DISTORTION          | Less than 0.02%                                |
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SS/NOV/77



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The Tandberg 10X is an amazing piece of machinery. Used in studios and in broadcasting, its professional credentials are outstanding. It's the only one in the world that gives you 10½" reels with a 15 ips facility, and the unique cross-field technique on all three speeds.

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Tandberg 10X  
for the professional

enables you to monitor the tape during fast winding. Another feature is manual spooling for precise location of programme material for accurate cueing and editing. The 10X has three motors, three speeds, four heads and electronic servo speed control—plus many other features, including optional remote control. And it's competitively priced.

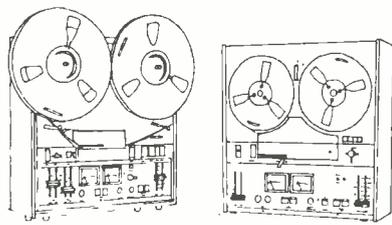
Although the 10X is the superstar of our reel-to-reel recorders, the medium-priced 3500X offers excellent recording qualities. It's a proven machine—reliable and versatile. It also incorporates the Tandberg Crossfield technique. Other features

include three speeds, four heads, A and B monitoring, 30–22,000 Hz + 3 dB at 7½ ips and a signal-to-tape noise ratio of 64 dB (IEC A-curve).

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Tandberg 3500X for  
the damn-near professional



**TECHNICAL SPECIFICATIONS**  
All specifications better than requirements of DIN 45 511

|  |                            |                              |              |
|--|----------------------------|------------------------------|--------------|
| <b>POWER REQUIREMENTS</b>  |                            |                              |              |
| 50 or 60 Hz  | 240/230/115 V              | 240/230/115 V                |              |
| <b>POWER CONSUMPTION</b>   |                            |                              |              |
|  | 100 W                      | 45 W                         |              |
| <b>TAPE SPEEDS</b> t.p.s.  |                            |                              |              |
|  | 15-7½-3½                   | 7½-3½-1½                     |              |
| <b>SPEED TOLERANCE</b> max.  |                            |                              |              |
|  | ± 0.3%                     | ± 1%                         |              |
| <b>WOW and FLUTTER</b> , max.  |                            |                              |              |
|  | 15 t.p.s.                  | 0.07%                        |              |
| Peak   | 7½ t.p.s.                  | 0.09%                        | 0.1%         |
| DIN 45 511   | 3½ t.p.s.                  | 0.15%                        | 0.18%        |
|  | 1½ t.p.s.                  |                              | 0.35%        |
|  | 15 t.p.s.                  | 0.04%                        |              |
| Weighted   | 7½ t.p.s.                  | 0.06%                        | 0.07%        |
| R.M.S.   | 3½ t.p.s.                  | 0.11%                        | 0.12%        |
|  | 1½ t.p.s.                  |                              | 0.25%        |
| <b>FREQUENCY RESPONSE:</b>   |                            |                              |              |
|  | 15 t.p.s.                  | 30-30 000 Hz                 |              |
|  | 7½ t.p.s.                  | 30-26 000 Hz                 | 30-26 000 Hz |
| DIN 45 500   | 3½ t.p.s.                  | 30-20 000 Hz                 | 30-20 000 Hz |
|  | 1½ t.p.s.                  |                              | 30-11 000 Hz |
|  | 15 t.p.s.                  | 30-25 000 Hz                 |              |
|  | 7½ t.p.s.                  | 30-22 000 Hz                 | 30-22 000 Hz |
| ± 3dB  | 3½ t.p.s.                  | 40-18 000 Hz                 | 40-18 000 Hz |
|  | 1½ t.p.s.                  |                              | 40- 9 000 Hz |
| <b>SIGNAL TAPE NOISE RATIO</b><br>at highest tape speed with Tandberg Tape or equivalent tape.                     |                            |                              |              |
|  |                            | 2-track                      | 4-track      |
| IEC A-curve (DIN 45 500, weighted)   |                            | 67dB                         | 65dB         |
|  |                            |                              | 64dB         |
| IEC, unweighted R.M.S. (DIN 45 500 unweighted)   |                            | 58dB                         | 58dB         |
|  |                            |                              | 57dB         |
| <b>HARMONIC DISTORTION</b> , max.  |                            |                              |              |
| From amplifier at 0dB  |                            | 0.2%                         | 0.3%         |
| From tape at 0dB record level  |                            | 2%                           | 3%           |
| <b>CROSSTALK ATTENUATION</b><br>at 1000 Hz, minimum  |                            |                              |              |
|  | Mono                       | 60dB                         | Mono 60dB    |
|  | Stereo                     | 50dB                         | Stereo 50dB  |
| <b>INPUTS</b>  |                            |                              |              |
| Input impedance/sensitivity, max. voltage at 400 Hz  | MIC (balanced):            | MIC:                         |              |
|  | 0.23 mV-35 mV              | 130 µ V-25mV                 |              |
| (MIC inputs are suitable for dynamic microphones. The sensitivity is automatically adjusted for the mic impedance) | RADIO: 50 k ohms/8m V-1.2V | RADIO: 50 k ohms /8m V-1.2V  |              |
|  | LINE: 200 k ohms/30m V-5V  | LINE: 500 k ohms /100 mV-10V |              |
| <b>OUTPUTS</b>   |                            |                              |              |
| Min. load impedance/voltage with unloaded output or power output for each channel                                  | RADIO: 5 k ohms/0.775 V    | RADIO/LINE: 5 k ohms/1V      |              |
|  | LINE: 150 ohms/1.5 V       | HEADPHONES: 100 ohms/1 V     |              |
|  | HEADPHONES: 8 ohms/5 mW    |                              |              |

To: Tandberg (UK) Ltd, Farnell House,  
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- 1 Otari MX5050 2 track, shop soiled ... .. £550
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- 1 AKG BX20 reverb ... .. £1,500
- 1 Vortexion 3+3 mixer ... .. £45
- New boom mic stands, each ... .. £15
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- 1 Pair Lockwood copies + 15" Reds ... .. £275
- 1 Roland space echo ... .. £260
- 1 Pair Tannoy 12" Red chassis ... .. £130
- 1 Pair Koss ESP9 with PSU ... .. £40
- 1 Scully 16 track, acorn electronics ... .. £5,750
- Jackfields, 20 way, per row... .. £14
- 3 Heavy duty 6' x 19" racks, each ... .. £30
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- 2 Philips valve comp/lim., pair ... .. £300

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## APRS management course

We quote in full from a recent note sent to us by the Association of Professional Recording Studios:

'If you ask almost anyone in a recording studio why they are in business, the likely reply is: "To record music". But APRS Executive think otherwise. They say, with some conviction, that the business of people in recording studios is to make money. And when you think about it, that is why we are all in business of some sort. It just happens that recording music is one of the more pleasant ways of achieving the common end. (Or is it?) Because APRS Executive believe that many studio managers need to match their recording skills with business know-how, they have organised a week-end management course to take place this coming November.'

The course is to be held at Great Fosters Hall, Egham, Surrey, from November 18-20, 1977. Cost, including all meals and accommodation is £110, plus vat. Numbers are to be strictly limited to 20. Further details and application forms from: Ed Mazek, 23 Chestnut Avenue, Chorleywood, Herts WD3 4HA. Phone: Rickmansworth 72907.

## Acoustic telephone coupler

Shure has introduced a new device that should do away with the need to 'croc clip' a reporter's tape machine to a telephone handset for feeding material back to base.

Basically, the model 50AC coupler comprises a specially enclosed miniature loudspeaker and a 1.5m lead terminated in a 3.5 mm jack plug. A rubber strap holds the unit in close proximity with a telephone mouthpiece, reducing background noise.

The jack can be connected to a mixer, or a portable cassette or reel-to-reel machine for playback. A lever on the side of the coupler slightly lifts it away from the mouthpiece, to allow live commentary to be added without interrupting the transmission of the interview or voice report.

Alternatively, a line-level microphone, such as Shure's model SM82 can be connected directly to the coupler for live reports, or when a reporter does not want to be en-

cumbered with a tape machine.

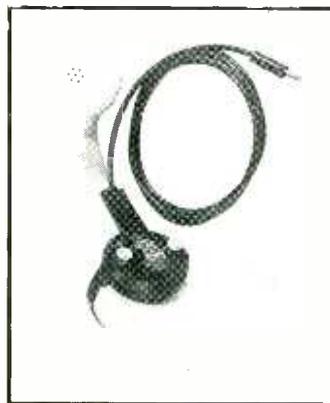
In addition, the coupler can be used as a conventional microphone. Its frequency response of 300-1k Hz has been tailored to approximate that of a telephone.

The 50AC weighs just 112g and costs £21.

Shure Brothers Inc, 222 Hartrey Avenue, Evanston, Ill 60204, USA. Phone: (312) 866 2200.

UK: Shure Electronics Ltd, Eccleston Road, Maidstone ME15 6AU. Phone: Maidstone (0622) 598881.

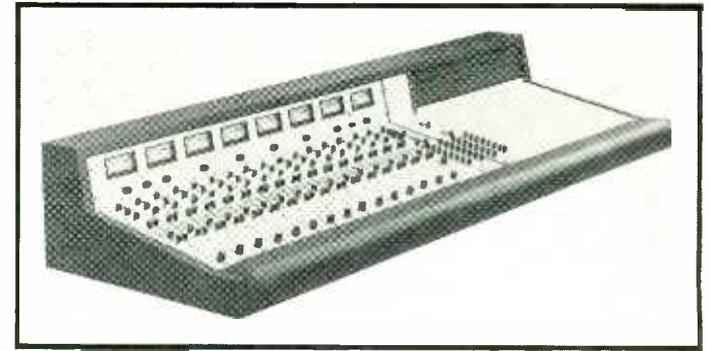
Shure 50AC acoustic telephone coupler.



## Cleaning up voice recordings

A computer-based processor developed by Rockwell is said to eliminate unwanted noises from voice recordings. The equipment, known as an automatic digital audio processor (ADAP), can be used either to clean a signal as it is being recorded, or to enhance a recording that has already been made. It is claimed that from 40 to 50 dB of highly-correlated noise can be removed with virtually no degradation in the desired voice signal.

Typical applications include on-scene radio reporting, on-location tv and movie filming, as well as



## Quantum 16/8 desk

Each input module has two independent echo and cue sends, six eq frequencies with an equalisation in/out switch, panning between odd and even-numbered program busses, a mic/line switch via a 15 dB pad, plus solo and mute.

Monitoring and output facilities include: an 8-track (optionally 16-track) monitor mix section, independent of program outputs; separate masters for control room monitors, studio monitors, cue busses and solo buss; a direct 2-track monitor input for stereo playback without disrupting the 8-track monitor mix; plus stereo master control and eight submaster controls. In addition, the talkback slates all eight busses, two cue busses, and the studio monitor feed.

The QM-168 costs \$5.9k.

Quantum Audio Labs Inc, 1905 Riverside Drive, Glendale, Ca 91201, USA.

Phone: (213) 841 0970.

enhancing vintage records by eliminating 'the tinny sound and bad acoustics' that were inherent in older studios and recording equipment. (Thought that gavethem their charm, but such is progress).

Two types of noise can be removed from voice tracks: additive sounds, generally music, traffic or other background noises; and convolutional sounds, such as resonances, room acoustics, or noises inherent in recording equipment. Rockwell International Corp, Autonetics Group, 3370 Miraloma Avenue, PO Box 3105, Anaheim, Ca 92803, USA.

Phone: (714) 632 4195.

## Pearl in the US

Cara International has been appointed as agents for the Pearl range of mics in the western states. Their address is 4145 Via Marina, 120 Marina del Rey, Ca 90291. Phone: (213) 821 7898.

## Varispeed A77, plus price cuts

FWO Bauch, UK distributors, has introduced three 2-track versions fitted with remote varispeed control units: the models 11102 (9.5 or 19 cm/s, NAB); 11106 (19 or 38 cm/s, NAB); and 11108 (19 or 38 cm/s, IEC).

The varispeed controller is housed in a separate unit and has a 5m cable to connect it to the tape machine. Speed variations of up to ±80% can be selected. Weighted wow and flutter with the controller is claimed to never exceed 0.06%. Price of the varispeed as a fitted option is £35.

Also announced is a price reduction of approximately 7% on high-speed versions of the A77. The 9.5 or 19 cm/s model 11106 is now priced at £544.

FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ.

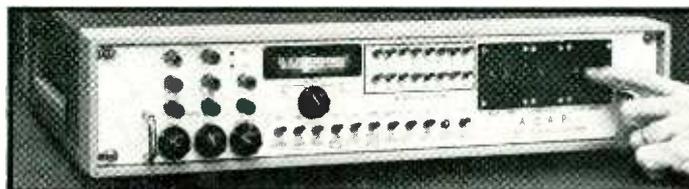
Phone: (01) 953 0091. Telex 27502.

## Pa installations

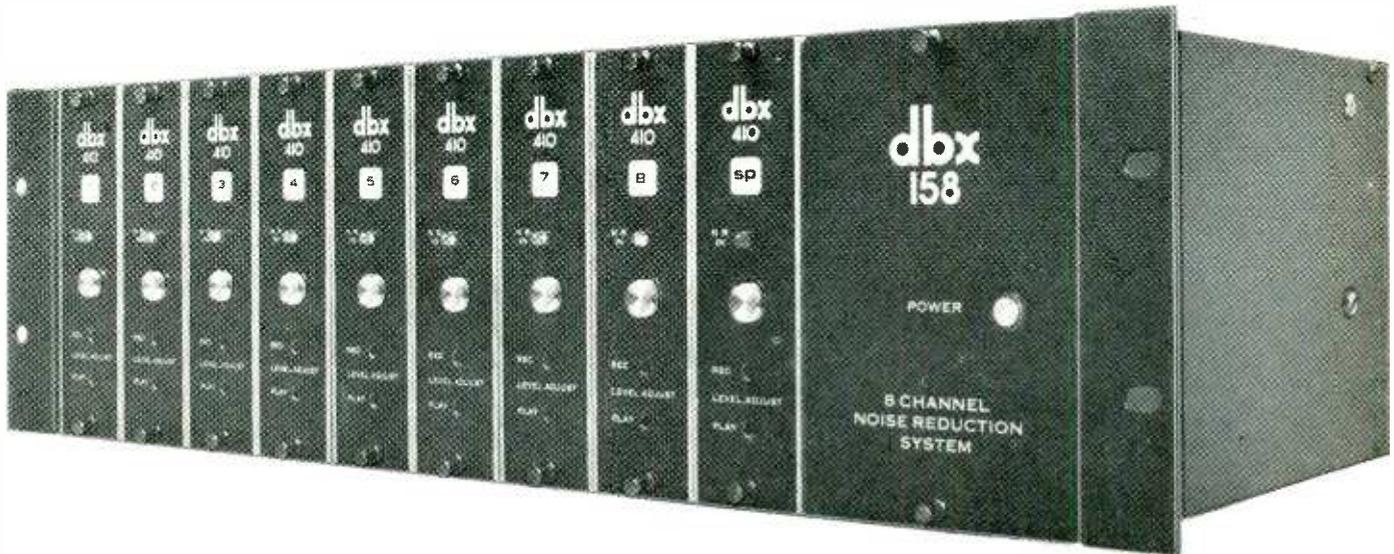
Maldwyn Bowden Associates, a company specialising in audio and lighting installations, has published a leaflet detailing the work it undertakes. Projects currently being completed include a large pa system for a Sussex hospital; the building of a-v studios with full slide synchronisation facilities, and a sound system that meets broadcast specifications; the design and construction of a sound system for a university arts theatre; and the fitting out of a London club with a complete sound and lighting system.

Maldwyn Bowden Associates Ltd, 168 Edward Street, Brighton, Sussex BN1 2JB, UK.

Phone: Brighton (0273) 67384.



# DBX Announce the New Model 158 Budget DBX Noise Reduction for the Small Multi-Track Studio



The dbx 158 is a semi-professional version of the well-established dbx professional series of noise reduction units. Recordings made with a dbx 158 may be decoded by any studio using dbx professional equipment.

At a U.K. List Price of £1614, the dbx 158 provides 8 tracks of *simultaneous* encode and decode noise reduction, obviating the need for mode switching of noise reduction system by operator or machine.

By reducing tape noise by more than 30db, it significantly increases the multiple overdub capability of any recorder – especially those using 1/2" 8 track recording formats.

dbx's unique and patented circuitry does not require critical matching of encode (record) and decode (play) levels, therefore no reference tones or metering are necessary.

Phono and Molex multi-pin connections allow rapid interface to the unit and modular construction with inclusive spare module ensures minimum downtime in the event of breakdown.

- ★ **Unbeatable 30db noise reduction**
- ★ **Total compatibility with dbx professional studio noise reduction equipment**
- ★ **Modular format**
- ★ **Simplicity of operation**

For full details on the dbx 158 or any dbx professional or semi-professional product, please contact



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Tel: 01-734 2812

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Oslo 1  
Tel: Oslo 412 996

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

## Tannoy—the benevolent giant

Tannoy is, without doubt, one of the most respected names in British audio. A survey conducted by *Music Week* in 1976 showed that of 116 recording studios who answered a questionnaire, 58% used Tannoy drive units for monitoring. (Incidentally, JBL came second in the survey, with 16.5%.) And such success has not come overnight for Tannoy.

The company was formed in 1926, by Guy Fountain, to manufacture and sell chargers for radio set accumulators. The rectifier was formed from tantalum and a lead alloy—hence the trade name of Tannoy. By 1930 the company had moved into the pa area where, of course, it is still a front runner.

Indeed the very success of the company in pa presents a perpetual legal problem for Tannoy, because the trade and public alike must continually be reminded that a pa system is not necessarily 'a Tannoy'. If the word 'Tannoy' were to become synonymous with pa, then it would no longer be allowed on the Register of Official Trade Marks and would pass into the public domain, in the manner of other once-registered marks like aspirin, linoleum and gripe-water.

It was in the early Fifties that Tannoy dual-concentric speakers started to edge their way into recording studio control rooms. They quickly found favour (like JBL subsequently) as a unit capable of producing high, clean levels of sound from the relatively low-rated power amplifiers that studios have traditionally favoured.

In 1974 Guy Fountain retired and Tannoy was bought by Harman International, which also owns Harman-Kardon, JBL and Ortofon. Recently the boss of Harman, Dr Sidney Harman, was made Under-Secretary of State for Commerce, under President Carter, and had no choice but to sell all his shares in the company. These were bought by Beatrice Foods, who not only make candybars, drinks and yoghurt, but Samsonite suitcases into the bargain.

While all this was going on, Tannoy in the UK has been maintaining its reputation and production, and a year ago moved production into a new factory at Coatbridge, on the outskirts of Glasgow. A party of audio journalists was recently shown round this factory, and without doubt what Tannoy are doing there is both brave and laudable.

In short, the object of the exercise at Coatbridge is to make the

work force happy while still making a profit. Doubtless it is significant that Tannoy's step-brother company, JBL, is involved in similar job-satisfaction schemes in the USA; and in many respects what Tannoy is doing at Coatbridge resembles what Bang & Olufsen is doing in Denmark. In both factories there is a move away from the traditional and soul-destroying conveyor-belt, mass-production line technique. Instead, there is a move towards group technology, with individual workers or groups of workers personally responsible for the finished product.

At Coatbridge the experiment goes further, under the watchful eye of sociologist Mary Weir, contracted by the Department of Employment to help make work more satisfying for all concerned. There is a deliberate attempt to break down class barriers, with management and shop floor workers sharing the same canteen, toilets, car park, and so on, and the contract of employment including a clause that promises every shop-floor worker job interchangeability. If, for instance, a coil winder becomes bored with winding coils, he or she can ask to be moved onto cone doping or magnet construction, and so on. Hand in hand with job interchangeability goes a very simple pay structure, with virtually no differentials.

Inevitably, job flexibility brings short-term problems and frustration for management. It takes time to learn how to wind coils well, and production efficiency is bound to suffer if there is a continual stream of new people learning to wind coils. The Coatbridge manager, Jim Hughes, is confident, however, that in the long term flexibility will pay off—eventually everyone on the factory floor will be able to wind coils, dope cones and construct magnets, so that even if there is a flu epidemic which lays low every single coil winder, production can continue with a simple reshuffle on the shop floor.

Realistically, however, this kind of approach can only work in an area where jobs are precious and the work force can be relied on to stay with the same company for years on end. And in the Coatbridge area jobs are certainly precious: the unemployment rate is 10% or more. The factory was built on spec by the local authority several years before Tannoy even thought of moving up North. On the day that Jim Hughes first visited the factory and turned on the lights to look round, there were soon 200 people at the door looking for jobs.

In the event, Hughes and his management staff were very selective over whom they employed.

They also brought in workers slowly, bringing some production staff up from London to train the first batch of locals, and then leaving the first batch of locals to train the next employed batch. 'We train quality into the production line,' is Hughes' philosophy.

Without doubt, some of those who visited Tannoy at Coatbridge were dubious about what they would see. The job enrichment philosophy sounds almost too good to be true, and in the hi-fi area there is already existing a classic example of what can go wrong when skilled industry is created in an area of high unemployment. The UK Government-backed hi-fi firm, Strathearn, based in Belfast, has so far secured an appalling reputation for rather poor production and quality control. This is caused simply by asking too much, to soon of local workers, who were either never previously employed or accustomed to working in heavy industry and quite unfamiliar with fine audio technology. But it is safe to say that the consensus of visitor opinion was that the Coatbridge experiment seems to be working, and the production line technique and inbuilt quality control leaves nothing to be desired.

There is, however, another side to the coin. Tannoy recently announced the launch of several new loudspeakers aimed at the professional studio and upper-end of the domestic hi-fi market. There is a 'black box' *Monitor Red* for studios with a single dual-concentric driver (price unfixed); the *Buckingham*, a 3-way system in rosewood cabinet (at a staggering £1000 each); and the *Windsor*, a smaller version of the *Buckingham* (at £600 each). These three speakers were demonstrated in a reception room at the Excelsior Hotel near Glasgow Airport, but—to be brutally frank—the consensus (probably unanimous) of opinion of all present was that the demonstration was unworthy of Tannoy.

Only a fool would normally try and judge the sound of a loudspeaker system on the basis of a short, semi-public demonstration. Subtle inadequacies in a system may make their presence felt only after prolonged listening; other, more immediate inadequacies may tend to disappear as the brain of the listener forgets past, arbitrary references. But the muddle of high frequencies produced by the *Buckingham* was no subtle inadequacy; it was a glaring disappointment. It is inconceivable that anyone with ears would spend £2000 on a pair of *Buckinghams* sounding like those at the Excelsior. The cheaper *Windsors* (but still £1200 a pair, remember) were better, as were the

*Monitor Reds*.

But the manner in which the demonstration was given seemed extraordinarily naive for a company like Tannoy. To show off the abilities or otherwise of a monitor in this order of price range surely requires a master tape, preferably with Dolby A. But Tannoy were using ordinary, commercial disc pressings, one of which at least (a Decca re-issue) rightfully belonged in the dustbin.

Could it be that Tannoy is being pushed by the American parent company into releasing these new speakers? If so, then the result could be disastrous. The 58% slice of the studio market that Tannoy hold is not impregnable. Other firms are moving into the area of high-efficiency, heavy-duty monitor-style systems. Rank-Wharfedale, for instance, have recently launched the *E Series*, which at only £250-350 a pair appears to bear favourable comparison with JBL and Tannoy systems at many times that price.

It would be a pity if the Coatbridge experiment were to fail, not for industrial or production problems, but because what the factory produces is handicapped by basic design faults, over-pricing and ill-considered demonstration techniques. The *Buckingham* and *Windsor* have not yet been officially launched in the UK, and we beg Tannoy to think twice and listen hard before making a further move in this direction.

Adrian Hope

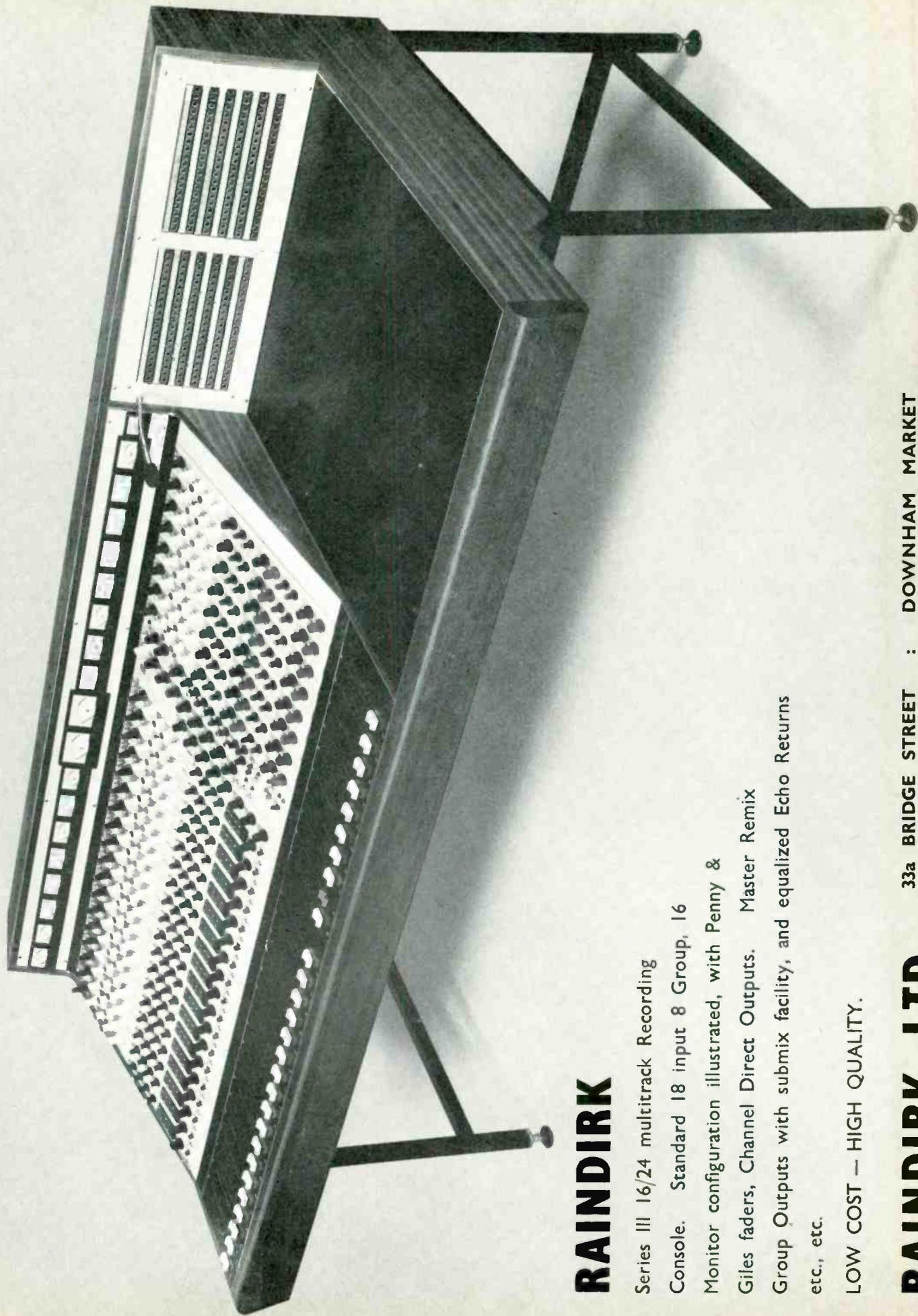
### SCAMP for Radio Clyde

The Edinburgh-based ilr station recently ordered a complete rack complement — 17 modules — of Audio & Design's signal processing gear. The modules included *SO1* compressor-limiters, *F300* expander gates, *SO3* sweep equalisers, *SO5* highpass and *SO6* lowpass dynamic noise filter/gates.

### Roger Squire name change

The company's studio equipment division has been re-named Roger Squire's Pro-Audio, 'to more truly reflect the range of products being sold'. These include gear bearing the Soundcraft, Allen & Heath, Chiltern, H/H, Alice, AKG, Calrec, Shure, Otari, Teac, Tascam and Revox brand names.

Full details of the entire range are to be found in a new 60-page catalogue, copies of which can be obtained free of charge from: Roger Squire's Pro-Audio, 55 Charlbert Street, London NW8 6JN. Phone: (01) 722 8111.



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## NEWS

### Two new APRS men

At the recent 25th agm, Simon White of Marquee Studios and Ken Townsend of EMI Studios were elected to the Executive, which now reads as follows: Jaques Levy (Chairman), Michael Beville, Roger Cameron, Clive Green, Dave Harries, Peter Harris, Leslie Lewis, Edward Pinniger, Peter Tattersall, plus the aforementioned Simon White and Ken Townsend.

### Broadcast Electronics move

The manufacturer of *Spotmaster* tape cartridge machines and compressor-limiters for am and fm broadcasting has moved to: 4100 North 24th Street, Quincy, Ill 62301, USA. Phone: (217) 244 9600. Telex: 250142.

### Af sweep measurement

Wandel and Goltermann has introduced a sweep measuring set with frequency ranges 200-4k Hz and 20-20k Hz. The unit can be used to set up, test and monitor speech, music and broadcast channels and systems. Most transmission parameters, including level, attenuation, return loss, impedance and frequency can be measured, the results being displayed on a crt. Weighted and unweighted noise measurements are an optional feature.

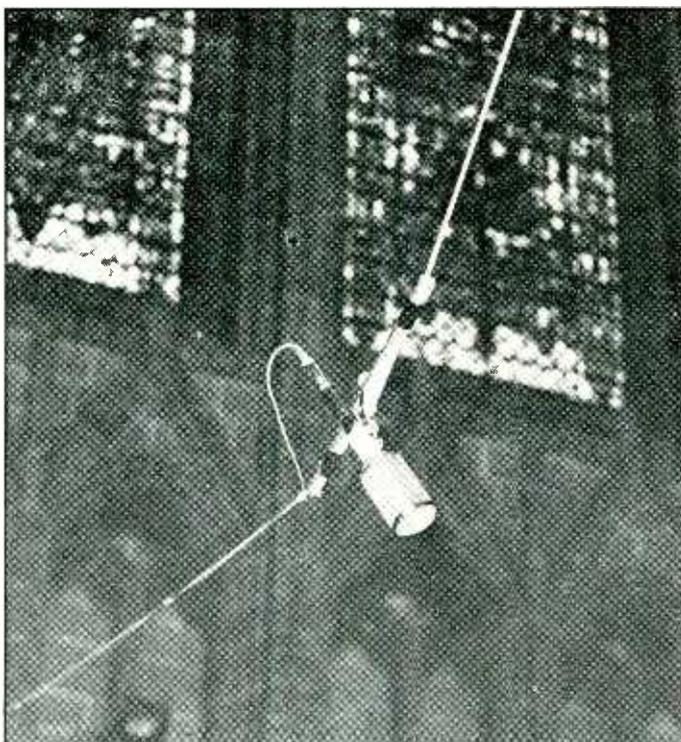
Wandel and Goltermann, Postfach 45, 7412 Eningen, UA, West Germany. Phone: 7121 8441.

UK: Wandel and Goltermann (UK) Ltd, 40-48 High Street, Acton, London W3. Phone: (01) 992 6791.

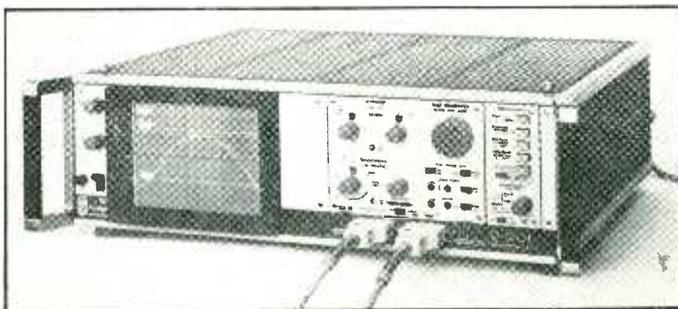
### DI box

A new unit from EMO Systems features a fully floating output to minimise hum problems, and is suitable for mixer inputs of upwards of 200 ohm impedance. Inputs to the box can be from an instrument (100 kohm impedance, 1V max output), an amp's speaker terminals (100 kohm impedance, 100V max input), or from an amp's slave output (8 kohm, 30V max).

Frequency response is a claimed  $\pm 1$  dB, 20-20k Hz (slave input, output loaded to 600 ohm). The box contains no active elements, measures 115 x 75 x 30 mm and weighs just 400g. Price is about £27. EMO Systems Ltd, Durham Road, Ushaw Moor, Durham City, UK. Phone: Durham (0385) 730787.



The Calrec sound field microphone in use in Liverpool Cathedral during the Centenary Celebration performance of Mahler's 8th Symphony. This live broadcast was the first transmission using the NRDC Ambisonics System, and was carried out by Radio City, Liverpool, in collaboration with engineers of the Independent Broadcasting Authority.



Above: Sweep measurement set from Wandel and Goltermann.

Below: The new BGW 250C power amp.



### Power amp

The new model 250C from BGW is capable of delivering 100W per channel into 8 ohm with a claimed im distortion of 0.03%, or 150W into 4 ohm at 1 kHz. The amp can also be operated in a bridged mono mode, delivering a power output of 251W into 8 ohm.

Features include front-panel clipping indicators and relay-

operated delay and speaker protection. Separate chassis and signal grounding connection are provided to eliminate earth loops.

BGW Systems, 13130 South Yukon Avenue, Hawthorne, Ca 90250, USA.

Phone: (213) 973 8090.

Canada: Omnimedia Corp, 10245 Cote de Liesse, Dorval, Quebec H9P 1A3. Phone: (514) 636 9971.

UK: Webland International Ltd, Mirabel House, 117/121 Wandsworth Bridge Road, London SW6 2NA.

Phone: (01) 736 0987. Telex: 25570.

### Bicentennial mic

The Electro-Voice *EV1776* electret features a 60-18k Hz range and a single-D cardioid pattern that increases bass as the performer moves closer to the mic. This latter feature can be used for a straight bass-boost, or to provide greater feedback reduction and isolation.

Electro-Voice Division of Gulton Europe Ltd, The Hyde, Brighton, Sussex BN2 4JU.

Phone: Brighton (0273) 66271. Telex: 87172.

### Pa speakers

Shure has introduced two systems—*SR112* and *SR116*—designed to operate with power amps capable of delivering up to 100W of continuous power into an 8-ohm load. Both units have identical performance characteristics: *SR112* is designed for permanent indoor installation, and also features extra weather protection to allow outdoor use for limited periods of time; while the *SR116* is a portable version with a carrying handle and designed to be roadie-proof.

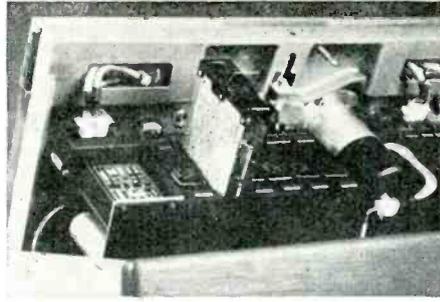
An spl of 95.5 dBA at 1.3m can be produced from an input of 1W, and frequency response is claimed to be virtually flat from 45-16k Hz. Drive units are two 203 mm bass drivers and a hf compression driver coupled to a 120° radial horn. Shure Electronics Ltd, Eccleston Road, Maidstone ME15 6AU. Phone: Maidstone (0622) 59881.

### Video Tradex 77

Following the success of last year's Video 76 exhibition, Video Tradex 77 is again being held at London's Heathrow Hotel from November 22-25. Sponsored and organised by our sister magazine, *Video & Audio-Visual Review*, the exhibition will provide an opportunity for the latest video equipment to be examined, including new video cassette recorders from Philips, JVC and Sony. Being held alongside, in the hotel's York Video Theatre, the Video Tradex Conference includes a half-day session on television sound.

For full details of the conference and free tickets for the exhibition contact Wendy Smeeth, Video & Audio-Visual Review, Freepost, Link House, Dingwall Avenue, Croydon CR9 2TA. Phone: (01) 686 2599 Ext 212.

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## Quartz precision. What it's done for watches, it does for the F400



In timekeeping, quartz accuracy is measured in millionths of a second. That's precision.

Now, with the F400 from Schlumberger, quartz precision comes to professional tape recording. Because the F400's DC drive motor is crystal-slaved and phase-locked, setting new standards of stability in tape transport speeds. Better, in fact, than 0.02%. With stability like this, the necessity for a speed control is eliminated.

The slave facilities make the F400 ideal for integration into computer-controlled systems. The DC drive makes possible a wider range of speeds; forward and reverse tape transport; and easily

controllable acceleration and deceleration.

Other features include modular construction of both mechanical and electrical components for easy maintenance, and hard-tipped long-life magnetic heads.

So when it comes to the latest technology in professional tape recording, think quartz. Think precision. Think F400.

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## NEWS

### Apology number 1

It appears that the US address for Revox quoted on p28 of the September issue was incorrect. It should have read as follows: Studer Revox America Inc, 1819 Broadway, Nashville, Tennessee 37203, USA.

### Apology number 2

We seem to have printed details of the same new product not just once, but twice. We refer to the item headed 'Nagra mini-mixer' on p32 of the September issue, and that entitled 'Mini-mixer for Nagra SN' on p22 of the October issue. In fact, the second item was meant to be a correction for the first, but we forgot to say so. To recap: forget the September item and refer to October.

### Future Film Developments move

The company no longer resides in beautiful downtown Wardour Street, but has moved a couple of streets in a westerly direction to: 36/38 Lexington Street, London W1R 3HR. The phone and telex remain unchanged: (01) 437 1892 and 21624, respectively.



### Burwen cans

The *PMB 8* stereo headphones from Burwen are of semi-open design but are said to have an excellent bass response similar to closed headphones, using internal damping material to attenuate most external noise. Frequency range is a claimed 15-26k Hz, and total harmonic distortion <0.3%. The cans can withstand a maximum spl of 112 dB at 1 kHz, and have a 150 ohm impedance. Weight is approximately 350g.

The orthodynamic driver used in the *PMB 8* utilises an ultra-thin voice coil diaphragm, positioned between two perforated disc magnets. The diaphragm has coaxial conductors printed on its surface that spiral in opposite directions to ensure uniform electrical impulses. The two disc magnets are sintered, which provides a large surface area for the active magnetic material. The drive unit segments are joined at the centre and the edge, so that the segments respond in phase.

Burwin Research Inc, 30 Cross Street, Cambridge, Mass 02139, USA.

Phone: (617) 491 5060.

### Special effects unit

The *STRAMP Echo-7000* from Peter Strüven is a combined stereo echo (plus reverb), phaser and vibrato unit. Because the delay and effect sections can be linked, other effects can be created.

20 dB headroom and a frequency range of the delay chain in excess of 8 kHz 'flat' (original signal: 20-20k Hz) are featured. Delay time for the first echo is continuously variable to a maximum of 300 ms. The unit is designed for 483 mm rack-mounting.

Peter Strüven GmbH, Bornheide 19, 2000-Hamburg 53, West Germany.

Phone: 040 801028.

### Equipment surveys 1978

The following is a list of equipment we will be surveying next year:

|   |                                 |
|---|---------------------------------|
| January: Multitrack machines            | July: Test equipment            |
| February: Equalisers                    | August: Power amplifiers        |
| March: Studio designers and consultants | September: Monitor loudspeakers |
| April: Cart machines and turntables     | October: Studio ancillaries     |
| May: Noise reduction                    | November: Special effects units |
| June: International issue               | December: Mixers.               |

Following our practice in the previous survey of mixers, the December 1978 issue will be devoted to broadcast and sound reinforcement desks, while the January 1979 issue (let's hope we're still around then) will survey multitrack consoles.

