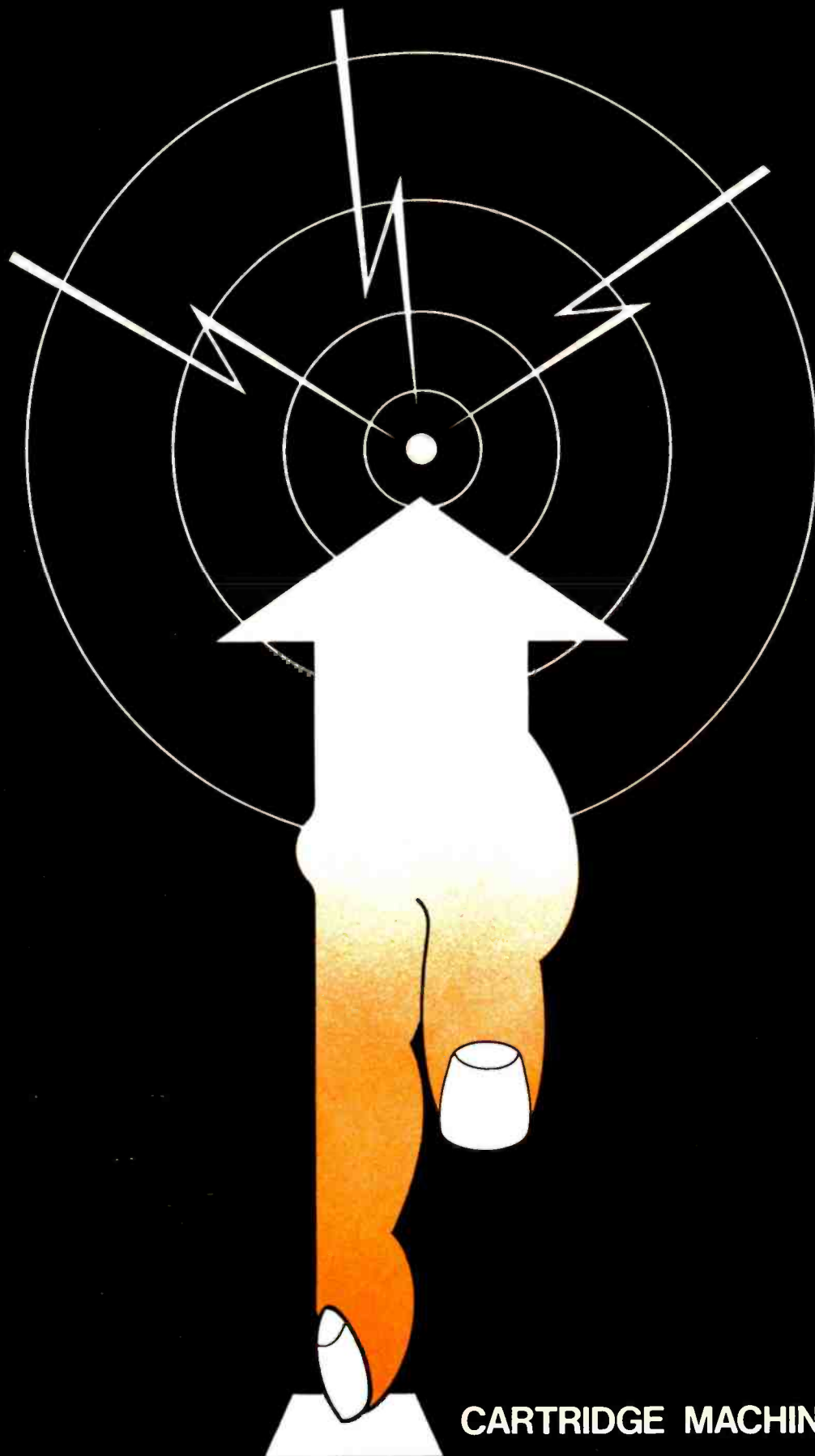


studio sound

April 1978 50p

AND BROADCAST ENGINEERING



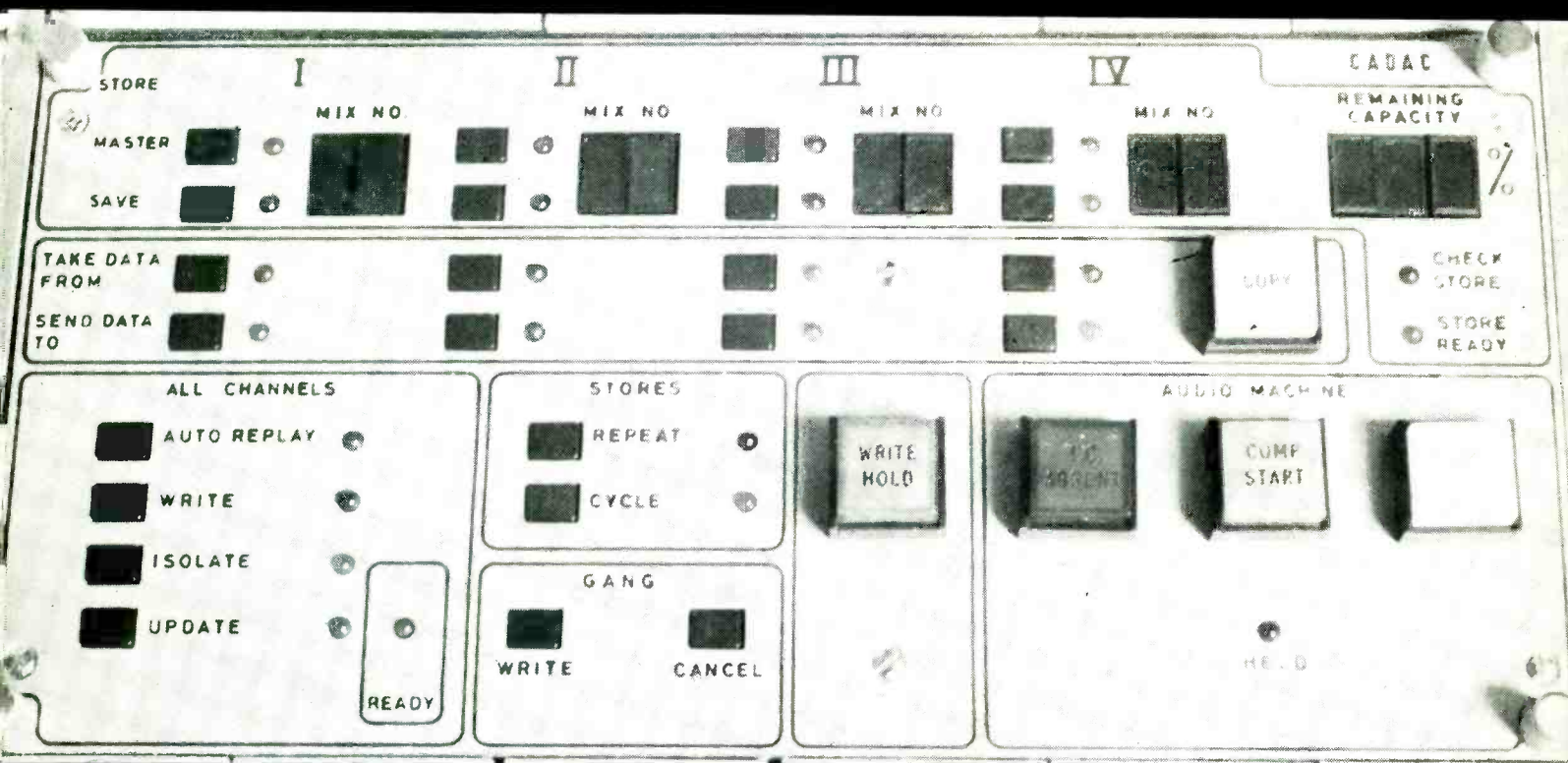
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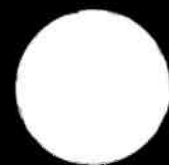


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STUDIO SOUND is published on the 17th of the preceding month unless that date falls on a Sunday, when it appears on the Saturday.

SUBSCRIPTIONS

STUDIO SOUND is available at an annual subscription of £8.20. All enquiries to: Subscription Dept, Link House, 25 West Street, Poole, Dorset BH15 1LL. Poole (02013) 71171.

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For overseas readers, outside Europe,* who require STUDIO SOUND within days of publication instead of weeks, we have the facility to send the magazine by Accelerated Surface Post (USA only) or Airmail. The Accelerated Surface Post charge is \$10 per annum. The Airmail charge is £12 (sterling) per annum. If you would like your copies of STUDIO SOUND sent by either of these methods, please write to the Editorial Office at Croydon.

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Total average net circulation of 12111 per issue during 1977. UK: 6175, Overseas: 5936.

studio sound

AND BROADCAST ENGINEERING

What a rip-off

A couple of weeks ago a member of STUDIO SOUND's illustrious editorial team popped into the record department of a well-known London department store (which shall remain anonymous but for the sake of identification shall be referred to as Harrods) and bought seven albums. It was time to catch up on those lps from which we'd heard a couple of tracks and now wanted to hear the whole album. Or to replace those classic albums that were almost worn through to the other side.

To give some idea of our eclectic tastes, the following were the lps selected: *Dark Side of the Moon* and *Animals* by Pink Floyd (Harvest); *Johnny the Fox* by Thin Lizzy (Vertigo); *Who's Next* by the Who (Track); *Rumours* by Fleetwood Mac (Warner Brothers); *Kiki Dee* by Kiki Dee (Rocket); and *Wheels of Fire* by the late and much-lamented Cream (Polydor). Your caped crusader of record pressing quality then settled down to a night of raucous listening. Some hope.

The two Floyd albums were unplayable. Both were so warped that their edges were practically touching the pickup arm during their excursion in a vertical direction. The Thin Lizzy album may have been flat, but contact with the rough cardboard inner or careless handling at the pressing plant had resulted in a particularly nasty surface noise on the first two tracks on both sides. Which is ok if you think that being able to listen to 2/3 of an album is better than nothing. But as one of the tracks in question features the chunkiest bass sound we've heard in a long, long time (hats off to John Alcock and Will Reid Dick) it was unforgivable. (At least it had the potential of being tasty — there was so much garbage on the pressing surface that it was difficult to be sure).

Next on the turntable was *Who's Next*, the surface of which was a little noisy but ok. (And by this stage in the proceedings there was little doubt that the threshold of tolerance to pressing nasties was beginning to take a nose dive — after all, the point of the exercise was to listen to some music not the record surface). As a counterpoint to Pete Townshend's scintillating guitar on *Won't get fooled again*, the stylus was dropped on Eric Clapton's opening riff to *White Room*. Ah, memories. And a nice pressing. This left Kiki Dee's album, which proved disappointing artistically but a nice recording; and *Rumours*, which couldn't be played — another warped pressing.

Thus out of seven albums that together cost slightly more than £26, only three could be played; that's almost £15 of junk vinyl. Ever get the feeling that most producers and engineers are wasting their time? After all their efforts and long hours in mixdown rooms, potentially under half of the people buying albums today will be able to hear what they intended them to — whether or not they like it is another matter. An article entitled 'After the cutting room' by Royer Slater on page 30 may explain why.

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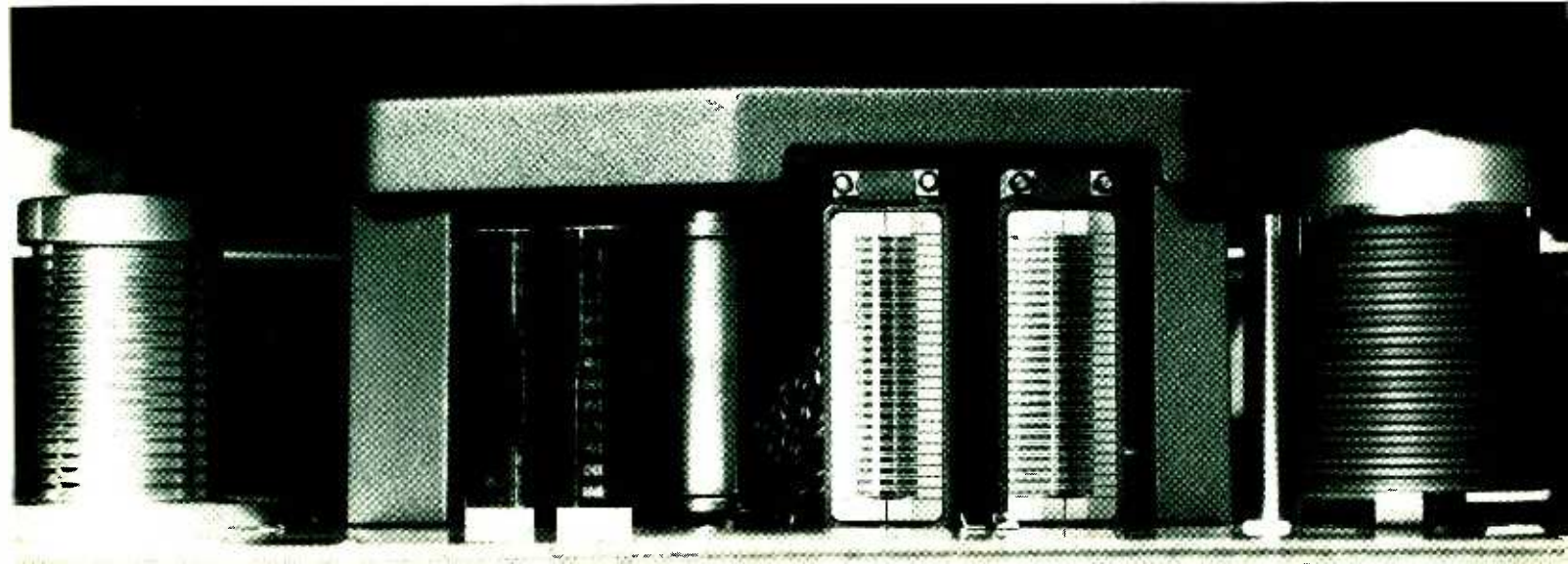
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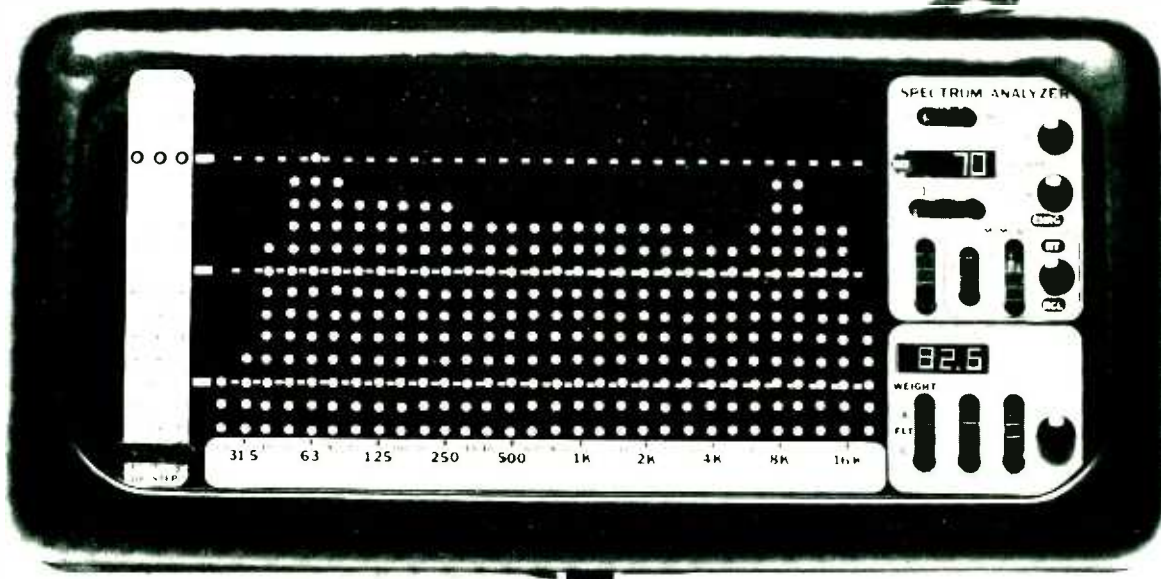
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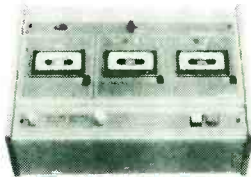
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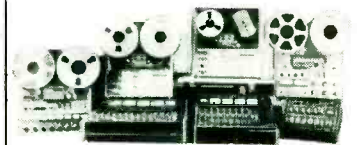
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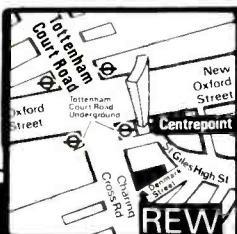
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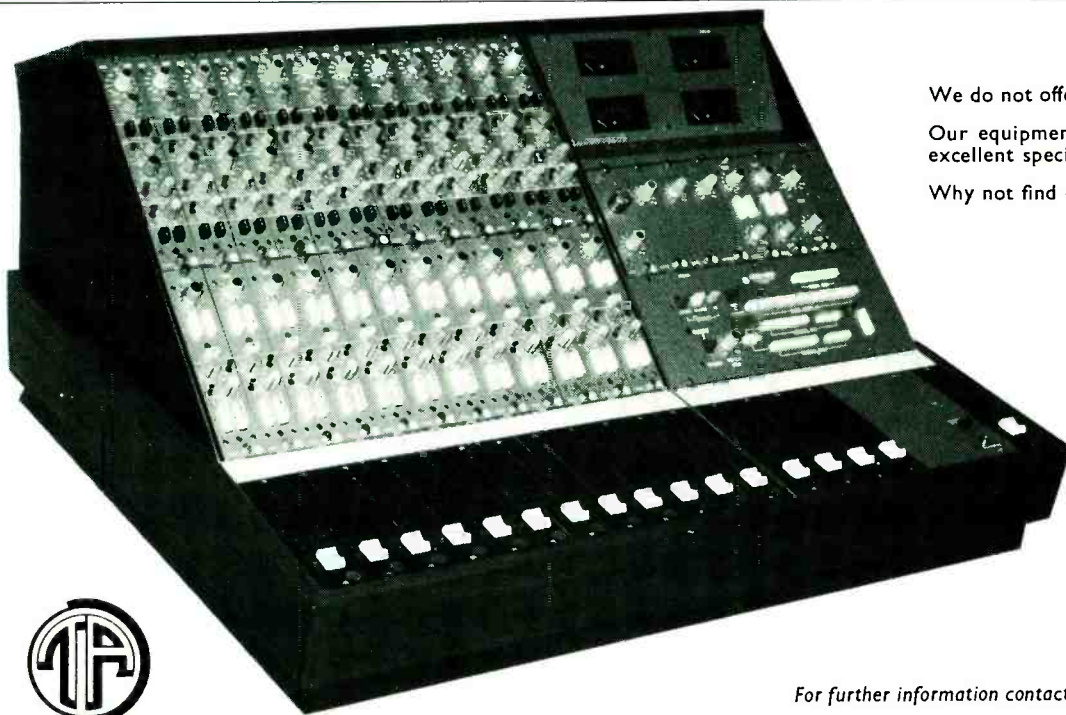
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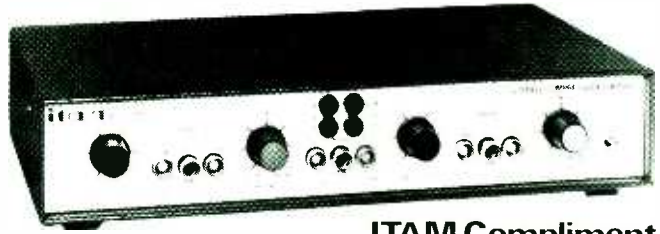
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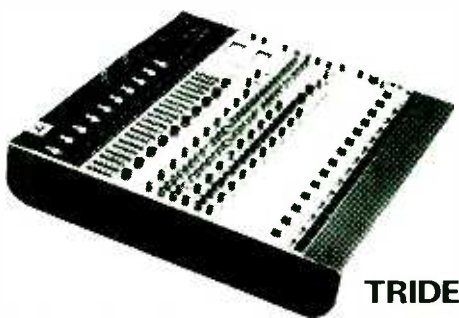
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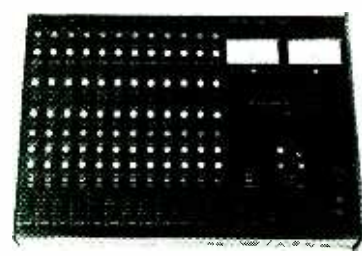
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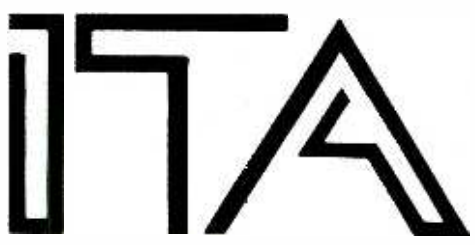
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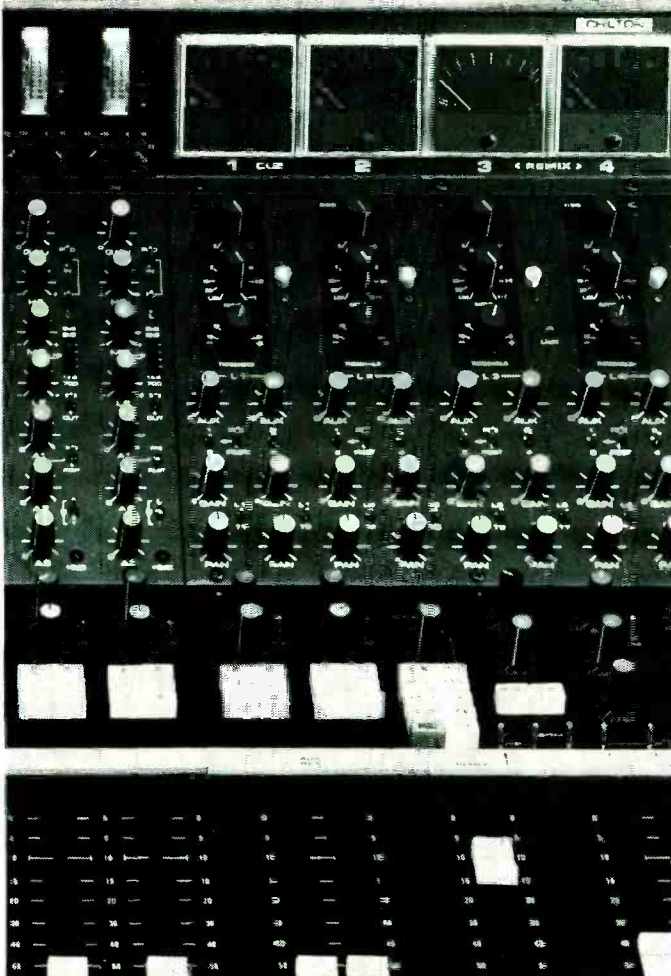
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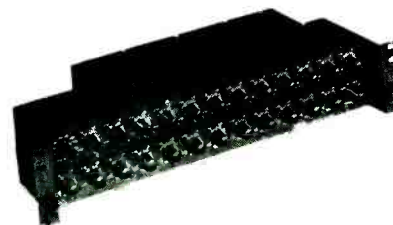
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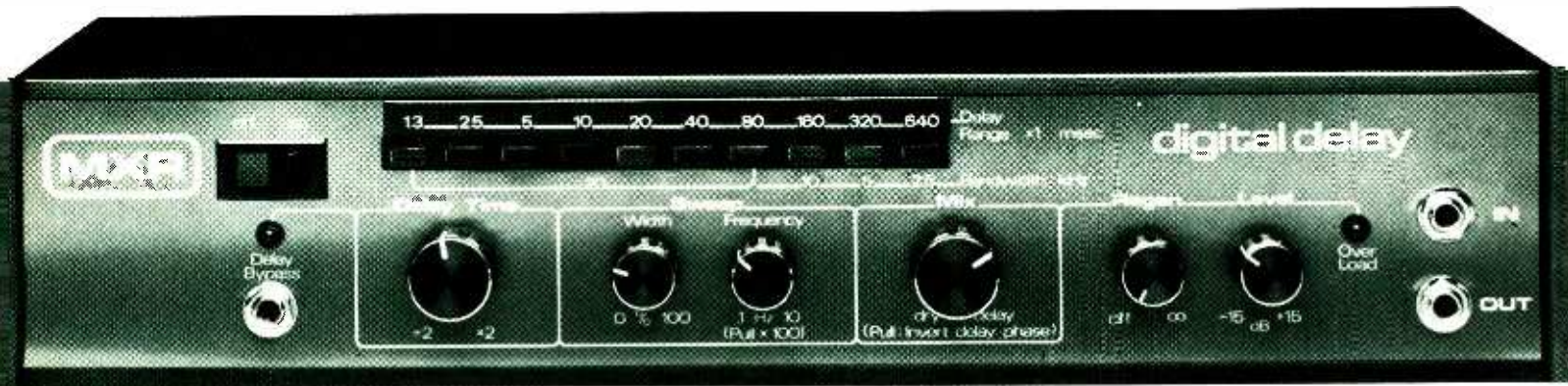
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MXR have been working on a new type of audio delay line. The result is the MXR Digital Delay.

It works on memory banks. Just like an analog computer. The system is called "Digital Random Access Memory". And it's a great improvement on the old type of 'shift register' delay.

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The basic unit delays a sound by between 0.08 m.sec and 320 m.secs. But you can add plug-in memory boards to increase this to 1.28 secs.

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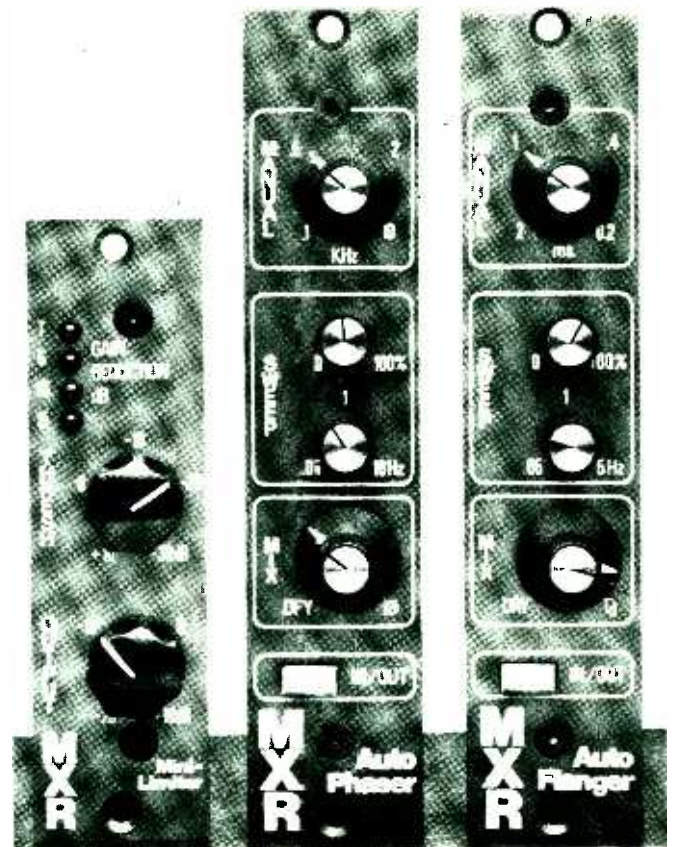
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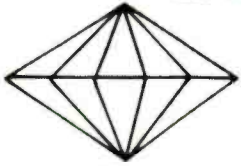
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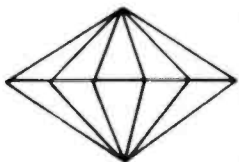
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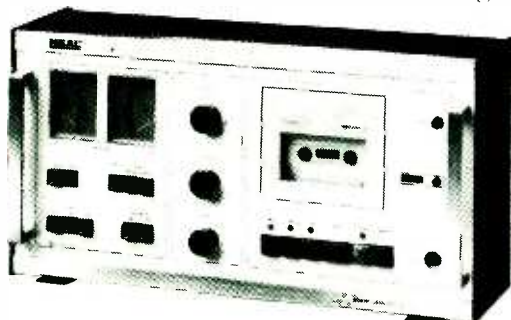


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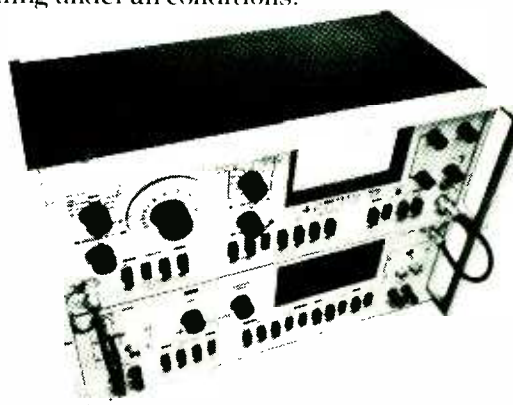
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There's search-to-cue, 60 or 120 ips shuttle under capstan control and super fast rewind. And many performance specs are a full order of magnitude better than those of other recorders in this field.



