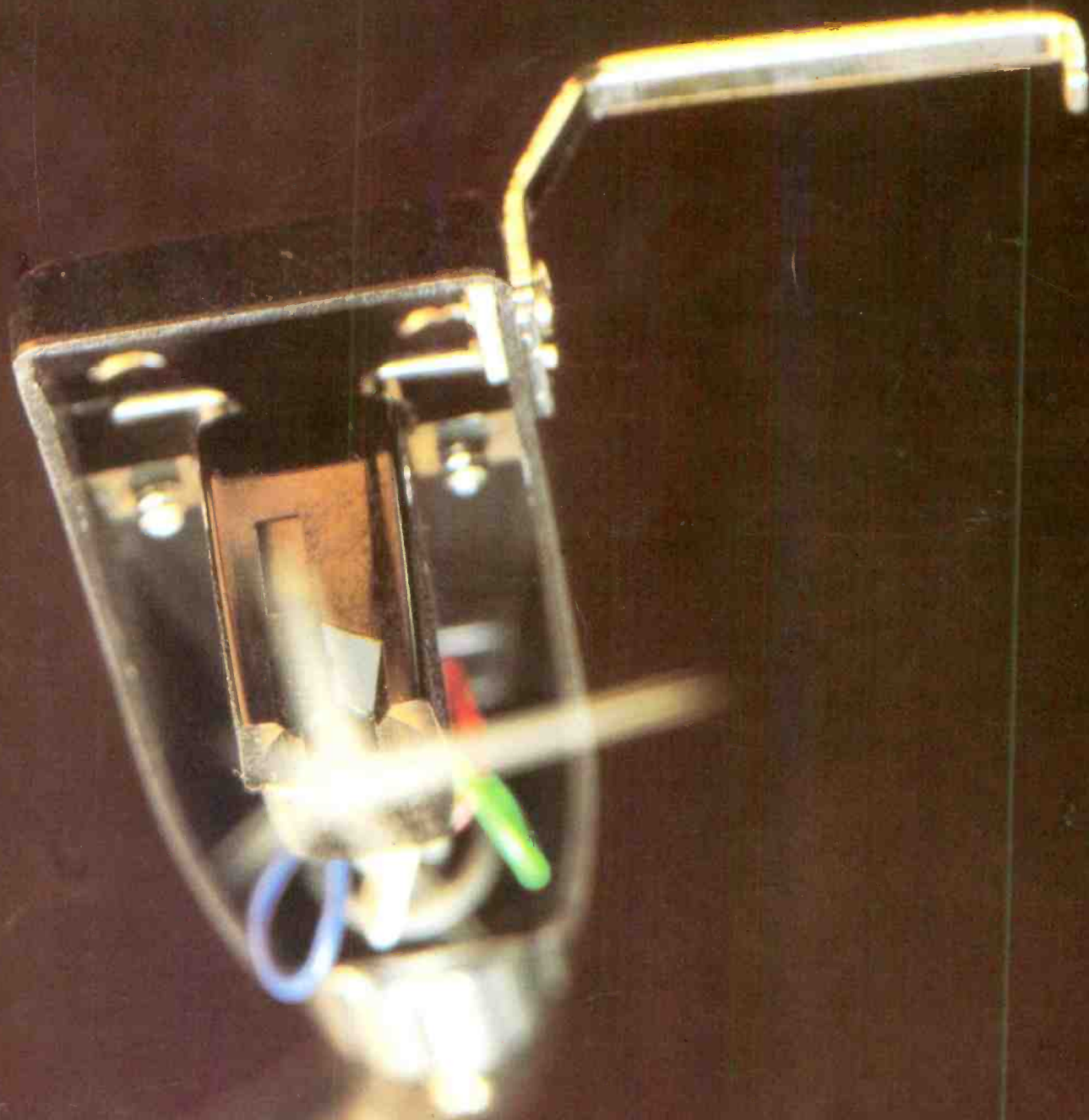


# studio sound

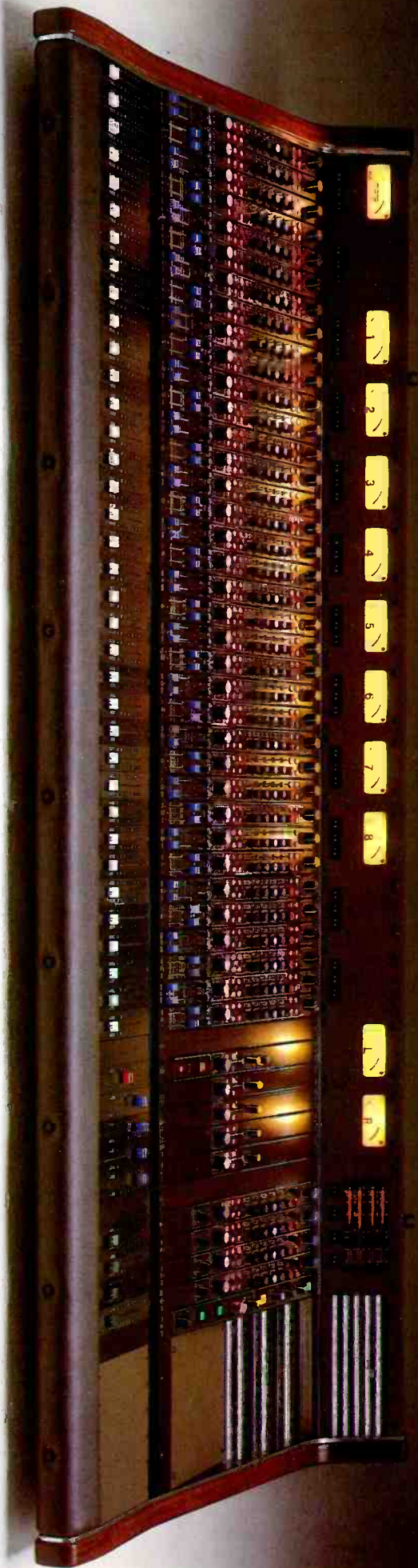
May 1979 60p

AND BROADCAST ENGINEERING



**Turntables, Arms  
and Cartridges**

# MIDAS 1979 maintaining a standard



## SUPERTRAMP SEVEN

36 into 8/2 Custom Live Sound Console supplied to Delicate Acoustics  
for the 1979 Supertramp World Tour, their seventh MIDAS console.  
How could MIDAS experience benefit you?

MIDAS AUDIO SYSTEMS LTD. ORPOND SQUARE, 54-56, STIMPNOCK STREET, LONDON, NW11 3XX, UK. 01-388-7000 01-387-7000  
MIDAS AUDIO CORPORATION, 8035 STRICKLAND, 8035 STRICKLAND, NEW YORK, N.Y. 10045 U.S.A. TEL 718-282-4100  
MIDAS CANADA, FRANK PRINSKIEN 6888 ELECTRO-ACOUSTICS, 3655 BUCKINGHAM ST. 1881 TORONTO, M3B 4B9, ONTARIO, CANADA TEL 416-868-0328

# studio sound

## AND BROADCAST ENGINEERING

**EDITOR**  
ANGUS ROBERTSON  
**ASSISTANT EDITOR**  
NOEL BELL

**PRODUCTION EDITOR**  
DRUSILLA DALRYMPLE

**CONSULTANT**  
HUGH FORD

**EDITOR'S PERSONAL ASSISTANT**  
WENDY SMEETH

**ADVERTISEMENT MANAGER**  
MIKE STORMER

**ADVERTISEMENT SECRETARY**  
MARION MOISER

**PUBLISHER**  
DOUGLAS G. SHUARD

**Editorial and Advertising Offices:**

**LINK HOUSE, DINGWALL AVENUE,  
CROYDON CR9 2TA, GREAT BRITAIN**

Phone : 01-686 2599

International: +44 1 686 2599

Telex : 947709

Telegrams: Aviculture Croydon

© Link House Publications Ltd 1979

All rights reserved.

*STUDIO SOUND is published on the second Friday of the preceding month.*

**SUBSCRIPTIONS**

*STUDIO SOUND is available on a rigidly controlled requested basis only to qualified personnel (see back page for terms of control), or for an annual cost of £9.50 to non-qualifying readers or where more than two copies are required in a studio or small organisation.*

*EUROPE Subscription cost £9.50*

*UNITED STATES Surface mail subscription \$20, airmail subscription \$40*

*OVERSEAS Surface mail subscription £9.50, airmail subscription £20.*

*All subscription and circulation enquiries to:*

*Subscription Dept, Link House Publications Ltd, Robert Rogers House, New Orchard, Poole, Dorset BH15 1LL, Great Britain.*

*Phone: 02013 71171.*

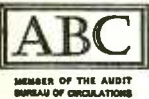
*Telex: 417109.*

**BACK COPIES**

*A limited number of back copies are available, 60p each*

**BINDERS**

*Loose-leaf binders for annual volumes of STUDIO SOUND are available from Modern Bookbinders, Chadwick Street, Blackburn, Lancashire. Price is £2 (UK and overseas). Please quote the volume number or date when ordering.*



*Total average net circulation of 13,366 per issue during 1978. UK: 6,257. Overseas: 7,109.*

NEWS	24
STUDIO DIARY	including Air Montserrat 30
BUSINESS	36
DESIGN CRITERIA FOR A PICK-UP ARM	Alastair Robertson-Aikman 38
BROADCAST TURNTABLES	John Lumsden 42
SURVEY: TURNTABLES, TONE ARMS AND CARTRIDGES	44
LETTERS	54
INTO THE DIGITAL STUDIO DOMAIN: PART TWO	P. Jeffrey Bloom 58
AGONY	68
REVIEWS: Hugh Ford	
EMPIRE BC1, SHURE SC35C, SHURE V15 MKIV,	
STANTON 500AL AND STANTON 680EL CARTRIDGES	70
EMT 950 TURNTABLE SYSTEM	80
MACINNES S-220 TONE ARM	86
SME SERIES III TONE ARM	88
INOVONICS 500 ACOUSTIC ANALYSER	Op Assessment 90

One of the great strengths of *Studio Sound* are our technical reviews written by Hugh Ford. Hugh Ford is probably the best equipped totally independent technical reviewer in Europe and it is no secret that much of his work is consultancy for equipment manufacturers—indeed there is no way that any technical magazine can support the technology required to review audio equipment designed to the highest specification for recording studios. Nevertheless, we believe our reviews to be totally unbiased and as accurate as physically and technically possible. We are not only interested in technical specifications, but in mechanical construction and such simple things as fuses which can have serious effect on safety if incorrectly replaced. However, many companies supplying review equipment to us seem to be under the impression that this is a service provided for their benefit, rather than actually informing studio engineers as to the relative performance of various units. We often come across problems during the preparation of reviews and where these are serious always contact the manufacturer/importer to either obtain another sample or discuss the problem. However, there have been instances of faulty equipment being supplied for review and this usually becomes obvious during the review, often requiring measurement of a second sample—this often puts us to considerable expense both in terms of repeated measurements and late copy to our printer. We are occasionally tempted to bill the supplying company, but usually manage to stand the cost and inconvenience. Since equipment supplied for review is deemed to be in 'merchantable quality', it should not be necessary for us to supply an advance copy of the finished review to the manufacturer, and this is rarely done, verbal discussions usually sorting out any problems. Since very little equipment is perfect, reviews usually bring up minor problems which are often of little significance—yet manufacturers often demand that we publish letters and corrections stating, for instance, that the fuse holder is now labelled and other such minor matters. Where space is available, we usually attempt to publish such letters, although deadlines mean that it is usually two or three months before comments appear. Although this delay could be eliminated by sending advance copies of reviews, we work to tight deadlines and offering this facility to comment puts an obligation on us that deadlines often make it impossible to keep—so we don't do it. Again, although we allow our reviews to be reprinted for promotional purposes, permission must always be obtained beforehand, and we never permit comments from reviews to be taken out of context. Nor are manufacturers permitted to add their own comments onto reprints since these would, by inference, be supported by *Studio Sound*, which is not always the case. These simple ground rules enable us to retain our reputation as to absolute impartiality, unlike certain American magazines. So if supplying equipment for review, please remember that it should be checked thoroughly before despatch, and if possible an engineer should accompany it to the laboratory. Supply as much information about it as possible—even engineering drawings are useful. And finally, after publication, by all means comment on reviews particularly if changes are being made that effect our comments (it often happens), but please keep it very short and to the point.



**A LINK HOUSE GROUP  
MAGAZINE**

**MAY 1979 VOLUME 21 NUMBER 5**

# AKG

ACOUSTICS



## A Microphone for Every Recording Situation!

The C422 is a new stereo condenser microphone and was developed from the well known C24, whilst the C424 was designed as a quadrophonic condenser microphone for making 4-channel recordings.

The C422 has two twin diaphragm systems, which allows each channel's polar response to be electronically adjusted with the remote control unit S42E. It is suitable for MS and XY stereo technique and the upper capsule

can be rotated through 180° for selection of the base angle in any recording situation. To enable the engineer to see the position of each capsule at a glance, even from a distance, we have mounted an LED on the front grille of each capsule. In the top of the housing of the

C424 are two elastically suspended twin diaphragm capsules, of which the upper one is also rotatable for selection of the base angle between front left/rear right and front right/rear left. Each channel is colour coded. The pre-amplifiers in both microphones are located in the housing and should be phantom powered with 9-52 V, according to DIN 45 596. (In case of C422 via the audio connections on the S42E.)

ADY263/E



AKG Acoustics Ltd.  
191 The Vale, London W3 7QS  
TF: 01-749 2042 (5 lines)  
TX: 289 38 (akgmic g)

Send this coupon for information about AKG products

- STEREO HEADPHONES
- MICROPHONES
- MAGNETIC CARTRIDGES

Name \_\_\_\_\_

Street \_\_\_\_\_

Town \_\_\_\_\_

Postcode \_\_\_\_\_ SS/5

# THE EVENTIDE MODEL H910 HARMONIZER

The HARMONIZER employs digital circuitry and random access memories to actually transpose input signals by up to a full octave up or down. Any musical interval can be achieved by the continuously variable control and the optional monophonic or polyphonic keyboard allows real-time 'playing' of the HARMONIZER so that the musician can harmonize with himself. The HARMONIZER can be used to maintain constant pitch in direct ratio when the speed of pre-recorded tape is varied up or down.

## DIGITAL DELAY

In addition the HARMONIZER is a low cost, very versatile delay line. The delay is variable in 7.5 ms steps up to 112.5 ms. A second output is optionally available that varies up to 82.5 ms.

## SPECIAL EFFECTS

Simultaneous use of feed back, delay and pitch change can be used to create previously unobtainable effects.

Other devices available in the Eventide range include the  
1745M Digital Delay System

FLANGER  
OMNIPRESSOR



U.K. Distributors



**Feldon Audio Limited**

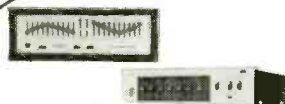
126 Great Portland Street, London W1. Telephone: 01-580 4314. Telex: London 28668

Eventide, Instant Flanger, Omnipressor and Harmonizer are trade marks designating the products of Eventide Clockworks Inc.

# REW Professional

*We Will Beat Any Genuine Advertised Price*

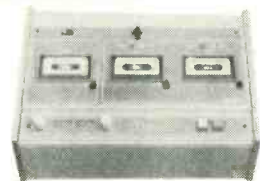
## Europe's Largest Suppliers of Studio



### EQUALIZERS SOUNDCRAFTSMEN

Graphic EQ's.  
SAE Parametric EQ's.  
JVC SEA 10 (2 x 5 Band),  
SEA20 (2 x 7 Band)  
TECHNICS SH9010 (2 x 5  
Band), SH9090 (1 x 10 Band)  
MXR (1 x 5 Band), (1 x 10  
Band), (2 x 10 Band)  
MM-Pace (2 x Band), SR271  
(1 x 27 Band)

### WOLLENSAK WOLLENSAK/West End Distributors



High Speed Duplicators.  
£1498.90 + VAT. New 2772A/V  
gives 2 stereo musicassettes in  
under 4 minutes. Call in for a  
demonstration.

### UHER PORTABLE RECORDERS

As used by most  
Broadcasting Companies.  
All models in stock plus every  
accessory available.



Very low  
prices, e.g.  
4000IC £225  
+ VAT.  
+ SONY +  
NAKAMICHI  
+ JVC +  
TECHNICS +  
TEAC.  
Portables all  
Off the Shelf.

# REW

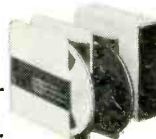
### REVOX Incredible stocks at ridiculous prices!



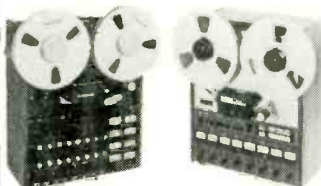
A77, B77, A700 Off the Shelf.  
High speed, low speed, vari-  
pitch + all accessories!  
Ring us now for the lowest price.

### TAPE AT TRADE PRICES

Any quantity—  
same price  $\frac{1}{4}$   
tape, 10 $\frac{1}{2}$ " reels.



AGFA PEM368 Metal ..... £10.06  
AGFA PEM368 Plastic ..... £7.79  
SCOTCH 207 Metal ..... £9.81  
SCOTCH 207 Plastic ..... £8.03  
MAXELL UD180 Metal ..... £8.89  
TDK AUDUA LB3600 Met £11.40  
TDK AUDUA L3600M Met £9.50  
SONY SLH-11-1100BL Met £10.00  
SONY SLH-740B Metal ..... £6.89  
REVOX 601 Metal ..... £11.80  
REVOX 601 Plastic ..... £10.00  
All above prices exclusive of VAT.  
Also large stocks of 7" & 5" reels.



### 8 TRACKS $\frac{1}{2}$ " or 1"

Both Tascam and Brenell  
Recorders in stock for immediate  
delivery.  
Plus complete range of 8 Track  
ancillaries.

### MICS-OVER 500 ALWAYS IN STOCK!



AKG We carry every model  
inc. capacitors  
BEYER Most dynamic + ribbons.  
CALREC 600 Range.  
SENNHEISER Large stocks.  
SONY All models.  
NAKAMICHI All models.  
E.V. Selected range.  
SHURE Very large range.  
NEUMANN All popular  
models.  
+ Cables, Transformers, Stands,  
Connectors & Clips, Windshields,  
etc.

### CANNON XLR'S ANY QUANTITY—SAME PRICE

XLR-3-116 £1.39 + VAT  
XLR-3-120 £1.06 + VAT  
XLR-3-316 £1.85 + VAT  
XLR-3-326 £1.06 + VAT

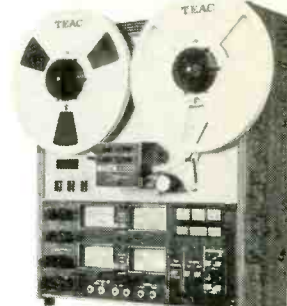
### AMPLIFIERS

HH S500D, TPA, All stage  
amplifiers.  
SAE From 2 x 50 watts to  
2 x 400 watts RMS.  
QUAD 405, 303, 50E usually  
in stock.  
JPS A fantastic range of budget  
studio amps.  
AMCRON DC 300A, D150A,  
D60. Trade prices.

### SPECIAL OFFER

**AMCRON D150A**  
£311 + VAT FEW ONLY

### TEAC A3340S



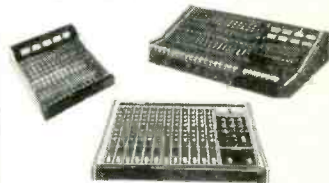
4-channel recorder.  
Symul-sinc. 10 $\frac{1}{2}$ " reels,  
7 $\frac{1}{2}$  + 15 ips.  
NOW BACK IN STOCK  
Price on application.

### MIXERS

The widest range under one  
roof!

From £35-£2500.  
Mixers in stock:  
SOUNDCRAFT 16/2, 12/2,  
12/4 Series II.  
HH 16/2, 12/2.  
MM All models.

TEAC-TASCAM Models  
1, 2, 3, 5 + Accessories.  
CANARY 10/2, 10/4.  
HILL 16/2, 10/2.  
SONY MX8, MX510, MX650.  
Plus ALLEN & HEATH,  
JVC, UHER, EAGLE, etc.



Plus Echoe's, Phasers, Flangers,  
Limiters, Noise Reducers,  
Expanders, Mix-Downs, Mic  
Stands, Cable Drums, Disco  
Gear, Chassis Speakers, Studio  
Monitors, Headphones, Demags,  
Splicers, etc.

**PRO-AUDIO & DISCO: 114-116 Charing Cross Road, WC2 01-836 2372 7851**  
Also separate floor of Hi-Fi and Video Phone 01-240 3386/7  
**TAX-FREE EXPORT & EXPRESS MAIL ORDER: REW House, 10-12 High Street,**  
**Colliers Wood, SW19. 01-540 9684** ● Also at 230 Tottenham Court Road, W.1.

# The Professional Everything Store

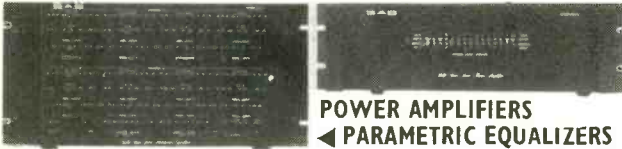
# Audio Established 1948

**Largest Stocks Lowest Prices!!**

## & Stage Equipment

### EXCLUSIVE FROM REW

**SAE** A superb range of studio electronics from the U.S.A.



#### POWER AMPLIFIERS PARAMETRIC EQUALIZERS

*Prices exclude VAT*

2800 Parametric equalizer 2 x 4 Bands.....	£408.00
1800 Parametric equalizer 2 x 2 Bands.....	£239.00
4000 Electronic crossover, stereo, variable frequency .....	£155.00
4100 Digital time delay, stereo .....	£354.00
2200 Power amplifier 2 x 100 watts .....	£346.00
2400L Power amplifier 2 x 200 watts .....	£578.00
2500 Power amplifier 2 x 300 watts .....	£755.00
2600 Power amplifier 2 x 400 watts .....	£887.00
5000 Impulse noise reduction unit.....	£176.00

### SOUNDCRAFTSMEN

America's Largest Manufacturer of Graphic Equalizers



#### GRAPHIC EQUALIZERS

2204 2 x 10 Bands.....	£199.00
2205 2 x 10 Bands, rack mount .....	£226.00
2209 2 x 10 Bands, rack mount, 600 ohm balanced in/out XLR .....	£319.00

#### NEW CLASS H POWER AMPLIFIER

MA5002 2 x 250  
watts, meters .....

*Prices exclude VAT*

#### HH DIGITAL MULTI ECHO

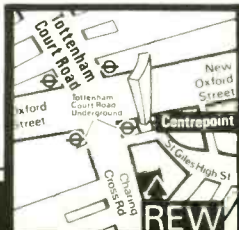
Studio quality at an economic price. Facilities include A.D.T., echo and reverb. Fully electronic (no tapes or discs) giving exceptionally low noise.



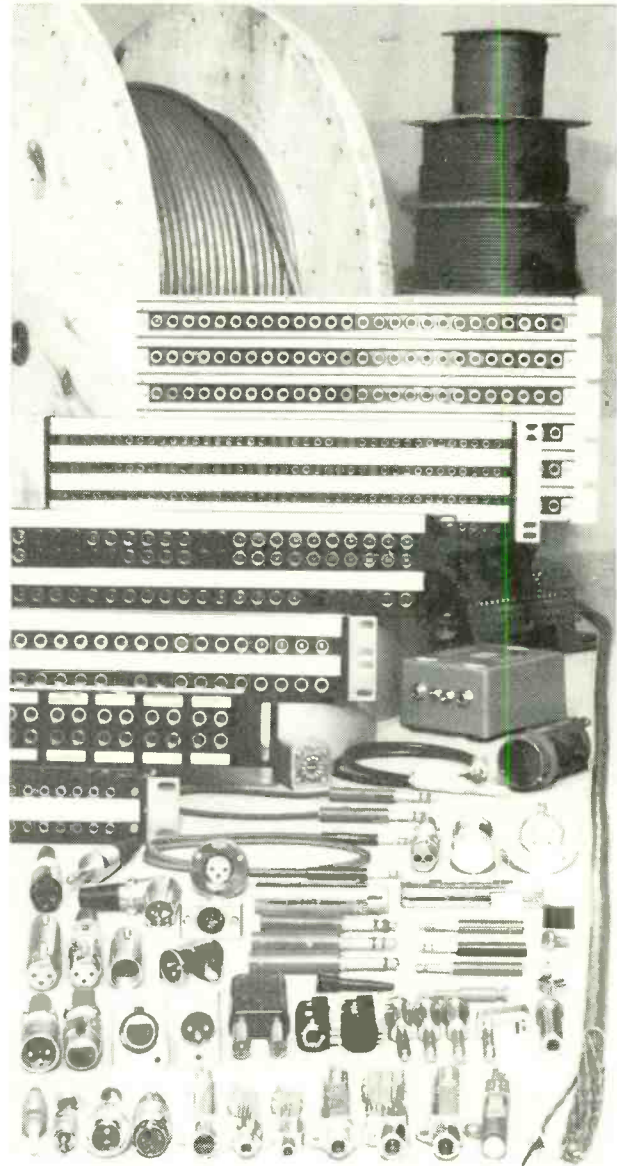
Open 9.30 am — 6 pm — 6 days a week  
Just walk in — 95% of advertised  
gear available off the shelf

Payment by: Cash,  
Barclaycard, Access,  
American Express, Diners,  
HP (Instant credit possible)

**THE LOW PRICE HOT  
LINE 01-836 2372**



**NEAREST TUBE STATION  
TOTTENHAM COURT ROAD UNDERGROUND**



Cable, Connectors, and  
Accessories for the  
Broadcasting & Recording  
Industries from

## FUTURE FILM DEVELOPMENTS

36/38 Lexington Street, London W1R 3HR  
Telephone 01-437 1892/3 • Telex 21624 ALOFFD G

**TRAD****ELECTRONICS  
SALES LTD.****FOR SALE**

MS M79 24-track with Sonaplan Autolocate ... ..	£15500
3MS M79 16-track ... ..	£10500
Studer A80 Mk.I 16-track ... ..	£11250
Studer A80 Mk.I 16-track with 8-track headblock ... ..	£12000
Studer A80 Mk.II 8-track (1400 hrs) ... ..	7500
Ampex MM1000 16-track and varispeed... ..	£6500
Ampex MM1000 16-track with 8-track headblock ... ..	£7000
Scully 280 16-track ... ..	£6000
Scully 280 8-track ... ..	£3000
Scully 280 8-track with syncmaster ... ..	£3650
Ampex AG440 8-track ... ..	£2500
Tascam 80/8 8-track on 1/2", as new ... ..	£2000
Otari 4-track on 1/2", as new ... ..	£1200
Ampex AG440 4-track on 1/2" ... ..	£1400
M.C.I. JH10 16-track with autolocate ... ..	£7000
Neve 16-8-16, very nice desk ... ..	£13500
Neve 12-4-8 ... ..	£7500
Neve 20-4-16 ... ..	£14500
Trident B 24-16-16 ... ..	£12000
M.C.I. 400 36-36 Light meters spectravue ... ..	£24000
Sound Workshops 32-32 automated ... ..	£24000
Audio Developments 14-4-8 ... ..	£2200
Audio Developments 14-8-4 ... ..	£2200
Audio Developments 007 10-4 ... ..	£1100
Audio Developments 0035 Pico mix (extras) ... ..	£700
Itam 10-4 Mk.II ... ..	£550
Allen and Heath quasi mix ... ..	£250
20-16-16 Custom desk ... ..	£2500
Dolby M16 ... ..	£4200
Dolby A360 ... ..	£295
Dolby A361 ... ..	£310
MXR dig/delay 4 cards ... ..	£1250
MXR 31 band graphics (new) ... ..	£340
Roland Graphics ... ..	P.O.A.

STC 4038 and 4033 mics, Electrovoice RE20 mics, all AKG mics, Neumann U87, as available—various prices.

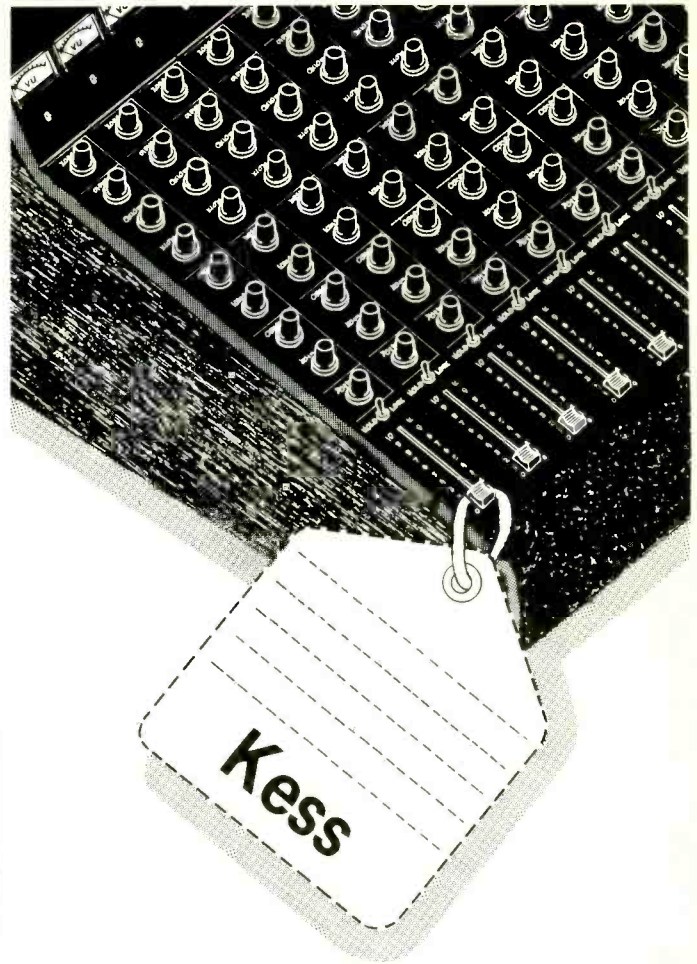
All goods listed above in stock at time of going to press

Prices are exclusive of V.A.T.

**149B ST. ALBANS ROAD  
WATFORD, HERTS.**

Tel. WATFORD 47988

Telex 262741



## ... tomorrows Gelf with yesterdays price tag

Not a pipedream... now that GELF ELECTRONICS have solved the perplexing problem, it's reality.

Famous for their desirable custom modular designs, Gelf have developed Kess, a new and significant range of non-modular consoles.

The standard of performance and construction of Kess derives from a name you can rely on, and happily, now at a price you can afford.

Available as front of house desks in 20/2 and 24/4/2 formats or monitor desks in 16/6 and 24/8 formats, our Kess range offers you:

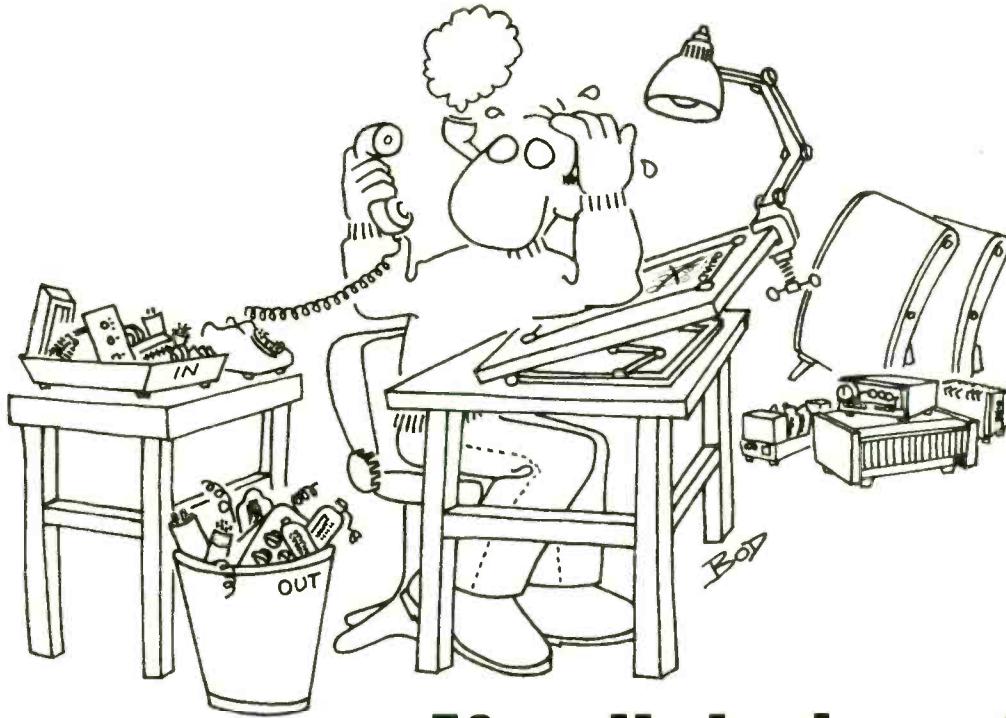
- 3-way EQ with sweep mid-range control
- 4 auxillary sends - effects and fold-back
- 4 stereo subgroups on 24/4/2
- 9 band graphic EQ on monitor desk outputs

If you would like to know more, give us a ring on 995 4712, we'll be happy to discuss your specific requirements, or fill out the coupon above and we'll send you the solution to your perplexing problem.