# Oscar Peterson plays Bösendorfer



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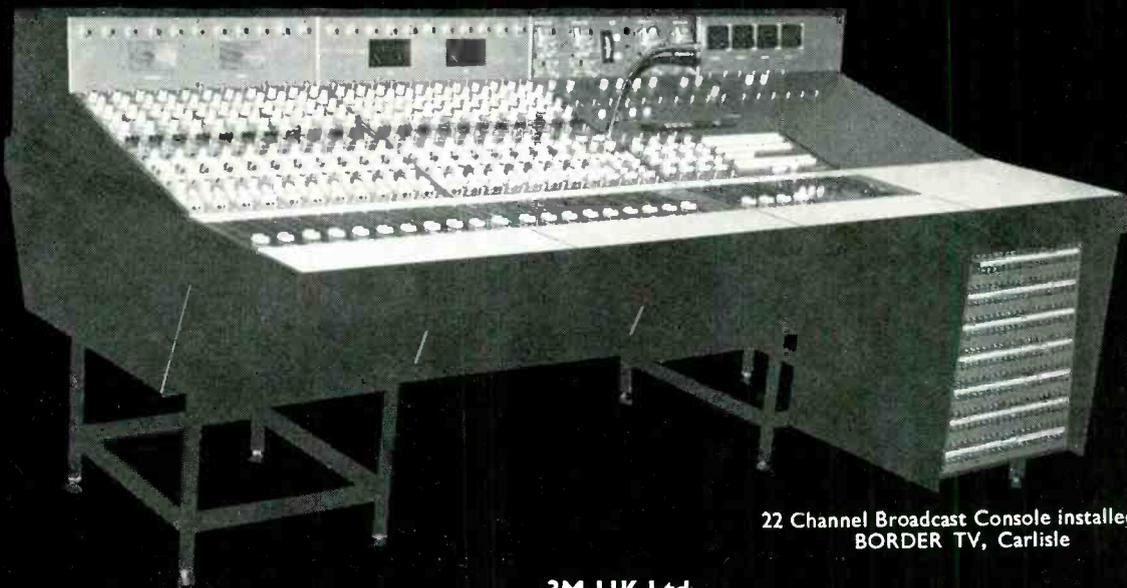
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### 3M UK Ltd

Witley Gardens  
Witley Walk, Southall  
01-547 5929/6045  
Telex: 932510

### Sait Electronics

Chausse De Ruisbroek 66  
B-1190, Bruxelles  
Telex: 21601

### Exhibo Italiana

Via F Frisi 22  
20052 Monza  
Italy  
Telex: 25315

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# A coincident microphone technique

Brian Preston

*There is at this time considerable controversy amongst engineers over the merits of simple microphone technique. The experience of someone who actually practises this commercially, may be of value to those who like the author are generally dissatisfied with the sound quality on the majority of modern recordings.*

**I** DO NOT agree with the claim that simple pair or coincident microphone techniques are not viable due to the time element involved in obtaining a satisfactory balance. Nothing is impossible and given the cooperation of all concerned with the recording, experience reduces the time aspect to acceptable levels. It is necessary, however, to give prior evaluation to the recording and to be in possession of ears capable of recognising the finer points of

*Christopher Herrick playing the Digby Dulcan harpsichord at Minterne House, Dorset.*



phase and coherence in the reverberation pattern, while being subjected to the full volume of the direct sound. Also essential is that the engineer be able to isolate himself from the musical notation, and recognise the subtle qualities of an acoustic instrument that the maker has strived for years to incorporate. It is important to evaluate the blend of these qualities with those of other instruments, as well as the resulting musical enhancement imparted by the addition of natural reverberation.

Occasionally one hears a sound so beautiful in its musicality that it defies description. The strings of The English Chamber Orchestra rehearsing under Charles Mackerras in Bath Abbey produced such a sound, and I well remember being captured by the sheer magic of the moment. On looking around at the many others present however, it soon became apparent that few had noticed, let alone experienced, the emotional content in the performance. With regret, this has been verified on many a subsequent occasion. And it is my contention that this important factor in musical production is more likely to be recognised by the critical listener than the musician. The effect is directly related to distance and the addition of natural reverberation, resulting in a sound of extreme purity and smoothness; quite a different character to that produced by close contact with the instruments.

If this is so then, logically, the greatest long term satisfaction will be achieved by recreating what is experienced in the best listening position of a particular location, based on the overall musicality of the sound. Subtle 'adjustment' of musicians and microphones can be used to eliminate, as much as possible, deficiencies of balance and such acoustic anomalies as may exist. To avoid any disturbing phase effects and break-up of the reverberation pattern, which become all too obvious on some of the very fine playback equipment now available to the public, it is essential that the sound be captured by microphones placed as closely together as possible. In practice this is best achieved by mounting one capsule above the other, thereby ensuring that all lateral information is received in phase. With microphones of extreme polar accuracy mounted at an included angle of 90°, a sound picture can be recorded that will demonstrate absolute positional accuracy, and an illusion of depth and perspective never experienced with the ubiquitous multimiking methods.

To be in a position to recognise this musical quality demands monitoring of the very highest standards, with loudspeakers of single-point sound source ensuring complete accuracy of phase and response throughout the entire frequency range. The ability to respond to minute transients and follow complicated waveforms is a requirement that must be met, if one is to be in a position to assess subtle degrees of improvement introduced into the recording chain. A freedom from box resonances and dispersion characteristics which allow minimal room contribution, complete the criteria, and it appears at this time that only full-range electrostatic loudspeakers come anywhere near offering sufficient quality to allow

continual analysis and subsequent improvement of both equipment and microphone technique.

Our own location monitoring is done with Quad electrostatics, and one always feels assured in the knowledge that the material actually on the tape when a session is over is up to par. The loudspeakers are driven by a BGW 250B, and this is the result of considerable investigation of available power amplifiers. The combination does appear to be extremely neutral and is quite capable of fooling the ear in moments of low concentration; though not without a 2 ohm resistor connected in series, because of the Quad's falling impedance at high frequencies. (Recent experimentation with a pair of aged 15W valve amplifiers does indicate, however, that these may well be more musically satisfying, but it is too early for me to elaborate on this.) I have on occasion been amazed at the level of sound produced by these loudspeakers on full organ in a fairly large vestry. Certainly my own findings indicate that many of the reservations often voiced about Quad electrostatic loudspeakers should be concerned, in fact, with the amplifier used. Of course, the bass extension is limited by the chosen physical parameters, but appears perfectly adequate down to 45 Hz. Since the loudspeaker distortion is so low it is possible to set them up quite close to the desk. Musicians sitting in the 'prime' seat have often commented on the illusion of listening to a scene which is not there, such is the transparency of the sound stage. It must be emphasised that this degree of accurate perspective can best be achieved by attempting to reproduce the direct sound level of the instrument as heard at the microphone position. Subjectively this feels too low a level for some people, and is due, of course, to the fact that the sound is emanating from one direction without the benefit of reinforcement from all-round reverberation. I am often aware when someone is playing one of our recordings that the sound level is higher than the direct sound I heard when standing behind the mics at the session.

Trying to find microphones of sufficient quality to do full justice to an original sound is difficult. In the end one has to evaluate the design parameters, finally coming up with certain alternatives that should be accurate if correctly engineered. Nowadays I use Schoeps microphones for almost everything. It is worth mentioning that these are transformerless and this, coupled with a diaphragm resonance above audibility, gives a clearness to the extreme top and an overall transient attack to the sound that is quite a revelation. Direct comparison with a pair of AKG 411s, sometimes used as an alternative if the acoustics are a little hard, shows that the latter introduce a slight veil over the sound, resulting in a warmer effect but with loss of detail. This is partially due to the inherently higher noise level.

After a period of experimentation with various angles I now usually set the mics at 90°, since positional and perspective accuracy appear more precise in this arrangement than with the wider angles favoured by some engineers. Likewise the cardioid mode is rarely used, as this *seems* to introduce unmusical characteristics into the sound: transients that are too well defined resulting in slightly less acceptability in the long term. Changing to hypercardioid immediately smoothes this if the polar response is accurate and the frequency response flat all round. There is also the added interest of reverberation pickup which closely approximates to the front/rear relationship of the human ear and, as previously mentioned, improves the musicality of the recording. Provided the polar response is very accurate it is possible, by vertically tilting the array, to vary considerably the apparent character of the rear reverberation without substantially altering the direct sound. This is very useful for eliminating obvious faults in the acoustics and can be quickly done.

I used this to advantage recently while we were recording the Silver Ring Choir in Bath. On this occasion a balance was achieved in about a quarter of an hour; very important when there are 80 singers waiting for you. Although hypercardioid is the most useful, there is no doubt that figure-of-eight is the mode that most closely approaches realism, and here we get back to Blumlein. Listening to good quality figure-of-eight recordings on electrostatic headphones fed by the very minimum of necessary electronics, results in one's head often turning due to some minor sound so accurate that the ear is completely fooled. Unfortunately, more often than not it is impractical to use this mode in unfamiliar locations, since it is more difficult to eliminate acoustic anomalies and therefore more time consuming. Or, alternatively, there is too much reverberation that cannot be overcome without the risk of introducing an echo.

If everything that needs to be recorded can be done with just two microphones, I much prefer to feed them directly into a stereo Nagra — this gives superb results. The machine is set up to very close tolerances, typically within 1 dB from 40 Hz to 18 kHz, and great attention to detail is given to the predistortion circuitry. With care it is possible to get this reading well below 0.5% (mainly third harmonic) at a level of +12 dBm, rising to approximately 0.7% at +16 dBm, the limiter's operating point. The Nagra's electronics are of sufficient accuracy to enable these waveforms to be nudged into phase, and this will usually maintain for a complete batch of tape.

The result is that it is virtually impossible, even with the most analytical monitoring equipment, to tell any difference when switching from source to tape on the machine. This is contrary to many opinions but nevertheless true. I must also mention that I believe a correctly set up pair of Dolby 361 units to be infinitely better than no noise reduction. There is, of course, a small degree of loss in introducing an additional stage in the chain but this is preferable to the problems one has to face otherwise. I have found that print-through is of little consequence with encoded tapes, whereas it is very difficult to record to the same level without severe problems if noise reduction is not used. Furthermore, even using the full dynamic range of the Nagra (one of the best machines available in this respect) the tape noise of even the quietest tape is apparent and masks some of the detail of the recording, resulting in slightly less depth to the perspective. In addition to this, modulation noise is evident on our B62 Studer as well as the Nagra. On dynamic loudspeakers, which are mainly incapable of following intricate high-frequency detail, this can be mistaken for part of the signal, and indeed makes it appear as though there is more high-frequency energy on the tape. With the right monitoring facility, however, it is perfectly possible to analyse these differences and come to a firm conclusion. ▶

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The 'control room' at the Minterne House recordings.



## A COINCIDENT MICROPHONE TECHNIQUE

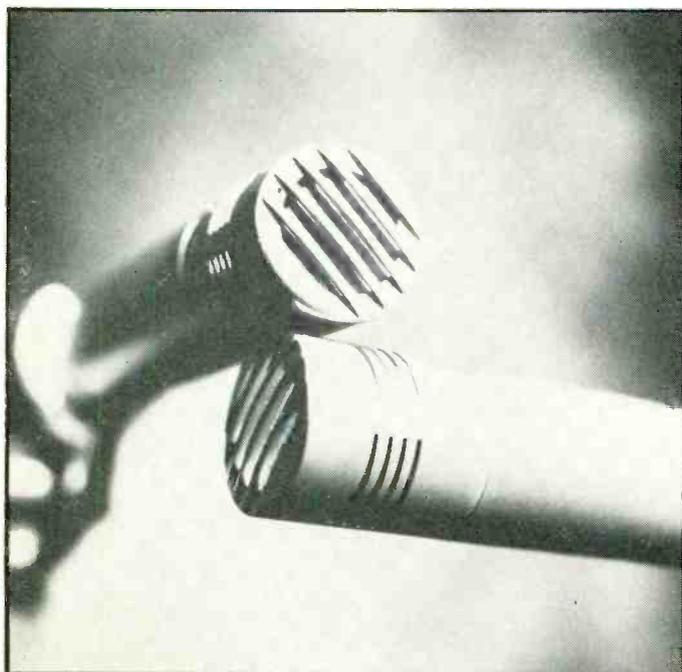
During a recent session at Hexham Abbey involving trumpet and organ, the Vivaldi two-trumpet concerto was to be recorded with the same player performing both trumpet parts. Schoeps hypercardioid microphones were used, set at 90° about 5m up and at a distance the ear confirmed as giving a good organ balance. The general sound of the earlier trumpet and organ and solo organ pieces was superb, with a positional accuracy, transparency of image and a freedom from distortion that left little to be desired. The organ and first trumpet were recorded, as were the other items involving trumpet, by mastering directly onto the Nagra. Crispian Steele-Perkins, the player, was placed to the left-hand side of the organ console, and pointing directly towards the microphones some distance away at the entrance to the nave. Overdubbing of the second trumpet was achieved by playing this master tape on the *B62* and re-recording onto the Nagra at the same time, superimposing the new image of the second trumpet, now placed on the right of the organ console, complete with its own reverberation pattern. The microphones were not moved, but during the copying procedure were fed, of course, through our Raindirk desk.

Both the Nagra and *B62* were extremely accurately matched with regard to frequency response, and particular attention was paid to azimuth. No equalisation or pan was used. The resultant recording is completely devoid of phase problems and of outstanding musical quality, closely resembling that which would be heard by the listener in a prime position.

The main difficulty experienced was the level of the second trumpet at entry points, and I found it impossible to anticipate this accurately, there being a degree of guesswork involved. I did find, however, that I was able to achieve a perfect balance almost instantly on hearing it, and to maintain this throughout the entire section by minute, completely inaudible movements of the fader. Editing on a nicely matched entry is not a problem, of course, with a fixed backing track.

This method of simple overdubbing is completely successful provided that careful equipment matching is adhered to, and results in a finished product of far greater musicality than do the normally accepted methods. It is quite an experience to listen to the alternating reverberation patterns of the two trumpets in this magnificent Abbey on a pair of Stax *SRX* headphones, and I am sure it would be quite enlightening to some engineers not familiar with this approach to sound engineering. In my opinion, however, the original master

Schoeps microphones mounted as a coincident pair. Photo: Stuart J. Thorn



The Silver Ring Choir of Bath.

Photo: Gregory Kynaston

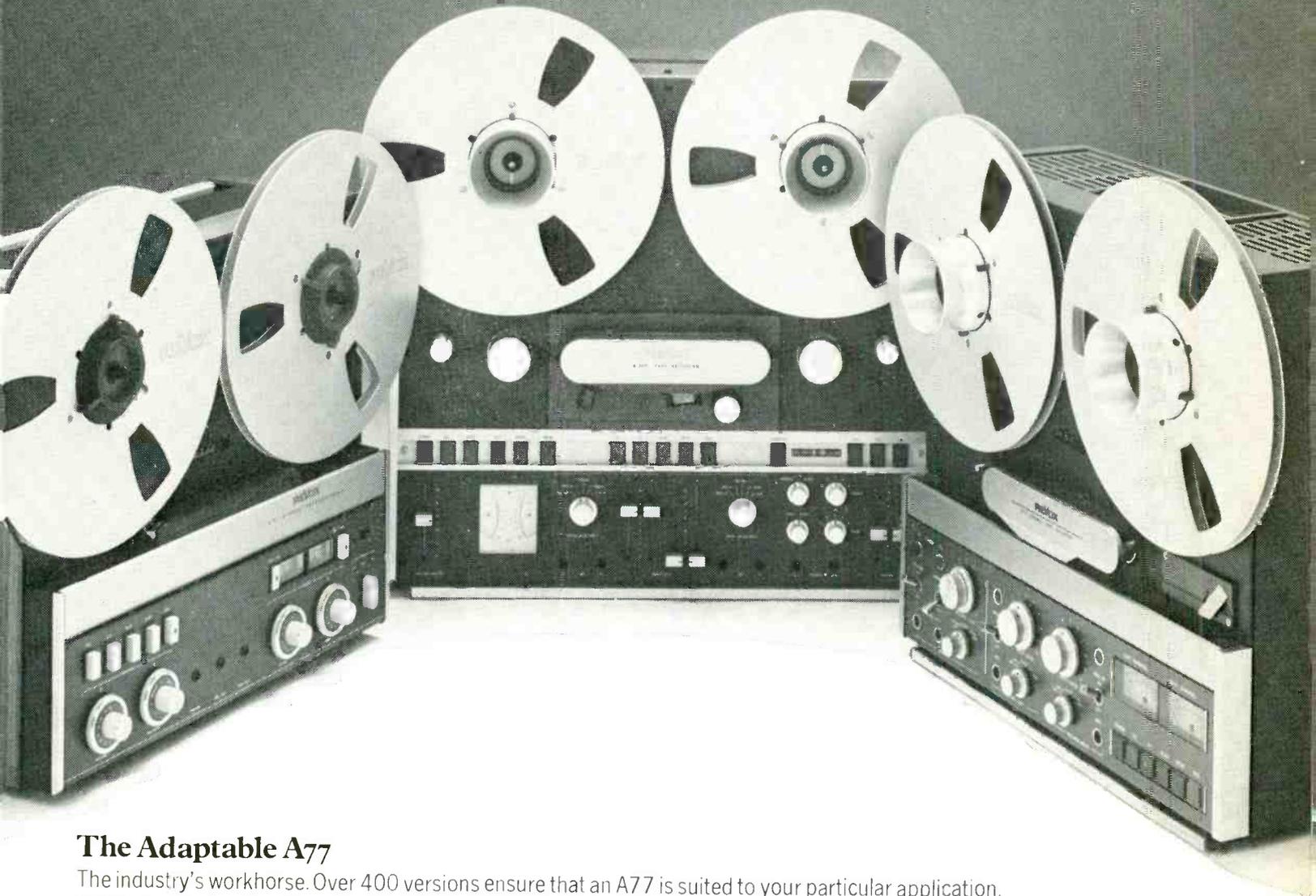
track can only be copied once with complete success, further attempts resulting in an obvious loss of transient attack and detail due to increasing third harmonic distortion and noise. It is also aggravated by slight cancellation of the extreme high frequencies due to tape weave effects, no matter how good a transport is used. A multitrack machine would probably enable this principle to be developed further, especially if equipped with predistortion circuitry in the record amplifiers. We have no such professional machine, but did experiment on a folk/rock session with a Teac *A3310* subsequently mastering down onto the Nagra. This enabled the same coincident pair, again hypercardioid, to be recorded three times and was largely successful. The main loss was due to third harmonic dimming, (now far more apparent with the semi-professional machine) and reinforced by the considerable amount of extra electronic circuitry involved.

Balancing on this session was done by standing behind the microphones and adjusting the musicians until it sounded right, anticipating the final stereo positioning after overdubs. It is interesting to note that the microphones and monitoring chain are so accurate that it is possible to eliminate minor acoustic problems and obtain a good balance with smooth sound at the microphone position, and find this virtually unaltered in the control room.

I find it disturbing that a reviewer will occasionally comment on the stereo instability of what I know to be an extremely accurate recording. I am sure this is mainly due to playback equipment of insufficient accuracy and multimike conditioning, and feel strongly that reviewers should have access to equipment capable of revealing phase detail and depth of perspective. It is also important that they be aware of the nature of live sound produced by a group of musicians in a good acoustic. Doubly so, considering the buying public is often not in a position to judge this, and therefore looks to the reviewer for guidance. Consequently, the future of musical sound largely depends on their knowledge, and the growing dissatisfaction felt by many critical listeners of the quality of some modern recordings must ultimately reflect this. It is perhaps worth noting that the quality of domestic high-fidelity equipment is improving very rapidly, and that this will probably result in an increase in the rate of disillusionment.

It is apparent from my own acquaintances that the non-musician listener, who represents the bulk of the buying public, ultimately requires that the music be smooth and unobtrusive, with freedom from all forms of distortion; and secondly that, in general, it is not played at a very loud level, even on fine equipment. These are different criteria to those of the musician, who is used to hearing the edgy harmonics and loud volume that comes from close contact with the instrument. Indeed, it is more in keeping with a position halfway down the concert hall. My contention is that this sound is more likely to be satisfactorily attained with the simple microphone technique and attention to detail described in this article than with the multimike methods so commonly adhered to today. ■

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# STUDER REVOX

# letters

Dear Sir, It is unfortunate, but historically not surprising, to read that your contributor Peter Smith, in the September issue of *STUDIO SOUND*, has fallen for the old fallacy that television companies are in the job of video and are apparently happy 'to hand over the problems of microphones to somebody else'.

In fact sound in television requires specialised knowledge and considerable expertise in audio techniques, particularly in music where multi-track recording and post sound dubbing are becoming some of the many tools of our profession.

Mr Smith should be so lucky to have his well-heeled Mobile Multitrack. However he does not have to work in a complex environment involving television cameras, lighting and set-design as well as the artists!!

Broadcast Sound is an integral part of television and is essential to complement the visual image. This demands highly dedicated and professional sound engineers/balancers, most of whom one may assume, have no intention of leaving such responsible work to other people 'to cover this or any other aspect' of television sound.

Yours faithfully, David T. Peart, Head of Sound HTV (Wales) Ltd.

## Peter Smith replies:

Having met those of my colleagues who are concerned with television, on the numerous occasions the mobile has been used in television and film work, I have a full respect for all aspects that they cover and the many problems they encounter. Mobile and fixed studio multitrack recording has been my profession for many years, and as such the 'complex environment' mentioned, is far from new to me.

In my experience I have not yet come across a mobile multitrack sound unit associated with television units. We have certainly filled a gap in equipment, which has been used to great advantage on the occasions to which I am referring, and has obviously provided a far wider scope.

I would be most interested to hear of any further comments in connection with this subject.

Dear Sir, I have no doubt that the Technics SP10 is quite an astonishing turntable. However, complete with a suitable pick-up arm, plus cost of mounting, plus cost of a fancy priced pick-up, the total cost of an operational turntable is of the order of £900. I am not very impressed.

I have a Technics SL1500 which (apart from slower build up to speed, no braking, no 7.8 rpm) actually gives about the same or academically a superior performance. My measurement of maximum intrinsic wow and flutter on my SL1500

is less than  $\pm 0.025\%$  (DIN peak unweighted). How about that?

However, as hinted by Hugh Ford, very low wow and flutter figures are purely academic because:

1) If the little hole in a disc is not within say 25 $\mu$  of the correct centre and/or is too large and thus fits sloppily on the turntable pin, this causes considerable wow.

A 'swinger disc' can produce anything up to say  $\pm 2\%$  wow.

2) Discs are usually made from tapes, and hence there may be considerable wow and flutter on the master tape—anything up to  $\pm 0.2\%$  is not beyond the realms of possibility on replay when feeding the disc cutter.

3) Disc cutting will also impart some wow. It is unlikely that this contribution is much less than  $\pm 0.02\%$  (DIN peak unweighted).

4) Disc creep on pressing will also impart some wow.

My observation is why pay about £900 for something, when I can do the job better for £140.

I would also like to add that I have two Sony tape machines (obsolete type) which under test and in practice exceed the test results of many so-called professional tape machines costing ten times the price.

I appreciate that the principal purpose of *STUDIO SOUND* is to sell equipment (Who says so?—Ed) but in fairness to your readers and manufacturers, more reviews of good and bad domestic, or at least reasonably priced equipment as opposed to ridiculously priced equipment, good and bad, might well be appreciated all round.

Of course I appreciate that there are potential buyers with more money than sense and thus a price tag of £500 attracts attention even if something at £140 is not only potentially equal but in fact is already far better than it needs to be, and has none of the faults of the more expensive equipment. No potty, unstable switches for example!

Yours faithfully, H M Finimore, Northampton Sound Recording, 36 Spring Gardens, Northampton.

Dear Sir, I was interested to read Fred Riley's article in *STUDIO SOUND* (August) which, among other things, bemoaned the lack of standardisation of signal phasing in professional audio practice.

A widespread convention for microphones is that a positive air pressure pulse (a compression) causes a positive voltage pulse at the in-phase terminal of the mic. A similar convention for loudspeakers is that a positive voltage on the plus or red terminal causes the cone to move forward and produce a positive air pressure pulse. Electronic equipment should be arranged so that

the phasing of the output is the same as that of the input. But even if all transducers and electronics were standardised, it would still be necessary to choose an arbitrary convention for magnetic flux polarity, disc cutting polarity, etc, for full phase compatibility between studios. This sounds like a job for the International Standards Organisation.

Poor microphone technique can also lead to reverse phasing. For example, many people do not realise that the front and back lobes of a ribbon mic are out of phase with each other (this can be seen by thinking about the way the ribbon moves when a pulse comes from the front or from the back). This means that the favoured practice of placing two artists, one either side of the mic results in them being oppositely phased in the electrical output. This can never be untangled; perhaps this is what happened on 'Don't Go Breaking My Heart'?

To make sure that all possible studio setups will be correctly phased, it is necessary to check the phasing of each piece of equipment and cable. This can be done very simply with a phasing meter, such as the 'Phase Tester' manufactured by my company. There is also a leaflet about microphone phasing available which I will be pleased to send to any of your readers who are interested.

Yours faithfully, David Hamill, Hamill Electronics Ltd, 492 Kingston Road, Raynes Park, London SW 20.

Dear Sir, I read Hugh Ford's review of magnetic tapes (August '77 issue) with interest, and would like to make a few observations on the measurement techniques and the results obtained:

The criterion for setting the hf bias that Mr Ford uses (4 dB overdrop at 10 kHz) is, I believe, widely used throughout the industry, although it is not necessary optimum for any particular tape. However, I am told there exists a British Standard which requires the bias to be set for 3.5 dB overdrop at 6.3 kHz.

Mr Ford seems to regard the dc method for measuring modulation noise as conventional. I had thought this went out of use long ago, or at least after the publication of the paper by E G Trendell in the *AES Journal*<sup>1</sup>. The measurement technique described there was used by Angus McKenzie in his review of tapes<sup>2</sup>.

Turning now to the results:

It is interesting to note that although Mr Ford comments that the difference in dynamic range between tapes is small, he still quotes the 3% thd measurement referred to an (arbitrary) magnetic reference level. For a reasonable comparison between tapes this measurement should be made with reference to the maximum output level (however defined). After all, a reviewer would not compare a 50W amplifier with a 40W amplifier by measuring distortion at 40W for both amplifiers.

By performing a linear regression on a plot of maximum output for 3% thd against the 1 kHz third harmonic level (in dB not %) the correlation is confirmed (the gradient being 0.49). This information may be used to relate Mr Ford's measurements to the same level (ref mol). The variation in third harmonic distortion is then no longer 'quite alarming'. This is to be expected

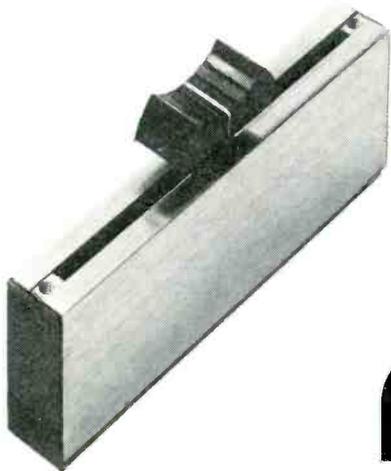
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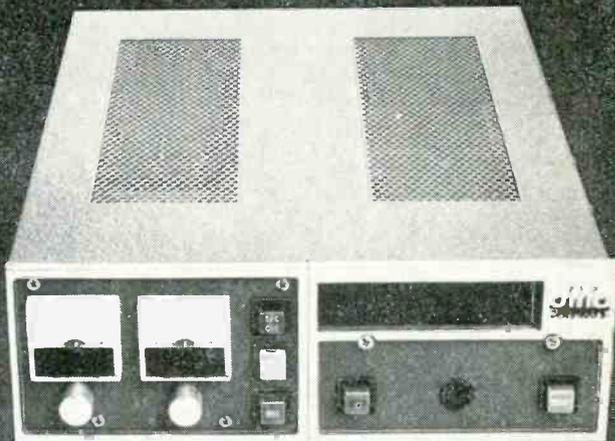
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## LETTERS

as the tapes are, presumably, all made of gamma ferric oxide.

I agree that the modulation noise figures are important. If we look at the dynamic range between the 10% im at 1 kHz and the modulation noise figures, two or three tapes are some way ahead. Incidentally, the modulation noise figures agree with the evidence of the pen recordings. If the dynamic range defined above was measured at 10 or 15 kHz, the difference would be even more remarkable and possibly a useful criterion.

The observation that the mol (maximum output level) and 10% im are not very well correlated leads me to make the following comment. The mol is a function of the tape's physical and magnetic characteristic. The intermodulation distortion is not only a characteristic of the tape (where there is harmonic distortion there will be intermodulation distortion), but also of the record/playback mechanism; this involves the coating thickness, bias level, gap length and other variables. I think that it is not unfair to point out that the ATR 100 was designed for high-output tapes (specifically 456) and the heads of the ATR 100 are of advanced and quite above-average design. It would be interesting, therefore, to see some of the measurements repeated on other machines. I believe Ampex would welcome this and that they have already suggested some measurements missed out of the survey.

One last point: if Mr Ford had been reviewing an amplifier he would have included a frequency response and phase response plot. The latter would probably reveal the reasons for the im

distortion variations. (Incidentally these would need to be plotted for no equalisation but at normal bias level.) Perhaps this could be done for future reviews?

Yours faithfully, G J Barton, University of Reading, Dept of Cybernetics, 3 Earley Gate, Reading.

(1) E G Trendell: 'The measurement and subjective assessment of modulation noise in magnetic recording', *JAES* 17, 6, p644.

(2) *Studio Sound*, 17, 2 (February 1975), p20.

### Hugh Ford replies:

To deal with the points raised by Mr Barton in the order in which they appear, I should first like to comment further on the situation so far as bias setting is concerned. Unfortunately, there is not any standardisation about bias setting for reel-to-reel machines. For that matter it would be most unwise to attempt a standard over-drop method of setting, because of the differences between tape types and their optimum bias requirements. It is agreed that the optimum bias for a particular tape type depends upon a number of compromises, the more important of which are distortion, modulation noise and sensitivity.

Tape manufacturers tend to suggest a recommended bias setting, but this may be based on over-drop at 1 kHz, 10 kHz or other high frequencies. The disadvantage of using 1 kHz is that the bias/sensitivity curve is flat at long recorded wavelengths, and there is a distinct preference for using 10 kHz where the bias/sensitivity curve is steep.

Similarly, the modulation noise measure-

ments specified by tape manufacturers are all too often to the dc noise method, and I'm afraid that I cannot agree with Mr Barton that this method 'went out of use long ago'. It is only hoped that the Trendell method will be adopted as an International Standard, and that tape manufacturers will be persuaded to use this method instead of the widely used dc method.

It is my opinion that modulation noise performance deserves much more attention that it currently gets, since the difference between tapes is wide and the subjective effect of modulation noise is very important. Certainly the pen recording of the uniformity of reproduction goes some way towards indicating modulation noise problems. But this is only part of the story because only long term defects show in pen recordings, and it is possible to have a very uniform tape with bad modulation noise performance.

I'm afraid that I do not see the point about the maximum output level in relation to a tape fluxivity. In the reviews I have specified the 3% third harmonic distortion point in relation to magnetic units, and the 3% point is generally considered to represent the maximum output level. As many organisations use a standard recording level the distortion at a standard fluxivity is also of interest, and this too has been included.

Finally, I readily admit that there are many interesting measurements that have not been included. But the amount of information given in any review is limited by space, and always one has to get a quart into a pint pot—or its metric equivalent. ■



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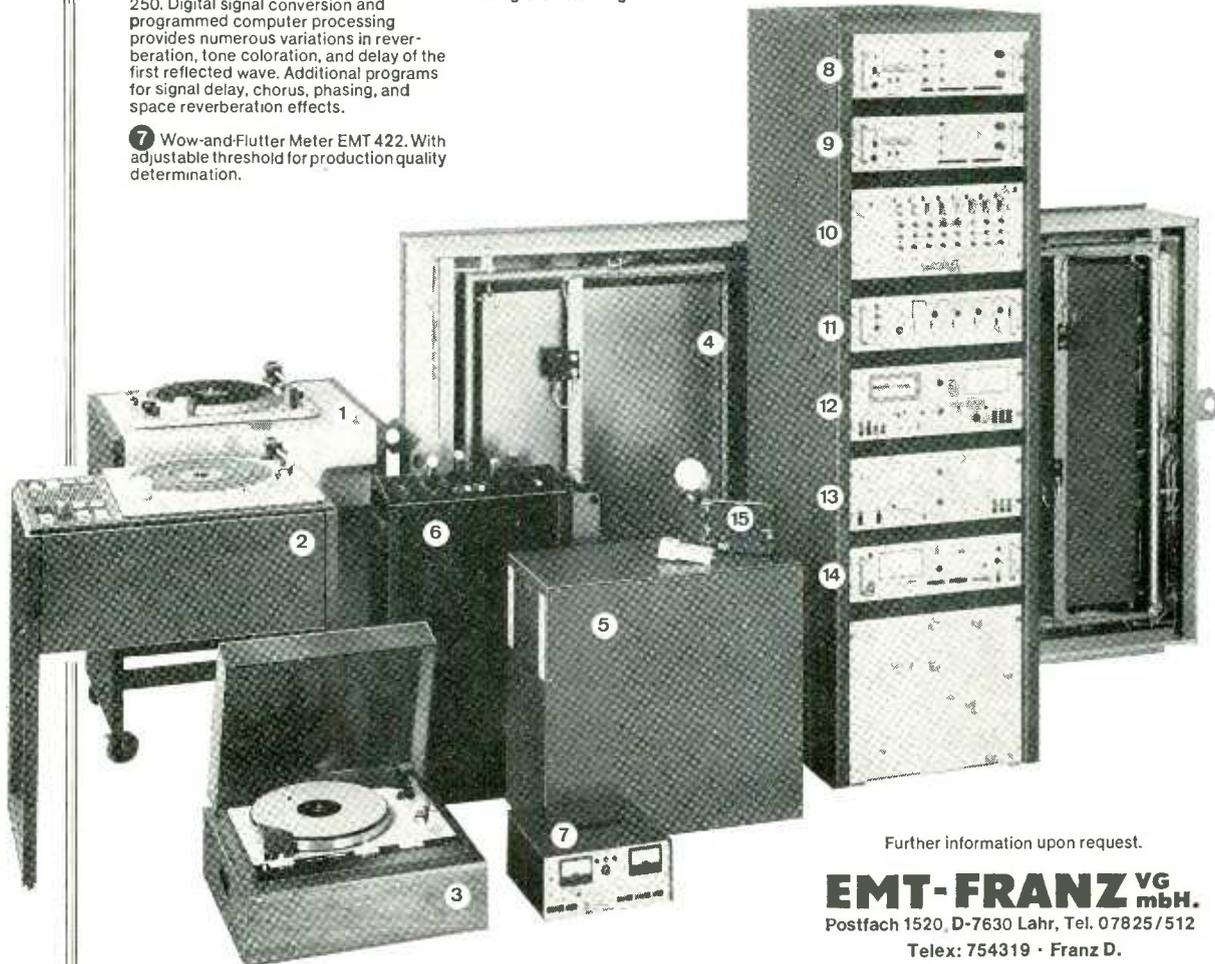


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# Microphones: who uses what

## a dipstick survey



Walk into almost any studio these days and you're confronted by a plethora of microphones. Most of them bear the AKG, Neumann or Sennheiser label, but on which instruments are they used? To find out, we wrote to some 250 recording studios around the world (mainly 24-track) and asked them to fill in a simple questionnaire. Each studio was asked what microphones they most commonly used for particular instruments. The response was a little disappointing—to say the least—since only 27 studios bothered to reply. The result is shown on the next three pages. It is obvious that the Neumann U87 is by far the most popular microphone, but the variety of other types in use is still quite surprising.

It would be futile for *STUDIO SOUND* to draw any conclusions from this survey, because microphone choice and technique is very subjective, even to the extent of brand loyalty. But it's still interesting to know what other engineers are using.