ATR-100

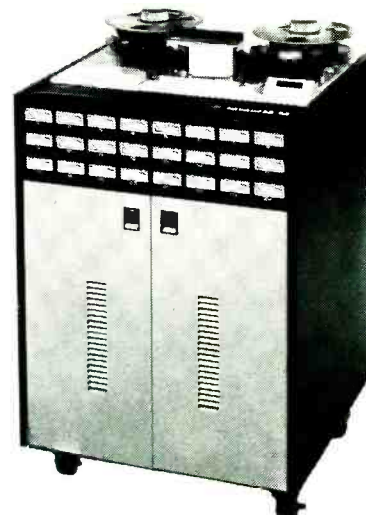
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Ampex gives you a lot of reasons to buy an MM-1200 multichannel audio recorder: fidelity, versatility and reliability. Performance specifications alone make this the leader among professional multi-track recorders.

The comprehensive features of the MM-1200 include: a choice of 8, 16 or 24 channels, electronic tape timer, search-to-cue, quick-change heads, and pull-out modular electronic bays for instant servicing.

It all comes together in the Ampex MM-1200 and that's why, sooner or later, you'll buy an MM-1200 for your studio.

MM-1200



The Many Ampex Options

	AG-440C	ATR-100	MM-1200
Console Version	✓	✓	✓
Rack-mount	✓	✓	—
Portable case	—	✓	—
Video Layback Head	—	—	✓
Multi-point			
Search-to-Cue	—	✓	✓
Disc Mastering			
Preview Version	—	✓	—
MQS Synchronizing			
Equipment	✓	✓	✓
Variable Speed			
Oscillator	✓	✓	✓



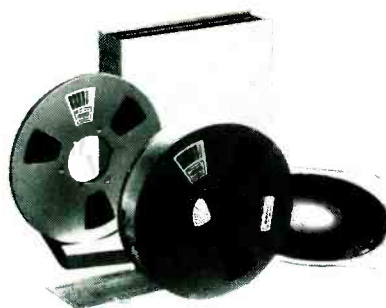
AG-440C

Versatile, Reliable Production Recorder

AG-440C capability takes you from one to eight separate channels of sound for imaginative, creative production work.

Use this machine for mastering, sweetening or mix-down work, and trust it to turn in a reliable, professional performance every time. Offering Sel Sync* synchronizer as a standard feature, the AG-440C has earned a permanent position in the world lineup of fine recording instruments.

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Paris (France)	609.91.55
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The 4-channel TEAC A-3340S is far more than the world's most versatile quadraphonic tape deck. It's also an inexhaustible partner in the creative process—one that opens up a realm of original sound limited only by your imagination. Think of a professional recording studio engineered into a 50 lb. package—at a fraction of its cost—and you'll start to imagine the capability of the A-3340S.



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CD1

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

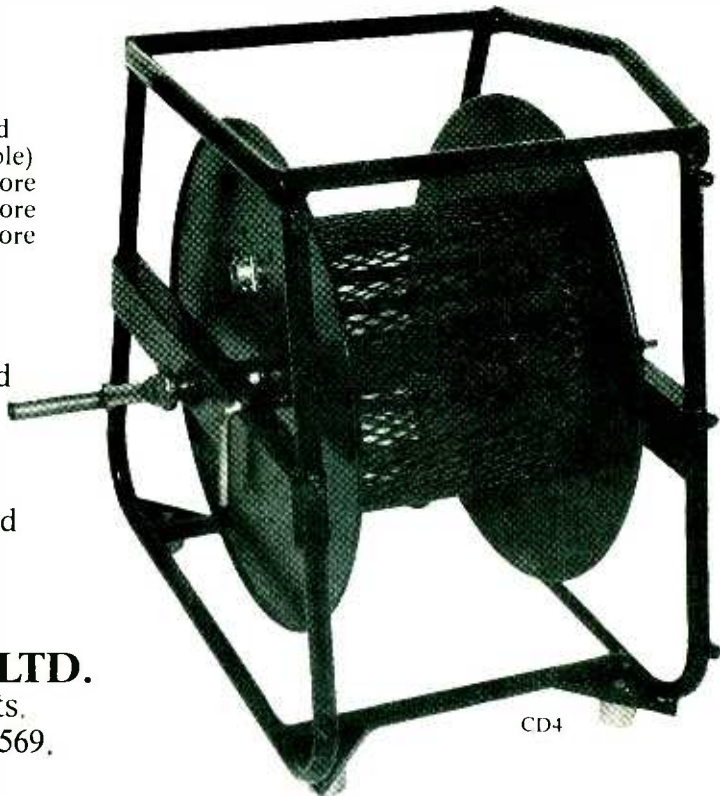
Model No.	Capacity Standard twin-screened cable	Multi-core cable
CD1	100m	50m (standard microphone cable)
CD2	200m	30m 3/4" Multicore
CD3	400m	60m 3/4" Multicore
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Weight range: 10lb to 120lb

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.

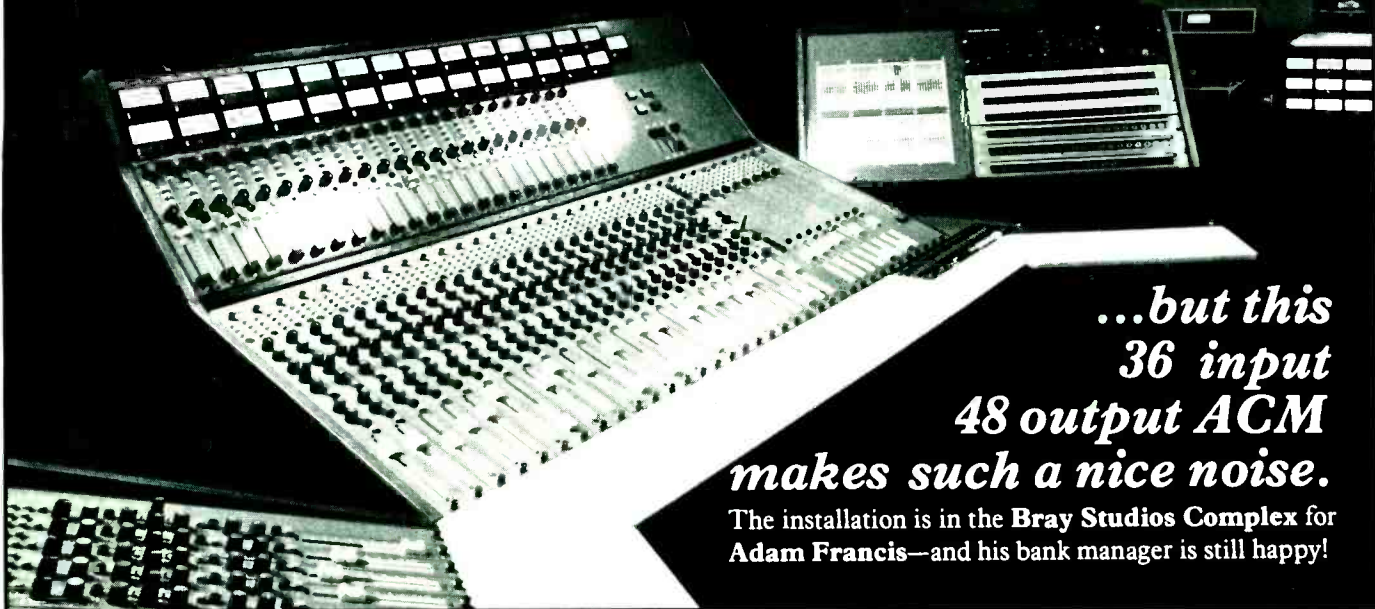
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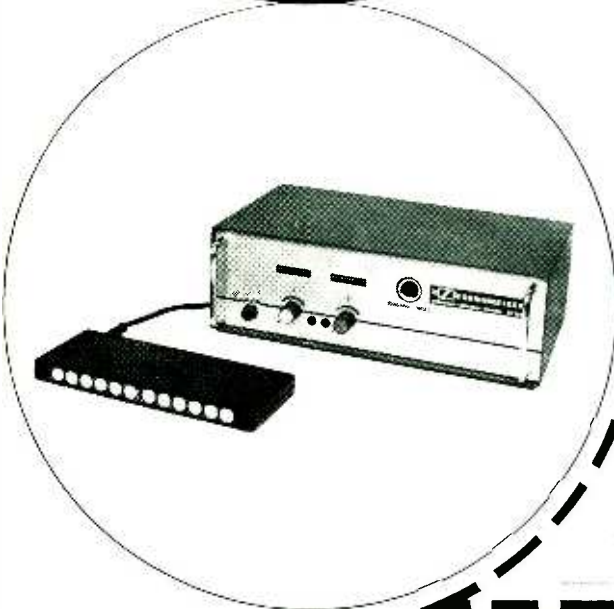
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transmission
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Headphone amplifier

Symetrix has introduced the *HA-10* 2-channel headphone amp. The unit is designed for rack-mounting and has separate front-panel mono outputs for each channel, plus a combined stereo output. Up to 10W rms into 4 ohms is available from each channel, and the outputs are internally protected against accidental short circuits. A maximum of eight pairs of 100-ohm cans can be powered from each channel.

The *HA-10* occupies just 44 mm of standard 483 mm rack space, and costs \$119.

Symetrix Inc, 109 Bell Street, Seattle, Washington 98121, USA. Phone: (206) 682 3076.

Fleximix for Royal Ballet

Trident are to supply a *Fleximix* 8-input/2-output desk to the Royal Opera House, for use by the Sadler's Wells Royal Ballet Company during their forthcoming UK tour of *Elite Syncopations* based on the music of Scot Joplin.

The console comprises two standard 8-way mainframes joined electrically and mechanically. It will incorporate the new input and output line balancing modules, which will eliminate possible problems resulting from the use of long microphone and connecting cables. Penny & Giles faders have been specified since the ROH considers these to be more suitable for its particular type of application.



AKG D222

... is a new dynamic microphone using the same 2-way technique found in the ubiquitous *D202*. The *D222* is approximately $\frac{2}{3}$ the size of its elder brother, and features a newly-developed 2-way capsule that can be changed very easily. Other features include built-in wind and pop protection; uniform and frequency-independent cardioid characteristics; 3-position bass cut switch giving -12, -10, -6 dB attenuations at 50 Hz; and low sensitivity to handling noise and mechanical shocks. The microphone has a dull black finish and costs £80.

AKG GmbH, Brunhildengasse 1, A-1150 Vienna, Austria.

Phone: (222) 921647. Telex: 118390. UK: AKG Acoustics Ltd, 182-4 Campden Hill Road, London W8 7AS.

Phone: (01) 727 0788. Telex: 28938.

US: Philips Audio Video Systems Corp, 91 McKee Drive, Mahwah, NJ 07430.

Phone: (201) 529 5900.

Telex: 138022.

Pulse width modulation power amp

The main feature of the new Sony *TA N88* is that it uses pulse width modulation (pwm) rather than Class A or B operation. The advantage, according to Sony, is that a high-power amp can be fitted into a small space. To prove the point the *TA N88* is quoted as being capable of delivering 160W rms per channel into 8Ω, yet occupies only 80 mm of standard 483 mm rack space and weighs a mere 11 kg.

The pwm system samples the incoming signal every 2 μs, and varies the pulse width of the 500 kHz sampling squarewave according to the signal's amplitude. A fully-regulated switching power supply ensures a constant voltage to the pwm circuitry, even during loud musical transients.

The following is an extract from the manufacturer's specification: **Frequency response:** +0.5, -1 dB 5-40k Hz into 8 ohm.

Distortion: <0.5% total harmonic and <0.1% im distortion.

Residual noise: <100 μV (8 ohm load; A-weighting).

Signal-to-noise ratio: >110 dB (short-circuit inputs; A-weighting). **Damping factor:** 20 (1 kHz; 8 ohm load).

Price: £500 approx.

Sony Corporation, PO Box 10, Tokyo Airport, Tokyo, Japan. Phone: 488221.

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.



Programmable ddl

The new model *DMX 15-80* from Advanced Music Systems is micro-processor driven, allowing it to store and recall different delay values during a mix. Delays are entered by means of a front-panel keyboard. The value selected is displayed on a large led readout and may be finely adjusted for optimum effect by means of two 'nudge' buttons. In addition, the unit can be interfaced with computer-assisted mixdown systems.

The *DMX 15-80* is modular and accepts up to ten memory boards, giving a maximum delay of 1s in 1 ms steps. And the specifications? The company quotes a signal-to-noise ratio of better than 93 dB and a bandwidth of 18 kHz for all delays. Impressive.

To extend the capabilities of the unit, a family of microprocessor-controlled effects cards will be released throughout this year. The first of these is a 'harmoniser' card which, it is claimed, will offer lower noise pitch changing than any unit presently available. The led display will double as a pitch ratio readout. Additional cards to be introduced later in the year will allow the unit to function as a completely programmable reverb, capable of producing plate and spring echo etc, electronically.

The unit is designed for mounting in a standard 483 mm rack, and is only 89 mm high and 254 mm deep. Unlike earlier ddls, no cooling fans are required.

We hear that delivery of the first unit has just been made to the new Strawberry South studios, where Eric Stewart *et al* will possibly be using it on the next 10 cc album. A second unit is expected to be installed soon at Grosvenor Studios, Birmingham.

A broadcast version of the unit will also be made available for pro-fanity delays of up to 10s. Advanced Music Systems, 66 Ightenhill Park Lane, Burnley, Lancashire, UK.

Phone: Burnley (0282) 36943.

US: Everything Audio, 7037 Laurel Canyon Boulevard, North Hollywood, Ca 91605.

Phone: (213) 982 6200.

Four-way compressor-limiter

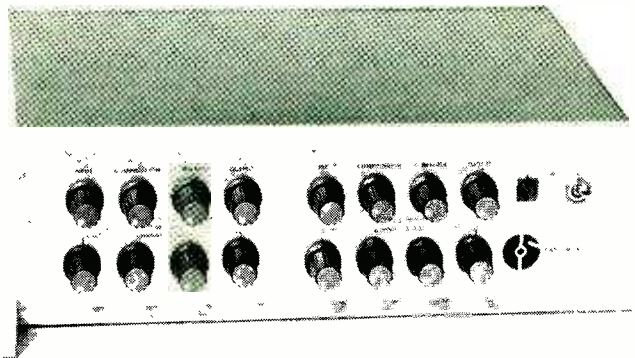
The *CL4* quad compressor-limiter from Cathedral Sounds comprises four identical units, each featuring variable threshold from -24 dB; compression ratio continuously variable from 1:1 to 20:1; and 0.1-5s release time. Make-up gain

is normal output level plus 8 dBm. The unit is available in a free-standing case or as a rack-mounting version.

Cathedral Sounds Ltd, Fourways, Morris Lane, Halsall, Ormskirk, Lancs L39 8SX, UK.

Phone: Halsall (0704) 840328. 24 ▶

Cathedral Sounds CL4 compressor-limiter



Noise Gates from Roger Mayer Electronics

- 150 nano second Attack Time
- -96 Dbm Output Noise
- .05% Distortion
- -56 Dbm Maximum Input Sensitivity
- Keying Input
- LED Indication of Non-Gating / Gating Operation

Sole UK Distributors:



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97-99 Dean Street,
London W1V 5RA
Telephone: 01-734 2812

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

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

Mike Llewellyn-Jones,
AP Postal 8178,
Madril 11, Spain
Telephone: 417 6280



Model RM68



Model RM68X
(Retrofits into Kepex Rack)

NEWS

Remote for Eventide ddl

Eventide has announced a new microprocessor-controlled remote control card that plugs into an unused connector in the Model 1745M digital delay line. It allows remote setting of delay and control of the 'repeat' and 'double' modes of operation, as well as adding two special features: automatic flanging with digital delay quality; and what is said to be an extremely effective method of vocal or instrumental 'doubling'.

The remote control unit costs \$550 or £300.

The two special features are obtained by allowing a microcomputer to vary the delay of one or more of the ddl's output modules. In the 'doubling' mode the time delay is varied in a pseudo-random manner which is similar, according to Eventide, to the natural effect caused by the inability of music-

ians to precisely duplicate a previous performance. The note-for-note exact doubling produced by most delay units is said to sound much more 'mechanical' than the new Eventide effect.

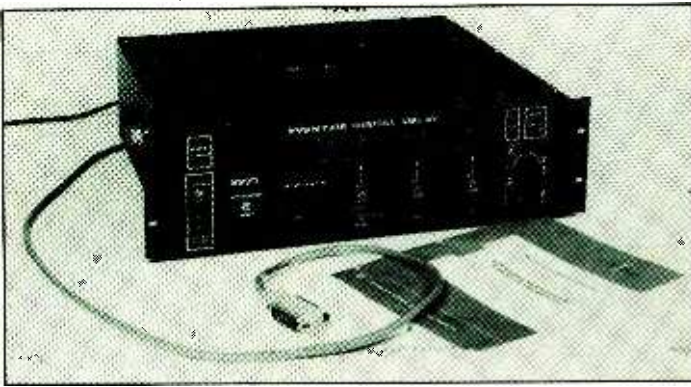
The card uses the ANSI/IEEE 488/1975 standard interface buss. It is thus compatible with many computers, including those made by Hewlett Packard and the low-cost Commodore PET. Apparently, while the 1745M was in its design stages it was decided that automation compatibility was an essential feature. For this reason, even early units that have been in use for up to two years will require only minor modifications to take the new card. Eventide Clockworks Inc, 265 West 54th Street, New York, NY 10019, USA.

Phone: (212) 581 9290.

UK: Feldon Audio, 126 Great Portland Street, London W1N 5PH.

Phone: (01) 580 4314. Telex: 28668.

Remote control interface for Eventide 1745M delay line



Fundamentals of recording seminar

The Banff Centre for Continuing Education, of Calgary, Canada, plans to hold the third annual seminar on the fundamentals of recording from May 29 to June 2, 1978. The one-week seminar will again be taught by Stephen Temmer, president of Gotham Audio and presently vice president (international) of the AES.

The course is described as extremely intensive, with six hours daily of scheduled classes and hands-on recording sessions. In addition, there are discussion sessions every evening that probe the philosophy of recording and exchange ideas on future technology.

Further details are available from The Registrar, The Banff Centre, School of Fine Arts, Box 1020, Banff, Alberta T0L 0C0, Canada. Phone: (403) 762 3391. Telex: 826657.

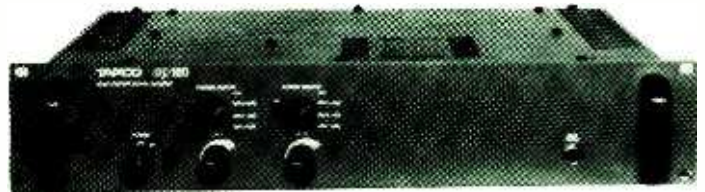
Portable 18/4 mixer

Macinnes Labs are now offering an improved version of their portable mixer that was introduced at last year's APRS exhibition. The mixer, which is built into a glass-fibre flight case, now features 18 (instead of 16) inputs for either mic or line, four outputs, two echo sends and a new Socapex multiway connector as standard. The model 18/4 will retain the £1600 price tag of its predecessor.

Macinnes Laboratories Ltd, Macinnes House, Carlton Park Industrial Estate, Saxmundham, Suffolk IP17 2NL, UK.

Phone: Saxmundham (0728) 2262/2615.

■ The company tells us that it can now supply its own multicore cable with as many as 70 pairs if required. Each pair is individually screened, and the cable is said to be extremely flexible compared with most conventional multicore.



Power amplifiers

Tapco has introduced three new sound reinforcement amps: model CP120 rated at 61W/channel or 122W bridged; CP500 rated at 255W/channel or 510W bridged; and CP500M which has the same power rating as the CP500 but comes complete with true peak-reading meters, a blown-fuse indicator and a thermal protection indicator.

Both basic amps are designed for 4-ohm operation 'for greater multiple-speaker hookup capability'. They are said to be especially suited to bi-amplification, where the CP 500 could be used for bass bins and the CP120 for hf drivers.

All models are protected by PowerLock. This senses any large input signals that could cause prolonged clipping, and then controls the output level during the period of time that would otherwise be perceived as clipping distortion. Normal music transients, of less than 1 ms in duration, are allowed to pass unaltered. The result, so say the manufacturer, is the complete absence of distortion and greater average power output, with input signals up to 30 dB above the amp's normal +4 dBm sensitivity. In addition, relay load coupling ensures silent switch-on, plus shutdown in gross fault conditions and thermal cut off. Positive protection against dc at the output terminals is also provided.

The CP120 costs \$339, the CP500 \$649 and the CP500M \$779. Transformer-coupled, balanced inputs on XLRs are available as an optional extra.

Technical Audio Products Corporation, 3810 148th Avenue NE, Redmont, Washington 98052, USA. Phone: (206) 883 3510.

Graphic equaliser

Cathedral Sounds has introduced a dual-channel graphic, model SGE20. Ten filters on octave centres

cover the range 30-16k Hz, with up to 12 dB cut or boost at each band centre frequency. A by-pass switch, led peak overload indicator and gain control are fitted to each channel. Distortion is claimed to be better than 0.04% at 0 dB output.

Cathedral Sounds Ltd, Fourways, Morris Lane, Halsall, Ormskirk, Lancs L39 8SX.

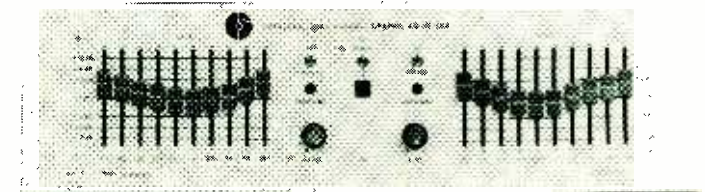
Phone: Halsall (0704) 840328

Digital transmission on stereo obs

The BBC has recently been using an experimental 2-channel digital transmission system to assess the feasibility of conveying high-quality stereo sound programme signals from ob sites to London in digital form. The first two broadcasts handled in this way were of concerts at Cardiff and Lancaster University. In both cases the digital signals were transmitted on a radio link from the ob site to a convenient BBC centre, using 4-phase dpsk (differential phase shift keying) modulation. They were then conveyed to London in suitably transcoded form on a television contribution circuit. On arrival in London, they were decoded to analogue form and mixed into the networked programme in the normal manner.

The majority of listeners to BBC Radio are in the range of stereo vhf transmitters whose programme feeds from London also make use of digital circuits. So, ignoring the short journey through the London continuity area, the signals radiated to them on these two occasions were in digital form all the way from the ob site to the local transmitter. This meant that the transmitted signal quality was virtually identical to that at the ob site itself.

According to the Beeb, associated engineering tests at Manchester





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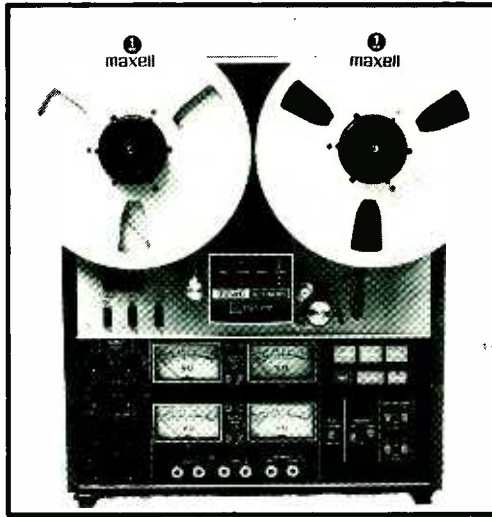
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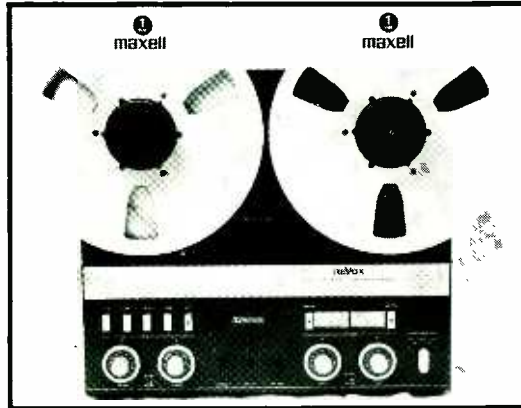


80/8

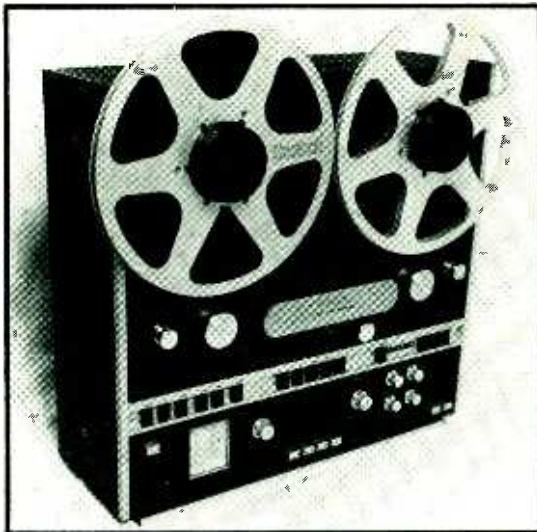
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NEWS

and Cardiff confirmed that the dpsk system can work satisfactorily over what would normally be regarded as very difficult propagation paths for a radio link. Eventually, the equipment to handle these signals would be compact, of simple and lightweight construction, and easy to operate.

Sits wanted

Can you give temporary employment for 12 months to an undergraduate reading for the degree of B Mus (Tonmeister) at the University of Surrey? If so John Borwick would like to hear from you. The 4-year course that he organises at Surrey is of the 'sandwich' type, including a year spent in the recording or broadcasting industry. Apart from studies in music, acoustics and electronics, the students have experience in mic balance, tape operation, mobile recording, etc, using professional equipment.

Interested employers are asked to contact John at the Department of Music, University of Surrey, Guildford, Surrey. Phone: Guildford (0483) 71281.

Automatic graphic equaliser

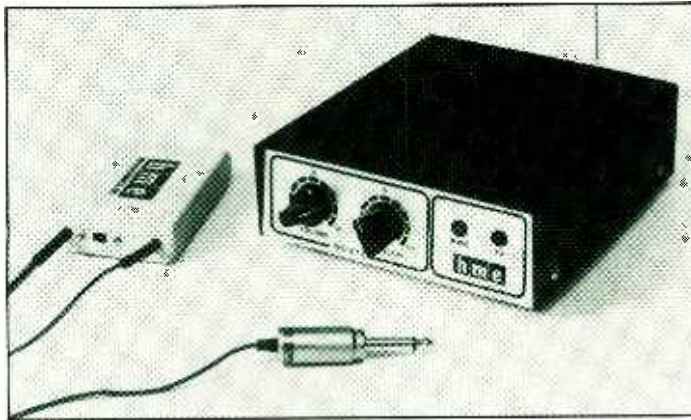
The new ADI 1500 2-channel graphic features a built-in pink noise generator and a series of red and green leds for quick and simple room and system equalisation to within ± 0.75 dBm. Up to 12 dB of boost or cut are available on ten octave centres in the range 31.5-16k Hz. Filters are of the double-pole Butterworth bandpass type.

Extract from manufacturer's specification:

Frequency response: ± 0 dB, dc-250k Hz (sic) with equaliser out; ± 0.5 dB, 25-22k Hz equaliser in. **Noise:** -104 dB ref max output; -82 dB ref 0 dBm.

Distortion: 0.05% total harmonic distortion at 0 dBm, 20-20k Hz. **Price:** \$795.

Audio Developments International Corporation, 530 Ramona Street, Palo Alto, Ca 94301, USA. Phone: (415) 321 3035. ▼



Pirate guitars?

HM Electronics has designed a cordless guitar system based on the radio mic principle. The *Cordless 1* (sic) consists of a pocket fm transmitter which plugs into the guitar output, and a remote receiver claimed to operate reliably at distances of up to 70m. Both the transmitter and receiver are crystal controlled for improved stability. The operating frequency isn't specified; the manufacturer states that 'special interference-free frequencies have been selected', which means that it probably isn't legal in the UK—or the US for that matter.

The system costs \$1295. HM Electronics Inc, 6151 Fairmount Avenue, San Diego, Ca 92120, USA. Phone: (714) 280 6050.

Didn't they do well

Audix recently won an order for several sound mixing consoles based on the *MXT 1000* broadcast desk. The equipment is principally designed for announcer operation and is intended to work in conjunction with a small studio—much of the hardware for the latter was also provided by Audix.

In addition to the normal mixing facilities, the consoles include remote controls for turntable units and tape recorders plus a chime unit for station indent. The desk assembly is built in wrap-around format and has space for a total of four turntables or tape machines,

▲ all within easy reach of the operator.