Sole UK distributors  
**chrom audio**

The Powerhouse, 300-320 Acton Lane, London W4 Telephone: 01-995 4712.





## If walls had ears?

"We can't possibly use an output condenser, it must cut the bass mustn't it? And what about the damping?"

"And no output transformer, what with all that hysteresis and iron distortion."

"Pentodes? Tetrodes?"

"No, No, nothing but triodes will do."

"Triodes then, but wait, we can't have all that accumulated Miller effect."

"Transistors then?"

"Oh no, this year's crop are all hard and brittle."

"And that see-saw phase splitter, it's asymmetrical; if we fed a square wave . . ."

"But what have square waves to do with programme?"

"Shut up, that's irrelevant."

"Class B? But doesn't that always produce crossover distortion?"

"Ah! Feedback will cure all;"

"No, No, we've read that too much feedback causes TID or something."

Of course, these things have little or nothing to do with good or bad amplifier design, and are not at all what you might overhear in our laboratory . . . . . zzzzzzzzz

For further details on the full range of QUAD products write to

**The Acoustical Manufacturing Co. Ltd.,**  
**Huntingdon, Cambs. PE18 7DB.**  
**Telephone (0480) 52561**

# QUAD

**for the closest approach to the original sound**

*QUAD is a Registered Trade Mark*



# THIS MONTH'S **SCAMP** MEMO.....

## S03 SWEEP EQUALIZER

- 40dB CONTROL RANGE (±20dB)
- VARIABLE FREQUENCY
- TWO 'Q' OPTIONS
- INPUT ATTENUATOR
- OPTIMUM MODULATION INDICATOR

The advantages of a SWEEP equaliser are really self evident: the engineer can exactly select area (eg fundamental or overtones) that requires accentuation or attenuation without the inevitable compromise between fixed positions. Although not as comprehensive as the parametric units around, this simpler parametric form is very easy to use and has selected 'Q' values that have proven most useful in general studio use.

### APPLICATION NOTES

#### 1. Phasing? - well not quite

Moving the frequency controls during operation will produce interesting phasing effects, or even waw-waw!

#### 2. Spot-Eq!

The ON-OFF, BOST-OFF-CUT controls of the S03 Sweep Equaliser are 'lick free' and can be used to give a particular effect to be switched in DURING the take, momentarily. Also to find problems in 'PEAK' and then 'DIP' them in one movement.

#### 3. Peak and Pch - Equalisation

In a lot of current mixing consoles yes, even some of the most expensive, the Pch send/return equalisation (yes - a bit to be desired, no London studio uses near 300's per rack) is a simple, expensive upgrade. There are even cases of 10 or more in a rack being used to totally supplement and upgrade the input channel equalisation some of the 100 racks.



AUDIO & DESIGN (RECORDING) LTD.  
84 OXFORD ROAD, READING  
RG1 7LJ, BERKS  
Tel: Reading (0734) 53411

# .....EQUALIZERS

## S04 PARAMETRIC EQUALISER

- 40dB CONTROL RANGE (±20dB)
- VARIABLE FREQUENCY 20Hz-20kHz
- VARIABLE 'Q', 1/5-5 OCTAVES
- BETTER THAN 30dB SHELVING
- OPTIMUM MOD. INDICATOR PER SECTION

The S04 Parametric Equaliser is the ultimate in equaliser flexibility. Two basic types of characteristic curve have been chosen - the mid-range has a symmetrical relationship between peak (boost) and dip (cut) curves whereas high and low ranges have an asymmetrical relationship. Additionally the high and low ranges can be switched between bandpass and bandstop mode, to provide high and low pass variable characteristic shelving filters.

### APPLICATION NOTES

#### 1. Hum-Rejection

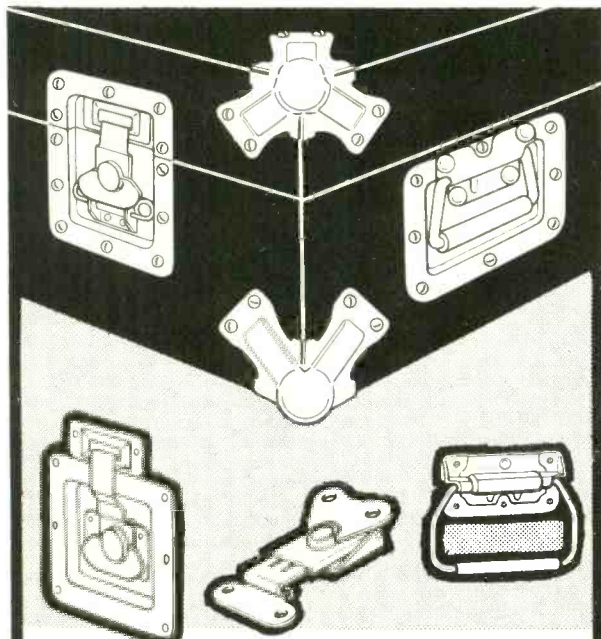
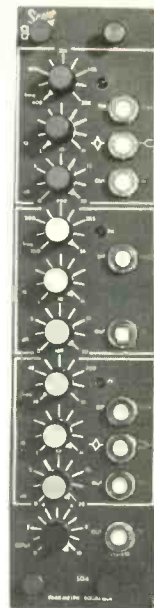
With the variable frequency control you select the hum region then narrow it right down with the variable 'Q' control to just the offending frequency before 'dipping' (or cutting) asymmetrically over 40dB's.

#### 2. Harmonic Enhancement

Selection of odd harmonics of the guitar, for instance, with the variable frequency 'Q' combination for accentuation or attenuation can dramatically alter the 'voice' characteristic of the instrument.

#### 3. 'THIRTIES' emulation

Using the high and low section variable frequency variable slope shelving it is easy to remove the bass and top energy subjectively and boost the mid-section to give the 'old' radio or film sound prevalent with earlier, limiter specification sound equipment.



Protex quick-release latches, handles, corner pieces and fasteners are used by some of the world's leading manufacturers because they are just right for the job.

**protex** FASTENERS LTD.

Arrow Road, Redditch, Worcs. Tel: Redditch 63231

## POWER AMPLIFICATION BY MUSTANG



Our SS.100 and SS.50 are economical amplifiers with outputs of up to 175 and 100 Watts RMS into 4-16 ohms, typical THD figures being 0.1%, slewing rate > 10V/μs, noise > 90dB down, zero level input, and full electronic protection. Considering these points with their proven reliability and robust construction, plug in output transistors and driver board, optional balanced input and 100V line output, and virtually ex stock despatches we reckon we take some beating! Contact us now for the full technical specifications.

Manufacturers of mixers, integrated mixer amplifiers and slave amplifiers, studio power amplifiers, transformers, lighting control equipment and cabinets for the home and export markets. Contact us for full illustrated technical brochures.

**MUSTANG  
COMMUNICATIONS**

Nelson Street, Scarborough,  
North Yorkshire YO12 7SZ  
England  
Telephone 0723-63298





# NO COMPETITION

The superb 3.77 is the only choice in compact professional recorders.

## Who says?

Hundreds of satisfied professional users— Broadcast authorities, studios, record companies, universities etc etc.

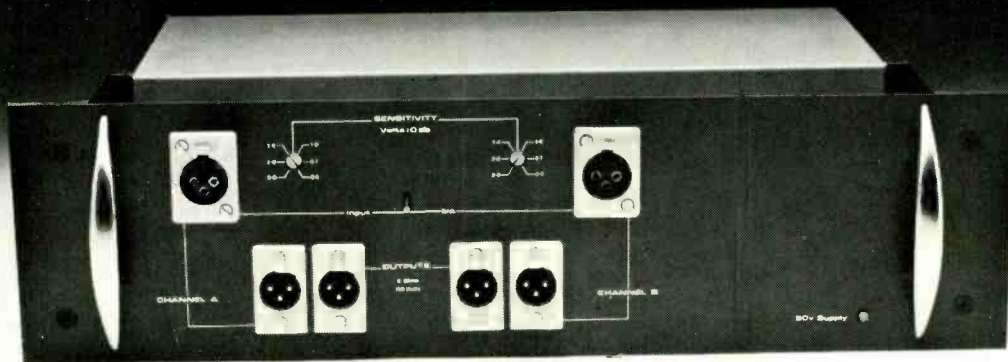
## What makes it the best?

The 3.77 provides more performance and features for your £ than any other model. Like 3 speeds, flat metal facia with excellent editing facilities, 100% variable speed control, logic control with motion sensing, line-up oscillator.

An **ITA** Product.

7 Harewood Avenue, Marylebone Road, London, NW1 Tel: 01 724 2407 Telex: 21870

# No stranger...



You may not have seen one quite like this before, but the major part of the product shown is not a stranger to professional audio — behind the disguise of a rack-mounting steel case, the XLR type connectors, the pre-set input level controls (variable from 0.5 to 3 Volts), and the channel input link switch, rests a familiar and particularly well respected power amplifier — the QUAD 405.

Professional conversion packages for QUAD 405's — available as a kit or ready assembled from

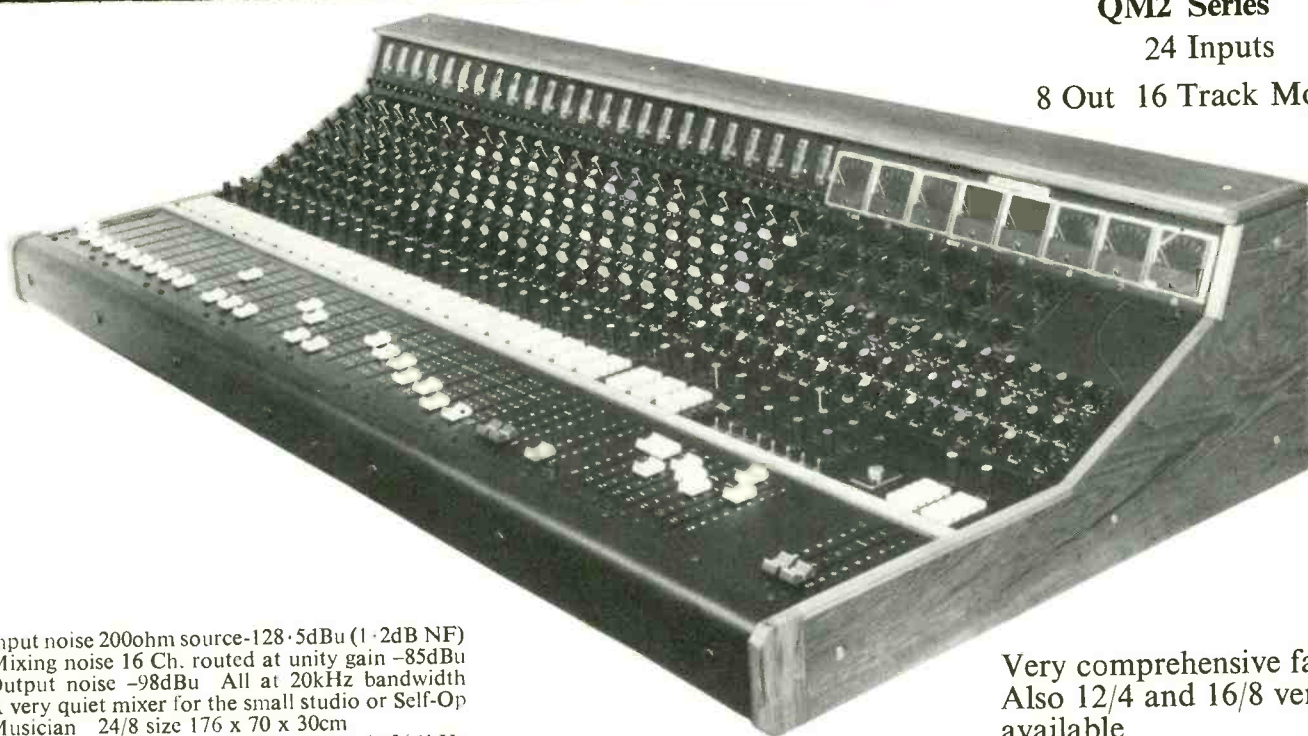
## SOUND REINFORCEMENT SERVICES

3 Melior Ct., Shepherds Hill, London, N6. Telephone for further details, 01 348 0212

### QM2 Series

24 Inputs

8 Out 16 Track Monitor



Input noise 200ohm source -128.5dBu (1.2dB NF)  
 \*Mixing noise 16 Ch. routed at unity gain -85dBu  
 Output noise -98dBu All at 20kHz bandwidth  
 A very quiet mixer for the small studio or Self-Op  
 Musician 24/8 size 176 x 70 x 30cm  
 \*Measured at 0dBm input: Distortion 0.01% 1kHz

Very comprehensive facilities  
 Also 12/4 and 16/8 versions  
 available

**CHILTON MAGNETIC TAPES LTD.**

Chilton Works, Garden Road,  
 Richmond, Surrey, U.K.  
 Tel: 01-876-7957

# New from Teac.

## A-3440 4 channel Recorder.

TEAC's famous 4 channel is now better than ever. Simplified switching allows all key functions to be controlled by one Function Select button. Improved headphone monitoring enables you to listen to one or all four tracks. Built-in Pitch Control gives you  $\pm 5\%$  speed variation.

## Industrial Model.

Designed with the professional user in mind, the Industrial model gives you improved signal to noise ratio, transportable cabinet, and wider ranging speed control. Also available dbx noise reduction unit (RX9) giving 30db signal to noise improvement.

**TEAC**  
from  
**ITA**

1-7 Harewood Avenue,  
Marylebone Road, London NW1  
Tel: 01-724 2497. Telex: 21879.



# 12th INTERNATIONAL EXHIBITION OF PROFESSIONAL RECORDING EQUIPMENT LONDON

**Dates of Exhibition.** Wed. June 20th — 10.00 hours to 18.00 hrs  
 Thurs. June 21st — 10.00 hours to 18.00 hrs  
 Fri. June 22nd — 10.00 hours to 17.00 hrs

**CONNAUGHT ROOMS . GREAT QUEEN ST . KINGSWAY . LONDON WC2**

Amity Shroeder  
 Amek  
 Alice  
 Audix  
 Agfa  
 AKG  
 Audio Kinetics  
 Audiomatic  
 Ampex  
 Audio Developments  
 Audio & Design  
 Allen & Heath  
 Atlantex  
 B & K Labs  
 F. W. O. Bauch  
 Beyer  
 Broadcast Audio  
 BASF  
 Bulgin Soundex  
 Canford Audio  
 Clive Green  
 Crowmay  
 Calrec  
 CB Electronics  
 Court Acoustics  
 Cetec  
 Communications Access.  
 Dolby Labs  
 Eardley Electronics  
 EMI Tape

Electronic Music  
 Ernest Turner Inst.  
 Fraser-Peacock  
 Formula Sound  
 Future Film  
 Feldon  
 Fitch Tape  
 Hayden Labs  
 Harmon Audio  
 H/H Electronic  
 Helios  
 ICM Cassette  
 ITAM  
 "International Musician"  
 Jacques Levy  
 James Yorke  
 John Page  
 Keith Monks  
 Klark-Teknik  
 Lockwood  
 Lee Eng.  
 Lennard  
 Lyrec  
 Leevers-Rich  
 Music Lab  
 Midas  
 3M  
 Magnetic Tape  
 Macinnes Labs  
 Malcolm Hill

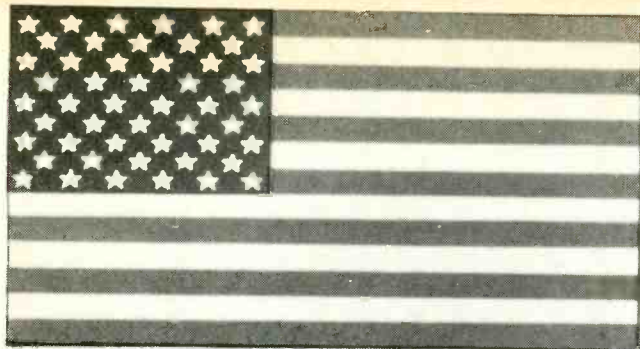
Neal-Ferroglyph  
 Neve  
 Publison  
 Pentagon  
 Penny & Giles  
 Philip Drake  
 Pyral  
 Professional Tape  
 Raindirk  
 Racal-Zonal  
 Rush Electronics  
 Roundhouse  
 Shure  
 Solid State  
 Sifam  
 "Studio Sound"  
 Soundcraft  
 Surrey Electronics  
 Scenic Sounds  
 SES Studio Equip  
 Shone Sound  
 Turnkey  
 Tweed  
 Tannoy  
 TRAD  
 Trident  
 Tandberg  
 Vitavox  
 Walter Luther  
 Wilmot Breeden

FREE TICKETS FROM

**APRS**

23 CHESTNUT AVENUE  
 CHORLEYWOOD HERTS  
 ENGLAND

EXHIBITORS AT TIME OF GOING TO PRESS



# American Newsletter

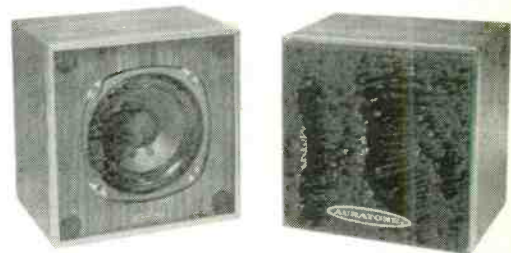
## Ampex ATR 700

Now every studio can afford legendary Ampex performance and reliability. Fully professional specification including balanced inputs/outputs, Cannon connectors, variable tape speed, sel sync. The price will fit this year's budget, not next year's! Sole distribution by ITA.



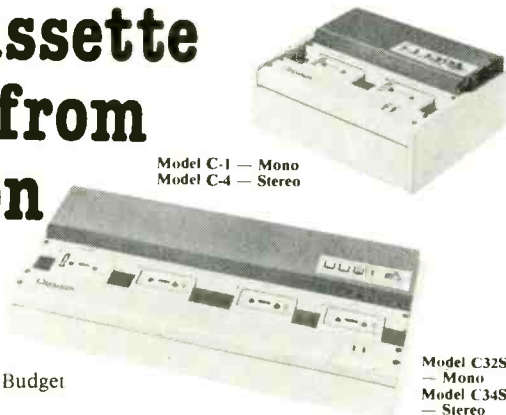
## Auratone

The amazing 5C Super Sound Cube. Only 6" x 6" — but it sounds enormous! Only £38 per pair.



## New! Cassette copiers from Pentagon

Simple operation — fully automatic 16 times speed. Choice of one or three copies. C32/34 — out-produces all other makes — 75 C60 per hour. Budget price from £587 + VAT.



Model C-1 — Mono  
Model C-4 — Stereo

Model C32S — Mono  
Model C34S — Stereo

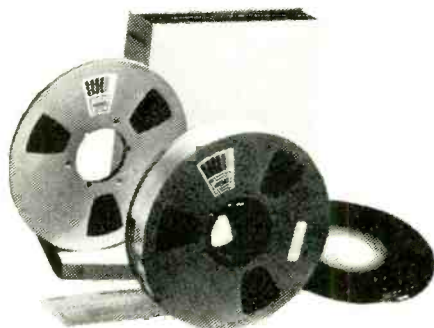
## Orban



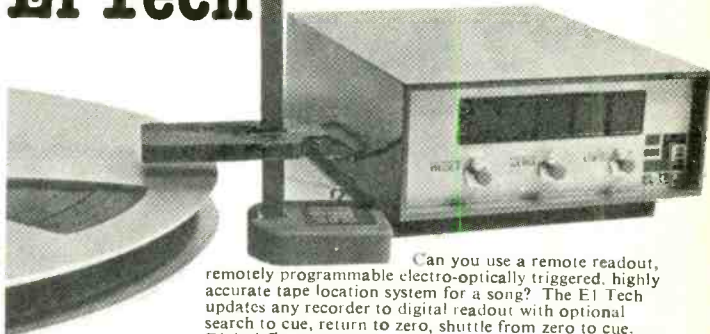
Dual channel multispring reverb unit. Each channel features four springs — far smoother than single spring systems. "Twang" and "boing" are virtually eliminated by incorporating a floating threshold limiter. Bass, mid-range EQ and bandwidth controls. The best compact reverb unit available.

## Ampex 3M

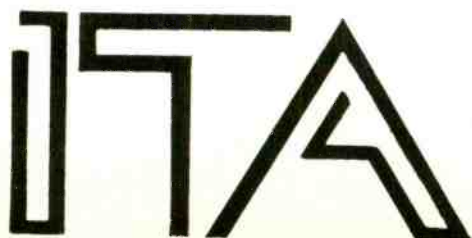
1" to 1" at Trade Prices



## El Tech



Can you use a remote readout, remotely programmable electro-optically triggered, highly accurate tape location system for a song? The El Tech updates any recorder to digital readout with optional search to cue, return to zero, shuttle from zero to cue. Digital Counter £234 + VAT  
Auto Locator £144 + VAT



1-7 Harewood Avenue, Marylebone Road, London NW1.  
Tel: 01-724 2497 Telex: 21879

FRANCE: Son Professionnel, 2 Rue des Tennerolles  
92210 Saint Cloud (Paris). Tel. 602 6815



# Why settle for second best?

When Rock City Studios at Shepperton Film Centre were equipping their brand new, prestige studios, they insisted on the most advanced electronics available to give them consistent, quality sounds.

Only Trident's TSM series mixing console met their stringent requirements and stayed within budget.

Their 32-24-24 configuration console has fully parametric equalisation, advanced I.C. circuitry, relayless switching and fully modular jackfield.

Contact Steve Gunn at Trident if you'll only settle for the very best.



## Trident Audio Developments Limited

Shepperton Studio Centre, Squires Bridge Road, Shepperton, Middlesex, England.  
 Telephone: Chertsey (09328) 60241 Telex: 8813982

**America Area 1** Studio Maintenance Services, California. Tel: 213-877-3311 **America Area 2** Sound 80 Inc., Minneapolis. Tel: 612-721-6341 **America Area 3** Winteradio Companies, Parma, Ohio. Tel: 216-886-5536 **America Area 4** Radio Band of America, New York. Tel: 212-687-4800 **Australia** John Barry Group, Sydney. Tel: 61-2-439-6955 **Belgium** Naybies, Brussels. Tel: 32-2-734-31-38 **Canada** La Salle Audio Products Ltd, Montreal. Tel: 513-342-2511 **France** Lazare Electronics, Paris. Tel: 33-1-878-62-10 **Germany** Peter Struven, Hamburg. Tel: 49-40-801028 **Holland** Cadac Holland BV, Hilversum. Tel: 31-35-17722 **Italy** Audio Products International, Milan. Tel: 392-273-896 **Japan** Continental Far East, Tokyo. Tel: 81-3-583-8451 **South Africa** Eltron (Pty) Limited, Johannesburg. Tel: 27-11-23-0018 **Spain** Neotecnica S.A.E., Madrid. Tel: 34-1-242-09-00 **Sweden** Satt Elektronik AB, Stockholm. Tel: 46-8-81-01-00.



# OTARI

## Reel to Cassette Duplicator

Unquestionably the finest in-cassette copier available. Two-speed reel master ( $3\frac{3}{4}$  and  $7\frac{1}{2}$  ips) and six servo-controlled slave units with ferrite heads. Eight times speed; four channels copied simultaneously. Highest attainable performance.

£4190+VAT

# ITA

1-7 Harewood Avenue,  
Marylebone Road, London NW1.  
Tel: 01-724 2497. Telex: 21879

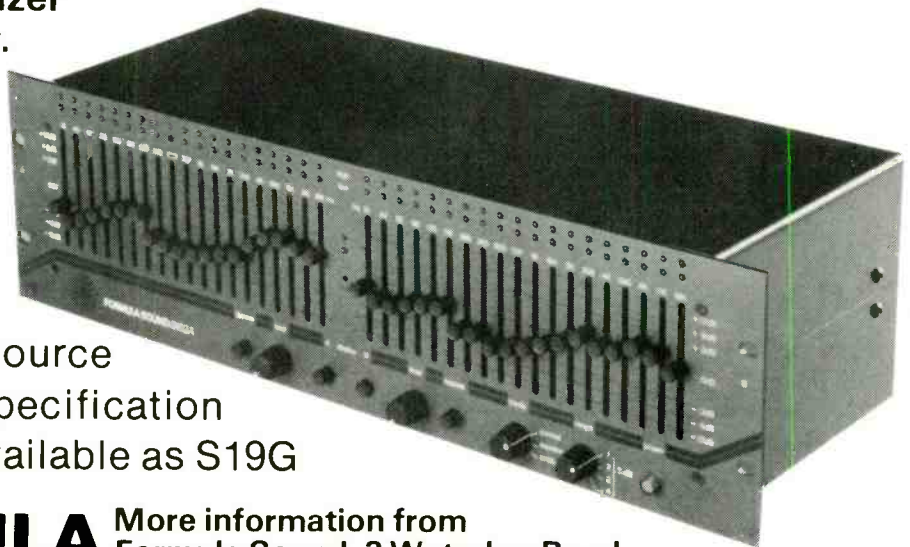
DP4050  
-OCF



## THE SUPERB S19GA HALF-OCTAVE EQUALIZER/ANALYSER

One unit combining dual  
19-band graphic equalizer  
and real-time analyser.

- Fast and simple to operate
- Greater selective frequency control
- Dual half-octave L.E.D. display
- Digital pink noise source
- Full professional specification
- Equalizer only is available as S19G



## FORMULA SOUND

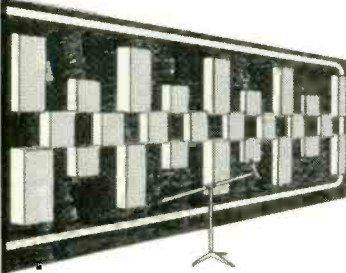
More information from  
Formula Sound, 3 Waterloo Road,  
Stockport SK1 3BD  
Telephone 061-480 3781 Telex 669249

## THE ACOUSTIC SCREENS from AK



- Space saving corner interlock system
- Welded metal frames
- Attractive 'cigarette proof' covering material
- Wide differential non crushing castors
- Custom size option
- Roof sections to match

## SONAPANEL ACOUSTIC SYSTEM



- Economic and flexible
- Individual layout scope
- Fast delivery
- Detachable fixture allows relocation or resale



AUDIO KINETICS (UK) LIMITED  
Verulam Road, St Albans, Herts, AL3 4DH. Tel: 32191. Telex: 299951



We are one of the leading equipment sales and installation companies, offering you a friendly and helpful service.

Every item we supply is tested and aligned in our own workshops, and after-sales service is always readily available.

We supply anything from an XLR to a complete 8-track studio installation, at competitive prices to clients that include recording and AV studios, government departments, schools, radio stations, theatres and PA companies in all parts of the world.

Our stocks include AKG, Allen & Heath, Beyer, Brenell, Ferrograph, JBL, MXR, Neal, Quad, Revox, Socom, Shure, Sonifex, Studiomaster, Tannoy, Teac, and Uher.



## STUDIO EQUIPMENT SERVICES

Studio Equipment Services Ltd.

The Studio Shop, Oxgate Farm  
Coles Green Road, London NW2 7EY  
Telephone: 01-452 1979

# Alice



*Our small mixers  
aren't cheap....*

*Alice* (Stancoil Ltd.)

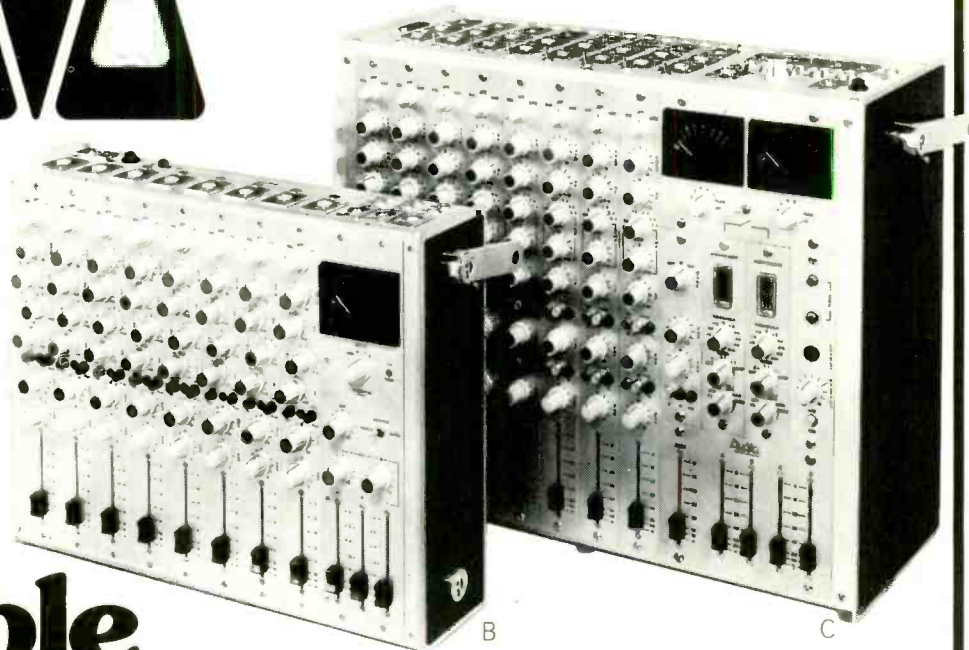
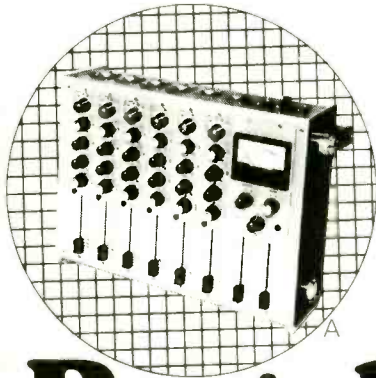
38 Alexandra Road, Windsor, England

Tel: Windsor (075 35)51056/7 Telex: 849323 a/b Aegis G

*...but then our big mixers  
aren't expensive.*

# Audio

## Developments



# Portable professional mixers

### Designed to team up with professional equipment for studio sound on location

Of advanced design and proven performance these are purpose built battery powered portables, of solid  $\frac{1}{8}$ " aluminium with carrying handles. Top quality components, modular construction and stringent quality control ensures the highest degree of reliability. For use on location with professional tape recorders — Nagras/Stellavox etc, outdoor broadcast, stage mixing or to supplement studio consoles when added capacity is required. Over 300 in trouble free use world wide.

#### MINIMIXER AD 007

8 in 4 out. Compressors. size 540 x 480 x 225mm Weight 22.7 kg

#### MICROMIXER AD 031

8 in 2 + 1 out + options size 420 x 335 x 127mm Weight 10 kg

#### PICOMIXER AD 045

6 in 2 out size 340 x 265 x 110mm Weight 6.2 kg

#### PICOMIXER AD 045

Mk II

#### AD 075 SuperSystem

#### AD 055 Stereo Compressor Limiter

A-Picomixer AD 045

B-Micromixer AD 031

C-Minimixer AD 007

### New Studio Compressor Limiter

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.