44 ▶



### Manufacturers and microphones referred to in this survey

**AKG:** D12, D25, D120, D140, D190, D202, D224, D707, D1200, CK15, CK8, C12, C412, C414, C416, C451 and C452.

**Altec:** 195A.

**Beyer:** M88, M160 and Soundstar.

**Electro-Voice:** RE10, RE15, RE16, RE20, RE55 and 666.

**Neumann:** KM54, KM83, KM84, KM84fet, KM85, KM86, KM88, M49, U47, U47fet, U48, U67 and U87.

**Pearl:** DC63.

**RCA:** DX44 and DX77.

**Schoeps:** CMC541, CMT56, CMT640, CTM44 and CT56.

**Sennheiser:** MD211, MD421, MD441, MKH405, MKH406 and MKH415.

**Shure:** SM2, SM7, SM53, SM56, SM57, SM58, SM68, 545 and 546.

**Sony:** C22, C24, C37, C38, C60 and C500.

**STC/Coles:** 4038.

**Telefunken:** M251.



| <b>WHO USES WHAT MIC</b>  | <b>CENTURY 21</b><br>John Hildebrand                              | <b>CRYSTAL SOUND (US)</b><br>John Fishbach                          | <b>EASTERN SOUND (CANADA)</b><br>John Ellison               | <b>EMI-ELECTROLA (W GERMANY)</b><br>Kurt Lorbach                        | <b>ESTUDIOS GEMA (SPAIN)</b><br>Raphael Poch                 | <b>WALLY HEIDER REC'ING (US)</b><br>Graydon Odell         | <b>HYDE PARK RECORDING (UK)</b><br>George Doherty  | <b>R G JONES (UK)</b><br>Gerry Kitchingham                     | <b>KINGSWAY RECORDERS (UK)</b><br>Louie Austin            |
|---|---|---|---|---|--|---|--|--|---|
| <b>KEYBOARDS</b><br>Organ with Leslie<br>Synth with Leslie<br>Pipe Organ<br>Piano<br>Harpichord                     | SM53<br>SM53<br>U67<br>KM84<br>KM84                               | RE15/20<br>—<br>C500<br>KM84/85<br>Group 128/419Z                   | U47fet<br>—<br>U87<br>U87<br>U47fet                         | U67/87<br>U67/87<br>U87/SM69<br>U67/SM69<br>U87/SM69                    | U87<br>MD441<br>U87<br>SM2<br>MKH406                         | U87<br>U87<br>U47<br>C414<br>C414                         | D202<br>D202<br>—<br>D202/C451<br>—  | D224<br>D224<br>U87<br>U87<br>U87                              | U87/D224<br>U87/D224<br>U47<br>U47/KM86<br>U87            |
| <b>GUITARS</b><br>Acoustic<br>Electric*<br>Electric Bass*<br>Mandolin   | KM84<br>RE15<br>U87<br>KM84                                       | Group 128/419Z<br>666<br>RE15<br>419Z                               | D224<br>U87<br>RE20<br>U87                                  | MD441/U87<br>U87<br>U87<br>U87  | CMT640<br>MD441<br>MD421<br>CMT640                           | KM84/C60<br>C37<br>666<br>KM86                            | D1200/C451<br>D1200/D190<br>D120<br>D1200  | C414<br>D224<br>U87<br>U87                                     | U47/KM88<br>Soundstar<br>U47<br>U47                       |
| <b>PERCUSSION</b><br>Snare Drum<br>Bass Drum<br>Tom-toms<br>Cymbals<br>Hi-hat<br>Triangle<br>Cow Bells<br>Xylophone | C38<br>C37<br>SM53<br>U87<br>SM53<br>SM53<br>SM53<br>SM53<br>SM53 | SM57<br>C22<br>U87<br>C500<br>KM84<br>Group 128/419Z<br>419Z<br>U87 | KM86<br>RE20<br>U87<br>U87<br>KM84<br>U87<br>RE20<br>U47fet | M49/KM84<br>D12<br>D707<br>M160/546<br>CK8<br>MD441<br>MD441/U87<br>U87 | C452<br>MD421<br>D202<br>KM86<br>C452<br>C451<br>C451<br>U87 | 546<br>666<br>SM56<br>U67<br>C22<br>U47fet<br>C500<br>C37 | D140<br>D12<br>D202<br>U87/C451<br>C451<br>C451<br>D1200<br>D140                             | C451/KM84<br>D224<br>C451<br>U87<br>KM84<br>KM84<br>U87<br>U87 | —<br>D12<br>D224<br>U87<br>KM88<br>U87<br>U87<br>C451     |
| <b>STRINGS</b><br>Violin<br>Viola<br>Cello<br>String Bass<br>Harp   | U47<br>U87<br>U87<br>C38<br>U87                                   | U87<br>405<br>KM84<br>C37<br>419Z/KM84                              | U87<br>U87<br>RE20<br>U47fet<br>U47fet                      | U87/KM85<br>U87/C414<br>U87/47fet<br>U87/47fet<br>KM84/C414             | U87<br>KM86<br>U87<br>KM86<br>KM86                           | U87<br>U87<br>DX77<br>DX44<br>C60                         | D1 200/C451<br>D1200<br>D1200/D202<br>D120<br>D1200  | KM84<br>KM84<br>C414<br>U47<br>U87                             | KM84/U87<br>U87<br>U47<br>U47<br>U87                      |
| <b>WOODWIND</b><br>Piccolo<br>Flute<br>Oboe<br>Cor Anglais<br>Clarinet<br>Bass Clarinet<br>Bassoon<br>Saxophone     | U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87              | 419Z/C22<br>419Z/C22<br>KM84<br>C37<br>KM84<br>U87<br>U87<br>666    | U87<br>U87<br>RE20<br>RE20<br>U87<br>U87<br>U87<br>U87      | SM53<br>U87<br>U87<br>U87<br>U87<br>U87/47fet<br>U87/47fet              | MD441<br>D224<br>MD441<br>MD441<br>—<br>U87<br>U87<br>U87    | U87<br>U87<br>U87<br>—<br>C37<br>C37<br>C37<br>U87        | D1200/C451<br>D1200/C451<br>D1200/C451<br>D1200/C451<br>D1200/C451<br>D1200<br>D1200<br>D190 | U87<br>KM84<br>U87<br>U87<br>U87<br>U87<br>U87<br>KM84         | KM88<br>U47/KM88<br>KM88<br>C12<br>U87<br>—<br>U86<br>U87 |
| <b>BRASS</b><br>Trumpet<br>Trombone<br>French Horn<br>Tuba  | U87<br>U87<br>U87<br>SM53   | C37<br>RE15<br>KM85<br>U87  | U87<br>U87<br>RE20<br>U47fet                                | U47/47fet<br>U47/47fet<br>U87<br>U87                                    | U87<br>U87<br>U87<br>U87                                     | 546<br>U87<br>C37<br>666                                  | D1200/C451<br>D1200/D120<br>D1200/C451<br>D120   | D224<br>U87<br>U87<br>U87                                      | D12<br>U87<br>U86<br>C12                                  |
| <b>VOCALS</b>   | U47/67  | 'Whatever sounds best'  | U87/47  | SM7/U47   | U87/KM56   | U87/47fet   | U87  | U87  | U47/87  |

\*Apart from direct injection.

| <b>WHO USES WHAT MIC</b>  | <b>LANSLOWNE (UK)</b><br>Robert Butterworth                           | <b>MAMA JO'S (US)</b>   | <b>MORGAN (UK)</b><br>Martin Levan  | <b>MUSICLAND</b><br>Mack                                     | <b>POLYDOR (UK)</b><br>Carlos Olms                | <b>RAMPORT (UK)</b><br>Cy Langston and Mark Dobson               | <b>REWARD</b>   | <b>SOUND 80 (US)</b><br>Tom Jung                           | <b>SOUNDS INTERCHANGE (CANADA)</b><br>Mike Jones             |
|---|---|---|---|--|---|--|---|--|--|
| <b>KEYBOARDS</b><br>Organ with Leslie<br>Synth with Leslie<br>Pipe Organ<br>Piano<br>Harpsichord                    | U67<br>U87fet<br>U67<br>U87fet<br>KM54                                | KM84<br>—<br>KM84<br>C414<br>C414                             | U87<br>U87<br>U87<br>U87/47<br>U87  | U87<br>U47fet<br>CT56<br>KM84/U47fet<br>DC63                 | D202<br>—<br>—<br>U87<br>—                        | U87<br>U87<br>U87<br>U87<br>U87                                  | U87<br>U87<br>—<br>C12<br>C12                               | U87<br>SM57<br>KM86<br>CMT56<br>KM88                       | U87<br>U87<br>U87<br>U87<br>KM86                             |
| <b>GUITARS</b><br>Acoustic<br>Electric<br>Electric Bass<br>Mandolin   | U47fet/KM54<br>KM54<br>KM84fet<br>KM54                                | M251<br>U87<br>U87<br>C414                                    | U87<br>U87<br>U87<br>U87  | MKH415<br>U87<br>RE20<br>KM85                                | M88<br>RE20<br>M160<br>—                          | U87<br>U87<br>U87<br>U87   | C12<br>U87<br>—<br>C12                                      | C452<br>SM57<br>—<br>KM88                                  | KM86<br>SM53<br>TM100<br>C452                                |
| <b>PERCUSSION</b><br>Snare Drum<br>Bass Drum<br>Tom-toms<br>Cymbals<br>Hi-hat<br>Triangle<br>Cow Bells<br>Xylophone | U87fet<br>D12<br>D202<br>U87fet<br>KM54<br>U87fet<br>U87fet<br>U87fet | SM57<br>MD421<br>C500<br>C451<br>C414<br>C414<br>C414<br>C414 | KM84/D224<br>U47/MD211<br>U87/KM84<br>KM84/M160<br>KM84/D224<br>U87<br>U87<br>U87 | U87<br>U47fet<br>U87<br>KM83<br>KM84<br>CT56<br>RE20<br>C414 | RE20<br>D25<br>RE15<br>U47<br>KM64<br>—<br>—<br>— | KM86/MD441<br>D12/D25<br>U87<br>U87<br>KM84<br>U87<br>U87<br>U87 | 195A<br>D12<br>U87/CMT44<br>U87<br>C12<br>U87<br>U87<br>U87 | SM57<br>MD421<br>U87<br>KM84<br>KM85<br>KM84<br>U87<br>U87 | SM57<br>D224<br>C452<br>C414<br>C414<br>SKM541<br>U87<br>U87 |
| <b>STRINGS</b><br>Violin<br>Viola<br>Cello<br>String Bass<br>Harp   | KM54<br>KM54<br>U67<br>U47fet<br>KM54                                 | C414<br>M251<br>C451<br>C22<br>C451                           | KM84/U87<br>KM84/U67<br>U87/47<br>U87/47<br>U87                                   | C414<br>KM84<br>KM84<br>KM54<br>DC63                         | U67<br>U67<br>U67<br>U67<br>—                     | U87<br>U87<br>U87<br>U87<br>U87                                  | C12<br>C12<br>C12<br>C12<br>C12                             | KM86<br>KM86<br>U87<br>U47<br>U87                          | U87<br>U87<br>KM86<br>U87<br>KM86                            |
| <b>WOODWIND</b><br>Piccolo<br>Flute<br>Oboe<br>Cor Anglais<br>Clarinet<br>Bass Clarinet<br>Bassoon<br>Saxophone     | U67<br>U67<br>U67<br>U67<br>U67<br>U67<br>U67<br>U87fet               | C414<br>C414<br>C414<br>C414<br>C414<br>C414<br>C414<br>C414  | U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87                              | CT56<br>C414<br>C414<br>CT56<br>U87<br>U47<br>KM86<br>KM86   | —<br>—<br>—<br>—<br>—<br>—<br>—<br>—              | U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87             | C12<br>C12<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87        | U87<br>U87<br>U87<br>—<br>U87<br>U87<br>U87<br>U87         | KM86<br>KM86<br>KM86<br>KM86<br>KM86<br>KM86<br>KM86<br>KM86 |
| <b>BRASS</b><br>Trumpet<br>Trombone<br>French Horn<br>Tuba  | U47fet<br>U47fet<br>U67<br>KM54                                       | DX77<br>DX77<br>U87<br>C500                                   | U87<br>U87<br>U87<br>U87  | U87<br>U47<br>U47<br>U47                                     | M160<br>U47<br>—<br>U47                           | U87<br>U87<br>U87<br>U87   | U87<br>U87<br>U87<br>U87                                    | U87<br>U87<br>DX77<br>RE20                                 | U87<br>U87<br>U87<br>U87                                     |
| <b>VOCALS</b>   | M49/U47fet  | M49   | U87/47  | U47/87   | U47   | U87/C416   | U87   | U87/C414   | U87/KM86   |

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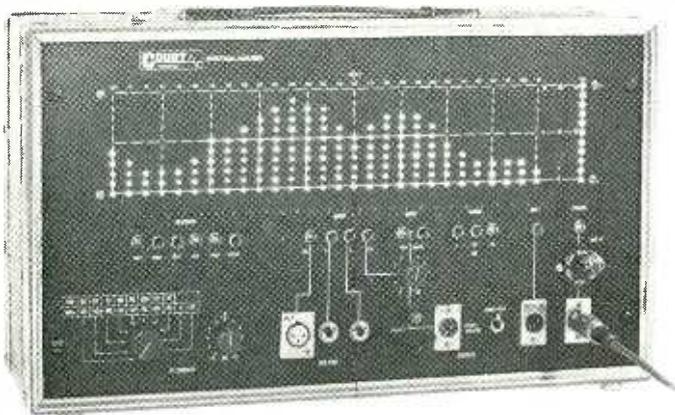
Telex: 262284 Amsdr G

Cables: JACMUSIC RICKMANSWORTH

| <b>WHO USES WHAT MIC</b>  | <b>SOUND LABS (US)</b><br>Various                             | <b>SOUND MIXERS (US)</b><br>Geoff                        | <b>STRAWBERRY (UK)</b><br>Peter Tattersall                   | <b>STUDIO CORNET (W GERMANY)</b><br>Wolfgang Hirschmann            | <b>STUDIO TEMPO (US)</b><br>T Montgomery                             | <b>STUDIO WEST (US)</b><br>Leroy Carroll                       | <b>TRIDENT (UK)</b><br>Ray Staff                        | <b>Freelance (1)</b><br>Mickey Crofford (US)                     | <b>Freelance (2)</b><br>Richard Dodd (UK)  |
|---|---|--|--|--|--|--|---|--|--|
| <b>KEYBOARDS</b><br>Organ with Leslie<br>Synth with Leslie<br>Pipe Organ<br>Piano<br>Harpsichord                    | U87<br>U87<br>C24<br>KM88/U87<br>KM88                         | DX77/C451<br>—<br>—<br>C451/U87<br>U87                   | U87<br>U87<br>MD441<br>KM86<br>U87                           | KM84<br>KM84<br>KM83<br>SM69<br>CMC541                             | RE20<br>—<br>C24<br>U87/C451<br>C451                                 | SM68<br>SM68<br>KM86<br>KM88<br>KM88                           | U67<br>U67<br>—<br>U67<br>U67                           | DX77<br>—<br>U47fet/KM88<br>U47fet/KM88<br>KM88                  | U87<br>U87<br>U47fet<br>C452<br>C452   |
| <b>GUITARS</b><br>Acoustic<br>Electric<br>Electric Bass<br>Mandolin   | C452<br>545<br>U47<br>C452                                    | C451<br>MD421<br>D202/RE20<br>—                          | KM86<br>M88<br>C414<br>MD441                                 | CMC541<br>RE20<br>RE20<br>CMC541                                   | C412/U87<br>MD421/RE20<br>RE20<br>C451                               | KM84<br>RE10/SM7<br>U67<br>KM84                                | C12<br>U67<br>U67<br>KM84                               | C452<br>U87<br>—<br>C452/U47fet                                  | C452<br>KM84<br>KM84<br>C452   |
| <b>PERCUSSION</b><br>Snare Drum<br>Bass Drum<br>Tom-toms<br>Cymbals<br>Hi-hat<br>Triangle<br>Cow Bells<br>Xylophone | C500<br>MD441<br>C452<br>C452<br>C452<br>KM88<br>U87<br>U87   | D202/MD441<br>RE20<br>U87<br>C451<br>KM84<br>—<br>—<br>— | MD441<br>D25<br>M88<br>U87<br>M160<br>KM86<br>KM86<br>KM86   | SM7<br>RE20<br>RE55<br>RE55<br>D224<br>RE20<br>RE20<br>U87         | MD421/C451<br>RE20/U87<br>RE20<br>C451<br>U87<br>C451<br>C451<br>U87 | KM84<br>MD421<br>MD421<br>KM84<br>KM84<br>KM86<br>KM86<br>KM84 | C38<br>D25<br>U67<br>4038<br>D224E<br>U67<br>U67<br>U67 | C452<br>C452<br>C452<br>U87/C452<br>C452<br>DX77<br>DX77<br>DX77 | C452/U47fet<br>D20/U87<br>KM84/D202<br>C452/U47fet<br>C452/KM84<br>U47fet<br>U47fet/87<br>U47fet/87  |
| <b>STRINGS</b><br>Violin<br>Viola<br>Cello<br>String Bass<br>Harp   | C412<br>C412<br>U47fet<br>U47fet<br>C412                      | C414/U87<br>C414/U87<br>KM86<br>KM86<br>C451             | U87<br>U87<br>KM88<br>KM88<br>KM88                           | CMC541<br>CK1S<br>DX77<br>U47fet<br>CMC541                         | C451<br>C451<br>C451<br>C451<br>U87                                  | KM84<br>KM84<br>U67<br>U67<br>KM86                             | U67<br>U67<br>C12<br>C28<br>KM84                        | U47fet/KM88<br>U87/KM88<br>U47fet/KM88<br>U47fet/KM88<br>U87     | C452/KM84<br>C452/KM84<br>U87/67<br>U47fet/67<br>U87/47fet   |
| <b>WOODWIND</b><br>Piccolo<br>Flute<br>Oboe<br>Cor Anglais<br>Clarinet<br>Bass Clarinet<br>Bassoon<br>Saxophone     | C451<br>C451<br>C412<br>C412<br>C412<br>U87<br>U47fet<br>KM84 | U87<br>U87<br>U87<br>U47<br>U87<br>U47<br>U87<br>U47     | KM88<br>KM88<br>KM88<br>KM88<br>M160<br>M160<br>M160<br>M160 | RE16<br>KM88<br>U47fet<br>U47fet<br>U47fet<br>C414<br>C414<br>C414 | U87<br>U87<br>U47<br>C451<br>U47<br>U47<br>—<br>RE20                 | KM84/86<br>KM84/86<br>KM84/86<br>—<br>U87<br>U87<br>U87<br>U87 | U67<br>U67<br>U67<br>U67<br>U47<br>U47<br>U47<br>U67    | U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87<br>U87             | C452/KM84<br>C452/KM84<br>C452/KM84<br>C452/KM84<br>C452/KM84<br>C452/KM84<br>C452/KM84<br>C452/KM84 |
| <b>BRASS</b><br>Trumpet<br>Trombone<br>French Horn<br>Tuba  | U87<br>U87<br>U87<br>DX77                                     | DX77<br>U87/MD421<br>U87<br>U47                          | U47<br>U47<br>U47<br>M88                                     | DX77<br>DX77<br>U87<br>U87   | MD421<br>C451<br>C451<br>MD421/RE20                                  | U48<br>U67<br>U67<br>U48                                       | 4038<br>4038<br>U67<br>C28                              | U47fet/KM88<br>U47fet/KM88<br>U87<br>U87                         | U47<br>KM86/84<br>KM84/U87<br>U87/47fet  |
| <b>VOCALS</b>   | SM7/C414  | U87/C414   | U87/47   | SM69/U47   | U87/47   | U87/KM86   | U87/47  | U47fet/87  | U87/47   |

# COURT'S IN SESSION - - -

... And our case rests on the fact that inside or outside the studio, we offer the most experienced and comprehensive service for monitoring and live performance sound systems.

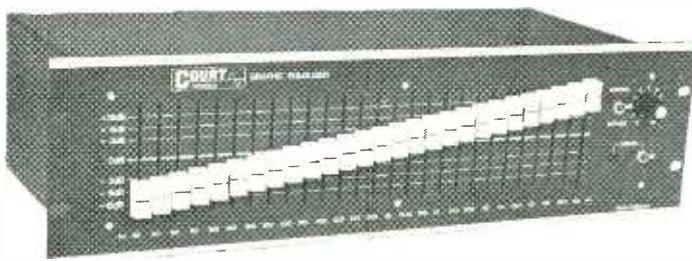


## CASE No. 1

### SPECTRUM ANALYSER RTA-C2

$\frac{1}{3}$  octave analyser based on ISO centre frequencies showing the entire audio spectrum visually. Calibrated condenser mic reads SPLs, with dbm on line inputs reading RMS or PPM.

19in. rack mounting or flight case.  
110-250v or battery operated.  
Also available for consultancy hire.

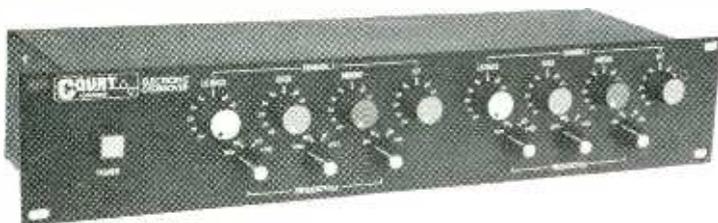


## CASE No. 2

### GRAPHIC EQUALISER GE-27

27-band  $\frac{1}{3}$  octave equaliser based on standard ISO frequencies giving  $\pm 12$  db of equalisation. When used with our spectrum analyser, provides the ultimate control over your sound system.

Available balanced or unbalanced.  
19in. rack mounting or free standing.



## CASE No. 3

### ELECTRONIC CROSSOVER EC-2/3/4

New phase-constant design with maximally flat 2nd order Butterworth filters with active filter slew rate in excess of 20v/ $\mu$  sec for negligible IM distortion and phase shift up to and beyond 20 khz. Stereo units with level controls on each output.

Four switchable frequencies at each point.  
2-way: 500, 800, 1000, 1200hz.  
3-way: 500, 800, 1K, 1K2hz and 3, 5, 6, 7khz  
4-way: 100, 150, 225, 300hz and 500, 800, 1k, 1k2hz and 3, 5, 6, 7khz.  
Special frequencies to order.  
Balanced or unbalanced available.  
110-250v, 19in. rack mounting.

Whether your verdict is an off the shelf or custom built system, consult us before installing yours. We have over 20 different types of monitors and associated equipment. If you have already installed a system, we can provide you with a spectrum analysis of its performance, and tailor it exactly to your requirements.

In addition to our range of JBL and Tannoy standard or custom monitors, we can supply most leading makes of equipment at special package deal prices.

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# AES 58th Convention, a preview

The 58th AES Convention will be held from November 4 to 7 at the Waldorf-Astoria, New York. Over 100 manufacturers will be showing a wide range of their products.



The LA 57th AES Convention

## LIST OF EXHIBITORS

B=Booth, D=Demo Room

|                            |                     |                                  |                 |                                |                    |
|----------------------------|---------------------|----------------------------------|-----------------|--------------------------------|--------------------|
| <b>Acoustic Design</b>     | B 98                | <b>Community Light and Sound</b> | D 1053          | <b>IVIE</b>                    | B 91 & 92          |
| <b>Acoustilog</b>          | B 70                | <b>Concertaudio</b>              | T 1             | <b>Irv Joel and Associates</b> | B 60 & 61          |
| <b>Agfa-Gevaert</b>        | B 83                | <b>Crown</b>                     | Basildon Room   | <b>JVC</b>                     | D 1002             |
| <b>AKG</b>                 | D 1065, 1067 & 1069 | <b>David Link Associates</b>     | B 18            | <b>Keith Monks</b>             | T 8                |
| <b>Allison</b>             | B 32                | <b>dbx</b>                       | D 10U           | <b>Ken Schaffer Group</b>      | Ballroom Tier 15   |
| <b>Amber</b>               | B 44                | <b>Dolby</b>                     | B 15 & 16       | <b>K&amp;L Sound</b>           | B 77               |
| <b>Ampex</b>               | B 85-90             | <b>Duncan Electronics</b>        | Basildon Room   | <b>Koss</b>                    | B 6                |
| <b>Ashly Audio</b>         | Ballroom Tier 6     | <b>EI-Tech</b>                   | B 2             | <b>LaSalle</b>                 | Basildon Room      |
| <b>Audico</b>              | T 15                | <b>Electro-Voice</b>             | D 10G & 10H     | <b>Lexicon</b>                 | B 21               |
| <b>Audikon</b>             | B 27                | <b>Emilar</b>                    | B 75            | <b>Liberty/UA</b>              | B 80               |
| <b>Audio &amp; Design</b>  | B 26                | <b>Eventide</b>                  | B 54            | <b>Magnesax</b>                | T 16               |
| <b>Audio by Zimat</b>      | B 17                | <b>Ferrofluidics</b>             | B 64            | <b>Martin Audio/Video</b>      | B 1                |
| <b>Audio Developments</b>  | B 82                | <b>Forsythe Audio</b>            | B 76            | <b>MCI</b>                     | B 48, 49 & 50      |
| <b>Audio Marketing</b>     | D 10E               | <b>Gallien-Krueger</b>           | Basildon Room   | <b>MICMIX</b>                  | B 53               |
| <b>Audio Processing</b>    | Ballroom Tier 3     | <b>Gotham Audio</b>              | D 1080 & 1082   | <b>3M</b>                      | D 1012             |
| <b>Audiotechniques</b>     | B 45-47 & D 10E     | <b>Gotham Export</b>             | —               | <b>Mitsubishi</b>              | D 1014             |
| <b>Audio Transport</b>     | B 20                | <b>Grandy</b>                    | B 13            | <b>MXR</b>                     | B 71               |
| <b>Auditronics</b>         | D 1071              | <b>Hammond</b>                   | B 93 & 94       | <b>Nagra</b>                   | B 84               |
| <b>Automated Processes</b> | B 41 & 42           | <b>Harrison</b>                  | B 55, 56 & 57   | <b>Neutrik (Philips)</b>       | D 1065             |
| <b>B&amp;K</b>             | B 7 & 8             | <b>Holland Electronics</b>       | Ballroom Tier 5 | <b>Neve</b>                    | B 39 & 40          |
| <b>BGW</b>                 | B 62 & 63           | <b>Infonics</b>                  | D 10R & 10S     | <b>Nexus</b>                   | B 65               |
| <b>Big Time Holdings</b>   | —                   | <b>Inovonics</b>                 | D 10W           | <b>Orban/Parasound</b>         | B 24               |
| <b>Bozak</b>               | D 1007              | <b>Interface Electronics</b>     | B 5             | <b>Otari</b>                   | B 29, 30 & 31      |
| <b>Bruce Anthony</b>       | —                   | <b>International Audio</b>       | B 19            | <b>Pacific Recorders</b>       | T 12               |
| <b>BTX</b>                 | Ballroom Tier 7     | <b>International Electro</b>     | —               | <b>Peavey</b>                  | D 1043             |
| <b>Cetec</b>               | D 1068              | <b>Magnetics</b>                 | B 4             | <b>Pentagon</b>                | B 62 & 63          |
|                            |                     |                                  |                 | <b>Pratt-Spector</b>           | B 28               |
|                            |                     |                                  |                 | <b>Precision Systems</b>       | T 2                |
|                            |                     |                                  |                 | <b>Quad/Eight</b>              | Basildon Room      |
|                            |                     |                                  |                 | <b>Quantum Audio Labs</b>      | B 74               |
|                            |                     |                                  |                 | <b>Recortec Inc</b>            | T 9                |
|                            |                     |                                  |                 | <b>Rockwell Int</b>            | —                  |
|                            |                     |                                  |                 | <b>SAE</b>                     | B 11               |
|                            |                     |                                  |                 | <b>Sagamore Publishing</b>     | B 46               |
|                            |                     |                                  |                 | <b>Sansui</b>                  | D 1011             |
|                            |                     |                                  |                 | <b>Schaeffer, Ken</b>          | T 14               |
|                            |                     |                                  |                 | <b>Scully</b>                  | D 10J              |
|                            |                     |                                  |                 | <b>Sennheiser</b>              | D 1005             |
|                            |                     |                                  |                 | <b>SESCOM</b>                  | B 52               |
|                            |                     |                                  |                 | <b>Shure</b>                   | B 36, 37 & 38      |
|                            |                     |                                  |                 | <b>Sierra Audio</b>            | T 11               |
|                            |                     |                                  |                 | <b>SONTEC</b>                  | B 25               |
|                            |                     |                                  |                 | <b>Soundcraft</b>              | Basildon Room      |
|                            |                     |                                  |                 | <b>Soundstream</b>             | D 1095             |
|                            |                     |                                  |                 | <b>Sound Technology</b>        | B 35               |
|                            |                     |                                  |                 | <b>Sound West</b>              | B 72 & 73          |
|                            |                     |                                  |                 | <b>Sound Workshop</b>          | D 1025             |
|                            |                     |                                  |                 | <b>Spectra Sonics</b>          | B 33 & 34          |
|                            |                     |                                  |                 | <b>Stanton</b>                 | B 51               |
|                            |                     |                                  |                 | <b>Stephens Electronics</b>    | B 12               |
|                            |                     |                                  |                 | <b>Struven, Peter GmbH</b>     | B 14A              |
|                            |                     |                                  |                 | <b>Studer/Revox</b>            | B 58 & 59 & D 1003 |
|                            |                     |                                  |                 | <b>Studio Maintenance</b>      | Basildon Room      |
|                            |                     |                                  |                 | <b>Studio Sound</b>            | B 10               |
|                            |                     |                                  |                 | <b>Superscope</b>              | B 3                |
|                            |                     |                                  |                 | <b>Tandberg</b>                | —                  |
|                            |                     |                                  |                 | <b>Tangent</b>                 | Ballroom Tier 4    |
|                            |                     |                                  |                 | <b>Tapemaker Sales</b>         | B 79               |
|                            |                     |                                  |                 | <b>TDK</b>                     | D 10K              |
|                            |                     |                                  |                 | <b>TEAC</b>                    | D 1001             |
|                            |                     |                                  |                 | <b>Technics</b>                | D 10Y & 1000       |
|                            |                     |                                  |                 | <b>Tektronix</b>               | B 81               |
|                            |                     |                                  |                 | <b>TENTEL</b>                  | B 14               |
|                            |                     |                                  |                 | <b>Uher of America</b>         | —                  |
|                            |                     |                                  |                 | <b>UNI-SYNC</b>                | B 95, 96 & 97      |
|                            |                     |                                  |                 | <b>UREI</b>                    | B 22 & 23 & D 1044 |
|                            |                     |                                  |                 | <b>US Pioneer</b>              | D 10L              |
|                            |                     |                                  |                 | <b>Westec Audio/Video</b>      | —                  |
|                            |                     |                                  |                 | <b>Whirlwind Music</b>         | T 13               |
|                            |                     |                                  |                 | <b>White Instruments</b>       | B 69               |
|                            |                     |                                  |                 | <b>Woram Audio</b>             | D 1079             |
|                            |                     |                                  |                 | <b>Yamaha</b>                  | D 1017             |

## Measurement

The *model 232* reverberation timer to be exhibited by **Acoustilog** measures room decay or T-60 directly in seconds on a digital display in each of seven octave bands. Resolution over the 10s range is claimed 10 ms, and timing accuracy  $\pm 3\%$ . A built-in pink noise generator can be accessed externally or bypassed completely when desired. The unit requires only 44 mm of standard rack space.

The *4400A* multipurpose test set will be exhibited by **Amber**. The instrument contains a function generator, low-distortion oscillator, tone burst generator, log sweep generator and pink-noise source. An autoranging, digital dBm meter with a range of over 150 dB is featured, with a resolution of 0.01 dB, true rms response and selectable weighting. The receiver section contains a wave and spectrum analyser, plus a digital plot recorder. This latter feature can be used to generate amplitude and phase/frequency response plots, differential gain, and amplitude and phase versus time plots on any standard oscilloscope. Also on show: a range of accessories, including a programmable attenuator to generator transfer curves of compressors, limiters etc; and an xy recorder interface to generate copies of stored plots.

**Audio Developments International (ADI)** will be showing the new *type 1003*  $\frac{1}{3}$ -octave digital spectrum analyser. Features include four digital memories for response evaluation; crt display; pink-noise generator; mic and line inputs; three response time constants; plus analogue and digital interface to accessories or a computer. Also on display will be the *type 1503*  $\frac{1}{3}$ -octave equaliser with band selection for interfacing to the *type 1003*.

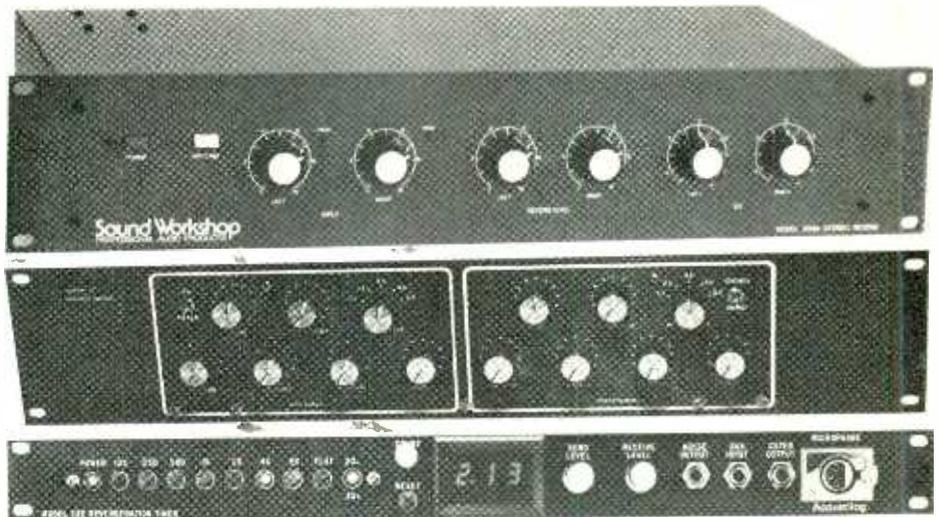
A variety of instruments will be exhibited by **B&K**, including the *2131* real-time digital frequency analyser in use as a data processor for a demonstration of 3-dimensional acoustic measurements. Other exhibits will be set up to demonstrate the measurement of tape machine and loudspeaker phase response, and wow and flutter on turntables.

**Inovonics** will be demonstrating for the first time the new *model 500*  $\frac{1}{3}$ -octave real-time analyser. The unit is powered by rechargeable batteries for portability, and offers the choice of peak or three averaging responses. A built-in octave and wideband pink-noise source and integral reverb time analysis (T-60) are also featured. In addition, the company's range of recording and broadcast-related products can be seen.

**Ivie** will be showing its range of test equipment, including the *IE-10A* octave-band spectrum analyser. The unit is calibrated in dB-spl and dBm; A and C-weighted sound pressure levels can also be measured. Power is derived from built-in rechargeable batteries, and the unit comes complete with a capacitor microphone.

A new audio generator, *model 1410A*, can be seen on the **Sound Technology** stand. The unit features a balanced, floating output, and is capable of producing composite im tones plus single tones from 10 to 110k Hz. A range of distortion analysers will also be on show.

**Tektronix** will be exhibiting the *T900*



**Top:** Sound Workshop model 242A stereo reverb. **Centre:** Master Room Super C reverb control unit with improved signal-to-noise ratio. **Bottom:** Acoustilog model 232 reverb timer.

*Series* of 'low-cost' oscilloscopes that feature dc to 15 or 35 MHz ranges; the *5000 Series* of modular oscilloscopes with dc to 2 MHz range and 10  $\mu$ V to 10 V/division sensitivity; the *5LAN* (range: 100 kHz, 10 Hz resolution) and *7L5* (range: 5 MHz, 10 Hz resolution) spectrum analysers; and the *TM500 Series* of test and measurement equipment, which includes counters, multimeters, generators, and signal processors.

**White Instruments** will be exhibiting a range of active and passive equalisers, and real time analysers, including the *model 150* octave-band analyser and the new *model 142A* spectrum monitor for peak-reading,  $\frac{1}{3}$ -octave measurements. Active equalisers on show include the new *series 4200*  $\frac{1}{3}$ -octave (cut only) unit, the *series 4000*  $\frac{1}{3}$ -octave cut/boost unit, and *model 4100* octave-band stereo unit.

## Microphones

The new *System C* capacitor microphone can be seen on the **Electro-Voice** stand. The system features a number of interchangeable elements that can be put together to suit the application. Two pre-amps (one for hand-held use and the other for booms) and four capsules with omni, cardioid, hypercardioid or 'shotgun' response are available. All the mics are claimed to be as reliable and rugged as dynamic models.

**Shure** will be showing the new *SM59* dynamic mic, which features a cardioid pattern and a specially-designed shock mount to minimise the pickup of mechanical vibration. Also to be seen: the new *50AC* acoustic telephone coupler (see p 26).

## Mixers

**Allison** will be showing the *65K Series* of automation programmers. These can hold up to 65 536 bits of encoded instructions, or 8192 analogue functions, or combinations of both analogue and digital information. A 3.2 ms access time for any number of programmed functions is featured, with four levels of error detection.

An operational 8-track recording studio comprising semi-professional and professional gear from a number of manufacturers will be a feature of the **Audio by Zimit** stand.

**Audio Transport Systems** will be exhibiting its complete range of desks aimed specifically at the broadcast and discotheque market. Also on show will be a new range of discotheque loudspeakers.

The new *600 Series* of desks for tv, audio-visual, sound reinforcement and theatres will be displayed on the **Audionics** stand. 16/16 versions are available as standard, with one line and two mic inputs on each channel. Facilities are provided for interfacing the monitor and talkback chain with theatre intercom systems. Multitrack recording can be carried out while the console is being used for sound reinforcement purposes. Separate outputs are provided for paging and foldback, plus an extra  $6 \times 16$  matrix for effects. Faders are dc-controlled for connection to a computer, synthesiser or external special effects unit. The system can be expanded to a 32/32 format.

**Duncan Electronics** are to show the *series 400* conductive plastic faders that are available in two stroke lengths (7 and 11 cm) and single or dual units. Linear, audio and 'balance' tapers can be supplied in a wide range of resistance values.

**EI-Tech** are to show the *Take-finder*, a unit for locating the wanted sections of tape and which features a digital readout. Also on display will be a *model 1616-25* desk with 16 input channels, 16 monitor-cue controls, 2 echo busses, 2 cue busses and a 96-point patch bay.

**Harrison** will be showing its new second-edition automated consoles, the *4032B* and *3624 series*. The company also plans to introduce the *864 Auto-Set*, a process control micro-computer designed specifically for the audio industry. Several software packages are to be made available for multitrack recording, live performance, tv production and master control applications. Further details from their stand.

**Holland Electronics**, probably better known for their custom-built systems for the

## AES 58th CONVENTION, A PREVIEW

broadcast industry, will be exhibiting the new *OA-100* audio op-amp module, the *327* series of plug-in amp boards, and several new console modules. For the broadcaster, the *system 100* modular amplification and distribution system and the *HK521* automatic line selector will be on display.

A selection of desks for recording, pa and theatre use can be seen on the **Interface Electronics** stand. Four, 8 and 16-track versions are available, with between eight and 32 inputs. Options on input modules include octave-band,  $\frac{1}{3}$ -octave or parametric eq, and tunable crossovers.

**Irv Joel and Associates** will be showing a **Cadac** compact automatic console, the **CARE** automated recording/remix system, and **V-cat** voltage-controlled attenuators. **MRL** test tapes and **Pultec** equalisers and filters can also be seen.

The **Chiltern QM-1** desk, which is available in a variety of formats with 12 to 24 inputs, four or eight output groups and 8 or 16-track monitoring, will be exhibited by **LaSalle Audio Products**. The console is of modular construction, with each channel regrouped on the master modules. Each channel module has mic and line input, tape return input, break jack and direct output. Other features include ppm metering at input and output; full sweep hf and lf filters with 18 dB/octave roll-off; four auxiliary sends; and pan and remix facilities.

**MCI** are exhibiting the newly-automated **400B Series**, which is fitted with the **JM-50** automation system. The company's range of tape machines and other consoles can also be seen.

**Neve** will once again be demonstrating the **NECAM** computer-aided mixdown system, which incorporates full control of tape machine operations as well as automation of console facilities via floppy discs.

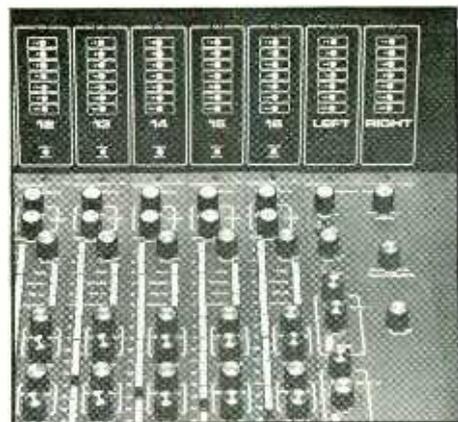
A range of desks will be exhibited by

**Quantum Audio Labs**, including the new **QM-168**. Sixteen input channels, 8 program busses and 8-track monitor mix section independent of program outputs are featured, plus separate masters for control room monitors, studio monitors, cue busses and solo buss. Each input channel has a 6-frequency, 3-knob eq section with peaking and shelving characteristics, two echo and cue sends, solo, mute and panning between odd and even-numbered program busses. A smaller desk with similar features, **QM-128**, can also be seen.

The **Series One 12/2** and **16/2** 'road' mixers, and the **Series Two 4** and **8-track** studio consoles will be exhibited by **Soundcraft**. The **Series Two** consoles feature a variety of options, including sweep-frequency eq, ppm metering and Penny and Giles faders. On show for the first time will be the **Series Three**, a fully modular studio console for 16 and 24-track recording. The desk features 4-band sweep eq, highpass filter, eight auxiliary sends and returns, switchable vu/ppm metering, auto pre/post solo, and a patch bay.

**Sound West** will be showing several examples from the **Midas PR System** consoles, which feature a range of 29 standard modules to cater for sound reinforcement, multitrack recording and broadcast applications. On view will be a 32-input/8-stereo subgroup sound reinforcement console, a 24/16 recording console, and a special demonstration desk fitted with a variety of input/output and auxiliary modules.

**Sound Workshop** are to demonstrate the new **Series 1600** 16-track recording console. The board is fully modular, allowing it to be purchased in as small a configuration as 12/2 for later expansion to 36/24 without factory modifications. Also on show will be the **1280** 8-track desk now available with a new **Super Eq** 15-frequency eq section; the **242A** stereo reverb system; the **223A** electronic crossover; and the **421** broadcast/discotheque mixer.



Tangent 3216 desk with input/output modules.

**Spectra Sonics** will be showing the following rack-mounting equipment: the **Model 1100** mixer with six mic/line inputs and a mono output; and the new **Model 712** stereo 200W/channel power amp. A model **1026/26** console, capable of handling 26 mic, line and tape inputs and with 26 direct, one mono, three cue, four echo, and various monitor outputs, can also be seen on their stand.

The **Trident Fleximix** system will be displayed on the **Studio Maintenance Service** stand. Of modular construction, the system can be expanded to handle 40 input channels, 24-track monitoring and 10 mixed output groups. Also on display: the **model CB9066** parametric equaliser/filter which features high and lowpass filters with 22 dB/octave slopes.

The model **3216** desk to be shown by **Tangent** features fet switching to 'electronically restructure' the input/output module function blocks, and eliminate the need for repatching during mixdown or overdub. Sixteen output busses plus direct are provided for submaster assign, with 3-band parametric eq on each channel. The monitoring capability allows all 16 input/output modules to be used for recording, while an independent, simultaneous stereo mix is being carried out. Options include a 24 and 32-channel mainframe, and a 156-point patch bay.