The company has also received an order for *3500 Series* consoles to replace the present installation at the ITN main London studios. The new desks are both 24 and 36-channel models equipped with eight output groups.

Audix Ltd, Station Road, Wenden, Saffron Walden, Essex CB11 4LG, UK.

Phone: Saffron Walden (0799) 40888.

Talking newspaper wants equipment

A group of volunteers in East Sussex intends to produce weekly cassettes of local news and magazine-type material to be distributed free to local blind and partially-sighted people. They already have a high-speed tape duplicator and the necessary tape machines to record the master tapes, but are lacking any of the odds and sods with which to equip their small production studio.

Which is where you, the readers of *STUDIO SOUND*, can help. The group would be grateful for donations of any redundant microphones, stands and goosenecks, mixers, cue/talkback systems, cables, connectors, etc. Age of the gear is immaterial, but it must be in working order.

If you have any gear you think may be useful, contact Richard Cox, Technical Officer for the Blind, Social Services Department, 34/35 Wellington Square, Hastings, Sussex. Phone: Hastings (0424) 434780.

Don't just leave it to somebody else to help, turn out your junk drawers now. You know it makes sense.



Audio voltmeter

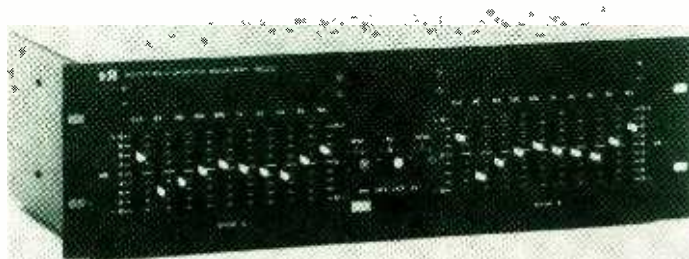
▲ Now available in the UK from Hayden Labs, the Sennheiser *UPM550* voltmeter is said to have been designed with the audio engineer very much in mind. Possibly to this end, its main features are quoted as high sensitivity, 30 μ V to 100V full-scale deflection and a bandwidth of 10-1M Hz (10-100k Hz on microvolt range). In addition, the meter features filters suitable for dBA and noise measurements to CCIR 468.

The meter scale is switchable between true rms and quasi-peak to DIN 45405. Two ac outputs are provided: one to drive an oscilloscope or other external

device; and the other for a pair of cans. Price of the *UPM550* is £480. Hayden Laboratories Ltd, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW, UK. Phone: Gerrards Cross 88447. Telex: 849469.

Nagra hire

Hayden Labs are opening a hire department at their London showrooms, 6 Bendall Mews, Bell Street, London NW1. Phone: (01) 723 4441. The department will loan Nagra tape machines and the full range of accessories, as well as Sennheiser microphones.



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OTARI's DP-6000 duplicator is designed for quality sound duplications at the super high speed of 64:1! Its uniquely slanted loop bin insures smoothest 240ips transport of your 3 3/4ips master. Up to 10 slave units are centrally and automatically controlled. A quartz-crystal bias generator is employed, and crystal-coated ferrite heads assure clean, clear duplications for years on end.

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technology. Otari studio master recorders, duplicators, QC monitors and tape loaders are meeting rugged everyday production schedules with the highest performance standard in every sector of audio recording and duplicating industries.

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U.K.: Industrial Tape Applications, 1-7 Harewood Avenue, Marylebone Road, London NW1
France: Reditec, 62-66, Rue Louis Ampère, Zone Industrielle des Chanoux, 93330 Neuilly-s/Seine
Belgium: Trans European Music S.A., Koeivijverstraat 105, 1710 Dilbeek, Brussels

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letters

Walk don't run

Dear Sir, Your November and December editorials tell the true story. Technology is becoming a replacement for talent and ingenuity. Studios are competing for the accolade of having the most black boxes, tracks, and computerised mixdowns. Newcomers to the industry are being denied a valuable learning and developing experience by being given all these new toys before they can handle the basics. They lose an appreciation for new devices because they do not know what it's like to work without them. How can a young engineer expect to turn out a decent quad mix from a 42-channel board before he can produce quality mono mixes from 6-channels?

It surprises me when, in another recording publication aimed at beginners and small studio owners, I read letters from young engineers and beginners complaining about the perils of live recording (My gosh! No retakes? No U87s? No comfy chairs?). They have been so spoiled by multitracks and million dollar studios that they lose their spontaneity, and they learn little about the medium with which they work. They have insufficient knowledge of acoustics and electro-acoustics (transducers). I recently saw a 'professional' soundman attempt to battle a highly reverberant room by turning up the echo on his console hoping for the room ambience and the artificial echo to meet out of phase and cancel! In my opinion, no real talent is allowed to develop because young engineers have brand new 'magic' toys thrust into their hands before they have mastered the basics. Not only are they robbed of a valuable learning experience by not attempting to overcome difficulties without them, but they also become dependent on these devices, and any developing talent is stifled.
Yours faithfully, **B Papoff, Toronto, Canada.**

Academy Filters

Dear Sir, Referring to the article entitled 'Audio Consoles' in the January issue of STUDIO SOUND there appears to be some confusion regarding the expression 'Academy Filter'.

This is a 'de-emphasis' network, not 'pre-emphasis'. All pre-emphasis is subjective and is the result of applying the so-called 'Academy' de-emphasis to the loudspeaker system being used. As cinema loudspeakers can vary widely from one manufacturer to another the original 'Academy Curves' were given as an electrical characteristic at the output of the power amplifier and a separate curve was assigned to approximately five commercial US cinema loudspeaker systems.

More recently, and particularly with the development of Dolby-encoded photographic soundtracks in which Elstree Studios were

jointly involved, an attempt has been made to rationalise the cinema reproduction system, by standardising the electro-acoustic output of cinema loudspeaker systems in an auditorium environment. Once this is done, the 'Academy' de-emphasis curve also becomes one standardised characteristic.

Shortly, ISO Standards will be published covering all these aspects.

Yours faithfully, **A W Lumkin, Technical Consultant, EMI Elstree Studios Ltd, Borehamwood, Herts, UK.**

Martin Jones replies:

Apologies for my loose terminology regarding the Academy Filter, though I do not believe I am alone in this tendency. Our film dubbing consoles usually incorporate an 'Academy' de-emphasis network in the monitor section in order to give a representative sound on the dubbing theatre speakers. The signal feed to the optical sound recorder then includes pre-emphasis as judged necessary. The recent work on standardisation of the Academy curve is most welcome and represents a major development in the quality of cinema sound.

Coincident miking

David Hastilow (Letters January issue, p32) has asked us to point out that the Sennheiser gun mic to which he referred is, in fact, a model 816 P48 and not a model 851. Also the two Schoeps microphones mentioned are better described as a CMTS 501U twin-capsule bi and omnidirectional stereo mic, and a MTSC 54 cardioid stereo twin (110° ORTF-principle) mic that accepts Collette-program capsules—**Ed.**

Dramatic Error

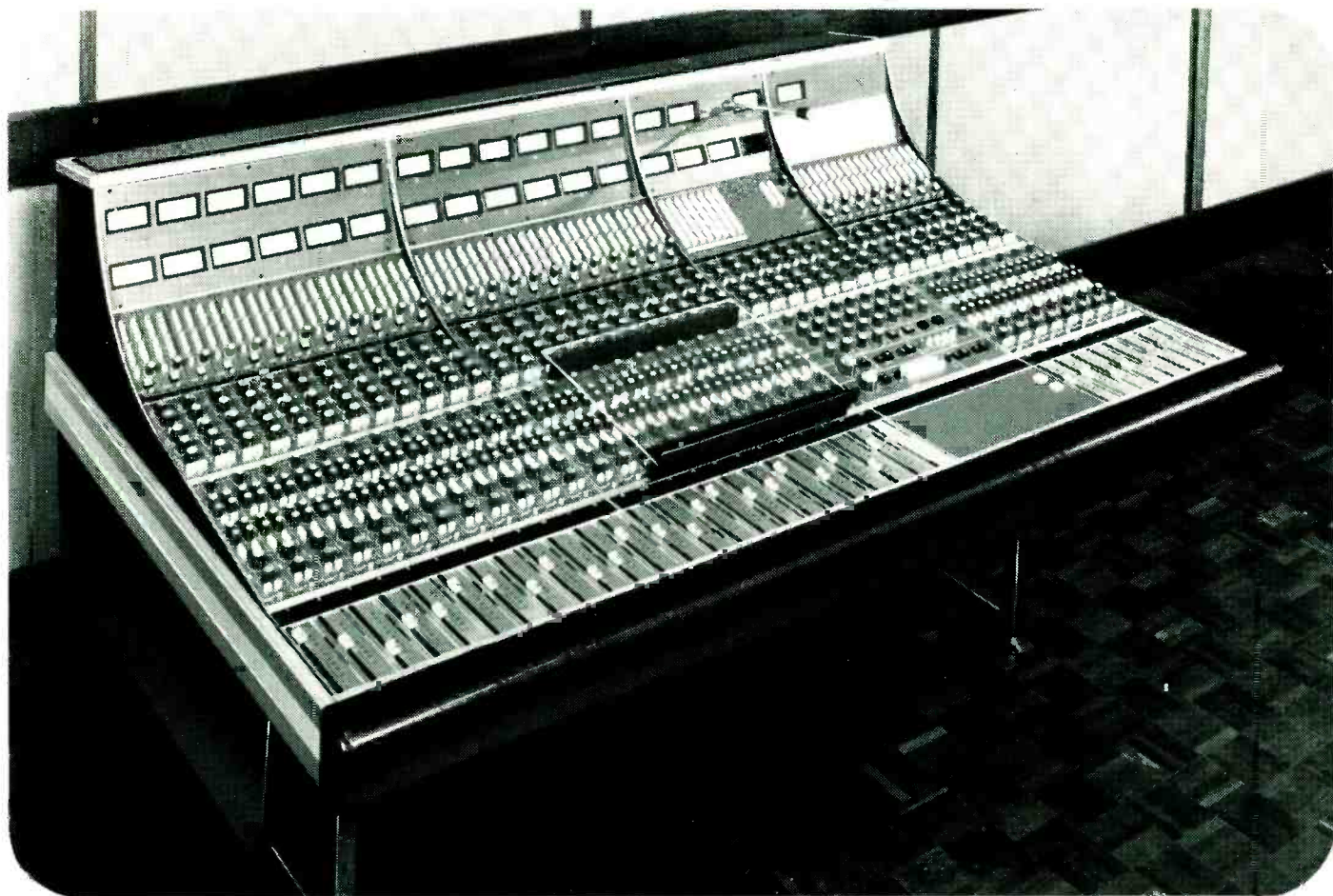
Dear Sir, In his article 'Audio Consoles' (STUDIO SOUND, January 1978), Martin Jones is incorrect in saying dramatic control panels were first seen at Broadcasting House. Although when the BBC occupied Broadcasting House in 1932 two 15-channel control panels were installed, the first such panel had been in service since 1928 at Savoy Hill. It had ten channels and was designed by Capt A G D West, a BBC research engineer.

The first major drama to employ it was 'Kaleidoscope'. Written and produced by Lance Seiveking, it featured John Gielgud and was acclaimed by the press as an 'extraordinary feat of broadcasting' and 'real wireless drama'. Other successful plays to employ this control panel at Savoy Hill were 'The Squirrel's Cage' (1929), 'Paths of Glory' and 'The Marie Celeste' (both 1931).

Yours faithfully, **J F Ratcliff, 17 Mooreland Road, Bromley, Kent.**

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Neve

After the cutting room

Royer Slater

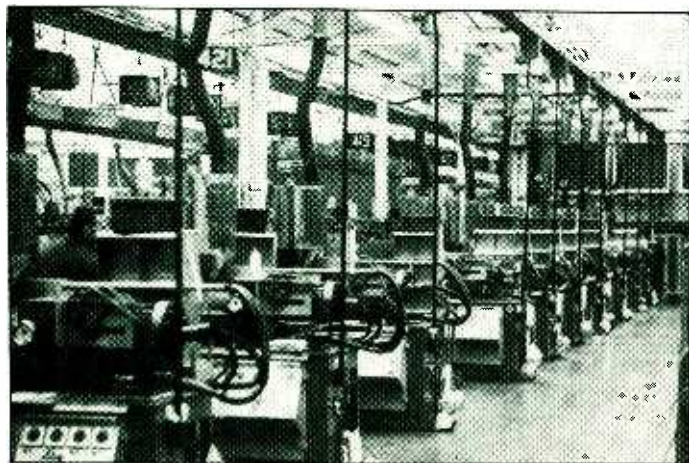
For many years I've been guilty of regarding the record factory as a black box—lacquers are inserted at one end of the box and slabs of vinyl are churned out of the other. Great pains are taken by producers and studio engineers to produce a perfect tape; the producer can even supervise the last link in the audio chain, the cutting of the lacquer. But it's then up to the black box to preserve the mechanical accuracy of that lacquer and to justify the loving care and expense of the recording process. You sometimes wonder if you're wasting your time.

OVER THE LAST FEW YEARS I've spoken to countless people who've criticised the quality of record pressings. I particularly recall having a quick pint between cutting sessions with a well-known and respected cutting engineer. The conversation moved onto record pressings and he voiced his opinion that there has been a general degradation in the quality of pressings; and of his suspicion that the proportion of recycled vinyl used in records has been on the increase.

He recounted how he'd cut an album for one of the country's top pop producers—perfectly, he had thought. But the producer later complained that the test pressings exhibited considerable crosstalk between adjacent grooves. So the album was cut again, this time with as much 'land' as possible between adjacent grooves, especially immediately before and after each track where crosstalk from adjacent grooves is most noticeable. Inevitably, it seemed, the crosstalk was still evident when the second test pressing came from the factory. To prove his cut the cutting engineer then made another lacquer from the same tape—this time leaving the absolute minimum of land between adjacent grooves—and played it back to the producer. There was no crosstalk whatsoever, proving that the fault was in the record manufacturing process!

Pressing quality

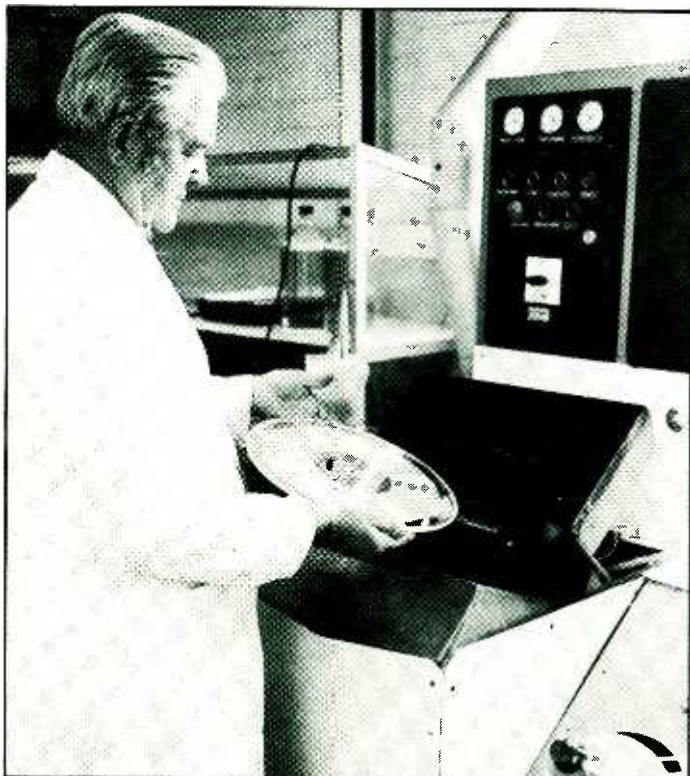
For my own part, as a recipient of sample records from record



companies for over eight years, I've learned to recognise some of the characteristics of records pressed by different manufacturers. I looked back through my record collection to compare mid-Sixties pressings with those mailed to me recently. This initial comparison is based purely on visual criteria, for recording technology has advanced—and my old records have been damaged by repeated use of a poor cartridge in any case!

Decca's pressings have always been very good but there's been a very slight deterioration recently, a common defect being small raised areas in the playing surface. These are situated in the same place on both sides of the record, and suggest that both stampers have been simultaneously damaged by a hard impurity in the vinyl pressing compound. One of the recent samples I happened to pick up had a raised dust pattern on the lead-out area; which suggests either dust behind the stamper or (much more likely) dust on the original lacquer during its preparation (more about this later).

Reports given to me suggest that EMI are the worst major record manufacturer (although, as will be seen later in this article, they apparently go to great lengths to control quality). You'll find no pits or bumps on the surface of a 1964 Beatles album, even on pressings



(and again, with the exception of Decca) 30 cm records are thinner and therefore, I would suggest, more prone to warping; although several manufacturers (but not EMI) strengthen their pressings by forming the stampers to mould thicker rings of vinyl within the label area.

Large-scale production

So, what are the mystical sciences which serve to mass produce the studio's creative efforts? EMI Records operate Britain's largest pressing plant. It employs about 2500 people in manufacturing, warehousing and distribution, and turns out 1.25 million records per week. It seemed to make sense, then, to get some first-hand information about what happens there. Geoff Webb, the commercial manager, guided me around their 16-acre factory at Hayes in Middlesex.

Whether by accident, or to make the initial point, Geoff first pointed out the laboratory where all the raw materials supplied to EMI are tested before use. The blend of materials used by EMI to manufacture its records consists mainly of a vinyl copolymer together with a small amount of metal soap and carbon black (which gives an otherwise transparent product its black colour). Other materials are included, but they seemed rather secretive about the magic mixture.

When a cut lacquer arrives at the matrix department it is first subjected to examination and the catalogue number is stamped within the lead-out area. The lacquer is a flat aluminium disc coated with a special cellulose acetate—the coating is soft, enabling it to be cut. As such it isn't electrically conductive and must first be made so.

After cleaning with a detergent, the lacquer is sensitised by spraying with a dilute solution of stannous chloride. It is then sprayed with a mixture of chemical solutions, the operative reaction being the reduction of silver nitrate to deposit a silver mirror on the

made from well-used matrices (as indicated by the reference codes which EMI kindly press onto all their records). But today you'll not look too far before finding a 'sink' in the surface—although bumps are rare—suggesting that the culprit is dirt behind the stamper. The surface of the record is almost always covered in minute scratches and scuffs. This damage appears to be caused to the record itself either during pressing or afterwards, rather than a fault in the matrix department, which processes the cut lacquers and produces the stampers. (Indeed, it should be said that EMI's matrix department is second to none.) Perhaps I may quote a classical-record reviewer of a major music magazine about EMI's pressings: 'One has to apply a different standard—two out of three, or three out of four, have surface noises that would be plain unacceptable if they were from, say, Philips. But then I think, "Well, it's an EMI after all!"'

Phonodisc, the record manufacturing side of Philips (who have also pressed Polydor's records for some 12 years) are the only major record manufacturer in the UK to have shown any marked improvement over the years. In the mid-Sixties their Ips were covered with bad pits and rough noisy ridges. Their Ips now have clean, silent dimple-free surfaces although their 18 cm singles (which are injection-moulded) are the worst in the country, having tidemarks of rough plastic extending well into the recorded area, deep radial scratches and paint from the label painting process (unique to Phonodisc's 18 cm records) on the playing surface.

I have little faith in CBS pressings when I inspect them because of their mottled appearance, due to the surface being covered with slight dimples, but this appears to have no audible effect. However, CBS do take the biscuit for the depth of the pits in their pressings. Fortunately the really bad examples that I've seen have occurred on heavily modulated records where the drastic effect of these pits on my stylus is masked. Another worrying characteristic of CBS-manufactured discs is the way in which records pressed after a fair production run have surface marks akin to a rotary skid. CBS pressings mailed to me recently have invariably been review copies from the first sets of stampers, where this effect isn't evident. But on some examples I've been shown, the skidding has occurred to the extent that the matrix number scratched in the lead-out area has practically been polished from the stamper. I dread to think of the effect on the audio information!

Another very obvious change in pressings over the last decade is that Ips seem generally to be made from a softer plastic, the only major exception being Decca, who still use a hard vinyl. In addition



surface. The pretreatment with stannous chloride ensures that a perfect and uniform mirror is produced. If this stage of the process is not carried out with adequate cleaning and rinsing, and with uncontaminated reagents, a satisfactory end product will be impossible to achieve.

The silvered lacquer is then immersed as the cathode within a nickel electroplating bath, the process of which can be simply described in terms of the migration of nickel from a pure nickel anode, through an electrolyte of nickel sulphamate, onto the lacquer.

The plating must be kept under strict control as faults will reflect on the whole record manufacturing process. The silvered lacquer is first preplated at a low temperature and current density while the initial (delicate) nickel-coating is deposited. The current can then be increased to deposit the bulk of the nickel onto the lacquer. The high current density tends to increase the temperature of the electrolyte and so strict temperature control is necessary. The instrument used does in fact serve a dual purpose: it regulates the temperature by controlling pneumatic valves on heating and cooling water supplies; and also provides a chart record for any 32 ▶

AFTER THE CUTTING ROOM

subsequent quality checks and investigations.

Len Morton of EMI's matrix department assured me that quality control is extremely tight at the plating stage. The most likely faults, whether due to contamination of the electrolyte, incorrect temperature or plating too rapidly, are a 'stressy' deposit (which can take a saucer shape and may produce post-echos in the end product) and pitting (which can result in a lump or a depression on the pressings).

The deposition takes about four hours, after which the lacquer is removed and washed. The nickel deposit, known as the 'master', is peeled off. The master, a negative of the original lacquer, is carefully cleaned and then immersed in a colloidal preparation to form a very thin barrier film on its surface. Thanks to this film, the master can itself be nickel-plated in the same way as the lacquer disc and the new nickel deposit, hopefully an exact copy of the original lacquer, can be easily peeled off. This second generation deposit, a positive known as the 'mother', is played for test purposes. I was assured that due to the hardness of the nickel and the light playing head used (1.5g) the mother isn't damaged by being played.

After further inspection, the mother is coated with a barrier film by immersion in the colloidal preparation, in the same way as its predecessor. The stamper is then grown by electro-plating onto the mother.

Before the stamper finds its way onto the record press, it is necessary to accurately punch a hole in the centre. This is achieved using a device of EMI's own invention. The stamper is fixed onto an illuminated turntable and an image of the spiral is optically projected onto a small screen. The position of the stamper on the turntable is adjusted until the spiral doesn't swing when the turntable is rotated. When this condition has been achieved, the same device punches an accurate central hole in the stamper. Records pressed from off-centre stampers (known as 'swingers') are an unfortunately common fault among records manufactured by certain smaller companies and it seems a pity that this simple but effective device of EMI's hasn't been adopted more widely.

The stamper is next formed in a hydraulic press so that its own negative, the record pressing, will have the required contours. Stampers are each given a code letter to assist in later quality control investigations and, presumably for reasons of tradition, these follow the letter order in the word 'Gramophone', so that the first stamper from a mother is designated 'G', the second 'R', and so on.

Great care is taken when handling all matrix stages, especially those in the negative stage where the delicate information contained in the base of the original groove is in a raised form and, as such, is very vulnerable. Stampers are randomly checked on a radioactive thickness gauge as a stamper of uniform thickness is essential to produce pressings with a flat playing surface.

EMI's record presses are to the company's own design and manufactured in the factory's own workshop. But for a company with such an immense and diverse reputation, EMI's presses aren't at all elegant and even struck me as being home-made in their construction. My confidence in the manufacturing operation was therefore somewhat reduced at this point—probably also due to the contrast between the clinical care of the matrix room and these mechanical monstrosities. They sit in rows and somewhere within their invisible bowels the records are made, to be borne to the world without any human intervention. With the exception of one surviving manually-operated press (used solely for test purposes) all the machines are completely automatic. Once the stampers and the appropriate paper labels have been loaded, they churn out records unattended until told to stop. There are 112 presses in EMI's factory—and often more for new presses are installed and operated for a few weeks, in order to iron out any gremlins before despatch to the customers (mainly EMI factories overseas).

The stampers are fastened in the press to each of two flat plates, care being taken to ensure that there is no dust or dirt on either the back of the stamper or on the plate—this would distort the stamper and cause a pit in the surface of the pressing. Channels within the plates permit the passage both of steam for heating and water for cooling; controlled by pneumatic valves.

At the beginning of each pressing cycle the stampers are first heated while in the 'open' position and, at the same time, the paper

labels and preheated vinyl compound are introduced between the stampers. The plates are then brought together under hydraulic pressure and heated by steam to 160°C. After a few seconds the steam is cut off and cooling water is circulated through the plates. The hydraulic pressure is released when the record has cooled and the record, still warm, is mechanically removed from the press. While the press itself commences its next cycle, a unit on the side of the machine removes a 'flash' of excess vinyl from the edge of the record by rotating it against a knife. The vinyl is collected for reclamation and re-use, along with rejected pressings (after removal of the label area).

18 cm records are delivered by the press ready-sleeved and perforated with their alternative centre; while 30 cm records fall onto a pile in the 'out' tray, which I'm assured doesn't damage the record. A flat spacer is automatically dropped onto the pile after every fifth record. Still in piles and unsleeved, 30 cm records are taken to an area adjacent to the press shop and allowed to cool for a few hours before being bagged.

At bagging, each 30 cm record is visually inspected before being inserted into an automatic machine which inserts the record into both the paper inner bag and the outer sleeve—with a disconcerting bang. I must admit that assurances to the contrary didn't convince me that no damage was inflicted on the record by this cruel device. A classical lp is given preferential treatment, being inserted into a luxurious polythene-lined inner bag (instead of the all-paper inner used for pop records) and sleeved by hand.



EMI points out that it goes to great lengths to monitor the quality of its product. The first few copies from a new set of stampers—and samples from each run—are taken to the quality control department for checking. Singles are played right through for faults because of their short duration, but 30 cm lps are played backwards at 78 rpm (an odd sight to behold!) on specially adapted record players. These record the position of any clicks on a paper printout and the appropriate section of a suspect record is then checked on cans. In the event of a stamper or press fault being proved, the press operatives are instructed by intercom to shut-off the offending machine and the press run is isolated for further investigation. An additional quality control studio, manned by an experienced classical musician, auditions samples of classical records.

The durability of pressings is tested at EMI on a device which repeatedly plays the record at high speed with three playing arms simultaneously. Simulation of a thousand performances can quickly be achieved for examination of the degree of degradation.

Small-scale production

The West Drayton pressing plant of WEA Records, which was taken over from Island Records in February of this year, is tiny when 34 ▶



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ADV 220/E

AKG acoustics

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AFTER THE CUTTING ROOM

contrasted with the vastness of EMI's operation. I visited the factory just as the takeover by WEA was announced; my host was Nick Flower, then the Managing Director of Island Records Manufacturing Ltd. Although WEA intend to increase production considerably, at the time of my visit there were just 16 semi-automatic presses for 30 cm records, arranged as eight pairs. Each of the eight press personnel manually loads the paper labels and the pre-heated vinyl into one press while the other press in that pair is in the middle of its cycle. The finished record, still warm, is removed from the press by hand and placed onto a rotating turntable, where it is held by suction while the 'flash' of excess vinyl is trimmed automatically. The pressing cycle on the presses, made in Germany by Taunus Ton Technic, is automatic. A granulated record compound is used and is poured straight from the sack into the hopper above each of the eight vinyl extruders, one for each pair of presses.

The 'Quality Department' checks samples from each press run both visually and on cans, and the factory's rejection rate (according to Nick) averages 7% of the total production. Of these, 1½% are rejected at the press line, 4% by the quality department and the rest during the final visual examination of each record which accompanies the manual sleeving operation. As at EMI (and every other record factory, for that matter) the label area of rejected pressings is cut out and the remainder of the record, together with the flash, is reclaimed. The vinyl is regranulated and passed through a magnetic channel which removes ferrous impurities (though I haven't any idea how the metal gets there!). Reclaiming must of course be carefully controlled, for impurities can damage the stampers as well as producing useless pressings. As a safeguard, instead of mixing the reclaimed vinyl with new vinyl and using it on all 16 presses, the recycled material is only used on one pair. I was informed that this is so that if the reclaimed vinyl does become contaminated, the problem is isolated to one operator. The whole of the affected batch can then be removed and scrapped, if necessary.

The economics relating to the recycling of vinyl are that a quarter of the material used by each press is wasted, whether as flash or as reject pressings—by recycling some of this vinyl the wastage can be reduced to between 10 and 15%.