#### Specification

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  
FREQUENCY RESPONSE 1dB 20 Hz to 30 kHz NO  
COMPRESSION  
DISTORTION 0.1% at 1kHz to 10kHz NO COMPRESSION  
+8dB input  
MAX. COMPRESSION 25dB  
MAX. OUTPUT +19dB at 1kHz +12dB at 20Hz  
COMPRESSION Dependent on the MAX. OUTPUT and MAX  
NOISE Wideband — 68dB Band Limited — 71dB

# Audio

## Developments

Hall Lane, Walsall Wood  
WALSALL, W. Midlands, WS9 9AU  
Telephone: Brownhills 5351/2/3 (STD Code 05433)  
Telex: 338212 Audio

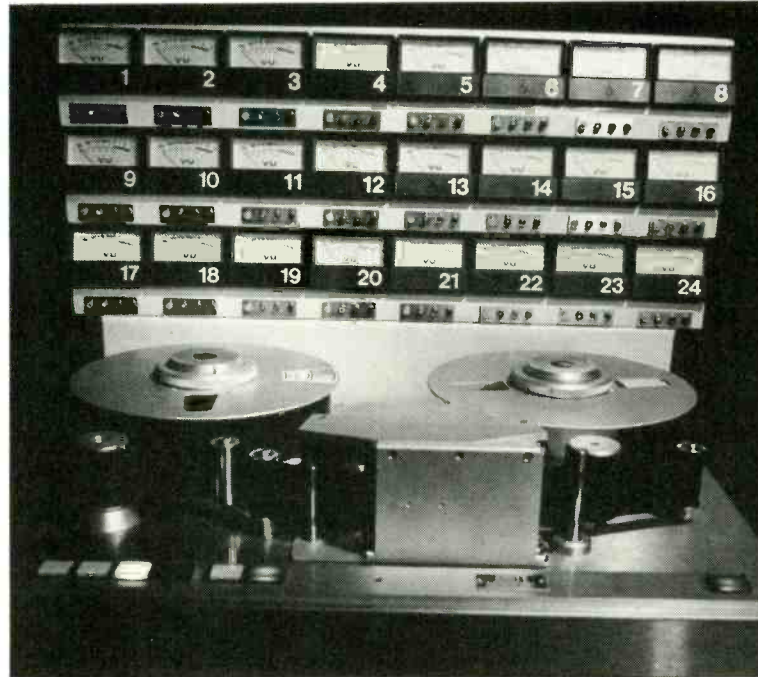
## Coherent Communications

Ivan Kruglatt  
13733 Glenoaks Boulevard  
Sylmar California 91342 USA

# AMITY PROFESSIONAL

## 24 TRACK 2" PRO TAPE RECORDER

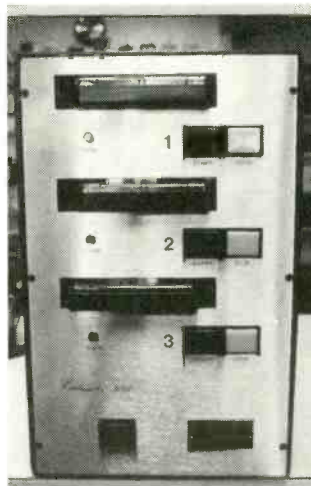
VU Penthouse. Complete remote control facilities. Line level transformer. Balanced XLR output. XLR input. Modular electronics. Auto locate.



Built to stringent specifications under the most hygienic conditions at our new Luton factory.

# AMITY TRIPLE STACK CARTRIDGE

Machine to complement the proven success of the "Cartmaster". (Large quantities already supplied to B.B.C. and many other important stations all over the world.)



**Amity Shroeder Ltd.,  
Unit 5,  
39-41 Princess Street,  
LUTON, Beds.**

Please send me further details of Amity Shroeder wide tape transports:

Name .....

Company.....

Address .....

.....

.....

# NEUTRIK

SWISS MADE

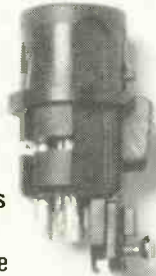
## THE ENGINEERED CONNECTOR

Available in 3 and 5 pin, Black or Silver Finish

**Helicon Contact**  
provides strong contact



**Tapered Damping Inserts**  
greatly reduces mechanical noise



**Hardened Steel Spring Catch**  
virtually no wear and tear,  
yet soft easy movement

**Insert**  
3 Pole & 5 Pole



NC3FC



**Solid Diecast Glass Blasted Housing**  
no screws, unique cable grip and strain relief self adjusting for instant wiring

**Unbreakable Strain Relief  
And Locking Device**



NC3MC

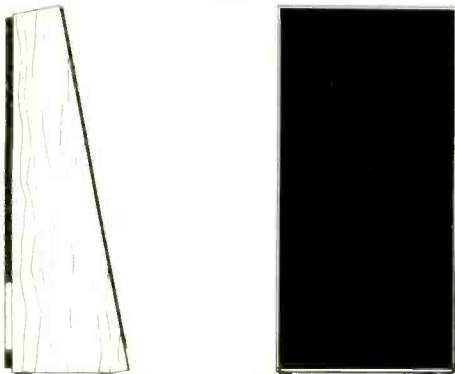
SOLE U.K. AGENT

### Eardley Electronics Ltd

Eardley House, 182-184 Campden Hill Road, London W8 7AS

Telephone: 01-221 0606 Telex: 299574

# Boothroyd Stuart—Meridian Active Loudspeaker M1



An active loudspeaker derives great musical and sonic benefits from the incorporation of electronics specifically matched to the enclosure and drive units. Each of the three drive units is driven directly by its own power amplifier and is individually protected against abuse. The electronic crossover is a constant voltage design which has only a 1.8dB energy ripple. This, combined with electronic time delay and phase compensation, gives a speaker system which is minimum phase ripple and time delay compensated up to 5KHz. The exact action of the crossover and phase compensation is the result of several years' investigation into stereo image formation in multi-way speakers.

Feedforward and feedback correction, and the use of a high order bass system comprising a specially designed driver and auxiliary radiator results in a speaker whose response is smooth and even, from 26Hz to 20KHz.

This loudspeaker is, in our opinion, the ultimate development in an accurate, musical loudspeaker — the stereo image accuracy, depth and spaciousness, combined with the wide and smooth frequency range and high level possibility ensures that the loudspeaker will not intrude upon the musical experience. This is the meridian of loudspeaker design.

Units currently in use worldwide = 116.

Units currently in use in Britain = 18.

Units supplied in Britain by Subjective Audio = 12.

Sensitivity —20dBm for 85dB spl @ 1m @ 1KHz  
 Output maximum 108dB spl @ 1m music programme  
 Noise 20dB spl  
 Response —3dB 26Hz—25KHz  $3/8\pi$  steradians  
 ±2dB 150—20KHz  
 Input for full output 0dBm over 4K or 600Ω  
 or —20dBm over 4K or 600Ω

Matching Size

±1dB wrt reference 30Hz—20KHz  
 990mm high (39in), 495mm wide (19.5in), 345mm deep (14in)  
 Approx 30 kilos (66lb)

Weight

**SUBJECTIVE AUDIO**  
**6 WINDSOR ROAD,**  
**PALMERS GREEN,**  
**LONDON N13,**  
**ENGLAND**

01-886 7289



8 channel, 2 group MXT—1000—each channel fitted with compressor

The MXT—1000  
 A unique system enabling your own requirements to be built from standard equipment

**MXT-1000**  
**AUDIO MIXING**  
**SYSTEM**

Manufacturers of  
 sound systems  
 and electronics

**Audix Limited**  
 Station Road, Wenden  
 Saffron Walden  
 Essex CB11 4LG

**Tel: Saffron Walden**  
 (0799) 40888  
 Telex: 817444

**audix**

# SAVE OVER £800 AN 8-TRACK STUDIO PACKAGE YOU CAN'T AFFORD TO MISS...

## ALLEN & HEATH BRENELL MINI 8 STUDIO PACKAGE, COMPRISING:

- MOD II CONSOLE 16 X 8
- HEAVY DUTY POWER SUPPLY
- BRENELL MINI 8 1 INCH COMPATIBLE  
STUDIO RECORDER
- DIGITAL TAPE COUNTER
- ELECTRONIC VARISPEED UNIT
- PRO-LIMITER
- PLUS—FREE OF CHARGE, CATHEDRAL CL4  
QUAD COMP/LIMITER
- FINANCE AVAILABLE

WRITE OR TELEPHONE FOR DETAILS TODAY



**CATHEDRAL SOUND LTD.,  
FOURWAYS, MORRIS LANE,  
HALSALL, ORMSKIRK,  
LANCS. L39 8SX  
TEL. HALSALL (0704) 840328**



Illustrated above are the two latest additions to the well-known range of WOELKE Wow and Flutter Meters, the ME 201 Flutter Classification Unit, and the ME 401 Automatic Distortion Meter. Fuller details on application.

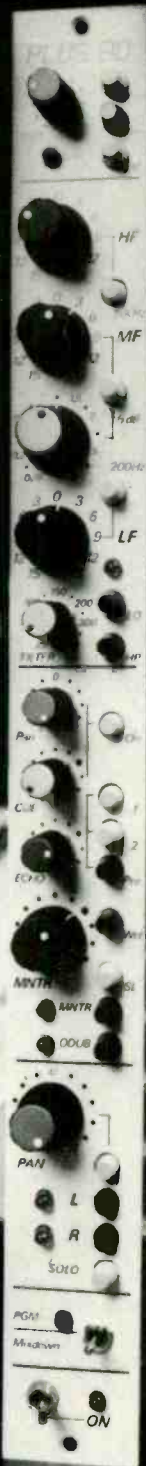
## LENNARD DEVELOPMENTS LIMITED

206 Chase Side, Enfield, EN2 0QX  
Tel. (01) 363-8238/9

# PLUS 30

If we are able today to expand our RS 80 mixing console, it's because, from the beginning of our Society we didn't overdiversify and always went on with mixing consoles. Thanks to our experience, and to well-known engineers who take part in our production creation, we master all parameters making a mixing console performant, reliable and functional...

Our design engineers are efficient, and thanks to them RS 80 console offers as much as the competitors do... for some dollars less. RS 80 console is available with 28 to 36 inputs. Automated version RS 80 + RS 64. (Distributor request).



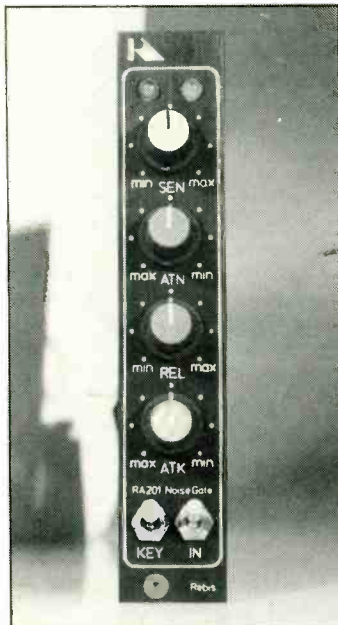
AES Bruxelles Booth 126.

**42, rue Pierre Nicole 75005 PARIS  
Tél. 634.01.36**

## Rebis Noise Gate

Rebis Audio has introduced the RA201 noise gate, the first in a new range of 133mm x 25mm compatible modules which can be accommodated in a 16-channel rack or fitted to existing equipment. The module has variable controls for sensitivity, attenuation, release and attack and has in/out switching and a key input switch. Red and green LEDs indicate gating and non-gating. Specifications of the module are sensitivity -60dBm to +20dBm; attenuation 5dB to 40dB; release time variable from 40ms to 10s; attack time variable from 15µs to 4ms; noise -92dBm (20Hz to 20kHz); frequency response  $\pm 1$ dB from 20Hz to 20kHz; distortion 0.01% THD at +12dBm at 1kHz; output +23dBm into 600Ω. The module's power supply will accept 24V to 40V DC at 50mA. Price of the RA201 is £62, the 16-channel rack costs £50 and power supply £78.

Rebis Audio, Kinver Street, Stourbridge, West Midlands DY8 5AB, UK. Phone: 0384 71865.



## Acoustilog 232A Reverberation Timer

Acoustilog has updated its original Model 232 reverberation timer with the introduction of the Model 232A. The new model offers a number of improvements over the original model including lower total system cost, higher accuracy, easy one-person operation and instantaneous readout. The Model 232A has automatic level detection,



Philips recently demonstrated its new Compact Disc digital PCM disc player to the technical press, the new disc playing in stereo for one hour, or mono for two hours, and only being  $\frac{1}{2}$ in in diameter. Technical details shortly.

timing accuracy within  $\pm 2\%$ ,  $T_{60}$  range accuracy within  $\pm 2$ dB, digital display of reverberation time within each of 19 different frequency bands, a measurement range of 63Hz to 12.5kHz, two noise averaging filters, zero-crossing circuitry for external inputs, AKG phantom-powering, calibrated send and receive controls, and LED level indicators. A wide range of options are available including true rms log scope output, pulse and trigger jacks, remote display, and 48V phantom-powering. Price of the Model 232A is \$795. Acoustilog Inc, 19 Mercer Street, New York, NY 10013, USA. Phone: (212) 925-1365.

## Adams-Smith synchroniser

The Adams-Smith tape recorder synchroniser mentioned in the recent article on *Tape Synchronisers* and imported into Britain by Pye TVT, is now also being marketed into the recording studio field by 3M UK Ltd who may be contacted for further information.

Acoustilog 232A



## Audico distributor

The range of audio cassette duplicating and loading equipment manufactured by Audico, and shown at the recent AES exhibition, is now being distributed in Britain by Christian Audio Visual Services Ltd, 171 Chase Side, Enfield EN2 0PH. Phone: 01-363 6125.

## TDK metal tape

Further news on metal alloy tape development was released by TDK at the recent Consumer Electronics Exhibition in Las Vegas. The tape developed by TDK uses metal alloy particles formed by a reduction method while in a liquid state employing sodium borohydride, and composed of small particles approximately  $300\text{Å}$  in diameter ( $3 \times 10^{-8}$  m) strung together in a necklace like chain. TDK's original Avilyn formulation was cobalt enriched ferrite and comprised particles of a needle-like form measuring about 0.5 microns ( $0.5 \times 10^{-6}$  m) in length in a random, but generally linear composition. The small magnetic particle formulation

makes it possible to pack a greater number of metal alloy particles onto a coated tape film enabling a yield of up to 3,500 gauss, and providing a coercivity of 1,060Oe compared to 540Oe for Super Avilyn, and remanence of 2,600G compared to 1,550G. Unlike normal tapes, the metal alloy particles are not a conventional oxide and are thus susceptible to rust formulation by oxidation from the atmosphere, so TDK has developed a technique giving each particle a protective film.

The high coercivity enables higher recording levels to be accommodated on the tape and with a coating thickness of about 4 microns and erasability of 60dB, can provide an additional 1.5dB at 333Hz and +5dB at 16kHz over Super Avilyn tape, when +5dB bias level is used. Frequency response is also increased. Marketing plans for TDK X-C60 metal alloy cassettes have not yet been announced, nor has the company's intentions in supplying tape in wider formats.

## Quad-Eight expansion

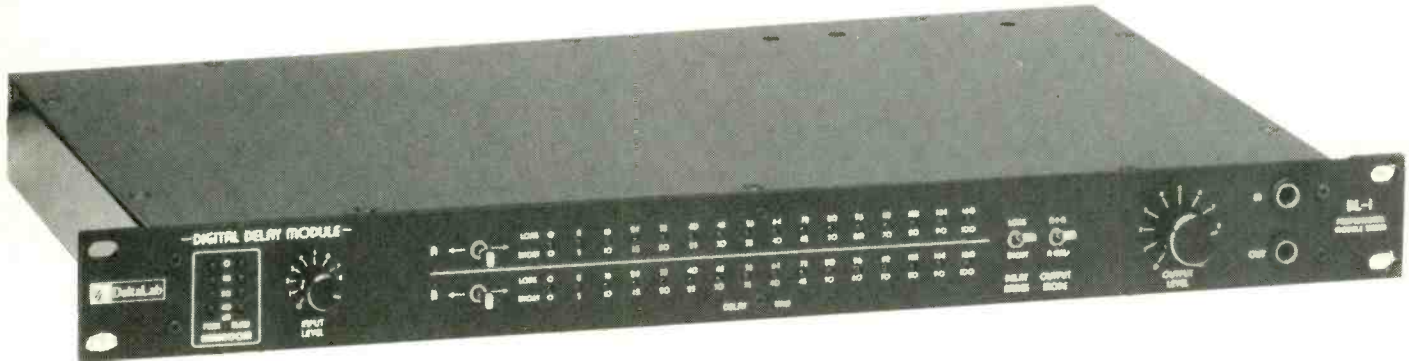
North Hollywood based, Quad-Eight has expanded its facilities to meet increased demand for its products. The company has acquired an additional 11,000sq ft in an adjacent building which is to be customised to house their modular console production, and digital research and development department. In addition to this Quad-Eight has appointed three new dealers, in Los Angeles—Everything Audio; in Northern California—Accurate Sound; and in New York—Martin Audio. Quad-Eight Electronics, 11929 Vose Street, North Hollywood, Cal 91605, USA. Phone: (213) 764-1516.

## Spectra Sonics move

Spectra Sonics has moved to a custom designed factory adjacent to the Ogden Municipal Airport. Spectra Sonics' new address is 3750 Airport Road, Ogden, Utah 84403, USA. Telephone number remains the same: (801) 392-7531.



The DELTALAB DL1 offers 160 mS digital delay with a no compromise 20Hz-15KHz bandwidth and 85dB dynamic range even at maximum delay



# NOW THE DL2 'ACOUSTICOMPUTER' OPENS UP A WHOLE NEW AREA TIME DOMAIN MANIPULATION



It is a stereo unit of equally impressive performance but in addition offers:-

- ★ Supplementary 2 second delay modules
- ★ 16 Synthesised room acoustics
- ★ Continuous repeat, doubling, vibrato etc.,
  - ★ Internal time base VCO
  - ★ Positive and negative flanging
  - ★ Equalisation controls

UK Distributors



Scenic Sounds Equipment  
97-99 Dean Street, London W1V 5RA

Telephone : 01-734 2812/3/4/5  
Telex : 27 939 Scenic G



### Portable loudspeaker ▲ stand

Ultimate Support Systems has introduced a novel lightweight, portable loudspeaker stand. The stand, designed by Darrell Schoenig, is based on the construction techniques used in hang glider construction and is of a foldable design. The stand weighs a mere 12lb yet is capable of supporting either narrow column or wide bass enclosure loudspeakers weighing up to 300lb and uses a spring locking system and push-pull fasteners which can be set to two height settings and allow loudspeakers to be tilted for optimum PA use.

Ultimate Support Systems, Inc, 824 E Lincoln, Fort Collins, Colorado 80524, USA. Phone: (303) 493-4488

### Community Recording Services

Community Recording Services is an association of individuals who make their careers in the music and recording industries, and offers its members the opportunity to keep pace with "this business called music, through a co-operative state of the art, multitrack recording studio, and by organising committees to pursue special interests, meetings, seminars and conferences to exchange and disseminate information to promote the creative use of the recording industry." Society members have access to all the recording and production facilities of the co-operative studio, and the ability to exchange educational, technical and artists ideas

amongst the members. Membership is open to anyone actively involved in the music and recording industry. Details from Community Recording Services, PO Box 4672, Vancouver, BC, V6B 4A1, Canada.

### High Fidelity '79 Exhibition

Although not strictly within the scope of this magazine, mention should be made of the High Fidelity '79 Spring Exhibition at the Cunard International Hotel, Hammersmith, April 24-29. This exhibition often sees the introduction of items which impinge on the studio scene, particularly amplifiers and loudspeakers, and with over 150 brand names being shown no doubt this year's exhibition will be no exception.

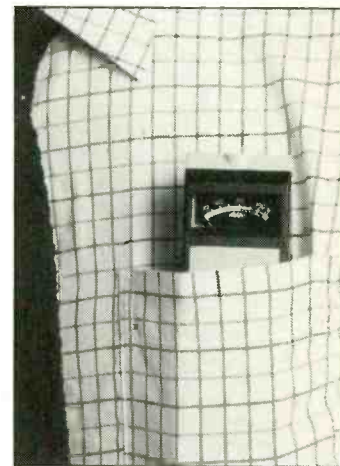
### German electronic music workshop

German musician Klaus Schulze, a respected electronic music performer, has opened a synthesiser school and electronic music workshop in Hambühren, West Germany, which also doubles as a demonstration and sales shop giving individualised attention to potential purchasers and users. The main purpose of the synthesiser school is to introduce as many musicians as possible to the field of synthesised electronic music. This is accomplished by offering weekend courses of two 8-hour sessions in which the participants are introduced to the basics of synthesisers

and their associated studio electronics. The courses are tailored to the level of knowledge of the participants and tuition is carried out by means of recitals and demonstrations, but with the main emphasis being put on practical work on the available instruments. The courses are limited in numbers to a maximum of 10 people per course and teaching is by Klaus Schulze together with a number of experienced musicians and technicians. Tuition is carried out in a professionally equipped 8-track studio and the available equipment includes, Moog, ARP, PPG, and Korg synthesisers; Sound Workshop console; Otari 2/4/8-track tape recorders; Dynacord studio and PA equipment; AKG reverberation; BGW amplifiers; Electro-Voice loudspeakers; and Neptun equaliser and analyser. Cost of the course is DM250 and full details are available from Klaus Schulze Prod, Schwarzer Weg, D-3101 Hambühren, West Germany. Phone: 05084 3588.

scale and the meter operates at the press of a button. Price of the meter is £70.

DOHM London Limited, DOHM House, 130 Gipsy Hill, London SE19 1PL, UK. Phone: 01-670 5883.



### DOHM noise level meter

Designed primarily for measuring environmental noise pollution in industrial applications, the new DOHM compact, pocket sized noise level meter also has audio applications. Activated by a 2.7V, 100 hour battery, the meter has a built-in capacitor mic and filter and gives frequency-weighted readings based on the IEC 123 Scale A recommendation. The meter readout covers the range 40dB(A) - 120dB(A) on a single

### New Neve console

Preliminary information has become available on the Neve 8098 console for 46-track recording—further details of which will be available at AES Brussels. The new console is an L-shaped design and will accept 56 input channels with 48-track monitoring for 46-track recording. The console features full eq and Penny and Giles faders on each channel; master mic/line changeover facilities; master cut A and B facility to enable pre-selected groups of channels to be muted; four reverberation outputs with delay and slap-back facilities; six cue (folback) groups, four mono and one stereo output; and muting positional solo facilities on all channels. The 48-track monitor mixdown section has full quad panning and the 48-track metering is available with either VU, PPM or paragraph meters. All the usual facilities found on Neve consoles such as full quad monitoring, studio loudspeaker circuits, comprehensive talkback facilities, a range of patch panel options, integral limiter/compressor effects units, etc are available to customer specifications. In addition the 8098 will accept the *Necam* computer assisted mixdown system and VCA subgrouping facilities. An additional feature of the 8098 is the provision of extra reverb return inputs and a multifrequency line-up oscillator.

Neve Electronics International Limited, Cambridge House, Melbourn, Royston, Herts SG8 6AU. Phone: 0763 60776. 28 ▶

### Sound Workshop reverb unit

Sound Workshop has introduced the new *Model 262* stereo spring reverberation system featuring a versatile equaliser section with each channel being adjustable by  $\pm 15$ dB over the high and low frequency bands. Frequency selection is fully sweepable from 50Hz to 1kHz (low band), and from 500Hz to 10kHz (high band); and the eq bandwidth is optimised for proper contouring of the reverberant signal. The

*Model 262* allows dry/wet mixing (for broadcast and disco applications); full drive level into 600 $\Omega$  loads; and has LED level indicators, active balanced inputs, and matched Bi-FET preamps. The basic unit is priced at \$700, although an alternative version with transformer balanced outputs and XLR connectors is available priced \$750.

Sound Workshop Professional Audio Products, Inc, 1324 Motor Parkway, Hauppauge, NY 11787, USA. Phone: (516) 582-6210.

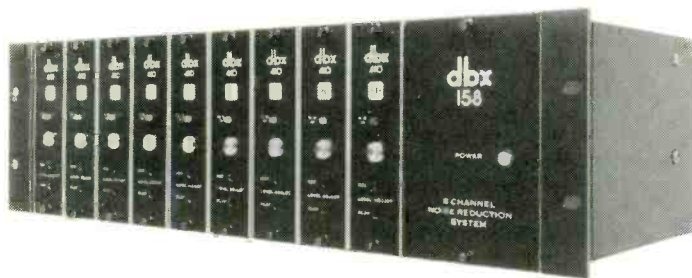


# Budget dbx Noise Reduction for Multitrack.

**Ideal for use with Teac, Otari, Itam and Dokorder machines**  
**Unbeatable 30 db Noise Reduction.**  
**Total compatibility with DBX Professional studio Noise Reduction equipment.**  
**Modular format. Simplicity of operation.**

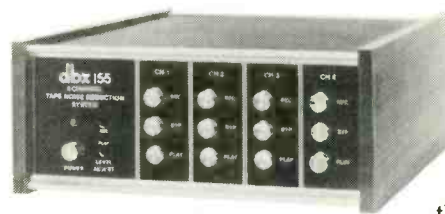
## MODEL 158 - £1,498.00

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



## MODEL RM 155 - £650.00

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



## MODEL 155 - £325.00

A free standing switchable 4 channel unit of identical performance to the RM 155 which

is easily expandable as the studio grows.

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

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



**Scenic Sounds Equipment,  
97-99 Dean Street,  
London W1V 5RA.**

Telephone : 01-734 2812

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

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

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

Norway  
**Kvam Audio,**  
 Tollbugt 7,  
 Oslo 1  
 Tel : Oslo 412 996

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

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

**Soundcraft recorder**

Soundcraft Magnetics, a subsidiary of Soundcraft Electronics, has announced the introduction of its first tape recorder the *SCM 381-8*, a 1in, 8-track recorder which has been under development for about two years. The *SCM381-8* is an entirely new design featuring a precision engineered transport based on a cast aluminium deck plate for tape path stability. It has a simple tape path with the capstan mounted on the outside of the tape to avoid tape oxide wear. The recorder will accept 10½in reel size; operates at 15in/s; speed stability is 0.01%; wow and flutter 0.03% (IEC); wind time 100s (2400ft); and start time 0.5s to 0.1% wow and flutter. The unit's main control panel for all audio and transport functions is removable allowing it to be used for remote control, and similarly the unit's varispeed control is removable. The main panel, in addition to the usual functions, also contains a tape counter which reads in minutes and seconds, plus a search-to-zero function. The recorder is NAB equalised (other options available); has a record/replay frequency response of 30Hz



to 20kHz (+1dB/-2dB); replay S/N of 68dB unweighted 10Hz to 100kHz; sync output bandwidth of 16kHz; line output bandwidth of 22kHz; will accept inputs of -10dBm to +20dBm, 10kΩ; and outputs are -10dBm to +10dBm at OVU +22dBm maximum. Price

of the *SCM 381-8* is \$10,500 in the USA, or £5,250 plus tax, and where applicable freight and customs duty in the UK, Europe and Canada. Soundcraft Magnetics Limited, 9-10 Great Sutton Street, London EC1V 0BX, UK. Phone: 01-251 3631.

**Contracts**

● Quad-Eight has recently supplied two automated consoles to Nippon TV; acquired a contract from Norsk Film of Oslo for a customised *QE-2441S* film re-recording console and shipped a *QE-2441S* unit to Romania Films.

In the USA, equipment has been sold to WBS Post Production Services in Dallas; a *QE-831* console to WBS, Houston; and two custom *QE-2441S* units to Chicago Recording.

In Hollywood, Quad-Eight has received orders for three custom *Compumix III* systems for MGM; a 76-input custom *Compumix III*, a *QE-2441S* and a custom electronic looping console for Universal Studios; and a *Compumix* automated re-recording and turnkey package for Lion's Gate Films. They have also installed a *QE-2441S* for 20th Century Fox; a *Compumix III* system and custom electronic looping console for Ryder Sound Services; and re-equipped the TODD-AO facility with a 96-input, 6-track re-recording console in Studio A and a 24-input, 4-buss stereo re-recording console in Studio B.

● Neve has supplied Granada Television with a 32-channel console fitted with *Necam* computer for a new music recording studio in Manchester.

● Racal-Zonal type 888 tape has been chosen by Thames Valley Broadcasting exclusively for all recording purposes.

● Allen and Heath has supplied an 8-track studio package to former Genesis vocalist, Peter Gabriel.



*Survival stereo panner*

*Autopanner*, a studio quality effects unit which will autopan the input signal in stereo or quad with adjustable image width, symmetry and pan speed. Panning can be triggered by the internal waveform generator or by the amplitude of the input signal, and the unit can be slaved from other effects generators, or can in turn slave further units accepting a DC control voltage. The panner will also duck and vibrato.

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

**People**

● Willi Studer has been awarded an honorary doctorate of technical science by the Swiss Federal Institute of Technology, Zurich, in appreciation of 'his achievements as a creative engineer, designer and manufacturer of equipment in the field of magnetic sound recording.'

● Christopher McDouall has been appointed group managing director of the Neve Group of Companies.

● Penny & Giles has appointed David McLain as marketing director with responsibility for the company's range of potentiometers and studio faders.

● John Phelan has been appointed to the newly created position of general manager for Filmways Audio Services.

● Lee Whiting has joined Reslosound as sales administrator for the company's range of microphones, radio mics and industrial communications systems.

**Survival Projects autopanner**

Scenic Sounds Equipment has introduced the Survival Projects

**Wayne Kerr automatic bridge**

A new addition to Wayne Kerr's range of test instruments is the *B605* microprocessor based automatic component bridge. The instrument is a fully automatic L, C, R, Q and D measuring instrument with autorange and autotrim within 0.1% accuracy over three selectable frequency ranges—100Hz for electrolytic capacitors and large inductors; 1kHz as a general purpose test frequency; and 10kHz for low value components such as small capacitors. The *B605* terminals are suitable for 2, 3 or 4-terminal measurements, whilst a small matching adaptor, the *JU4*, provides single-handed loading and removal of components with axial, radial or preformed leads.

Wayne Kerr, Wilmot Breeden Electronics Limited, Durban Road, Bognor Regis, Sussex PO22 9RL, UK. Phone: 02433 25811.



*Wayne Kerr B605*

# SYNCON

## Mixing business with pleasure

Recording is a personal experience made better or worse by the ergonomics of the mixing console. Syncon has more creative facilities than any other unit in its price range, not that you will find many 24 track consoles at any price to compare with the following standard features. A 22 page information package will reveal even more. Write today.

- 28 input-output module capacity.
- 24 track monitoring and metering.
- Quad and Stereo echo returns.
- Quad monitor and mixdown.
- Free grouping and subgrouping.
- Single master Record-Remix switch.
- Sweep frequency eq. with switchable Q.
- Noise and distortion insignificant.
- P & G Faders as standard.
- + 26 dB output on groups and inserts.
- Producers desk with full patchbay options.

**AHB**  
ALLEN AND HEATH BROS. LTD.

### Agents

**Audiomarketing**  
Stamford U.S.A.

**Son Professionel**  
Paris

**Intersonic**  
Stockholm

**Fading**  
Madrid

**Studio Sound**  
Frankfurt

**S.E.D.**  
Brussels

**Sun Music**  
Denmark

**Audiolab Hellas**  
Greece

**Peter Bollen**  
Eindhoven

**Lastron**  
South Africa



Al Williams  
with 28/28 Syncon  
at the Musicworks, London

# studio diary

## Air Montserrat

If you say 'Montserrat' to most people it stirs vague memories of Nicholas, without a T, who wrote *The Cruel Sea*. However that situation is set to change as a million record buyers reach for their atlas after reading the legend 'Recorded at Air Studios Montserrat'. While most of us struggled through another gloom-laden winter, an intrepid band of engineers, technicians, piano tuners and carpenters were working flat out in the heat of the Caribbean to put the finishing touches to one of the most advanced recording studios anywhere on the planet.

The idea of building a studio somewhere hot, romantic and remote but reachable came to George Martin and Geoff Emerick of Air Studios after they had completed a relaxed and artistically successful album with America on one of the Hawaiian islands where they converted an ordinary house into a recording studio using a mobile unit. The house-island formula worked so well that it was decided to repeat it.

The concept jelled and the search was on for the right island. The Caribbean offered distinct advantages being fairly easily accessible from Europe, close to such important music business centres as New York, Miami and Nashville, and not impossibly far from California. Not to mention the roots, rock, reggae and rasta rhythms rapidly attracting the elite of the white rock scene to this dark brown part of the world.

George Martin chanced to come to Montserrat (he hadn't heard of it either), a beautiful island, green and mountainous, restful and without any of the racial problems which are making places like Jamaica virtual no-go areas for

white faces. Amazingly enough the island is still a British colony, and likely to remain one for the foreseeable future because the people like it that way.

Dave Harries, manager of Air Studios Oxford Circus, who supervised the project practically from start to finish, pointed out a few other advantages: "the studio will obviously be attractive to tax exiles, and the island gives a virtual 15-year tax holiday to new businesses, plus duty free importation of equipment and building material. If those conditions hadn't existed, then the freight costs on top of import duties would have made it a non-starter." Advantages for the island were income, employment and publicity.

The studio complex itself is perched high on a hillside overlooking the blue Caribbean and is set in 26 acres of mango, citrus and coconut groves. There is a 50ft swimming pool, a games room with pool table, table tennis, pinball, darts and a videotheque. The excellent local chef presides over a large kitchen and dining room, and can whip up anything from egg and chips to vegetarian dishes or lobster thermidor.

Building it was quite an operation requiring almost military planning. Every piece of electrical and electronic equipment had to be detailed and shipped out from the UK or the US. No nipping down the road to your friendly electrical shop here. Local contractors and architects were used with the Air people supervising. And the workforce, despite such colourful names as 'Violence' and 'Apache', turned out a high standard of workmanship, and finished the project in just over a year.