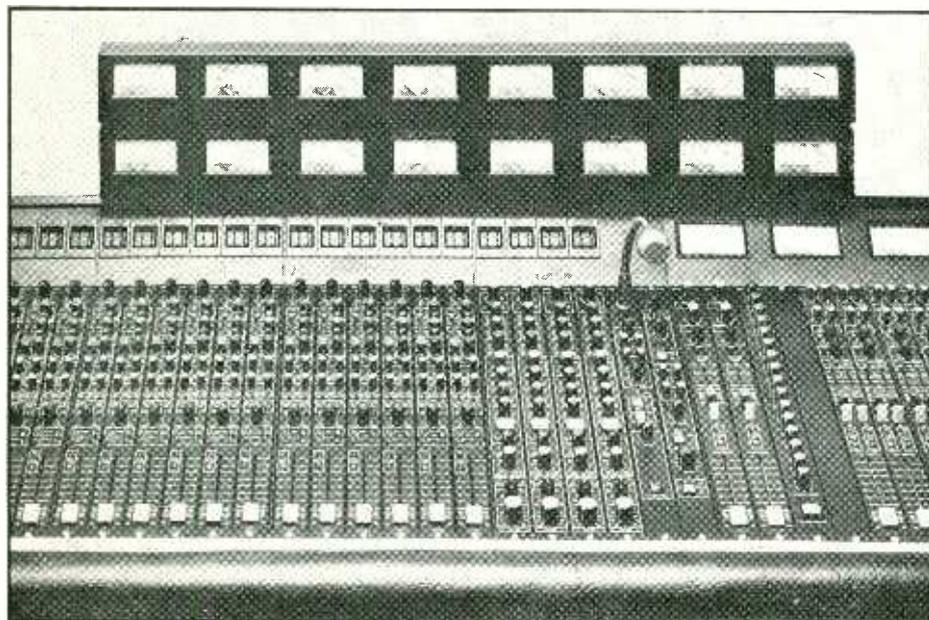
**TEAC** will be showing a variety of **Tascam** desks: the **Model 1** line-level mixer in 8/2 format; the **Model 2** 6/4 mixer with eq on each channel and switched multiple inputs; and the **Models 5** and **8** with eight channels, full eq and multiple inputs. The latest version of the **40/4** 4-track with simul-sync, the **80-8** 8-track and the **90-16** 16-track tape machines can also be seen.

### Monitor loudspeakers

Two new **Gauss** chassis speakers will be shown by **Cetec**. The model **1502** 'super tweeter' is capable of delivering 126 dBA at 1.3m with 90° dispersion, and has a claimed frequency range of 3-20 kHz. Power handling capability is 30W rms—if this is exceeded for any reason the dural diaphragm can easily be changed. The **1841** 25-cm guitar speaker handles up to 150W rms continuously, and delivers 123 dBA at 1.3m.

A demonstration of a range of bass horns, ▶

16-track Midas console supplied to Shiva Studios, Brussels.





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## AES 58th CONVENTION A PREVIEW

bass and full-range cabinets, stage monitors and multicellular and radial hf horns has been arranged by **Community Light and Sound**. Also available will be a new 100-page catalogue, and the results of recent tests of spl, response, distortion, Q and DI measurements on units and cabinets used in sound reinforcement installations.

**Emilar** will be showing the *EC 175* high-frequency compression driver. Frequency range is a claimed 500-15k Hz, and distortion less than 0.5% at 100 dBA spl when coupled to the *EH 800* horn. The unit is rated for 30W maximum power, and has a pressure sensitivity of 143 dBA spl from 1W.

**Ferrofluidics Corporation** will be demonstrating a new automatic dispensing system that controls and meters the injection of *Ferrofluid* into loudspeaker coils. The fluid is said to enhance the performance of loudspeakers by preventing the voice coil rubbing the magnet assembly, and also increase the power handling capability. A new fluorocarbon formulation is now available with a claimed improved temperature range and chemical inertness.

The new *MS100* 3-way monitor will be shown by **Forsyth Audio Systems**. Frequency response is a claimed  $\pm 2$ dB, 38-21k Hz on axis, and  $\pm 3$  dB, 35-15k Hz at 45° off-axis. The monitor is capable of handling 70W continuously, with 200W peaks.

**Koss** will be showing the *CM1030* monitor, a 4-band system with a 25-cm bass driver, a 25-mm tweeter and a 25-mm 'treble' tweeter that use acoustic transformers to increase headroom, plus two 11.5-cm midrange units. A quasi second-order network gives crossover frequencies of 6 kHz (6 dB/octave), 2.5 kHz (18 dB/octave) and 400 Hz (6 dB/octave).

The *SPEC-15L* loudspeaker system

comprising a 40-cm bass driver, exponential horn, acoustic lens and 5-cm horn driver can be heard on the **US Pioneer** stand.

### Power amplifiers

**Audio Marketing** are to show the new **H/H** stereo power amplifier and the new **Allen and Heath S6/2** broadcast mixer. The model *S5000D* amp is rated at 500W/channel into 2.5 ohm, with a claimed total harmonic distortion of 0.005% and im of 0.02%. The desk is equipped with two stereo tape, two stereo RIAA gram and two mic inputs, plus an automatic 'ducker' for voice-overs. Also on display: the **Allen and Heath SD12/2** mixer, which had similar features to the *S6/2* but also comes with echo send, panpot and solo on each channel.

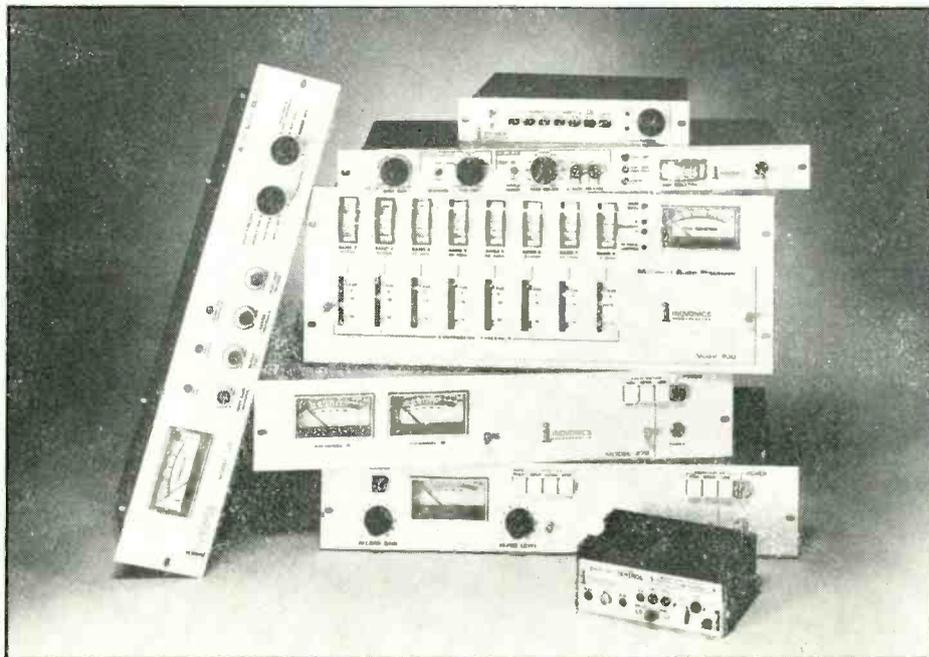
The new *250C* power amp to be seen on the **BGW** stand is rated at 100W/channel into an 8-ohm load or 150W/channel into 4 ohm. Im distortion at 100W output is claimed to be less than 0.03%. Front-panel clipping indicators are fitted, and a switch converts the amp to mono operation (251W into an 8-ohm load).

**Gallien-Krueger** will be exhibiting the new *1000S/1000SN* power amps. Output is rated at 200W per channel; third harmonic distortion is said to be less than 0.05%; and a signal-to-noise ratio of 110 dB is claimed. Also to be seen: a new 16/8 console featuring three bands of parametric eq per channel and  $-128$  dBm input noise.

The new *CS-100* stereo power amp, which is capable of delivering 200W/channel into 4 ohm, can be seen on the **Peavey** stand. Frequency response is a claimed  $\pm 0.1$  dB, 20-60K Hz, total harmonic distortion less than 0.05%, and im less than 0.1%. Also on show for the first time will be the new **Mark 2 Series MR-7** rack-mounting mixer, which is equipped with high and low-impedance inputs on each of the seven stereo

54 ▶

A range of measurement and signal processing gear to be shown by **Inovonics**, including the model 230 8-band broadcast compressor-limiter.

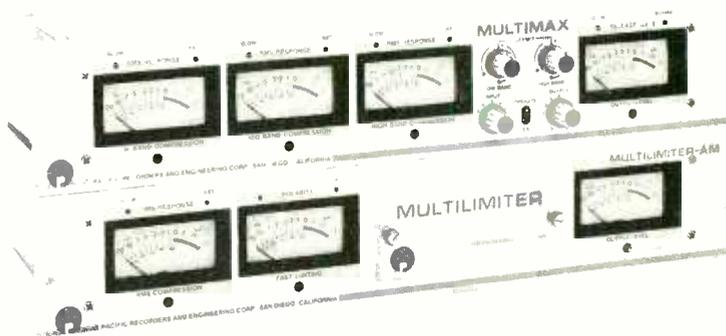


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The built-in calibration microphone is equalized to the IE-10A case to ensure flatness. An external input is provided for on-line signal monitoring and use with other types of microphones.

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## AES 58th CONVENTION, A PREVIEW

channels. Pre-monitor send, 4-band eq, stereo pan and led overload indicators are standard features.

Yamaha will be showing the new *P-2100* stereo power amp, rated at 85W/channel. Features include inputs on *XL*R and phono connectors; calibrated input attenuators; and switched monophonic operation. Frequency response is a claimed  $\pm 0, -0.5$  dB, 20-50k Hz, and total harmonic distortion 0.03% at 50W output.

### Tape and tape duplicating

A new packaging for cassette pancakes on *STACK* hubs can be seen on the Agfa-Gevaert stand. The hubs are equipped with a new interlock claimed to cut down time and handling costs. Tape to suit *C-60*, *C-90* and *C-120* cassettes are supplied in boxes of 40 pancakes to reduce storage space.

David Lint Associates will be showing a new 'hot-press' ferrite tape playback head made by the HPF Division of **Panasonic**. The head is said to have particular application in tape duplicating.

The model *200/D* duplicator unit capable of handling Dolby-encoded master tapes will be demonstrated by **Infonics**.

**International Audio** are to exhibit the *Alpha Series* of cassette conyng systems that allow a 60-minute cassette to be duplicated in under two minutes. The deck transport utilises five motors to minimise the number of necessary belts and pulleys. Up to two extra slaves can be added, and automatic rewind of both master and slave is provided at the end of each run. A jammed or short cassette initiates a visual alarm.

The *LT-1600B* system to be exhibited by **Liberty/UA** comprises a master unit housing head pre-amps, slave driver electronics, bias supply, master deck and tape bin, and up to 10 slave transports. Duplicating ratio is 16:1 with a 19 cm/s master tape (8-channel on 25 or 12.5 mm tape, or 4 or 2-channel on 12.5 or 6.25 mm) spinning at 304 cm/s. Slaves running at 76 or 152 cm/s can operate with 6.25 mm cartridge or 3.8 mm cassette tape. Between 640 and 840 8-track carts, or 320 to 420 cassettes, can be produced per slave in 8 hours. Also on show will be the *CW25* cartridge and *CW155* cassette tape winder.

**3M** will be showing *Scotch 250* mastering tape, which is said to have a 4 dB signal-to-noise advantage and better hf saturation performance than *206*.

The highlight of the **Pentagon** range will be the *1100 Series*, which is available in reel-to-reel, reel-to-cassette, and cassette-to-cassette versions. The system is modular and accepts up to 11 slaves. Features include end of tape sensing, track select, automatic rewind of masters, automatic cue on reel, motion indicators, and individual channel controls (preset or manual). Duplicating ratio is 16:1 with reel masters and slaves running at 152 or 304 cm/s (depending on the recording speed of the master tape). Cassette master and slaves spin at 76 cm/s.

The latest model of automatic cassette loader, now available with an optional cassette feed mechanism, will be shown by **Superscope**. The loader fills cassettes at 610



The new Telefunken M15A available with up to 32 tracks and built-in c4.

cm/s, and boasts new features said to increase accuracy and reliability.

Two new mastering cassettes, models *AD* and *SA* will be shown by **TKD**. *AD* is intended for standard applications, while *SA* is a high-energy tape requiring a high bias.

### Tape machines

The *ATR-100* mastering machine to be shown by **Ampex** features a third harmonic distortion figure of less than 0.3% at 370 nWb/m; <1% im at the same level; 80 dB signal-to-noise ratio at 76 cm/s (ANSI A-weighted); and a frequency response of  $\pm 0.75$  dB, 100-15k Hz at 38 cm/s.

The model *4500* SMPTE time code synchroniser can be seen on the **BTX** stand. The unit will synchronise two or more multi-tracks, and is said to be capable of controlling dc or crystal-controlled capstans with an accuracy of 100  $\mu$ s. Synchronisation codes as low as -18 dBm can be read, thus eliminating the need for a buffer interface.

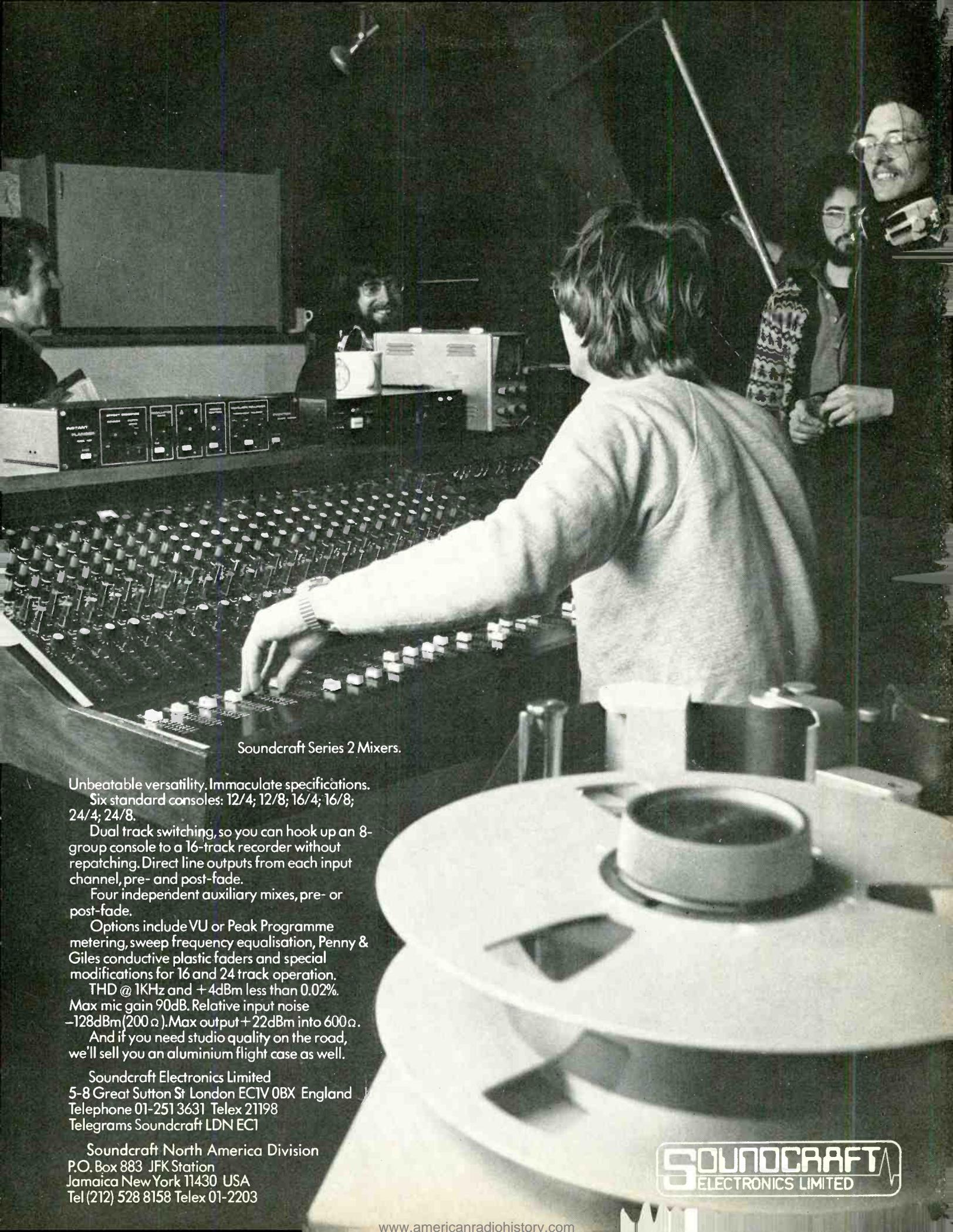
The new **Telefunken M15A** multitrack can be seen on the **Gotham** stand. The machine, which will be on show for the first time at an AES Convention, is available in 8, 16, 24 and 32-track configurations, running at 19 and 38 cm/s or 38 and 76 cm/s. Electronics are easily accessible in two slide-out drawers beneath the transport. Up to 24 tracks of telcom c4 noise reduction can also be accommodated. Also on display will be the latest **Neumann** disc-cutting control console, *SP77*, which feature variable 'Q', dual-program equalisers to ensure that both program and preview channels are properly matched.

A range of tape transports available in one to 24-track formats will be exhibited by **International Electrn Magnetics**. The model *240* audio processor, models *230* and *231* graphic equalisers, and the model *306* dual-band limiter can also be seen.

A digital, 2-channel tape machine using 6.35 mm tape running at 38 cm/s will be exhibited by **Mitsubishi**. A signal-to-noise in excess of 90 dB is claimed, with total harmonic distortion less than 0.01% at 'full output'. Coding is by means of 14-bit natural binary. Wow and flutter is said to be equivalent to the accuracy of the crystal oscillator.

**Nagra** will be exhibiting the *SNS* stereo

56 ▶



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## AES 58th CONVENTION, A PREVIEW

portable machine fitted with a new automatic level control and noise reduction system. The machine is claimed to represent a new approach to 'light-weight' recording.

The *MX-5050* machine to be shown by Otari is available in 1, 2, 4, and 8-track versions, and features adjustable bias for high-energy tapes, synchronous or dc-servo capstan, and front-panel controls for bias, eq and operating level.

The new *Q-11* autolocator will be demonstrated by Stephens Electronics. Microprocessor control is said to ensure light tape handling and allow cues to be located without overshoot. Cue locations and commands are stored in any of ten memories, and can be sequenced to cycle automatically. The system is available as a hand-held control unit, or in a complete remote electronics package. The company's capstanless 24 and 16-track tape machines can also be seen.

Studer/Revox will be demonstrating a new system for synchronising audio and video tape recorders and film transports. The *TLS-2000* uses SMPTE code, and can link up to four machines in any combination with a claimed accuracy of  $\pm 100 \mu\text{s}$ . Lockup time is 3s, and parking accuracy  $\pm 1$  frame.

A digital tape machine, with frequency range claimed to be flat from dc to 18 kHz, a dynamic range of 90 dB and noise and distortion 85 dB below peak level, will be demonstrated by Soundstream. Two, 4 and 8-channel versions should be available for inspection.

Tandberg will be showing a range of receivers and reel-to-reel and cassette machines. Of particular interest should be the new model *IOXD* tape machine, which features a crossfield recording head and a 3-motor logic transport.

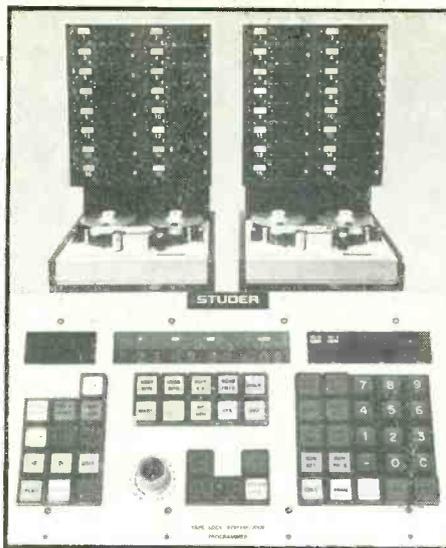
Technics will be showing its range of quartz-controlled, phase-locked turntables, three of which have  $\pm 9.9\%$  speed variability. Their exhibit will also include the *RS-1500US* reel-to-reel machine with isolated-loop transport; the *SB-7000A* and two linear-phase loudspeakers; the *RS-9900* rack-mounting cassette deck; and two equalisers with variable amplitude, bandwidth and centre frequency.

A range of tape tension gauges will be shown by Tentel. The devices can be used while the tape machine is in operation—thus allowing the operator to 'see' mechanical sources of wow and flutter—and are said to work with virtually any transport from Nagra portables to Ampex *MM 1200* multitracks.

### Signal processors

The model *SC-68* stereo parametric equaliser to be exhibited by Ashly Audio has 1/20-octave or broad-band tone control action, and selectable bandwidth and frequency over a 50:1 range. Also on show: the *SM Series II* mixing consoles; *SC-50* peak compressor-limiter; and a new mono parametric equaliser.

Audio & Design will be exhibiting the new *Gemini Compact* stereo compressor-limiter and three new *SCAMP* modules: the *SD11* adt/flanger which in the adt mode of operation offers 0-40 ms variable delay and



Studer/Revox TLS-2000 synchronising system.

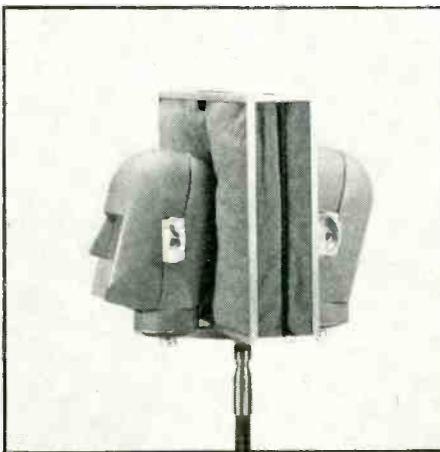
feedback (for 'digital' echo); the *SO8* 2-in/8-out distribution amp; and the *SO23 Autopan*, which will be on hand (we are told) to perform 'amazing' feats of channel-changing dexterity. Other units on show include the *E950-RS* paragraphic equaliser, *F760 Compex* limiter, *F769 Vocal Stressor*, plus other *SCAMP* modules.

The new *TD-1* analogue time delay unit for sound reinforcement systems will be demonstrated by Bozak. It features four delay outputs, with a maximum of 100 ms delay in 25 ms steps. Each output has a separate level control.

Crown will be showing the new *EQ-2* equalisation system, which comes complete with a test record of pink noise signals in bands across the audio spectrum. Also on display: a 2-channel, 11-band equaliser with octave-centred bands; and the new *DL-400* stereo control system. The latter unit features 3-band tone controls for each channel with selectable centre frequencies, digital readout of channel volume levels, and eight high-level and two processor inputs. The new *DL-440* 220W/channel stereo amp can also be seen.

dbx will be exhibiting a range of noise reductions systems for various applications. These include the model *KP-22*, a direct plug-in replacement for the Dolby *CAT-22*

Dummy head for JVC Q-Biphonic recording.



card; model *142* broadcast unit; models *152*, *154* and *157* 'budget' 2 and 4-channel units with simultaneous or switchable code and/or decode facilities; model *192* 2-channel switchable, and *193* 2-channel simultaneous record and replay system for the Nagra *IV-S* machine; and model *194* single-channel, switchable record/replay and 5-input mixer system for Nagra *4.2*, *4L* and *III* series machines. Also on show will be the new model *158* system that offers eight channels of simultaneous record and replay noise reduction.

A wide range of equipment will be shown by Eventide, including the model *1715M* digital delay system that offers up to 320 ms of delay in 20 ms steps; the model *H190 Harmonizer* unit that can be used to delay a signal by up to 112 ms, or change its pitch within a 2-octave range, or reduce feedback in a pa set up, or perform all three simultaneously for special effects; the model *2830 Omnipressor* that combines the characteristics of a compressor, expander, noise gate and limiter in one unit, and which can be used in a 'dynamic reversal' mode to reduce the attack-decay envelope of a plucked string; and the model *FL201 Instant Flanger*. The latter unit utilises a 'true time delay circuit' (rather than analogue) to produce many more nulls, and what is said to be a much deeper effect than previously available. A review of the *Instant Flanger* appeared in the July '77 issue, p90.

Once again JVC will be demonstrating the *Biphonic* (2-channel) and *Q-Biphonic* sound systems. The new *PTL* (phase tracking loop) and double *PLL* (phase-locked loop) demodulators will be used for the CD-4 demo. The *Q-Biphonic* technique is said to be an extremely effective method of recreating a stable 360° localisation of sound around the listener. The system can be heard in operation via loudspeakers, headphones, or a specially-designed *Q-Biphonic* listening chair.

The new *Delta-T Model 92* digital delay system will be demonstrated by Lexicon. Two independent outputs with up to 120 ms of delay are featured. Noise and distortion is claimed to be 0.08%, and dynamic range greater than 90 dB. Also on show: the larger *Model 102* stereo digital delay system, and the *Model 27* pitch shifter.

The latest *Super C* reverb unit to be shown by MICMIX is said to feature improved signal-to-noise, plus options for adjustable led overload indicators and phantom-powered long-distance connections to the sound column without any loss in its 'natural sound ambience' characteristics. An improved version of the *Time Warp* delay unit, the *TW II* can also be seen. The unit now has a 'substantially improved' signal-to-noise ratio, a second variable delay output for triple tracking, time pedestal switching for extended delay, and bypass switching. Also of interest should be the *Master Audio Meter* dual-channel led panel indicator, which will be shown in its original time peak/rms mode, and its new quasi-peak (IEC)/rms capability.

MXR will be demonstrating a digital delay unit that features delay times from 80  $\mu\text{s}$  to 320ms; the delay may be expanded to a maximum of 1.28s by means of plug-in memory boards.

The model *III B* spring reverb unit, model

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## AES 58th CONVENTION, A PREVIEW

245E stereo synthesiser, model 418A compressor-limiter, model 515EC sibilance controller and model 622 parametric equaliser will be exhibited by **Orban/Parasound**. The model 622 is a successor to the well-known model 621, and is now said to feature superior rf suppression, lower distortion and greater bandwidth.

**Quad/Eight** will be demonstrating the CPR-16 computer-programmed reverb unit. The device is capable of producing a variety of effects, including tape loops, springs, plates and the sound of an acoustic chamber. Dynamic range is claimed to be in excess of 80 dB, noise -80 dBm, and total harmonic distortion 0.1%. The reverb time may be set between 250 ms and 20s; hf damping, lf filtering and decay time are also controllable. In addition, The *Model Pacifica 28/16* modular console will be displayed.

**SAE** will be showing a variety of units: models 2800 and 1800 stereo parametric equalisers; model 2200 stereo power amp rated at 100W continuous power per channel with 0.05% total harmonic distortion; and the model 5000 impulse noise reduction system for 'de-clicking' old 78s for reissue where no master tape exists.

**Sennheiser** will be demonstrating the *VSM 201 Vocoder* that can produce artificial speech sound for special effects purposes.

**UREI** will be demonstrating for the first time a new digital delay line for sound reinforcement setups. Delay in variable between 1 and 128 ms at each of four outputs. Also on show: the new *Model 1813 Time Aligned* studio monitors; a 32-channel bargraph level meter; the new *800 series* crossover networks; and the new *Model 515* parametric equaliser.

A range of hardware and software for quadrasonic processing and decoding will be demonstrated by **Woram Audio**. Of particular interest should be a demo of *Biphonic* and *Q-Biphonic* sound, with a-b comparisons between the latter and 'regular' quadrasonic recordings.

## Miscellaneous

**Hammond** will be showing the *Audio File*, a new hi-fi equipment cabinet comprising on 483 mm rack designed to look inconspicuous in a domestic setting. Equipment can be rack-mounted or layed on shelves.

The **Ken Schaffer Group** will be exhibiting the new *Schaffer-Vega X-10* wireless diversity system, which is said to eliminate the problems found with previous wireless systems: signal-to-noise ratio exceeds 90 dB; a dual-diversity receiver eliminates dropouts over a minimum 100m performing range; and multiple-stage 'helical stage cavities' are claimed to make the unit virtually immune from interference from any source. Specifically designed for use with high-level electronic instruments—guitars, 'electrified' flutes etc—the system is already in use by over 24 bands. In addition, the transmitter may be fed by a high-output mic, such as a lavalier, for stage, tv and film applications. A crystal-controlled frequency lock between 150 and 210 MHz allows up to 12 separate systems to be used on a single stage without crosstalk.

A new 14 kHz film sync generator, plus metal racks, toroidal power transformers, and other components and hardware, will be shown by **Martin Audio/Video**.

**Scully** will be showing the *Lathe*, which features digital lpi readout for repeatable settings, 16 $\frac{2}{3}$  rpm speed for CD-4 cutting, and quick-change mounting of the cutter head. Feed and depth is driven automatically by digital information from the frequency and level content of the program material.

**Stanton** will be showing the new *Model 681BPS* stylus that features a forked tip. This allows record 'negatives', metal stampers and matrices having raised rather than engraved tracks to be played. Thus the quality of a pressing can be checked by comparing the first-generation copy of the master matrix. The new *881S* 'calibration' stylus can also be seen.

And last, but by no means least, the ever-smiling crew from **Studio Sound**, in the persons of Editor Ray Carter and Ad Manager Tony Newman, will be on hand to tell it like it is. ■



The new Schaffer-Vega X-10 wireless diversity system to be shown by the Ken Schaffer Group. Up to 12 individual foldback or paging channels can be operated on a 'standard-size' stage without crosstalk occurring.

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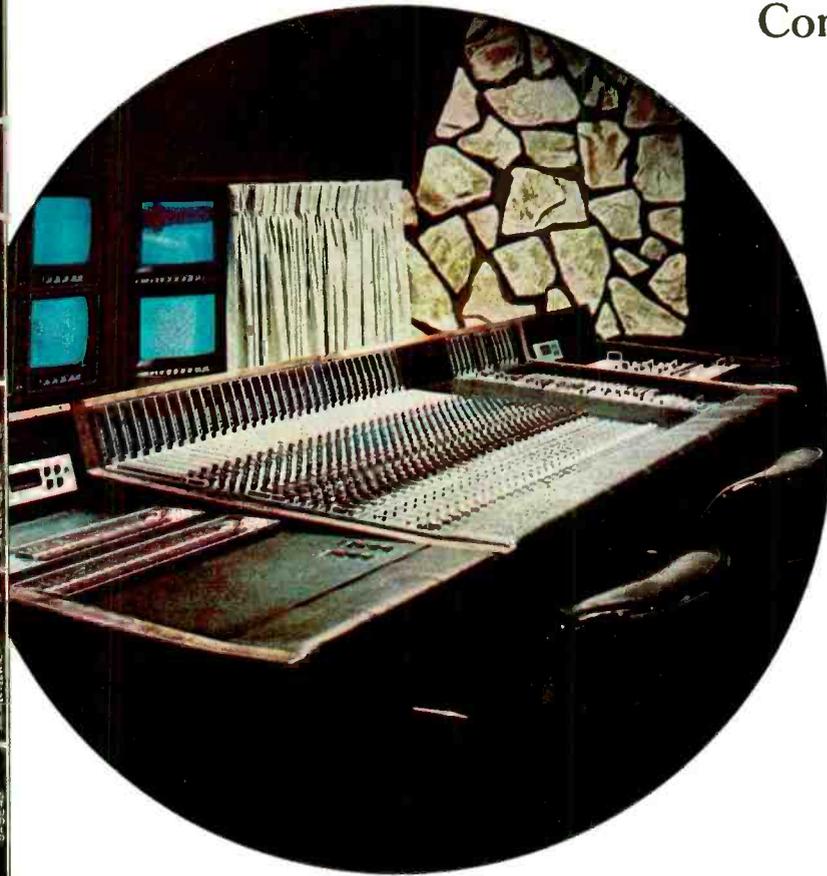
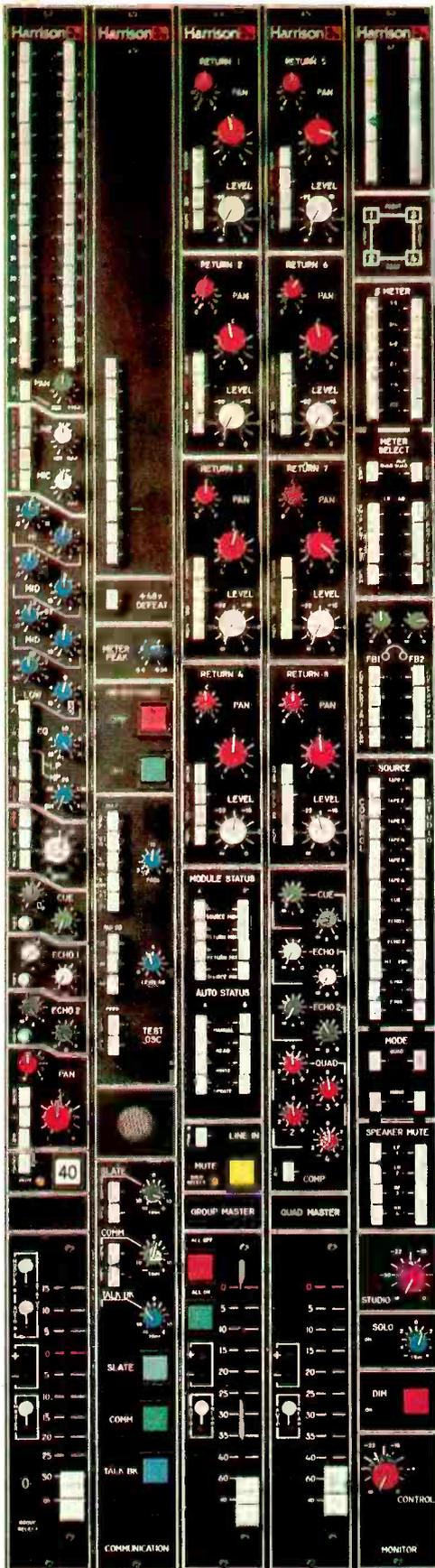
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ADRIAN HOPE

## Riding the laser beam

IN OUR RECENT PIECE ON Pink Floyd and their live performances, the question was raised as to what kind of stage show Floyd can possibly put on next to top the last audio-visual spectacular of films, dry-ice smoke, and just about everything else short of World War III.

Half the answer was recently found at the Metropole Cinema in Victoria, London. *Love Light*, billed as a laser musical, features an hour of laser graphics on a giant screen. The white beam from a single laser is split into the colours of red, green, yellow and blue by a prism in a device built by General Scanning Inc of Boston. The four coloured beams are fed through modulators and galvanometers controlled by digital signals recorded on a Hewitt-Packard 8-track computer graphics recorder.

Essentially, each galvanometer behaves like an x-y plotter, moving the laser beams in a pattern so fast that what appears on the screen stands out as a solid trace. The patterns can remain still or move continually, like Lissajous figures on an oscilloscope screen; they can take up either recognisable or surrealistic patterns. The whole moving spectacle is sync'd with pre-recorded rock music. The overall effect is a pretty staggering sight.

The London Planetarium provides the other half of the answer to the hypothetical question. Madame Tussaud's have been staging *Laserium*, billed as a cosmic laser concert, 'a collage of vibrant colours and laser illusions, choreographed to music, that dazzles the imagination.' However, don't be

put off by the words!

The *Laserium* show was first staged in Los Angeles in 1972, but in fairly crude form. As with the *Love Light* show, the white beam from a 1W Krypton laser is split by a prism into four colours, and the separate beams projected onto the vast, white domed roof of the Planetarium. The beams are under the control of modulators and galvanometer deflectors, again from General Scanning. But whereas the *Love Light* laser scans are 100% preprogrammed on a graphics recorder, only very basic features of the *Laserium* display are programmed on tape. To a very large extent, what the laser beams do depends on how the laser operator (or 'laserist' in the new jargon) feels. And this in turn depends on how the audience reacts to what he is doing.

The music is a selection from commercially available ELP, Strauss, Floyd and Walter Carlos tracks, most of it well known. The tape recorded music is replayed using a Teac 3340, Accuphase amps and 16 AR-11 speakers situated around the vast Planetarium. The 'laserist' has a basic routine for each piece of music: for instance, a preprogrammed circle or ellipse for each laser beam, followed by sweeps of the Planetarium dome with these laser shapes as the mood and music takes him. If the audience applaud an effect, there is more of the same.

The *Laserium* equipment is being constantly refined, the current control panel having rotary pots, switched pre-sets, and a couple of quad panpots. Foot pedals, to give the laserist the equivalent of an extra pair of hands, come next.

It doesn't take much imagination, for anyone who has seen both shows, to picture a rock group, orchestra or ballet performed live with effects similar to those used for both the *Love Light* and *Laserium* shows, under the control of a laserist sitting alongside the sound engineers. Someone has to do it—it's just a question of which group does it first, and when.

## We will dupe them on the beaches

ABOUT TEN YEARS AGO, composers and musicians created music while engineers recorded them. Then along came the likes of Phil Spector and George Martin, whereupon producers started to earn their money. 'Production' is now accepted by trade and public alike. The vinyl lp has become an art form all of its own, with the public no longer expecting live and recorded performances to sound the same. But not everyone who dabbles with production has the necessary

combination of musical and engineering talent.

One American superstar had her boyfriend produce an album—it cost over £100 000 and laid an egg. Another chappie wasted valuable studio time trying to create a 'backwards' sound for a 'forwards' musical phrase, simply by having the musicians read from right to left instead of left to right. He'd overlooked the fact that although the notes will come out in the correct sequence when the tape is played back, any off-beat accents are shifted to the on-beat to create a lurching rhythmic pattern.

On the other hand, some producers overcome almost superhuman odds. Although it's fairly well known that Beach Boy Brian Wilson is by legend deaf in one ear (which is why most of the early Beach Boys records were mastered in mono only), it is far less well known that one highly respected electronic-musical wizard, mixing stereo in the States, hears only in mono. And we're *not* naming names, in this case.

In the film industry, of course, the public has been routinely fooled for the last half century. The famous film sequence of Hitler dancing with delight at the fall of France was faked by looping together eight frames which happened to show him waving an arm and scratching his leg. And in the recent film success, *Rocky*, everyone is very impressed with how the star keeps going at one-arm press-ups. But watch carefully and you'll see just where the short length of film showing a single press-up was joined into a loop.

In 1941 the late Bernard Herrmann, who scored most of the Hitchcock films (including *Psycho*), produced the music for *The Devil And Daniel Webster*, which was retitled *All That Money Can Buy* in the UK to avoid corrupting the British public with the word 'devil'. In the film, the Devil, played by Walter Huston, is shown playing a barn dance fiddle in virtuoso manner. Actually, Herrmann had overdubbed four separate fiddles, using optical sound recorders, to produce what sounded like one astonishingly brilliant player. Herrmann played the track to Jascha Heifetz, and fooled him into believing that it was a 'brilliant young Yugoslav player' down from the mountains.

For my money the best audio production hoax was played by the BBC and the British Council on the whole of the USA. At the time of Dunkirk, Winston Churchill made his famous 'We will fight on the beaches . . .' speech at the House of Commons, and the British Council thought it would be a fine idea if the speech could be replayed to our American allies. But, of course, the original occasion hadn't been recorded, and in view of the state of the War at that time Churchill had no time to make studio recordings. However, he agreed to let an actor imitate him. Norman Shelley was chosen and, at the BBC, read the parliamentary transcript of Churchill's speech into a microphone. The resultant shellac discs were approved by Churchill, who reputedly congratulated Shelley on even 'getting my teeth'. The discs went off to the USA and were played over the air, with no one any the wiser, until recent relaxations of War security enabled Norman Shelley to tell all.

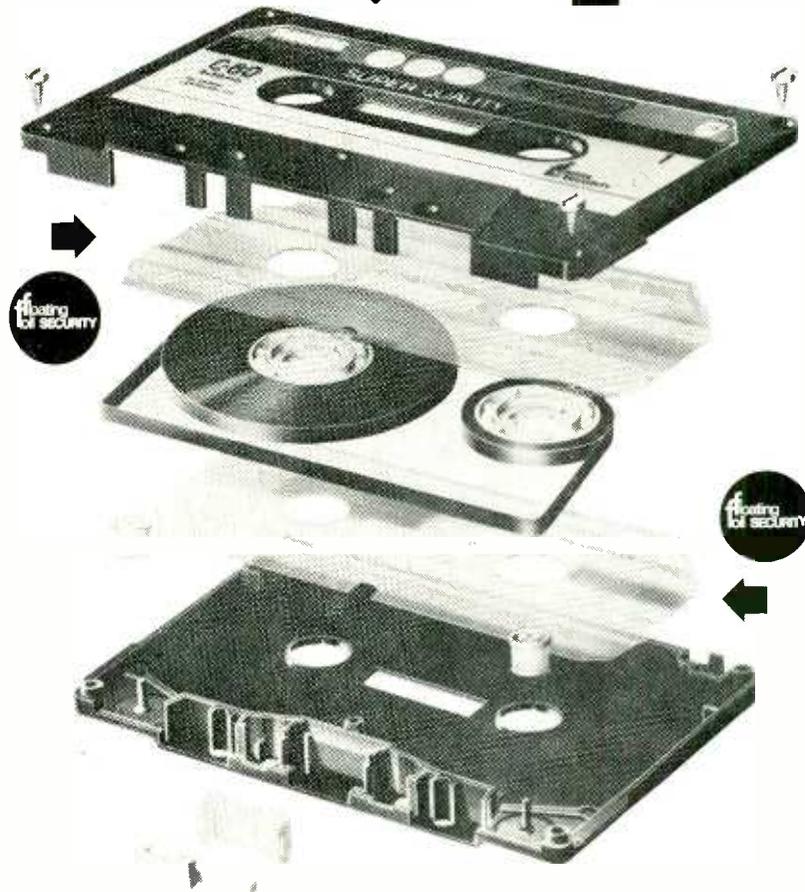
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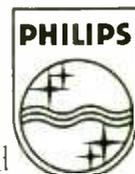
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# It's ours. Electro



When you've been a leader in professional microphone development and engineering as long as we have, you're very picky about the products you put your name on.