Conclusion

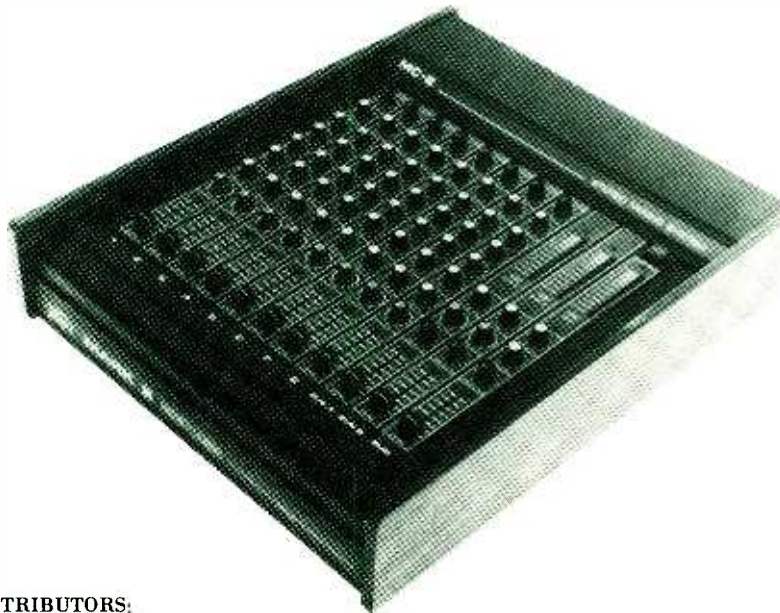
In this article I have described the manufacture of records by compression moulding, but in the last few years injection moulding of 18 cm records has been introduced by both EMI and Phonodisc. In this method of manufacture soft plastic is injected into the space between the stampers. This method permits greater production, and both EMI and Phonodisc now make all their 18 cm discs by this method. Phonodisc have further simplified their 18 cm production by pressing the label details into the label area of the record itself. The centre of the record is then painted, giving the effect of black letters on a coloured background, thus eliminating the need for printed paper labels. No doubt, audiophiles will never be satisfied with gramophone records which use the present mechanical means of origination and reproduction, whatever new technologies may be applied to their manufacture. But in fairness to the record manufacturers, who are so often on the receiving end of abuse, it is a highly complex collection of processes, each stage of which must be carried out with nothing less than the greatest of care. The slightest impurity in materials or even the oversight of a tiny speck of dust can impair or even ruin the end product.

Modern production economies dictate a high rate of production using many automatic processes. That means getting the job done as quickly as possible. As the manager of one small record factory once told me: 'We could make exceptional quality records instead of just good ones if we were allowed to take the time and to exercise the required amount of care. But it would cost so much that no-one would pay us for it'.

The 'discerning few' may voice their dissatisfaction with the standards of gramophone records; but the mass market demands high volume at a low price. In the absence of a two-tier structure relating price to quality, that's how it must stay. ■



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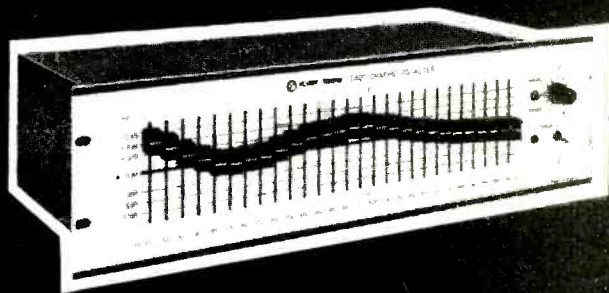
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Recording made easy

NO DOUBT you have seen the adverts in these and other pages for the D'arblay Sound Studio Workshop course—£30 for six cassettes, six illustrated booklets to complement the cassettes, a glossary, and the promise of a studio visit and advice. At £30 it sounds like a good deal, but a look at the package handed out to the press produced more and more reservations the closer we looked at it.

Several journalists with a knowledge of both the hi-fi and studio fields spotted numerous factual errors, and even more passages in the booklets and cassettes which, although not actually wrong in the dictionary sense, missed the point in a disturbing manner. We feared they would leave anyone acquiring their knowledge of hi-fi and studio sound from the course with some decidedly curious notions. Here are some verbatim examples of both errors and curiosities taken from the cassettes and literature handed out to the press for review.

'Good studio equipment can only cover a range of about 30 decibels.'

'Some of the best studio equipment can only handle sounds varying up to about 30 Db' (*sic*).

'Some studios contain equipment which can in part compensate for a poor frequency response curve. These are very similar to the treble, bass and tone controls on an amplifier or record player. In the studio, these tone controls are called Response Selection Amplifiers . . . This process of adjusting response selection amplifiers (RSAs) is called equalisation.'

'The E-string of a guitar will vibrate with a frequency of 320 Hz.'

'The bottom string of a piano vibrates 53 times a second.'

'Sophisticated studio versions (of condenser mics) often require 300V from a power unit.'

'Bias' is at one time quoted as 30-40 kHz and elsewhere as 50-100 kHz.

According to the cassettes 'no microphone is sufficiently advanced to cope equally well with frequencies ranging from 20 Hz-20k Hz'.

There then follows a recorded example of a voice made 'with a microphone which doesn't respond to middle frequencies', and a further example of how middle frequencies can be amplified to 'bring out the voice' by the gradual addition of more presence using an *rsa*. In the context of audio compression, an example is given of pop music compressed to a range supposedly of between '3 and 4 dB' and the student advised that 'classical music somehow seems to suffer when subjected to similar treatment . . . (so) when recording classical music it's better, although tedious, to control the recording levels by hand'.

There is more, but by now you will either

share our reservations or think the D'arblay course is just for you.

Realising that D'arblay were advertising in these pages I wrote citing points like those above, and asked either for acknowledgement that these were errors or for comments in defence. Quite a few errors were acknowledged, but it was argued that 'to produce the press sampler, time was obviously not on the side of those responsible for typing, typesetting, printing, etc. Inaccuracies which we have found have now been rectified. Similar problems regarding the cassettes will also mean changes.' The 300V supply for a condenser mic was a mis-print for 30V (*sic*). And not all criticisms were accepted. According to D'arblay the E-string on a guitar is 320 Hz, but all my reference books cite the E-string as 330 Hz. It is also argued by D'arblay that 'even response from 20-20k Hz is difficult to produce in a microphone'. This may be so, but it doesn't prevent manufacturers such as AKG, Calrec and B & K from producing mics that are useably flat over that whole range. Even response in the audio business is always 'difficult' to produce, and that's one of the reasons why good audio equipment costs money. D'arblay say they 'have frequently come across the term *rsa* in many situations and find it very useful'. Perhaps everyone in the studio business really does talk about *rsa*'s rather than graphics parametrics and eq, and I've just never, ever heard them.

Assuming that all the *admitted* errors in the course literature and cassettes are now corrected (and this will surely cost D'arblay a fortune in time and money) it would seem to be mainly thanks to the press who have picked up mistakes in the material given to them for review. But for my part at least the mistakes pointed out were only by way of example; so what of the remainder? And what a curious way to go about finding out where and how a project is wrong! Most publishers check and revise *before* publishing. Particularly puzzling has been the reaction of some other reviewers. Whereas ex-Studio Sound man John Dwyer panned the course in 'Wireless World', other publications have been kind to it. Have these reviewers actually ploughed through it all before writing. And if so how much do they know about recording technology? Well, the 'Melody Maker' arranged for a group of CBS studio engineers to listen to the tapes, and published some of their comments. 'I can't see it being any good for professionals, and if I knew a kid who wanted to be an engineer I wouldn't recommend it,' said one engineer. But 'they're certainly accurate', said another. This so puzzled me, that I checked with CBS studios. It turns out that the 'Melody Maker' interview lasted an hour

and a half, and the published transcript was very heavily edited. More to the point, in that hour and a half the CBS engineers could not possibly do more than listen briefly to selected parts of the six double-sided cassettes and scan through the seven booklets. Quite simply, they just didn't hear or read most of the dubious passages cited above. And I was relieved to hear that, like me, Bob Summers, the maintenance and technical engineer at CBS, has never in his life heard the phrases 'response selection amplifier' or '*rsa*' used in a studio. One theory is that it is a relic of old times at Auntie Beeb.

In an effort to be sure that anyone answering any of the current D'arblay adverts receives a revised version kit of cassettes and literature, I asked D'arblay to be sure to let me see the revised version material as soon as it was ready.

Finally, two months after the original press launch, D'arblay sent me the revised version booklets. There was no sign nor mention of any revised version of the cassettes so presumably these still contain the original errors. In the literature the majority of the most glaring errors which I'd pointed out in my role of unpaid editorial consultant have been corrected. But our old friend the *rsa* is still featured, the E-string is still tuned to 320 Hz and the glossary now explains Dolby as recording high frequencies on tape 'at levels considerably higher than their actual levels relative to mid-range frequencies'. In fact it's only *low level* hf that is boosted to reduce hiss. Other not-really-wrong-but-nevertheless-curious points not noted in my 'editorial' capacity remain predictably unchanged. A ppm for instance 'provides a much better indication of the relative loudness of sound' than a vu; and a $\frac{1}{2}$ -track recording is one 'occupying the upper 40% of tape'. Clean sound is 'the actual sound from a scene, free from added commentary' and a coincident pair of microphones is 'responsible for the sound from stereo headphones appearing to be inside the head'. Really?

Other definitions are equally curious or surprising to find in a glossary of sound studio terms. But perhaps engineers really do use terms like 'peak up', 'pot cut', 'formant', 'carbon microphone' and 'ionophone' as part of their daily routine.

Spiked again

IF YOU HAVE a digital clock in your studio, perhaps as part of an elapsed time display, you may have wondered why the elapsed time readouts are OK but the clock time sometimes goes haywire. Next time this happens, check that no one has been working in the building with an electric drill or other similar power tool. Although drills and the like are suppressed, in so much as they don't produce too much rf, they can still generate some nasty spikes that feed back down into the mains, especially as the motor starts. Since some digital clocks work by counting the mains frequency waveform peaks and dips, it is not surprising that the time readout goes haywire if a mass of spikes from a drill suddenly gets into the mains. At least one studio I visited recently has carefully fitted

extra suppression to all its in-house drills and power tools, and it makes sense for other studios to do likewise.

I am sure that anyone in the business is by now well familiar with the interference effects produced by thyristor-based dimmer light switches. But just in case there's anyone around still in the dark let me remind them that thyristor controls work by chopping the mains waveform to reduce the overall power fed to a load (which may be a light or motor). Every time the waveform is chopped there's a vicious spike of rf, and it's almost impossible to suppress this spike with components of small enough physical size to fit into a normal wall switch housing. The interference spikes radiate from the mains wiring and can obliterate medium and long-wave AM radio reception. They can also break through into audio equipment, making a characteristic (once you've identified it!) motor-boating sound. You would be surprised how many owners of domestic audio equipment have been fooled into thinking it has developed a fault, by not knowing that a wall dimmer switch is the real culprit.

Finally, an even less well-known fact on thyristor controls. In the States someone for some reason—who knows what?—ran a tape machine on a circuit that contained a thyristor control. Perhaps he overlooked the fact that even when such controls are turned full on they can still chop the waveform slightly and generate pulses. And in this case something very mysterious happened. So he wrote to an audio magazine for advice. The machine ran perfectly but wouldn't record. Almost certainly, the high-frequency spikes produced by the thyristor were getting through to the record head and serving as an erase signal. Bear it in mind and don't laugh; strange things don't always happen to someone else. A few years back one London studio couldn't get rid of the sound of Chinese voices from some recordings. No, it wasn't un-erased material running backwards and sounding Chinese. It really was the sound of Chinese voices, coming from a high-power embassy transmitter and breaking through into an audio circuit.

agony

A well-known book publisher recently received the following letter from the head of the music department at a Belfast comprehensive school:

Dear Sir, we received 'Instruments of the Orchestra' last week. Unfortunately, I have to return the package as there was a hole in the first record. I would be grateful if you could replace it as soon as possible.

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Eddie Veale receiving the Acoustic Design Award



Tony Shields receiving the Jodrell Bank Award



Peter Harris receiving the Overtime Award



▲ Howard Barrow receiving the Tandoori Award

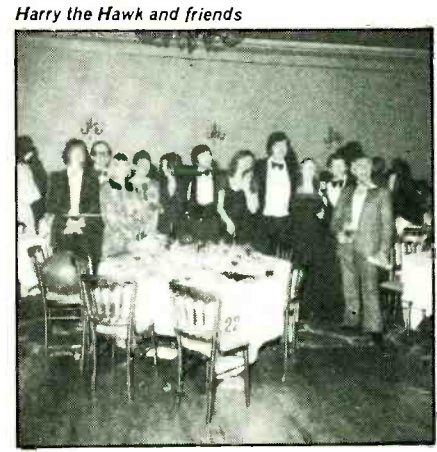
▼ Derek Tilsley collecting Les Lewis's award



Adrian Kerridge receiving the Close-Mike Award



Guest speaker Geoffrey Everett



Harry the Hawk and friends

Deaf dinner awards 1977

The Industry saluted itself at the recent second annual Awards Dinner of the Distinguished Engineers' Audio Federation. After ample proportions of alcoholic beverages and gastronomic delights were consumed by the gathered throng, the rotund Mr Arthur Mullard, ably assisted by a Mr Itchi Nakas, made the presentations. There were three nominations for each award; in the following list the winner's name is printed in bold type.

The nominations for THE ACOUSTICAL DESIGN AWARD were:

Tom Hidley of Eastlake Audio 'for his Hawaiian lava-rock sandwiches';

Eddie Veale of Audiotek 'for fixing his mother-in-law's talkback problem';

John Borwick of the University of Surrey 'for his investigation into obsolescence of recording equipment—undertaken at a little-known studio in Barnes'.

The nominations for THE JODRELL BANK AWARD were:

Stephen Court of Court Acoustics 'for actually *buying* a copy of Studio Sound';

Ziggy Jackson of MCI 'for volunteering to blow into a breathalyser';

Tony Shields of Ampex 'for smashing up his car with a lavatory cistern'.

The nominations for THE OVERTIME AWARD were:

Dave Harries of Air 'for coming here on his darts night';

Peter Harris of The Music Centre 'for his track record at Wembley, White City and Catford';

Peter Booth of Trident Studios 'for unloading his lunch into a passing goods wagon'.

The nominations for THE SATURATION AWARD were:

Bob Hine of BASF 'for not taking the hint at last year's Dinner';

John Prigmore of 3M 'for inspiring the leading role in the film *Jaws*';

Harvey Wallbanger of Agfa 'for inviting Ted Bowden to this function'.

The nominations for THE OVERLOAD AWARD were:

Bob Hill of Trident 'for burning his bra—and everybody else's';

George Peckham of The Master Room 'for ignoring the hole in the middle';



John Prigmore receiving the Saturation Award



Bob Hill receiving the Overload Award



Ken Atwood receiving the Maintenance Award

Sean Davies of British West Hampstead 'for thinking hair lacquer was the German inventor of the recording blank'.

The nominations for THE MAINTENANCE AWARD were:

George Balla of CBS 'for changing the last letter of his name to an A';
Noel Jesuadian, Ray Prickett and Malcolm Davis of Pye 'for managing to squeeze into Studio No 2 and closing the door';

Ken Atwood of Nova 'for maintaining anonymity on Streatham Common'.

The nominations for THE TANDOORI AWARD were:

Edward Masek of the Association of Professional Recording Studios 'for thinking unitrack was a tape recorder';

Robin Jones of R G Jones 'for adjusting his address in public';

Howard Barrow of Pye 'for standing guard while Noel Jesuadian, Ray Prickett and Malcolm Davis were in Studio No 2'.

The nominations for THE DEALER OF THE YEAR AWARD were:

Peter Eardley of AKG 'for securing the Playboy Club's lettuce contract';

Dag Felner of MCI 'for dropping the J from his name because his teeth kept falling out';

Michael Bauch of FWO Bauch Ltd 'for renting his dinner jacket to Brian Whittaker'.

The nominations for THE AUTOMATION AWARD were:

Les Lewis of Rupert Neve & Company 'for motorising Derek Tilsley's knee-caps';

Clive Green of Cadac 'for his voltage-controlled pipe cleaner';

Andy Stirling of Allen & Heath 'for his rotating flash cubes'.

The nominations for THE DROP-OUT AWARD were:

Geoff Emerick of Air 'for having his ears pierced';

Ken Townsend of EMI 'for taking a bucket-full of maggots to the DEAF Golf Championship';

Arthur Haddy of Decca 'for thinking that Allen & Heath was a double act'.

The nominations for THE CLOSE-MIKE TECHNIQUE AWARD were:

Bob Auger of Bob Auger Associates 'for donating his teeth for this Award';

Richard Millard of Audio International 'for keeping off the carbon tetrachloride';

Adrian Kerridge of Lansdowne Recording Studios 'for the high-frequency roll-off in his ears which was doubtless responsible for his Acker Bilk Hits'.



▲ Dag Feiner receiving the Dealer Award

▼ Ken Townsend receiving the Drop-Out Award



Arthur Mullard strikes a pose with Mr Itchi Nakas

The 3M party having a good time



Malcolm Jackson always holds his wallet



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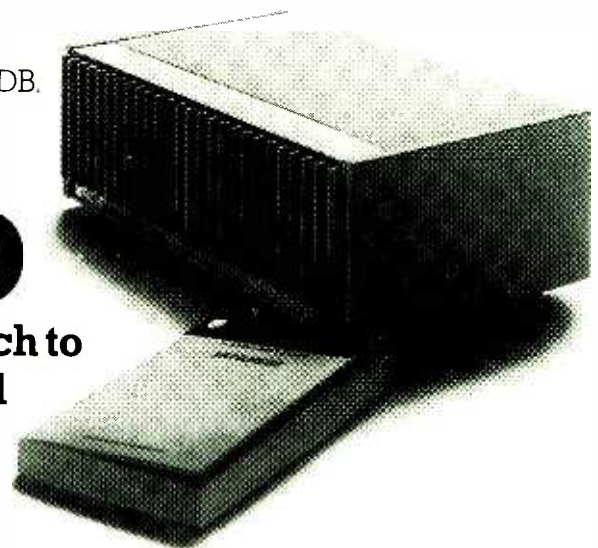
Clever chaps these British!

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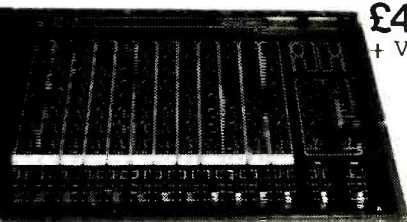
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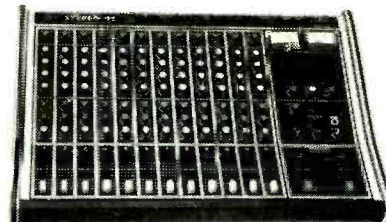
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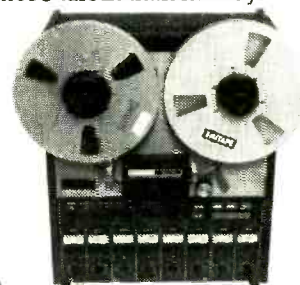
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Sound on stage, mic techniques

Terry Nelson

Why do most pa rigs sound so lousy? What can you do to improve it? Here we look at the problem of on-stage miking. Part two of this article to be published next month will look at the ways in which the resultant mix can be amplified and still sound as it should.

RECENT years have seen the development of the humble 'pa' from the 25W mixer/amps and two line source columns that we all knew and hated to the situation in concert halls and stadiums today, ie walls of speaker cabinets and horns, forests of microphones, plus power capabilities of 20-50 kW or more. Studio-quality main mixers and monitor mixers are common, as is the growing list of ancillary studio equipment, etc, etc.

But what of the end result? Is the resulting sound any better than that we got in the good/bad old days of the Vox AC30, with the vocalist struggling to get through with the 25W horror mentioned above—or coming out loud and clear when he got the message about the old Vortexion 50W valve jobs? (Those of you who had Wallace amps please abstain from comment!) Unfortunately, in many cases the sound is quite deplorable, with the added discomfort of being much louder, more distorted and with an apparent cut-off frequency—to the sound mixer's ears—of around 800 Hz. How often have we heard the moans of 'it's too loud', or 'too trebly', and experienced the generally distorted high-frequency splash from the tweeters with aggressive mid-range from the horns. And vaguely wondered whether someone has forgotten to connect the bass bins.

Following the lead given by some excellent articles on pa in STUDIO SOUND that offered some nice technical do's and don'ts (not forgetting practical advice), I feel that this is perhaps a good moment to stop and reflect on the subject of sound reinforcement in general, air some personal grievances and offer some (hopefully) constructive food for thought. It is encouraging to see this magazine embracing both sides of the coin—recording and live performance—since a better understanding of both situations can only benefit the end product—the music. This article is written mainly from an artistic and practical standpoint and I hope that not too many technical 'clangers' have been dropped!

The most common type of installation would appear to be a speaker tower on each side of the stage area, connected for either mono or stereo. On-stage miking usually consists of drums, instrument amplifiers, Leslie cabinets, any brass or woodwinds or piano, and vocals. Directs are often taken from electric keyboards and occasionally from the instrument amps and/or instruments. The mic lines and directs are split to be routed to the on-stage monitor mixer and the auditorium-based main mixer. Or in the absence of a monitor mixer the main desk's foldback facilities will be used for monitoring.

High-quality monitor speakers are used for on-stage foldback and may be complete stacks placed at right angles on either side of the stage. There is an increasing use of $\frac{1}{3}$ -octave or octave equalisers (in conjunction with an analyser) between the mixer and power amplifiers in order to compensate for the hall acoustics. Electronic crossovers for the speaker systems are commonplace for larger installations, as is the appearance of what was hitherto confined to studio equipment—compressor-limiters, digital delay lines, flangers, etc. In fact some of the more sophisticated set-ups must certainly make quite a few studios jealous.

So what's wrong with that and where is the problem? And is the answer now being formulated? Obviously, time and money are being

spent to try and achieve an acceptable reproduction of what is actually happening on-stage (and now and again succeeding), but unfortunately the results do not always justify the means.

A brief run-through of a typical group line-up may throw some light on the shortcomings and problems involved in amplifying the different instruments:

Electric guitar. This is usually in the form of a microphone placed nearly inside a speaker of what may be a multicabinet set-up. Directs, either from the instrument or the amplifier, or a mixture of mic/direct may also be used. For many of today's rock guitarists, distortion (in the form of fuzz boxes, amplifier circuitry or plain overdriving) is an important ingredient in the type of sound required. The result through the pa is a sound that is very often too aggressive and far too bright—with a tendency to swamp everything else.

Acoustic guitar. If the musician doesn't own an *Ovation* with its own transducers in the bridge, this is commonly amplified via one or two directional mics. Other than that, quality transducers such as the *FRAP* or Barcus-Berry are gaining ground, thus reducing feedback problems (but don't forget to buy the pre-amps!).

Bass guitar. More or less the same conditions as for electric guitar, often ending up too 'boomy' and lacking in definition and presence.

Keyboards. This can cover a multitude of instruments, as varied as chalk and cheese and everything in between: organ, piano (electric and acoustic), synthesisers, clavinet, mellotrons, etc, etc, with nearly as wide a range of amplification dispositions. There seems to be a trend towards mixing them direct, with Leslie cabinets being miked either on or off-stage. However, mic/direct lines may also be taken from guitar-type amplifiers. The other strong possibility is that the performer will have his own submixer feeding an on-stage monitor system and the main desks. But the results are very varied! A general 'peakiness' or 'edgy' sound is often noticed, with the Leslie horn being too 'shrieky'. Another problem is that when the volume starts to go up, any difference in tone colour is very often lost in the blur; this is especially true for organ and such instruments as string synthesisers. Acoustic piano, a problem at the best of times, will either be miked inside the lid or pickups such as Barcus-Berry, *FRAP* or Helpinstill will be used.

Brass/woodwinds. Microphones are nearly always used, though transducers are again a possibility, especially for solo instruments. Here a certain 'raspiness' or too much top is often noticed. However, to be fair, this is also brought about by bad microphone technique on the part of the performers. Unless, of course, you want your saxophone to sound like it's blowing raspberries all night!

Drums. Everyone's nightmare! A set of amplified biscuit tins or wood blocks would often be more appropriate. Presumably the 'toc-toc' sound is in an effort to make the drums cut through the general welter of sound assaulting the public's ears. Here close-mic techniques are normally the rule, with very often an overhead pair for cymbals and the overall kit—and everything else on stage. Other percussion instruments are usually handled in much the same way, though transducers may be used in certain cases.

Vocals. The rule here is cardioid or hypercardioid microphones—

either variable or single-D, depending on the type of bass response favoured by the artist. Result: the sound is often distorted and hence lacking in definition, with the added problem of too much presence and/or treble and not enough body or depth. Obviously, a bad mic technique on the part of the singer will not help matters either.

And the problem doesn't end here. The amplified sound must now be launched effectively into the auditorium. One of the main problems arising from the common stage sound set-up is the familiar 'flanging' effect due to the path length differences of the sound arriving from the two side stacks and on-stage instrument amplifiers. Open air conditions will generally be even worse due to wind or air currents. Another problem is that of reverberation. ('And how', I hear you sigh!) It is a sad fact that many of the larger venues in which bands are obliged to play were not designed for concerts and, more often than not, are cavernous acoustic nightmares. Halls are often rectangular concrete structures, giving rise to multiple or slapback echoes with a few standing waves thrown in for good measure. Finally there is the problem of on-stage monitoring. This condition is then further aggravated by spurious pick-up by the on-stage mics actually lengthening the reverberation times. As well as direct pick-up by the mics there is also the problem of vibrations from the stage going up the mic stands and into the microphone. This is a very real problem, especially as stands are often placed directly on the floor with no isolation or shock mount. (I found this out to my cost when the bass mic for a Leslie was picking up the drums beautifully, especially the bass drum. Placing the mic on a thick piece of foam rubber helped quite a bit.) And as if all this wasn't enough the resulting sound may be severely filtered due to path length differences and phasing effects, the comb notches being as much as tens of decibels deep.

It is only fairly recently that the need for an efficient on-stage monitor system has been realised and this is a field that certainly

needs development. An incident that nearly says it all is recorded for all to hear on Deep Purple's *Made in Japan*, where before a number Ian Gillan asks for more monitor on the vocals, and the engineer replies: 'You mean you want everything louder than everything else?' This is a situation that can easily arise if the mixing facilities to each monitor are limited, or there is a lack of a certain discipline. The guitarist says all he can hear is the organist, and vice versa: the singer says they are both too loud but would like to hear the piano, etc, etc. So the volume merry-go-round continues, ending up with very high spl's on stage where no one hears anything but a pain in their ears. Excessive level may also be caused by attempts to override echoes from the auditorium (especially the slapback variety) all contributing to muddle the sound due to the high risk of the monitors being picked up by the microphones. Another drawback is that the sound from the monitors meets little or no absorbent material, which gives rise to reverberant conditions and perhaps standing waves, all contributing to the general confusion. (Some stages are notorious for this and make playing conditions *very* disagreeable.)

Evidently, these are all worst-case conditions; it would (one hopes) be rare to find them all together. Though it would appear that the defaults in present sound systems have been exaggerated and that we may as well give up, the intention has not been to attack but rather underline the pitfalls and problems of sound reinforcement. This is especially so for those readers who either have little experience of pa, but are interested, or for those of us who are performers and who may not be aware of all the difficulties facing their sound team but know a good or a bad sound when they hear it.

The second part of the article in next month's issue will deal with musical and artistic objectives, suggestions for performance and examples from existing sound systems. ■

Frank Zappa and his band at Berne, Switzerland. Note the individual monitors, the rack cabinet for Frank's guitar amps and effects units, and the pedalboard control unit at his feet.



Survey: cartridge machines and broadcast turntables

Forthcoming surveys include test equipment (July), power amplifiers (August) and monitor loudspeakers (September). Manufacturers and agents are invited to submit product details for publication to reach the editorial offices (address p3) at least eight weeks before the issue publication date (preferably a lot earlier).

CARTRIDGE MACHINES

AIR CHECK

Sound Audio, Electronic & Video Techniques, 1 Oldershaw Mews, Maidenhead, Berks, UK. Phone: Maidenhead (0628) 33011.

The company has recently introduced a new range of *Air Check* cartridge machines. Wow and flutter is claimed to be less than 0.01% (no conditions quoted, however). Normal and fast-forward modes are available. Price: between £197 and £280.

AMITY SHROEDER

Amity Shroeder, Unit 5, 39-41 Princess Street, Luton, Beds. Phone: (01) 836 7811/2/3. Telex: 21359. (London office).

Type: single-slot machine available in mono, stereo, replay or record/replay versions.

Cart format and size: primary and secondary cue tones on A carts.

Frequency response: ± 2 dB, 40-15k Hz at 1 kHz and 10 dB below NAB recording level.

Signal-to-noise: 54 dB below NAB reference level.

Distortion: <2%, at NAB level.

AUDI-CORD

Audi-Cord Corporation, 1845 West Hovey Avenue, PO Box 611, Normal, Ill 61761, USA. Phone: (309) 452 9461.