So were Air Studios satisfied with the hurricane- and earthquake-



proof studio they got for their £300,000 to £400,000 outlay? "The completed studio has got to be one of the best in the world. We've got the latest Neve desk, co-specified with them. There are 46 channels now and there will be 52. It's claimed to be the best performer of any of the big consoles," says Dave.

Recording technology is one of the few remaining areas of electronics where British firms survive in the market, often leading it. "Rupert Neve did the basic design work himself, and the desk is another step along the way from anything else. It incorporates such innovative improvements as 8-way foldback, whereby every musician has his own mixing console for foldback so they can individually adjust the balance in their own cans. This cuts out the problem of feeling that they are not hearing enough of their own or another instrument. There are eight pre-selected folds so they can balance it."

"The microphone amplifiers are actually in the studio. Neve did a lot of investigating and found that the shorter the leads the better the performance. So the amplifiers are in the studio, although there is still remote level switching in the control desk for the amplifiers," says Malcolm Atkin who installed most of the equipment.

Other studio equipment includes two new MCI 24-track recorders, three Ampex ATR102 stereo machines and an MCI synchroniser for 46-track work. Control room monitoring is with Tannoy or JBL

speakers.

Air did their own acoustic work and design to avoid "too much of the same thing" which they felt many specialist companies delivered. There are two main areas in the approximately 30 by 30ft studio. One is fairly 'dead' acoustically with a low ceiling, bass traps and guitar traps built into the wall, while the other part can be made 'lively' or quieter with adjustable drapes. There is a large isolation booth with an independently sprung floor and an enclosed piano booth giving the 7ft 4in Bosendorfer its own acoustic environment. The pianist is still in the main room so he or she needn't feel cut off, yet the piano can still be miked at a reasonable distance.

The control room had to be large to take the big desk, but at 20 by 20ft, you can tell that it has been designed by engineers who've suffered long enough in cramped control rooms. There is a large window on to the studio, and an even larger window giving a view across the golf course to the Caribbean. The golf course is an added plus for the older members of the music and recording fraternity.

One of the big differences between Air Oxford Circus and Air Montserrat is the sound proofing. "At Oxford Circus the sound proofing is to keep the sound out, but this is a quiet little island and the double cavity construction here is to keep the sound in, otherwise we would keep everyone awake at night," says Dave.

MCI multitracks and Ampex 2-track recorders behind Neve





Neve console

A price tag of £10,000 per week at the studio means that the studio will be used by the established and successful. But closer examination of what you actually get for the money brings the cost into perspective. For that £10,000, up to a dozen people will be completely looked after. Accommodation, plus food, soft drinks, beer, and access to a well stocked wine cellar. And depending on how well prepared the bands are, they can get a 2-month advance booking flight to neighbouring Antigua for just £230 return.

"The bands, friends, relatives and helpers will live in villas round the islands so they can get away from the studio environment to relax. While some members of a band might be busy with overdubs, the others will be able to use the water skiing and skin diving gear that will be available. There will also be a chauffeur-driven bus and private cars at their disposal, so they will get quite a lot for their money," says Dave.

Geoff Emerick, on the island to lend a critical triple-grammy ear to the new studio, has no doubt about the biggest single benefit of the new studio. "Working on an island like this is great for the creative side of things. The atmosphere is friendly and very relaxed. There are no pressures and the artists can concentrate on creating and recording. Just like we did recording one of Wings' albums cruising round the US Virgin Islands. The combination of location and technical facilities make this one of the best studios around."

First band to record at the studios were The Climax Blues Band, who by a happy coincidence, were also the first outfit to record

at Air Studios Oxford Circus. All of them seemed very happy with the progress being made on the album. Recording sessions were relaxed and the band were obviously enjoying their stay. Hopes were high that this could be the album they have been waiting for. Recording engineer was Colin Fairley but it remains to be seen if any of the local musical influence has crept in. Climax certainly exerted their musical influence on the island, doing a gig at one of the local dance spots, much to the delight of the young Montserratians.

Recording techniques have come a long way since Geoff Emerick engineered *Sergeant Pepper* on a 4-track 12-input valve desk. And although, like many others, he still swears by the 'valve' sound, the studio in Montserrat has much that pleases him. "The desk has a nice high sparkly 'top' which I like, and we can record on 46 tracks by running both 24 tracks in electronic lock. By the time all the overdubs have been done on a straight 24-track machine, the tape may have been spooled about 1,000 times and you lose a lot of 'top', particularly on the drums. To avoid this, you record the drums and rhythm section on one tape and store it. Using the other 24 tracks, you do the rough mix, then when you have got what you want and are ready for the final mix you use this as a reference guide, do the overdubbing on the second tape, and go back and do the final mix on the first tape. I used this technique on the new UK album."

Next artist due for a bit of Montserrat Air will probably be Jimmy Buffet, just coming to the fore in the UK and Europe but an established artist in the US. Emerick hopes to record him sometime in April or May. Other acts pencilled in are Chicago, Blondie, perhaps Wings even, and Mick Jagger has recently paid a visit. Local acts do not figure in plans at the moment, but a lot of influential ears will be in the neighbourhood so we could be hearing a lot more of artists like Bankie Banx and Black Prince.

There are one or two drawbacks to Montserrat, of course. Booze is about £2 a bottle, cigarettes are 25p, and the girls are much too friendly.

Bill Third

### Regents Park Recording, London

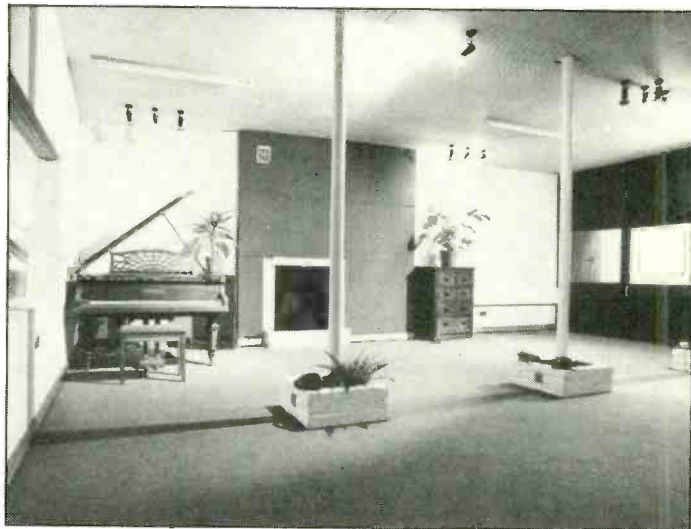
Contrary to what one might think, Regents Park Recording is not situated in Regents Park but in St John's Wood—just round the corner from the tube station of that name. Housed in a building

whose previous existence was as a Parish Hall, Regents Park Recording has recently re-equipped its studio from 16-track to 24-track. The studio originally opened for business in March 1977 and is an offshoot of Quixote, the radio commercial production company run by Duncan Bruce. Although the two companies are nominally separate entities, the studio shares office space and administration staff with Quixote. Such are the ties between the two companies that Quixote books the studio every morning of the week for radio commercial recording.

To find out how the change to 24-track had gone I spent a pleasant afternoon with chief engineer Steve Lipson, and marketing and promotions manager Graeme Perkins, discussing not only what has already been achieved, but also their plans for the future. Steve and Graeme

upper level which has an eye-catching wood surfaced roof is used as the administration offices, whilst the lower level, reached by a narrow staircase, comprises the control room and studio. The narrow staircase doesn't present any problems as the studio also has direct access from the street for the loading and unloading of equipment.

The control room has, as already mentioned, one of the new Trident TSM consoles offering 40 inputs and 32 outputs. This has several customised features including a half normalised jackfield as opposed to fully normalised, but with fully normalised auxiliary sends. Other features are a 3-position stepped oscillator and 3-position equalisation at 100Hz, 1kHz and 10kHz. Steve is very pleased with the console and paid particular praise to the engineers at Trident and SHE Audio who ensured that the



Regent Park Recording

firstly explained that they had decided to go 24-track at the end of last year because they felt that they had achieved as much as they could with their previous 16-track set-up. Having decided that they needed to update they were left with a choice—whether to rebuild the studio or to re-equip. Eventually they decided to re-equip, because there were a number of variable factors involved in rebuilding (of which more anon). To facilitate re-equipping the studio closed down on December 15, 1978, reopening on January 10 as 24-track, the most obvious changes being the replacement of their Amek 20/16 console with a 40/32 Trident TSM console, and replacement of their 3M 16-track recorder with a 3M 24-track.

Before detailing the features and equipment available in the studio and control room, it should be noted that the building housing the studio is split into two levels. The

re-equipping of the control room was completed within the time allowed.

Tape equipment available includes a 3M 24-track machine with Audio Kinetics XT24 Intelocator, two Studer B67s, one of which is a high speed machine, and Revox A77 and A700. Steve informed me that they were currently building a remote box with a varispeed facility for use with the tape machines. Regarding the two Studer B67s Steve explained that they had coupled one machine to two Dolby 361 modules, whilst the other was coupled to two Dolby 360 modules allowing off-tape monitoring. As for tape they are currently using Scotch 256 recorded at +6dB over Ampex, 200 nWb/m (+5dB over MRL test tapes). They had been using BASF tape but encountered a tape oxide shedding problem, however since changing to Scotch 256 have had no problems.

To the right of the console is a custom-built case housing ancillary processing equipment. Units being used include: Lexicon *Primetype* digital delay; *Scamp* noise gates, limiters, autopanners and time shaper; two dbx comp/limiters; Urei 1176 limiter/amp; Orban *Parasound* and de-esser; Bell flanger; and Eventide *Harmonizer*. Other ancillary equipment includes EMT reverb, Master Room echo unit, White equaliser, and a Klark Teknik graphic equaliser. Loudspeakers are JBL 4343s driven by Turner amplifiers, together with Auratones, and Steve Lipson also has a pair of Court *CTIs* under consideration. The control room also has available a selection of domestic equipment including a Nakamichi 550 cassette recorder, Thorens/SME record deck, and Quad 33/303 amplification. Size of the control room is some 600sq ft and it offers excellent vision to the studio.

Turning to the studio this is approximately 1,100sq ft, has a spacious isolation booth to the left rear, and also has available a number of acoustic isolation panels. The studio uses Lockwood/Tannoy monitors driven by Turner amps for foldback, plus Beyer *DT100* headphones and a wide variety of mics with the emphasis being on dynamic models. Microphones spotted during my visit included AKG 202s, 204s and *D12s*; Beyer *160s* and *201s*; Electro-Voice *RE10*; Neumann *KM84s* and *KM87s*; and a Shure *SM57*. The studio has a number of instruments available for hire including a Steinway piano, and Rhodes and Hammond organs.

The studio and control room are 'own-designed' with Steve Lipson being the main design contributor. Whilst being rather stark in appearance, the acoustic characteristics are extremely good. A point worth mentioning is the fact that there is a line of thin pillars running centrally through the studio/control room which act as supports for the upper level and which although noticeable do not significantly impair vision or restrict studio space utilisation.

Following the re-opening of the studio, studio manageress Karen Goodman ran the studio whilst the rest of the team took a well earned rest to recover from their efforts in re-equipping in the space of four weeks — studio personnel include Rob Arenstein, Martin Adam, Alan Jackoby and Perry Andrews. The studio doesn't have a resident maintenance engineer, but this aspect is not neglected as one afternoon every two weeks is

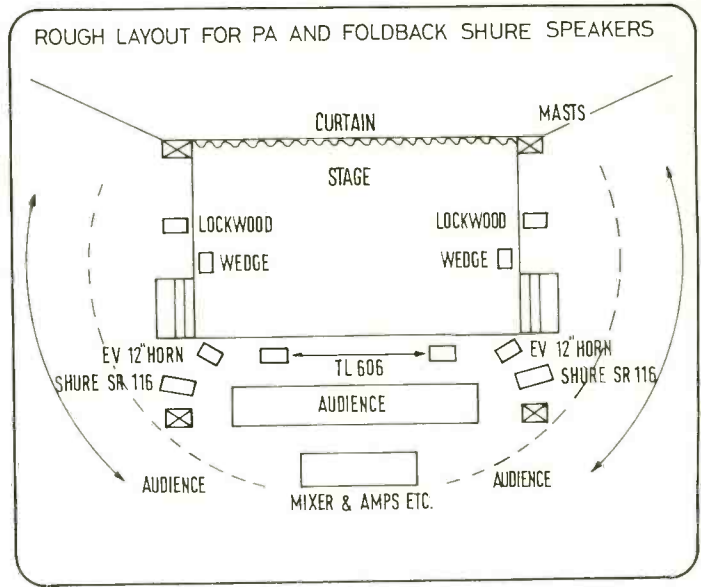
set aside for technicians from SHE Audio to check all is well. An example of the amount of care taken with regard to maintaining standards is the fact that the studio piano is tuned daily. Studio users have included Steve Harley, The Rich Kids, Viv Stanshall, R.D. Laing, Eddie & The Hot Rods, and currently Kenny Ball and his Jazzmen.

With regard to the future Regents Park Recording has some rather ambitious plans. Apart from a slight repositioning of the console and ancillary equipment case to afford better operational usage, and the building of a rest room — as Steve put it, "not just for relaxation, but somewhere to park those record company personnel who aren't involved in producing or recording and who only get in the way" — the studio aims eventually to complete a major rebuild in the not too distant future. As mentioned earlier there are a number of variable factors which will decide the timing and nature of the rebuilding. The major factor being the possibility that Quixote, the radio commercial production company, will be moving out of the upper level to an adjacent building. Should this happen then Graeme and Steve intend moving the 24-track studio to the upper level and carrying out a complete rebuild of the interior of the ex-Parish Hall. Currently they intend that the rebuilding will include the provision of two studios, one on each level and both with floating floors. As previously stated, the upper level will have a 24-track studio, whilst their present thinking is to use the lower level as an 8-track demo studio with the console integral to the studio, ie there will not be an acoustically isolated control room.

Regents Park Recording has built up a reputation of achieving good results with a particular kind of sound. The re-equipment of their studio has undoubtedly improved their facilities considerably; however I hope that any rebuilding will not entail sacrificing their sound. The studio is certainly forward looking, ambitious and very friendly. It was a pleasure to talk to people who have really given a great deal of thought to their work and who have ambitious plans for the future. I am sure we will be hearing much more from Regents Park Recording.

Regents Park Recording, 27A Queens Terrace, St John's Wood, London NW8 6DY. Phone: 01-586 5633.

Noel Bell



### The Beeb invades Leysin

Following on from the success of last year's *Snowtime Specials*, the circus came to town again at Leysin, Switzerland. Or more precisely 21 BBC outside broadcast trucks and lorries with 15 tons of equipment joined forces with the big top of Music Circus to record two European coproductions for television, *Abba in Switzerland* and *Disco in the Snow*. The two shows will be seen by an estimated worldwide audience of 200 million.

These productions effectively entailed the setting up of a complete television theatre in one of the largest four-mast circus tents in Europe, snow and altitude not withstanding. However, to the credit of all concerned, the installation was completed without any major problems. As with most TV shows today, the great majority of the numbers were mimed, with only Bonnie Tyler and Leo Sayer singing direct for the *Disco in the Snow* show. The programmes were to be recorded in front of an audience of 2,000-plus, which meant both a monitor system for the stage and a PA for the audience. In charge of the sound for the tent was Alan Taylor, who left his customary place in the Neve-equipped mobile outside to Barrie Hawes. Most of the monitor and PA gear was supplied by RG Jones (who often supply the BBC for OB productions) who also supplied Chris, Frank and John to set it up and look after any problems. Mixing was by way of a Midas 16/2 with four auxiliaries, the group outputs being used for the

PA and foldbacks for the stage monitors.

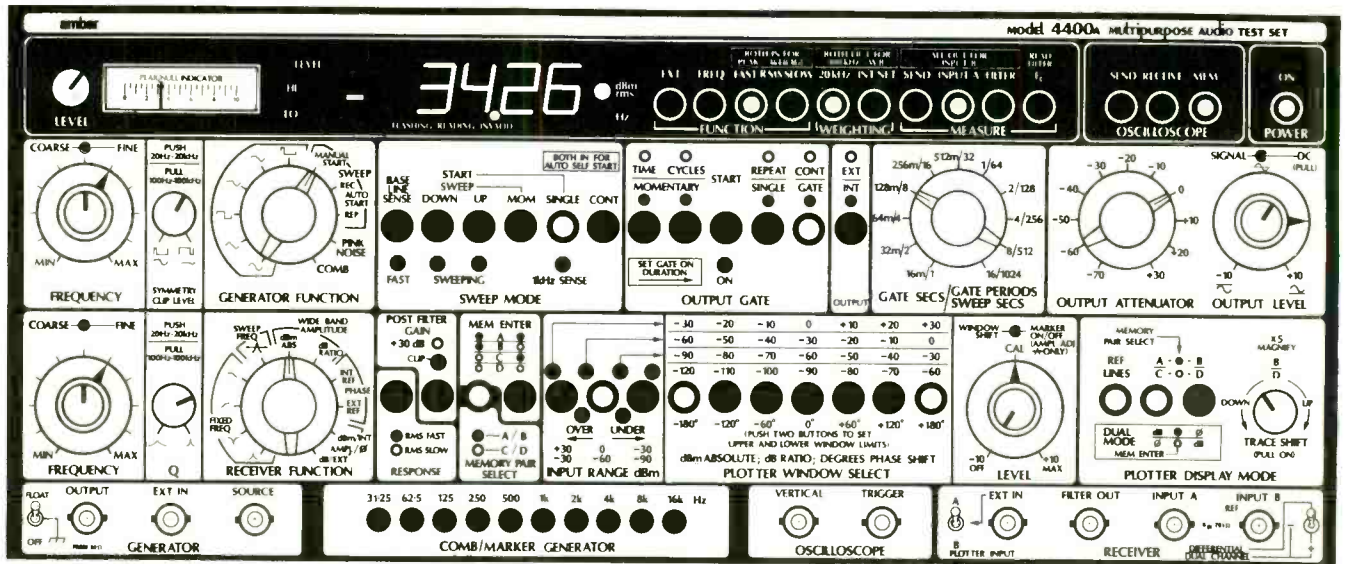
The PA consisted of multiple pairs of line source columns mounted around the inner perimeter of the tent in order to achieve as even a distribution as possible. Power was provided by four Quad *50E's* and half a crown. I'm sorry, I'll read that again, by one channel of a *DC300A*. The stage monitors consisted of two Lockwoods with Tannoy *Monitor Golds*, two wedges and two Shure *SR116* cabinets that were each mounted on a mast facing back to the stage. For these last two an old Midas *10/2* was used as an equaliser! Power was provided by a second *DC300A* plus the remaining channel from the first one. Most of the backing tapes, if not all, used by the artists were two track — one instrumental, one vocal — enabling the balance between music and vocal to be varied to choice. A Soniflex *6/1* mixer was also available for press film crews during rehearsals.

Once rehearsals were under way it became evident that the performers wanted foldback levels that started to tax the capabilities of the system (though Abba did make television history by asking that the instrumental track be turned down rather than the vocals up!). This was especially true of those who were used to the concert stage. Alan also commented that most of the times he had done OB's in circus tents the ground surface was grass with the result that the sound changed very slightly whether there

34 ▶



# amber model 4400a multipurpose audio test set



- \* Sweep Generator
- \* Noise Generator
- \* Comb Generator
- \* Burst Generator

- \* Digital Level Meter
- \* Digital Frequency Counter
- \* Wave Analyser

- \* Spectrum Analyser
- \* Replaces most of the discrete instruments found in the test lab!



UK Distributors  
**Scenic Sounds Equipment**  
 97-99 Dean Street,  
 London W1V 8RA.  
 Tel: 01-734 2812/3/4/5

## Just add a studio...

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

### Microphone splitters and combiners



### Direct injection boxes



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

### In-line transformers and accessories

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



### Sescom leads...others follow



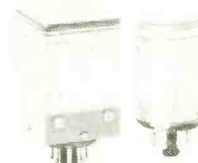
Sescom twin core microphone extension cords, available in 5, 25, 25 (thin), and 100 foot lengths, are made from high quality rubber type cable with XLR 3 pin audio connectors. Shown is the 25T thin beiden lead.

### Cable tester



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

### Audio modules

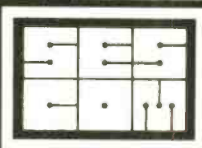


Sescom audio modules are designed for easy fitting and servicing, operating from a single power supply and shielded to prevent hum pick up. All these units plug into standard 8 or 11 pin plugs.

Make ends meet with

# SESCOM

Quality Engineered Sound Products



Distributed by

## Atlantex

16 High Street, Graveley, Hertfordshire.  
 Tel: 0438 50113



Ask for the latest Sescom catalogue now, or ring our hotline 0438 50113 quoting your Access or Barclaycard number for immediate despatch.

was an audience or not. In this case however the site was tarmac covered with gravel and when full of people the absorption factor went up considerably with the result that by the end of the first night (The Abba Show) the score was one Tannoy ko and one Shure complaining of severe overdrive! (It must be said that the Tannoy died in a most spectacular fashion.)

Needless to say, in certain parts of the tent the monitors completely drowned out the PA and for some artists the foldback level was still considered insufficient! This was where your friendly *Studio Sound* reporter was able to be of some assistance by lending some of his stage gear to the Beeb so that the following day saw the foldback re-inforced with two Electro-Voice *TL606* cabinets driven by a *D150A* and two custom-built cabinets each with *EVM* 12in speakers (one with an *8HD* horn) driven by a *Quad 303J*. These four extra speakers were positioned among the audience stage front so as to give additional spray back to the artists, wake up the front row and for the second night, *Disco in the Snow*, a very noticeable improvement in the sound could be noted, especially in the tightness of the bass end.

In fact this whole incident underlined the situation now facing 'live' programmes of this kind. Performers in many cases now demand the sort of volume levels encountered at rock concerts and the kind of equipment used until now by the BBC just is not made for high power work. At the same time the visual aspect nearly always takes preference meaning that large stacks and monitors onstage are just not on (unless they can be hidden behind the stage curtains which rather defeats the object). Alan told me that plans are now afoot for certain outside broadcast stages to be built with monitors incorporated into the decor, i.e. hidden behind steps, rocks, etc. in order to alleviate the problem. However, the difficulties don't end there. The moment the volume level starts to reach significant proportions the cameramen start to get unhappy as the vibrations can cause microphony in the TV cameras and thus upset the producer when he sees his monitor screen full of dancing black lines and not dancers! (Stand up the man who said same difference!) All is not roses for the OB sound teams.

The techniques used on these shows have their amusing sides for those of us who are not directly involved in broadcasting. For



◀ Abba at Leysin

Midas mixer supplied by R G Jones in the tent at Leysin

instance, in the interests of realism Roxy Music played with onstage amplifiers that were not plugged in or connected to the keyboards—only the guitars! No doubt the eagle-eyed will spot the absence of glowing pilot lights. In the same spirit stage microphones are often used—up to five for these particular shows—and Alan often employs a 'reverse' mixing technique. This means that the mic is open for any announcements or ambience before the number starts and is faded down the moment the backing tape is faded up. Similarly, at the end of the song the mic is brought back up again for the same effect and in the case of a handheld microphone being clipped back onto its stand, the audience hears a realistic 'click' and is convinced of a live vocal!

All in all an interesting couple of days made even more enjoyable by the friendly reception of the BBC staff. For those interested screening of the programmes should be around Easter. Terry Nelson

### Shade Tree, Wisconsin

Lake Geneva is not only the name of a rather pleasant resort in Switzerland, but also the location of The Playboy Resort in Wisconsin state in North America. Shade Tree, *The Musicians' and Producers' Resort Studio* is owned by Andy Waterman who has just taken over Castle Recording in Lake Geneva, moving and re-naming the facility to premises within the Playboy Lake Geneva Resort and Country Club whose other resources are best left to the imagination. Rudi Breuer designed and built Shade Tree and the studio is unusual in featuring a sound proof window that can either be fitted with sound and light absorbent panels, or left to pro-



vide a fantastic view of the woods and rolling countryside. Shade Tree is MCI based with *JH-528* 24-channel automated console, *JH-16-24* multitrack with dbx or Dolby, Studer *A80*, MCI *JH-110*, Ampex *440B*, EMT and AKG reverb, Urei, dbx, and MXR limiters, Marshall *Time Modulator*, Eventide *Harmonizers*, Orban *De-esser*, parametric and stereo synthesiser, Urei  $\frac{1}{3}$ -octave eq, *Gain Brains* and *KepeX*, and Audio & Design Recording *Vocal Stresser*, *Time Shape Module*, *Expander Gates*, *Dynamic Noise Filter* and *Pan Effects Module*. Monitors are Urei and JBL, Crown driven, while the studio includes a Baldwin *Concert Grand*, Hammond *C3*, Fender *Rhodes*, Studio drum set, Wurlitzer *Electric Piano*, and many more instruments. Judy Watterman is studio manager, Janet Reid director of sales, Steve Hoyt chief technical engineer and Dave Neitzke's talents include mixing and PR! Shade Tree, at Playboy Resort, Lake Geneva, Wisconsin 53147. Phone: (414) 248-2490.

### Majestic damaged by fire

Majestic Recording Studios of Clapham, London, has suffered from the ravages of a serious fire, cause unknown. The fire, which was discovered late on the evening of Saturday, January 27, took 40

firemen some 10 hours to put out and left the studio in a state of chaos. Fortunately there was no one in the building when the fire broke out in the studio reception area and the blaze was confined to the reception area by the studio fire doors. However, the zealotness of London's firemen (who had to wear breathing apparatus in the thick smoke) to check that the fire hadn't spread elsewhere, entailed them axing down the studio fire doors, and hence allowed the thick smoke to penetrate to the studio and control room. The result of the blaze has been the complete gutting of the reception area and a layer of thick brown sludge over everything else.

Studio engineer Steve Picco described the results of the fire as "appalling; every unit of equipment has suffered from the effects of smoke or sludge". Accordingly, since the fire the studio has remained closed whilst all equipment is subjected to major overhaul and repair, or where necessary replacement/update. However, fortunately for Majestic nearly all their stored tapes came through the disaster untouched. If reconstruction and repair goes according to plan Majestic hopes to reopen in late April at which time we will report on developments, incendiary devices, boxes of matches, etc thoughtfully left in the editorial offices, of course.

# It all adds up to the world's most versatile sound system.

Millbank produce well engineered, well styled sound equipment backed by a 2-year guarantee.

At Millbank, we are proud of our flexibility.

With PAC-SYSTEM, we offer you the widest available range of plug-in system variables. Millbank is the only company in the world with plug-in ambient noise sensor, graphic equaliser, monitor amplifier, AM and FM tuners—and total system status monitoring. In fact, you can get from us any-

thing you need for a reliable installation—simply and economically—because everything plugs in: no costly specials.

When you start with a Millbank system, expansion is virtually limitless. Our sound systems are used in every type of public building from airports to supermarkets, cafes to concert halls. Every major product is researched, designed and manufactured in the United Kingdom.

“Mind the doors, please...”

(Public address system, Metro Underground, Brussels.)

“Mr Lee to the Personnel Office, please...”

(Factory call system, Seiko Watch Service Centre, Kuala Lumpur.)

“Half-time score at Anfield is one-all...”

(Public address system, Arsenal Football Ground, Highbury.)

“Stand by to receive helicopter...”

(Operational instructions, Frigg oil rig, North Sea.)

“The round-London coach tour leaves in 5 minutes...”

(Public announcements, Hilton Hotel, London.)

**THE NAME THAT SAYS IT ALL**

**ME**  
MILLBANK



Millbank Electronics Group Limited, Wokfield, Sussex TN22 1PS. Telephone: Wokfield (08254)4166

International: 825-4166. Telex: 95505 MILBANK G. Cables: Euraudio Wokfield Sussex

www.americanradiohistory.com

### Back to first principles

SIMPLE systems are go. The new Blumlein Memorial crossed figure-of-eight mic incorporates a pair of mono Schoeps capsules. It is easy to forget that what Blumlein originally proposed (and patented) way back in the early Thirties was a crossed coincident pair of figure-of-eight mics, *not* crossed cardioids. By 1932 Blumlein had already observed that a stereo image could be shifted outside the arc defined between a pair of loudspeakers, by reversing the phase of the signal being fed to the opposite loudspeaker.

By a happy coincidence, this phase reversal takes place automatically if you are recording with a crossed pair of coincident figure-of-eights. So why are modern 'natural acoustic' recordings made with crossed cardioids rather than figure-of-eights? The answer seems to be that the engineers involved in natural acoustic recording have been unhappy with the results obtainable from existing ribbon or double diaphragm capacitor capsules when used in crossed figure-of-eight mode. But Schoeps of West Germany seem to have succeeded where others have failed, by offering a single diaphragm capacitor capsule which can be paired in crossed figure-of-eight mode to offer pretty much the microphone facility of which Blumlein dreamed in 1932. First reports from those who have used the new Schoeps capsules (eg Enigma) and replayed the results on coherent phase loudspeakers (eg Kef 105 or Tannoys) suggest that now, just 47 years after Blumlein's original proposals, we are finally getting somewhere with two loudspeaker stereo. Provided the crossed pair is carefully placed, so that ambience from the rear doesn't swamp direct sound, the reproducing loudspeakers virtually disappear leaving, as one listener put it, "a virtual holograph of the original live sound image".

Of course both the NRDC-Ambisonics team in the UK and Ben Bauer of CBS in the USA have for many years praised the Blumlein approach. Both the Calrec-Ambisonic *Soundfield* mic and the SQ Ghent mic system devised by Bauer represent an extension of Blumlein's original idea for sampling the sound field at a single carefully chosen point. There has so far been little Calrec HJ material to hear and it was a great shame that the plans laid by the BBC and the NRDC-Ambisonics engineers to transmit the 1978 Proms in the HJ format surround sound from a Calrec *Soundfield* mic came to nothing, due to industrial disputes within the Beeb. But the Calrec mic was slung at the centre front above the Albert Hall podium and it is an open secret that although no encoded surround sound material was transmitted, the raw B-format output of the Calrec mic was informally taped each night. Unfortunately this is unlikely to be transmitted now. Likewise, there has so far been relatively little aural evidence of how the SQ Ghent mic performs. But recently a single copy of a Mexican pressed CBS SQ Ghent recording found its way to these shores.

*La Orquesta Filarmónica de las Americas* performs a suite from Porgy and Bess, and a selection from Carmina Burana under Morton Gould. The recording was made during a live broadcast (but not taped off-air, of course) using the Neumann *QM-69* Ghent mic (which uses four cardioid capsules and an encoder which replicates forward oriented SQ). This was slung above the orchestra to give a very wide musical spread. For my money it's one of the best surround sound recordings to date and SQ-knockers should give it a listen if, as planned, CBS press copies in the USA.

There is still no sign of commercial progress on the surround sound or quadraphonic front, the issue of standardisation now being pretty clearly resolved as 'in the left-hand corner', the BBC, IBA, NRDC and Nippon Columbia with UHJ, HJ and similar formats and 'in the right corner', CBS SQ backed very half-heartedly by EMI. So far there seems to be no sign of real agreement and collaboration between the opposing corners, and after talking separately to many of those involved several points seem clear to me at least. All those involved appear in agreement that you can't have a perfect surround sound system, that also gives perfect results in stereo and mono. There is a difference of opinion however on the long term need for good compatibility in stereo. Although both camps regard stereo and mono compatibility as essential in the short term, the right corner (CBS etc) tend to think of stereo being around longer than the left corner (Ambisonics) and thus place more overall emphasis on stereo compatibility. The Ambisonics camp reckon they have a fine tuned balance of five relevant parameters which gives the best compromise and one of the parameter compromises is a 35° phase anomaly at centre front in stereo. But CBS SQ clearly regard this as unacceptable, and will countenance no phase anomaly at centre front in stereo. Although the issue of centre front phase in stereo is by no means the whole story, it is certainly a substantial stumbling block to agreement, collaboration and standardisation.

Everyone is agreed, however, that surround sound will never take off commercially until the standardisation issue is settled. Personally I'm convinced that surround sound will never take off until the public is offered not only standardisation, but also a very simple reproduction system with the minimum of knobs to twiddle and buttons to push. The current situation, where a couple of stereo amps are used in conjunction with a separate and button-ridden decoder is a nightmare of inconvenience. To get all the speakers correctly wired, left front to left front and so on *and* correctly phased, left to right and front to rear, is like winning the pools. And to keep resetting all the separate amplifier and decoder controls, after for instance using part of the system for its originally intended mono or stereo purpose, is courting disaster. It will take a long time for me to live down the memory of starting to play Ben Bauer

the above mentioned SQ disc with just about every system switch in the wrong position after some enthusiastic dusting by a house-proud wife. No surround sound system, however well designed and worldwide standardisation, will succeed unless it is idiot proof at the domestic end.