So it should come as no surprise that our new System C represents years of planning, field testing, and a healthy dose of brilliant engineering. Including a new proprietary process that permanently charges the diaphragm to keep audible output levels constant for years.

Our new line includes the CH15S Hyper Cardioid System; the CL42S Shotgun System; the CO15P Omni System; and the CS15P Cardioid System. Or any custom combination of heads, electronics, and accessories you want.

More importantly, our entirely new E-V System C offers significant advantages that, quite frankly, haven't been available until now.

It's an exceptionally versatile System because it's totally modular.



#### PE15 Electronics

E-V phantom-type electronics have a simple, straightforward circuit design. Compatible with all 3/4" accessories. Includes 15' cable with Switchcraft connector, 310 clamp, foam lined metal utility case.



#### CL42S System

The Shotgun System. Includes CL42E Cardiline<sup>®</sup> head, SE15 electronics, 315A windscreen, 309 shock mount, handle, large molded foam lined carry case.



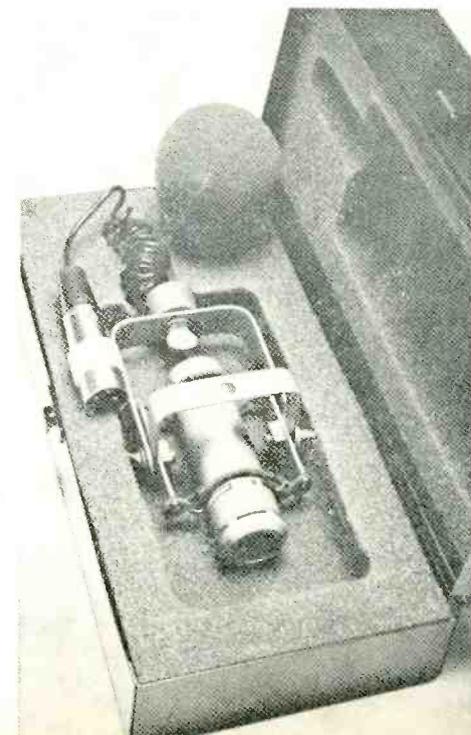
#### SE15 Electronics

Our "short" electronics are programmable for phantom-type or AB power. With 15' cable, Switchcraft connector, utility box.



#### CA10 Attenuator

Reduces head output app. 10 dB for high SPL's.



#### CH15S Hyper Cardioid System

First hyper cardioid to maintain actual hyper cardioid characteristics at *all* frequencies. A real breakthrough.

CH15E head has extremely uniform polar characteristics. It's more directional than heads twice its length.

SE15 "short" electronics have dual remote power capacity using an internal switching system.

System is covered by our unconditional 2 year warranty.

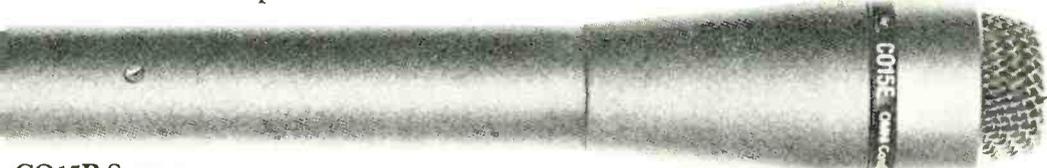
# Voice System C.

Heads, electronics — the works — are designed to work simply and efficiently with each other.

It's a totally reliable System. Built with the kind of field tested toughness you've come to expect only from E-V.

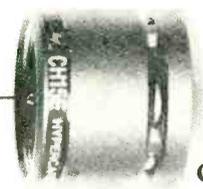
It's a system backed by our convictions: an unconditional 2 year guarantee and our reputation for fast service when you need it.

Your E-V dealer will show you how remarkable our System really is. You'll prove it to yourself on the first job. EV's System C. The new standard of excellence for professional condenser microphones.



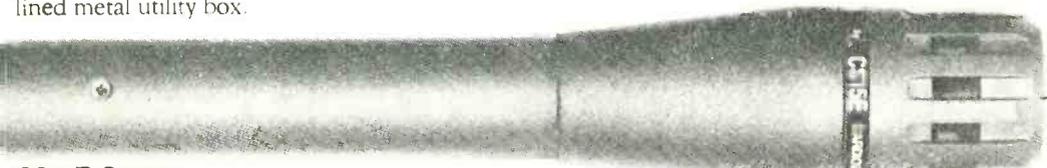
### CO15P System

The Omni System. Includes CO15E head, PE15 electronics, 315A windscreen, 310 stand clamp, 15' cable with Switchcraft connector, foam lined metal utility box.



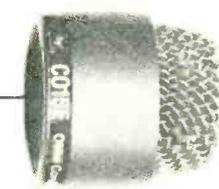
### CH15E Head

Hyper Cardioid single-d condenser. As directional as heads twice its length. With 315A windscreen.



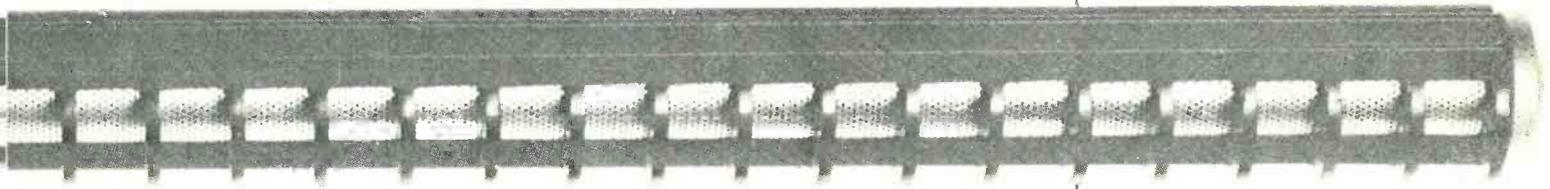
### CS15P System

The Cardioid System. Includes CS15E head, PE15 electronics, 315A windscreen, 310 stand clamp, 15' cable with Switchcraft connector, foam lined metal utility box.



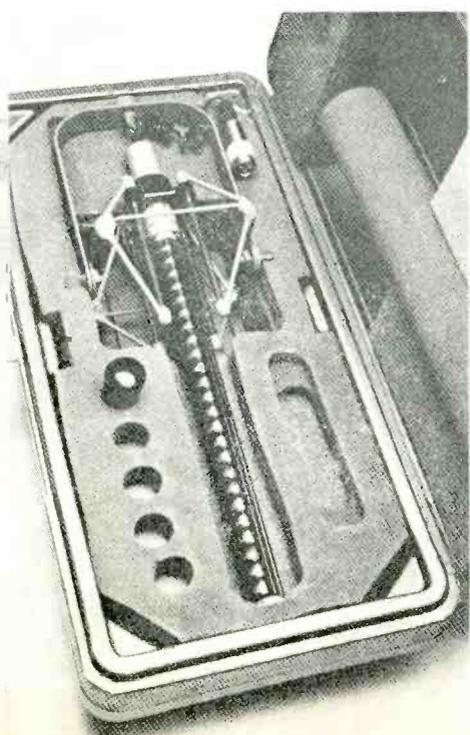
### CO15E Head

Truly omni-directional even at high frequencies. For voice or instruments. With 315A windscreen.



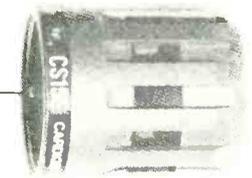
### CL42E Cardiline Head

Integrated cardioid and line interference above 1 kHz. Angle of acceptance is more uniform with frequency than any other shotgun mike. With 343 windscreen.



### CH15S System

The Hyper Cardioid System. Includes CH15E head, SE15 electronics, 315A windscreen, 304 mini-shock mount, foam lined utility box.



### CS15E Head

Standard single-d cardioid element with proximity effect that's perfect for vocal use. With 315A windscreen.

### CL42S Shotgun System

Gives you more quality, performance, convenience and accessories than any other shotgun.

CL42E Cardiline<sup>®</sup> head has more uniform angle of acceptance. High end doesn't collapse. Hot output level. And it's shorter and lighter.

Comes with our SE15 "short" dual powered electronics. Or order our new PE15 phantom-type electronics.

System is backed by our unconditional 2 year warranty.

And at a significantly lower price than any other equivalent package.

To: **Electro-Voice Division, Gulton Europe Limited,**  
**The Hyde, Brighton, Sussex BN2 4JU.**  
 Send me details of the EV System C.

NAME: .....  
 COMPANY: .....  
 ADDRESS: .....

# Survey: microphones and ancillary equipment

Not all models on offer from a particular manufacturer are necessarily listed in this survey. Generally, the listings include those microphones that may find application in broadcasting (studio and reporting), up-market sound reinforcement and/or recording studios. Forthcoming surveys include multitrack tape machines (January), equalisers (February) and studio designers and consultants (March).

**KEY**  
**Transducer type:** MC—moving coil; R—ribbon; DR—double ribbon; C—capacitor; E—electret; PG—pressure gradient.  
**Polar response:** O—omnidirectional; C—cardioid; HC—hypercardioid; SC—supercardioid; B—figure-of-eight; V—various; VS—various, switchable; S—special.

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

**AKG**  
**AKG Akustische u Kino-Geräte GmbH, Brunhildengasse 1, A-1150, Vienna, Austria.**  
**Phone: (222) 921647. Telex: 118390.**  
**UK:** AKG Equipment Ltd, 182-184 Campden Hill Road, London W8 7AS. Phone: (01) 229 3695/727 0788. Telex: 28938.  
**US:** Philips Audio Video Systems Corp, 91 McKee Drive, Mahwah, NJ 07430. Phone: (201) 529 5900. Telex: 138022.  
 Agents in most countries.

|      |    |    |     |       |        |                 |
|------|----|----|-----|-------|--------|-----------------|
| D12  | MC | C  | 200 | 0.22  | £65.00 | Attached cable  |
| D58  | MC | HC | 200 | 0.072 | £25.00 | Talkback mic    |
| D110 | MC | O  | 200 | 0.10  | £33.00 | Lavalier mic    |
| D140 | MC | C  | 200 | 0.23  | £50.00 | Bass-cut switch |
| D160 | MC | O  | 200 | 0.12  | £44.00 | —               |
| D190 | MC | C  | 200 | 0.23  | £33.00 | —               |
| D202 | MC | C  | 200 | 0.16  | £68.00 | Two-way mic     |

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

|           |    |    |     |      |         |                 |
|-----------|----|----|-----|------|---------|-----------------|
| D224      | MC | C  | 200 | 0.13 | £93.00  | Two-way mic     |
| D900      | MC | SC | 200 | 0.30 | £75.00  | 'Shotgun' mic   |
| D2000     | MC | C  | 200 | 0.23 | £50.00  | —               |
| C422 comb | C  | VS | 200 | 0.50 | poa     | Stereo mic      |
| C424      | C  | C  | 200 | 0.50 | poa     | Quadro-mic      |
| C34 comb  | C  | VS | 200 | 0.60 | poa     | Stereo mic      |
| C414EB    | C  | VS | 150 | 0.60 | £225.00 | See review, p86 |

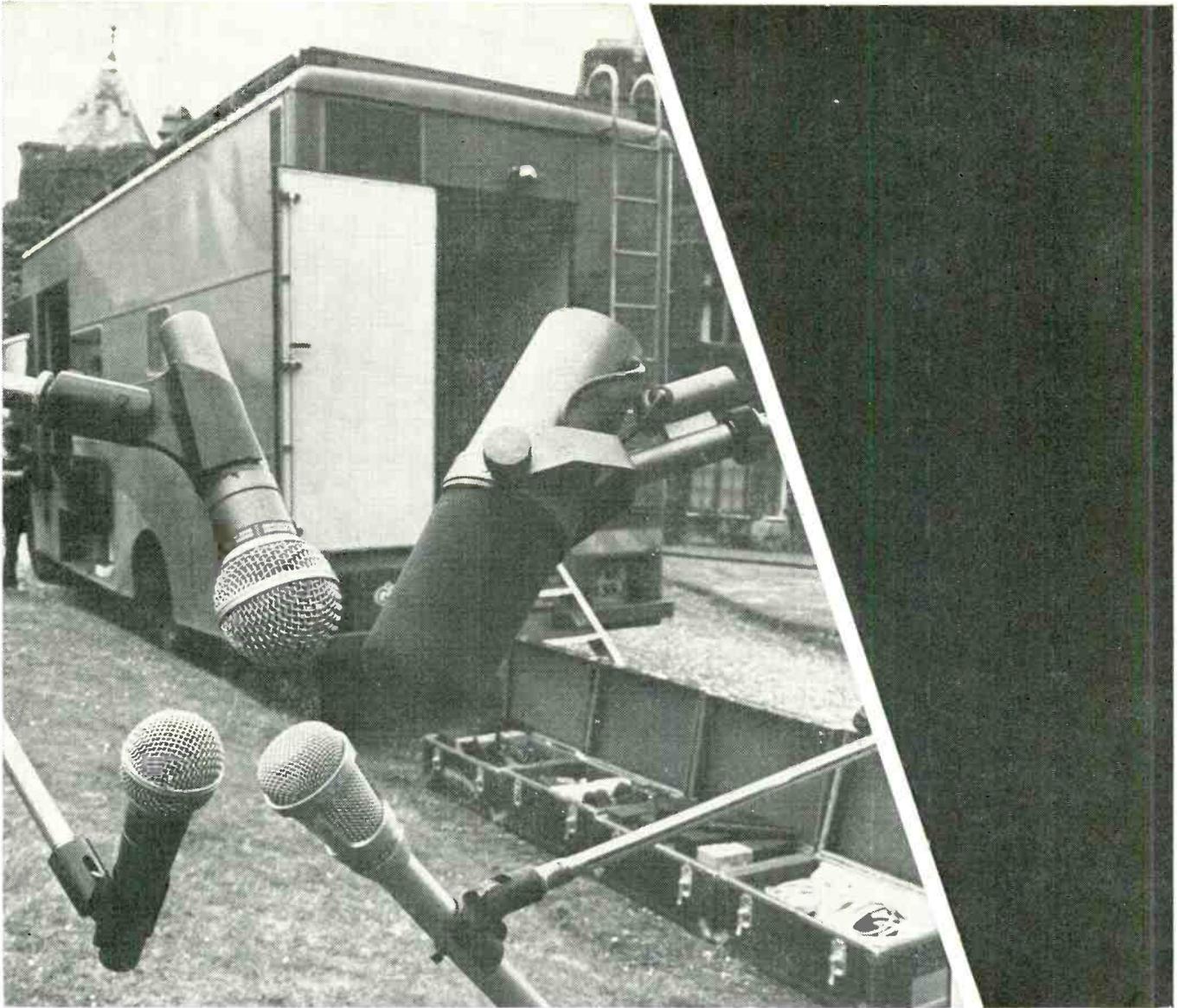
**CMS-range of pre-amplifiers, capacitor capsules and accessories:**

|                  |                                    |   |        |      |        |               |
|------------------|------------------------------------|---|--------|------|--------|---------------|
| C451             | A pre-amp for 9-52V power supplies |   | £47.00 | —    |        |               |
| C452             | A pre-amp for 48V power supplies   |   | £60.00 | —    |        |               |
| <b>Capsules:</b> |                                    |   |        |      |        |               |
| CK1              | C                                  | C | —      | 0.80 | £30.00 | —             |
| CK1S             | C                                  | C | —      | 0.80 | £30.00 | With presence |
| CK2              | C                                  | C | —      | 0.80 | £30.00 | —             |

66 ▶



From left to right: Electro-Voice RE20  
 Beyer M640  
 Neumann U87  
 Reslo Cabaret radio microphone  
 Calrec CM1050C



## Stones' Rolling Studio



A complete recording studio in a van? For Mick Jagger, it is almost a necessity. Mick and the Stones can be inspired to produce their next hit anytime, but when they're on tour or on vacation, the best recording studios aren't always around the corner. The Stones rely on their Shure-equipped mobile studio for the unmatched recording perfection they insist upon, for these moments of midnight inspiration. Whether in a recording session or on stage, the Stones' SM7, SM58, SM82, SM53 and SM56 microphones are their assurance of consistent quality and natural sound.

Shure Electronics Limited  
Eccleston Road, Maidstone ME15 6AU  
Telephone: Maidstone (0622) 59881



## SURVEY: MICROPHONES

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

### AKG cont'd

|     |   |    |   |      |        |                 |
|-----|---|----|---|------|--------|-----------------|
| CK5 | C | C  | — | 0.95 | £50.00 | Windscreen      |
| CK8 | C | SC | — | 1.50 | £50.00 | Short 'shotgun' |
| CK9 | C | SC | — | 1.10 | £65.00 | Long 'shotgun'  |

All output values are in units of mV/μB.

The company also manufactures a wide range of power supplies, windshields, shock mounts and goosenecks.

### B&K

**Bruel & Kjaer, 23 Linde alle, DK-2850 Naerum, Denmark.**

Phone: (02) 800500. Telex: 15316.

**UK:** B&K Laboratories Ltd, Cross Lances Road, Hounslow, Middx TW32 2AE. Phone: (01) 570 7774. Telex: 934150.

**US:** B&K Instruments Inc, 5111 West 165th Street, Cleveland, Ohio 44142. Phone: (216) 267 4800. Telex: 810421.

Agents in most countries.

The company is better known for their instrumentation microphones, but points out that several are suitable for music recording.

4133 C O 25 12.5 £181; \$391 3.9-40k Hz

4165 C O 25 50 £181; \$391 3-20k Hz

A suitable pre-amplifier for these capsules, model 2619, costs £170 (\$368).

Output figures are in units of mV/Pa.

### BEYER

**Eugen Beyer Elektrotechnische Fabrik, D71 Heilborn, Thereseinstrasse B, PO Box 170, West Germany.**

**UK:** Beyer Dynamic (GB) Ltd, 1 Clair Road, Haywards Heath, Sussex RH16 3DP. Phone: Haywards Heath (0444) 51003.

**US:** Hammond Inc Ltd, 155 Michael Drive, Syosset, NY 11791.

Phone: (516) 364 1900. Telex: 961396.

Agents in most countries.

|           |   |    |     |          |         |                  |
|-----------|---|----|-----|----------|---------|------------------|
| M160N     | DR                                      | HC | 200 | —152 dBm | £105.00 | DIN connector    |
| M160C     | As M160N with XLR and stand clamp       |    |     |          | £108.46 | —                |
| M260N     | R                                       | HC | 200 | —153 dBm | £42.49  | DIN connector    |
| M260C     | As M260N with XLR and stand clamp.      |    |     |          | £45.10  | —                |
| M260SM    | As M260N with 'voice/off/music' switch. |    |     |          | £55.22  | DIN connector    |
| M260N(C)2 | As M260C with 'voice/off/music' switch. |    |     |          | £58.08  | —                |
| M500N     | R                                       | HC | 200 | —153 dBm | £55.96  | DIN connector    |
| M500C     | As M500N with XLR and stand clamp.      |    |     |          | £59.49  | —                |
| M101N     | MC                                      | O  | 200 | —150 dBm | £50.16  | DIN connector    |
| M101C     | As M101N with XLR and stand clamp.      |    |     |          | £54.12  | —                |
| M111N     | MC                                      | O  | 200 | —155 dBm | £59.40  | Studio lavalier  |
| M67N      | MC                                      | C  | 200 | —148 dBm | £46.44  | Shock resistant  |
| M67C      | As M67N with XLR and stand clamp.       |    |     |          | £50.41  | —                |
| M69N      | MC                                      | C  | 200 | —144 dBm | £37.30  | DIN connector    |
| M69C      | As M69N with XLR and stand clamp.       |    |     |          | £50.41  | —                |
| M201N     | MC                                      | HC | 200 | —149 dBm | £48.05  | DIN & windshield |
| M201C     | As M201N with XLR connector.            |    |     |          | £49.63  | —                |
| M88N      | MC                                      | HC | 200 | —144 dBm | £79.56  | DIN connector    |
| M88C      | As M88N with XLR and stand clamp        |    |     |          | £82.37  | —                |
| M550LM    | MC                                      | O  | 500 | —153 dBm | £12.67  | Broadcast use    |
| X1N       | MC                                      | C  | 200 | —146 dBm | £35.60  | Pop filter       |
| X1N(C)    | As X1N with XLR and stand mount.        |    |     |          | £37.31  | —                |
| MC711     | C                                       | O  | 200 | —        | £105.60 | DIN or XLR       |
| MC712     | C                                       | O  | 200 | —        | £114.40 | DIN or XLR       |
| MC713     | C                                       | C  | 200 | —        | £116.60 | DIN or XLR       |

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

|       |   |   |     |   |         |                   |
|-------|---|---|-----|---|---------|-------------------|
| MV714 | C | C | 200 | — | £125.40 | DIN or XLR        |
| MC715 | C | O | 200 | — | £114.40 | Lapel or lavalier |

All the above sensitivity figures refer to the EIA rating.

The company also manufactures a wide range of power packs, mic leads, floorstands, base plates, goosenecks, clamps, windshields and thread adaptors.

### CALREC

**Calrec Audio Ltd, Hangingroyd Lane, Hebden Bridge, West Yorkshire HX7 7DD, UK.**

Phone: Hebden Bridge (042284) 2159.

Agents in most countries.

**CM1000-series** of 48V phantom-powered mics with non-detachable capsules:

CM1001C C O 1k 0.8 £48.80 Hand-held

CM1050C C C 1k 0.8 £48.80 —

CM1051C As CM1050C with bass roll-off. £48.80 —

**CM2000-series** of 48V phantom-powered mics with detachable CB20C pre-amplifier and a choice of capsule:

CM2001C C O 1k 0.8 £55.30 CC01 capsule

CM2003C C O 1k 0.8 £55.30 CC03 capsule

CM2050C C C 1k 0.8 £55.30 CC50 capsule

CM2051C C C 1k 0.8 £55.30 CC51 capsule

CM2056C C C 1k 0.8 £55.30 CC56 capsule

**CM2100-series** of 7.5-50V phantom-powered mics with detachable CB21C pre-amplifier and choice of capsule:

CM2101C C O 1k 0.8 £62.90 CC01 capsule

CM2103C C O 1k 0.8 £62.90 CC03 capsule

MC2150C C C 1k 0.8 £62.90 CC50 capsule

CM2151C C C 1k 0.8 £62.90 CC51 capsule

CM2156C C C 1k 0.8 £62.90 CC56 capsule

Pre-amplifiers:

CB20C 48V phantom-powered. £33.10

CB21C 7.5-50V phantom-powered. £40.70

Capsules:

|      |  |        |
|------|--|--------|
| CC01 | Hand-held omni for 'in-shot' tv vocal. | £22.20 |
| CC03 | Studio omnidirectional.                | £22.20 |
| CC50 | Full-range cardioid.                   | £22.20 |
| CC51 | Bass roll-off cardioid.                | £22.20 |
| CC56 | Spherical mesh head, vocal cardioid.   | £22.20 |

The Coles range of microphones previously marketed by STC



The *inaudible*  
CAMBRIDGE Microphone

The ribbon pressure-gradient microphone principle is the simplest and most inherently "pure" one known. It is virtually incapable of insinuating any message of its own into the medium.

Today's market for quality enables us, in our embodiment, to use ridiculously expensive magnetic materials and machining methods for a patented design giving more than adequate S/N for 20 KHz bandwidth.\*

Our built-in preamp is a spectacular achievement in its own right, designed by a famous American Noise Reducer. Its high level output permits the purist to bypass several stages and transformers.

But our favourite endorsements come from artists. Violinists, 'Cellists, Wind-players, Singers, Keyboard-players, Percussionists, Conductors and Producers who have recorded via our microphones agree on the accuracy and honesty of the results. The beautiful sounds they hear are theirs—not ours.

**CAMBRIDGE MICROPHONES**

125 IRVING ST., FRAMINGHAM, MASS., U.S.A. 01701  
Tel. (617)-879 2282

\*Bass response available either flat or with mild anti-proximity effect attenuation; switchable at extra cost.

*Rycote*

Microphone Windshields  
& shockmounts



FOR  
SENNHEISER  
815, 415, 435  
AKG 451, CK1,  
CK8, CK9

*Durable, lightweight, made to last.*

Edgehill Farm, Edge, Stroud, Glos. GL6 6PA

Telephone: Painswick 813615

seen from  
professional  
angle



the 201 is something  
quite personal...

The M 201 Hypercardioid moving coil microphone is designed for recording or broadcasting. The M 201 offers excellent separation characteristics in extreme acoustical conditions.

**Specifications:**

Frequency Response: 40-18000 Hz.  
Output Level at 1 kHz: 0,14 mV/μ bar  
± -56 dbm (0 dbm ± 1 mW/10  
dynes/cm<sup>2</sup>). EIA Sensitivity Rating:  
-149 dbm. Hum Pickup Level:  
5 μV/5 μ Tesla (50 Hz). Polar Pattern:  
Hypercardioid. Output Impedance:  
200 Ω. Load Impedance: > 1000 Ω.  
Connections: M 201 N (C) = Cannon  
XLR-3-50 T or Switchcraft: 2+3 =  
200 Ω 1 = ground. M 201 N = 3-pin  
DIN plug T 3262: 1+3 = 200 Ω  
2 = ground. M 201 N (6) = 6 pin  
Tuchel.  
Dimensions: length 6", shaft ∅ 0,95".  
Weight: 8,60 oz.

**BEYER DYNAMIC**



BEYER DYNAMIC (GB) LIMITED  
1 Clair Road, Haywards Heath, Sussex.  
Tel: Haywards Heath 51003



## SURVEY: MICROPHONES

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

### Calrec cont'd

CM10C 7.5-50V phantom-powered talkback mic on 320-mm non-drop stem. £68.57

Output figures are in units of mV/μB.

The company also manufactures a range of phantom power supplies, power distribution systems and general accessories, including extension tubes for detachable capsule mics.

The CM2050C and CM2051C were reviewed in the May 1977 issue, p68.

### CAMBRIDGE

Cambridge Records, 125 Irving Street, Framingham, Mass 01701, USA.

Phone: (617) 879 2282.

C-5T R B 250 -55 dBm \$375 Shock mount

C-5A As C-5T with line-level pre-amp. \$495

Model C-5A requires ±15V regulated power supply. Price: \$125.

Output figures referenced to 1 mW for 10 dynes/cm<sup>2</sup> sound pressure.

The mics were reviewed in the May 1977 issue, p70.

### COLES

Coles Electroacoustics Ltd, Pindar Road, Hoddesdon, Herts, UK.

Phone: Hoddesdon 66685.

UK and Worldwide: Hampstead High Fidelity Ltd, 63 Hampstead High Street, London NW3 1QH.

Phone: (01) 435 0999/6377.

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

The range of broadcast microphones were previously manufactured by Coles for marketing by STC.

|      |    |   |        |        |         |           |
|------|----|---|--------|--------|---------|-----------|
| 4021 | MC | O | 30     | -80 dB | £67.62  | —         |
| 4104 | PG | B | 30/300 | -70 dB | £93.50  | Lip mic   |
| 4115 | R  | B | 30/300 | -70 dB | £63.65  | Lip mic   |
| 4038 | R  | B | 30/300 | -85 dB | £162.10 | 30-15k Hz |
| 4105 | MC | O | 30     | -82 dB | £55.69  | —         |
| 4037 | MC | O | 30     | -84 dB | £58.65  | Broadcast |
| 4119 | R  | C | 30/300 | -79 dB | £45.75  | —         |

All microphones come complete in a wooden case. Output figures are referenced to 1V/dyne/cm<sup>2</sup>.

### DAN GIBSON

R D Systems of Canada Ltd, 128 Pears Avenue, Toronto, Canada.

Phone: (416) 487 1162.

UK: John Page Ltd, 169 Oldfield Lane, Greenford, Middlesex UB6 8PX.

Phone: (01) 578 2641. Telex: 24224. Reference 568.

EPMP650 — SC 150 -42 dBm £225 —

A parabolic microphone with a clear plastic reflector, built-in equaliser and pre-amplifier, and speech/music switch. Also provided is a headphone output for on-site monitoring. Power is derived from two 9V batteries.

### DYMA

Dyma Engineering, Route 1, Box 51, Taos, New Mexico 87571, USA.

Phone: (505) 756 2686.

Traveller MC O 600 +14 dBm £159.00 —

The microphone is designed for remote broadcasting via telephone lines or circuits. A suitable telephone coupler is available for direct connection to such lines (with approval where necessary). Price: \$75.00. 70 ▶



British-Made

# p+n

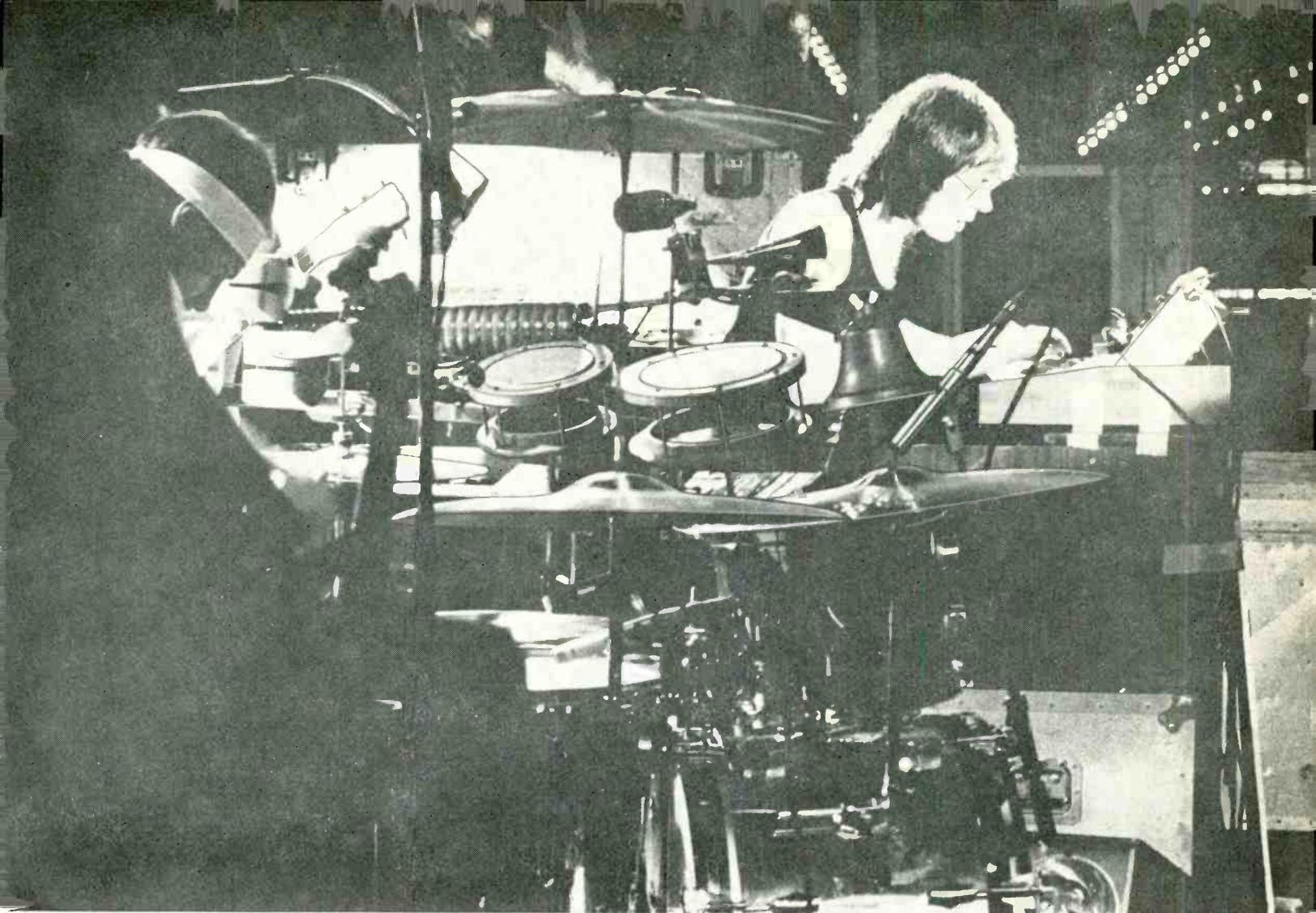
## THE HIGHEST QUALITY STANDS at a price you can buy

The p + n range of music stands provides you with a comprehensive range to suit all your playing requirements—whether you're an earnest amateur or the most demanding professional. Find out now about p + n quality stands at realistic prices by telephoning Treforest (044 385) 2453 or by writing to—



**p+n**

Peter and Nicholas Engineering Company Limited,  
Treforest Industrial Estate,  
Mid. Glamorgan CF37 5UA.



# MANFRED MANN

and his Earthband

## "Achieving my Sound"

During my long experience I have used different sound equipment. Mick Williams, my sound-engineer, and I have found AKG products to be the most suitable for our purpose.

This is why:

**For all vocals: AKG D 2000 E**

A rugged hardwearing microphone.  
Good integral popshield.

**For guitar stacks: AKG D 1200 E**

The switchable e.q. on this mike is very useful.

**For bass stacks: AKG D 202 E**

In addition to the direct inject the microphone on the bin gives the depth.

**For kick drum: AKG D 12**

This mike gives a good fat sound and takes plenty of stick.



**For lo floor tom, hl floor tom, rack tom and snare: AKG D 224 E**

The lack of the proximity-effect on these two-way cardioid microphones suit Chris Slade's drum tuning, giving a hard solid sound.

**For hi hat: AKG C 451/CK 1**

This condenser microphone provides super clear definition of the super highs.

The A 51 swivel joint between the capsule and the preamplifier makes for easy positioning.

**For keyboards: AKG 100 K**

My Moog, the Hammond C 3, the Rhodes and the omni-string synth run through the new AKG 100 K keyboard mixer which is very flexible and has great e.q. for those instruments.

182/4 Campden Hill Road Kensington

AKG Equipment Ltd.

London W8 7AS Tel. 01-229-3695, 01-727-0788

## SURVEY: MICROPHONES

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

### EAGLE

**Eagle International, Precision Centre, Heather Park Drive, Wembley HA0 1SU.**

**Phone: (01) 902 8832. Telex: 922131.**

**Belgium: Eagle International SA, Rue du Midi 147, 1000 Bruxelles.**  
Phone: (02) 513 0477.

**Holland: Eagle International Electronics BV, Ridderkerkstratt 15, Rotterdam-Lombardijen.**

Phone: 198 661.

|        |    |    |     |         |        |              |
|--------|----|----|-----|---------|--------|--------------|
| PROM20 | E  | C  | 600 | -60 dBV | £38.95 | —            |
| PROM40 | E  | HC | 600 | -70 dBV | £29.75 | 'Rifle' mic  |
| PROM60 | E  | O  | 600 | -69 dBV | £32.30 | Tie-clip mic |
| PROM70 | E  | C  | 600 | -70 dBV | £34.70 | 10 dB f-to-b |
| PROM80 | MC | C  | 200 | -76 dBV | £37.60 | Body as M70  |
| PROM90 | MC | C  | 600 | -72 dBV | £43.90 | —            |
| SME900 | E  | O  | 600 | -70 dBV | £22.00 | Stereo mic   |
| CO-96  | E  | O  | 600 | -70 dBV | £21.90 | 'Pencil' mic |

All output values are in units of dBV/Pa ( $\pm 3$  dBV).

The company also manufactures a wide range of stands, booms, goosenecks and matching transformers.

### ELECTRO-VOICE

**Electro-Voice Inc, 600 Cecil Street, Buchanan, Mich 49107, USA.**

**Phone: (616) 695 6831.**

**Canada: Electro-Voice Division of Gulton Industries (Canada) Ltd, 345 Herbert Street, Ganoquoque, Ontario.**

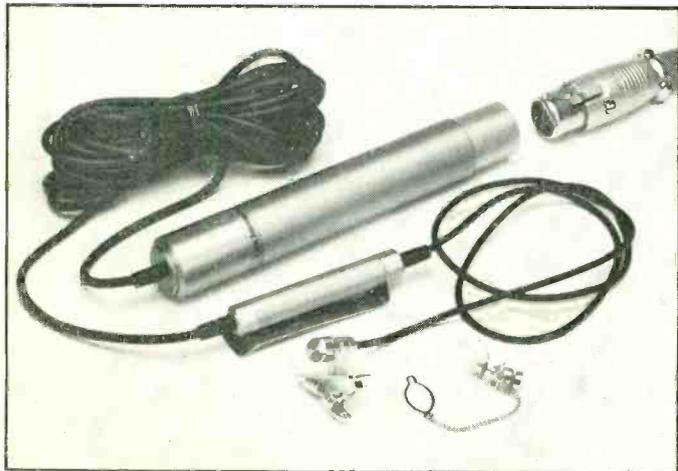
**Europe: Electro-Voice SA, Romerstrasse 49, 2560 Nidau, Switzerland.**

**UK: Electro-Voice Division, Gulton Europe Ltd, The Hyde, Brighton BN2 4JU.**

Phone: Brighton (0273) 66271. Telex: 87172.

|      |    |    |         |        |         |                  |
|------|----|----|---------|--------|---------|------------------|
| RE10 | MC | SC | 150     | -56 dB | £114.25 | Bass-tilt switch |
| RE11 | MC | SC | 150     | -56 dB | £125.90 | Bass-tilt switch |
| RE15 | MC | SC | 150     | -56 dB | £190.25 | Bass-tilt switch |
| RE16 | MC | SC | 150     | -56 dB | £199.80 | Bass-tilt switch |
| RE20 | MC | C  | Several | -57 dB | £331.85 | Shock mounting   |
| e27C | MC | C  | Lo/Hi-Z | -58 dB | £53.40  | Bass emphasis    |
| 631B | MC | O  | Lo/Hi-Z | -56 dB | £52.00  | —                |
| 635A | MC | O  | 150     | -55 dB | £65.00  | Shock proof      |
| 660  | MC | SC | Lo/Hi-Z | -56 dB | £71.80  | Close miking     |
| 671A | MC | C  | Lo/Hi-Z | -57 dB | £68.45  | General purpose  |
| DO54 | MC | O  | 150     | -58 dB | £88.95  | Boom or stand    |
| DS35 | MC | C  | 150     | -60 dB | £90.35  | Blast filter     |
| RE50 | MC | O  | 150     | -55 dB | £104.00 | Noise-free       |
| RE55 | MC | O  | 150     | -57 dB | £173.15 | 40-20K Hz        |
| 1776 | E  | C  | 150     | -50 dB | £91.62  | Blast filter     |
| CS15 | E  | C  | 150     | -45 dB | £224.95 | 40-18K Hz        |

Eagle PROM 60 system



| Model | Transducer type | Polar response | Impedance | Output | Price   | Remarks      |
|-------|-----------------|----------------|-----------|--------|---------|--------------|
| CO90  | E               | O              | 150       | -57 dB | £94.79  | Lavalier mic |
| CO85  | E               | O              | 150       | -56 dB | £147.10 | 'Mini' mic   |
| RE85  | MC              | O              | 50-250    | -61 dB | £116.35 | Lavalier mic |
| RE51  | MC              | O              | 50-250    | -54 dB | £116.35 | Headset      |
| 644   | MC              | C              | Lo/Hi-Z   | -53 dB | £121.80 | 'Gun' mic    |
| DL42  | MC              | C              | 150       | -50 dB | £342.10 | 'Gun' mic    |
| CL42S | E               | C              | 250       | -33 dB | £473.93 | System C     |
| CH15S | E               | HC             | 150       | -40 dB | £366.51 | System C     |

### KEITH MONKS

**Keith Monks (Audio) Ltd, 26-28 Reading Road South, Fleet, Hampshire, UK.**

**Phone: Fleet (02514) 7316/3566. Telex: 858606.**

**C133D** MC O 200 -71dB £42.60 Hand or stand

**C133K** As C133D with on/off switch. £46.50

**C133SU** As C133K with XLR connector. £54.40

The C133SU is also available in a 30-ohm version (-83 dB output).