UK: Lee Engineering Ltd, Napier House, Bridge Street, Walton-on-Thames, Surrey KT12 1AP. Phone: Walton-on-Thames 43124. Telex: 928475.

100 SERIES

Type: single-slot machines available in mono, stereo, replay and record/replay versions.

Cart format and size: unspecified.

Frequency response: ± 2 dB, 50-15k Hz.

Signal-to-noise: -50 dB ref NAB level at 1 kHz (mono).

Wow and flutter: 0.15% peak-weighted.

Features: recorder option available as 110/120 Series; the latter incorporates a digital tape timer.

140 SERIES

Type: four-slot machines otherwise identical to the 100 Series. A digital remote control/sequencer is available for use with the 140 Series.



UMC Beaucart type 10

BEUCART

Beaucart Division, UMC Electronics Co, 460 Sackett Point Road, North Haven, Ct 06473, USA.

Phone: (203) 288 7731.

Sweden: F Ericsson, Edsviksv 79, 18235 Danderyd, Stockholm.

Phone: (468) 753 0874. Telex: 12486

UK: Seltech Equipment Ltd, 16 York Road, Maidenhead, Berks SL6 1SF.

Phone: Maidenhead (0628) 36315 Telex: 848960.

TYPE 10/20

Type: These machines use identical electronics and differ only in the size of cartridge. The *Type 10* takes NAB A carts while the *Type 20* accepts A, B and C sizes.

Format: available as mono, stereo, replay and record/replay versions.

Signal-to-noise: 47 dB mono; 44 dB stereo.

Distortion: <2% at standard NAB level.

Wow and flutter: 0.15% to DIN 45507.

Features: optional secondary and tertiary cue tones.

BEUCART 2

Type: low-cost mono only machine.

Cart format and size: mono replay and record/replay versions handling A carts only.

Frequency response: ± 2 dB, 50-15k Hz.

Wow and flutter: $\leq 0.15\%$, DIN-weighted.

Features: stop cue only; machines are of small physical size.

CUEMASTER

Consolidated Electronic Industries Pty Ltd, 15A Anderson Road, Thornbury, Victoria 3071, Australia.

Phone: 44 0791. Telex: 32463.

UK: Granet Communications Ltd, 39 Beechcroft Manor, Oatlands Drive, Weybridge, Surrey KT13 9NZ.

Phone: Weybridge 47785.

900 SERIES

Type: single-slot mono replay-only (906), single-slot mono record/replay (903); stereo versions are models 986 and 983 respectively. Each record/replay unit needs to be mated to a model 903R (mono) or 983R (stereo) module which contains the necessary metering and control elements.

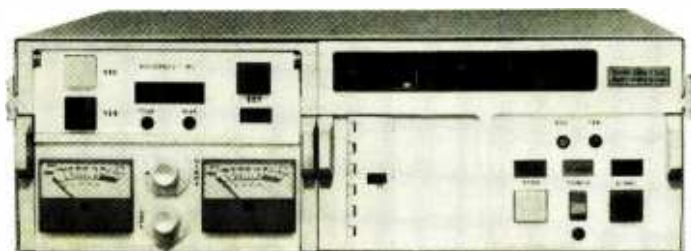
Cart format and size: all models available with or without primary, secondary and tertiary tones for NAB A carts.

Frequency response: ± 2 dB, 40-12k Hz; ± 3 dB, 30-15k Hz; reference 1 kHz.

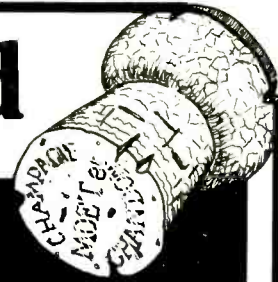
Signal-to-noise: mono >59 dB and stereo >57 dB;

46 ►

Modu Cart 100 from Audi-Cord

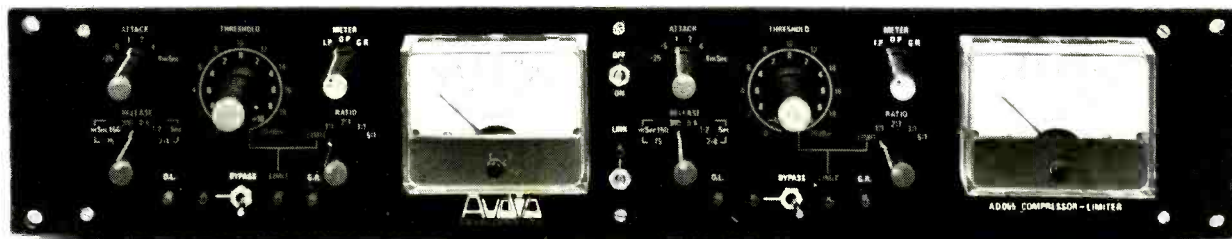


Well and truly launched



Audio

Developments



Studio Compressor-Limiter

Specification

THRESHOLD

The effective point of the gain reduction elements.

COMPRESSION — Adjustable in 2dB steps from -10dB to +10dB.

LIMIT — Adjustable in 2dB steps from 0dB to +20dB.

RATIOS 2:1 3:1 5:1 Limit (20:1).

RELEASE TIME

Adjustable — 75mS 150mS 300mS 600mS 1.2 sec. 2.4 sec.

ATTACK TIME

Adjustable — 0.25mS 0.5mS 1mS 2mS 4mS 8mS.

METER

Switchable to read INPUT, OUTPUT or GAIN REDUCTION.

P.P.M. movement Ernest Turner or Sifam Type 24. In the Gain Reduction mode the meter appears in the feedback loop and reads the actual amount of compression in dBs and follows the release time.

L.E.D. INDICATORS

There are indicators to show AUDIO OVERLOAD; COMP/LIM. BYPASS; LIMIT MODE; when GAIN REDUCTION is taking place, when the units are LINKED.

FREQUENCY RESPONSE

1dB 20Hz to 30kHz. NO COMPRESSION.

DISTORTION

0.1% at 1kHz to 10kHz. NO COMPRESSION + 8dB input.

MAX. COMPRESSION 25dB.

INPUT IMPEDANCE

10KOHMS. BALANCED AND FLOATING VIA TRANSFORMER.

OUTPUT IMPEDANCE

75OHMS. BALANCED AND FLOATING VIA TRANSFORMER.

MAX. OUTPUT +19dB at 1kHz. +12dB at 20Hz.

MAX. INPUT

Dependent on the MAX. OUTPUT and MAX. COMPRESSION.

NOISE Wideband -68dB. Band Limited -71dB.

POWER REQUIRED 240v ac or 110v ac. 50/60Hz.

WEIGHT 4.5 kg.

Thoughtfully designed to give unobtrusive operation, a vital piece of recording equipment you won't know you've got.

The ADO55 is for rack mounting. The controls on the attractive front panel are clearly laid out and colour-coded for greater simplicity. All the input and output connectors have XLR, DIN and PO Jacks fitted as standard.

The ADO55 Compressor is a dual channel compressor/limiter with a comprehensive range of useful facilities. The two identical systems may be linked for stereo operation.

Audio

Developments

Hall Lane, Walsall Wood

WALSALL, W. Midlands, WS9 9AU

Telephone: Brownhills 5351/2/3 (STD Code 05433)

Telex: 338212 Audio

EMS VOCODER 2000

for the treatment and modulation of human speech and the production of speech-like effects from music or other sounds. Used by radio, television, studios, groups and theatre.

Zen On Music Co Ltd
25 Higashi Gokencho
Shinjuku-Ku
Tokyo

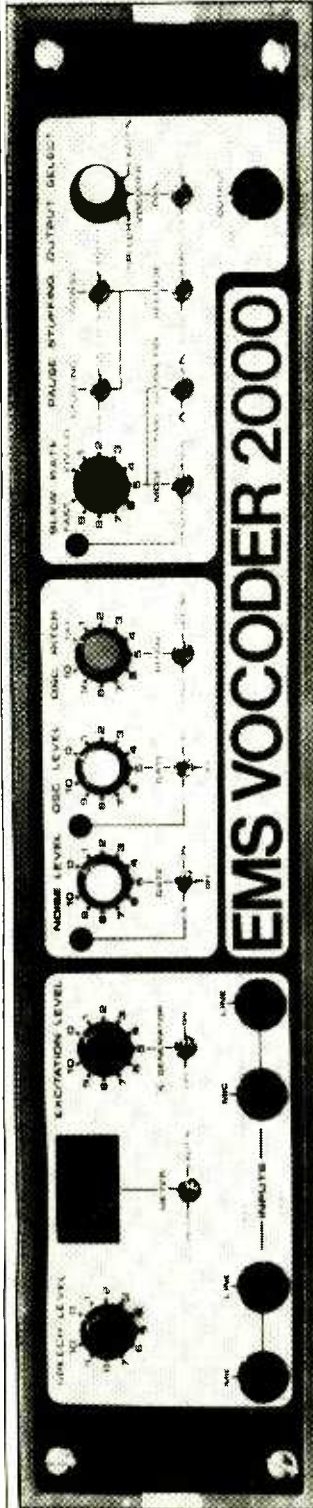
Electronic Music Studio Supplies
5832 Westminster Avenue
Montreal

Piano Center
122 Rue de Paris
Montreal 93100
Paris

EMSA (Electronic Music Studios of America, Inc.)
269 Locust Street
Northampton
Massachusetts

EMS West Germany
7257 Ditzingen 3/Hiemerdingen
Finkenstrasse 4
07152 - 53273

EMS
The Priority
Great Milton
Oxford
08446 - 729



SURVEY: CARTRIDGE MACHINES

reference +16 dBm.
Distortion: <0.25% at +16 dBm at 400 Hz.
Wow and flutter: <0.2% (no conditions).
Features: normally free-standing but up to three modules can be accommodated across a standard 483 mm rack; air-damped solenoid does away with the need for pre-loading or cartridge eject mechanism.

HARRIS

Harris Corporation, Broadcast Products Division, PO Box 290, Quincy, Ill 62301, USA.
Phone: (217) 222 8200.
UK: Dynamic Technology Ltd, Zonal House, Alliance Road, London W3 0BA.
Phone: (01) 933 2401 Telex: 935650.

CRITERION 90 SERIES

Type: single-slot replay-only (90-1), triple-slot replay-only (90-3) and single-slot record/replay (90-2); full remote control.
Cart format and size: all models are available in mono or stereo formats with or without primary (1 kHz), secondary (150 Hz) and tertiary (3.5 kHz) tones for NAB A, AA, B and BB carts (90-1 and 90-3), or A, AA, B, BB, C and CC carts (90-3).
Frequency response: +3, -2 dB, 50-300 Hz; ±2 dB, 300-16k Hz.
Signal-to-noise: mono -58 dB typical, stereo -55 dB typical; reference 1 kHz at NAB standard level of 160 nW/m.
Distortion: <1.5% at NAB standard reference level at 1 kHz.
Wow and flutter: ≤0.15%, NAB-weighted.
Features: free-standing or rack-mounting versions available; start time adjustable 0.08-0.5s; hysteresis synchronous motor and direct-drive capstan.

IGM

IGM, 4041 Home Road, Bellingham, Wa98225, USA.
Phone: (206) 733 4567.
UK: Lee Engineering Ltd, Napier House, Bridge Street, Walton-on-Thames, Surrey, KT12 1AP.
Phone: Walton-on-Thames 43124. Telex: 928475.

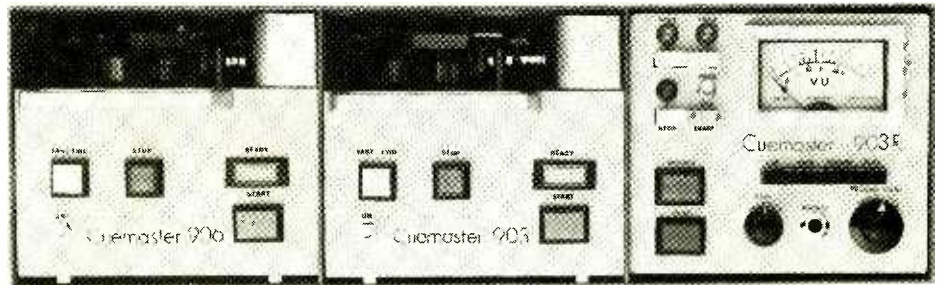
INSTACART

Type: available in either 12, 24 or 48-slot format for automated broadcasting applications. All machines can be supplied in mono or stereo.
Cart format and size: all cue tones on A carts.
Frequency response: "meets or exceeds NAB standards for cartridge tape recording..."
Signal-to-noise: -50 dB ref NAB level, unweighted.
Wow and flutter: <0.2% rms.

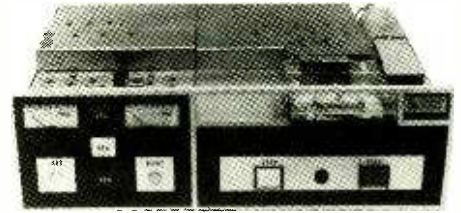
GO-CART

This system is a mass cartridge handling player intended for automated broadcasting applications. The desired cartridge is rotated in carrier until it

Mono cart machines from the Cuemaster 900 series



reaches the playing position. The machine removes the cart from the carrier belt and inserts it in the playing slot. The basic Go-Cart is supplied with a single playback deck and 42 cartridge positions. The unit may be expanded by adding more carrier trays to the belt up to a maximum of 78 cartridges in a 2m high cabinet. The manufacturer states the playing position meets all NAB specifications in terms of electrical and electronic performance.



ITC RP series

ITC

International Tapetronics Corporation, 2425 South Main Street, Bloomington, Ill 61701, USA.
Phone: (309) 828 1381.
UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts, WD6 4RZ.
Phone: (01) 953 0091. Telex: 27502.

3D SERIES

Type: three-slot replay-only machine in either mono or stereo.
Cart size: A and B.
Frequency response: ±2 dB, 50-15k Hz.
Signal-to-noise: 55 dB below tape 3% thd point; this figure is not related to the standard NAB recording level.
Wow and flutter: <0.2% rms, unweighted.
Features: one cue tone standard, other two optional. Record unit WRA may be used in conjunction with the bottom deck.

RP SERIES

Single-slot machines offering record/replay capabilities. Technical specification similar to 3D Series.

SP/WP SERIES

Play-only versions of RP Series. The SP models accept A and B size carts, while the WP model accepts C versions as well. Technical specification as per 3D Series.

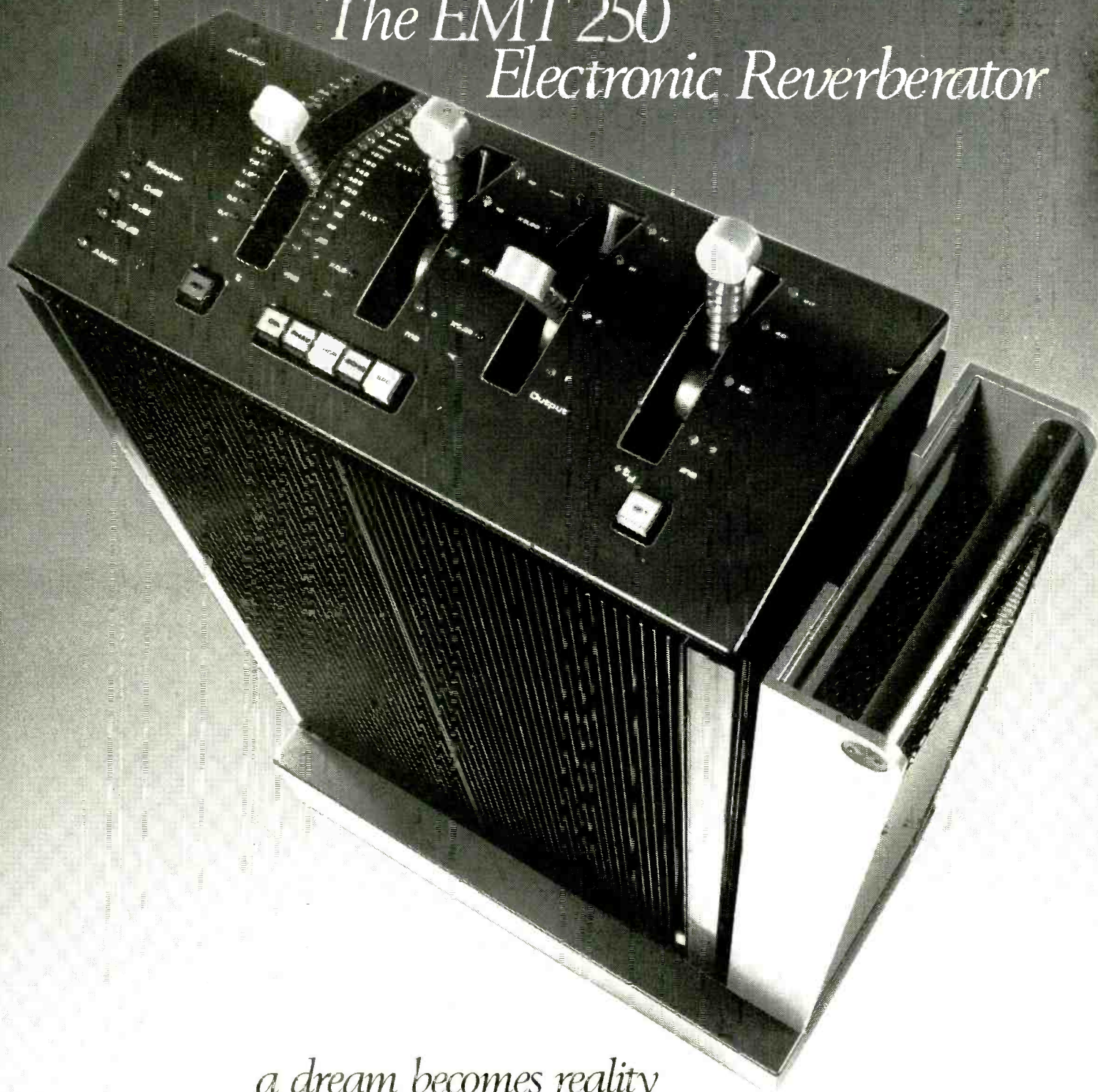
PD-II SERIES

Type: low-cost machines available in both play and record/play versions.
Cart size: A.
Frequency response: ±2 dB, 50-12k Hz.
Signal-to-noise: 52 dB below 3% thd recording level.
Wow and flutter: ≤0.2%, NAB-weighted.

SIS

SIS Recording Studios Ltd, 57 St Andrews Road, Northampton NN1 2PB, UK.
Phone: Northampton (0604) 30559.
Agents in Belgium, Denmark, Netherlands, Norway, Sweden and West Germany.

The EMT 250 Electronic Reverberator



a dream becomes reality

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

SURVEY: CARTRIDGE MACHINES



Model SR131 record/replay machine from SIS is not intended for broadcast use

The company manufactures two mono-format machines aimed at the small studio and discotheque market. It must be stressed that neither is intended for use as broadcast machines.

S130

Type: replay-only, single-slot, remote control for stop/start.

Cart format and size: mono plus primary cue tone on A or AA.

Frequency response: ± 3 dB, 40-16k Hz at -10 dB reference 185 nWb/m.

Signal-to-noise: > 48 dB, 20 kHz bandwidth, reference 185 nWb/m 0 dB.

Price: £235; \$480.

SR131

Type: record/replay, single-slot, remote control for stop/start.

Cart format and size: mono plus primary cue tone on A or AA.

Frequency response: ± 3 dB, 40-16k Hz at -10 dB reference 185 nWb/m.

Signal-to-noise: > 48 dB, 20 kHz bandwidth, reference 185 nWb/m.

Features: led recording level display and front-panel level adjustment.

Price: £375; \$755.

SONIFEX

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

Phone: Wellingborough (0933) 650700.

Q-PAC SERIES

Type: series of cart machines available in mono, stereo, replay and record/replay versions; the record machine Q-PAC-R is mono only.

Cart format and size: AA.

Sonifex Q-PAC record machine



Frequency response: ± 2 dB, 50-12k Hz ref 1 kHz.

Signal-to-noise: 56 dB ref 160 nWb/m.

Wow and flutter: 0.15% rms (conditions unspecified).

Features: low price and compact size. Single cue tone only.

Price: between £147 and £290.

QFX SERIES

Type: QFX-250 mono; QFX-500 stereo; QFX-R recorder.

Cart format and size: AA.

Frequency response: ± 2 dB, 40-15 kHz.

Signal-to-noise: 56 dB ref 160 nWb/m.

Wow and flutter: 0.15% (conditions unspecified).

Features: fast forward, single tone; QFX-R will record three tones. Model S5000 is basically a QFX Series machine with $+50$, -30% varispeed.

Price: between £385 and £514.

SQUIRE

Roger Squire's Pro-Audio, 55 Charlbert Street, London NW8 6JN.

Phone: (01) 722 8111. Telex: 298133.

S3000

Type: low-cost machine in mono-only, available with an optional record amplifier.

Cart size: A.

Frequency response: ± 3 dB, 50-12k Hz.

Signal-to-noise: -56 dB at unspecified conditions.

Price: £149; record amp £145.

S5000

Type: single-slot replay-only machine fitted with varispeed for band accompaniment.

Cart size: A.

Frequency response: ± 2 dB, 40-15k Hz.

Signal-to-noise: -62 dB (conditions unspecified).

Wow and flutter: 0.15% (conditions unspecified).

Price: between £355 and £495.

SPOTMASTER

Broadcast Electronics Inc, 4100 North 24th Street, Quincy, Ill 62301, USA.

Phone: (217) 224 9600. Telex: 250142.

UK: Broadcast Audio (Equipment) Ltd, PO Box 31, Douglas, Isle of Man.

Phone: Douglas (0624) 4701. Telex: 627900.

2000 SERIES

Type: a range of single-slot machines available in mono and stereo, in either replay-only or record/replay versions.

Cart format and size: NAB A carts; primary and secondary cue tones fitted as standard.

Frequency response: ± 2 dB, 50-15k Hz.

Signal-to-noise: -54 dB at NAB reference level, mono; -52 dB stereo.

Distortion: $\leq 2\%$ at $+16$ dB output level (magnetic reference level unspecified).

Wow and flutter: 0.2% rms, unweighted.

Features: may be supplied with an audition module for audible cue; 80 ms start/stop time.

Price: between £450 and £795.

3000 SERIES

Type: broad-spectrum series of machines in mono, stereo, replay-only or record/replay versions. The machines can be supplied in a number of widths depending on the size of cartridge to be used. For instance, the 3100 measures only about 15 cm wide, enabling three units to be placed side by side within a standard 483 mm rack.

Cart format: various models will accept A, B and C carts, respectively 3100, 3200 and 3300; primary cue tone.

Performance: generally as for 2000 Series (see above).

Features: start/stop time of 100 ms; Phase Lok III head bracket is claimed by manufacturer to minimise phasing errors between channels.

Price: between £697 and £1295.

4000 SERIES

Type: in performance details, this series is identical to the 3000 Series. Principal difference is machine size. The model accepting A and B size cartridges requires half standard rack width; size A, B, and C cart models occupy full rack width. The series is available in the usual mono, stereo, replay and record/replay versions.

Features: options include automatic/manual fast forward facility as well as secondary and tertiary cue tones.

Price: between £720 and £1295.

5000 SERIES

Type: multislot machines—5300 is three-slot and 5500 five-slot. The bottom slot can be used with an accessory amplifier module to enable recording work to be carried out with the machine.

Cart format and size: all models are available in mono, stereo, replay and record/replay versions. Machines will accept both A and B cart sizes.

Performance: as for 3000 and 4000 Series.

Features: options include secondary and tertiary cue tones accessed by field insertion of appropriate circuit card.

Price: between £1498 and £1796.

TEN/70

Type: single-slot machine with a fast forward facility fitted as standard; mono, stereo, replay and record/replay versions.

Cart format and size: mono or stereo A and B size.

Frequency response: ± 2 dB, 50-15k Hz.

Signal-to-noise: -54 dB at NAB standard reference level.

Distortion: $\leq 2\%$ record to playback at 160 nWb/m at 1 kHz.

Wow and flutter: 0.2% rms, unweighted.

Features: options include secondary and tertiary cue tones.

NAGRA

complete the picture...



...with their new NAGRA E

A dilemma Nagra were suffering for some time, was how to produce a self-contained Professional Tape Recorder which incorporated all the qualities of their highly acclaimed Nagra 4.2, but could be marketed in the lower price range. Almost anyone can manufacture a cheaper version of a successful product but Nagra were determined not to sacrifice standards for economy. Well, we are happy to announce they have achieved the perfect solution with the new Nagra E.

The astounding saving of around 50% has been principally achieved by the simplification of the speed stabiliser—a single operating speed of 7½ ips is provided. The tape deck and transport mechanism are closely similar to that

used on the Nagra 4 Series, which has become renowned worldwide for its reliability and performance.

Good news, for the operator in the field, is that the new model is slimmer and lighter than the 4.2 and comes complete with a measuring probe, circuit diagram and some essential spares. This means that bias adjustment resulting from tape type change can be easily carried out away from base. A single microphone input is provided which can be switched to accept dynamic or condenser types.

TECHNICAL DATA

Dimensions: 13.8 x 9.3 x 4in (351 x 336 x 104 mm)

Weight: 12.6 lbs (5.75 kg) with tape and batteries

Wow and flutter: ± 0.1%

Reels: 7 in cover open, 5 in cover closed.

Loudspeaker: 1.0W both switchable Tape/Direct

Headphones output

Frequency response recorded at -20 dB: 30—15,000 Hz ± 2 dB

S/N ratio, ASA "A": better than 66dB

Temperature range: 4°—158°F (-30 to + 70°C)

Please send me further details of the new NAGRA E and other models in the range.

Name _____

Address _____

HAYDEN

HAYDEN LABORATORIES LTD
Hayden House, Churchfield Road, Chalfont St. Peter,
Bucks, SL9 9EW Tel: Gerrards Cross 88447

SS4/NAG

SURVEY: CARTRIDGE MACHINES

500 SERIES

Type: single-slot machine accepting A, B and C size carts. Models available for desk or standard rack operation; they can be supplied in usual mono, stereo, replay and record/replay versions.

Performance: generally as other models except frequency response. Quoted as ± 2 dB, 50-12k Hz.

Features: can be obtained with delay mode of operation; 400 Series is an economy version of 500 Series.

MINI SERIES 303/305

Type: three and five-slot versions respectively of Ten/70 series of machine; can be supplied for desk mounting or in standard rack.

605/610CR

Type: five and ten-slot machines suitable for use in automated broadcast systems; decks have one cue tone as standard with an optional secondary and tertiary cue tone.

Cart format and size: mono, stereo, replay and record/replay versions; cart sizes A and B.

Frequency response: ± 2 dB, 50-12k Hz.

Signal-to-noise: 45 dB below standard NAB level at 1 kHz.

Features: a range of remote control and sequencer units. A recording module *MRM 600A* fits into a deck slot turning the slot above into a recording unit.

TAPECASTER

Tapecaster TCM Inc, Box 662, Rockville, Maryland 60851, USA.

UK: Roger Squire's Pro-Audio, 55 Charlbert Street, London NW8 6JN.

Phone: (01) 722 8111. Telex: 298133.

X700 SERIES

Type: single-slot mono, stereo, replay or record/replay machines.

Cart size: not stated.

Frequency response: ± 3 dB, 40-15k Hz.

Signal-to-noise: -60 dB at unspecified measurement conditions.

Wow and flutter: <0.2% conditions unspecified.

Features: claims to exceed the basic NAB specification in every detail.

Price: between £470 and £940.

TELEX

Telex Communications Inc, 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420, USA.

Phone: (612) 884 4051. Telex: 297053.

Netherlands: Pieter Bollen Gelvidstechniek BV, Hastelweg 6, Eindhoven.

Phone: (040) 512777. Telex: 59281.

West Germany: Radio-Technische Werkstätten GmbH, Neusser Str 397-399, D-500 Köln 60.

Phone: (0221) 764035. Telex: 8885217.

UK: Avcom Systems Ltd, Newton Works, Stanlake Mews, Stanlake Villas, London W12 7HS.

Phone: (01) 749 2201. Telex: 897749.

MC SERIES

Type: single-slot machines available in mono, stereo, replay-only and record/replay versions.

Cart format and size: AA or BB.

Frequency response: ± 1 dB, 50-15k Hz (exclusive of head contour effects).

Signal-to-noise: 52 dB stereo, 54 dB mono ref standard NAB level.

Distortion: record to replay less than 2% at standard NAB level.

Wow and flutter: <0.12%, peak-weighted.

Features: three cue tones as standard; fast wind mode

Price: from about \$1100, £600 up.



MCI DEALERS ARE LOCATED THROUGHOUT THE UNITED STATES AND THE ENTIRE WORLD . . .

AUDIO CONSULTANTS, INC.