### Headphone chair

MOST ENGINEERS have their own very rigid views on headphone listening. Some swear by cans for editing—others hate the restrictive feeling of a headband and sealed ear. Pretty much the same goes for domestic listening. An interesting half-way approach is being offered in the UK by Sound Seating Systems of Carshalton, Surrey. For £1,000-plus SSS will supply a custom-built all-enveloping chair with Bose speaker units built into the walls to provide the equivalent of an all-encapsulating can. The idea of a headphone chair isn't new. One of the first patents on binaural or dummy head stereo, dating back to Chicago in the 1920s, proposes the installation of just such chairs. They were to be used not only in the home but also in places of public entertainment such as cinemas. The SSS chair, christened despite its Chicago ancestry as Nova, produces some interesting results, especially on material recorded with binaural or dummy head techniques. Sound attenuation between the chair inside and outside is around 20dB, which means that an engineer can listen at high levels without disturbing others in the room or at low levels without being disturbed. It's also an interesting way to watch simulcast or video tape recordings with stereo sound. Engineers looking for a compromise between cans and monitors could well give can seating a thought.

### One route to the top

BACK IN my musician days I remember a couple of gigsters reckoning that if they joined the MU, and became politically active, they might one day make Prime Minister. They never did. But in California something almost as way out has already happened. Do you remember Mike Curb, once very active in the record business and producer for the Osmonds? Well at age 34, Mike Curb has already made it in Los Angeles as Republican Lieutenant Governor, second in command to Governor Jerry Brown. Curb won the position after a delightfully bitter election campaign against Democrat Mervyn Dymally, who celebrated his defeat by donating to charity all the furniture of the office that goes with the job. When Curb arrived he found not only the furniture gone but most of his duties non-existent—Dymally had transferred them to another office. But Curb is getting the last laugh. Just a month after inauguration he found himself sitting in the Governor's chair, following a sudden 31-hour trip by Governor Jerry Brown to Miami. By this reckoning Phil Spector should have no trouble at all making President. ■

# A story worth reading.

(Especially if you're a Somebody.)

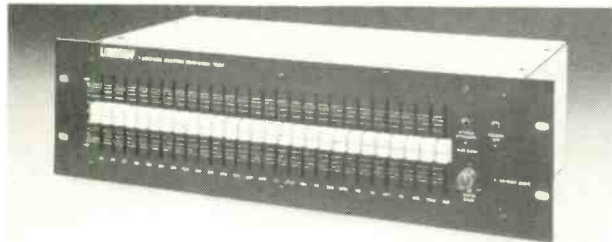


nce upon a time, there was a small, very lively electronics company called Lindsay. One day, after much time had been spent on planning and design, they produced a superb Graphic Equaliser with total reliability which they called Model 7607.

Now, word got around about this Model 7607, and everybody who was a Somebody for miles and miles around, came to see it. "Hey," they said in unison, "how can you produce such a superb Graphic Equaliser for such a great price?" "Easy," said Lindsay modestly, "because we sell on quality, and everyone knows there are a lot of Somebodies who want quality equipment. So they sell themselves and we don't have to charge the earth." All the Somebodies murmured their approval, then Lindsay said, "Since you're here, take a look at this." And he whipped the cover off something by his side.

The Somebodies rushed to crowd round. "An Analyser!" exclaimed one. "Yes, with 27 1/3-Octave bands!" cried another. After some time, they turned to Lindsay, but many had apprehensive expressions. "Are you producing the Analyser to the same high standards?" they asked. "Yes," nodded Lindsay. The Somebodies faces brightened. "And the same value?" "Of course!" said Lindsay.

And the Somebodies surged forward, shaking his hand and slapping him on the back. "We'll make you a big company!" they shouted. "Well," responded Lindsay smiling, "not too big. We don't want our standards slipping!"

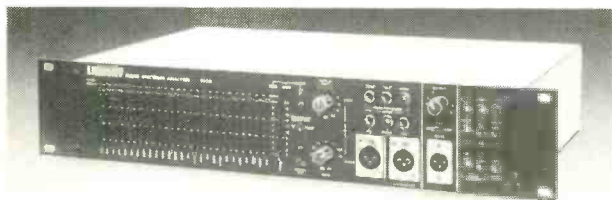


\*XLR input and output connectors. \*120V or 240V operation. \*19" rack mounting.

## What the Somebodies saw first.

1/3 OCTAVE GRAPHIC EQUALISER. MODEL 7607.

\*27 1/3 octave I.S.O. bands 40Hz-16KHz. \*± 12dB gain for each band. \*Low output noise. \*Low distortion. \*-22dB to +7dB input gain range. \*Unity gain bypass circuit. \*Maximum output level +22dBm. \*Output limit indicator. \*10K input impedance, transformer coupled (balanced and floating). \*Low output impedance, transformer coupled (balanced and floating).



## What the Somebodies saw second.

AUDIO SPECTRUM ANALYSER. MODEL 7634.

\*27 1/3 octave I.S.O. bands (40Hz-16KHz). \*1/3 octave filters meet specifications of ANSI S1.11-1971 Class III and I.E.C. 225-1966. \*Flat or "A" weighted broad band channel. \*Slow, "VU" or "PPM" time constants. \*28 x 11 L.E.D. display. \*10dB or 20dB display ranges. \*Display shift facility increases

dynamic range to 40dB. \*Over-range indication on each channel. \*Microphone and line inputs transformer coupled (balanced and floating). \*Microphone input displayed in dB SPL directly. \*Internal calibration facility. \*Gain range of 70dB. \*Overload limit indicators for input and gain. \*Internal noise generator, low impedance balanced output. \*2 independent memories, each with hold, accumulate and erase functions. \*19" rack mounting. \*Sync and video outputs.

If you're a Somebody, clip the coupon and send it to:

Highlife Productions, 2, Heathfield Terrace, Chiswick, London W4 4JE.

**LINDSAY** Because Somebodies want quality.

I am a Somebody. Please send me your detailed leaflet on:  
GRAPHIC EQUALISER  AUDIO SPECTRUM ANALYSER   
NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
(Please tick box)



# Design criteria for a pick-up arm

Alastair Robertson-Aikman (Managing Director, SME Ltd.)

**A pick-up (tone) arm should be capable of supporting a cartridge with minimum influence and maximum resistance to external forces acting on both the arm and cartridge. This article describes SME's approach to designing such an arm.**

THE SME *Series III* precision pick-up arm is the result of research and development extending over more than seven years. To appreciate what this involves, it is helpful to consider trends in cartridge design during a similar period.

In the early days the majority of cartridges were of a type in which the signal is generated by a moving magnet, and the minority of a type in which it is generated by a moving coil. During the Sixties moving magnet cartridges received more attention in their development and large-scale manufacture than any other type. Improvements were in three main areas:

- 1) the reduction of tip mass that is the effective mass of the armature portion of the generating system as measured at the point of contact with the record,
- 2) the weight of the fixed or stator portion of the generating system comprising the coils, pole pieces, screening capsule and the

cartridge body, 3) the link between these two things, the compliance or stiffness of the armature hinge which has to be carefully related to them if the stylus is to maintain contact with the record groove at all times.

With these refinements, the limitations of existing pick-up arms became apparent. The nicely related parameters of cartridge design could be seriously prejudiced if, for example, the arm's effective mass was too high. Arm manufacturers began to slim down their products making them lighter, but since conventional materials were still used they were less rigid as a result.

Until about five years ago moving coil, or dynamic cartridges as they are otherwise termed, were still something of a rarity, but a revival of interests brought many newcomers in a short period of time. Most were something of a mixed blessing because, whilst they pro-

duced a pleasing quality they employed what might be described as a brute force approach, ie low compliance and consequently a high tracking force requirement—features which the new breed of pick-up arms were not designed to contend with. The reaction was a demand for massive arms in which to use them, and it was not always realised that these would be unsuitable for high compliance cartridges.

One hears it asked if an arm is suitable for a moving coil cartridge. A pick-up arm is affected by the fundamental inter-relationships of cartridge design, but the method employed to generate the electric current is incidental. It is therefore a mistake to categorise according to magnetic and moving coil types for example, what matters is compliance and its relationship with the weight of the cartridge and the effective mass of the arm. The objective must be to make an arm that is as rigid and light as ingenuity permits so that it will suit the most advanced cartridges which, by implication, will have a high compliance and low weight.

A low mass arm can be adapted for use with a low compliance cartridge by adding an appropriate

40 ►



The days of amplifiers with one distinctive sound are gone. It is no longer enough just to amplify; today's musicians need amplification systems which are versatile enough to adapt to any instrument, any musical environment.


Similarly, the perfect mixing system is one which extends the performer's capabilities without being obtrusive.

In a field where quality and reliability are often sacrificed in the race for more advanced specifications,

*Kemble/Yamaha, Mount Avenue, Bletchley, Milton Keynes Telephone 0908 71771*

Yamaha stand alone in offering a comprehensive range of amplification and mixing units which combine advanced technology and traditional craftsmanship.

When you choose Yamaha, you can be sure that the only sounds you hear are the ones you want.

 **YAMAHA**  
Craftsmen to the world's  
musicians since 1887.

## Design criteria for a pick-up arm

weight to the cartridge—a piece of thin sheet lead weighing 4 to 5g would be fairly typical. Low compliance cartridges can be regarded as high compliance cartridges at an earlier stage of development, but if you adapt albeit degrade a low mass arm in this way, you can at least restore its potential when a high compliance cartridge of your choosing becomes available. This is not possible in the case of a high mass arm however, with which you are permanently committed to the use of low compliance cartridge.

The question may be asked, what is wrong with a low compliance cartridge in a massive arm? It is undeniably an inelegant engineering solution. The lower the stylus compliance, the higher must be the tracking force. The forces acting at the stylus are reacted equally in the record material and to a lesser extent in the pick-up arm, where they set up a mirror image of the signal which is reflected back to the stylus and reproduced. The evidence is that some people will find this coloration subjectively pleasant describing it as 'ambience', but it is not part of the original performance and can be found trying on a longer acquaintance.

An ideal cartridge would have zero effective tip mass and infinite compliance and the ultimate opposite would be infinite tip mass, with zero compliance. By considering these two extremes it helps to place matters in perspective. The playback system (pick-up cartridge, headshell and tone arm) must be as light as possible if sound coloration and in some cases acoustic feedback is to be avoided. This problem has been analysed thoroughly by Bruel & Kjaer A/S who at the AES Convention in New York 1977, presented a paper on the subject (Application Note 17-233, Bruel & Kjaer A/S).

Versatility was a pre-requisite of the new design, which would need among other things a more favourable strength/weight ratio than had hitherto been seen. It was evident that the majority of pick-up arms, including our own earlier models, reflected the manufacturing techniques of the first half of the century. They were composed mainly of cylindrical and rectangular shapes which lent themselves to traditional machining processes in materials such as brass and aluminium. Such arms are sometimes very beautiful to look at, but many have an effective mass in excess of 26g. In other words about the same as our *Series I* arm circa 1959! We turned to new materials and methods exploring the use of high precision moulded components in loaded

plastic, not for manufacturing economy, but because they offered a strength/weight ratio previously unattainable and allowed a new freedom of shape. Significant weight would only occur where it was required, provided in the form of lead inserts coined to a uniform density.

An innovative balance system incorporating a laminated main weight was devised and is now patented in the principal countries of the world. It permits not only its position, but its mass to be changed thereby securing the most favourable moment of inertia possible for a particular cartridge. Moving a constant mass through a greater distance does not do this since the effective mass changes as the square of the distance between its centre of gravity and the fulcrum of the arm. The point is brought home in that the addition of one gram at 9in radius or roughly corresponding to the stylus position, will make the same change in the total effective mass seen by the stylus as adding 81g weight at 1in radius. That is why we mould even our cartridge fixing screws in plastic.

Next for consideration was the tone arm itself. An aluminium tube could be light enough but would flex, particularly when used with a cartridge of low compliance. Loaded plastic was not found satisfactory for this component or as good as aluminium. The improvement we were seeking was found in titanium with its high strength/weight ratio. It also offered the advantage that it could be given a glass hard skin, enhancing its rigidity and vibration attenuation properties.

Several possibilities exist for the shape of a tone arm. A straight tube is certainly the shortest distance between two points. It is also the prescription for the torsion bar spring of a motor-car and a gong! A 'J' form was better but an 'S' form was preferred. That it is convenient from a geometrical standpoint is incidental. A tone arm has not merely to be light and rigid but of a construction that will attenuate the transmission of vibration, so that it is not reflected back again to the cartridge. An ideal cartridge would only have an electrical output, but all have a mechanical output as well because the stylus motion is reacted at the cartridge body and the resulting vibrations pass into the arm. The level of these vibrations varies according to the cartridge construction and compliance.

In concept, the bearings of the *Series III* precision pick-up arm are

similar to those of its predecessors. The main spindle, or vertical axis bearing, is carried in twin high precision stainless steel ball races, shielded against the entry of dust and having a low starting torque characteristic. The horizontal axis bearing is on knife edges, simple and self adjusting. The loading on them is usually equivalent to 500-600lb/in<sup>2</sup>. The associated mass providing this loading excludes the possibility of resonance in or affecting the audio band. The significance of bearing friction in a pick-up arm is sometimes over-emphasised. For good sensitivity, friction must be low but beyond a point its importance diminishes rapidly because the last effects are lost in the greater problem of inertia. Our arms will deflect under a force equivalent to 20mg or less applied at 9in radius. By deflect we mean commence movement from a standstill. In this condition the specified force has to overcome stiction as well as friction and only this is meaningful. Other specifications should be looked at with this in mind.

At this point we had an arm which could be optimised for a wide range of cartridges, providing the essential conditions of rigidity, low inertia and sensitivity. These things would be sufficient if records were truly flat and concentric, but of course they are not. Their irregularities, together with such external influences as structure and airborne vibrations, subject the cartridge and arm to varying degrees of shock. So that it should not over react, the fluid damper was evolved. This device offers a high resistance to rapid motion but very little to the normal slower movements that the arm must make. The effect of the damper is concerned mainly with the arm as such and is complementary to the type of stabiliser fitted, for example, to the Shure *V15 Type IV* and other add-on devices which have appeared separately. The purpose of these is to read vertical surface information from the record so that the stator portion of the cartridge is driven by the stabiliser at subsonic frequencies instead of by the stylus. In conjunction with the damping of the *Series III* arm, excellent similarity of motion pattern between the stylus and stator portions of the cartridge is maintained with two fold advantage firstly, cleaner bass and secondly, a reduction or elimination of fore and aft motion at the stylus which produces wow.

In the arm/cartridge system, the greatest contribution to inertia is the mass of the cartridge itself and second to this the headshell and the carrying arm. The *Series III* headshell is a single piece moulding in carbon fibre and is extra-

ordinarily rigid. The coupling is at the end of the tone arm remote from the shell and close to the arm fulcrum where it makes a minimum contribution to overall effective mass. This design was originated by SME some years previously and since adopted elsewhere.

A further aim was to make the arm so that it could be set up with convenience and accuracy. The balance and bias adjustments are made by lead screws and the complete units can be made to traverse on its bedplate through a rack and pinion drive. This last function is for setting tangency at the required diameter and a protractor for the purpose is provided with each arm. Distortion due to tracking error changes is in inverse proportion to the radius at which it occurs. The geometry of the arm must therefore aim at providing minimum distortion, rather than minimum error.

Claims for improvement with alternative geometry are usually based on the assumption of a larger minimum recorded radius. Our alignment protractor establishes tangency at 2½in and this is realistic if all types of records are considered. A few records are recorded on an even smaller radius and at this point to curve of distortion plotted against radius rises almost vertically and would be further aggravated if the inner point of tangency were at a larger radius. All things being a matter of compromise, we believe ours to be as satisfactory as any bearing in mind that there can be as much as 7° vertical tracking error present in current cartridge and record cutting concepts.

Bias is effected with a weight and nylon filament. Although this is sometimes criticised on the grounds of appearance, it remains a very straightforward and effective means of securing what is required. Bias recommendations are approximate but usually adequate. If something more precise is required, an individual cartridge should be set up using a purpose designed record in conjunction with an oscilloscope. The fine adjustment built into the *Series III* arm is particularly useful here. A blank disc is of no value in this context as it does not simulate the tracing of a modulated groove.

To conclude, we believe that the *Series III* precision pick-up arm satisfies our aims by supporting a cartridge with minimum influence and maximum resistance to external forces acting on both the arm and the cartridge. At the same time the versatility of adjustment enables the operating conditions for a widely differing range of cartridges to be optimised. That we have been successful is confirmed by the many favourable reviews now appearing throughout the world. ■



# The Technology Must Serve The Music

This one thought is reflected in every facet of Solid State Logic's Master Recording Consoles. From the beginning, we wanted to offer the artists in our industry a truly exceptional instrument which would not limit their expression in any way. After years of quiet and deliberate work, we have created an unprecedented marriage of hardware, firmware and software with advantages and potentials years ahead of any other studio system.

**SSL's ULTRALOCATOR**, for example, brings automation to recording as well as mixing. The multi-track transport is directed to unlimited cue points which may be requested by songtitle, verse or other words, as well as sequential numbers and timecodes. All session data, such as track assignments and comments on takes, can be stored on floppy disc for video display or hardcopy printout. The proprietary SUPERCUE system enables unerringly accurate programmable drop-ins with tandem multi-track, monitor, and foldback switching.

**SSL's SOFTWARE ASSISTED MIXING (SAM)** is easily the most useful and easy to use mixing automation ever. SAM automatically selects the appropriate fader status, displays VCA levels on a built-in video screen, stores unlimited mixes, and enables extensive off-line manipulation of those mixes. Best of all, SAM is software based, which means he easily learns lots of new tricks to keep you ahead of the pack.

**SSL's SIGNAL PROCESSING** includes a full-feature compressor/limiter/expander/gate in each module. Front panel "Link" buttons enable an unlimited number of strapped stereo or quad units to be freely configured across the board. The module's four band parametric equaliser has continuously variable Q in each of the overlapping mid-bands, selectable peaking or shelving in the high and low bands, and separate variable HP and LP filters. Pushbutton switching enables the equaliser to be placed at the channel input, the channel output, in the dynamics unit sidechain, or in the monitor mixer. The dynamics unit can also be switched to the monitor mixer.

**SSL** has developed these and many other innovations to free the production team from the tedious, purely mechanical aspects of multi-track work, so that they may apply their full skills and judgment towards perfecting the artist's performance. If that sounds like music to your ears, contact us for additional notes. Or visit us at the Brussels or Los Angeles AES shows.

**Solid State Logic**  
—at the leading edge of recording technology

## Solid State Logic

Stonesfield • Oxford, England  
099 389 324 • TLX 837400

Milan, Michigan • USA  
313 663-6444 • TLX 230504

### Sales and Distribution

#### North America

Washington Musicworks Inc  
3421 M Street N.W.  
Washington, DC 20007  
Doug Dickey  
East Coast (202) 333-1500  
West Coast (213) 464-8034  
TLX 440519

#### UK

Solid State Logic  
Stonesfield  
Oxford, England  
Colin Sanders  
099 389 324  
TLX 837400

#### Italy

AEG Telefunken  
Viale Brianza 20  
20092 Cinisello Balsamo  
A. Savasi  
Milan 61798  
TLX 31473

#### Germany

B.F.E.  
65 Mainz 23  
Postfach 81  
West Germany  
Jeff Nieckau  
Mainz 42430  
TLX 4187300

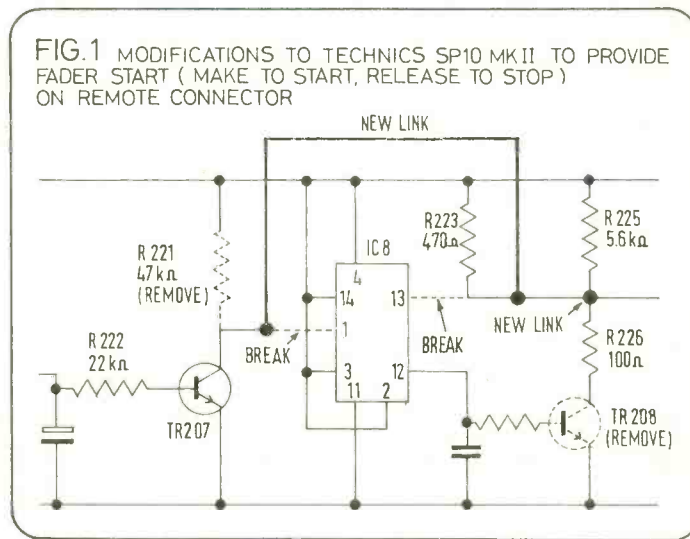
# Broadcast turntables

John Lumsden (Radio Clyde)

THE PROFESSIONAL gram unit, like all other audio equipment, has in recent years been transformed into a complex piece of electronics. It is not long since broadcast stations used either the excellent EMT 930 or one of the American turntables like the Gates, Spotmaster, Rusco or Sparta—all looking as though they came out of the same factory! Others, like the Pye, modified Garrard 401, never really got off the ground. However, they all offered one common facility—the ability to start almost instantaneously. Some, in particular the American units, better than others! The EMT product, as one would expect, was mechanically a complex unit using a 'slip platter' arrangement and a mechanical brake. This concept worked very well but produced a lot of mechanical hiss when cued-up with the brake operated which could be, and often was, picked up by the DJ mic. All measured parameters including wow, rumble and so on were excellent, but a fair bit of preventive maintenance was necessary. The American units were amazingly reliable and required a minimum of maintenance. The start time was excellent, due more to brute force than to technology, since a fairly massive motor was used. Most other parameters left a lot to be desired, in particular—wow.

So much for the past. The situation today is somewhat different. The introduction of the Technics SP10 MkII has offered the professional user all the features he requires except 78rpm—hardly a problem these days! The unit uses a 'state of the art' direct-drive motor and therefore has only one moving part. This means that the required maintenance is almost nil. The turntable speed is totally independent of mains frequency and mechanical wear, since it is quartz crystal locked and therefore extremely accurate. The motor itself, which is part of the turntable,

Broadcasting turntables have developed considerably in the past four years. John Lumsden examines their background, and makes a couple of comments about the Technics SP10 MkII based on operational experience.



**Table 1 Modifications to Technics SP10 MkII to provide fader start**  
After removing baseplate and extracting 'control circuit board', proceed as follows:  
1) remove R221  
2) remove TR208  
3) link R223 and R226  
4) Link TR207 collector and R223 (ie the hole now vacated by R221 to the vacant hole adjacent to TR208 emitter)  
5) Cut print — TR207 collector to IC8 pin 1  
6) Cut print — R223 to IC8 pin 13  
Re-assemble and test

has plenty reserve power allowing very tight cueing—about 10° to 15° of rotation being sufficient. Wow and rumble are held to almost unbelievable tolerances but, beware—the logic circuitry associated with motor speed control does not like strong magnetic fields. It is therefore important to keep any power transformers at least 50cm from the base of the unit. It is a great pity that Technics is not prepared to offer a 'mu' bottom-cover which would totally eradicate the problem.

Most radio stations are using

fader start techniques and this can be a problem with the Technics deck, since the remote start featured in the unit is a momentary 'push-to-start', 'push-to-stop'. This is clearly quite unsuitable. Interface modules have been tried but these can easily get out-of-step. The system shown in fig 1, where the control printed circuit card has been modified table 1, allows the turntable to run with a 'make' on the remote control cable and stop with an open circuit and has been found to be perfectly dependable

during the last two years.

The turntable is only part of the gram story. Magnetic cartridge pre-amps are extremely important too. Most radio stations again, and broadcast organisations generally, are using units made by Surrey, EMT, Alice or 'home brewed'. The home brews, unlike most of the manufactured units, usually incorporate a means of adjusting mid frequency and high frequency equalisation, which in the writer's opinion, is absolutely vital even when using the best cartridges available. The range of cartridges and styli is indeed extensive. The styli should be spherical which allows back cueing without unreasonable additional wear to the record run in the groove. Cartridges are usually chosen for smoothness and extent of frequency response together with stereo separation—the latter being possibly the most difficult to achieve. Suitable cartridges are manufactured by Stanton, Empire, Shure, and AKG to name but a few. Some are much better than others. The reader is urged to check the performance very carefully with particular attention to crosstalk.

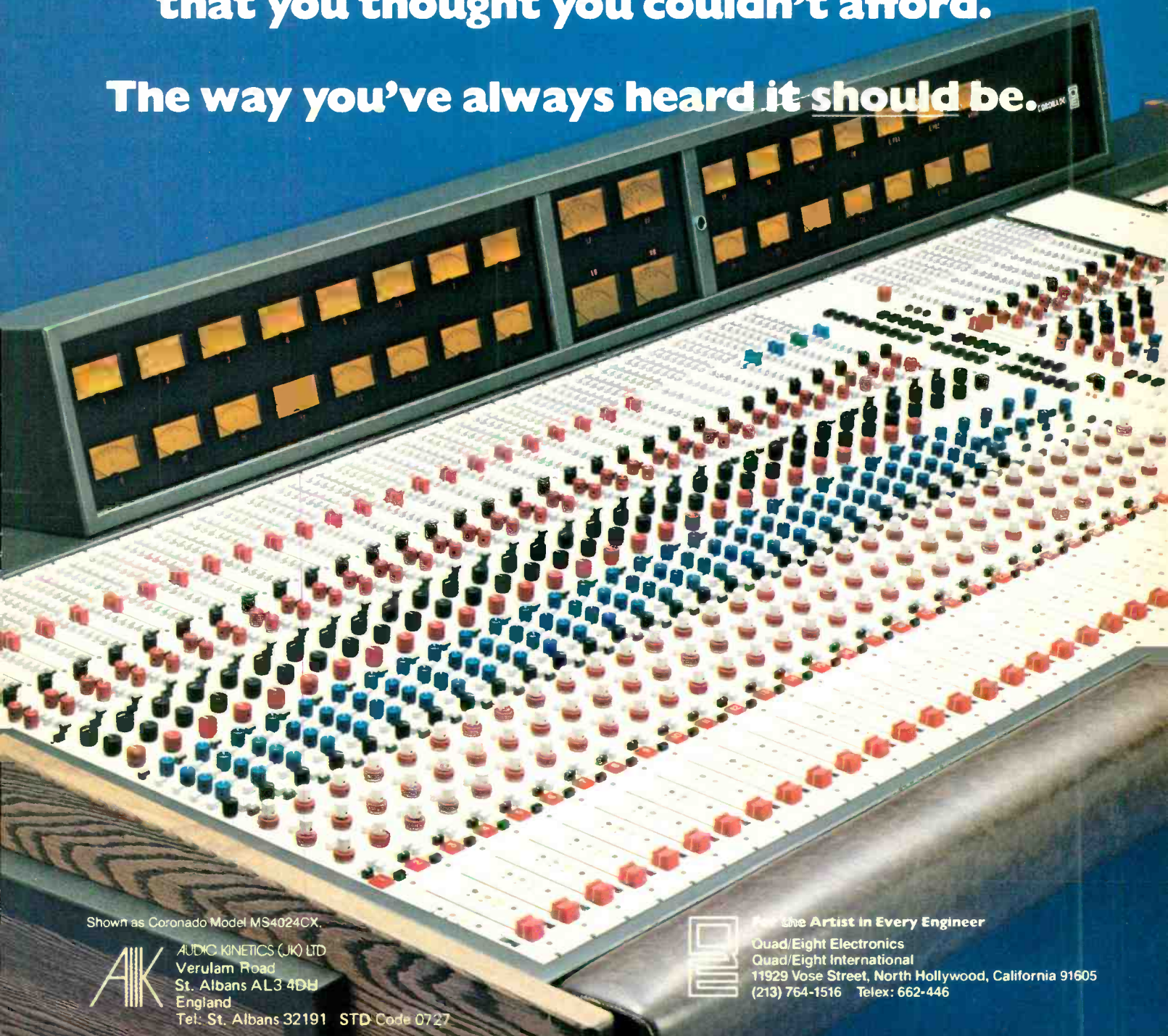
The pick-up arm is also of great importance and presently arms in use range from SME to Gray Micro-Track (almost unthinkable with an SP10 MkII) and a number of others including Sparta, Technics and Ortofon. An important feature to look for is a removable head shell and provisions for adjusting zenith, azimuth and stylus overhang. Adjustments to azimuth and zenith should be made to optimise the crosstalk measurements.

There are many other very good turntables, pre-amps, cartridges and arms on the market—their application is probably in the main outside the broadcast studio/control room for a variety of reasons. In broadcasting the requirement is for robust, high quality, gimmick free equipment.

# From Quad/Eight:

**The forty by forty,  
totally modular,  
fully automated,  
feature-packed,  
super-spec'd,  
recording and mixdown system  
that you thought you couldn't afford.**

**The way you've always heard it should be.**



Shown as Coronado Model MS4024CX.



AUDIO KINETICS (UK) LTD  
Verulam Road  
St. Albans AL3 4DH  
England

Tel: St. Albans 32191 STD Code 0727



For the Artist in Every Engineer

Quad/Eight Electronics  
Quad/Eight International  
11929 Vose Street, North Hollywood, California 91605  
(213) 764-1516 Telex: 662-446

# Survey: turntables, tone arms and cartridges

This survey attempts to include all record playing equipment used by broadcasters, recording studios and professional discos. It thus includes professional turntables and tone arms, high quality cartridges and low cost robust cartridges which accept back cueing. We apologise in advance to those companies omitted, but please contact us if you feel your products do fall within the studio market and we will include you next time round. Output voltages are quoted at 5cm/s record velocity.

## AKG (Austria)

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

Phone: 0222 921647. Telex: 01839.

UK: AKG Acoustics Ltd, 191 The Vale, London W3 7QS.

Phone: 01-749 2042. Telex: 28938.

## P8ES

Type: cartridge for use with arm featuring less than 15mg friction in any direction.

Stylus: elliptical, 5x17.8 micron, 0.42mg mass.

Tracking force: 0.75 to 1.25g, optimum 1g.

Response: 10Hz to 28kHz.

Output voltage: 3.75mV.

Channel separation: 30dB.

Optimum load: 47k $\Omega$ /470pF.

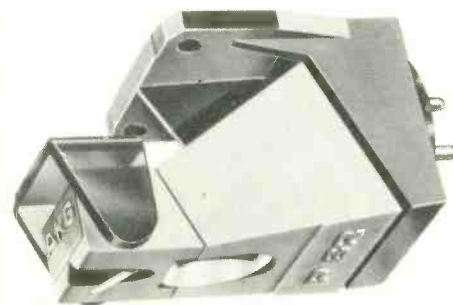
Weight: 5.86g.

Price: £68.50, stylus £41.20.

## PE8

Type: cartridge for manual or semiautomatic turn-

AKG P6R



tables.

Stylus: elliptical, 5x17.8 microns, 0.45mg mass.

Tracking force: 0.75 to 1.25g, optimum 1g.

Response: 10Hz to 23kHz.

Output voltage: 4mV.

Channel separation: 35dB.

Optimum load: 47k $\Omega$ /470pF.

Weight: 5.86g.

Price: £60, stylus £36.

## P6R

Type: robust cartridge designed to withstand back-cueing.

Stylus: spherical, 17.8 micron, 0.9mg mass.

Tracking force: 1 $\frac{1}{2}$  to 4g, optimum 3g.

Response: 20Hz to 20kHz.

Output voltage: 6.25mV.

Channel separation: 25dB.

Optimum load: 47k $\Omega$ /470pF.

Weight: 5.86g.

Price: £16.50, stylus £8.50.

## AUDIO-TECHNICA (Japan)

UK: Audio-Technica Ltd, Hunslet Trading Estate, Low Road, Leeds LS10 1BL.

Phone: 0532 771441. Telex: 557991.

USA: Audio Technica US Inc, 33 Shiawasse Avenue, Fairlawn, Ohio 44313.

Phone: (216) 836-0246.

## APT-12T

Type: tone arm for 12in turntables adjustable for a range of heights and base thickness, equilateral levelling base, removable head shell.

Tracking error: 1° 55'.

Vertical tracking force: 0 to 5g.

Cartridge weight: 3 to 23g.

Mounting board thickness: 5 to 25mm.

Price: £113.51, spare headshell £6.83.

## APT-16T

Similar to APT-12T, but for 16in turntables, tracking error 1° 30'.

Price: £95.68, spare headshell £6.83.

## APT-1

Type: robust cartridge for back-cueing with rugged hum resistant construction.

Stylus: spherical, 15 micron.

Tracking force: 3 to 5g.

Response: 20Hz to 20kHz.

Output voltage: 5.3mV.

Channel separation: 21dB.

Optimum load: 47k $\Omega$ .

Weight: 7.2g.

Price: £12.25, stylus £8.01.

## APT-2

Type: robust cartridge for fixed installations, back-cueing.

Stylus: elliptical, 10x17.8 micron.