**MO97D** MC O 200 -55 dB £54.95 DIN & switch

Output values are referenced to 0 dBm = 1 mW/10 $\mu$ B.

The company also manufactures an extensive range of stands, booms, cable drums, goosenecks, stereo bars, clamps and thread adaptors.

### LAWTRONICS

**Lawtronics Ltd, 139 High Street, Edenbridge, Kent TN8 5AX, UK.**

**Phone: Edenbridge (073271) 5191. Telex: 957186.**

**LM23** E S 60 -72 dB £26.70 Lavalier mic

Output figure is  $\pm 4$  dB at 1kHz below 1V/dyne/cm<sup>2</sup>.

### NEUMANN

**George Neumann GmbH, 1 Berlin 61, Charlottenstrasse 3, West Germany.**

**UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ.**

Phone: (01) 953 0091. Telex: 27502.

**US: Gotham Audio Corp, 741 Washington Street, New York, NY 10014.**

Phone: (212) 741 7411. Telex: 129269.

**KM83** C O 200 -131 dBm £95.00 10 dB cut

**KM84** As KM83 with cardioid pattern. £95.00 —

**KM85** As KM84 with 1f rolloff £95.00 —

**KM86** C VS 200 -133 dBm £274.00 Good bass

**KM88** C VS 200 -133 dBm £274.00 10 dB cut

**KMS85** C C 150 -135 dBm £95.00 'Pop' filter

**U87** C VS 200 -133 dBm £275.00 Bass rolloff

**U47 fet** C C 150 -133 dBm £261.00 See review p 92

**SM69 fet** C VS 150 -125 dBm £605.00 Coincident stereo

**KMA** C O 800 — £126.11 Lavalier mic

The model KMA may be used with radio-mic systems.

Output figures are EIA rating.

The company also manufactures an extensive range of 48V phantom power supplies, remote controllers, elastic suspensions, extension tubes, wind and pop screens, stands, booms and mounts, goosenecks and cable.

Two KM83 mics can be supplied with a specially-designed dummy head for binaural recordings. Price of the KUB0 system, complete with power supply, connecting cable, suspension support and carrying case, is £1038.

### PEARL

**AB Pearl Mikrofonslaboratorium, Knutsgatan 6, S-265 00 Astorp, Sweden.**

**Phone: 042 51520.**

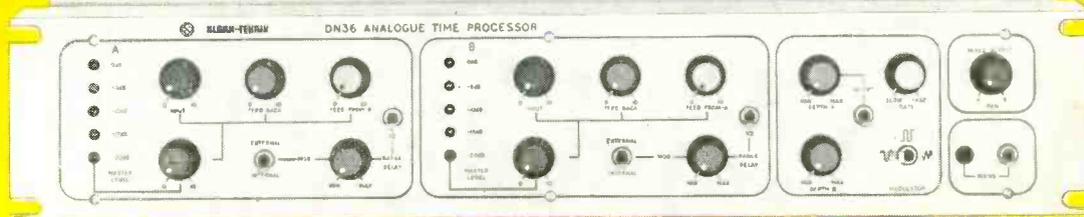
**UK: Allotrope Ltd, 36/38 Lexington Street, London W1R 3HR.**

Phone: (01) 437 1892. Telex: 21624.

**D44** MC SC 200 2.8 97\* Hand held

**LD18** MC O 200 2.0 210 Robust

**HM47** MC O 200 1.5 303 Lavalier mic



# DN36 ANALOGUE TIME PROCESSOR A NEW EXPERIENCE IN SOUND



**KLARK-TEKNIK**

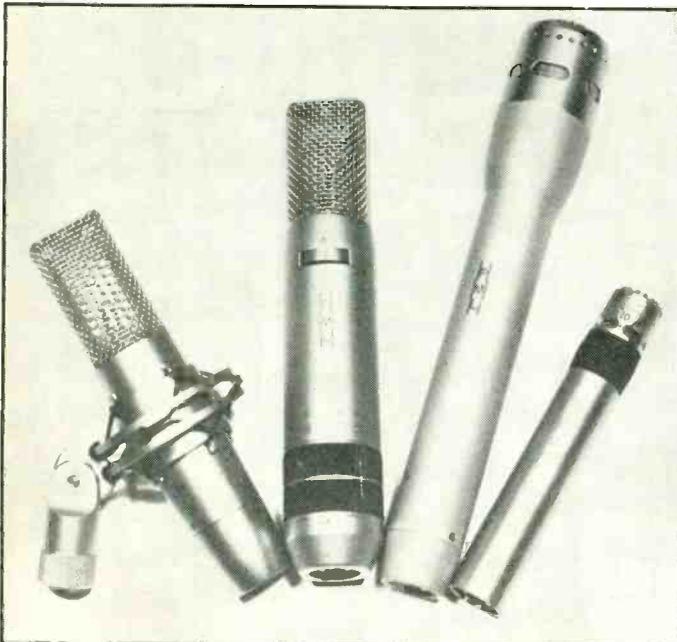
Kidderminster·Worcestershire·England  
Telephone (0562) 64027·Telex 339821  
Agents throughout the World

# SURVEY: MICROPHONES

| Model               | Transducer type              | Polar response | Impedance | Output   | Price       | Remarks       |
|---------------------|------------------------------|----------------|-----------|----------|-------------|---------------|
| <b>Pearl cont'd</b> |                              |                |           |          |             |               |
| HM49                | MC                           | O              | 200       | 2.0      | 435         | Robust        |
| RD16                | MC                           | C              | 200       | 2.0      | 204         | Light-weight  |
| RD34                | As RD16 with longer body.    |                |           |          | 215         | —             |
| RD36                | As RD34 with 200/Hi-Z.       |                |           |          | 307         | —             |
| RD34S               | As RD34 with switch.         |                |           |          | 288         | —             |
| F67                 | MC                           | C              | 200       | 2.0      | 268         | On/off switch |
| F69                 | MC                           | C              | 200       | 2.0      | 415         | Anti-feedback |
| DC20                | C                            | O              | 200       | 5.0      | 550         | 'Mini' mic    |
| DC21                | C                            | C              | 200       | 6.3      | 550         | As DC20       |
| DC63                | C                            | VS             | 200       | 2.5-4.0  | £250; \$420 | See below**   |
| DC73                | C                            | C              | 200       | 5.0      | £100; \$170 | Bass cut      |
| DC73/12             | As DC73 with SYMSI 12.       |                |           |          | 1032        | —             |
| DC96                | C                            | C              | 200       | 6.3      | 1093        | 180° capture  |
| DC96/12             | As DC96 with SYMSI 12.       |                |           |          | 1399        | —             |
| FP92CO              | C                            | C              | Lo/Hi-z   | 12.6/126 | 770         | 15V battery   |
| FP92KO              | C                            | O              | Lo/Hi-z   | 8.0/80   | 770         | As FP92CO     |
| SP84                | C                            | O              | 200       | 8.0      | 1046        | Variable eq   |
| SP85                | As SP84 with cardioid.       |                |           |          | 1046        | —             |
| ST8                 | C                            | VS             | 200       | 5.0      | 2960        | Two capsules  |
| TC4V                | C                            | V              | 200       | 10.0     | 1455        | +120V power   |
| VM40                | C                            | O              | 200       | 4.0-8.0  | 822         | SYMSI 48/12   |
| VM41                | As VM40 with cardioid.       |                |           |          | £114; \$190 | —             |
| 4030                | C                            | SC             | 200       | 4.0      | 2511        | 'Shotgun' mic |
| CL4AD               | E                            | O              | 200       | 6.3      | 508         | Lavalier mic  |
| CL4BD               | As CL4AD with self-powering. |                |           |          | 508         | 15V battery   |
| PB35                | E                            | O              | 200       | 6.3      | 284         | 15V battery   |

\*Prices are in Swedish Crowns unless stated otherwise. Capacitor mics are powered by SYMSI 48: ±48V (±6V) unless stated otherwise. (SYMSI 12: +10 to +48V).  
 \*\*Model DC63 is fitted with two ring switches and a 5-position attenuator, giving 44 possible combinations of output/polar response. The company also manufactures a wide range of capacitor mic power supplies, goosenecks, stands, convertors, extension tubes and lavalier adaptors.

A selection of Pearl microphones



| Model   | Transducer type  | Polar response | Impedance | Output | Price | Remarks |
|---|--|----------------|-----------|--------|-------|---------|
| 2560  | A radio mic transmitter operating on a carrier frequency of 41-45 MHz. Dynamic range is a claimed 70 dB and frequency range 40-15k Hz. The internal battery is rechargeable. |                |           |        |       |         |
| 2540  | A receiver for use with the 2560 transmitter. Output is adjustable up to 1V into a 200-ohm load.   |                |           |        |       |         |
| SK25T   | A lavalier or tie-clip mic suitable for use with the 2560/2540 system. It is supplied complete with aerial.  |                |           |        |       |         |
| All output values are in units of mV/Pa (ref 1V). |  |                |           |        |       |         |

## PEAVEY

**Peavey Electronics Corp, Box 2898, Meridian, Miss 39301, USA.**  
**UK:** Peavey Electronics (UK) Ltd, 49 The Broadway, Haywards Heath, Sussex RH16 3AS.  
 Phone: Haywards Heath (0444) 58301. Telex: 87265.  
 PBL MC O 250 -52 dB £57; \$113 Pa mic  
 PBH MC O 50k -52 dB £57; \$113 Hi-Z of PBL

## PEERLESS

**Peerless-MB GmbH, Postfach 1606, D6950 Mosbach, West Germany.**  
**UK: 06261 2953. Telex: 0466132.**  
**UK:** Peerless Fabrikkerne (UK) Ltd, 40 Nicholas Way, Northwood, Middlesex.  
 Phone: Northwood 27941. Telex: 923844.  
 The company is at present re-organising its entire range of microphones. Further details will be published in STUDIO SOUND when they become available.

## PHILIPS

**NV Philips Gloeilampenfabrieken, Electroacoustics Division, Eindhoven, The Netherlands.**  
**Phone: 040 78616.**  
**UK:** Pye TVT Ltd, PO Box 41, Coldhams Lane, Cambridge CB1 3JU.  
 Phone: Cambridge (0223) 45115. Telex: 81103.  
**US:** Philips Audio Video Systems Corp, Audio Division, 91 McKee Drive, Mahwah, NJ 07430.  
 Phone: (201) 529 3800.  
 LBB9020/25 MC C 200 poa £58.50 Speech/music switch  
 LBB9020/15 As above less switch. £54.00 —  
 LBB9100/05 MC C 200 poa £57.00 Low handling  
 LBB9101/05 MC O 200 poa £57.00 Speech/music  
 LBB9030/00 E C 1k poa £44.50 Gooseneck mic  
 The company also manufactures a wide range of talkback mics, stands, booms, extension shafts and pre-amps.

## RESLO

**Reslosound Ltd, Aboyne House, 50A High Street, New Romney, Kent, UK.**  
**Phone: New Romney (06793) 4264.**  
**UK:** James T Coppock (Leeds) Ltd, Highfield House, Royds Lane, Leeds LS12 6LJ.  
 Phone: Leeds (0532) 634652.  
**US:** Unicord Inc, 75 Frost Street, Westbury, NY 11590.  
 Phone: (516) 333 9100.  
 MPD MC O 30 -88 dB £17.50 Pencil-type  
 RGP71 MC SC 200 -82 dB £37.34 20 dB f-to-b  
 S91 E V V -52 dB £49.08 4.5V battery  
 S80H MC C 200 -58 dB £52.44 40-20k Hz  
 PD3 MC V V -88 dB £26.29 General purpose  
 UD1 MC SC V -58 dB £40.20 'Pop' filter  
 UD3 MC SC V -58 dB £38.50 UD1 capsule  
**Cabaret system:**  
 Comprising TX100 radio mic and briefcase-mounted receiver. Operating frequency: 174.8 MHz. Aerial system is free-hanging 6.7 cm wire. Frequency response: 40-15k Hz ±2 dB. Microphone has omnidirectional polar response and is powered by 9V battery. Normal working range is about 300 m. Receiver output is at 'mic' level, 30 ohm impedance (600 and Hi-Z also available). Price: £330.00. A separate belt-mounting transmitter, model TXT, and free-standing receiver, model RXA, are also available. Prices: £106.00 and £154.00 respectively. The company also manufactures a range of stands and goosenecks. 74 ▶

# YOUR MOVE.



F.W.O.Bauch Limited 49 Theobald Street Boreham Wood Herts WD6 4RZ Tel: 01-953 0091 Telex: 27502

## SURVEY: MICROPHONES

| Model | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|-------|-----------------|----------------|-----------|--------|-------|---------|
|-------|-----------------|----------------|-----------|--------|-------|---------|

### SCHOEPS

Schalltechnik Dr-Ing Karl Schoeps, 75 Karlsruhe 41, Spitalstrasse 20, Postfach 410970, West Germany.

Phone: (0721) 42016/42011.

UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA. Phone: (01) 734 2812. Telex: 27939.

US: Studer Revox America Inc, 1819 Broadway, Nashville, Tenn 37203. Agents in most countries.

The CMC series of complete capacitor mic comprise a pre-amplifier module connected directly, or via an 'active' cable, to an interchangeable capsule. The mics listed below utilise the CMC5 pre-amps (48V phantom powering); the CMC3 operates from 12V phantom and the CMC4 from 12V 'parallel' powering. The type number of the complete mic is composed of the pre-amp model plus capsule (eg CMC56=CMC5+MK6 capsule).

|        |   |    |    |         |      |                |
|--------|---|----|----|---------|------|----------------|
| CMC52  | C | O  | 40 | 1.2     | £229 | Flat response  |
| CMC53  | C | O  | 40 | 1.0     | £229 | Hf boost       |
| CMC54  | C | C  | 40 | 1.2     | £235 | —              |
| CMC540 | C | C  | 40 | 1.6     | £245 | Close miking   |
| CMC541 | C | HC | 40 | 1.3     | £259 | —              |
| CMC55  | C | VS | 40 | various | £297 | Two patterns   |
| CMC56  | C | VS | 40 | various | £361 | Three patterns |

CMTS501 stereo VS 200 various £792 —

A stereophonic capacitor mic with cardioid, bi- and omnidirectional patterns on each capsule. The capsules are mounted one above the other, and can be rotated through 360°. 48V centre-point powering. (CMTS301 identical with 12V powering.)

MTSC54 stereo C 40 1.3 £484 —

A stereo (110° ORTF-principle) twin-capacitor mic with two MK4 capsules mounted at either end of a T-bar. Axial separation is 170 mm. Pre-amplifier

| Model   | Transducer type | Polar response | Impedance | Output | Price | Remarks      |
|---|-----------------|----------------|-----------|--------|-------|--------------|
| CMH52C  | C               | O              | 40        | 1.0    | poa   | 'Pop' filter |
| CMH54C  | C               | C              | 40        | 1.2    | poa   | 'Pop' filter |
| 'Conventional' capacitor mics. Available in 12 and 48V phantom, plus 12V 'parallel' powering. |                 |                |           |        |       |              |
| CMT62   | C               | O              | 200       | 1.5    | poa   | 60 or 145V   |
| CMT64   | C               | C              | 200       | 1.5    | poa   | as above     |
| CMT640  | C               | C              | 200       | 1.5    | poa   | as above     |

All output figures are in units of mV/μB.

### SENNHEISER

Sennheiser Electronic, 3002 Bissendorf, Hannover, West Germany. Phone: 05139 8011.

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

Phone: Gerrards Cross 88447. Telex: 849469.

US: Sennheiser Electronic Corp (NY), 10 West 37th Street, New York, NY 10018. Phone: (212) 239 0190. Telex: 421608.

|         |    |    |     |      |             |                    |
|---------|----|----|-----|------|-------------|--------------------|
| MD211   | MC | O  | 200 | 0.13 | £86; \$242  | Flat response      |
| MD214   | MC | O  | 200 | 0.10 | £82; \$221  | Lavalier mic       |
| MD408   | MC | SC | 200 | 0.13 | £31.50      | Integral gooseneck |
| MD416   | MC | C  | 200 | 0.13 | £75; \$202  | Hand-held          |
| MD418   | MC | SC | 50  | 0.13 | poa         | Integral gooseneck |
| MD421   | MC | C  | 200 | 0.20 | £85; \$220  | Switched base eq   |
| MD430-2 | MC | SC | 200 | 0.18 | £35; \$95   | Close miking       |
| MD441   | MC | C  | 200 | 0.20 | £115; \$312 | Shock mount        |
| MKE10   | E  | O  | 4k7 | 1.00 | £45.55      | Mini lavalier 76 ▶ |



# BROADCASTING PERFECTION

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Tel: 01-435 0999/6377

All microphones shown are used by the major TV and radio networks worldwide.

# Big tough cable drums from Keith Monks



CD1

Every Keith Monks cable drum is a multi-purpose carrier—for microphone, speaker or power cables. They're built of tough reinforced steel, with firm-standing rubber feet. And there are four different models to suit every job.

- \* Each one has a removable centre drum—use one frame, several reels, to save time, cost and space.
- \* Each one has a nylon-dipped black finish—hard-wearing and rust resistant, for indoor and outdoor use.
- \* They all stack with other frames of the same size—make rigid, stable space-savers.

Check this table to find the cable drum to suit you!

| Model No. | Capacity<br>Standard twin-screened cable | Multi-core cable                |
|-----------|--|---------------------------------|
| CD1       | 100m                                     | 50m (standard microphone cable) |
| CD2       | 200m                                     | 30m ¾" Multicore                |
| CD3       | 400m                                     | 60m ¾" Multicore                |
| CD4       |  | 200m ½" Multicore               |

Weight range: 10lb to 120lb

And if there isn't a cable drum to suit your requirements – modifications and special designs can be made to order!

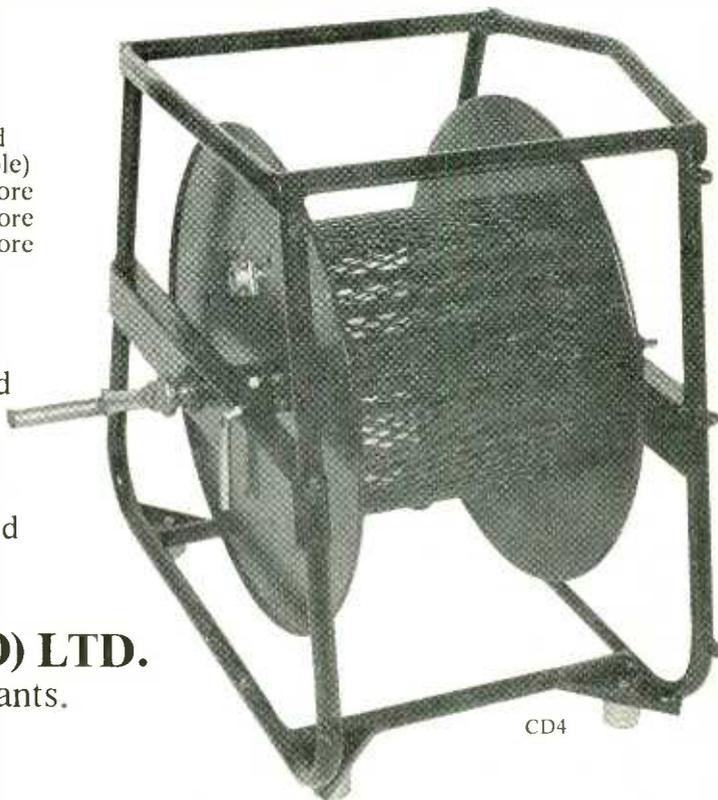
Find out more about Keith Monks cable drums – just get in touch at the address below – we'll be pleased to send you more information without obligation.

## KEITH MONKS (AUDIO) LTD.

26 Reading Road South, Fleet, Hants.

Telephone: Fleet (02514) 20568 or 3566

Telex: 858606.



CD4

Distributed throughout the world by recognised distributors.

## SURVEY: MICROPHONES

| Model                    | Transducer type | Polar response | Impedance | Output | Price       | Remarks          |
|--------------------------|-----------------|----------------|-----------|--------|-------------|------------------|
| <b>Sennheiser cont'd</b> |                 |                |           |        |             |                  |
| MKE802                   | E               | SC             | 200       | 0.50   | £84; \$210  | } See review p90 |
| MKE402                   | E               | C              | 200       | 0.30   | £71; \$175  |                  |
| MKE202                   | E               | O              | 200       | 0.30   | £61; \$150  |                  |
| MKE2002                  | F               | O              | 1k5       | 1.00   | £123; \$350 | Dummy-head pair  |
| MKH105                   | C               | O              | 200       | 2.00   | £174; \$410 | 12V a-b          |
| MKH125                   | C               | O              | 200       | 0.32   | £193; \$550 | Lavalier mic*    |
| MKH126P48                | C               | O              | 200       | 2.00   | £193; \$550 | As MKH125        |
| MKH406P48                | C               | C              | 200       | 2.00   | £203; \$460 | 48V phantom      |
| MKH406                   | C               | C              | 200       | 2.00   | £203.10     | 12V a-b          |
| MKH416P48                | C               | SC             | 200       | 2.50   | £213; \$530 | 48V phantom      |
| MKH416                   | C               | SC             | 200       | 2.00   | £213; \$530 | 12V a-b          |
| MKH816P48                | C               | HC             | 200       | 4.00   | £288; \$650 | 48V phantom      |
| MKH816                   | C               | HC             | 200       | 4.00   | £288; \$650 | 12V a-b          |

Output figures are in units of mV/μB.

\*MKH125 and MKH126P48 share a common capsule (MK12) with different power unit. The former is 12V a-b powered, while the latter is designed for 48V phantom supplies.

### SESCOM

**Sescom Inc, PO Box 590, Gardena, Ca 90247, USA.**

**Phone: (213) 770 3510. Telex: 3467023.**

**UK:** Macinnes Labs Ltd, Carlton Park Industrial Estate, Saxmundham, Suffolk IP17 2NL.

Phone: Saxmundham (0728) 2262/2615.

For other overseas agents see October '77 issue, p44.

|       |   |   |     |        |         |               |
|-------|---|---|-----|--------|---------|---------------|
| MC325 | E | O                                       | 200 | -55 dB | \$48.65 | Tie-clip mic  |
| MC326 | A | 4-48V phantom-powered version of MC325. |     |        |         |               |
| MC340 | E | O                                       | 200 | -55 dB | \$66.00 | Stand or hand |
| MC341 | A | 4-48V phantom-powered version of MC340. |     |        |         |               |
| MC350 | E | C                                       | 200 | -55 dB | \$70.00 | Stand or hand |
| MC351 | A | 4-48V phantom-powered version of MC350. |     |        |         |               |

The company also manufactures a wide range of hand-held and gooseneck-mounting talkback mics, mic splitters and combiners, extension cords, in-line transformers and accessories, active di boxes, matching transformers and pre-amplifier modules.

### SHURE

**Shure Brothers Inc, 22 Hartrey Avenue, Evanston, Ill 60204, USA.**

**Phone: (312) 866 2200.**

**UK:** Shure Electronics Ltd, Eccleston Road, Maidstone ME15 6AU.

Phone: Maidstone (0622) 59881. Telex: 96121.

Agents in most countries.

|      |         |                          |        |          |         |                     |
|------|---------|--------------------------|--------|----------|---------|---------------------|
| SM7  | MC      | C                        | 150    | -79 dB   | £225.60 | Bass presence       |
| SM10 | MC      | C                        | 200    | -87 dB   | £58.60  | Headset mounted     |
| SM12 | As SM10 | with built-in ear piece. |        |          | £78.60  | —                   |
| SM11 | MC      | O                        | 200    | -85dB    | £46.80  | Lavalier mic        |
| SM33 | R       | HC                       | 38/150 | -76.5 dB | £147.00 | Bass switch         |
| SM53 | MC      | C                        | 150    | -81 dB   | £150.00 | Wide range          |
| SM54 | As SM53 | with 'pop' filter.       |        |          | £159.00 | —                   |
| SM57 | MC      | SC                       | 38/150 | -82 dB   | £72.60  | Presence boost      |
| SM58 | As SM57 | with 'pop' filter.       |        |          | £93.00  | —                   |
| SM59 | MC      | C                        | 150    | -83 dB   | £96.00  | See review p94      |
| SM61 | MC      | O                        | 150    | -82 dB   | £65.40  | 'Pop' filter        |
| SM62 | MC      | C                        | 150    | -82 dB   | £73.80  | 'Pop' filter        |
| SM82 | C       | C                        | 260    | -19 dB   | £144.60 | Line amps & limiter |

All output figures are referenced to 0 dB=1V/μB, open-circuit.

The company manufactures a range of attenuators, low and highpass filters, phase reversers and transformers for in-line mounting with XLR connectors. Also available: mic stands, lavalier mounts, cables, windscreens, pop filters, goosenecks and pre-amplifiers.

### SNS

**SNS Communications Ltd, PO Box 448, Hove, Sussex BN3 6JA, UK.**

**Phone: Brighton (0273) 724444.**

The company manufactures a radio microphone system, *The Olympian*, based

| Model  | Transducer type | Polar response | Impedance | Output | Price | Remarks |
|--|-----------------|----------------|-----------|--------|-------|---------|
| on the AKG CE5 electret capsule. The transmitter is incorporated into the hand-held mic body, and operates on fixed frequency in the band 174-175 MHz. The unit is powered by rechargeable batteries. The receiver is intended for battery/mains operation, and incorporates an output socket for recharging the transmitter's batteries. Price: £395. |                 |                |           |        |       |         |

### SONY

**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. Telex: 264149.

**US:** Sony Corporation of America, 9 West 54th Street, New York, NY 10019.

Phone: (212) 371 5800.

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|        |   |    |     |         |         |                    |
|--------|---|----|-----|---------|---------|--------------------|
| ECM16  | E | O  | 250 | -58 dBm | £15.00  | Mini lavalier      |
| ECM50  | E | O  | 250 | -56 dBm | £25.00  | Lavalier           |
| ECM150 | E | O  | 250 | -56 dBm | £100.00 | Broadcast lavalier |
| ECM220 | E | C  | 200 | -57 dBm | £25.00  | Hand/stand         |
| ECM250 | E | C  | 200 | -56 dBm | £22.00  | Pa                 |
| ECM270 | E | C  | 200 | -56 dBm | £27.00  | 'Pop' screen       |
| ECM280 | E | C  | 200 | -55 dBm | £35.00  | 30-18k Hz          |
| C38B   | C | VS | 250 | -68 dBm | £235.00 | 'Studio quality'   |

The company also manufacture a wide range of booms, stands, goosenecks and thread adaptors.

### SUPERSCOPE

**Superscope Inc, 20525 Nordhoff Street, Chatsworth, Ca 91311, USA.**

**Phone: (213) 998 9333/873 2000.**

**Europe:** Superscope Europe SA, Avenue Loise 430, BP4 Brussels, Belgium.

Phone: 649 9483. Telex: 26602.

|       |   |   |       |        |     |                   |
|-------|---|---|-------|--------|-----|-------------------|
| EC1   | E | O | 'low' | -52 dB | poa | —                 |
| EC3   | E | C | 'low' | -52 dB | poa | —                 |
| EC5   | E | C | 'low' | -52 dB | poa | —                 |
| EC9P  | E | C | 250   | -56 dB | poa | Low-cut filter    |
| EC12B | E | O | 250   | -52 dB | poa | Tie-clasp or boom |
| EC15P | E | O | 250   | -52 dB | poa | Mini tie-clasp    |
| EC33S | E | C | 'low' | -46 dB | poa | Coincident stereo |

Output figures are referenced to 0 dB=1V/10 μB at 1 kHz.

### TECHNICS

**Matsushita Electric Trading Co Ltd, PO Box 288, Osaka Central, Japan.**

**Phone: Osaka 204 5111.**

**UK:** Technics, 107-109 Whitby Road, Slough, Berks SL1 3DR.

Phone: Slough 34522. Telex: 848761.

**US:** Panasonic Co. Technics Dept, One Panasonic Way, Secaucus, NJ 07094.

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#### MICRON

**Audio Engineering Ltd, 33 Endell Street, London WC2 H9BA, UK.**

**Phone: (01) 836 9373.**

**US:** Micron Audio Products, 401 East 74th Street, New York, NY 10021

Phone: (212) 744 3065.

The company manufactures a range of radio microphone systems. These can be supplied with a variety of transmitters, receivers and microphones. One such system is reviewed on p96.



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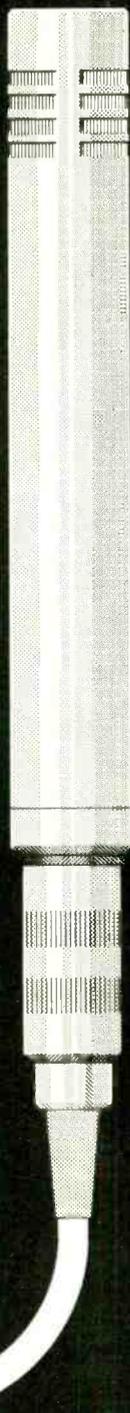
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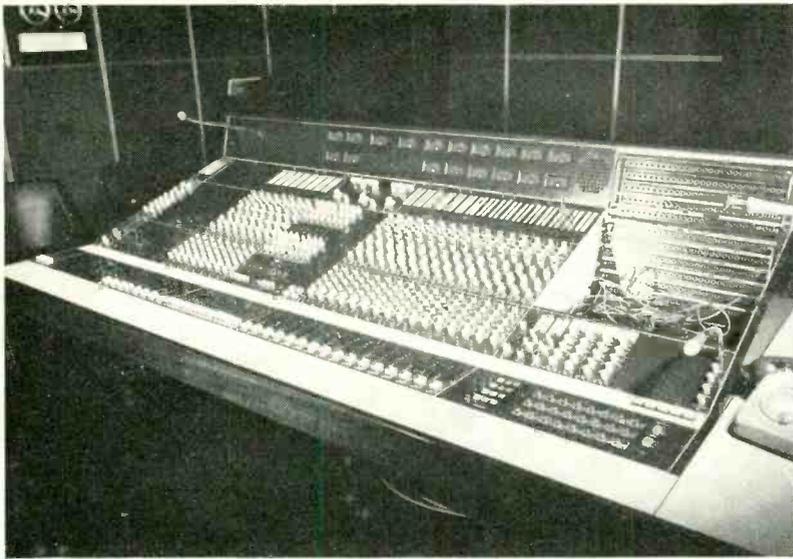
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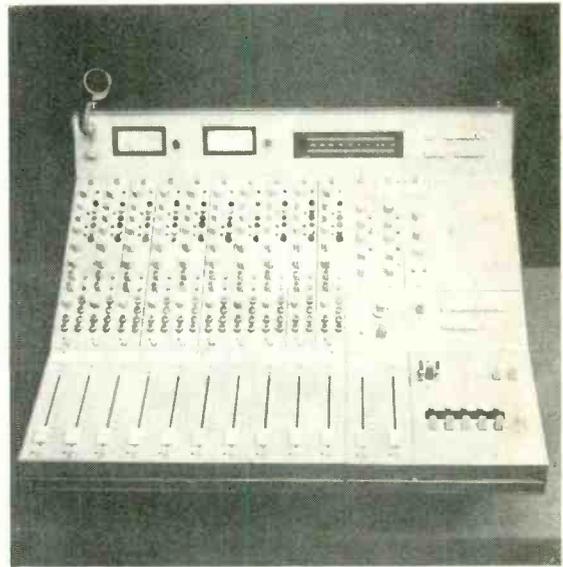
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# work

## In search of purity

Studio engineers, routinely involved in drop-ins, edits, repairs, overdubs and retakes, might be surprised at the extent to which some sectors of the record-buying public are even now still unaware of the audio lies to which they are routinely listening. Pop recording is, of course, now widely accepted as a creative art form all of its own, like the American film musical. Overdubbed, echo-riden and splice-constructed perfection is as normal as a singer praising Kansas in August surrounded by corn as high as an elephant's eye . . . and an invisible symphony orchestra.

But quote to a classical music enthusiast an instance like how a featured operatic soloist of repute took seventeen takes to manage the difficult task of hitting a pianissimo top B-flat after a forte passage, and you will receive in return a stare of disbelief. It will even come as a surprise to many 'legitimate' record buyers to learn that orchestral recordings, especially of opera, are recorded in segments, out of sequence—just as a film is shot—to fit in with soloists' availability, and to balance the strain between simple and strenuous passages.

But even though the average classical music enthusiast may not be aware of the extent to which he or she is buying artificially engineered perfection, there is at least a growing understanding of the degree to which many classical recordings are artificial in their sound, due to close-miking techniques. Gradually the realisation is spreading that the use of a large number of microphones placed very close to the gentlemen of the orchestra inevitably produces unnatural effects, simply because the sound of any instrument at close range is quite different from that of the same instrument heard in the distance.

Only those who never attend a live orchestral performance—or whose ears are painted on—can fail to notice that an orchestral recording built up from *Lego* blocks of close miking sounds different from the same orchestra heard live, or miked in purist fashion from a

reasonable distance. And here beginneth an interesting situation. The casual record buyer who knows or cares nothing about either the sound of close-miking or the artificial creation of perfection, gradually but inevitably builds up an entirely false picture of how a live musical performance really sounds.

Even recordings publicised as 'live' and made with relatively simple miking techniques are anything but pure in the traditional sense. Last year, for instance, EMI recorded the revival of Sir William Walton's *Troilus and Cressida* opera at Covent Garden. An 8-track Studer was used, with a pair of AKG C24s as the main stereo pair; six KM84s along the footlights mixed as a second pair; five more KM84s around the orchestra pit, mixed as a third pair; and a KM86 as the fourth pair far out on the extreme left and right for ambience. The recording was made flat, with no limiting or compression; only manual compression by hand was used at the mix-down stage.

But still the entire operatic performance was recorded on three separate nights, for inter-cutting of the best passages of each night to build up the best possible final result. For the listener in search of purity, it's a step up from close mics, eq and echo plates; but its still a long way short of Mecca.

Likewise, the BBC, often cited as one of the few bodies left producing pure sound, would now not dare transmit the whole truth and nothing but the truth.

At a recent promenade concert of Britten's *War Requiem*, first hand comparison of the sound as heard from a seat in the stalls, the sound as transmitted in stereo by BBC Radio 3, and in mono by BBC tv, proved a sobering experience. From the stalls, one of the main soloists, Peter Pears, was consistently drowned out by the orchestra, and what words were audible came through as unintelligible. The other male soloist, Thomas Hemsley, was clearly in far, far stronger voice.

But tapes made of the stereo radio broadcast had the differences in the voices ironed out, Pears cutting far more firmly through the orchestra, and often intelligible. A tape made of the mono tv broadcast brought both Pears and Hemsley even further forward from the orchestra. A single BBC 4038 ribbon mike had been used to cover both singers, but angled so as to help Pears more than Hemsley and leave the independent radio and tv sound mixers with their balance options open. And able to give the listening and viewing public what they now expect.

Who, then, is now consistently making pure recordings, on a commercial scale, attractively packaged and at a reasonable price for anyone left out there who is still interested in how a performance really sounds; and with only the most obvious warts removed by tape surgery? Probably the only answer is Enigma. It's a logical answer because during the summer of 1976 John Boyden and Peter Whiteside formed Enigma Records Limited to fill what they saw as a gap in the record business. Especially now that the major record companies no

longer use pop profits to subsidise their classical lists, such companies are tending to exercise great caution towards new artists or those who have not yet gained an international reputation.

Rising costs throughout the whole recording and release chain encourage even greater caution. Boyden and Whiteside believed—and still believe—that all too many commercial classical recordings are now so full of compromise, intended to make them widely palatable, that they end up as unacceptable to any particular audience. Compromise overkill, one might say.

Both Boyden and Whiteside know the record and music business from the inside, so what they say should not be taken lightly. Boyden was, of course, formerly Managing Director of the London Symphony Orchestra, and his dismissal towards the end of 1975 kept the gossip columns and the pages of the satirical magazine 'Private Eye' filled with fun for months on end. It seems that those concerned are now busy litigating amongst themselves, but essentially there were two main bones of contention: one, the ability of the LSO to hold its liquor; and the other, a power struggle within the orchestral ranks between those who wanted André Previn out, and those who wanted to get rid of those who wanted André Previn out.

Although questions were raised in the anti-Previn faction about his musical abilities, I was interested to note when I met John Boyden recently at an Enigma recording session that his only comments on the incident tied in with the avowed Enigma musical philosophy—namely that you can go too far in the popularisation of music to sell records and concert tickets. 'You don't have to compress all the peaks', he says, comparing music with mountains to be climbed. 'The listener should have to make some effort to enjoy what he hears.'

Boyden believes that the decline of classical music sales in the USA is a direct result of over-popularisation, as is traditional there. 'Over the years, you've had Toscanini doing sponsored broadcasts, and a series of Bach's Greatest Hits, Grieg's Greatest Hits, and so on. There was even one compilation lp of classical music for people who hate classical music: a hundred popular themes *sequé* over two sides of an lp.'

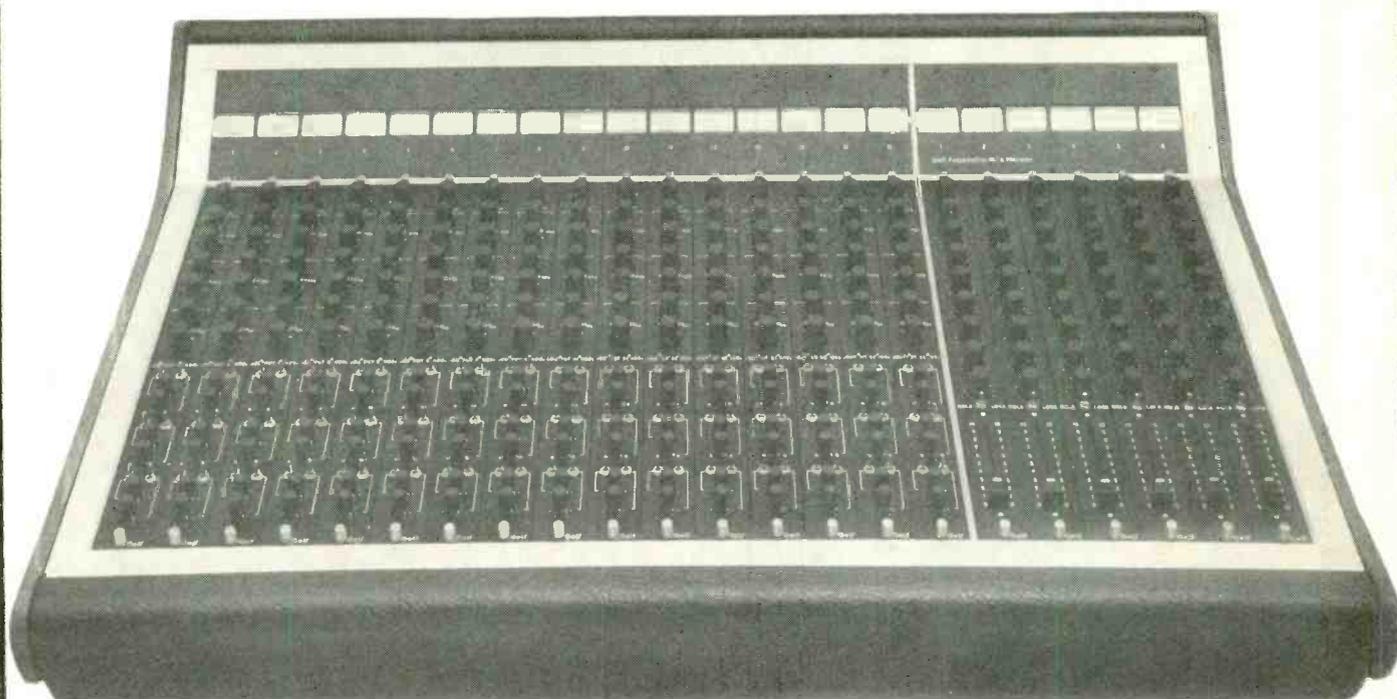
Implicitly, and even once in a while directly, Boyden's talk of 'reducing everything to easily digestible pap' ties in with the Previn power struggle. But curiously, a closer look at the history of both

They know the score at Enigma.