Nashville, TN 37212; (615) 256-6900
Richardson, TX 75081; (214) 238-0605
(Dallas office)
Florence, AL 35630; (205) 766-6624
(Muscle Shoals office)

AUDIO INDUSTRIES CORP.

Hollywood, CA 90028; (213) 851-4111

AUDIO TECHNIQUES, INC.

Stamford, CT 06902; (203) 359-2312

AUSTIN PROFESSIONAL AUDIO, INC.

Austin, TX 78701; (512) 477-3706

MILAM AUDIO CORPORATION

Pekin, IL 61554; (309) 346-3161

PACIFIC RECORDERS and ENGINEERING CORPORATION

San Diego, CA 92121; (714) 453-3255

SOUND 80, INC.

Minneapolis, MN 55406; (612) 721-6341

WORLD ELECTRONICS, INC.

N. Miami Beach, FL 33160;
(305) 949-8918

INTERNATIONAL

GERMANY (WEST)—R. BARTH KG,
Hamburg; (49-40) 229-8883

HOLLAND—PIETER BOLLEN

Eindhoven; 040-512777

BELGIUM—DELTA EQUIPMENT S.A.

Brussels; (011-32-2) 376-6034

ENGLAND—MCI (Professional Studio Equipment) LTD.

London; (011-44-1) 388-7867

FRANCE—STUDIO EQUIPMENT S.A.

Paris; (011-33-1) 647-6401

SPAIN—SINGLETON PRODUCTIONS

Barcelona; (011-34-3) 228-3800

SWEDEN—TAL OCH TON A.B.

Goteborg; 031-13 02 05, 13 02 16

CANADA—CHROMACORD CORP.

Lachine, Quebec; (514) 636-8183

MEXICO—AUDIO Y CONSULTORIA

Mexico 11, D.F.; (905) 584-2713

ARGENTINA—PLATTEN S.R.L.

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COLOMBIA—INGESON LTDA.

Bogota; 43-60-44

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NEW ZEALAND—CEPAK AUTOMATION LTD.

Wellington; (011-64) 736-898

JAPAN—CONTINENTAL FAR EAST, INC.

Tokyo; (011-81-3) 583-8451

KOREA—AUDIO SUPPLY COMPANY

Seoul, PO Box 46, Ma-Po Post Office

REPUBLIC OF SOUTH AFRICA—VITAPHONE (PTY) LTD.

Johannesburg; 22-2067/22-0665

WEST INDIES—PROFESSIONAL SOUND EQUIPMENT LTD.

Kingston 11, Jamaica; 93-39138

PUERTO RICO—HOPE, BENNETT, BLACKBURN, INC.

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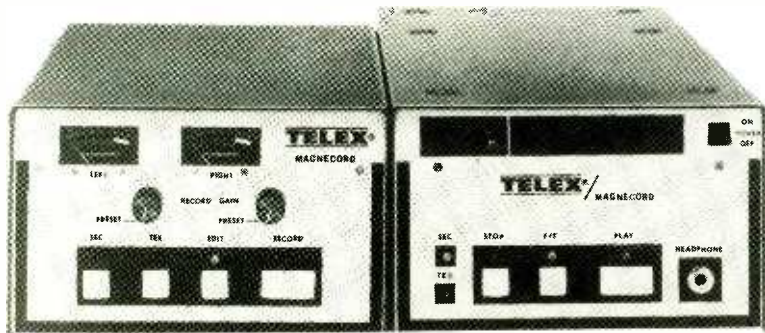


Professional Recording Equipment

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Fort Lauderdale, Florida, USA 33334
Phone (305) 566-2853 / Telex 51-4362



Left: Broadcast Electronics Spotmaster model 3200 RPS stereo record/replay machine for size A and B carts



Below: Record/replay model from Telex MC Series

BROADCAST TURNTABLES

EMT

EMT-Franz GmbH, Postfach 1520, D-7630 Lahr, West Germany.

Phone: 07825-512. Telex: 754319.

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

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

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

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

EMT 928

Speeds: 78, 45 and 33 $\frac{1}{3}$ rpm.

Type: belt drive; three-phase induction motor driven from internal oscillator.

Start time: 1s.

Wow and flutter: <0.1% to DIN 45507.

Tone arm: EMT 929.

Rumble: unweighted better than -50 dB; weighted to DIN 45539 -65 dB.

EMT 930

Speeds: 78, 45 and 33 $\frac{1}{3}$ rpm.

Type: friction drive from mains-powered hysteresis motor.

Start time: 0.5s.

Wow and flutter: <0.075% to DIN 45507.

Tone arm: EMT 929.

Rumble: -46 dB unweighted; -64 dB DIN-weighted.

EMT 950

Speeds: 78, 45 and 33 $\frac{1}{3}$ rpm; optional varispeed over $\pm 6\%$ range.

Type: direct-drive from dc servo motor.

Start time: 0.2s.

Wow and flutter: less than 0.05% measured to



Harris CB1201 turntable

DIN 45507.

Tone arm: EMT 929.

Rumble: -54 dB unweighted; -70 dB DIN-weighted.

Other: available in three basic versions—chassis standard width, chassis narrow width and console-mounting.

HARRIS

Harris Corporation, Broadcast Products Division, PO Box 290, Quincy, Ill 62301, USA.

Phone: (217) 222 8200.

UK: Dynamic Technology Ltd, Zonal House, Alliance Road, London W3 0BA.

Phone: (01) 993 2401. **Telex:** 935650.

CB1201

Speeds: 33 $\frac{1}{3}$, 45 and 78 rpm.

Start times: less than 1/16 turn (22.5°) at 33 $\frac{1}{3}$ rpm, 1/10 turn at 45 rpm and 1/2 turn at 78 rpm.

Wow and flutter: <0.1%, NAB-weighted at 33 $\frac{1}{3}$ rpm.

Speed accuracy: < $\pm 0.3\%$ at 33 $\frac{1}{3}$ rpm.

Rumble: 45 dB (stereo) below NAB reference level recorded at 3.54 cm/s rms velocity at 33 $\frac{1}{3}$ rpm.

Features: synchronous motor and idler-wheel drive.

McCURDY

McCurdy Radio Industries Ltd, 108 Carnforth Road, Toronto, Ontario M4A 2L4, Canada.

Phone: (416) 751 6262. **Telex:** 963533.

UK: Seltech Equipment Ltd, 16 York Road, Maidenhead, Berks SL6 1SF.

Phone: Maidenhead (0628) 36315. **Telex:** 848960.

US: McCurdy Radio Industries Inc, 1051 Clinton Street, Buffalo, NY 14206.

Phone: (716) 854 6700. **Telex:** 4923219.

SS3159

This unit comprises a National (Technics) SP10D direct-drive turntable platter with speeds of 33 $\frac{1}{3}$ and 45 rpm, and a Micro-Trak 303 tone arm complete with Stanton 500L or Shure M44C cartridge, mounted in a console. Local or remote operation is provided, and an optional cue amplifier is available.

Frequency response: within 0.5 dB of RIAA curve, 30-10k Hz; ± 1 dB of RIAA curve, 10-20k Hz; 0-10 dB roll-off below RIAA response also available.

Speed regulation: <0.15% with varying load.

Wow and flutter: <0.03% rms.

Rumble: better than -50 dB to DIN A-weighting, or -55 dB to IEC B-weighting, or -70 dB to DIN B-weighting.

Distortion: 0.5% at +8 dBm output, 30-20k Hz, using reverse RIAA input network.

MCI

MCI Inc, 4007 NE 6th Avenue, Fort Lauderdale, Florida 33304, USA.

Phone: (305) 566 2853. **Telex:** 514362.

UK: MCI (Professional Studio Equipment) Ltd, 54-59 Stanhope Street, London NW1 3EX.

Phone: (01) 388 7867. **Telex:** 26116.

The company is to introduce a broadcast turntable system comprising the following units: a Technics SP10 MkII turntable platter, Ortofon arm and an RIAA pre-amplifier built specially by Audio & Design. The unit will be available in either a standard horizontal 483 mm rack-mounting format, or built into a standard MCI console. Price of the latter configuration is expected to be about £1000. 54 ►



Right:
EMT 950
turntable in
'narrowline'
format

Below:
EMT 928
turntable





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



BROADCAST PATTERN AUDIO JACKFIELDS FROM FUTURE FILM DEVELOPMENTS

19in Rack Mounting,
from one to six rows

of 20, 24 or 26 Jacks. The jacks are mounted on a plastic block which is in turn mounted on a 19in panel. Each row is fitted with a legend (designation) strip and wire support bar. The panel is steel, cadmium plated, chromate passivated and stove enamelled hammer-tone silver.

ALSO Audio Patch Cords . Microphone Cable . Installation Cable . Multiway Cable . Post Office and Render Jacks . Cable Markers . Lever Keys . Linear Faders . Cannon Connectors . Preh Connectors . Tuchel Connectors . Switchcraft Connectors . Military Tri-Lock Bayonet Connectors . Audio Attenuators . Wahl and Weller Soldering Irons . PML Microphone Accessories . Hellermann Sleeves and Tools . Crimp Terminals . Cable Drums . AB Engineering Wire Strippers and DeSolder Guns.

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LONDON W1R 3HR

Tel. 01-437 1892/3
Telex: 21624 Aloffd G

SURVEY: BROADCAST TURNTABLES

MICRO-TRAK

Micro-Trak Corporation, 620 Race Street, Holyoke, Mass 01040, USA.
Phone: (413) 536 3551. Telex: 955497.
UK: Lee Engineering Ltd, Napier House, Bridge Street, Walton-on-Thames, Surrey, KT12 1AP.
Phone: Walton-on-Thames 43124. Telex: 928475.

MODEL 720

Speeds: 33 $\frac{1}{3}$, 45 and 78 rpm.
Weight of platter: 2.5 kg.
Drive system: synchronous motor driving platter through idler.
Start time: 1/16 revolution at 33 $\frac{1}{3}$ rpm.
Tone arm: deck drilled for Micro-Trak 303 arm.
Wow and flutter: 0.3%.
Rumble: 36 dB below NAB standard level.

MODEL 740

Similar to the above model, but with only two speeds —33 $\frac{1}{3}$ and 45 rpm. This unit carries a slightly heavier platter.

The company also manufactures a range of tone arms to suit its turntables.

RUSSCO

Russco Electronic Manufacturing Inc, 1070 Brookhaven Drive, Clovis, Ca 93612, USA.
Phone: (209) 299 2167.
UK: Roger Squire's Pro-Audio, 55 Charlbert Street, London NW8 6JN.
Phone: (01) 722 8111. Telex: 298133.

STUDIO-PRO

Speeds: 33 $\frac{1}{3}$ and 45 rpm.
Platter weight: 3 kg.
Drive system: idler wheel.
Wow and flutter: 0.2% (conditions unspecified).
Rumble: -38 dB (conditions unspecified).
Start time: 1/16 revolution at 33 $\frac{1}{3}$ rpm.
Price: £251.

CUE-MASTER

Speeds: 33 $\frac{1}{3}$, 45 and 78 rpm.
Platter weight: 2.5 kg.
Drive system: idler wheel.
Wow and flutter: <0.3% (conditions unspecified).
Rumble: -36 dB (conditions unspecified).
Start time: 1/16 revolution at 33 $\frac{1}{3}$ rpm.
Price: £216

SPOTMASTER

Broadcast Electronics Inc, 4100 North 24th Street, Quincy, Ill 62301, USA.
Phone: (217) 224 9600. Telex: 250142.
UK: Broadcast Audio (Equipment) Ltd, PO Box 31, Douglas, Isle of Man.
Phone: Douglas (0624) 4701. Telex: 627900.

CUE-MASTER

Speeds: 33 $\frac{1}{3}$, 45 and 78 rpm.
Start time: about 1/10 of a revolution at 45 rpm.
Wow and flutter: <0.3%.
Rumble: 36 dB below standard NAB level.
Platter weight: 2 kg.
Features: accepts 25 cm tone arms.

STUDIO PRO

Speeds: 33 $\frac{1}{3}$ and 45 rpm.
Start time: 1/10 of a revolution at 45 rpm.
Wow and flutter: <0.2%.
Rumble: 38 dB below standard NAB level.
Platter weight: 2.5 kg.
Features: accepts 25 cm tone arm.

TECHNICS

Matsushita Electric Trading Co Ltd, PO Box 288, Osaka Central, Japan.
Phone: Osaka 2045111.
UK: Technics, 107-109 Whitby Road, Slough, Bucks SL1 3DR
Phone: Slough 27516
US: Technics by Panasonic, One Panasonic Way, Secaucus, NJ 07094.

SP10 MkII

Reviewed in September 1977 issue, p66.
Speeds: 33 $\frac{1}{3}$, 45 and 78 rpm.
Weight of platter: 2.9 kg.
Drive system: direct-drive, phase-locked to quartz reference.
Start time: 0.25s to 33 $\frac{1}{3}$ rpm, equivalent to 25° rotation at the same speed.
Wow and flutter: 0.025% rms to Japanese standards; 0.035% to DIN 45507.
Rumble: -50 dB to DIN 45539A.
Features: remote start facility.
Price: £500 approx.

SL-1000MkII

This is a plinth-mounted version of the SP10 MkII, complete with a high-quality titanium tone arm.

Other quartz-controlled models available: SL-1300Mk2, SL-1400Mk2, SL-1500Mk2. ■

Technics SP10 MkII turntable, power unit and remote control



THE GREATEST LITTLE 8 TRACK IN THE WORLD THE NEW FULL LOGIC BRENELL MINI 8



The first one inch tape recorder to bring true professional standards within the grasp of the smaller budget conscious studio.

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Hornsey, London, N.8. Tel: 01-340 3291 Telex: 267727 BATGRP G**

work

Never mind the oscilloscopes, here come the earholes

Worthing is a quiet South Coast town locked happily into the retired persons residential area mode. Of the 90 000 population, at least a third are 65 years old or over. Picturesque scenery, bingo, inevitable coastline, low industrial profile; and in the summer, a good deal of sun. Perhaps you remember the old Southern Region 'Sunny Worthing' posters? No, oh well—believe me, it's got everything.

So it may seem surprising to discover that, nestling in the very centre of this little haven, is an all-electric, fully equipped, 24-track recording studio; the only one on the South Coast, in fact. I refer of course to Pebble Beach Sound Recorders Ltd, whose managing director is Andy Cowan-Martin. 'You may remember these premises as Saturn Studios' he said, 'before Adam Seif bought the place and we updated to 24-track.' Adam Seif is a musician and, as it happens, son of Marks and Spencer magnate Edward Seif; he is also the company chairman.

Andy Cowan-Martin, it is fair to say, has always had a finger in the music business. He started a sound-on-sound 2-track studio in a converted garage in the Sixties, with eggboxes on the walls and two AKG D202s, on Hayling Island, Portsmouth. 'Worst thing was the smell of the eggboxes,' he recalled, 'although they did the job acoustically.' When he wasn't recording music he was managing and/or promoting it.

When Andy joined as studio operations manager, Saturn Studios were 4-track, later expanding to 16-track before the creation of Pebble Beach in 1976. 'With the help of marketing manager Andrew Gould, we've diversified the Pebble Beach company activity into associated fields, such as a record company, production leasing and sale, and artist management. So unlike Saturn we don't rely solely on studio hire business.' OK, but why set up a studio in Worthing in any case? 'Why not?' (Andy again.) 'Bands are used to travelling to gigs and expect to work when they

get there; and we're only 90 miles from London.' Pebble Beach keep aside a floor of the nearby Central Hotel for overnight stay, which is included in their daily hire rate. 'The most important thing about a studio is not so much where it is but rather the staff, the facilities, and the indefinable atmosphere that goes with a good studio'.

The studio complex, purpose-built for Saturn, is a fire escape and a couple of alleys away from their office suite; no more than two or three minutes walk. It comprises a studio, control room, kitchenette and toilet, all on one level. The 65 m² studio takes the form of a reversed L; a double glass panel joins it to the control room area at the long end, where a Yamaha *Conservatory* piano sits, with a drum riser situated at the shorter end. In the knee of the L is a 'bright' varnished cork area, designed primarily for bass instruments, adjacent to the double-door

loading access. These doors are so spaced that, assuming loading operations are complete, the resulting void can be used as a vocal/acoustic booth. For this purpose mic and foldback lines are plumbed in, and there's even a little heater.

'Because the studio had a relatively small area, it was obvious that we had to utilise every bit of space to its maximum potential,' said Tony Platt, the chief engineer who modified the studio acoustics with Andy Cowan-Martin when Pebble Beach took over. 'So we designated various areas for use with particular instruments. When we first took the studio over, the entire area—walls, ceiling, floor—was covered with *Travacoustic* tiles, making it very dead. We needed the option of a "bright" or a "dead" response in various parts of the studio, so the first thing we did was to remove all the tiles, and plaster onto the *Jiproc* board beneath. We then had to choose the right kind of curtain material, and decide where best to put it.'

You may already feel that such phrases as, 'rule of ear', 'experience' and 'custom-built' are appropriate in describing Pebble's acoustical analysis techniques. You would be right, with the perhaps unusual proviso that, in this case, such methods seem to have worked. Tony Platt frankly admits that: 'We went round several curtain shops and "listened" to curtains.' Follow that. But curtains were found, and are mounted on slides

around selected areas of the studio. House-built mobile screens of high density foam, faced with hardboard on one side and hessian on the other, provide screening where required. Standing-wave breakers stand proud of the wall in places, these being part of the BBC design on which the studio was originally based. The walls surrounding the piano have been felt-covered, producing a particularly pleasing 'bright' characteristic.

Mic and foldback lines are terminated together on panels at logical intervals around the studio just below knee height, foldback levels being musician-controlled via plug-in distribution boxes feeding the robust Beyer *DT100* cans. There are no permanent studio monitors, these being hooked-in when required. Talkback is via a single Eagle pa horn, and a reverse talkback system is to be fitted soon.

Tony Platt is a great believer in using the right tool for the right job, a view that splices neatly into his 'never-mind-the-oscilloscopes his 'never-mind-the-oscilloscopes here-come-the-earholes' philosophy with AKG *D202*, Neumann *U87* and Electro-Voice *RE20* microphones. There can be no doubt that the Electro-Voice is the star of the show as far as Tony is concerned, a microphone selected especially for the debut album of Pebble Beach recording artist Sonny Worthing, as you will already know if you study your ads... 'It's the

58 ►

Pebble Beach control room



The Professional's Choice



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The deck that closes the gap between top ranking amateur tape recorders and full grown professional studio machines. Full logic control and motion sensing, 3 tape speeds, real-time counter, open head format, built-in mixer with balanced mic. inputs and RIAA pre-amplifier make the A700 a self-contained and versatile recording system.

The Modular B77

Latest addition to the Revox range, the B77 with its logic control, self-sharpening tape cutter, easy access to heads, remote and varispeed controls and modern styling make it the natural choice of the semi-professional and the true Hi-Fi enthusiast.

Sole U.K. distributors, F.W.O. Bauch Limited, 49 Theobald Street,
Boreham Wood, Hertfordshire WD6 4RZ

STUDER REVOX

WORK

most amazing multipurpose microphone I've ever come across,' enthused Tony, a freelance engineer for many years before he joined Pebble Beach. 'It has a remarkably selective cardioid response; we've recorded an acoustic guitar on it, adjacent to a fully operating drum kit, with only a hint of snare crosstalk on the guitar track. It's also very robust, does not suffer from proximity effect bass boost, and the response and clarity at the top end is frightening!'

At this point we moved on to the control room. Its 19m² floor was carpeted; also the walls and ceiling. Mounted either side of the double glass panel were JBL 4350 monitors powered by Turner 500 amps with bi-amplified bass and top spectra. Standing on an elevated section was the control hardware: a wrap-around custom built 32/24 Helios desk, originally acquired from Rampart Studios. In addition to the usual parametric eq, monitor and foldback panels, the desk was fitted with ten Audio & Design F700 compressor-limiters and four Roger Mayer noise gates, which apparently were put through their paces recently by a French punk rock band. Tony explains: 'They had a rhythm box with bass drum, snare drum and hi-hat all coming out of one mono output. They wanted to split it across three tracks. First my head ached, then my eyes began to water . . . but using the noise gates and limiters together, with judicious use of eq, both before and after the noise gates, we were able to split the compound rhythm into its three components, and later mix them down at the level and in the position we wanted. When I'd got back up on my stool . . .' he continued, 'the RM noise gates seem to be a lot smoother and faster in operation than Kepex gates. We found that by playing around with the threshold and decay times we could completely change the rhythm emphasis, which was quite amusing.'

Delay effects are provided by two AMS delay flanger units, two high speed Revox A77s with 100% varispeed, and a Studer A62 which doubles for copies. Reverberation is provided by a large stereo EMT plate tucked away in the kitchenette.

The mastering machine is a Leavers-Rich *Proline 2000* which was selected mainly for its ease of servicing. 'In one respect we're working in a hostile environment, in so much as we don't have a



Our photographer was so amazed by the neat shape and home-grown acoustics of the studio that he was trembling when he took this pic. That's his story anyway . . .

permanent maintenance engineer.' (Maintenance engineer Roger Peyton is on 24-hour call.) 'We wanted a machine that could be easily maintained as far as possible by the average balance engineer. So for our particular application everything seemed to point to the *Proline*. A similar reasoning applies to our 50 mm Lyrec 24-track; it's very easy to line up and maintain, the circuit cards being easily accessible. It's also, of course, cheaper! The Lyrec remote control console which we also use, has been a great bonus to us. A nice feature on the Lyrec is the 2-position bias select facility, which allows us to offer the option of BASF or Scotch tape to clients.' Both main recording machines are fitted with Dolby A noise-reduction equipment.

Pebble Beach's staff all show enthusiasm and competence, attributes more often seen apart. The youngest member of the staff, Eli Perl (the other engineer), joined them two years ago after spotting an ad in the local press for a 'young tape assistant'. Within a matter of days he'd memorised the number of sugars, and who preferred tea. After three months Tony Platt threw him in at the deep end and he did his first full session. Tony now considers Eli to be a very

competent engineer, the advantage of this training being that he still makes a lovely pot of tea. Eli, who previously worked for London-based Lightning Records, describes his first taste of studio engineering succinctly as 'terrifying'.

So who books studio time? 'Anybody from a record company to a private individual', said Tony Platt. 'Pete Gage came in to produce Linda Kendrick's single *Go On Girl* for Private Stock Records recently. When he took the tape to Private Stock they nearly kissed him—loved it, in fact. He finds it convenient to use us, likes the studio and in particular, I suspect, our Electro-Voice microphone sound!' And what studio wouldn't like that? 'We manage singer/songwriter Sonny Worthing for Transatlantic Records, who's doing very well in Europe at the moment. We're in all the directories now and most record companies know us; we also produce and manage the punk rock band The Depressions. So work comes in from all different directions. We're happy to see our product finding its way into offices throughout the music business, because we know we get a good sound.'

Finally, any funnies on the private individual would-be-client

front? Tony again: 'We had a query from a lady once who, as it turned out, played piano like Mrs Mills, had the same name, and if I remember right, even looked like Mrs Mills. She phoned us up, told us she wanted to record some piano music, and asked us how much we charged per hour. We told her, and to our surprise, she seemed happy with it. So we booked her in. We were just about to ring off when she said, "Oh, one thing I know I must ask you: what type of tape recorder should I bring?"'

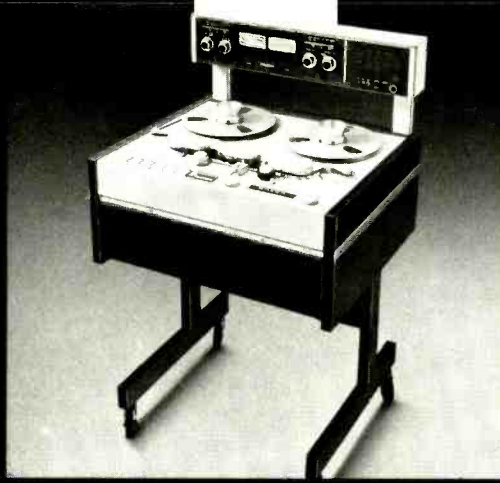
Richard Dean

agony

The four-piece rock band were new to the recording business; in fact this, their first demo in a small out-of-town studio, was shaping up pretty badly. Where was the 'atmosphere' achieved on stage? The vocals, for a start, sounded out of tune. Actually, they were always out of tune; during the band's two years of road experience this unsettling home truth had been obscured by high volume, bad pa and beer. The same went for the drummer's erratic beat, the lead guitarist's incompetent solos, the bass player's duff notes . . . Suffice it to say that this band were musically incapable.

The studio couldn't reverb the vocals as requested, so the inevitable tape echo was heavily deployed, in the best bathtime-on-the-Swiss-Alps tradition. Still the band were not happy. The lead guitar sounded 'flat', at least that's how they described it. Couldn't the engineer do something with it? Suddenly he had it. Inverse echo, he thought. This bunch won't understand it, but they'll love it! And sure enough, he was right. For after he had re-threaded the tape, echoed the now backward guitar, and replayed the finished sequence, he was congratulated heartily.

After a little thought, the lead guitarist, three quarters over the moon, remarked: 'That's a really great effect. Hey, fellas, I think we ought to use that live.'

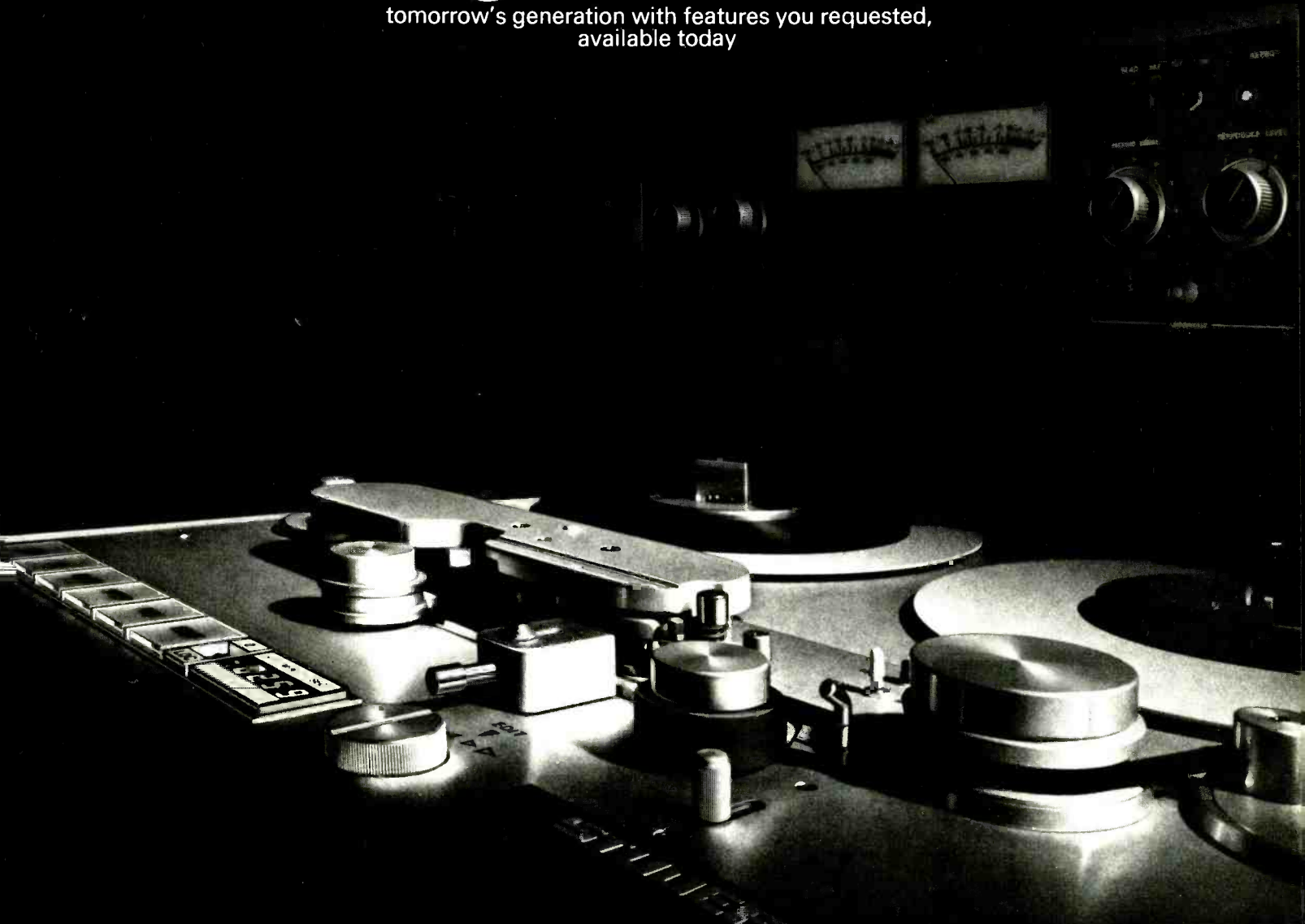


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reviews

Ivie 10A spectrum analyser

Hugh Ford

MANUFACTURER'S SPECIFICATION

Measurement ranges: Calibrated -110 dBm to $+9$ dBm using external jack input; measures to $+49$ dBm (218V rms) using optional accessories; calibrated 45-146 dB spl using built-in microphone; accuracy of calibrated ranges ± 1 dB.