Tracking force: 3 to 5g.

Response: 15 to 22kHz.

Output voltage: 5.3mV.

Channel separation: 23dB.

Optimum load: 47k $\Omega$ .

Weight: 7.2g.

Price: £13.29, stylus £9.41.

## APT-3

Type: robust cartridge for fixed installations, back-cueing.

Stylus: elliptical, 7.6x17.8 micron.

Tracking force: 2 to 3g.

Response: 15Hz to 25kHz.

Output voltage: 5.3mV.

Channel separation: 23dB.

Optimum load: 47k $\Omega$ .

Weight: 7.7g.

Price: £16.82, stylus £11.23.

## ENERTEC SCHLUMBERGER (France)

Erterec Schlumberger, 296 Avenue Napoleon-Bonaparte, F-92505 Rueil-Malmaison, France.

Phone: (1) 732 9223. Telex: 203404.

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

Phone: 01-993 2401. Telex: 935650.

## TD212/2, TD222/2

Type: turntable system with built-in pre-amplifiers and monitoring system, fast start with turntable/counter plate under electromagnetic control, logic control, spot lamp, multiple eq settings, available freestanding, or chassis console.

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

Platter: 2.5kg, 300mm diameter, accepts discs up to 16in.

Drive system: not specified.

Start time: 500ms.

Wow and flutter:  $\pm 0.2\%$  DIN.

Rumble:  $-50$ dB.

Tone arm length: 250mm.

Tracking force: 0 to 6g.

Cartridge: accepts all standard cartridges.

Pre-amp:  $+12$ dB output, gain 40dB to 48dB.

Equalisation: RIAA, and 25 $\mu$ s, 50 $\mu$ s, 100 $\mu$ s. 46 ►

# fact: this condenser microphone sets a new standard of technical excellence.

The Shure SM81 cardioid condenser is a new breed of microphone. It is a truly high-performance studio instrument exceptionally well-suited to the critical requirements of professional recording, broadcast, motion picture recording, and highest quality sound reinforcement—and, in addition, is highly reliable for field use.

Shure engineers sought—and found—ingenious new solutions to common

problems which, up to now, have restricted the use of condenser microphones. Years of operational tests were conducted in an exceptionally broad range of studio applications and under a wide variety of field conditions.

As the following specifications indicate, the new SM81 offers unprecedented performance capability—making it a new standard in high quality professional condenser microphones.



## SM81 puts it all together!

- WIDE RANGE, 20 Hz to 20 kHz FLAT FREQUENCY RESPONSE.
- PRECISE CARDIOID polar pattern, uniform with frequency and symmetrical about axis, to provide maximum rejection and minimum colouration of off-axis sounds.
- EXCEPTIONALLY LOW (16 dBA) NOISE LEVEL.
- 120 dB DYNAMIC RANGE.
- ULTRA-LOW DISTORTION (right up to the clipping point!) over the entire audio spectrum for a wide range of load impedances. MAXIMUM SPL BEFORE CLIPPING: 135 dB; 145 dB with attenuator.
- WIDE RANGE SIMPLEX POWERING includes DIN 45 596 voltages of 12 and 48 Vdc.
- EXTREMELY LOW RF SUSCEPTIBILITY.
- SELECTABLE LOW FREQUENCY RESPONSE: Flat, 6 or 18 dB/octave rolloff.
- 10 dB CAPACITIVE ATTENUATOR accessible without disassembly and lockable.

## Outstanding Ruggedness

Conventional condenser microphones have gained the reputation of being high quality, but often at the expense of mechanical and environmental ruggedness. This no longer need be the case. The SM81 transducer and electronics housing is of heavy-wall steel construction, and all internal components are rigidly supported. (Production line SM81's must be capable of withstanding at least six random drops from six feet onto a hardwood floor without significant performance degradation or structural damage.) It is reliable over a temperature range of  $-20^{\circ}\text{F}$  to  $165^{\circ}\text{F}$  at relative humidities of 0 to 95%!

Send for a complete brochure on this remarkable new condenser microphone!

## SM81 Cardioid Condenser Microphone



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

## SURVEY: TURNTABLES, TONE ARMS AND CARTRIDGES

cont'd Enertec Schlumberger

**Monitoring:** built-in speaker.  
**Power:** 127/220V 50Hz, others to order.  
**Price:** 212/2 £1,690, 222/2 £1,867 complete with Stanton or Shure cartridge.

### DSD (USA)

**Dynamic Sound Devices, PO Box 369, Com-mack, New York 11725, USA.**  
**UK:** Wilmex Ltd, Compton House, New Malden, Surrey KT3 4DE.  
**Phone:** 01-949 2545. **Telex:** 8814591.

### DSD Optimizer

**Type:** phono pick-up cartridge load optimiser which allow the addition of extra capacitance to meet the correct loading required by many pre-amps, and also resistive loading. Unit comprises switches to select correct loading as determined by optional CCM-1 battery operated capacitance meter.  
**Capacitance range:** 0 to 350pF in 50pF steps.  
**Resistance:** infinity to 40kΩ.  
**Filter:** passive low pass 2.5MHz cut-off.  
**Price:** pair *Optimizers* £24.95, with CCM-1 meter £69.95.

### EMT (West Germany)

**EMT-Franz GmbH, Postfach 1523, D-7630 Lahr, West Germany.**  
**Phone:** 07825 512. **Telex:** 754319.  
**UK:** FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ.  
**Phone:** 01-953 0091. **Telex:** 27502.  
**USA:** Gotham Audio Corp, 741 Washington Street, New York NY 10014.  
**Phone:** (212) 741-7411. **Telex:** 129269.

### EMT 928 series

**Type:** turntable system with built-in pre-amplifiers with aux platter for fast start under electro-magnetic control.  
**Speeds:** 33 $\frac{1}{3}$ , 45 and 78rpm.  
**Platter:** 12in diameter.  
**Drive system:** belt drive from 3-phase induction motor driven from internal oscillator.  
**Start time:** quick start 1s, turntable start 6s.  
**Wow and flutter:** 0.1% DIN.  
**Rumble:** -50dB DIN.  
**Tone arm:** EMT 929.  
**Equalisation:** DIN 45536, DIN 45537, NAB, RIAA and flat.  
**Pre-amp:** output 1.55V into 200Ω, 44dB gain, max 55dB.  
**Power:** 110/117/220/240V, 50/60Hz.  
**Price:** mono version 928M £830, stereo 928STM £887.

### EMT 930

**Type:** turntable system with choice of separate pre-amps, quick start.  
**Speeds:** 33 $\frac{1}{3}$ , 45 and 78rpm.  
**Platter:** 13in diameter.  
**Drive system:** friction drive from mains powered hysteresis motor.  
**Start time:** quick 500ms, turntable start 1s.  
**Wow and flutter:** 0.075% DIN.  
**Rumble:** 26dB stereo DIN.  
**Tone arm:** EMT 929.  
**Pre-amp:** EMT 155(st) output +4 to +8dB, equalisation DIN 45536/37, NAB, RIAA/IEC, DIN 45533, BBC, flat, (£370 mono, £510 stereo). EMT 153st output max +21dBm, equalisation only IEC/DIN/NAB/RIAA, (£298 stereo for moving coil, £259 stereo for magnetic).  
**Power:** 117/200/220/240V 50Hz, 60Hz to order.  
**Price:** £1,059 less tone arm and pre-amp, £1,345 with arm and pre-amp.

### EMT 950

**Type:** turntable system with direct drive, console or chassis mounting, pre-amps, monitor loudspeaker and fast start.  
**Speeds:** 33 $\frac{1}{3}$ , 45 and 78rpm.  
**Platter:** 13in diameter.  
**Drive system:** direct drive from DC servo motor.  
**Start time:** 200ms.  
**Wow and flutter:** 0.05% DIN.  
**Rumble:** signal-to-noise ratio weighted 70dB.  
**Tone arm:** EMT 929.  
**Pre-amp:** plug-in cards, output +6dB, max +22dB.  
**Equalisation:** DIN/NAB/IEC/RIAA or flat.  
**Power:** 100 to 130V, 220 to 240V, 50 to 60Hz.  
**Price:** £2,510.

### EMT 929

**Type:** statically and dynamically balanced tone arm with extremely low frictional losses, typically 0.5mN or 50mg at stylus tip, stylus force adjustable from 0 to 5g.  
**Price:** £139.03.

### OFS15/OFD15/OFS25/OFD25/OFS65/OFD65

**Type:** mono cartridge for use with EMT 155 pre-amp.  
**Stylus:** conical 15 micron stereo, mono standard grooves 25 micron or 65 micron (as in type number), S version sapphire, D version diamond.  
**Tracking force:** 25 5g, 65 9g (head is 4g heavier than 25).  
**Response:** 30Hz to 15kHz.  
**Crosstalk:** mono.  
**Output voltage:** 4mV 25, 3mV 65.  
**Prices:** OFS sapphire £36.53, OFD diamond £56.26, sapphire stylus £3.26.

### TSD15/TMD25/TMD65

**Type:** stereo T series cartridge with magnifying lens for use with EMT 155 or 153 amps.  
**Stylus:** diamond 15 micron stereo, 25 micron mono, 65 micron standard grooves.  
**Tracking force:** 2 to 3g.  
**Response:** 20Hz to 20kHz.  
**Crosstalk:** 25dB, TMD mono.  
**Output voltage:** 0.75mV.  
**Prices:** TSD15 £128.68, TMD £12.57.

### 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 78rpm.  
**Start times:** less than 1/16 turn (22.5°) at 33 $\frac{1}{3}$ rpm, 1/10 turn at 45rpm and 1/4 turn at 78rpm.  
**Wow and flutter:** 0.1%, NAB-weighted at 33 $\frac{1}{3}$ rpm.  
**Speed accuracy:** ±0.3% at 33 $\frac{1}{3}$ rpm.  
**Rumble:** 45dB (stereo) below NAB reference level recorded at 3.54cm/s rms velocity at 33 $\frac{1}{3}$ rpm.  
**Features:** synchronous motor and idler-wheel drive.  
**Price:** approx. £475.

### MACINNES (UK)

**Macinnes Laboratories Ltd, Macinnes House, Carlton Park Industrial Estate, Saxmundham, Suffolk IP17 2NL.**  
**Phone:** 0728 2262/2615.

### S-220

**Type:** professional stereo tone arm for broadcast applications using high compliance cartridges. Light alloy arm, adjustable lateral balance, adjustable arm height.  
**Tracking error:** +4°, -1°.  
**Vertical tracking force:** 1 to 6g.  
**Offset angle:** 22°.  
**Length:** 310mm total, effective 220mm.  
**Arm height:** 40 to 60mm.  
**Price:** £69.

### 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:** 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 45rpm 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 0.5dB of RIAA curve, 30Hz to 10kHz; ±1dB of RIAA curve, 10Hz to 20kHz; 0-10dB roll-off below RIAA response also available.  
**Speed regulation:** 0.15% with varying load.  
**Wow and flutter:** 0.03% rms.  
**Rumble:** better than -50dB to DIN A-weighting, or -55dB to IEC B-weighting, or -70dB to DIN B-weighting.  
**Distortion:** 0.5% at +8dBm output, 30Hz to 20kHz, 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 19in rack-mounting format, or built into a standard MCI console. Price of the latter configuration is expected to be about £1000.



*Mechanikai Laboratorium SL-101*

### MECHANIKAI LABORATORIUM (Hungary)

**Export: Elektroimpex, 1392 Budapest, PO Box 296, Hungary.**  
**Phone:** 321330. **Telex:** 225771.

### SL-101

**Type:** turntable system with pre-amps, direct drive,

# More Than Great Specs, Great Ideas.

For the past three years we've been telling you about the benefits of using graphic equalizers; now we've made it even easier to appreciate them. Introducing the MXR Dual Fifteen and Thirty-One Band Equalizers. Two equalizers designed with the imagination and understanding to solve your toughest equalization problems. Designed for use in either studios or sound reinforcement situations, our new eqs offer features not previously available at any price.

The Dual Fifteen Band Eq features two channels of equalization with the bands set two-thirds of an octave apart. By breaking the frequencies down further than conventional octave equalizers, you now have the flexibility to contour your music with much greater selectivity. As most musical information occurs in the midrange, this is where you need even more definition, and the Dual Fifteen Band Eq gives you six bands of contour in this area rather than the usual four. In addition, each channel has its own level control.

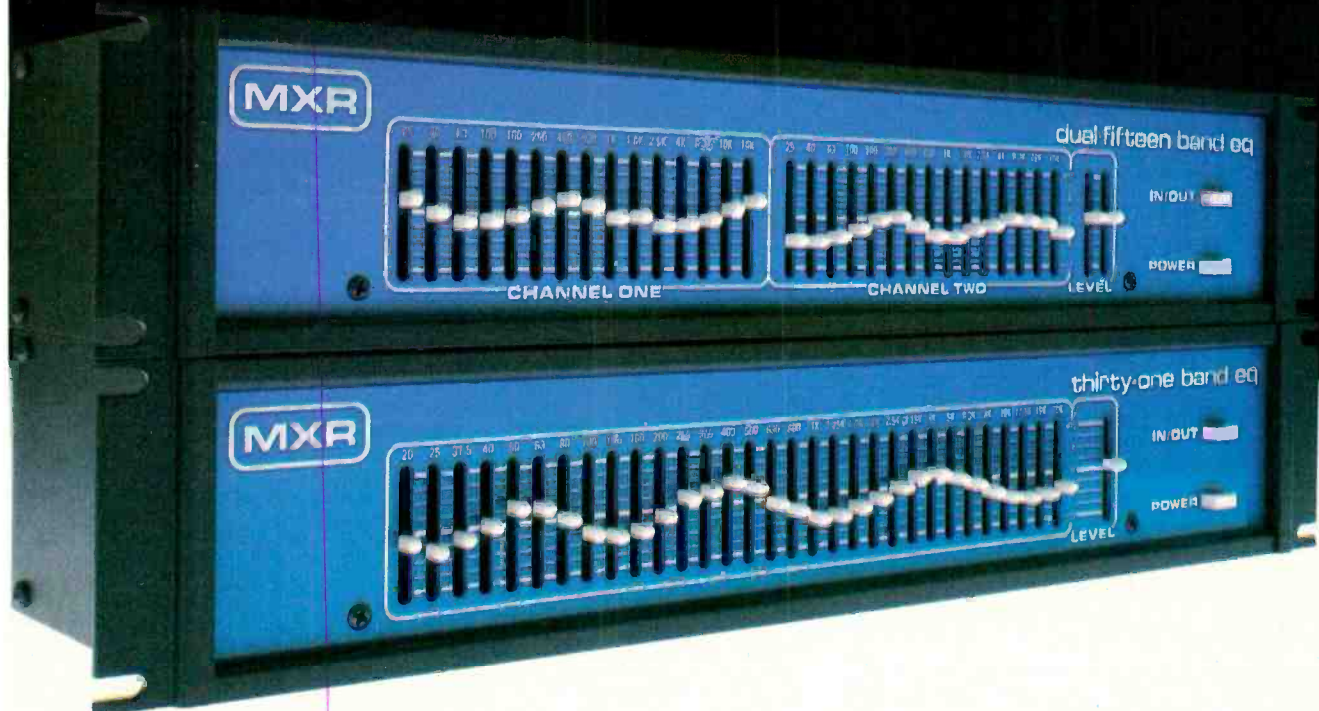
The Thirty-One Band Eq divides the frequency spectrum even further. A single channel unit, the Thirty-One Band features frequency bands set one-third of an octave apart, generally regarded to be the optimum amount of resolution.

When used in conjunction with any PA system, our equalizers can make a bad environment sound good, and a good performance sound great. Unlike parametric equalizers, the frequency response change is immediate and easily visible, so that when you shape a response curve you know what it's going to sound like.

Both units feature a range of  $-12$  to  $+12$  decibels on each band, standard 19" rack mount, and the rugged construction you always get with an MXR product. Both units also feature phone plug input/output connections, (the Thirty-One Band also features Cannon type XLRs), high slew rate (7V/microsecond), and incredibly low noise (better than  $-90$  dBm). But not only do we offer great specifications, we produce great ideas... you wouldn't expect any less from us.

Atlantex Music Ltd., 16 High Street,  
Graveley, Herts., England, (0438) 50113

**MXR** Professional  
Products Group



## SURVEY: TURNTABLES, TONE ARMS AND CARTRIDGES

cont'd Mechanikai Laboratorium

monitoring, console or chassis mounting.

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

**Platter:** 12in.

**Drive system:** direct drive DC servo motor.

**Start time:** 1s ( $\frac{1}{4}$  rev).

**Wow and flutter:** 0.07% DIN.

**Rumble:** 70dB weighted DIN.

**Cartridge:** supplied with either EMT *TSD15* or Shure *M75EJ*.

**Pre-amp:** output +6dBm, max +12dBm.

**Equalisation:** RIAA or flat.

**Power:** 220V 40 to 60Hz.

### MICRO ACOUSTICS

Micro Acoustics Corp, 8 Westchester Plaza, Elmsford, NY10523, USA.

**Phone:** (914) 592-7627.

**UK:** Webland International Ltd, 129 Walham Green Court, Moore Park Road, London SW6 2DG. **Phone:** 01-385 9478. **Telex:** 25570.

#### 2002e

**Type:** professional cartridge.

**Stylus:** elliptical 5x17.8 micron, beryllium cantilever.

**Tracking force:** 0.7 to 1.4g.

**Response:** 5Hz to 20kHz.

**Output voltage:** 3.5mV.

**Channel separation:** 30dB.

**Optimum load:** 10k $\Omega$  to 100k $\Omega$ .

**Weight:** 4g.

**Price:** £65.78, stylus £27.87.

#### 530MP

**Type:** professional cartridge.

**Stylus:** micropoint.

**Tracking force:** 1 to 1 $\frac{1}{2}$ g.

**Response:** 5Hz to 20kHz.

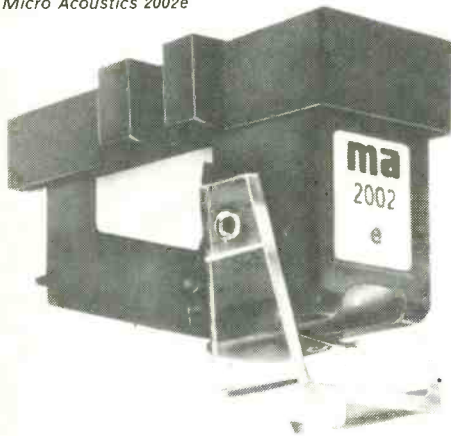
**Output voltage:** 3.5mV.

**Channel separation:** 35dB.

**Weight:** 4g.

**Price:** £121.78, stylus £60.89.

Micro Acoustics 2002e



### 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:** 09322 43124. **Telex:** 928475.

#### MODEL 720

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

**Weight of platter:** 2.5kg.

**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:** 36dB below NAB standard level.

#### MODEL 740

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

#### Gray Micro-Trak 303

**Type:** professional tone arm which features horizontal viscous damping providing a retardant force to fast motion whilst allowing slow motion such as tracking without any hindrance.

### KEITH MONKS (UK)

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

**Phone:** 02514 20568. **Telex:** 858606.

**USA:** Keith Monks USA, 652 Glenbrook Road, Stamford, Conn 06906.

**Phone:** (203) 348-4969.

#### M9BA Mk3

**Type:** laboratory tone arm, low mass, damped, unipivot, with contact system using mercury wells, magnetic bias (skating) compensation, accurate balance.

**Tracking error:** zero at 60mm arranged for minimum distortion.

**Vertical tracking force:** standard version L up to 1.5g with cartridges weighing 5-7g, H version for cartridges weighing 7-8g, S version for cartridges with high tracking weights such as Decca London.

**Pivot friction:** less than 4mg lateral and vertical.

**Turntable height:** 32 to 64mm.

**Arm length:** 228mm.

**Features:** additional top arms available enabling spare cartridges to be correctly mounted and set-up for rapid change.

**Price:** \$179.95.

### ORTOFON (Denmark)

Ortofon Manufacturing A/S, 11B Mosedalvej, DK-2500 Copenhagen-Valby, Denmark.

**Phone:** 01-462422. **Telex:** 27587.

**UK:** Harman (Audio) UK Ltd, St John's Road, Tylers Green, High Wycombe, Bucks HP10 8HR.

**Phone:** 049481 5221. **Telex:** 837116.

#### M20FL Super/M20E Super

**Type:** cartridges using variable magnetic shunt principle.

**Stylus:** M20FL fine line 8 micron, tracking 1 $\frac{1}{2}$  to 1 $\frac{3}{4}$ g; M20E elliptical 8x18 micron  $\frac{3}{4}$  to 1 $\frac{1}{2}$ g.

**Response:** 10Hz to 25kHz.

**Output voltage:** 4mV.

**Channel separation:** M20FL 27dB, M20E 25dB.

**Optimum load:** 47k $\Omega$ /400pF.

**Weight:** 5g.

**Price:** total/stylus M20FL Super £61.78/£37.78. M20E Super £52.82/£30.67.

#### F15E MkII/FF15E MkII/VMS20E MkII

**Type:** cartridges using variable magnetic shunt principle.

**Stylus:** elliptical/spherical 18/8x15 micron F15E, tracking 1 to 2g; 8x18 micron VMS tracking  $\frac{3}{4}$  to 1 $\frac{1}{2}$ g.

**Response:** 20Hz to 20kHz.

**Output voltage:** 5mV.

**Channel separation:** 25dB, FF 20dB.

**Optimum load:** 47k $\Omega$ /400pF.

**Weight:** 5g.

**Price:** total/stylus F15E MkII £24.40/£13.33, FF15E MkII £17.33/£10.22, VMS20E MkII £35.11/£23.56.

#### MC20/MC30

**Type:** moving coil cartridge, stylus is not user changeable, but must be returned to factory for exchange.

**Stylus:** fine line 8 micron.

**Tracking weight:** 1 $\frac{1}{2}$ g.

**Response:** 5Hz to 60kHz, 20Hz to 20kHz  $\pm$ 1dB.

# Aphex Dealers

### APHEX SYSTEMS LTD.

7801 Melrose Avenue,  
Los Angeles,  
California 90046  
**Tel:** (213) 655-1411  
**TWX:** 910-321-5762

### APHEX AUDIO SYSTEMS AUSTRALIA, PTY. LTD.

(Sydney) **Tel:** 261381  
**TLX:** (790) AA24035

### APHEX BENELUX

(Brussels) **Tel:** (02) 345.44.44  
**TLX:** (846) 26409 (TEMBEL B)

### APHEX BRAZIL

(Rio de Janeiro) **Tel:** 205.35.66  
**TLX:** (391) 1121008 (XPSPC BR)

### APHEX AUDIO SYSTEMS CANADA, LTD.

(Toronto) **Tel:** (416) 363-8138  
**TLX:** 06225500 (OCTO TOR)

### APHEX CHICAGO LTD.

**Tel:** (312) 642-8910

### APHEX DENMARK

**Tel:** (01) 59 1200

### APHEX COLORADO, LTD.

(Golden) **Tel:** (303) 278-2551

### APHEX FRANCE S.A.R.L.

(Paris) **Tel:** (1) 500.57.87  
**TLX:** (842) 290846 (IPARIS)

### APHEX GERMANY, GmbH

(Frankfurt) **Tel:** (0 64 42) 53.03  
**TLX:** (841) 184174 (INTRO D)

### APHEX HAWAII, LTD.

(Honolulu) **Tel:** (808) 521-6793  
**TLX:** 7430148 (SOUND)

### APHEX ISRAEL

(Tel Aviv) **Tel:** 232-143

### APHEX JAPAN, LTD.

(Tokyo) **Tel:** 478 7641  
**TLX:** (781) 2224244 (NNR)

### APHEX MIDLANTIC

(Washington D.C.)  
**Tel:** (202) 363-1223

### APHEX NEW ENGLAND

(Boston) **Tel:** (617) 232-0404

### APHEX NEW YORK, LTD.

(West Orange, New Jersey)  
**Tel:** (201) 736-3422/(212) 964-7444  
**TWX:** 710.994.5806 (APHEX LTD. WOG)

### APHEX SCANDIA

(Stockholm) **Tel:** 08-67.80.69

### APHEX SOUTH, INC.

(Nashville) **Tel:** (615) 327-3075

### APHEX SYSTEMS (SUISSE) SA

(Le Mont-Sur Lausanne)  
**Tel:** 021/33.33.55  
**TLX:** (845) 24107 (VOGUE CH)

### APHEX TEXAS, LTD.

(Dallas) **Tel:** (214) 351-6772  
**TLX:** 732715 (APHEX DAL)

### APHEX AUDIO SYSTEMS UK, LTD.

(London) **Tel:** 01-359 5275  
**TLX:** 268279 BRITRO G

### APHEX WEST

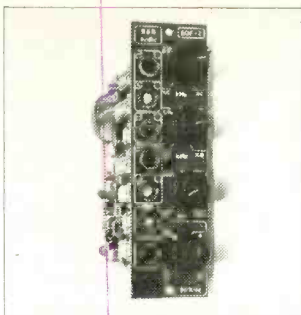
(Los Angeles) **Tel:** (213) 655-1411  
**TWX:** 910.321.5762 (APHEX WEST LSA)





## Parametric Equaliser

A very versatile instrument for getting sounds just right. It's modular and directly retrofits APSI 550. EQ is peak or shelf. Filter is high or low pass, tunable. Bandwidth is 20Hz to 20kHz. Reciprocal cut or boost on EQ.

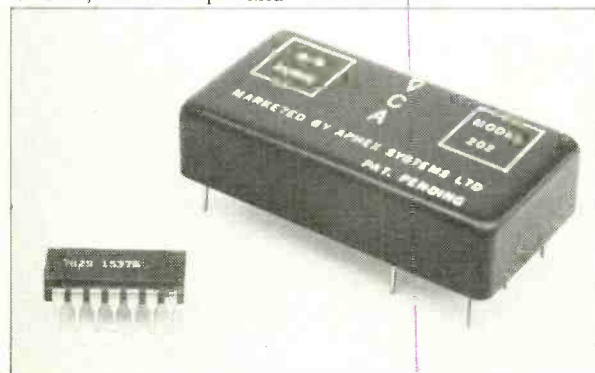


Input	High level	+ 30dBm (max) at 34K $\Omega$
	Low level	+ 20dBm (max) at 11K $\Omega$
Output	High level	+ 30dBm with - 93dBm noise
	Low level	+ 20dBm with - 103dBm noise
Frequency response	EQ & filters out	10Hz to 20kHz, $\pm$ 0.1dB
	EQ & filters in	20Hz to 20kHz, - 1dB
Distortion	Harmonic & IM	< 0.1%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

## Voltage Controlled Attenuator

The first high quality VCA in the professional audio market. It's available in chip form for OEM, or in a complete module, with full input and

output facilities for direct fitting to any automated console with existing VCA's. However, we can design a VCA package to fit any other manufacture.



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

## Grouping and Automation System

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

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

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

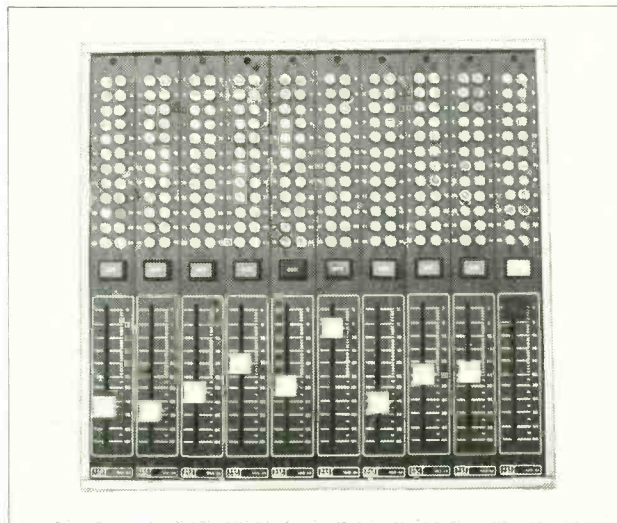
For MCI equipment, a compatible automation package is available.

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

Maximum output is + 24dBm. The system comes in two parts - control console and VCA case.

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

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



# Aphex

## The Aphex Aural Exciter

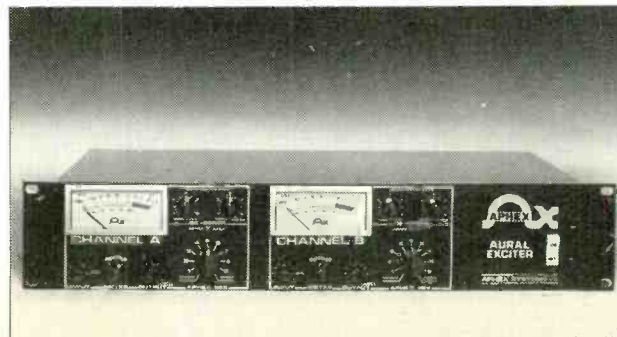
One of the most exciting signal processors to have been invented.

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

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

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

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



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



# Cuemaster

## CARTRIDGE MACHINES



**FIDELIPAC®**



**NOVATRON**

400 FX  
EFFECTS CONSOLES



**Cetec Broadcast Group**

**schafer SPARTA**



**Granet**

Communications Ltd.

39 BEECHCROFT MANOR, OATLANDS  
DRIVE, WEYBRIDGE, SURREY KT13 9NZ

Weybridge (0932) 47785

## SURVEY: TURNTABLES, TONE ARMS AND CARTRIDGES

cont'd Ortofon

**Output voltage:** MC20 0.07mV, MC30 0.08mV, pre-pre-amp required (or transformer).  
**Channel separation:** 25dB.  
**Optimum load:** 47kΩ.  
**Weight:** 7g.  
**Price:** MC20 £68, exchange £39.36, MC30 £221.33.

Ortofon M20FL Super



### PICKERING (USA)

Pickering & Company Inc, Sunnyside Blvd,  
Plainview NY 11803, USA.

Phone: (516) 681-0200.

Europe: Pickering & Co Inc, Succursale de Chavornay,  
Port-franc, CH-1373 Chavornay, Switzerland.  
Phone: 024 512220. Telex: 24957.

### XSV/3000

**Type:** high quality cartridge with stereohedron  
stylus, and cleaning brush attached.

**Stylus:** stereohedron.

**Tracking force:** ½ to 1½g.

**Response:** 10Hz to 30kHz.

**Output voltage:** 5mV.

**Channel separation:** 35dB.

**Optimum load:** 47kΩ/275pF.

**Weight:** 5.5g.

**Price:** £64, stylus £31.50.

### XV-15 series

**Type:** range of cartridges with cleaning brush  
attached.

**Stylus:** 1200E elliptical 5x17.8 microns, 750E and  
625E 7.6x17.8 microns.

**Tracking force:** 1200E 2 to 1½g, 750E ½ to 1½g, and  
625E ½ to 1½g.

**Response:** 10Hz to 30kHz (1200E), to 25kHz 750E  
and 625E.

**Output voltage:** 4.4mV.

**Channel separation:** 35dB.

**Optimum load:** 47kΩ/275pF.

**Weight:** 6.3g.

**Prices:** total/stylus XV-15/1200E £50.50/25, XV-15/  
750E £42/£23, XV-15/625E £27.50/£20; XV-15/625DJ  
ruggedised version for disco cueing, white body,  
no brush, £29.50.

### XUV/4500-Q

**Type:** wide bandwidth cartridge for stereo and  
discrete quad discs such as CD4, with brush.

**Stylus:** quadrahedral with quadrahedron tip.

**Tracking force:** ½ to 1½g.

**Response:** 10Hz to 50kHz.

**Output voltage:** 4.4mV.

**Channel separation:** 35dB.

**Optimum load:** 100kΩ/100pF, low capacitance  
cables required.

**Weight:** 5.5g.

**Price:** £76, stylus £39.50.

### QRK (USA)

QRK Electronic Products Inc, 1568 North Vista,

Fresno, Cal 93703, USA.

Phone: (209) 251-4213.

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

Phone: 09322 43124. Telex: 928475.

### Galaxy

**Type:** professional turntable with DC servo con-  
trolled motor, ±10% speed control, instant start,  
provision for cue slipping without loss of speed,  
plus back cueing with no motor drag. Speed readout  
on LEDs, remote switching.

**Speeds:** 33½ and 45rpm.

**Price:** approx. £350.

### 12C

**Type:** rugged turntable with tone arm.

**Platter:** 12in diameter, 2.5kg weight.

**Drive system:** synchronous motor, outer rim drive  
with idler.

**Start time:** 1/6th revolution for full speed.

**Wow and flutter:** 0.1%

**Rumble:** -48dB.

**Pre-amp:** available as accessory.

**Power:** 115V 60Hz, option 230V 50Hz.

**Price:** £190.

### Custom 2

Similar to 12C but only 33½/45rpm, rumble -52dB.