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## WORK

Boyden and Whiteside makes this contempt for classi-pop appear as something of a contradiction to their past careers.

Before the LSO, Boyden was deputy md for the EMI label 'Music for Pleasure', and it was he who created, with the tobacco giant WD & HO Wills and the LPO, the 'Wills Master Series'. This went out on 'Classics for Pleasure' (rudely retitled 'Coughing' or 'Cancer for Pleasure' by those foolish enough to believe the scurrilous rumours that inhaling carcinogens like raw tar can be injurious to health). Likewise, Peter Whiteside was in charge of MFP's promotion, and went on to become Marketing Manager for Precision Tapes.

Reading between the lines, Boyden and Whiteside faced problems inside EMI. By marketing the budget MFP label aggressively, and releasing sensibly sleeve-noted original recordings rather than reissuing or promoting *The 1812* yet again, they were a threat to EMI's full-price releases. Finally, they left EMI and took what is without doubt a substantial gamble—namely trying to make their own new Enigma Records the first new classical record company to entrench itself in the UK since the War.

This is no mean ambition, for running a new record company is certainly more difficult than running a theatre or opera house. 'There's no Arts Council grant to bale you out when things go wrong,' reminds Boyden. True. One fringe theatre in London gets £40 000 a year from the Arts Council, who subsidise its production of esoteric plays that directors love to direct, and actors love to act in. Quite frequently their performances have to be cancelled

because there is just no audience out front. Can you imagine a record company managing to survive with a list of records that no one bought?

By the end of 1976, Enigma Classics had ten records (at £3.49 rrp) on the market and actually selling. By July 1977 there were 25, with four more scheduled for release later this year.

I was present at the recording session for one of these (Beethoven piano sonatas played by British pianist, John Lill) an occasion on which I had the opportunity of talking to John Boyden, along with Tony Faulkner, who joined Enigma early this year after several years with Angus McKenzie Facilities.

That Faulkner should join forces with Boyden is fitting and perhaps inevitable. For Faulkner is as outspoken about modern trends in recording as Boyden is about modern trends in marketing. In short, Faulkner is very much a purist, Blumlein crossed-pair man, which is not surprising in view of his AMF background. While both he and Boyden recognise the market for close-miked, multitrack mixed versions of the classics, as can often be expected from CBS, they have no interest in that market whatsoever. 'It's the Double Diamond of the record business', says Faulkner, 'and we're more interested in real beer.'

Boyden is equally frank: 'It makes orchestral recordings sound like a wall of sound with no depth or perspective. They multitrack a piano by putting mics underneath, inside and all round, end up with a dry mix and put it all through a horrible plate. The only snag is it doesn't then sound like a piano. A small group ends up sounding like a bunch of dwarfs playing toy instruments, which is fine if that's

what you like. And as for a large orchestra; well, it's all compressed and there's no light or shade. Except that every now and again the recording engineer calls up an orang-outang to swing the woodwind forward on a trapeze for a solo.'

It's not surprising in this context that of the 29 recordings already issued or in preparation, 19 have been made using mainly a coincident or nearly coincident (ie less than 10-cm spacing) pair. A couple have been made using a coincident pair augmented very marginally by one extra microphone, and only around six large orchestral works have been made using multimics. But even in the case of multimiking, it is still the case that a very large proportion of the sound comes from a main coincident pair.

At the session I attended, pianist John Lill was playing in an empty Conway Hall to a crossed pair of Calrec CM1050 phantom-powered condenser mics. Faulkner is clearly a Calrec fan, and shares with me the belief that it's only a snobbish 'if it's inexpensive and British it can't be good' prejudice that steers some producers away from Calrec, and toward more expensive and often no better, or even less desirable, equivalents. 'The main point in favour of these Calrecs', says Faulkner, 'is that their response is the same both on and off-axis. There is no sibilance off-axis as in some other condenser mics, and no cavity resonance. What this means is that I can safely point the pair up over a soloist to pick up more natural ambience if I want to.'

Another interesting point found by Faulkner when using crossed pairs is that it's safer to use the pair actually crossed in an 'x' with

the mics used vertically one over the other, rather than spaced out in a 'v' with the capsules looking at each other. There's a real risk that the latter configuration will produce virtually mono sounds at some distances from the source.

Faulkner is one of the few people I've met who realise that what Blumlein proposed in the early Thirties was a crossed pair of *figure-of-eights*, not cardioids (as these were not then available). But he has found that there is a real risk of getting a 'bathroom sound' unless the figure-of-eights can be moved close and high over the sound source. With cardioids, which came along after Blumlein's original work, you can more safely move further back. But reputedly the Beecham recordings once available on EMI were made with crossed eights. And they were beautiful.

At the Conway Hall there's a small ante-room that is ideal for monitoring. Enigma use a pair of Spendor BC1s—always the same pair; always the same speaker left and right; and always at virtually the same gain. A Neve 12/2 desk, with Dolby A and a Studer stereo machine completes the picture.

Levels are set once and that's it. And the levels set are kept in fact deliberately low, with zero vu at 185 nWb/m, or in line with older rather than modern tapes. This puts the peaks 6 dB down below normal levels to leave masses of headroom. And, of course, the 12 dB improvement in noise thanks to Dolby still leaves a 6 dB overall improvement in noise into the bargain. Bias on the Studer is also deliberately kept relatively low, to help keep the top end very clean. The relatively simple recording system

84 ►

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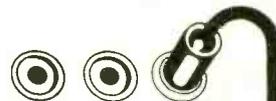
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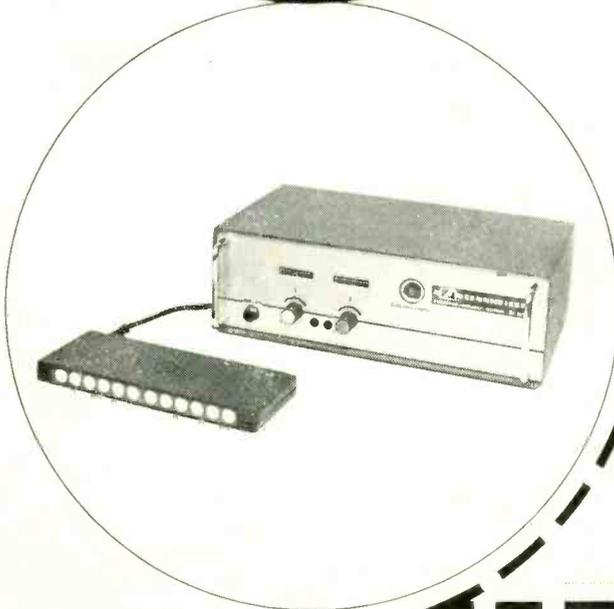
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## WORK

makes for very short set-up time: for a 10 am start at the Conway Hall they'd arrived at 9 am.

'But that was cutting it fairly fine, because we know that hall well', explained Faulkner. 'But frankly, it's one of the bullshit legends of modern recording that it takes a long time to set up. Unless, of course, you come along with a pantechicon of gear to hump around.'

The next Enigma recording, a sub-contract job from elsewhere, was to be early music in quad, but the setup was to be equally simple—four cardioids in a cluster, dished slightly downwards to help the hall reverb die away more naturally.

Reverting to that original train of thought—that few record buyers today realise the true extent to which recorded perfection is artificially achieved—it's sobering that even Enigma feels obliged to repair errors. 'It's essential,' runs Enigma philosophy, 'because a mistake in a concert is gone in a fleeting moment, but on a record it's there forever. So we edit. But we are not into doing a Frankenstein job, patching a bit here with a bit there and so on.'

What Enigma are into is going for an as near as dammit perfect take and then repairing fluffs by editing in repairs from re-takes that match in tempo and feel. Level differences are no problem because with the faders left untouched from take to take there aren't any differences in level—unless of course the artist chooses to make them for himself. It must make quite a change for musicians recording for Enigma to know that if they play take 2,

louder than take 1, then take 2 on tape will be louder than take 1.

For editing Faulkner uses a special block jointly designed with Joel Tall of Washington, one of the tape pioneers. The block cuts the two ends of the tape to be joined into matching arrow-shaped butts, so that each stereo half of the tape is cut and joined at a similar angle. This is different, of course, from a straight slant slice, which can produce stereo image shift by effectively slicing one channel a few milliseconds ahead of the other. And a straight, 90° slice in film fashion inevitably produces an audible impulse.

For mastering Faulkner borrowed from an early American technique, also intermittently used in this country. This involves copying the master tape backwards, and using the backwards dub for disc cutting. The object is to iron out the time differences between high and low frequencies that result from a non-linear inductance lag at the recording and playback head coils. (A square wave recorded on tape looks unsquare as a result of hf lag, but can be squared again by recording the tape backwards.) Faulkner firmly believes that with his simple, that is to say purist, stereo recordings the difference is decidedly audible—transients in particular benefiting.

Realistically then, Enigma's issues are likely to be the nearest thing to purity available on a commercial basis. 'But remember we are not, and don't want to be, a kitchen table business,' says Enigma. 'We're not interested in selling records to a hundred audio enthusiasts. We want to sell recordings of performances for people who

are interested in musical performance.'

But doesn't the adoption of repair edits negate this? 'You have to remember that any inadequacy on a record will become more noticeable every time that recording is played,' argues Faulkner. 'And it just isn't feasible to make a perfect recording every time, with all the notes in exactly the right places even when you play the tape at half speed. You need a degree of artificial aid.'

OK. But doesn't this philosophy as pursued by a company like Enigma take even a stage further the creation of a listening public that expects perfection from every musical performance and is thus wide open to disappointment? 'Well, it pushes orchestras to get things right at concerts,' argues Faulkner. 'And it also encourages them to play safe—which may not necessarily be a good thing.' An interesting thought.

It also makes Enigma's job just that much more difficult. Recently STUDIO SOUND's sister publication *Hi-Fi News and Record Review* carried, by an entertaining coincidence, three reviews back to back: one of a CBS operatic recording; one of a tenor and piano duet issued by Enigma; and another of a live orchestral recording also from Enigma. The reviewers were all highly respected in their field and far, far more knowledgeable about music than I'll ever be.

The CBS recording featured a famous opera singer who was praised by the reviewer. It was, in fact, the same opera singer who had taken seventeen shots at that high B<sub>6</sub> mentioned at the beginning of this piece. The reviewer writing

on the Enigma tenor and piano duet, which was made in simple but studio-style conditions by Enigma, and thus left room for editing, praised the performance and the recording to the hilt. The orchestral recording of *Coronation Anthems* was made in purist style by Enigma on location, and thus re-creates the original performance; warts and all. It was slated by the third reviewer, for both musical content and recording.

It's interesting in this context to ponder on what might have happened had Enigma been around to release a simple crossed-pair recording of the original performance of the same anthems as performed at the Coronation of George II in 1727. Musicologists familiar with original contemporary scores confirm that they seldom showed any sign of rehearsal markings, which suggests that the orchestra at such functions was virtually sight-reading on the night. And contemporary reports of that George II Coronation gig suggests that either little or no rehearsal was involved, or that Handel was as a veritable newt. There were, it seems, fifty singers and approaching 200 musicians. The performance was nothing short of a musical shambles. Can you imagine what the reviews for a truly pure live recording of the event would read like, if such a recording were issued next month?

Just as you can't fool all the people all of the time, so you can't please all the people all of the time. And with an avowed philosophy like Enigma's—'We don't want our records to sound like other people's'—it's a safe bet that the company will never be short of mixed reviews.

Adrian Hope

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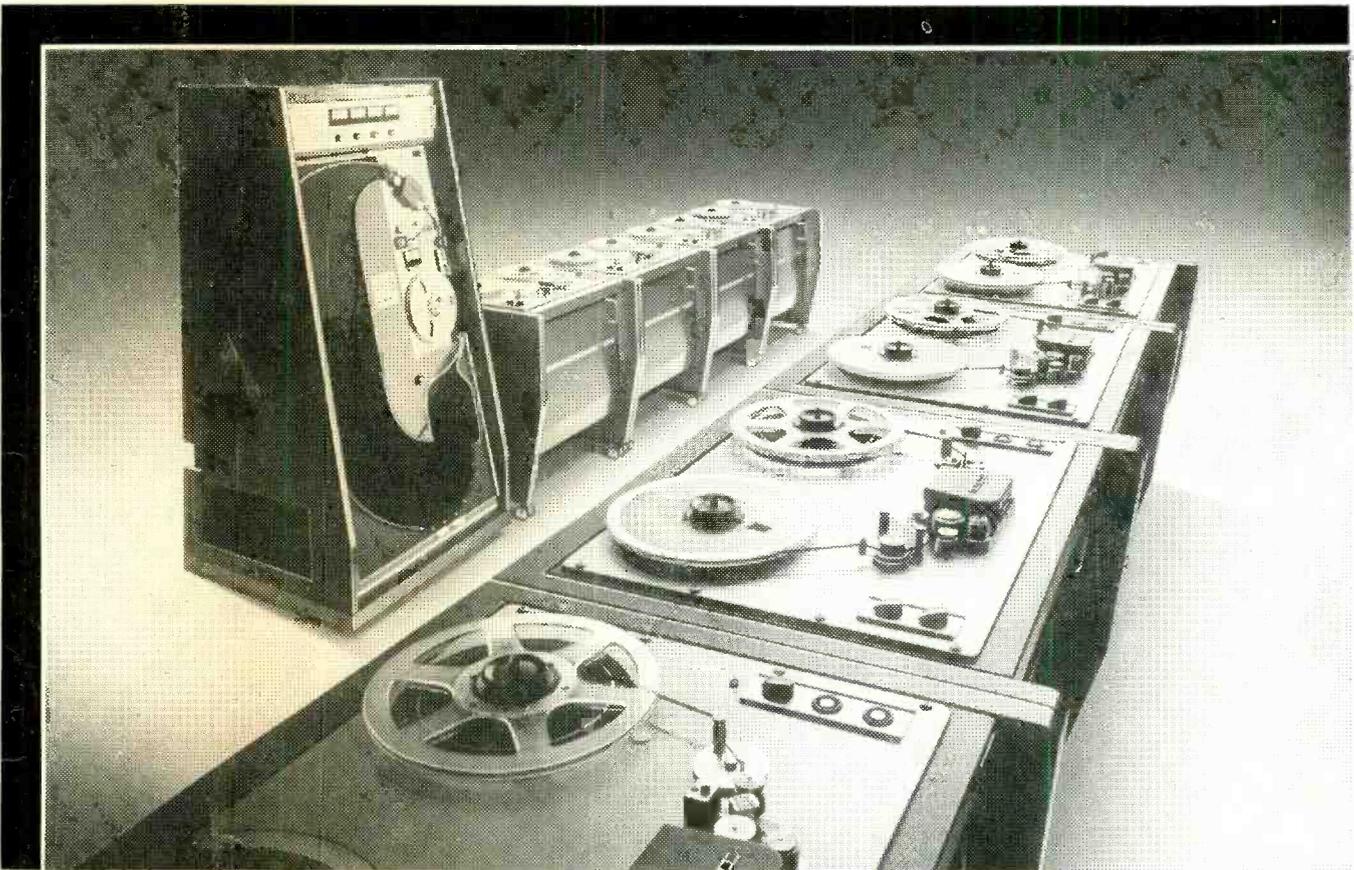
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# reviews

## AKG C414EB condenser microphone Sennheiser Type K2 microphone system Neumann U47 fet condenser microphone Shure SM59 dynamic microphone

Hugh Ford

**M**EASUREMENTS on the microphones were undertaken, in general, in open air conditions; thus the plots of frequency response and the polar diagrams were not done under strictly anechoic conditions. It follows that some minor reflections from the ground and nearby objects interfered with the characteristics which would have been observed in a true anechoic environment. Manufacturers' specifications are to be found in the microphone survey, pp 64.



### AKG C414EB

This studio-type condenser microphone is of the twin-diaphragm type, and includes a number of facilities in addition to the electrically switchable polar diagrams devised from the twin-diaphragm construction. A single switch on the microphone body selects the polar characteristics from cardioid, omnidirectional, figure-of-eight or hypercardioid. These basic characteristics as found at 1 kHz are shown in fig. 1.

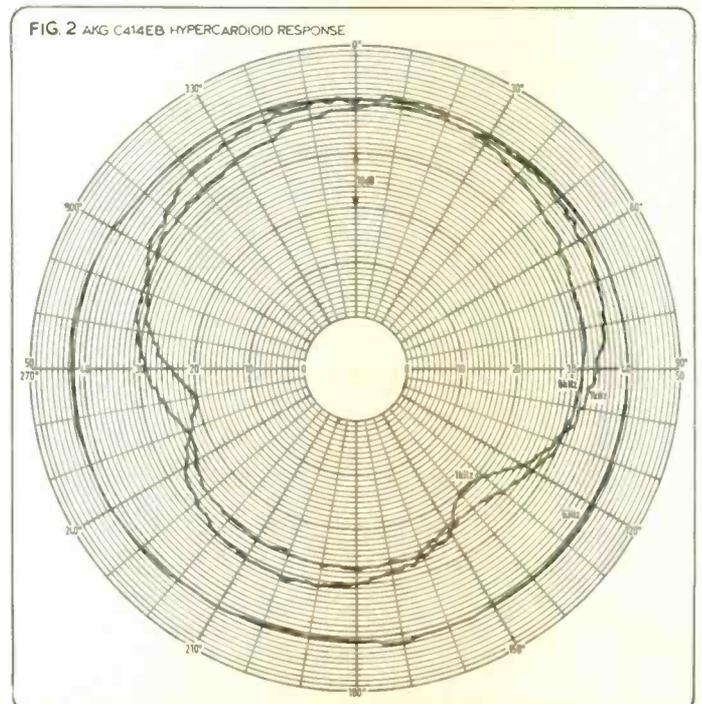
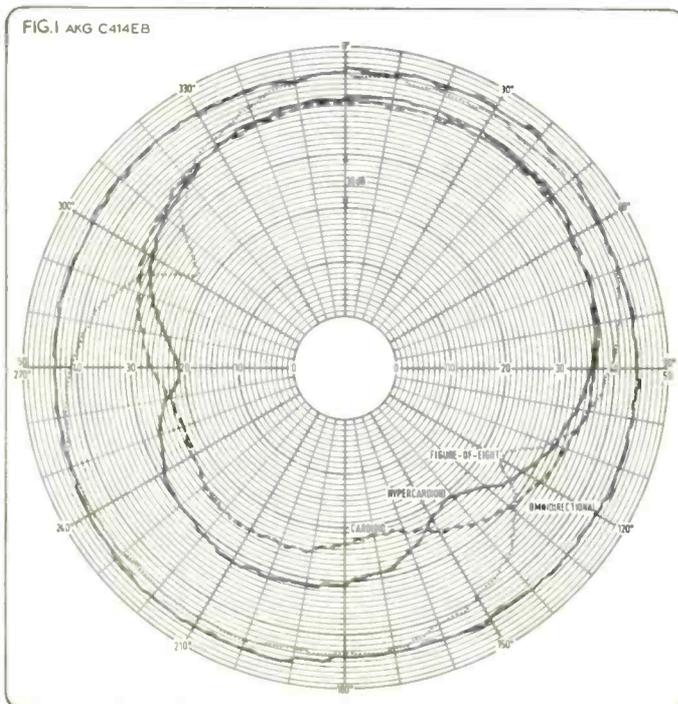
The relation between the directional characteristics and frequency is shown in fig. 2 for the hypercardioid characteristic. It can be seen that while the front characteristics are very good, there is some imbalance between frequencies off-axis and to the rear.

Two further switches on the microphone body provide a highpass filter with a choice of cutoff frequency between nominal 75 Hz and 150 Hz, and also an attenuator with -10 and -20 dB positions. The latter is a very good design, which in practice is a capacitive attenuator at the input of the microphone's fet pre-amplifier, thus avoiding any possibility of overload.

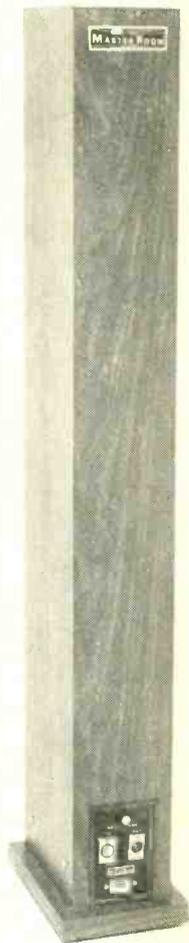
The on-axis frequency response and the characteristics of the highpass filters are shown in fig. 3 for the cardioid polar pattern. Little change in frequency response was observed for other directional patterns. Furthermore, the directional characteristics in the other plane at 90° were very smooth, with the microphone angle having insignificant effect on the frequency response. The measured sensitivity at 1 kHz coincided with the manufacturer's specification of 0.6 mV/microbar (6 mV/Pa for those who prefer SI units). It was found that the noise\* was less than 29 dB spl A-weighted, or 25 dB CCIR-weighted rms reference 1 kHz.

As with most condenser microphones this one is powered by a phantom system (AKG provide power supplies where required), with

88 ▶



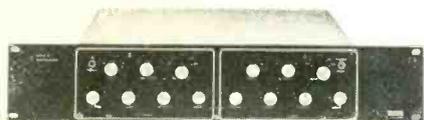
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## AKG C414 EB

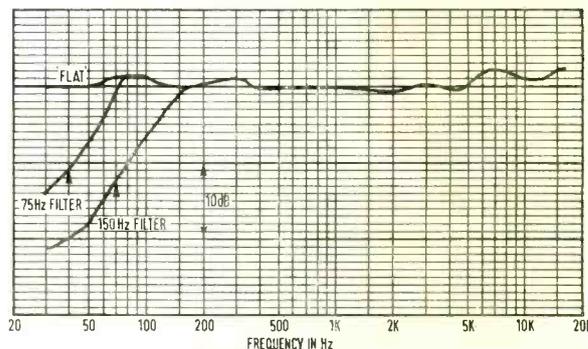
the internal dc-de converter being supplied from a zener-stabilised supply that accepts inputs over the range 9V to 52V. The current consumption at 12V input is about 5 mA, and as a result of the zener stabilisation rises with input voltage. Where higher input voltages are used the current consumption can be reduced by removing an internal link, which inserts an extra series resistor in the power supply leads.

The form of construction is a satin chrome,

wedge-shaped grill supported on a satin chrome body, to the underneath of which is attached the XLR input plug. The overall finish is such that the surfaces are generally non-reflective. A hinged microphone clamp has been provided for mounting the microphone onto stands having normal threads. In addition, a large number of accessories are available, including a combined flexible mount and windshield finished in matt black that should be ideal for film and television work.

90 ▶

FIG. 3  
AKG C414 EB  
FREQUENCY RESPONSE



## agony

The local symphony orchestra in a Northern industrial town was reprimanded recently by the appropriate authorities for practising racial discrimination. Although they had employed a Pakistani triangle player, the authorities noted with displeasure that the musician in question had clearly been left without anything to play during inordinately long stretches of the symphonic performance.

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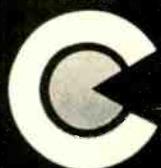
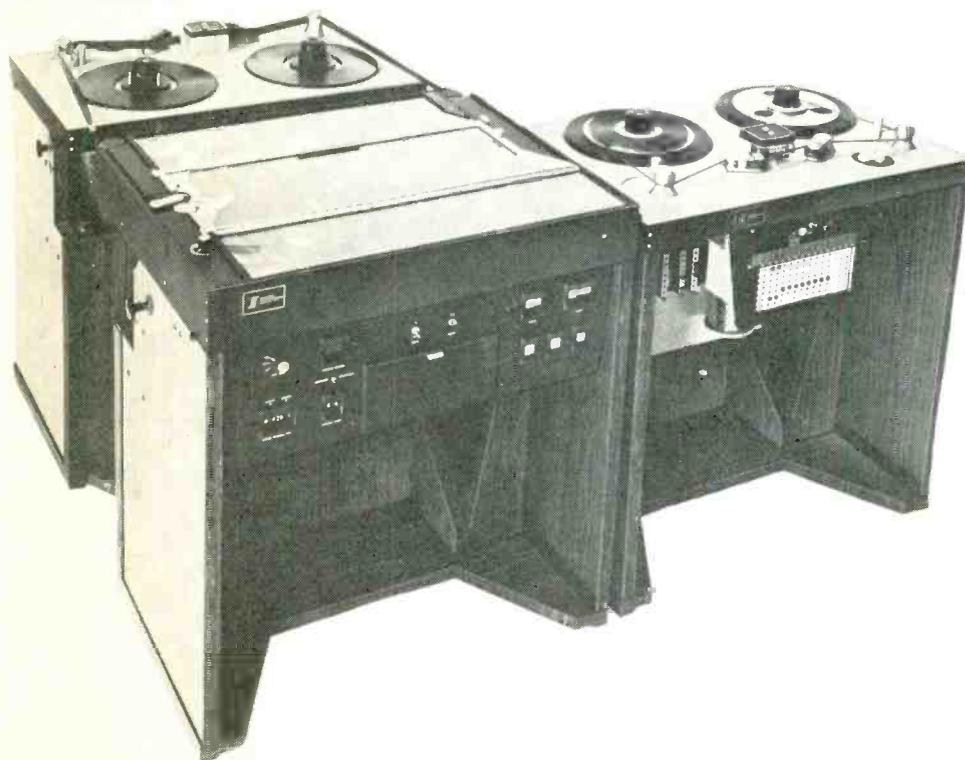


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STUDIO SOUND, NOVEMBER 1977

## SENNHEISER TYPE K2 SYSTEM

The system comprises the *K2U* pre-amplifier body onto which may be screwed a series of different microphone capsules: the *ME20* omnidirectional capsule; *ME40* cardioid capsule; and *ME80* 'super cardioid' capsule. All three capsules are electret, which means that the pre-amplifier does not have to produce the high polarising voltage normally associated with capacitor microphones. Thus its function is purely that of a pre-amplifier, with a resultant very low power consumption and lack of complication due to the use of an internal battery power supply.

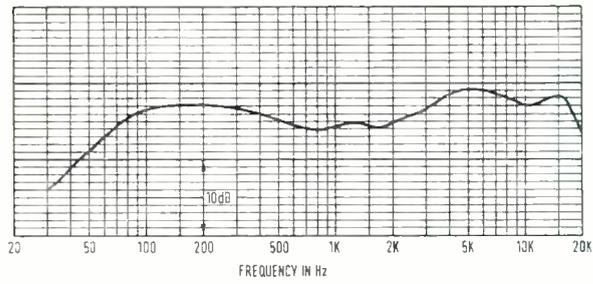
A single 5.6V battery is used, this being the Mallory type *PX23* which is generally available in retail shops and has a claimed life of an amazing 600 hours in use. The battery fits within the tubular body of the *K2U* module the complete pre-amplifier and its *XLR* connector being a tube of about 18 mm in diameter and 160 mm in length. On the side of the tubular body there is a small slide switch for turning the unit on or off. The switch also has a half-way position, which serves as a battery check position in association with a miniature red led indicator mounted by the switch.

The sensitivities of the *ME20*, *ME40* and *ME80* capsules were found to be effectively identical at 0.6 mV/μBar at 1 kHz (6 mV/Pa) in the on-axis position, but naturally the polar diagrams were substantially different. However, the on-axis frequency response of all three cartridges was very similar; fig. 6 shows a typical response for all three capsules.

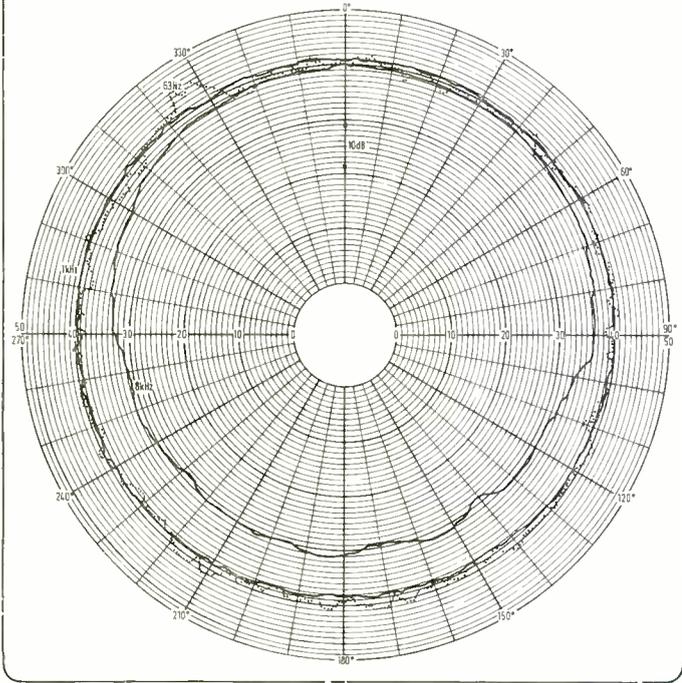
Turning to the directional characteristics, fig. 7 shows the polar diagram for the omnidirectional *ME20* cartridge. It can be seen that while the performance to the front is of a good omnidirectional characteristic, the response to the rear falls off rather excessively at high frequencies and could be a cause for complaint in some applications. On the other hand, the performance of the cardioid *ME40* capsule, as shown in fig. 8, is a good and well-balanced cardioid pattern, with a very satisfactory balance between high and low frequencies over a wide angle about the on-axis position. The directional performance of the *ME80* 'super cardioid' capsule, as shown in fig. 9, exhibits better rejection to the rear than the *ME40* cardioid capsule but, as is to be anticipated, the usable angle about the on-axis position is more restricted. Furthermore, there is severe high-frequency attenuation once the usable acceptance angle has been exceeded. The frequency response to the rear of the microphone, however, is good.

A limited investigation into the noise performance showed that all three capsules were similar, the noise certainly being below 21 dB spl A-weighted or 29.5 dB CCIR-weighted rms reference 1 kHz—both of which represent a very good performance. As is to be expected from the use of the electret principle, which eliminates the need for a dc-dc converter, there was no sign of spurious high-frequency outputs from the microphone. It was felt generally that the Sennheiser *type K2* represents a versatile and not too expensive system for smaller studios who cannot afford very expensive and specialised microphones.

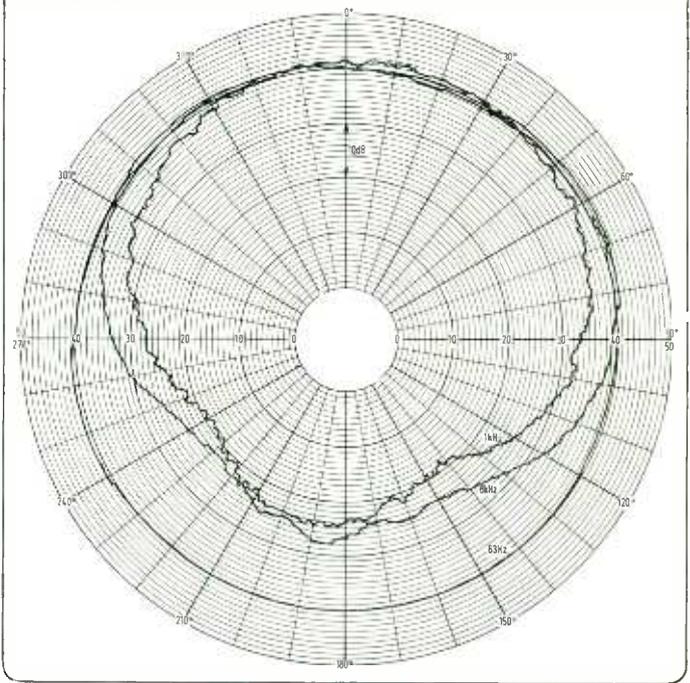
**FIG. 6**  
 SENNHEISER TYPE K2  
 SYSTEM  
 FREQUENCY RESPONSE



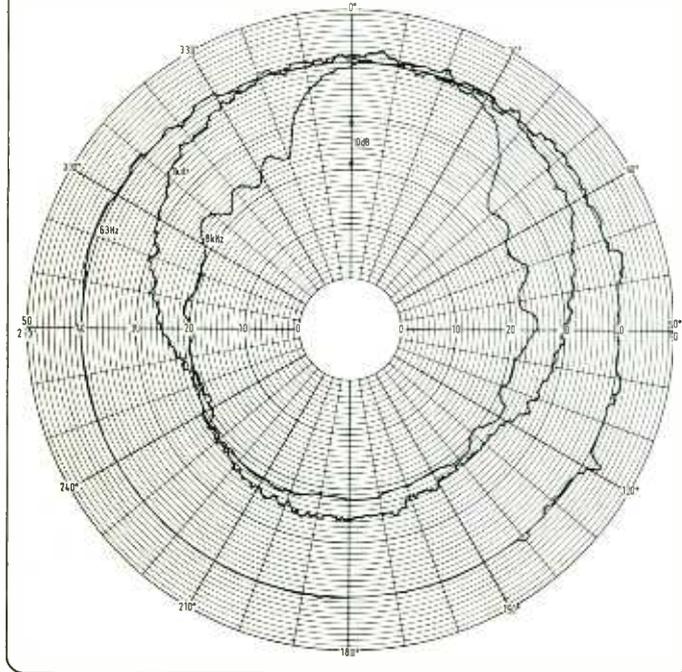
**FIG. 7** SENNHEISER ME20



**FIG. 8** SENNHEISER ME40



**FIG. 9** SENNHEISER ME80



## NEUMANN U47fet

The Neumann *U47fet* condenser microphone is an fet version of the well-established *U17* microphone which has been around for many years. The fet version offers lower noise and a higher signal handling capability.

The directional characteristic is cardioid and, as can be seen from fig. 4, on-axis balance is very good over quite a wide angle. At some points to the rear, however, the balance between frequencies becomes rather critical, with narrowly defined points at which the high-frequency response exhibits a notch. Fig. 5 shows the on-axis frequency response, which is very flat, and also the effect of the inbuilt and switchable highpass filter. This provides a useful facility for reducing wind noise and other unwanted low-frequency effects.

The filter switch and two further attenuator switches are recessed but can be operated with any pointed object, such as a pencil or small screwdriver. One attenuator switch provides a -10 dB step of gain reduction at the input to the microphone's pre-amplifier, while the other switch gives a further 6 dB of attenuation at the pre-amplifier's output to avoid overload in subsequent input stages of mixers, etc.

Microphone powering is by the 48V phantom system, the voltage tolerance recommended by

the manufacturer being +6, -8V on the nominal 48V. In view of the large permitted range no stabilisation is required. The nominal 48V supply is only required to deliver 0.5 mA, and a long-life battery supply independent of the microphone is available in addition to mains powered units. As is normal the power is applied via the signal cable, which can optionally be connected by an *XLR* or Tuchel connector.

The measured microphone sensitivity at 1 kHz was found to be 0.8 mV/ $\mu$ Bar, which coincides with the manufacturer's specification. Internal noise\* was measured at less than 23 dB spl A-weighted rms, or 30 dB CCIR-weighted rms reference 1 kHz. It was noted that spurious outputs from the internal dc-dc converter were at an extremely low level, being less than 3  $\mu$ V below 200 kHz.

Unlike most microphones, the *U47fet* has an inbuilt swivel arm for mounting the microphone onto stands with a standard thread. Sensibly, the arm has a screw-type cable clamp to keep the cable clear of the microphone body. While this is a fairly bulky cylindrical microphone, the dull satin finish is to a high standard and reasonably non-reflective for film and television work.