Filters: octave bandwidth ANSI S1.11 1966 Class 1, second-order Chebychev; selectable detector decay times—pink noise mode 3.8 dB/s, monitor mode 42 dB/s; centre frequencies 32, 63, 125, 250, 500, 1k, 2k, 4k, 8k and 16k Hz, accuracy $\pm 3\%$ (typically $\pm 1\%$); relative filter flatness ± 0.5 dB; passband flatness 0.5 dB (ripple); A-weighted and C-weighted sound level filters; filter shape and accuracy satisfies ANSI S1.4 1971 type S2A, S2C and IEC 123 (1961) for 'slow' response.

Display: 10-channel 160 led array; dynamic ranges of 45, 30 and 15 dB selectable with resolution steps of 1, 2 or 3 dB; display leds adjust intensity automatically for room brightness; graticule has automatic 'solid-state' edge lighting.

Pre-amplifier: 100k ohm input impedance; 0-80 dB gain in 10 dB steps; bandwidth 10-40k Hz; flatness ± 0.5 dB (20-20k Hz); thd 0.1% at 2V rms for loads ≥ 600 ohm; damage level input 1000V ac or ± 1000 V dc; output short-circuit protected.

Microphone: omnidirectional condenser microphone cartridge, sound level measurement Type 2; typical microphone preamp response flat to 8 kHz then ± 1 dB to 18 kHz at incidence 0° free field (taken from manufacturer's graph).

Power: battery operation—nickel-cadmium rechargeable, at operating time approximately 2 hours continuous at 25°C , fast-charge cycle of 3 hours; low-battery indicator light; ac-line operation—from ac adaptor/charger, 115/230V ac 50/60 Hz; charge indicator light.



Environmental: all circuits temperature compensated; operating temperature -10°C to $+50^\circ\text{C}$; non-operating temperature -30°C to $+65^\circ\text{C}$; operating humidity 0-90% meets ANSI S1.4-1971 and S1.11-1966 (R1975).

Dimensions (whd): 69 x 153 x 41 mm.

Weight: 430g net.

Price: £381.

Manufacturer: Ivie Electronics Inc, 500 West 1200 South Orem, Utah 84057, USA.

UK Agent: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Hertfordshire.

THE IVIE IE-10A spectrum analyser is a small battery-operated instrument offering ten octave bands arranged on the standard centre frequencies of 31.5, 63, 125, 250, 500, 1k, 2k, 4k, 8k and 10k Hz. As this is a real-time analyser each octave band has its own level display, the complete display being formed by a 10 by 16 matrix of red led indicators. Each octave band's level display of 16 vertical leds is arranged such that only one indicator is illuminated at any given time. Thus the complete display is in the form of a horizontal line as opposed to a bar graph. Each octave band is easily identified with the leds arranged behind an edge-lit graticule that also bears three separate scales calibrated in decibels. A 3-position toggle switch selects the vertical range in decibels, allowing the level difference between display steps to be switched to 1, 2 or 3 dB. This gives ranges about the 0 dB calibration of $+3$, -12 dB; $+6$, -24 dB; or $+9$, -36 dB.

A further 3-position toggle switch selects octave analysis, A-weighting or C-weighting, and also fast or slow display response speed in the octave analysis mode. This is done by first selecting A-weighting and then octave mode for fast response; or first selecting C-weighting and then octave mode for slow response.

Two additional toggle switches form attenuators—one gives -10 or -20 dB attenuation and the other -30 or -60 dB attenuation. Using the inbuilt 25 mm condenser microphone the 0 dB condition is arranged such that 0 dB scale indication corresponds to 140 dB spl. Alternatively, the display may be switched to work with an external input, in which case the 0 dB scale indication represents an input of 0 dBm. Optional external attenuators may be used to extend the input voltage range.

The input is via a standard phono socket in the base of the instrument. A further phono socket provides an output from the pre-amplifier section of the instrument, and allows the microphone's amplified output to be fed to other testgear at a high level. The only remaining connector is a small jack socket into which the mains power unit/battery charger is plugged, for either running off the mains or fast charging the internal battery. During charging a red led indicator adjacent to the switches is illuminated—this indicator also lights when battery voltage becomes too low.

The readability of the display was found to be very good, with the brightness of the display leds and of the graticule illumination automatically adjusting to the ambient lighting conditions. However, it was not so easy to read the control settings, but this is inevitable in view of the small size of the instrument. Surprisingly, the instrument has to be handheld, since no facilities are included for fixing to a tripod or microphone stand; the inclusion of a standard bush would be a definite advantage.

In other respects the operation was delightful. Unfortunately, the input phono socket proved to be a rather unreliable connection—a more reliable type of connector could well be justified on such a piece of professional testgear.

Pre-amplifier

The input to the pre-amplifier was found to have a high input impedance of 99.3k ohm

62 ▶

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square wave (single pole -3 dB at 100 KHz) $+15$ KHz
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30 Hz-20 KHz Within 0.5 dB

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Clipping point complementary to RIAA curve
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50 Hz-20 KHz Within 0.5°

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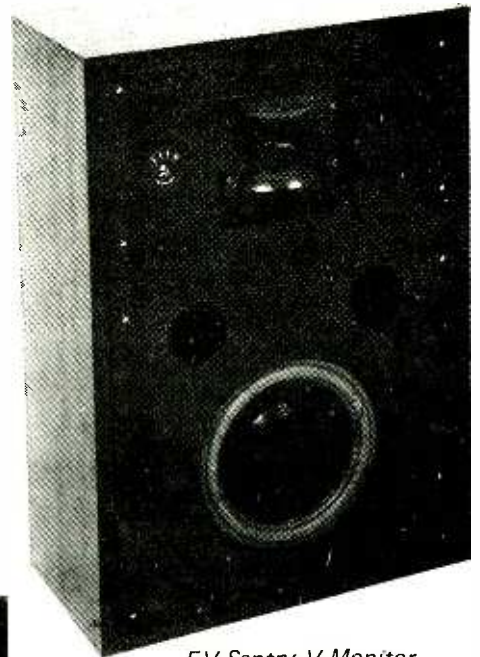
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IVIE 10A REVIEW

in parallel with 26 pF, and thus is suitable for connection to almost any signal. The output impedance was very low, and the input/output gain could be adjusted from 0 dB to 80 dB by means of the attenuator switches that provide 10 dB steps in gain.

Output clipping occurred at +11 dBm using a sinewave input, which corresponded to 2 dB above the maximum indication on the display. It would appear, therefore, that the crest factor capability of the pre-amplifier is inadequate when the maximum display levels are approached. The frequency response of the pre-amplifier for minimum and maximum gain settings is shown in fig. 1. It can be seen that the response is effectively flat from 20 Hz to 40 kHz, and well within specification.

Harmonic distortion of the pre-amplifier varied greatly with the gain in use, being well below 0.1% second or third harmonic at 0 dBm input and output but rising with the gain setting; fig. 2 shows the third harmonic at maximum gain and 0 dBm output. Although at first sight the distortion at high frequencies may appear large, this will not affect in any way the display, but does limit the use of the pre-amplifier for some other purposes.

Investigations into the accuracy of the two switched attenuators showed that the worst case cumulative error was 0.2 dB, with the maximum step error being 0.4 dB—an adequate performance for this type of instrument.

As is to be expected, the dynamic range at the pre-amplifier's output varied with the gain setting: output noise over a 20-20k Hz band was -71.5 dBm at minimum gain rising to -19 dBm at maximum gain, the appropriate A-weighted noise being -74 dBm and -21.3 dBm. Once again the noise performance is more than adequate when the pre-amplifier is used with the display, but caution may be required for other applications.

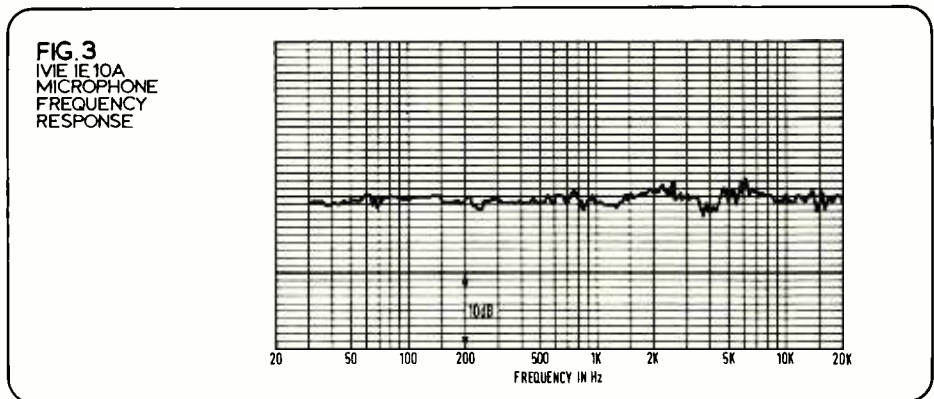
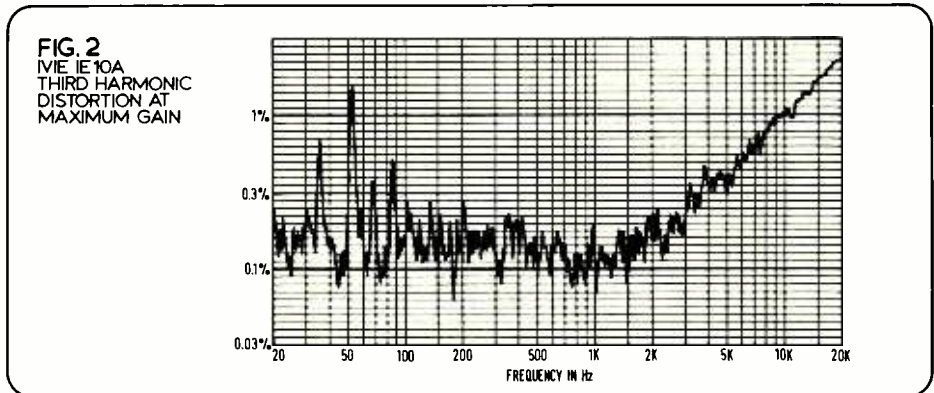
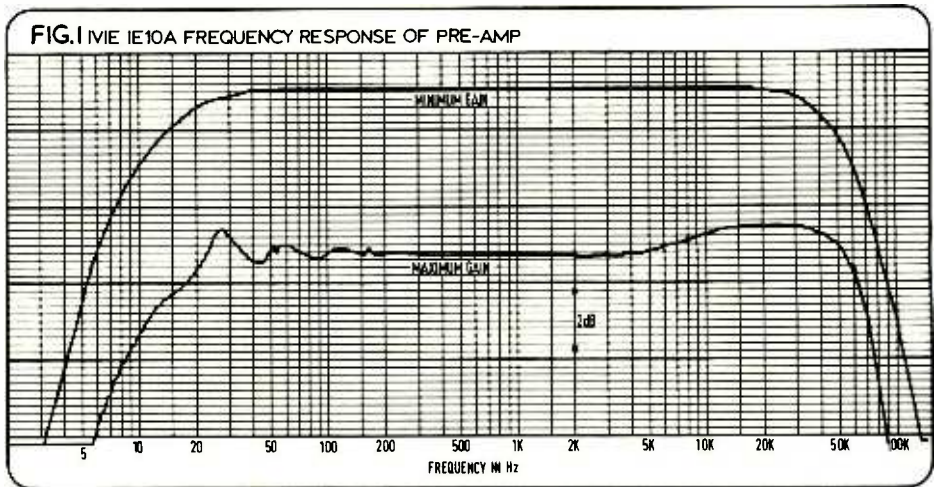
Display

When operating in the octave analysis mode the display can have one of two speeds of operation; the decay time in the fast mode being about 37 dB/s and in the slow mode about 3.5 dB/s. However, in either of the weighted modes the effective ballistics of the display were found to conform to the International Standard 'slow' characteristics, as per IEC 179 'Precision Sound Level Meters'. Furthermore, the rectifier in the instrument is a genuine rms rectifier as should be used for sound level measurements.

Checking the accuracy of the steps between the display led indicators showed that with the 1 or 2 dB per step settings the display was always within 0.4 dB step error or cumulative error over the full range. With the 3 dB per step setting the accuracy was within a worst case error of 0.5 dB between steps of 1.5 dB cumulative error over the full range. Thus the accuracy of the display is well within its readability.

Without plotting the filter shape for each of the octave filters it is difficult to determine the centre frequencies with good accuracy, but basic tests suggested that the centre frequencies were within $\pm 3\%$ of their nominal values, and within specification.

In fact the filter shape was plotted for two filters and found to be within the American



Standard S1.11 Class 1 requirements. The accuracy of the A and C-weighting curves was also well within the standard requirements.

When using maximum pre-amplifier gain and the 3 dB per step condition residual noise limits the display at the higher frequencies; the residual noise being -107 dBm in the 8 kHz octave and -101 dBm in the 16 kHz octave.

Use with the microphone

When using the instrument as a sound level meter the residual noise was found to be as above, but the A-weighted noise was equivalent to only 36 dB spl and the C-weighted noise 39 dB—a respectable performance for an instrument of this type. Checking the microphones on-axis frequency response produced fig. 3, which shows an adequately flat response

that extends above the upper limit suggested in the manufacturer's specification. A measurement of the microphone's sensitivity showed that the overall instrument was within 1 dB, which is the best that can be read on the display.

Summary

The Ivie IE-10A would appear to be an ideal instrument for checking room equalisation and for general maintenance purposes where a quick check on frequency response is desired. An added bonus is that it acts as a sound level meter, but in this role it is not sensitive enough for measuring the background levels in studios. So far as the performance is concerned, the only reservation I have is the crest factor capability of the pre-amplifier; in all other respects the instrument performed well and within specification. ■

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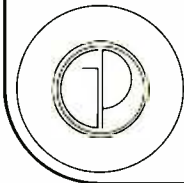
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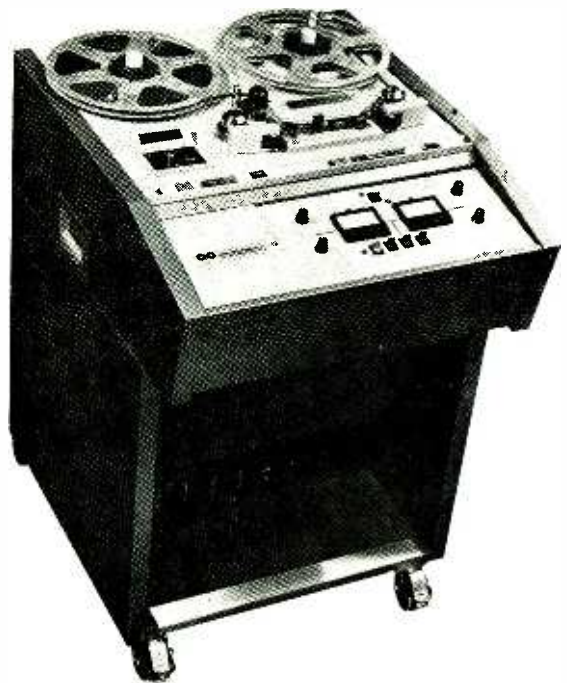


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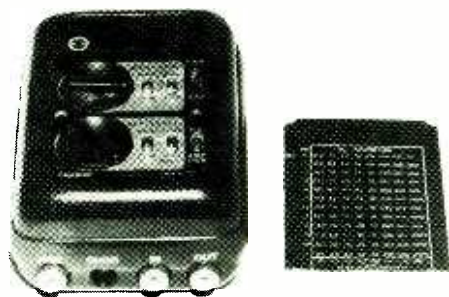
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Ivie I5A distortion analyser

Hugh Ford



MANUFACTURER'S SPECIFICATION

Analysers

Measures distortion 0.01-100% in nine ranges. 80 dB distortion range for inputs from 0.16V rms to 100V rms. Accuracy ± 1 dB. Input overload indicator. Fundamental rejection greater than 90 dB at 1 kHz. Input impedance 100k ohm shunted by less than 20 pF. Selectable highpass filter has 60 Hz rejection of 25 dB.

Oscillator

Selectable 1 kHz or 4 kHz tones. Frequency accuracy $\pm 5\%$. Output level adjustable from 1.0V rms to 1.0 mV rms. Harmonics 85 dB down at 1 kHz, 65 dB down at 4 kHz. 50 ohm constant output impedance.

Power

Battery operation: rechargeable nickel-cadmium. Operating time approximately 12 hours continuous at 25°C. Fast charge cycle of 3 hours. Low-battery indicator light. Ac line operation from ac adaptor/charger. 115/230V ac, 50/60 Hz. Charge indicator light.

Environmental

All circuits temperature compensated. Operating temperature -10°C to $+50^{\circ}\text{C}$. Nonoperating temperature -30°C to $+65^{\circ}\text{C}$. Operating humidity 1% to 90%.

Mechanical

Aluminium case fusion bonded with nylon. Dimensions (w x h x d) 69 x 92 x 39 mm. Net weight 285 gms.

Price: £153.

Manufacturer: Ivie Electronics Inc, 500 West 1200 South Orem, Utah 84057, USA.

UK Agent: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Hertfordshire.

THE IVIE IE-15A distortion analyser comprises two sections: a low-distortion oscillator with fixed nominal frequencies of 1 kHz and 4 kHz; and a notch filter section for fundamental rejection at a fixed nominal frequency of 1 kHz. Since it is intended for use with the Ivie IE-10A spectrum analyser the instrument does not contain any form of metering, but may be used with other forms of meter.

The analyser is housed in a small aluminium case which is well finished and very clearly laid out. All the controls are on the front, and the phono-type connectors for the signals and the jack connector for the external mains power supply/battery charger are at one end of the case. Powering is normally by the internal nickel-cadmium battery, but simultaneous battery charging and mains powering is achieved by a power unit supplied with the instrument. Power on is indicated by a red led indicator on the front of the instrument. A second led shows battery charging, and is also illuminated when the state of charge of the internal battery becomes too low for reliable operation.

The oscillator section is controlled by a 3-position miniature toggle switch that has an 'off' position and positions for 1 kHz and 4 kHz outputs. Output level is controlled by a potentiometer in conjunction with a toggle switch which provides high and low-output voltage ranges, the maximum output being nominally 1V rms and the minimum 1 mV rms.

Like the oscillator section the analyser section has a high/low-level switch and a potentiometer level control for setting zero level; in addition there is a red led indicator for showing overload conditions. Normal operation is by means of these controls and a flat/1 kHz notch toggle switch. The flat position is used to set zero level, while the notch position is used to measure total harmonic distortion of

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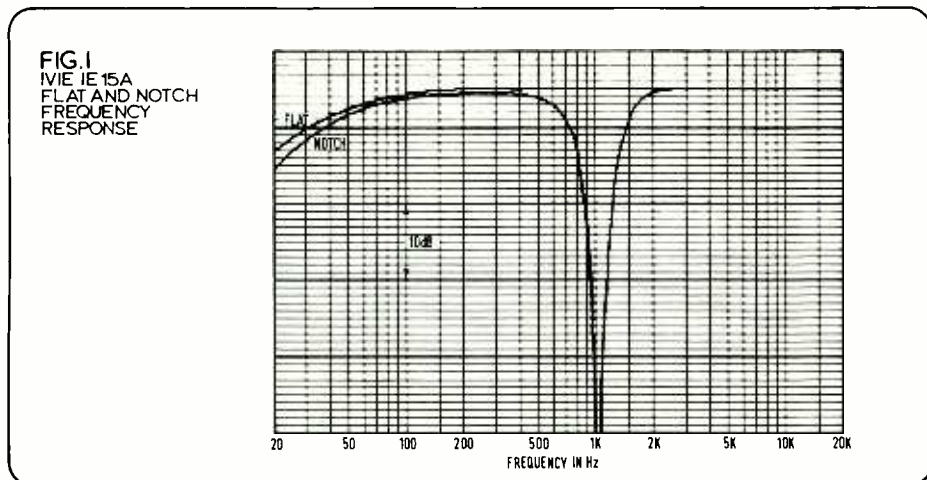
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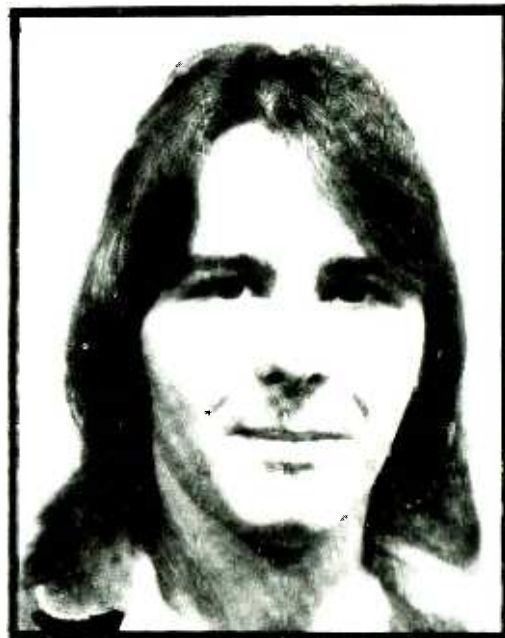
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*Freelancer Martin Lawrence engineered and mixed the Lol Creme/Kevin Godley three album masterpiece 'Consequences' which was released worldwide on 17th October by Phonogram.



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IVIE 15A REVIEW

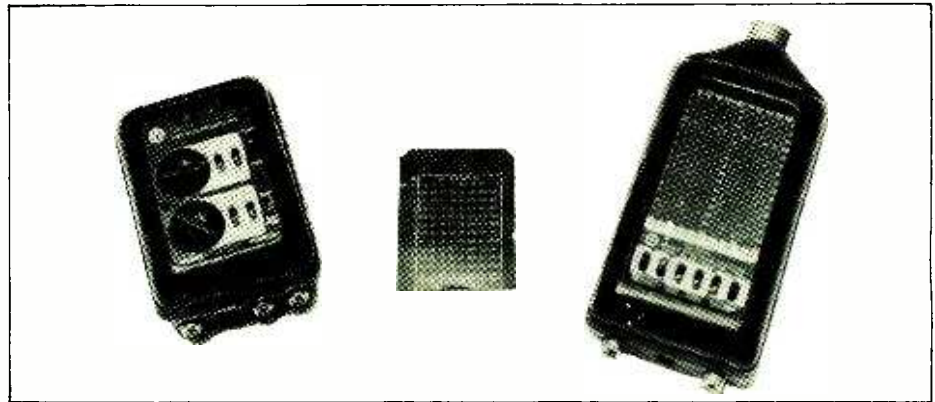
a 1 kHz signal. However, there is one further toggle switch that has positions for total harmonic distortion and amplifier power measurement. In the latter position the variable input level controls are bypassed, and a 40 dB attenuator inserted between the input and the output of the analyser section. This 40 dB attenuation brings down the high potential amplifier output voltages to suitable levels for measurement by the Ivie IE-10A.

As the spectrum analyser contains an A-weighting network, this facility can be used in conjunction with the distortion analyser to reduce the level of any mains hum in the distortion products. However, even though this practice is advocated by the manufacturers, it is potentially a source of errors in distortion measurement, since the A-weighting has a nominal boost of +1.2 dB at both 2 kHz and 3 kHz where the second and third harmonic of the 1 kHz fundamental tone lie.

Oscillator section

The maximum available output was found to be 1.14V rms at 1 kHz into an open circuit, with the 4 kHz output 0.2 dB less at all attenuator settings. In the 'high' output setting the potentiometer control allowed the output level to be reduced to 18 mV rms; the 'low' setting overlaps this range with a maximum output of 39 mV rms and a minimum of 0.6 mV rms. The output impedance was comfortably low and varied little with the attenuator settings, being between 52 and 49 ohm.

Distortion was measured into a high impedance and also into 600 ohm. The distortion of the 1 kHz signal was found to be constant with harmonics at least 90 dB below the fundamental (0.003%), and the total harmonic distortion and noise giving a reading of 0.006%.



Distortion at 4 kHz was higher, with the second harmonic predominating at -70 dB (0.03%), the third harmonic 2 dB lower and the higher harmonics at least 85 dB down.

The frequency of the oscillator was found to be either 988 Hz or 3.99 kHz, the latter exhibiting slight drift but not to a significant degree.

Overall, the oscillator performance can be said to be very good for the purpose of distortion measurement, but it is felt that the maximum available output of nominally 1V is too low for many professional applications. However, the available output levels are excellent for use with domestic equipment.

Analyser section

The input impedance of the analyser at 94.78k ohm in parallel with 16 pF was adequately high for any normal applications. The input voltage range for overload indication is also more than adequate at 200 mV to 6V in the low input range, or 4.5 to over 100V in the high input range.

Checking the notch filter, the characteristics of which are given in fig. 1, showed that it

had a maximum rejection in excess of 100 dB with negligible effect upon the level of the harmonics. The specified rejection of 90 dB was reached over the frequency range 977.8-997.0 Hz which, although outside the specification for frequency, is well within the measured frequency of the internal oscillator.

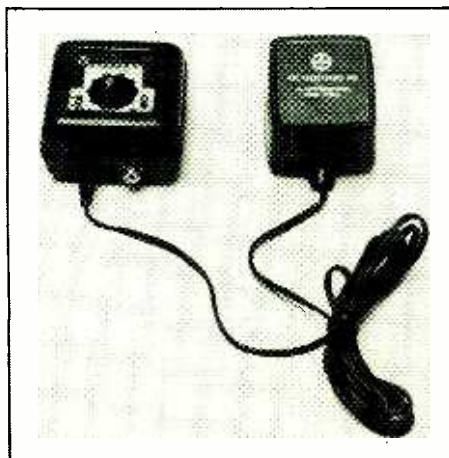
The residual distortion of the analyser section was found to be very good at less than 0.0025%, with the noise in the output being 20 μV, which is more than adequately low, in conjunction with a sensibly low output impedance of 10.49k ohm.

Summary

The Ivie IE-15A distortion analyser is a very useful tool for measuring total harmonic distortion at 1 kHz. It is functionally designed and very easy to use as no balance controls are needed. It is designed for use with the Ivie IE-10A spectrum analyser, but is not dedicated to this instrument and may be used with any sensitive meter. The only disadvantage is that alternative meters will probably not have facilities for reducing the effects of mains hum. ■

Ivie 20A pink noise generator

Hugh Ford



MANUFACTURER'S SPECIFICATION

Frequency range: 10-40k Hz, 3 dB bandwidth; ±0.5 dB, 20-20k Hz.

Output: level variable from 0.0-1.0V rms; crest factor 3.75; output attenuation selectable in 2 dB increments from 0 dB to -58 dB; cumulative error not more than ±0.5 dB; output short circuit protected; output connector standard phono jack.

Noise generation: digitally generated by CMOS circuitry; word length greater than 2 billion bits; clock rate 250 kHz; word repetition time 2.4 hours; noise distribution approximates Gaussian.

Power: battery operation—rechargeable nickel-cadmium, operating time approximately 12 hours continuous at 25°C, fast charge cycle of 3 hours; low-battery indicator light; ac-line operation—from ac adaptor/charger, 115/230V ac 50/60 Hz; charge indicator light.

Environmental: all circuits temperature compensated; operating temperature -10°C to 50°C; non-operating temperature -30°C to +65°C; operating humidity 0-90%.

Dimensions (whd): 69 x 69 x 44mm.

Weight: 200g net.

Price: £112.

Manufacturer: Ivie Electronics Inc, 500 West 1200 South, Utah 84057, USA.

UK Agent: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Hertfordshire.

THE IVIE IE-20A is a miniature pink noise generator that may be operated either from its internal nickel cadmium battery, or from the

mains via a mains power supply that also acts as a fast battery charger. The latter is typical of many imported power units, in that it consists of a small case to which are attached the prongs of an American-type flat pin plug. Of course this will not fit normal mains connectors but can be used with a shaver adaptor with UK 13A sockets. A mains tap switch is included in the charger that will operate from either 115 or 230V ac, the output of the charger being a lead equipped with a small jack plug to fit the noise generator.

The generator's output is via a standard phono socket that is fed from two attenuators: a ten-position rotary switch with 2 dB steps between 0 dB and -18 dB; and a three-position miniature toggle switch that provides 0 dB, -20 dB and -40 dB steps. Thus the nominal 0 dB output can be attenuated in 2 dB steps down to a maximum attenuation of -58 dB (-40 and -18 dB), with the nominal 0 dB level adjustable by a screwdriver-operated potentiometer accessed through the rear of the unit.