**Price:** £240.

QRK Galaxy turntable



### REVOX (Switzerland)

Willi Studer, Revox ELA AG, Althadstrasse 146,  
CH-8105 Regensdorf-Zurich, Switzerland.

Phone: 01-840 2960. Telex: 58489.

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

Phone: 01-953 0091. Telex: 27502.

USA: Studer Revox America Inc, 1919 Broadway,  
Nashville, Tenn 37203.

Phone: (615) 329-9576. Telex: 554453.

### B790

**Type:** direct drive electronic turntable with ultra  
short tangential tone arm with servo electronic tone  
arm follow-up.

**Speeds:** 33½ and 45rpm.

**Platter:** 313mm diameter, 1.1kg weight.

**Drive System:** direct drive with electronic control  
and digital readout, ±7% speed variation.

**Start time:** 2s at 45rpm.

**Wow and flutter:** 0.05% DIN.

**Rumble:** -68dB DIN.

**Tone arm:** electronically controlled lowering, linear  
tracking, less than 0.5° tracking error, tracking force  
5 to 20mN.

**Cartridges:** supplied with either Ortofon VMS20E  
MKII or M20E Super.

**Power:** 100/110/120/200/220/240V, 50 to 60Hz.

**Price:** £385 with VMS20E, £395 with M20E.

### SHURE (USA)

Shure Brothers Inc, 222 Hartrey Avenue,  
Evanston, Ill 60204, USA.

Phone: (312) 866-2200.

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

Phone: 0622 59881. Telex: 96121.

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

The new-generation tape transport incorporates a pinch-roller-free direct drive capstan with phase-locked-loop dc-servo circuitry. Tape speeds are 15/30 ips with  $\pm 20\%$  stepless varispeed and a digital percentage readout. Features include full dc-servo on supply and take-up

motors for constant tape tension, automatic switching between input/sync/reproduce electronics with gapless punch-in/punch-out. And a sliding tape-speed controller, built-in digital timer, auto/manual motor-driven head shields plus 40-ohm balanced output, to name but a few. It comes with the latest electronics featuring a single plug-in card per channel.

The MTR-90 is also available in a 16-track frame, and a 16-track prewired for 24 which can be upgraded to a 24-track machine simply

and economically. For the full story, get in contact with your nearest Otari distributor.

# OTARI

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

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

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



## SURVEY: TURNTABLES, TONE ARMS AND CARTRIDGES

cont'd Shure

### SC35C

**Type:** rugged cartridge for broadcast and disco, withstands repeated back cueing, bright orange spot on stylus tip for increased visibility.

**Stylus:** spherical.

**Tracking force:** 4 to 5g.

**Response:** 20Hz to 20kHz.

**Output voltage:** 5mV.

**Channel separation:** 20dB.

**Price:** £18, stylus £6.60, optional elliptical 78rpm stylus £9.

### M44 series

**Type:** series of cartridges with various styli.

**Stylus:** M44C 18 micron spherical, 3 to 5g tracking, M44-7 similar but 1½ to 3g tracking, M44E with elliptical and tracking 1½ to 4g.

**Response:** 20Hz to 20kHz.

**Output voltage:** 9.5mV.

**Channel separation:** 20dB.

**Price:** M44C and M44-7 £11.10, stylus £6.90, M44E £11.70, stylus £7.50, 78rpm stylus £6.90.

### M95ED

**Type:** high trackability cartridge.

**Stylus:** elliptical 5x17.8 micron.

**Tracking force:** ¾ to 1½g.

**Response:** 20Hz to 20kHz.

**Channel separation:** 25dB.

**Price:** £29.70, stylus £21.60, 78rpm stylus £7.80.

### V15 Type IV

**Type:** high performance cartridge with damper with carbon fibre brush.

**Stylus:** hyperelliptical biradial, optional spherical.

**Tracking force:** ¾ to 1½g.

**Response:** 10Hz to 25kHz.

**Channel separation:** 25dB.

**Output voltage:** 3.5mV.

**Price:** £80.70, stylus £30.90.

### M232/236

**Type:** professional tone arm, simple and rugged with full range of adjustments. Mounting through single hole, M232 is for 12in turntables, M236 for 16in.

**Price:** £31.50.

### Shure SC35C



### SME (UK)

**SME Ltd, Steyning, Sussex BN4 3GY.**

**Phone:** 0903 814321.

**USA and Canada:** Shure Brothers Inc, 222 Hartley Avenue, Evanston, Ill 60204, USA.

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

### SME Series II Improved

**Type:** precision tone arm with low friction pivots, low inertia, lever operated hydraulically damped

lifting control.

**Vertical tracking force:** 0 to 1.5g.

**Horizontal force:** 20mg will deflect the arm.

**Bias:** adjustable to correspond with tracking force.

**Arm length:** 229mm.

**Height:** 27mm to 41.3mm.

**Price:** £71.75, with detachable shell £78.65.

Optional fluid damper which renders arm less lively applied at a radius of 36mm making it more effective than damping applied at the bearings, price: £21.75.

### SME Series III

**Type:** precision tone arm, uses high precision moulded components with added metal inserts where weight is required, nitrogen hardened titanium tube, carrying arm removable for multicartridge use.

**Vertical tracking force:** 0 to 2½g.

**Horizontal force:** 20mg will deflect the arm.

**Cartridge weight:** 0 to 12g.

**Arm length:** 229mm.

**Height:** 60.3mm to 32.6mm.

**Price:** £130.95.

SME also manufactures a range of accessories for its arms including glass re-inforced nylon screws for cartridge mounting.

### SONETEC

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

**Phone:** 654 0707. **Telex:** 203347.

### DR1000

**Type:** Turntable system using Technics SP10 MkII turntable with EPA-100 tone arm, Shure M75 cartridge and RIAA pre-amplifier with +12dB output, internal monitor speaker.

### 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:** 0624 4701. **Telex:** 627900.

### CUE-MASTER

**Speeds:** 33½, 45 and 78rpm.

**Start time:** about 1/10th of a revolution at 45rpm.

**Wow and flutter:** 0.3%.

**Rumble:** 36dB below standard NAB level.

**Platter weight:** 2kg.

**Features:** accepts 25cm tone arms.

### STUDIO PRO

**Speeds:** 33½ and 45rpm.

**Start time:** 1/10th of a revolution at 45rpm.

**Wow and flutter:** 0.2%.

**Rumble:** 38dB below standard NAB level.

**Platter weight:** 2.5kg.

**Features:** accepts 25cm tone arm.



Left: Stanton 500 replacement stylus and right: the cartridge



Stanton 680EL

### STANTON (USA)

**Stanton Magnetics Inc, Terminal Drive, Plainview, New York 11803, USA.**

**Phone:** (516) 681-0415. **Telex:** 510-221 1845.

**UK:** Wilmex Ltd, Compton House, 35 Malden High Street, New Malden, Surrey KT3 4DE.

**Phone:** 01-949 2545.

### 500 Broadcast Series

**Type:** series of cartridges aimed at broadcast use. **Stylus:** 500A 17.8 micron spherical, 500AL 17.8 micron heavy duty for disco, 500EE 7.6x17.8 micron elliptical, 500E 10x17.8 micron elliptical.

**Tracking force:** A and E 2 to 5g, EE 1 to 2g, AL 3 to 7g.

**Response:** 20Hz to 20kHz.

**Channel separation:** 35dB.

**Output voltage:** 5mV.

**Optimum load:** 47kΩ/275pF.

**Weight:** 5g.

**Prices:** total/stylus 500A and AL £16.60/£9.75, 500E £19.95/£12.75, 500EE £23.35/£15.55.

### 680 series

**Type:** reference series cartridge and claims to offer an 'optimum performance to price ratio'—an unusual technical term.

**Stylus:** elliptical 680EE 7.6x17.8 micron elliptical, 680EL robust disco cueing type, elliptical 10x17.8 microns, 680AL disco spherical 17.8 micron stylus.

**Tracking force:** 680EE ¾ to 1½g, 680EL 2 to 5g.

**Response:** 20Hz to 20kHz.

**Output voltage:** 4.1mV.

**Channel separation:** 35dB.

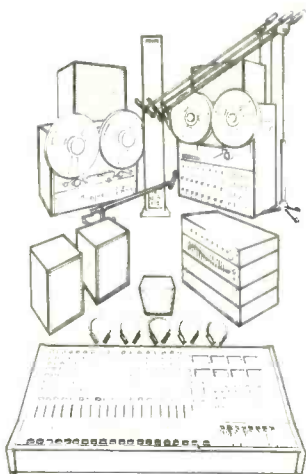
**Optimum load:** 47kΩ/275pF.

**Weight:** 5.5kg.

**Price:** total/stylus 680EE £34.35/£20.95, 680EL £34.35/£20.95, 680AL £16.60/£9.75.

# Our business is helping you with yours

Considering or upgrading a multitrack system?  
We offer a select range of studio equipment, backed with advice, demonstration and service. Turnkey sell, install, lease or hire.



## SYSTEMS

As our name implies, at **TURNKEY** we specialise in systems. From the simplest four channel setup to large eight or sixteen track installations, we can tailor a package to fit your exact needs. This can include acoustics advice, wiring, consoles, training and so on. Ask for our 'Quotation Sheet' or call Andrew Stirling now, on 01-440 9221 and discuss your requirements first hand.

## MONITORING

**QUAD** is a remarkable company that has stayed in the forefront of monitor amplifiers for over a decade. Their current series, the 303 and 405 are available for medium and high power use.

**JBL** and **TANNOY** share the market for studio monitors worldwide. We demonstrate and supply matched systems for budget and big-time monitoring. The renowned **AURATONE** mini-mighty speaker cubes, are also in stock.



## SIGNAL PROCESSORS

The choice is immense. We cannot sell them all so we pick and choose the best. Take **MXR** for example. This American based company has grown from making effects for guitars to studio equipment for professionals. Their digital

## MICROPHONES

As with speaker systems, the choice of microphones is very much one of personal preference and we stock a range to satisfy most requirements. Our current favourites are the new **CSE** range by **AKG**. This is a system (in similar lines to the revolutionary **C451** range some years ago) of interchangeable bodies and capsules. As electret technology is used, the prices are correspondingly low.



delay and graphics are second to none. **Roland** of synthesiser fame, have introduced their 'Studio Series' of rack-mount units, including a phaser/flanger with extensive control facilities. We also have the budget **ACCESSIT** range.

## ACCESSORIES

As well as supplying standard plugs, tapes etc., We have developed an exclusive range of 'hard to find' studio accessories.



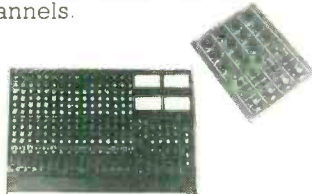
Take for example our 'Great British Spring' - a high quality stereo reverb developed for the budget conscious studio.



We also have . . . mike boxes . . . track sheets . . . preamplifiers . . . direct boxes . . . rolling consoles . . . and much more. Full details in our 'TURNKEY by mail' catalogue.

## MIXERS

Our exclusive 1478 is a freebie with all four track recorders. Treble, bass, pan and level on four channels.



The **RSD**, 16 by 4, offers great value for money in budget multitrack mixers. Packed with features and our own mods for 8 track.

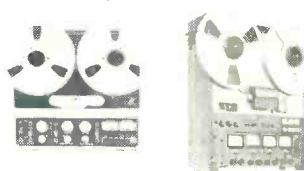
**SOUNDCRAFT** is well known for its' state of the art performance. We have extensive experience of the Series Two, 16 by 8.



**SYNCON** by **A&H** is a major breakthrough in the design of big consoles for 16 and 24 track. We offer fast delivery and installation.

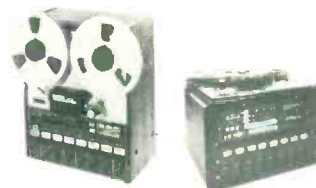
## TAPE RECORDERS

**REVOX** lead in the field of 2 track mastering. The new **B77** includes all the features that were hot-rodded to the **A77**.



**TEAC's** new 3440 is the updated version of the 3440S. Now with varispeed, logic switching, monitoring and motion sensing.

The **TASCAM 80-8** is the most reliable half inch, 8 track recorder available. We also supply **dBx** and a studio console optionally.



The 8 track, one inch from **SOUNDCRAFT MAGNETICS** is a sophisticated workhorse with unique remote control facilities.



Write or call for a free copy of the 'Turnkey Book', the 'Turnkey by mail' catalogue and **TEAC's** 'Are you ready for Multitrack' book. You are welcome to come and visit our extensive demonstration showroom at any time during normal office hours.

**8 East Barnet Road,  
New Barnet,  
Herts EN4 8RW**  
**Supply & Installation  
of Recording Equipment**  
**Telephone 01-440 9221**  
**Telex: 25769**

**turnkey**

# Letters

## Stellavox SP8 review

Dear Sir, Thank you for the opportunity to comment on the review of the Stellavox SP8, by Hugh Ford.

I was surprised to note in the summary that Mr Ford had 'the impression that it may not stand up to the hard life suffered by professional portables'. These machines first in the SP7 and now SP8 format have been doing just that for 10 years. Paragraph four of the review appears to contain the reason for Mr Ford's impression for he has given an inaccurate description of the basic construction of the recorder. The case is formed not from a diecast box, but from a machined thick alloy bar, supporting the input/output connectors, and from alloy girders, supporting controls and meters. There are diecast frames top and bottom, firmly screwed to clamp the whole into an exceptionally rigid box, in conjunction with alloy deck and base-plates.

Some of the problems found during the review were due to the machine being supplied without the normal pre-delivery setting-up, because the writer was then at the SMPTE convention in New York. The stereo head had a noise problem, not from misalignment, but because it was a stock head, not as yet aligned for any machine at all. The amount of bias and low frequency motor noise (not tone) in the output of this head relates to the final setting-up, when bias frequency and noise rejection would be accurately adjusted. Incidentally, I find that if greater than the manufacturer's bias rejection is attempted, the square wave performance is impaired, as the bias traps themselves ring more than a damped head.

Mr Ford considers the overload margin to be too narrow with high output tapes; he has not appreciated that the equalisation and gain are set within each head assembly to provide optimum operation with a given tape, such that +4dB on the meters corresponds with 2% or less distortion on that tape. Thus with Scotch 207 the distortion at +4dB with the monohead tested is 1.2%; with the stereo head it is 1.9%. The stereo head gives this distortion at 2dB higher flux level than the mono, thus 320nWb/m tone should replay at approximately +4dB rel. 0.775V, not +6.5dB as measured; I suspect an incorrect reading here. If a tape such as Scotch 250 is used, then the recorded level for a given meter indication would be correspondingly higher; thus the overload margin is a constant related to tape characteristics rather than test tape level, as assumed by Mr Ford.

Yours faithfully, Bob Woolford, John Page Limited, Wesley House, 75 Wesley Avenue, London NW10 1DA.

**Ed:** One of course hopes that John Page Ltd does not normally supply Stellavox recorders unaligned, merely because one person is absent from the office. No information was supplied regarding the construction of the recorder, as would normally be found in a comprehensive service handbook.

Dear Sir, Your review of the Stellavox SP-8 raises a couple of interesting questions. I've never used a Stellavox for film sync, so I can't speak for its performance in such applications,

but in my work as a classical recording engineer and sound projectionist, a Stellavox mixer and Stellamaster SM-7 have been the nerve centre of my operation for several years. They've never failed me on location; if something goes wrong I look elsewhere. In my studio the SM-7 sits in easy reach on top of the mixer and it's the machine I always turn to for really critical masters or copies.

There are two reasons for this long and faithful service. One is the intrinsic excellence of its Rolls Royce-like construction. The other is the quality of service provided by Bob Woolford of John Page Ltd, the Stellavox representative in Great Britain. No machine is better than the standard of its maintenance and Bob has looked after it with the precient assiduity of the Queen's physician. Together we've worked out modifications to adapt it to my particular requirements; if I wanted it to include a Geiger counter or an automatic egg timer. Bob would come up with the answer.

When a machine—any machine—is an integral element of an art, there are certain parameters of performance which don't reveal themselves to quantitative measurement. Any engineer with a stable of meticulously maintained Studers at his disposal probably has a favourite to which (one wants to say, 'to whom') he entrusts his most demanding work. 'Stella' is my most dependable colleague. She's stood up very well indeed, thank you, to the 'hard life suffered by a professional portable'. I couldn't function without her.

Yours faithfully, John Whiting, Director, Persona Productions, 49 Great Cumberland Place, London W1H 7LH.

**PS** I know of one particularly hardy specimen which finished a shooting session after being dropped 30ft on to a cement floor. It's a test the engineer in charge would probably have failed.

## Synchronisers

Dear Sir, Having read the article on Tape Synchronisers by Richard Dean in November Studio Sound, I found it interesting but incomplete. Apparently Mr Dean was relatively unfamiliar with the MCI unit, perhaps because of its relative newness.

A few features missed are as follows:

1. The MCI Autolock 'locks' any two machines to a 'worst case' lock window of 50µs, one half the competitor's lock window, providing better phase relationship between machines.
2. The Autolock will lock two MCI machines with no change in flutter spec and will lock to a SMPTE source with 1% flutter adding less than 0.1% to the MCI machine. This is done by micro-processor logic with a variable integration factor weighted by the master source flutter.
3. The Autolock will lock an MCI machine to any source of SMPTE or EBU code.
4. Fast wind back and chase modes do not require modified or wideband electronics. Any channel of the machine may be used for code.
5. The unit will work with any code level down to -10VU (ref 250nWb/m).
6. The unit is dropout immune. Any erroneous or missing code is reinstated with code at the same

rate or speed. The operator can even manually lift the tape off the heads without affecting lock as long as the speed is constant.

7. The unit will lock over the complete variable speed range of MCI machines.
8. The unit features a built in code generator which will generate SMPTE, EBU or SMPTE Drop Frame (NTSC).
9. Tapes which need to be locked but have differing or erratic time codes can be locked in Dumb Mode. This mode locks the Sync Words without regard to the actual time location.
10. The unit will lock to 60Hz or 50Hz Pilot tone.
11. Offset can be entered by keypad or by use of the Manual Advance/Retard button. If the Manual buttons are used to obtain usual lip sync the resultant offset can be recalled for reference. The offset range can be up to ±24 hours.
12. A programmable record enable/disable function permits automated editing.
13. In Fast Lock Mode the unit will lock machines from any tape positions. If more than four seconds of PLL servo are required, the slave goes to Fast Mode and servos to within four seconds of lock at fast wind speeds.
14. No hunting or sampling is required in fast wind. Just as with the well known AutoLocator the AutoLock always knows where the tape is and goes directly to the desired location.

If your readers consider this additional information along with the fact that the entire units measure only 18cm high, 30cm wide and 12.7cm deep and mounts with the machine remote in a common package they will probably consider the price of £4,000 quite a bargain.

Yours faithfully, Thomas Hay, vice president, engineering, MCI, 4007 N.E. 6th Avenue, Ft. Lauderdale, Florida 33334, USA.

## Feedback Wattmeter review

Dear Sir, I refer to the review in your February 1979 issue (page 62) of the Feedback EW604 Wattmeter. Your reviewer correctly points out that in certain circumstances it is possible for the meter output socket to be at a dangerously high potential relative to the mains earth and suggests that this could be obviated by use of a shrouded socket.

This criticism is accepted as a valid one and has, in fact, been expressed to us from other sources. Although the suggestion of a shrouded socket would go some way towards meeting the criticisms, Feedback now feels that the only certain way to avoid potential hazard is to eliminate the meter socket entirely and this is now being done. The meter point will, however, still be accessible internally to those who wish to use this facility and are willing to take upon themselves the responsibility of ensuring that any connection made to the point is a safe one in the context of the particular application.

I hope this letter will serve to reassure your readers that Feedback takes very seriously current requirements relating to health and safety at work.

Yours faithfully, Geoffrey H. Stearman, Technical Director, Feedback Instruments Ltd, Park Road, Crowborough, Sussex. 56 ▶

# Publison Audio Professional Manufacturing

## CATCH THE 'NEW' SOUND WITH THE 'NEW' AUDIO COMPUTER!...



### DHM 83 B

By means of complex digital manipulation of memorized sounds (memory capacity : 210 kilobit), this device allows many original effects :  
**Dual delay**, with various combinations bandwidth – maximum delay (bandwidth up to 20 kHz. Delay up to 1200 mS. On request, up to 5000 mS).

**Echo**  
**Pitch shifting**, from –2 to +1 octave. Sophisticated micro computer operates phase-coincidence of joining points, and eliminates “glitches”. Minimum and maximum delays of pitch-shifting are adjustable.

**Automatic arpeggio**  
**Reversed sound** : electronic equivalent of a magnetic tape running reversed. Reversed sound can be itself pitch-shifted.  
**Memory latch** : memorized sound can repeat indefinitely. Start, length, reading sense and pitch-shifting of repeating sequency are adjustable. Numerous applications : rhythm with any natural sound, memory synthesizer, by means of associated keyboard, ETC !



### DHM 89 B2

Similar to DHM 83 B, but with true stereo possibility : 2 independent inputs, 2 independent pitch ratio.

FOR FURTHER INFORMATION CONTACT PETER DEAN

## Publison Audio Professional

5-7-9 RUE CRESPIN DU GAST 75011 PARIS

TEL : (0-10-33-1-) 357 64 08

**Revox design flaw?**

Dear Sir, I am writing about a design flaw in Revox tape recorders which no-one other than myself seems to have noticed. Or perhaps it just does not affect others' work as it does mine.

The problem is a noise of well-defined pitch given off by the tachogenerator used for capstan speed control. The noise—and I refer to an acoustic noise, not a sound picked up on the tape itself—is clearly audible across my living room, where I had intended to use a recently acquired A700 to record my practice sessions (I am a concert pianist). The pitch changes by an octave with change of tape speed, the one associated with 15in/s being the most noticeable. Of course it would be even more objectionable in Dabney Lounge, the lovely small room where I perform at Caltech, and which is quieter than my living room. The A700 is such a nice machine otherwise that it is a shame to be unable to use it for serious work because of this flaw.

Having obtained my particular machine used, from a friend who had bought it new and hardly used it, I thought at first it simply needed adjustment of the tachogenerator. (Apparently the noise is produced in the manner of a siren, by the many little notches in the tach ring surrounding the capstan motor.) Revox here in Los Angeles (Van Nuys, California actually)

did in fact reduce the noise considerably—but not enough. I then sent it to Revox USA headquarters in Nashville. They were very nice but said that it couldn't be reduced further, and confirmed that it is a 'design feature' of the machine—I call it a 'design flaw'. At least they don't claim it has any positive value!

A high official of Revox in Nashville—he has since left, I understand—further said to me words to the effect of "You think it's a problem with the A700? We sell \$6000 Studers with the same problem." And indeed, as I have found myself in various studios and Revox dealerships around Los Angeles recently, I have been able to confirm that all the Revox machines make the same noise. I have listened to A77s, B77s—no A700s because I haven't seen any around—and a Studer at Westlake. This last gave out a nice clear tone. The salesman I was talking with said, "You know, I've used this machine for years (it's actually in a control room there) and I never noticed that sound."

I wrote to Revox in Switzerland about this, but they seem to treat it as something wrong with my particular machine, despite their own people—in Van Nuys and Nashville—agreeing that there is nothing wrong with this particular machine.

I am upset myself, of course, because I bought a machine for a purpose for which it

turns out to be unsuited and unusable. And it's frustrating because it's such a good machine otherwise. And it's confusing a little because Michael Fraser, the engineer who has recorded a recent concert of mine with an A77, says his is silent.

In going back over the various reviews published of the A700 and other Revox machines—including one by Hugh Ford—I see that no-one, apparently, has noticed this problem. But perhaps there are other readers who would like to know about it before buying.

Yours faithfully, James Boyk, California Institute of Technology, Los Angeles, California.

**Revox replied**

"... it would seem that it is not a siren effect as one might think at first glance, but is due to magnetostriction in the core of the tach head. The filling of the notches would not produce the hoped for quieting and to get rid of the described magnetic effect is a completely different thing altogether. It would appear therefore, that we will not be able to offer an effective remedy."

Ed. We have come across several musicians who have made the same comments about 'noise', but then most people learn to ignore it with time. The solution would be to use light to measure speed, rather than magnetic effects.

**SURVEY: TURNTABLES, TONE ARMS AND CARTRIDGES**

cont'd Stanton

**681 series**

**Type:** calibration cartridge series.  
**Stylus:** 681A 17.8 micron spherical, tracking 1½ to 3g; 681SE 10x17.8 micron elliptical, tracking 2 to 4g; 681EEE 5x17.8 micron elliptical tracking ¾ to 1½g; 681EEES stereohedron, tracking ¾ to 1½g, 681BPS 20 micron for playing metal stampers and matrices, tracking 3 to 7g for stampers, 1 to 1½g for matrix.  
**Response:** 10Hz to 20kHz, to 22kHz EEE and EEES.  
**Output voltage:** 5.5mV A and SE, EEE and EEES 3.5mV.  
**Channel separation:** 35dB.  
**Optimum load:** 47kΩ/275pF.  
**Weight:** 5.5g.  
**Prices:** total/stylus 681A £44.20/£22.75, 681EEE £53.30/£27.50, 681EEES £72.95/£35.50, 681BPS £115.00.

**881S**

**Type:** professional calibration series, 'the highest quality (and priced) cartridge Stanton can make'.  
**Stylus:** stereohedron.  
**Tracking force:** ¾ to 1½g.  
**Response:** 10Hz to 20kHz.  
**Output voltage:** 4.5mV.  
**Channel separation:** 35dB.  
**Optimum load:** 47kΩ/275pF.  
**Weight:** 5.7g.  
**Price:** £87.95, stylus £48.95.

**TECHNICS (Japan)**

Technics by Panasonic, One Panasonic Way, Secaucus, New Jersey 07094, USA.  
**Phone:** (201) 348-7000.  
**UK:** Technics, National Panasonic Ltd, 107-109 Whitby Road, Slough SL1 3DR.  
**Phone:** 0753 34522. Telex: 847652.

**SP-10 MkII**

**Type:** direct drive turntable.  
**Speeds:** 33½, 45 and 78rpm.  
**Platter:** 32cm diameter, 2.9kg.  
**Drive System:** direct drive, phase locked to quartz reference, DC brushless motor.  
**Start time:** 250ms 33½rpm (25° rotation).  
**Wow and flutter:** 0.035% DIN.  
**Rumble:** -50dB DIN 45539A, -73dB DIN 45539B.  
**Price:** £604.40.

**EPA-100**

**Type:** variable dynamic damping universal tone arm, titanium nitride arm pipe on gimbal suspension.  
**Vertical tracking force:** 0 to 3g.  
**Friction:** 5mg lateral and vertical.  
**Arm length:** 250mm.  
**Tracking error:** 1.1° inner, 2.1° outer grooves.  
**Height:** 42mm to 90mm.  
**Price:** £275.51.

**SL-1000 MkII**

Comprises SP-10 MkII, and EPA-100 arm mounted

**Thorens**

TD 126 MkIII



in SH-10B3 obsidian turntable base weighing 12kg to prevent acoustic feedback.  
**Price:** £1,155.42.

**THORENS (Switzerland)**

Thorens Franz AG, Hardstrasse 41, CH-5430 Wettingen, Switzerland.  
**Phone:** 056 262861. Telex: 53681.  
**UK:** Metrosound Audio Products Ltd, Freedex House, 4/10 North Road, London N7 9HN.  
**Phone:** 01-607 8141. Telex: 264773.

**TD126 MkIII**

**Type:** semi-professional transcription turntable.  
**Speeds:** 33½, 45 and 78rpm.  
**Platter:** 12in, diameter, 2.15kg weight.  
**Drive system:** one step belt drive with servo controlled DC motor.  
**Arm:** TP16 MkIII.  
**Wow and flutter:** 0.04%.  
**Rumble:** 51dB unweighted, 72dB DIN weighted.  
**Power:** 117/220V 50/60Hz.  
**Price:** £280 including arm, base and cover.

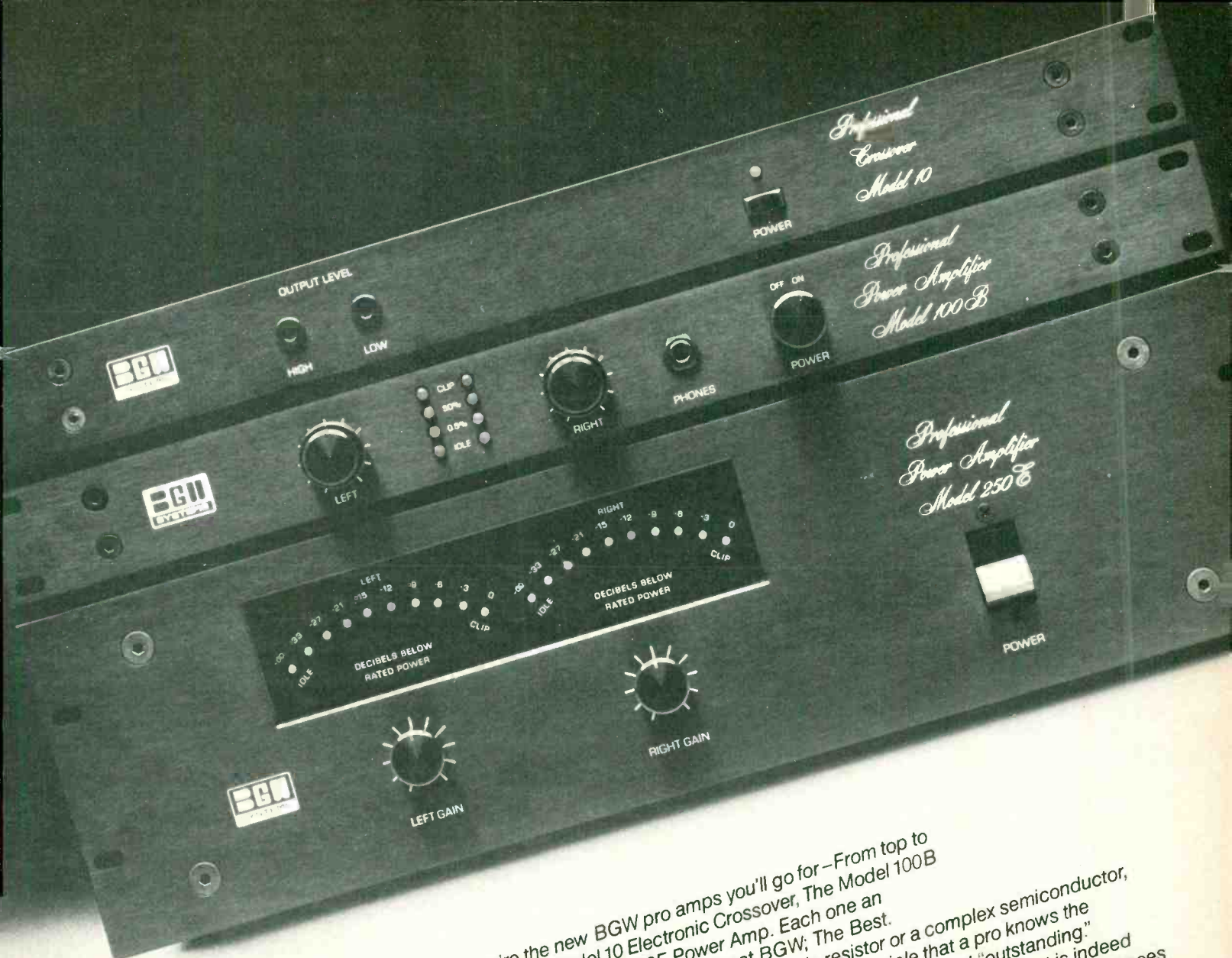
**TP16 MkIII**

**Type:** Isotrack tone arm.  
**Lateral tracking error:** 0.18°/cm radius.  
**Arm length:** 230mm.  
**Friction:** 0.15mN in both planes.  
**Bias (skating) compensation:** magnetic force without friction.  
**Price:** £35.

**TMC63**

**Type:** moving coil cartridge.  
**Tracking force:** 20N.  
**Stylus:** 8 micron diamond fine line.  
**Response:** 20Hz to 20kHz.  
**Output voltage:** 0.75mV.  
**Channel separation:** 25dB.  
**Compliance:** 12x10<sup>-8</sup> cm/dyne.  
**Price:** £175. PPA990 pre-pre-amplifier £100.





# Professionals Swear by Them, Competitors, at Them.

They're the new BGW pro amps you'll go for - From top to bottom, The Model 10 Electronic Crossover, The Model 100B Power Amp, and the 250E Power Amp. Each one an extension of our basic philosophy at BGW; The Best.