94 ►

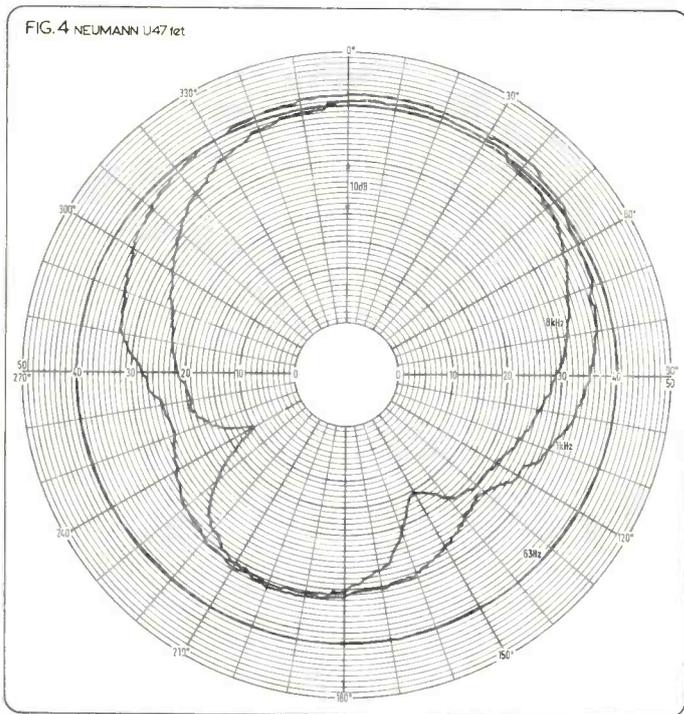
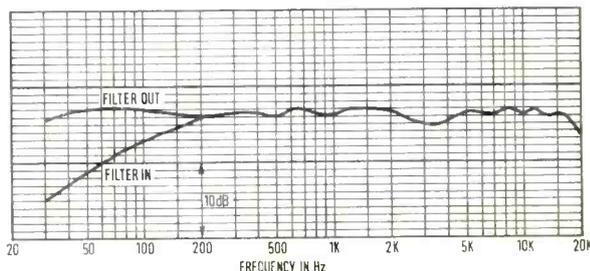


FIG. 5  
NEUMANN U47 fet  
FREQUENCY RESPONSE



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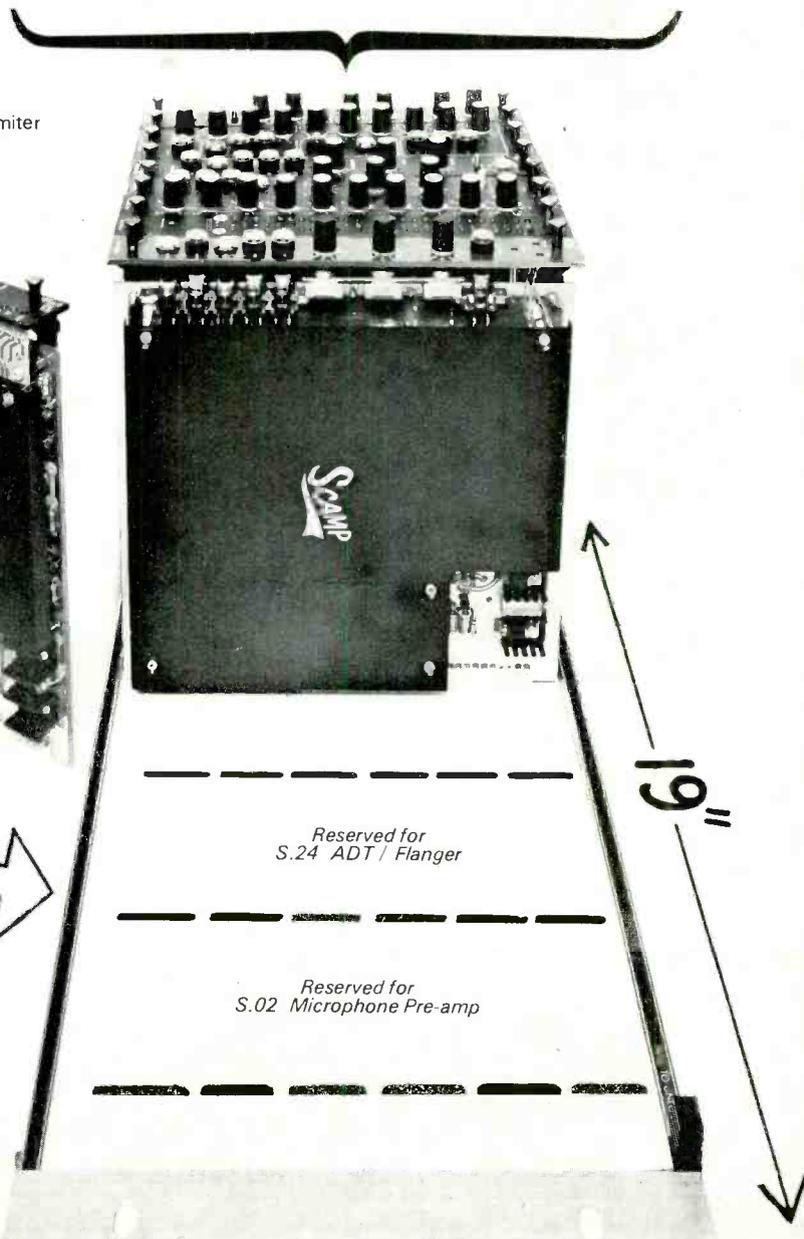
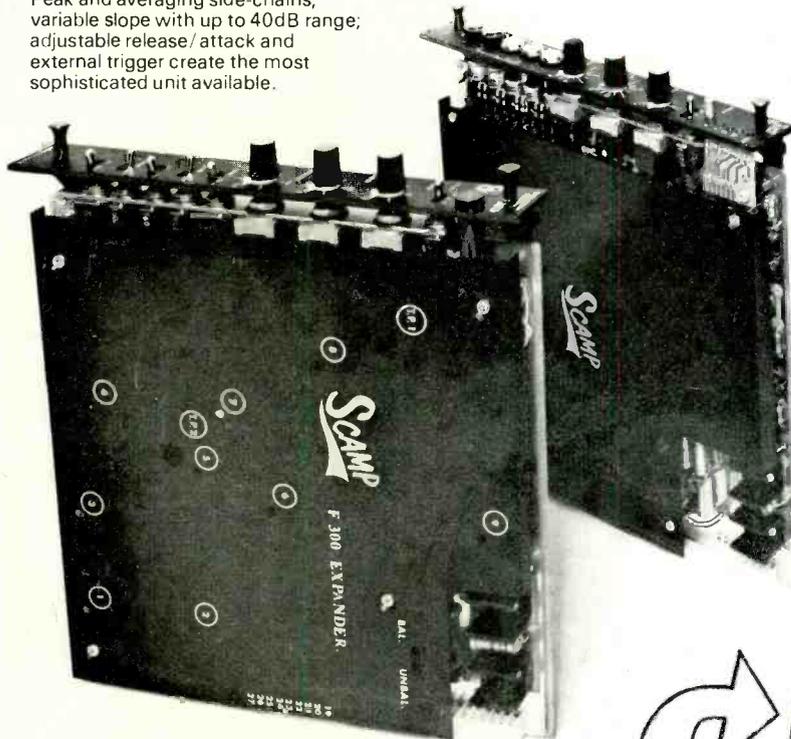
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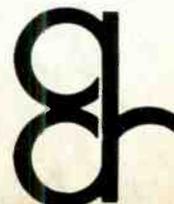
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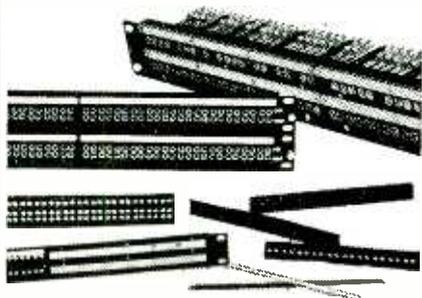
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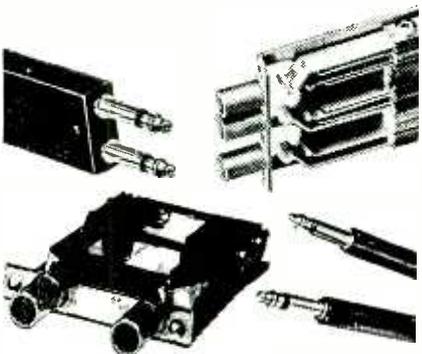
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### SHURE SM59

The Shure *SM59* microphone is intended primarily for speech and general entertainment use, as opposed to music recording and high-quality applications in the studio. Basically it is a dynamic microphone with a sensitivity of 0.064 mV/ $\mu$ Bar (0.64 mV/Pa), which is typical of low impedance dynamic microphones, and a polar diagram that is mildly cardioid (fig. 10). While the polar diagram does exhibit a reasonable front-to-back ratio at mid-frequencies, it is decidedly disappointing at high frequencies, with the rear frequency response being unbalanced.

So far as the on-axis frequency response is

concerned, this is intentionally rolled-off at low frequencies, as shown in fig. 11, to reduce the effects of handling noise. However, the response is generally flat above 200 Hz as is desirable for speech use in the entertainment industry. With this application in mind, the external finish is relatively dull, and is described by the manufacturer as 'champagne enamel finish'. The mechanical construction is typical of most hand-held microphones, with a slim tubular handle and a fairly large grille section of larger diameter. An *XLR* plug is fitted to the end of the handle section, and provides the normal floating output associated with low-impedance dynamic microphones.

\*NOISE: These figures are only offered as a guide. It was not possible to measure them under completely silent conditions, because of lack of time due to copy deadlines.

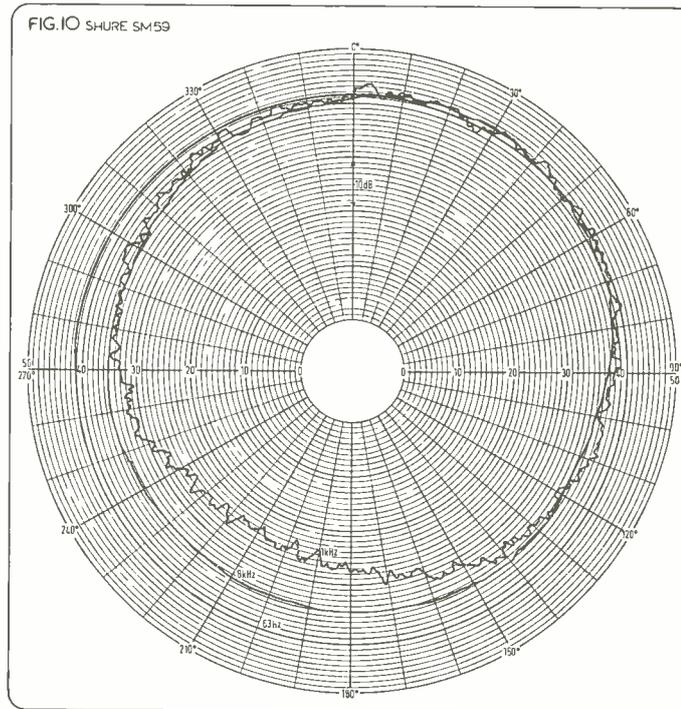
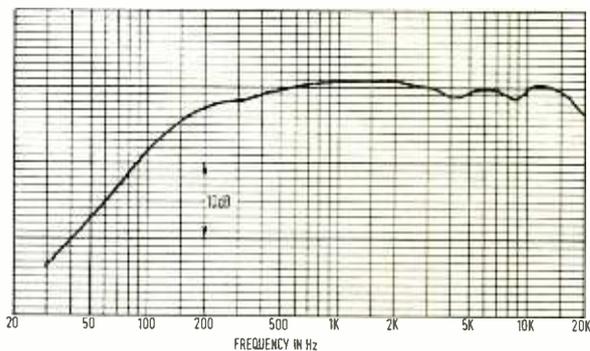
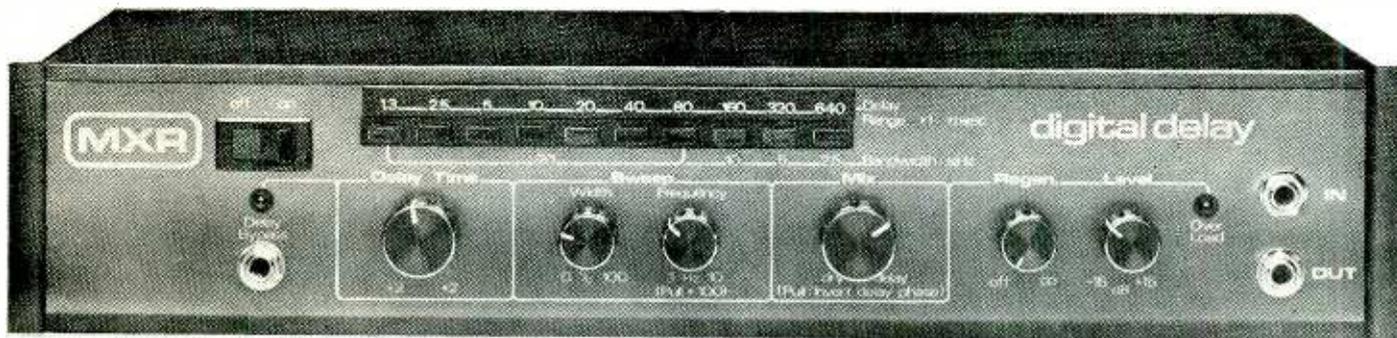


FIG.11  
SHURE SM59  
FREQUENCY RESPONSE



agony

According to a recent item in the 'America' columns of the London Daily Mail, the latest gimmick in the stateside burial market is talking gravestones. When mourners get near enough to the grave of their loved ones it automatically spouts a synthesised message like: 'I'm Jane Smith. I died on June 16 1976. Thanks for coming to see me'. The company that makes these little goodies says there is such a big order, it can't build them fast enough.



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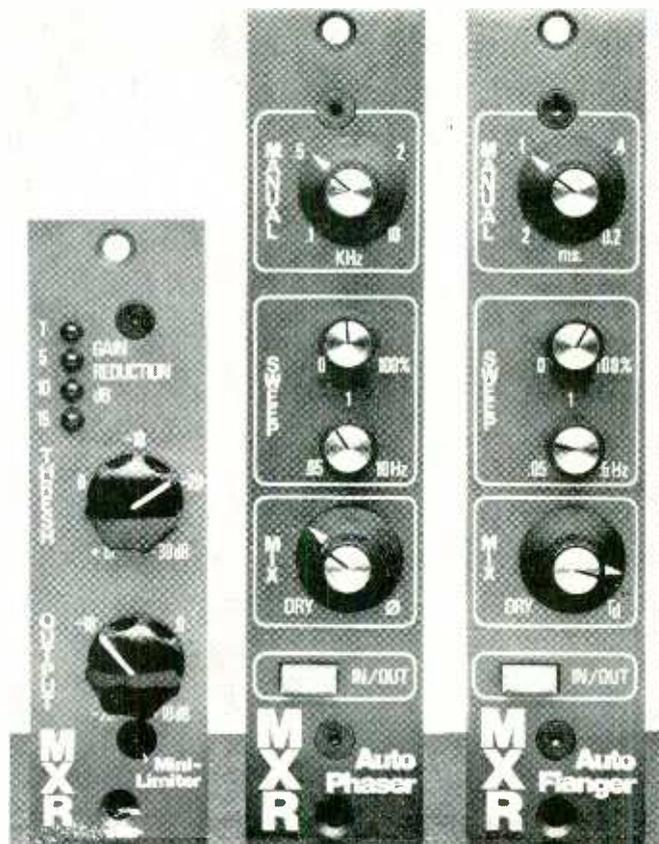
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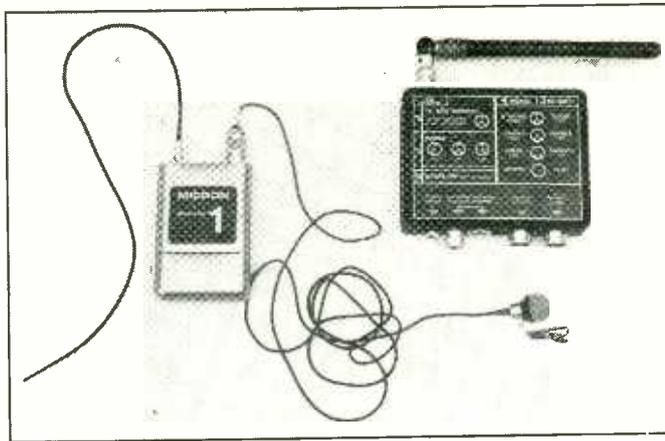
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SS11 77



# Micron 101 radio microphone system

Hugh Ford



## MANUFACTURER'S SPECIFICATION

**Carrier frequency** (to order): 30-50 MHz, 100-200 MHz, 400-500 MHz; frequency error less than 0.005%.  
**Modulation system:** fm,  $\pm 75$  kHz deviation; 50  $\mu$ s pre-emphasis.

**Overall af frequency response:** 50-15k Hz.

**Microphone inputs:** (a) dynamic 200-ohm balanced; (b) dynamic via 20 dB pad, 2000-ohm unbalanced; (c) powered for Sennheiser mics, with or without 20 dB pad; (d) powered for Sony ECM 50.

**Mic input sensitivity:**  $-74$  dB (150  $\mu$ V) for line-up level.

**Receiver output:**  $-51$  dB  $\pm 2$  dB (2.2 mV) from 50 ohms for line-up level.

**Receiver muting level:** 0.5  $\mu$ V nominal.

**Signal strength:** indicator lamps show muting level and 20 and 31 dB above muting level.

**Tuning indicator range:**  $\pm 30$  kHz (vhf band).

**Image rejection:**  $> 60$  dB.

**Adjacent channel rejection:**  $> 80$  dB ( $\pm 450$  kHz).

**Signal-to-noise ratio:** (overall system at 55 kHz deviation, 8 dB above line-up level, rms weighted levels) transmitter at max af gain:  $< 55$  dB; transmitter 20 dB below max gain:  $> 70$  dB; received signal level 20  $\mu$ V:  $> 50$  dB.

**Distortion** (overall system for 1 kHz tone):  $< 0.4\%$  thd at line-up level;  $< 0.5\%$  thd 8 dB above line-up level. Transmitter at max af gain, limiter operating: 40 dB above limiter threshold  $< 1.0\%$ .

**Limiter performance:** range:  $> 45$  dB; attack time: 25 ms per 10 dB; recovery time, short term overload: 10 dB/s, long term overload: 10 dB per 20s.

**Transmitter output power:** 30 mW or 10 mW into 50 ohm, to order.

**Battery life** (approx): single PP3 gives 2 hrs continuous or 4-5 hrs intermittent; manganese Mn-1604 gives 6-9 hrs continuous or 9-12 hrs intermittent.

**Price:** receiver: £265.65; transmitter: £264.50.

**Manufacturer:** Audio Engineering Ltd, 33 Endell Street, London WC2.

THE MICRON range of radio microphone equipment consists of a variety of versions of both transmitter and receiver, not all of which can be used in the UK because of restrictions imposed by the Post Office upon carrier frequency and transmitter power. Not only is it illegal to operate radio microphone equipment without a transmitting licence, but the equipment is also restricted in the UK to the 174 MHz band allocation, and to a maximum power of only 10 mW. These restrictions severely limit the use of radio microphone

equipment, as the use of most types of legal systems results in severe radio propagation problems. There is absolutely nothing that the manufacturer can do about this, except to adopt complicated and expensive multi-diversity reception techniques.

In spite of these problems radio microphones find many applications in film and television work, in addition to their relatively common use in the theatre and—thankfully—less common use for bugging people. Hence this review of the Micron 101 transmitter and its matching

mobile receiver.

The Micron 101 receiver is a small, self-powered unit contained in a rectangular metal case measuring about 100 mm high by 60 mm wide and only 20 mm thick—about the size of a pack of 20 cigarettes. Power is derived from a PP3 size battery, which can be easily changed without the use of tools, and the receiver is designed such that the transmitter battery condition is indicated should there be the danger of loss of power. This is done by the transmission of a subsonic tone by the transmitter, such that the normal audio feed continues without interference.

At the top of the transmitter there are two sockets: a miniature co-axial socket for the 43 mm-long flexible wire aerial, and an 8-way LEMO connector for the microphone connections. Virtually any dynamic or low voltage capacitor microphone can be used by selecting the required pins on this connector, which also serves the purpose of switching the transmitter on when the microphone connector is inserted. In addition, there are further facilities on the top of the transmitter. These include a screwdriver-operated input sensitivity control, which is adjusted with the help of two led indicators that illuminate at 10 dB intervals when a 'set level' pushbutton is pressed on the transmitter, and a further pushbutton that transmits tone at line-up level. Both these pushbuttons can be locked down and, sensibly, they are recessed so that they cannot be accidentally operated, but are readily operated with a sharp instrument such as a pencil.

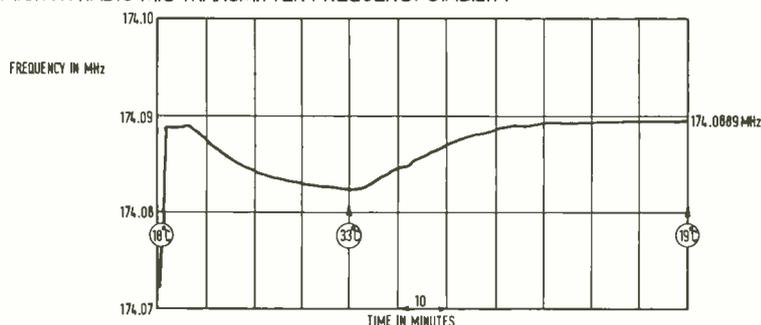
The receiver is mounted in a diecast alloy box, and offers many facilities. Firstly, while it is not self-powered as such, it can be operated from a small battery pack that uses eight HP7-type batteries. Alternatively it can be from Nagra III or IV internal power, or any other 12V supply. The receiver aerial connection is by a standard 50 ohm BNC. This allows either a small 'helicoil-type' aerial to be plugged directly into the receiver, or a separate remote aerial to be used by means of coaxial extension leads. Two Preh-type sockets facilitate the connection of power to the receiver (there being no on/off switch) and also provide an audio output at microphone level for direct connection to mixer inputs, etc. A headphone jack output is also provided for use with monitoring headphones of the higher impedance types ( $> 400$  ohms).

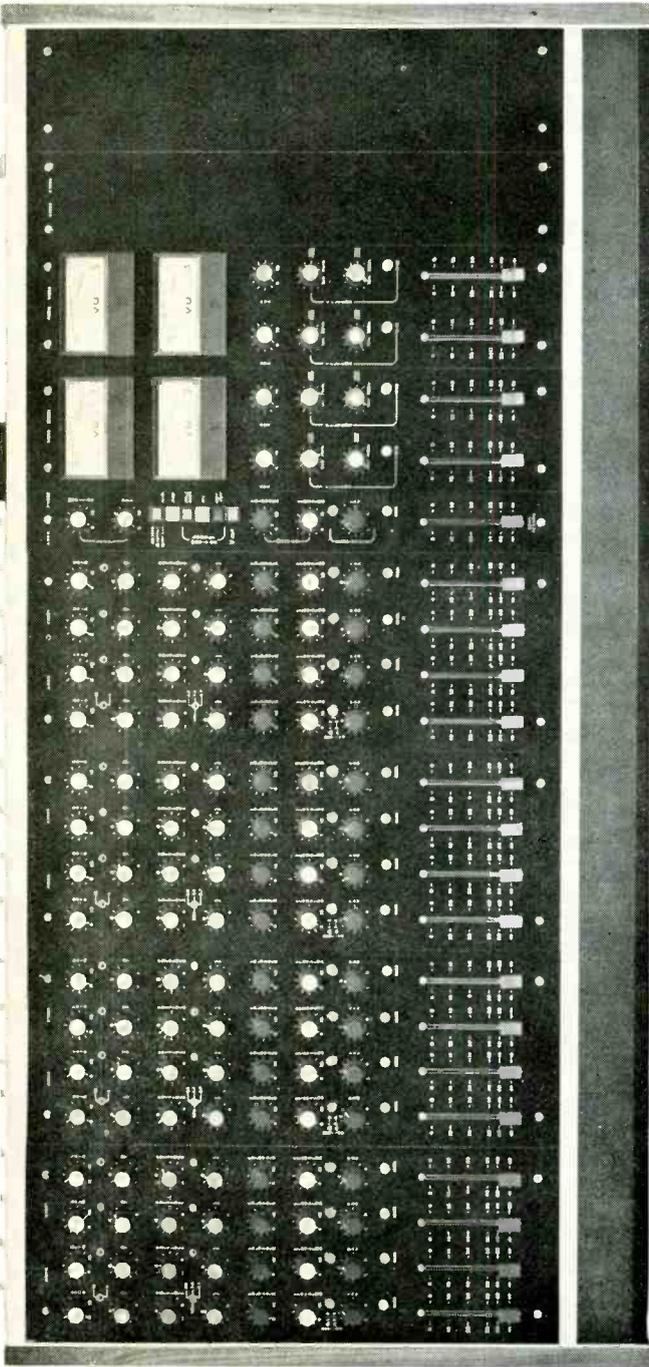
The receiver features an interesting display, which consists of a pattern of five leds mounted behind a transparent screen for good visibility in high ambient light levels. The display, which is operated in conjunction with a 3-position, shielded toggle switch, indicates received signal strength, receiver tuning accuracy and both transmitter and receiver battery condition.

## Performance

One of the more important aspects of radio microphones is the frequency stability of the transmitter. This was checked from switch-on at 18°C, after which the transmitter was warmed-up until its temperature rose to 36°C. The resulting drift in frequency, which was minimal, is shown in fig. 1, which also shows the recovery to the original frequency as the transmitter temperature was again dropped. At this juncture it should be mentioned that the

FIG.1 MICRON RADIO MIC TRANSMITTER FREQUENCY STABILITY





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## MICRON REVIEW

nominal frequency of the transmitter should have been 174.1 MHz  $\pm 0.005\%$ , and that the measured frequency was just outside this tolerance.

Operation of the line-up tone button gave an fm deviation of 22 kHz, which is correct and corresponds to a vu meter indication of zero on the mixing desk, or to ppm mark '4', having regard to the nominal maximum system fm deviation of  $\pm 75$  kHz. The required microphone input level for the 22 kHz deviation could be varied from 120  $\mu$ V up to 12 mV by the use of the preset gain control in the transmitter, when using the connections for dynamic microphones. Although this sensitivity is adequate for the intended applications, the input impedance of a constant 200 ohms, irrespective of sensitivity setting, is too low—most dynamic microphones like to look into about five times their rated impedance, such that a 200-ohm microphone should generally be matched into at least 1000 ohms.

Investigations into the performance of the automatic gain control within the transmitter showed that the level of speech was kept well within the system deviation limits of  $\pm 75$  kHz, but that sharp clicks could overdeviate the system. However, this matter is not felt to be significant. Not only did the agc system take account of peaks in speech, but also the long term level control, which has a long recovery time, was found to be very effective and unobtrusive in operation.

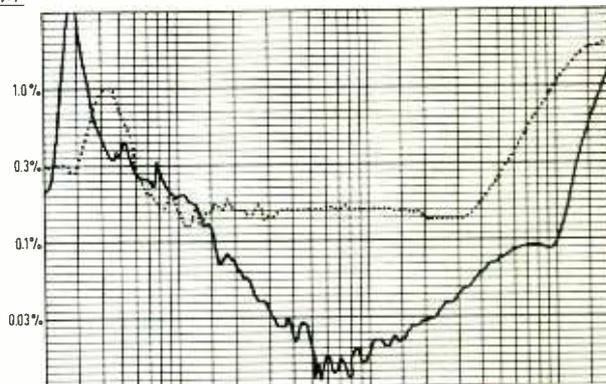
Overall system distortion at 10 dB audio frequency limiting in the transmitter is shown in fig. 2. This illustrates that the distortion is well within the manufacturer's claims at mid-frequencies, but does tend to rise at the extremes of the af band—this being a common feature of limiters.

As far as frequency response is concerned, it was checked that the system had the specified 50  $\mu$ s de-emphasis and pre-emphasis time constants. The overall frequency response was also checked at both minimum and maximum af gain in the transmitter. At minimum gain the response is very flat, as shown in fig. 3, but at maximum gain (which would not normally be required) the situation is such that the high frequency response falls off to a mild extent with a  $-3$  dB point at 10 kHz (as shown in fig. 4).

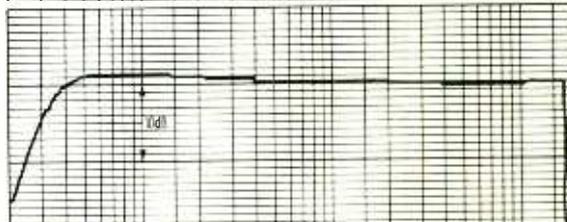
### MICRON RADIO MIC SYSTEM

**FIG. 2**  
HARMONIC DISTORTION AT 10dB LIMITING ON TRANSMITTER AND MAXIMUM AF GAIN

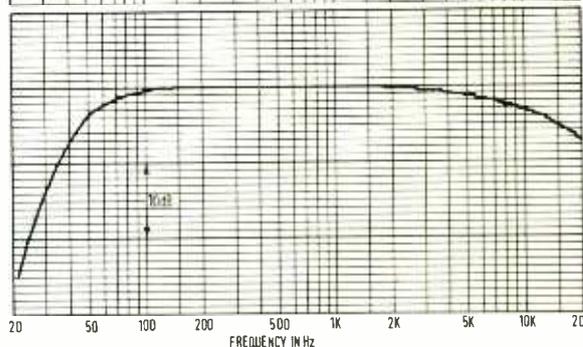
SECOND HARMONIC.....  
THIRD HARMONIC———



**FIG. 3**  
FREQUENCY RESPONSE AT MINIMUM GAIN



**FIG. 4**  
FREQUENCY RESPONSE AT MAXIMUM GAIN



System noise referred to  $\pm 75$  kHz frequency deviation also varied to a mild extent with transmitter af gain, but the worst-case figures of greater than  $-60$  dB rms over the band 20–20k Hz;  $-72$  dB rms A-weighted; or  $-56$  dB CCIR-weighted rms (reference 1 kHz and unity gain) are all completely satisfactory, and held over a wide range of receiver signal strengths.

The receiver signal strength metering proved

to be most effective in operation, with initial exit from the muted condition occurring at 0.6  $\mu$ V radio frequency input. Successive indications occurred at 4.5  $\mu$ V and 45  $\mu$ V rf input levels.

The receiver was found to limit at 3  $\mu$ V input, at which level the system af output was 6.3 mV for  $\pm 75$  kHz fm deviation at the main output, or 0.8V at the monitoring headphone output. While the latter had an internal impedance of about 100 ohms, the main output had a very low impedance, and was compatible in impedance and level with common microphone inputs to mixers, etc. A minor irritation was the type of headphone jack socket used for the monitoring output. This was of the 3-pole (tip, ring and sleeve) variety, which has a small diameter end and is less common than the large ended variety. However, the output had a satisfactory level and impedance for higher impedance types of cans.

### Summary

Overall the performance of this radio microphone system was very good, and the standard of construction gave no cause for complaint. Clearly, much thought has been applied to the design of the system, and while it is by no means cheap, it has a good performance to offer and is versatile in its applications and input facilities.

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Static intermodulation distortion 50 Hz+7 KHz,  
4:1 Output +10 dBV.7 —90 dB, 0.003%

Dynamic intermodulation distortion 3.18 KHz square wave (single pole —3 dB at 100 KHz) +15 KHz sine wave, 4:1. Relative to 15 KHz component.  
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Frequency response RIAA accuracy  
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Clipping at 1 KHz Output +24 dBV.7

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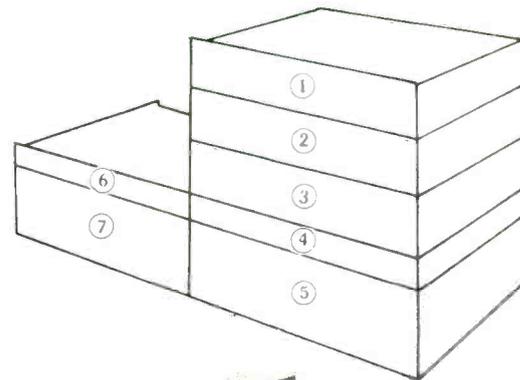
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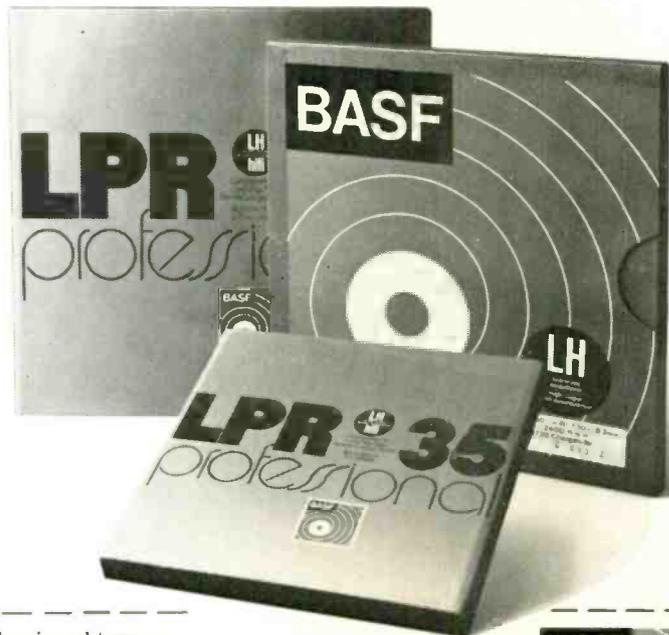
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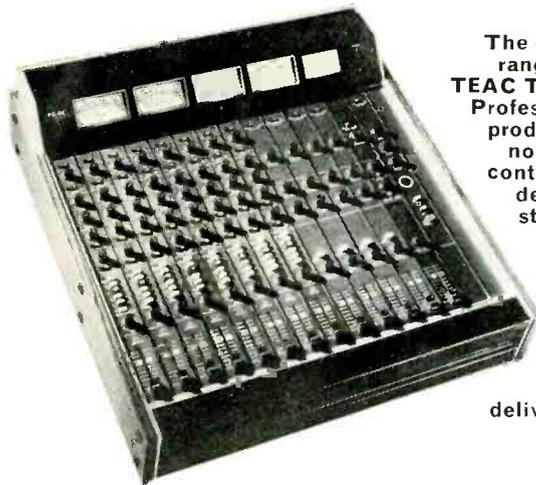
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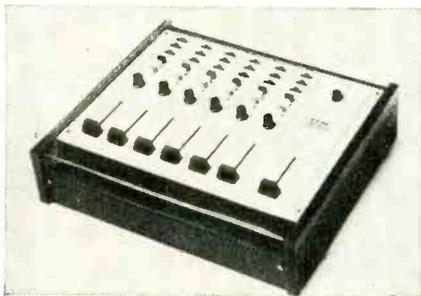
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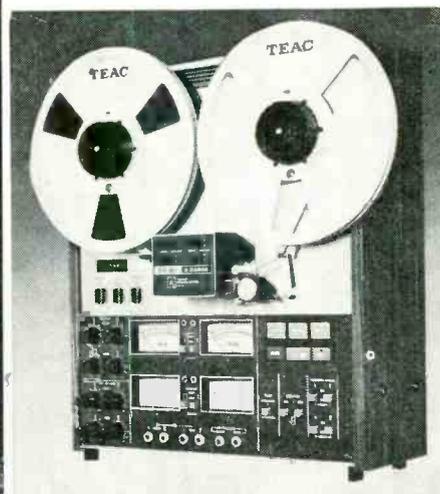
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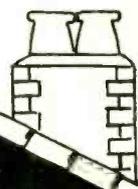
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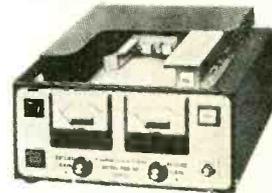


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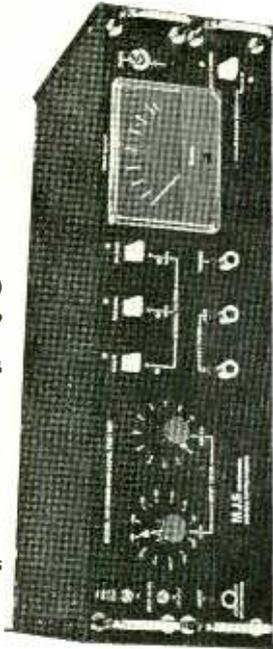
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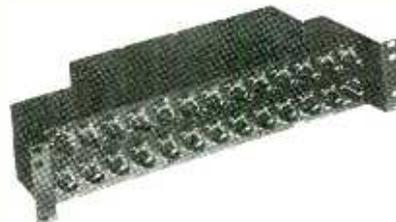
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**the music laboratory**  
01-349 1975

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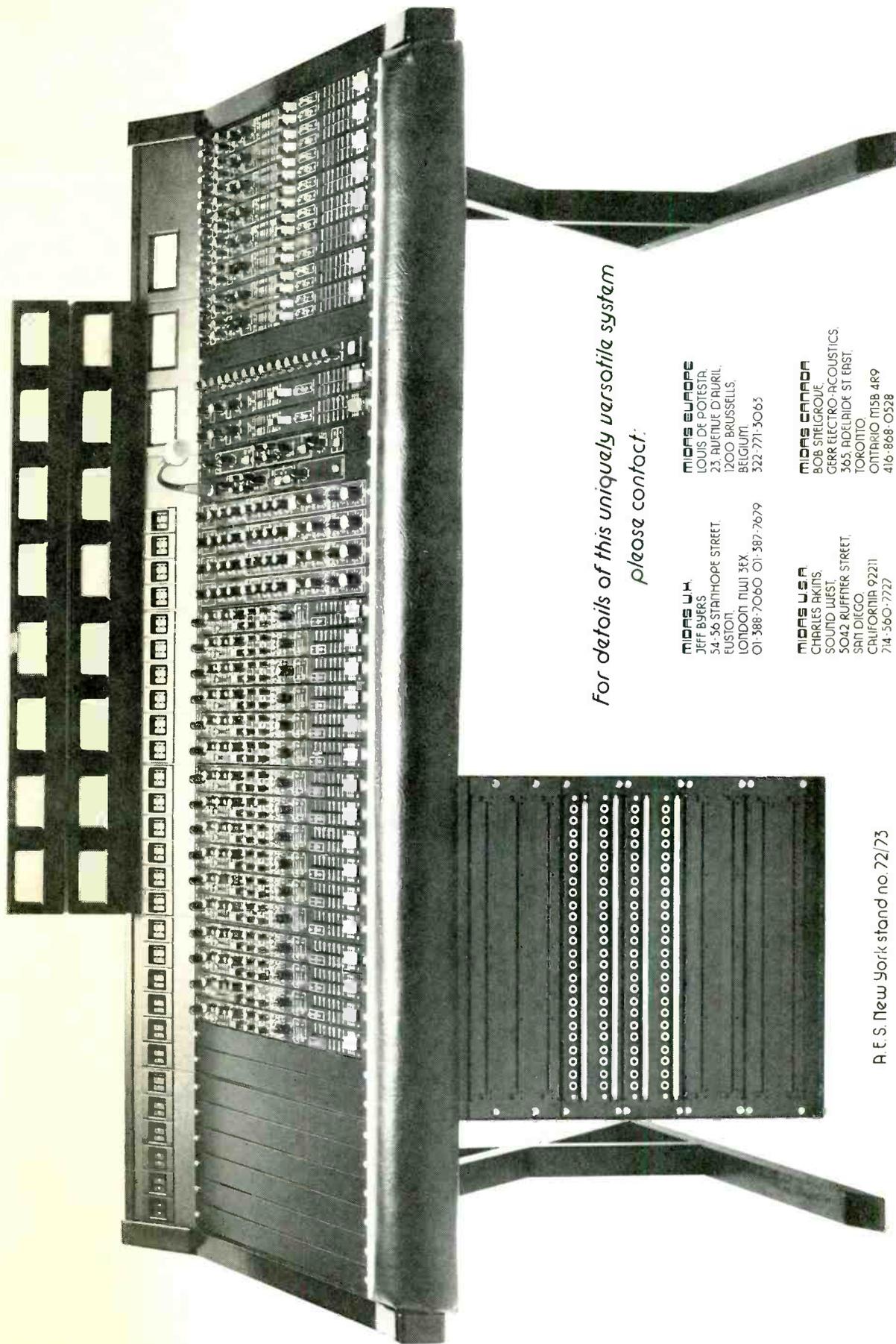
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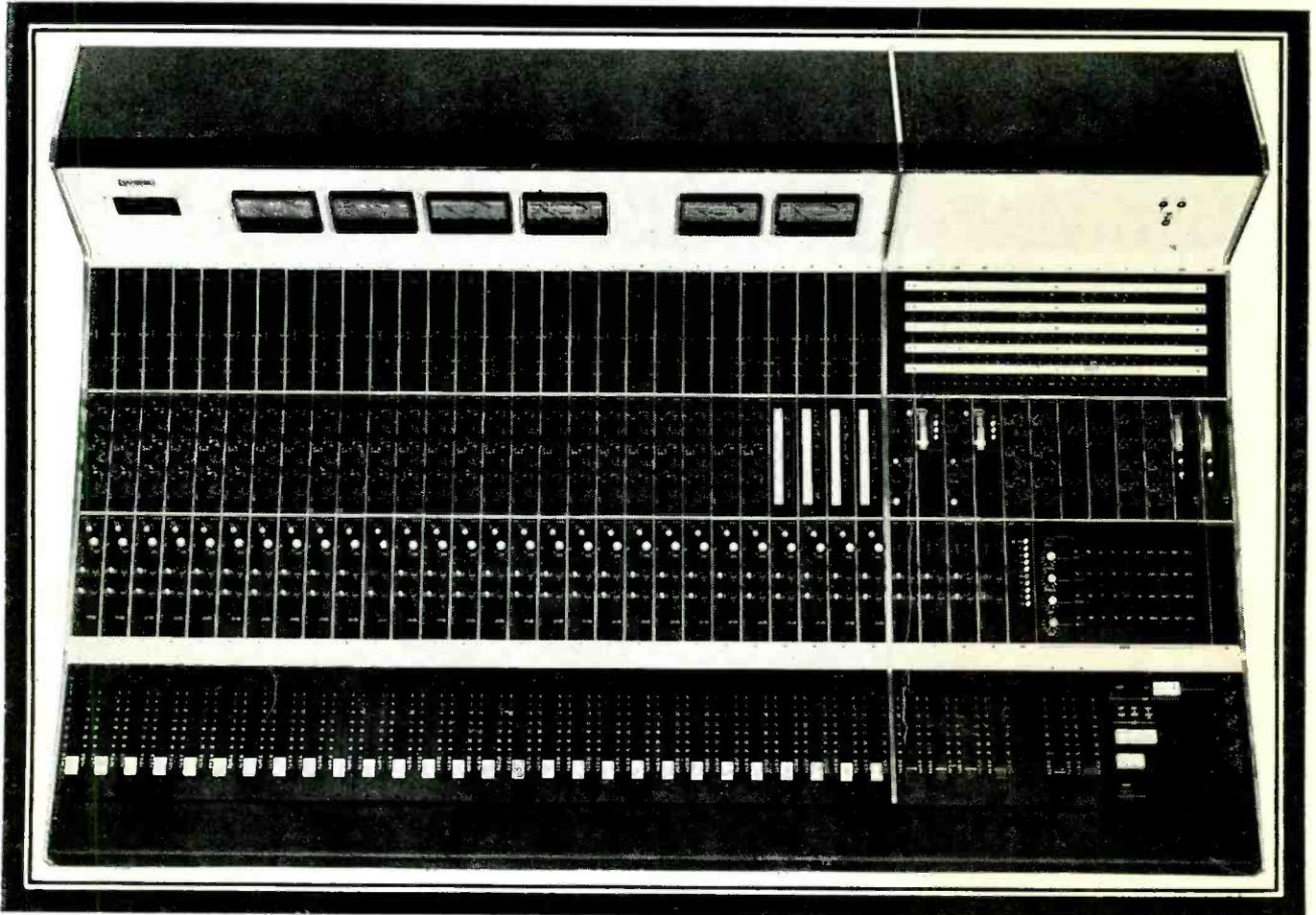
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