The only other control is an on/off miniature toggle switch located on the front panel. One red led indicator is illuminated when an output appears from the pink noise generator, and another serves two purposes: firstly when the

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IVIE 20A REVIEW

battery is being charged, and secondly if the voltage of the internal batteries becomes dangerously low during battery operation.

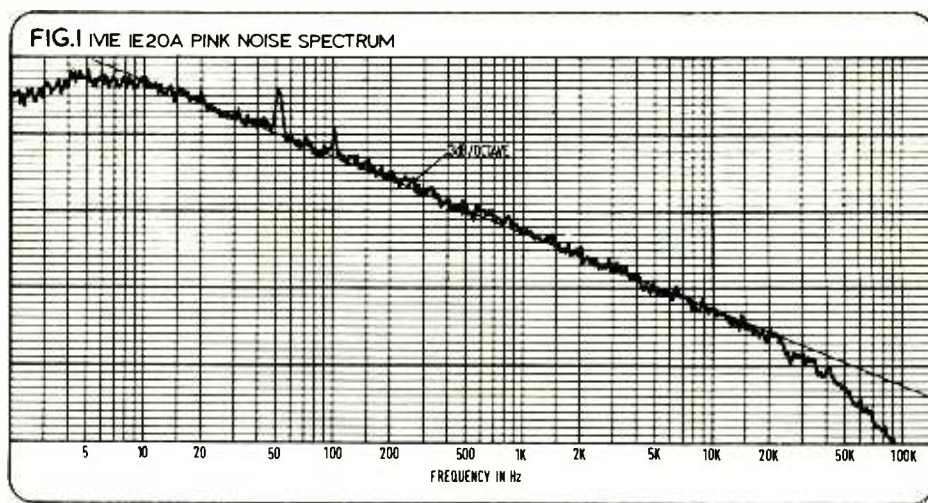
In operation all the controls were found to be easy to handle in spite of the small size of the unit, and the attenuator settings were clearly marked and easy to read.

Performance

As received the output voltage at 0 dB attenuation was found to be 0.96V as indicated on a wideband true rms meter, such that the output was effectively calibrated in dB relative to 1V. The rear screwdriver-operated level control provided a full range of adjustment, with easy calibration for 0 dB attenuator setting to correspond to 0 dBm (0.7746V) or lower values if desired.

The 20 dB toggle switch attenuator was checked for accuracy at both 1 kHz and 8 kHz using $\frac{1}{3}$ -octave filtering, and found to have a worst error of 0.3 dB at either frequency; the rotary 2 dB step attenuator was found to always be within 0.2 dB either step error or cumulative error—more than adequate performances well within specification. The output impedance rose to a maximum of approximately 16 ohm with adjustment of the attenuators—an adequately small impedance for virtually any applications.

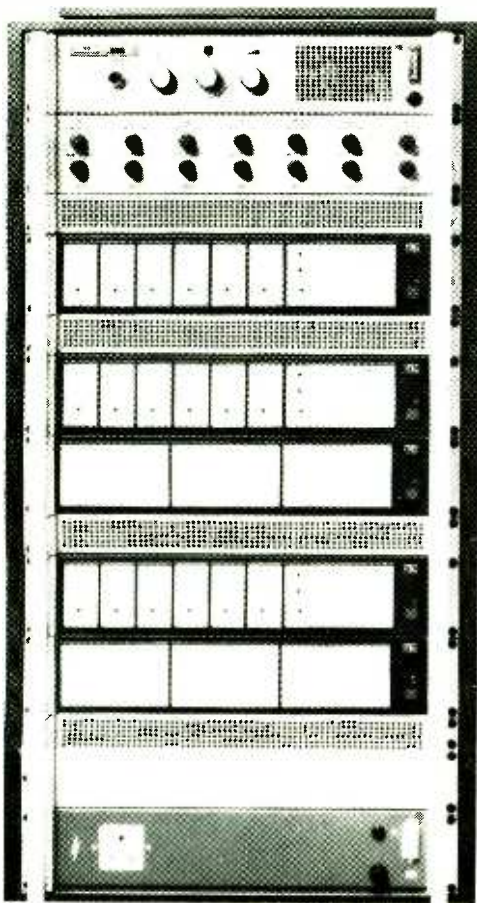
As can be seen from fig. 1, which is a constant bandwidth spectrum analysis of the noise output from 2 Hz to 100 kHz, the noise spec-



trum is very close to the theoretical 3 dB/octave line from 10 Hz to 20 kHz. It will be noted, however, that peaks occur in the analysis at 50 and 100 Hz. These are the result of mains powering during the production of the spectrogram; the level of hum is not significant for most likely uses. Spurious constant frequency outputs from the clock used to drive the digital noise generator were at a minimal level—always less than 300 μ V—and it is felt that the pink noise output has excellent characteristics for audio frequency response investigations.

Summary

The Ivie *IE-20A* pink noise generator is an excellent instrument for portable use, and is also much at home in the laboratory where a more sophisticated instrument is not available. Its performance is more than adequate for the equalisation of sound systems, and such purposes as aligning the frequency response of tape recorders and generally investigating transmission systems in conjunction with any form of suitable spectrum analyser—such as Ivie's own *IE-10A*. ■



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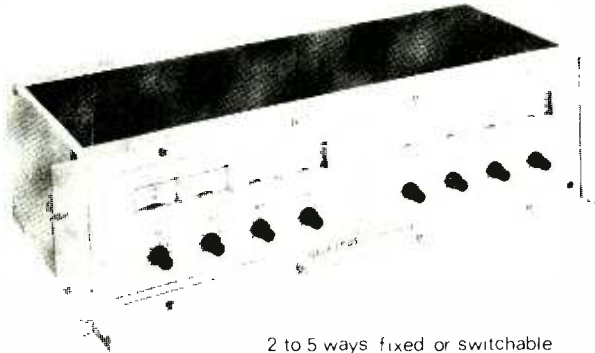
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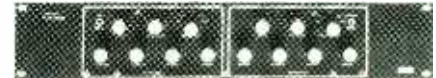
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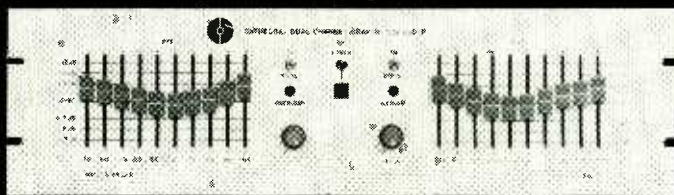
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Marshall time modulator

Nik Condron

AN OPERATIONAL ASSESSMENT

We had hoped to publish Nik's operation assessment in the January issue—alongside Hugh Ford's technical review. However, an extended tour prevented his completing it in time.

THE MARSHALL *Time Modulator* is the latest in a succession of delay lines that use either digital or analogue circuitry. Being an analogue device the Marshall has the advantage that 'quantising noise' and other types of digital error are eliminated. On spec, the noise figures are better than most other devices in this field—and practical use would certainly seem to bear this out.

The function of delay lines is to give a repeat of the input signal, the delay of which should be variable over as wide a time as is practical. The development of this function has been to extend the facilities of such units, enabling them to perform as many effects as possible. These range from 'repeat echo' at the longer time ranges, which is accomplished by feeding the output signal via a feedback loop to the audio input of the circuit. At the other end of the time-scale no audible delay can be heard, but due to phase cancellation the effect of phasing is produced. Add to this the facility to alter the pitch of the feedback signal and you have flanging. In between these two basic functions are a host of allied effects and sound-treatments, limited only by the capabilities of the particular device and the imagination of the engineer.

The *Time Modulator* is probably the most advanced unit produced so far. It is obvious that a great deal of time and energy have been spent on devising a machine that is at the same time able to provide as many functions as possible—and yet be ergonomically simple enough not to require a degree in electronics to use it! At first sight the front-panel layout appears very complex because the rack-mounted unit is built to the smallest vertical dimension possible at present. It is, in fact, the same size from the front as a Dolby 361. All the controls are clearly labelled and it doesn't take a lot of imagination to work out their exact functions. The device also comes with a very well laid out instruction manual, with the basic—and many more advanced—panel settings illustrated for the benefit of engineers who either haven't the time to go through the whole manual, or who are eager to get to grips with the machine the moment it is installed.

To make things even easier, the three input and output sockets at the rear are brought up to the front panel on 6.35 mm jack sockets. Working from left to right, the first control on the front panel is for input level, and is coupled with an overload led. The next control is labelled 'time delay' and is used for centering the delay and setting limits. It is also the manual flanging control, and has a led to indicate the overdrive point. The third main control is a time control voltage attenuator. This controls the level of the internal sine control voltage, the level of the external control voltage, and alters the depth of the effect function. Next to this is the 'position function switch' giving three effects: 'time mod', which is used for dynamic time functions such as flanging, vibrato, double-tracking and other effects; 'audio delay', which is used for any non-variable delay; and 'phase shift', which couples the auxiliary delay line. This second delay line is a totally separate section and provides an overall delay of the total affected sound. On spec, it gives the unit a total delay time in excess of 100 ms. The control voltage input is rated from zero to +10V—the higher the voltage the shorter the delay. This voltage range makes it possible to hook up a synthesiser to the device. The only controls not mentioned so far are four level controls: 'feed through', which governs the degree of the original signal to the output or input of the unit before the auxiliary delay line, and controls the level of the first signal in a single delay function (in the single delay mode) or the odd numbers of a regenerated signal; 'feedback control' which, as its name suggests, is the control used for strapping back the overall signal to the input of the device, controlling regeneration and resonance; 'delay output', which controls the level of the delayed signal or even numbers in a regeneration signal; and 'overall output', which is the only control for the auxiliary delay output level. These four controls must be adjusted together to produce the right degree of effect in more complex sounds.

What I liked about the machine was its accessibility, especially in the external control voltage function. Despite it being physically half the size of many simple flangers or delay units, it performed under fire as well as any of these—and in many cases better. A lot of the effects it produces can be achieved with more conventional devices, though not nearly so easily. It is not hard to obtain passable adt, triple track, resonant flange or 'cardboard tube

echo' with the equipment available in most studios. However, using this kind of analogue unit it is possible to achieve a greater flexibility with such effects, and to try out in a few moments many interesting alternatives. With the *Time Modulator* it is possible to turn what begins as an ordinary chorus effect into a resonant vibrato; or even interval and arpeggio effects like those of a primitive sequencer. Many exciting possibilities are available using the temporary pitch change facility of this kind of circuit.

All of the flow-diagrams detailed in the manual should provide a good basis for experiment, and will also serve to provide an engineer with a very good working knowledge of the abilities of the *Time Modulator*. I was fortunate enough to have the machine in my own studio for about a week, while I was working on a solo synthesiser project. Later on, during the final mixes in a large London studio, I was able to use the device again to provide some very exciting effects on several of the tracks. Because of the primitive nature of my own studio, I had to record many of the 'modulated' signals onto backing tracks. Many of the resulting sounds, which I discovered more by luck than judgment, were so evocative that in certain cases they formed the basis of that particular title.

The machine isn't cheap. But as it would replace much existing equipment, it would seem to be very worthwhile—especially to a studio where space is at a premium. My only criticism is that because of its small size it's often hard to reach the controls—or read their legends when the unit is racked with other equipment. I would suggest to any studio installing a *Time Modulator* that it be placed at eye level in good light, preferably mounted between two blank panels of the same size as an aid to concentration.

Even now it surprises me how quickly yesterday's technological masterpiece can become simplified and packaged in little boxes for the use of musicians on stage. It is a very good thing that this should happen—and sooner or later it will occur with the *Marshall Time Modulator*—because otherwise recording studios would be the only domain in which these effects could be used. Surely the idea of these units is ultimately to enhance music—not just provide clever noises—and as such must be available to the professional performer who wants to achieve as good a sound on stage as he can in the studio. ■



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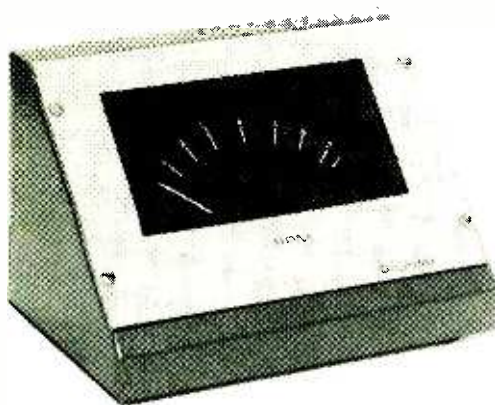
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Soundex peak programme meter



Hugh Ford

MANUFACTURER'S SPECIFICATION

Input impedance: minimum 16k ohms; floating or unbalanced
Frequency range: 15-35k Hz
Supply voltage: 24V dc (other supply voltages to order)
Supply current: 150 mA including illumination
Meter scaling: either 'dB' (-22 to +4 dB) or 'ppm 1-7'
Finish: two-tone; light brown hammer finish case with light grey semi-gloss front panel

Rise and fall times: 4 ms and 1s respectively, for zero level
Temperature range: 0-40°C
Input connections: two cables of 2m—twin-screened audio connection and dc power supply input (power supply available.)
Dimensions (whd): 150 x 95 x 95 mm
Price: £75.
Manufacturer: Soundex Audio Ltd., 91 Farmer Road, Leyton, London E10

THE SOUNDEX peak programme meter consists of an Ernest Turner meter movement, to the back of which a small printed circuit board is fitted to contain the electronics of the meter drive amplifier. The complete unit is housed in a small sloping panel instrument case which gives the whole unit quite a smart appearance.

Two leads each of 2m in length protrude from the rear of the case; in production meters these will be installed with a Heyco grommet which should give the leads security against being pulled out of the casing. One lead allows powering of the meter's electronics from a +24V dc supply, and the other twin-screened lead is the unbalanced signal input.

While no power supply is included in the meter's case, an optional unit is available. It is

understood that in the future a power supply in a matching case that will fit to the rear of the meter's case will be available. The optional power supply unit was in the form of a glass-fibre pcb with solder-spill output terminals and a screw connector for the mains power input. Both this and the electronics fitted to the meter appeared to be well made with professional quality components. The illuminated meter movement was to the requirements of British Standard 4297:1968, which relates to the standard peak programme meter as used by the British Broadcasting Corporation.

In passing it does no harm to remind readers that this standard meter is different to quasi-peak instruments as specified by the German DIN standard or the CCIR Recommendation 468, and that none of the instruments read true

peak levels of transient signals. Measurement of an equipment's noise performance is normally performed with the latter instruments, and not with a peak programme meter which will give different results.

Anyhow, returning to the Soundex ppm, its performance was evaluated in terms of the British Standard 4297:1968, 'Specification for the characteristics and performance of a peak programme meter'. The meter movement has the standard scaling from 1 to 7 in white on a black background with a white pointer—all correct to standard dimensions. Although the meter is illuminated the light level was rather dim. However, the manufacturer is modifying the illumination in production instruments.

The zero-level calibration for meter mark '4' was found to be within 0.1 dB of the nominal 0 dBm. It can be seen from table 1, however, that the meter sensitivity for other scale marks, which should be 4 dB apart, is not within standard requirements.

TABLE 1 METER SENSITIVITY

Meter reading	Actual input (dBm)	Standard requirement
7	+13.2	+12 ± 0.5
6	+7.8	+8 ± 0.3
5	+3.9	+4 ± 0.3
4	0.0	0.0
3	-4.0	-4 ± 0.3
2	-7.4	-8 ± 0.3
1	-11.0	-12 ± 0.5

Unlike the sensitivity results, the frequency response as shown in fig. 1 was found to be extremely flat, where it should be flat, and to roll-off correctly at low frequencies. The unbalanced input was found to have an impedance of 17.2 kohm in parallel with 520 pF (including the 2m input cable).

The overload characteristics were found to be satisfactory, as was the sensitivity to reverse polarity errors and the response to isolated unidirectional pulses. But, while the fall time from meter mark '7' to mark '1' was within specification at a measured 3.1s, the response to tone bursts as shown in table 2 was not to standard.

TABLE 2 TONE BURST RESPONSE

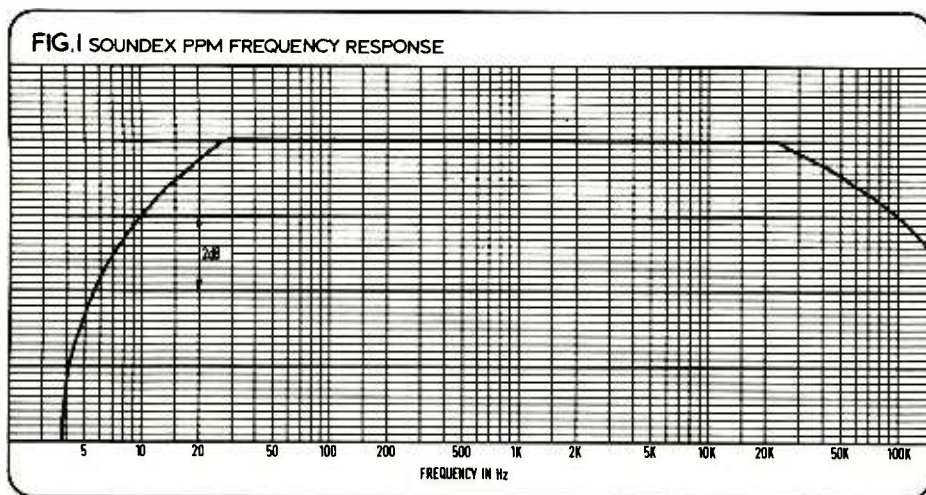
5 kHz burst length	dB with respect to mark 6 reading	standard requirement
steady state	0.0	0.0
100 ms	+0.3 dB	0.0 ± 0.5 dB
10 ms	-1.0 dB	-2.5 ± 0.5 dB
5 ms	-1.5 dB	-4.0 ± 0.75 dB
1.5 ms	-4.0 dB	-9.0 ± 1.0 dB

Summary

This instrument turned out to be rather disappointing with its poor scale linearity and poor dynamic performance in terms of the British Standard or BBC peak programme meter. Maybe these are simply factors that can be corrected by means of internal pre-set adjustments, but the instrument was certainly not up to standard as supplied.

Manufacturer's comment:

While we regret that the pre-production sample sent for review exhibited incorrect alignment, we would like readers to note that each unit sold is accompanied by an individual calibration certificate verifying its conformity to BS 4297.



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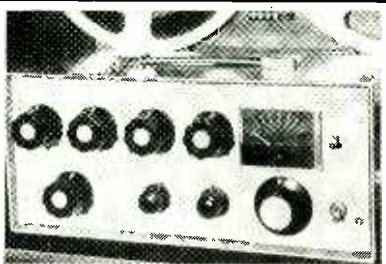
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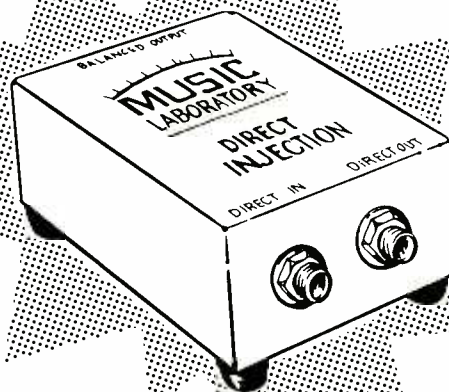
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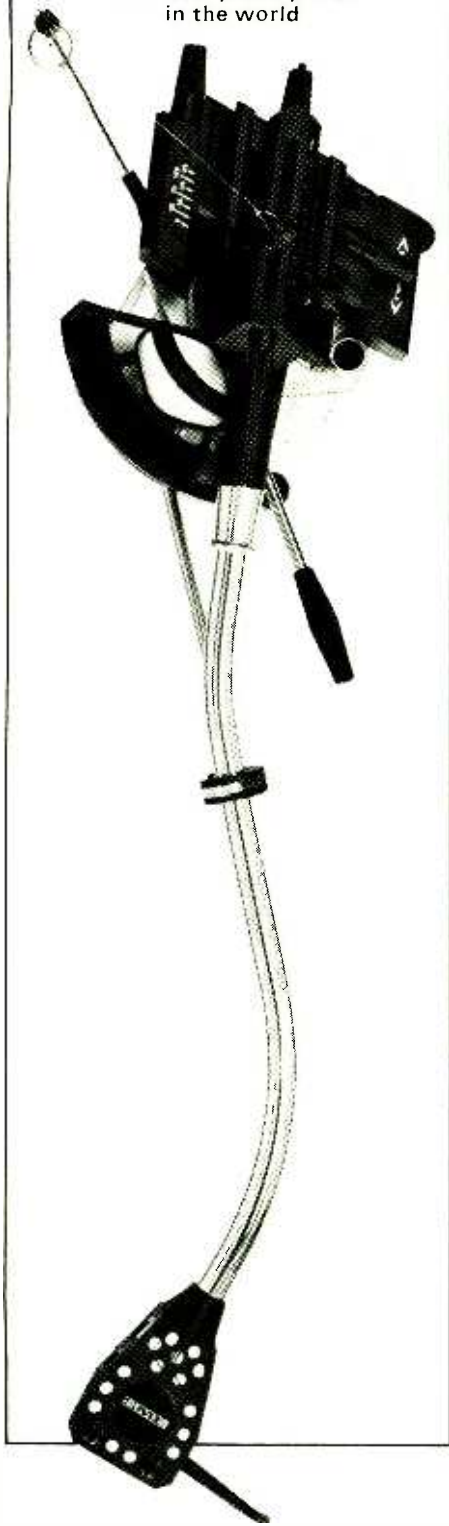
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MANUFACTURER'S SPECIFICATION

Frequency range: 300-3k Hz.
Impedance: 200 ohm at 1 kHz.
Output level: 119 dB spl from 1V rms at 1 kHz.
Distortion: <3% thd at 1 kHz for 10V rms input.
Manufacturer: Shure Brothers Inc, 222 Hartrey
Avenue, Evanston, Ill 60204, USA.
UK: Shure Electronics Ltd, Eccleston Road,
Maidstone ME15 6AU.

AT FIRST GLANCE I was quite impressed by the Shure telephone acoustic coupler; it all looked good news for radio reporters. A handy, hard-wearing attachment that can be slipped over the mouthpiece of a standard telephone enabling you to feed voice reports and actuality down the phone line.

It was easy to fit: simply place the small speaker over the mouthpiece, secure it with the rubber strap provided and you were in business. Also it kept the Post Office happy. Dismantling a telephone mouthpiece to 'crocclip' a tape machine to their equipment is, of course, illegal. The Shure coupler satisfied their requirements.

So far so good. I found in practice, however, that the coupler is an unmitigated disaster. The quality of the material fed through the attachment was on the whole appalling. One voice report fed from the London 'Machete Man' siege was so bad that the audio engineer on duty refused to accept it.

There are several reasons for this. First of all the coupler, which is ideal for use on American telephone handsets, is simply not the right size for use in the UK. Because of the plastic rim around the mouthpiece the speaker sits a few centimetres above the carbon microphone. And although the seal with the rubber band is tight, you suffer an inevitable drop in quality.

So why market a piece of relatively expensive equipment that is not designed for use in this country? A spokesman for Shure told me that, in his opinion, the difference between British and American telephones makes very little difference. The important factor was the seal between the coupler and the mouthpiece—if the unit is attached correctly, a few centimetres difference between the two should make absolutely no difference in quality. To ensure that I wasn't being excessively critical about the lousy quality the coupler gave, I canvassed opinions from some of my colleagues.

IRN's Sports Editor, Mervyn Hall, wasn't at all impressed by the coupler: 'They are expensive, costing over £20. If they only cost £5 the coupler would be worth having as a standby. But there is no improvement in quality . . . in fact the reverse. The only advantage I can see is if you find yourself in a country that has totally sealed phones, like

Czechoslovakia. As far as I am concerned they are an overpriced gimmick. Definitely not recommended.'

Paul Woodley was one of the first IRN reporters to test the coupler: 'I used it at the Windscale Enquiry and found it disappointing, to say the least. It's quick and easy to attach on to the mouthpiece, but what the manufacturers seem to have overlooked is that it is simply the wrong size for British phones. Also it's too pricey.'

In summary, ten out of ten to Shure for ingenuity, nought out of ten for overseas field trials.

The above assessment was shown to Shure, who felt that the author had been rather unfair in his comments about the drop in quality of material fed through the coupler. They maintained that the quality was 'adequate' and remained intelligible over long distances.

Peter Sharp makes the following observation: 'It all depends on one's definition of "adequate". I will concede that, to the layman, the coupler will seem to produce no degradation in quality between a normal telephone conversation, and a taped conversation fed via the coupler. However, this is missing the point since both methods produce results that quite often cannot be broadcast because of insufficient quality. Shure would do well to remember that the coupler/telephone connection is but one link in the chain from reporter to listener. And each link will cause a drop in quality. At the radio station the incoming report will be recorded on NAB cartridge, and possibly a reel-to-reel machine. After any necessary editing the report may then be re-recorded for subsequent broadcast, possibly on a low-quality am channel. Somebody listening on his car radio as he fights his way through the morning rush-hour traffic expects to be able to hear every word of the report—otherwise a reporter is wasting his time. Hence my feelings that "adequate" quality is insufficient since you need to wring every drop of quality out of the phone lines'. ■



Classified Advertisements

Advertisements for this section must be pre-paid. The rate is **18p** per word, minimum **£3.60**. Box Nos. **45p** extra. Semi-display rates on application. Copy and remittance for advertisements in **MAY 1978** issue must reach these offices by **24th MARCH 1978** addressed to: The Advertisement Manager, **Studio Sound**, Link House, Dingwall Avenue, Croydon CR9 2TA.

Note: Advertisement copy must be clearly printed in block capitals or typewritten.

Replies to Box Nos. should be addressed to the Advertisement Manager, Studio Sound, Link House, Dingwall Avenue, Croydon CR9 2TA, and the Box No. quoted on the outside of the envelope. The district after Box No. indicates its locality. **SEX DISCRIMINATION ACT 1975:** No job advertisement which indicates or can reasonably be understood as indicating an intention to discriminate on grounds of sex (e.g. by inviting applications only from males or only from females) may be accepted, unless (1) the job is for the purpose of a private householder or (2) it is in a business employing less than six persons or (3) it is otherwise excepted from the requirements of the Sex Discrimination Act. A statement must be made at the time the advertisement is placed saying which of the exceptions in the Act is considered to apply.

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★**Wow and flutter meter**, Rank Kalee type 1740, similar to latest model, calibrated and in good working order. £150 plus VAT. Burgess Lane & Co. Ltd., Thornton Works, Thornton Avenue, London, W.4. 01-994 5752 and 5953. X

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340 7873,

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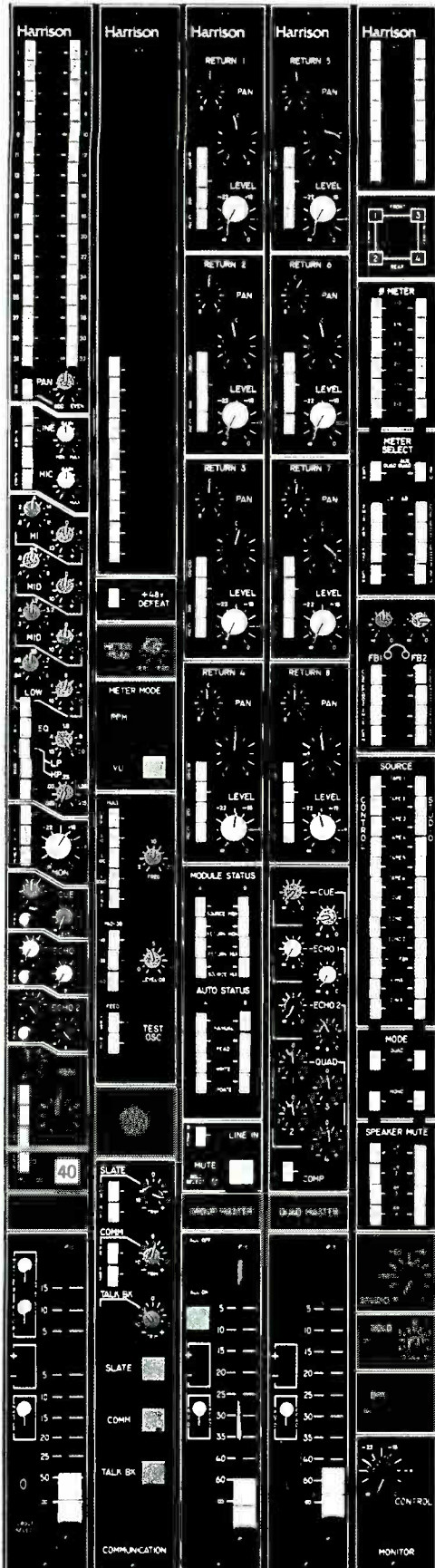
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