Whether its a simple resistor or a complex semiconductor, BGW is dedicated to the principle that a pro knows the difference between "good enough" and "outstanding." Because we know that quality in a pro product is indeed something you can see, touch and hear, everything that goes into a BGW product, everything we do in its manufacture, is designed to back up the man who depends on our gear to make his living. And, like all BGW products, the new 250E with our exclusive arc-scale power indicators. They're new 100B and Model 10 in answer to your demands. They're worthy additions to the solid-gold reputation that's been earned in recording studios, discos and concert stages throughout the world.

If you're not already a BGW Pro we invite you to compare any of our products with anybody else's. Anybody's. You'll then see why so many of your pro friends swear by us. And our competitors, at us.

## Go For The Best



BGW Systems, Inc.  
 13130 South Yukon Avenue,  
 Hawthorne, California 90250  
 In Canada: Omnimedia Corp.,  
 9653 Cote de Liesse  
 Dorval, Quebec H9P 1A3

# Into the digital studio domain: Part two

P Jeffrey Bloom (Polytechnic of Central London)

In Part One of this article we discussed how digital signals are formed and why their use can improve the subjective quality of recorded audio. In this second part, we examine more practical advantages of exploiting digital signals in a recording studio.

CURRENT mixing consoles are usually designed to be as flexible in function as the budget will allow. Unfortunately, flexibility in traditional analogue circuitry is usually only achieved by providing separate controls for every parameter that might need adjustment and a separate electrical pathway wherever one anticipates that this might be useful. This approach has led to enormous and complex consoles which are not only difficult to work with, but which also makes proper control of the listening room acoustics very difficult or impossible. Moreover,

these giant consoles are virtually impossible to automate completely and thus, if a large number of parameter or 'wiring' changes are needed simultaneously (other than channel levels) then editing or, alternatively, many extra hands are required.

Most of these undesirable features can be eliminated or at least improved upon by judicious application of recently developed digital techniques. These techniques primarily exploit the fact that the audio signal has been coded into a sampled signal since each sample (in the form of a binary number)

can be stored, moved, copied, or processed according to predefined and modifiable programmes. Properly designed signal processing hardware can therefore be carrying out many different functions concurrently and, if these functions are performed quickly enough, a single processor appears to be several devices 'simultaneously'. With a modest number of high speed digital processors and a modest number of controls, whose actual function may be defined at operating time, you should be able to perform not only all of the functions found on current consoles but, in addition, novel and otherwise impossible operations on both the recorded signals and the console configuration can be produced.

In this article, for the sake of readers with no experience in digital processing, two simple

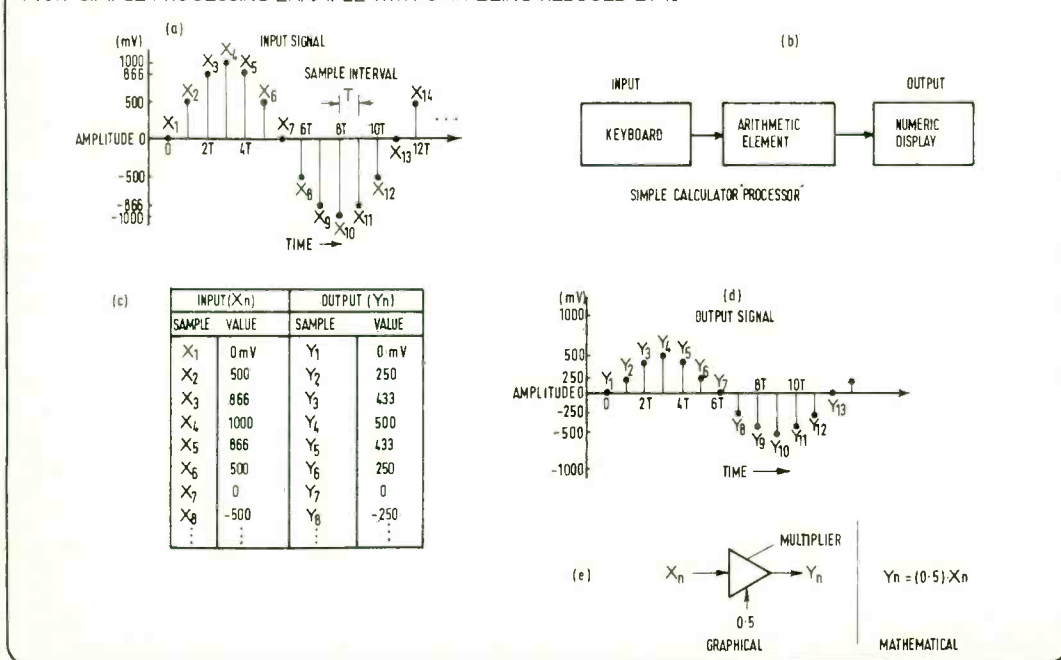
examples are presented illustrating the basic principles of how digital processing is done. This is followed by brief descriptions of how traditional studio processes may be implemented digitally, how digital processors can be designed to be flexible and automatable, what a complete studio system might look like and what is actually available now and in store for the future.

### Some simple examples

To illustrate how simple digital signal processing can be, it is perhaps instructive first to point out that most people have probably had experiences which are closely related—anyone who has used a digital (or even mechanical) calculating device should already be fairly familiar with some of the basic operations involved. For example, let us say that we have a table of numbers which are samples of the amplitude of the sine wave (fig 7a) which have been taken at equal time intervals as shown. If we ensure that the samples are listed in the order in which they were taken (left side of fig 7c), we can use this table as an input signal to our processor, which is a simple calculator (fig 7b). Taking the first of these input values, enter it into the calculator, and then, say, multiply it by 0.5 and record the displayed result as the first entry of an output table (fig 7c), we can say that this is a process which can be repeated for each of the input values. This simple process generates a table of numbers which is our output signal. Plotting these values reveals that we have generated a sine wave with the same frequency, but half the amplitude of the input sine wave (fig 7d).

Finally, we can make two types of short hand descriptions of this process in the form of either a simple equation or graphically (fig 7e). Here we can imply that

FIG. 7 SIMPLE PROCESSING EXAMPLE WITH GAIN BEING REDUCED BY  $1/2$



any discrete time series can be used as an input  $x_n$  (where the subscript  $n$  simply means the  $n$ th sample value of any series) and can be multiplied by 0.5 to produce the output series  $y_n$ .

In the preceding example, each output value was generated directly from one input value. Next we define a slightly more interesting process in which two input values contribute to every output value. In this case let us take the differences between two adjacent samples and generate output values by dividing these differences by two:

$$\text{ie } y_2 = (x_2 - x_1)/2,$$

$$\text{and } y_3 = (x_3 - x_2)/2, \text{ etc.}$$

(Note that  $y_1 = (x_1 - 0)/2 = 0$ , because there are no values of  $x$  before  $x_1$ ). The output values obtained by this second process are tabulated in fig 8a and plotted in fig 8b (dots) along with the input values (circles). In fig 8c we have generated a simple step-by-step description of the process which is in the form of a loop that could be repeated for as many times as there are input values. A graphical and mathematical description of this process is given in fig 8d—the box with the T indicates that each past value of a signal sample is generated by holding the previous current sample for one sample period.

The output of this second process for the sine wave input (as shown in fig 8b) is again a sine wave with the same frequency, but now the amplitude has been considerably reduced and the phase also shifted. One can analyse this system and show that this simple process is actually a high pass filter with amplitude and phase characteristics as shown in fig 8e.

Thus, in these two simple examples, we have seen how systematic repetition of very straightforward mathematical operations applied to sampled signals can be used to control a signal's amplitude and frequency response. We shall return to these results in a later discussion.

At this point, it would be useful to automate our calculator-processor (fig 7b) into a device which automatically does what we have been doing by hand and it is fairly straightforward to do this (on paper at least). Recall that sampled signals can be quantised and converted by binary numbers (see Part One of this article). Such signals are digital signals. If our goal is to be able to process a digital signal from an analogue/digital converter (ADC) according to the processing 'recipe' or *algorithm* described in the last example (fig 8d) we would have to add the following to fig 7b.

- i) A means of specifying what operations are to be carried out.
- ii) A means of holding (or stor-

FIG 8 ANOTHER SIMPLE PROCESSING EXAMPLE - NOTE IN (e) FREQUENCY IS SHOWN AS A FRACTION OF THE SAMPLING FREQUENCY

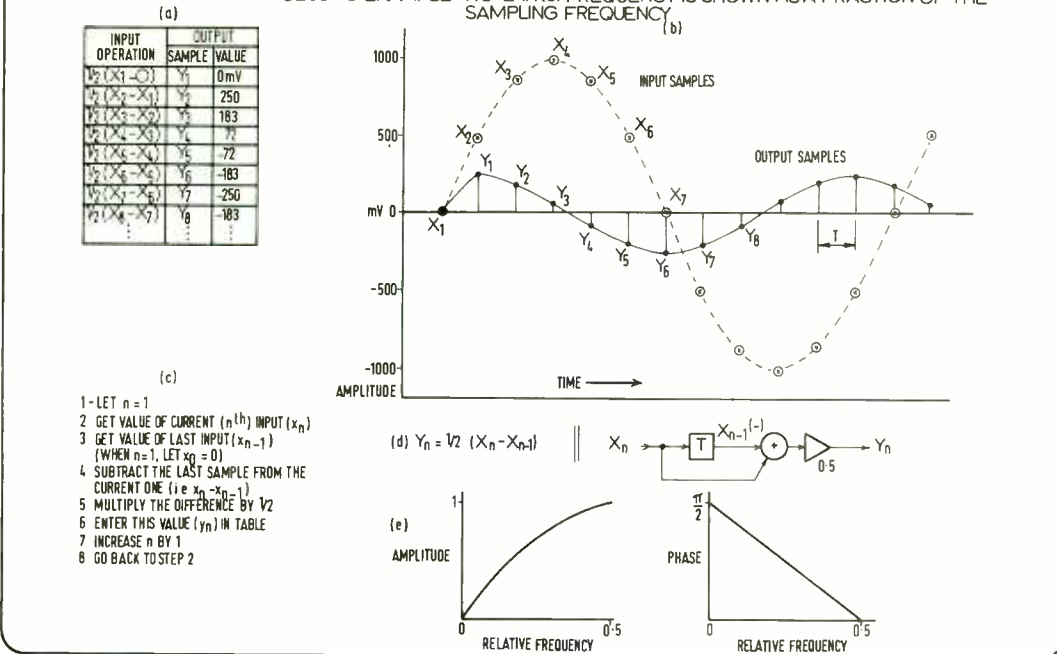
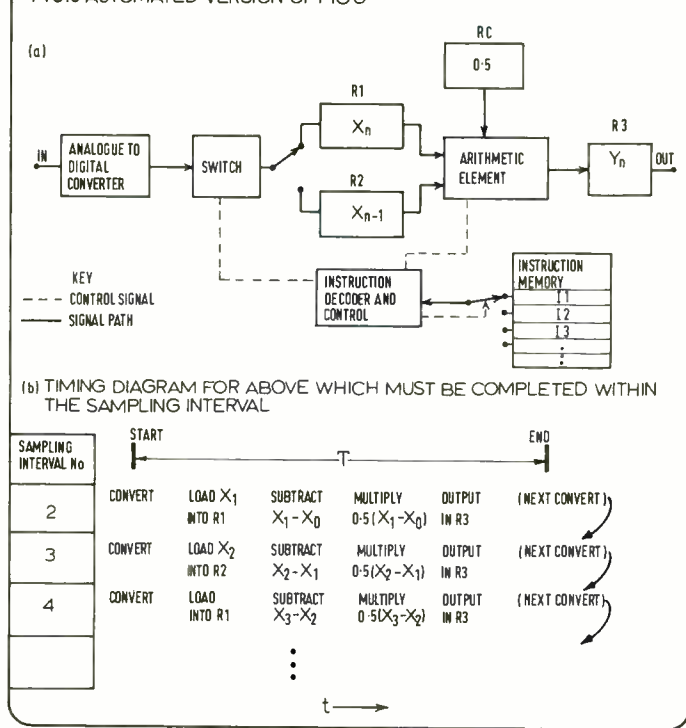


FIG.9 AUTOMATED VERSION OF FIG 8



ing) two consecutive digital samples while half their difference is being calculated. (Remember that the input signal from the ADC can never be stopped for longer than one sampling interval and since samples are arriving at the processor at regular intervals, they will be lost if they are not stored somewhere for as long as their value might be required.)

- iii) A means of ensuring that the periodic appearance of output

be ignored and the processor can get on with other things for the remainder of the sample period.

Consequently, one way the processor can be arranged is as follows. The ADC can feed its samples through a switch-like device which alternately loads one of two digital storage areas called registers with consecutive input samples. This is illustrated in fig 9a where the two input registers are labelled R1 and R2. Note that when loaded new samples will overwrite old ones. In a third register, RC, we can place the constant 0.5, which is needed in the process and doesn't change. Finally we add a memory holding the 'list' of processing operations and a device for interpreting the instructions and executing them.

The instruction memory is in practice a digital memory (an addressable set of registers which holds digital words). Into this memory one loads a programme similar to that in fig 8c but numerically coded. The instruction decoder examines each instruction in sequence, decodes it, and the issues commands to the other processor elements causing logical and arithmetic operations to be carried out according to the pre-arranged sequence. In this case the instructions might be: alter the switch to R1 (or R2); perform the desired sequence of arithmetic operations (this would take several instructions) using the values in R1, R2 and RC; and put the result into R3 to be output. The final instruction in the list instructs the controller to start this sequence again, so that the operations continue without intervention or interruption.

samples is uninterrupted and that one sample is output for each input sample.

We shall see that the modifications needed to satisfy the conditions above are relatively easy to make (again, on paper) because (as was stressed in Part One) the key feature of digital signals is the fact that between samples the input value is constant. This means that once the processor has obtained its value (which need take only an instant at the beginning of the sample period) then the input can

# Into the Digital Studio Domain

The timing of these operations is shown in fig 9b. Note that the entire list of instructions is repeated once during each sampling interval thus generating one output value for every input value. This implies that the duration of each instruction is many times shorter than the sample period T. Consequently, this (and generally) any complex process is always limited by the processor's speed and ability to carry out the required operations within a sample period.

It is worthwhile for those unfamiliar with computers or signal processing to try and follow the details of this last example because contained in it are most of the essential ingredients involved in digital signal processors.

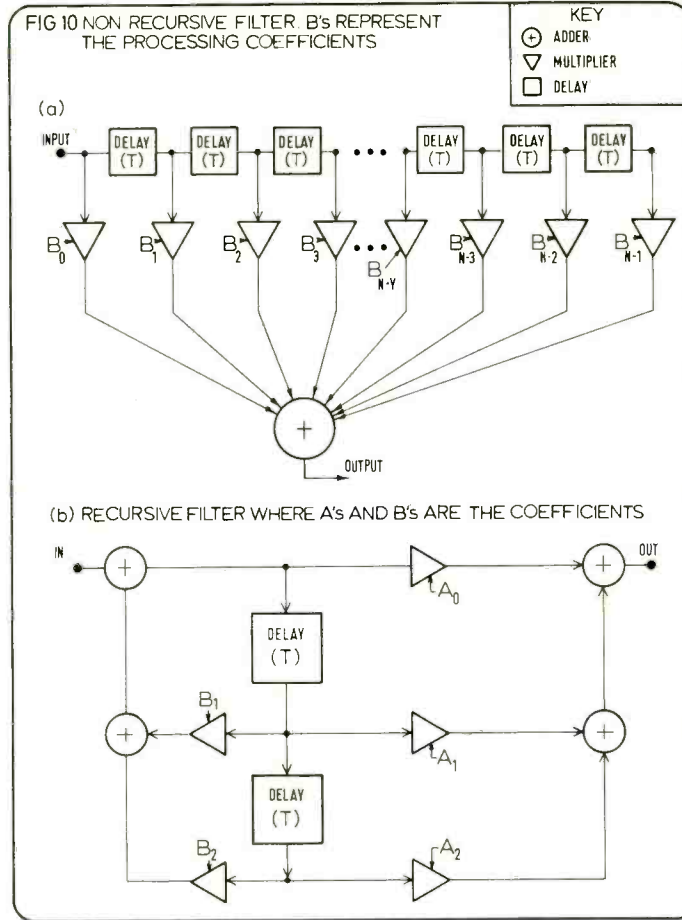
It is now perhaps a convenient point to return to reality, momentarily, and bring up the following. Although on paper these block diagrams are rather simple, one must appreciate that the circuitry needed to perform such operations efficiently and economically is rather complex and would involve modern medium-scale integrated (MSI) and perhaps even large-scale integrated (LSI) technology. Moreover, a single arrow indicating data flow in fig 9a could actually represent 16 (or more) interconnections. References 7 and Chapters 8-11 in 8 provide a clear and more complete picture of the complexity of signal processing hardware.

## DIGITAL IMPLEMENTATION OF RECORDING STUDIO PROCESSES

Illustrations so far have concentrated on specific and relatively primitive processes. However, the extension to many of the more complex processes generally requires primarily the addition of extra signal and coefficient memory and increased processor complexity rather than the addition of new concepts. Therefore, having shown two simple processing examples, we can now begin to discuss how digital circuitry can be employed effectively to implement processing commonly found in modern recording studios.

### Combining signals (mixing)

In the analogue domain, nothing could be easier than combining two or more signals in controllable proportions. Outputs from variable resistors or voltage controlled amplifiers are simply joined together in ways which are familiar to anyone in audio. To combine many signals, switches or relays (and a nightmare of wiring) are employed. These last aspects of analogue mixing consoles imply

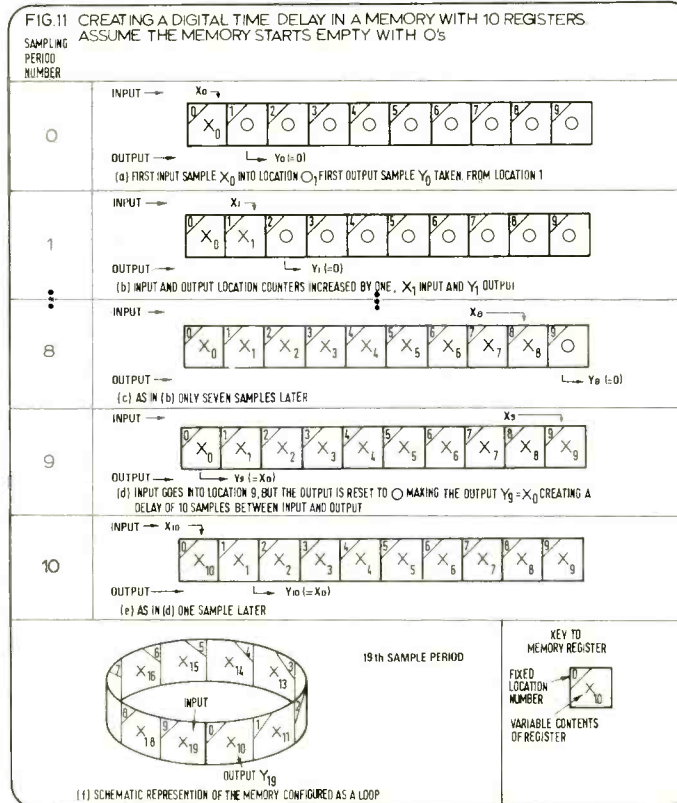


relative inefficiency and an unnecessarily high degree of unreliability.

Digital mixing, although conceptually simple, requires a fair amount of high speed, special purpose hardware to perform the job properly. At the lowest level, each input channel's signal must sequentially be fetched, scaled (multiplied) by an appropriate gain factor and added together with the results obtained by doing the same to other inputs feeding the selected output buss. Note that the gain factor can easily be supplied by the operator (through manual commands), from another computer, or—and this is where digital techniques really shine—it can be based on results of 'real-time' calculations being made on the current and past signal samples (in any channel). Thus, certain types of automatic gain control, compression, limiting, amplitude modulation, etc can be performed with little additional trouble.

Most of the difficulty doing digital mixing comes not from the complexity of the processing, but simply from having to realise one multiplication and addition for every output buss an input is routed to. For example, to send one input to stereo (and individually controlled) output busses, echo sends, monitors, and cues, at least eight multiplication and additions are required. For a 24-channel desk to support the above routing possibilities, a dedicated high speed mixing processor capable of at least 192 (24 x 8) multiplications per sampling interval would be required. Since current one-chip multipliers allow only, say 150 multiplications per sampling interval, two or more processing units operating in parallel would comfortably meet this particular demand. Signal routing, control, and timing protocol might be tricky here, but not too unlike any modern communication network using digital switching techniques.

Advantages of the all digital approach are that an intelligently designed mixing facility would allow programmable and controllable signal routing (without using failure prone mechanical switching) which could be preset or instantly modifiable. Moreover, once signal gain is digitally controlled (for virtually no extra processing time costs) input signals could also easily be inverted, half- or full-wave rectified, muted, soloed etc—all under automated control.

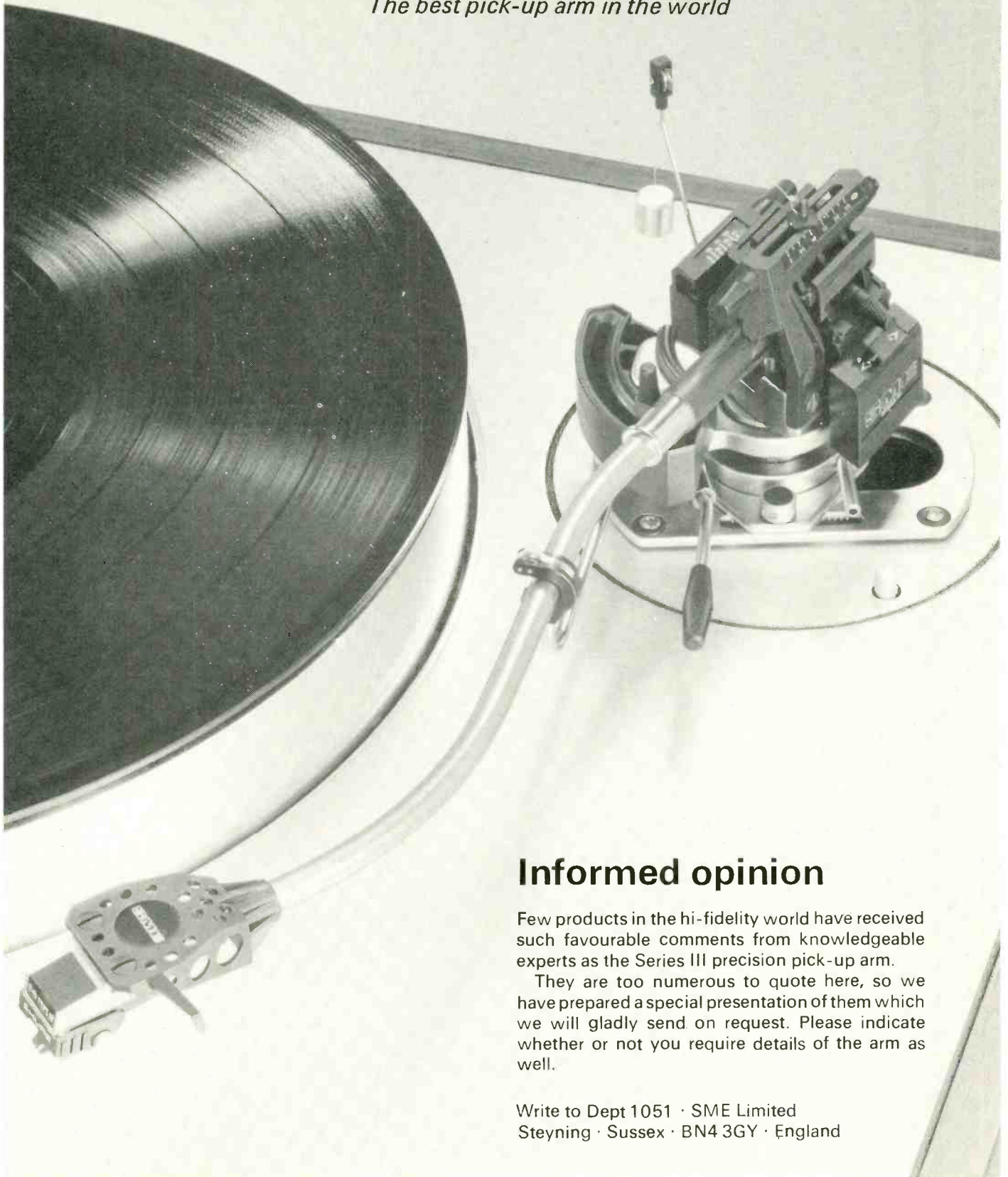


### Spectrum shaping (filtering)

Along with mixing, the ability to shape (or equalise) the spectrum of arbitrary signals is crucial to modern audio processing. Although a theoretical treatment of this subject is quite complex<sup>6,8</sup>, I will

# SME SERIES III

*The best pick-up arm in the world*



## **Informed opinion**

Few products in the hi-fidelity world have received such favourable comments from knowledgeable experts as the Series III precision pick-up arm.

They are too numerous to quote here, so we have prepared a special presentation of them which we will gladly send on request. Please indicate whether or not you require details of the arm as well.

Write to Dept 1051 · SME Limited  
Steving · Sussex · BN4 3GY · England

# Into the Digital Studio Domain

try to provide a hint at some of the available digital techniques and their practical advantages over analogue methods of filtering.

It is obvious to audio professionals that a large proportion of the myriad of knobs and switches littering a typical analogue mixing console is devoted to altering the transfer functions of the filters to which they are connected. In such consoles these knobs, switches and filter circuits are present because their use is anticipated. In defence of this practice one could point out that the components involved, although not always used, are relatively inexpensive; so, the redundancy of circuits guarantees that a large—but inherently limited—amount of independent spectrum shaping may be performed on each channel.

Nevertheless there are obvious disadvantages. First, if a particular transfer function is desired which is beyond the capabilities of the analogue filter modules available, you must generally either employ 'outboard' filter devices, or possibly abandon the effect. Secondly, the actual proportion of time that each filter control is in use—as a filter parameter control or a display of the parameter itself—is exceptionally low. Similarly, it would probably be unusual to find more than one or two filters being adjusted at any one time. In this respect, the high degree of redundancy present in analogue console filter controls seems wasteful and inefficient. Lastly, analogue filters cannot be easily automated.

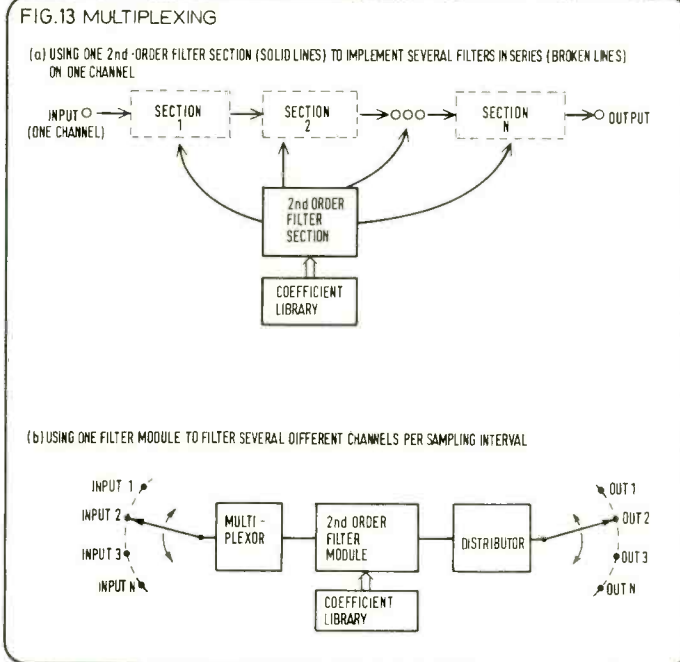
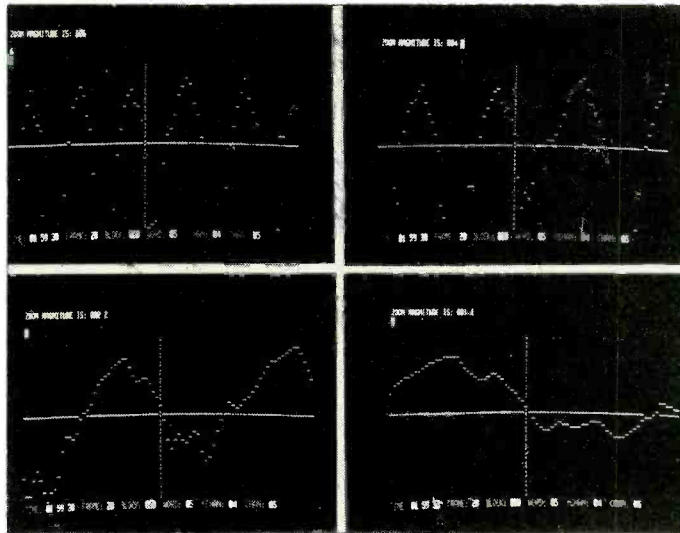
Digital filtering consists mainly of fetching signal samples (and coefficients) and adding, multiplying, and delaying. There are two distinct classes of digital filters: *nonrecursive* filters, which have a processing algorithm depicted by structures like that in fig 10a. Here, only past and present input samples are multiplied by coefficients and summed (as in fig 8e); and *recursive* digital filters in which past output values, as well as past and current input samples, contribute to forming the current output sample. A second order section (functionally equivalent to an LC analogue circuit) is shown in fig 10b.

While a discussion of digital filters involves theory well beyond the level of this article<sup>6,8,9</sup>, the primary advantages and disadvantages of both classes of filters are given in Table 2 in terms of processing time costs (to implement roughly equivalent frequency responses), and several other important aspects<sup>9</sup>. In terms of recording studio needs, the second order recursive structure of fig 10b would be the most likely candidate for

**TABLE 2 Comparison of Recursive and Nonrecursive Digital Filters.**

NON-RECURSIVE	RECURSIVE
Can have perfectly linear phase response (ie equal time delay at all frequencies).	Require relatively few coefficients and multiplications to achieve sharp and varied responses.
Are more stable than recursive (ie they do not go into oscillations).	Second order sections may be put in series or parallel combinations to improve response characteristics.

Fig. 12. Display on 3M editing system showing least magnified sample top left, moving to most highly magnified sample bottom right where each point represents an individual 20µs sample.



equalising audio channels owing to its moderately low processor demands: five multiplications, four additions and two delays are required to create each output sample. Furthermore by merely altering the five coefficients, this basic filter structure can be used to generate low-, band- and high-pass responses as well as 'notch' and 'shelf' responses. Thus, if pre-

determined sets of coefficients are stored in a filter 'library', a filter's response could be modified in the time it takes to replace the old set of coefficients with new ones. (This could be done with only one processor instruction). Advantages to this approach are fairly obvious:

- 1 Filters can be preset and be under program control;
- 2 Under program or automated

control, time varying filters could be easily realised;

- 3 Increasingly complex filter responses could be produced by 'connecting' several 2<sup>nd</sup>-order sections in series or parallel;
- 4 In contrast to analogue filters, digital filters can be programmed into existence wherever they are needed. Thus if filters are not needed in one channel, they may be used on another or the processor could be programmed to perform other functions.

## Time delays

Creating a time delay in a digital signal is both a trivial and a non-degrading process. This is completely opposite to the situation in analogue processing, where generating a delay mechanically, acoustically, or electronically inevitably degrades the input signal. In digital processing, a sample value never changes with time unintentionally—as long as the hardware works correctly! Consequently, a digital time delay is similar to pushing a stream of marbles down a narrow tube: after a while, one gets out at the far end the same marbles that went in, in the same order. (This is one reason why digital delay units were generally the first digital audio processing devices to appear and be accepted in studios).

In fig 11a-f, one method of implementing a time delay is illustrated. In each sampling interval, one input value is put into a register and one sample value output from another register. The location numbers of both the input and output are increased by one in each sampling interval. Thus, the time delay is determined by the (constant) separation in locations between the input and output, the sampling rate, and the memory length. Given a sufficiently long memory, you can produce echo effects by summing one (or more) delayed output samples with the input sample.

## Other processing possibilities

To start, most available analogue and digital signal processors could be duplicated with digital processing equipment: phasing, flanging, harmonising, reverberation, multiple and adjustable delays, chorus effects, etc. In addition to these, you can also generate effects which today are rather difficult to obtain: vocoding, manipulation of spatial images using spectral changes and time shifting, placing of solo (or close miked) instruments into proper perspective in an ensemble or orchestral recording, adding controlled non-linear distortion: clipping, soft (valve-like) distortion, rectification, compression, etc. Furthermore there are a growing number of digital techniques which allow otherwise impossible proces-



## Into the Digital Studio Domain

sing to take place: electronic micro-editing of signal waveforms, retuning individual mistuned notes, time compression or expansion without frequency shifting, reversal of segments of recorded material in real-time, controlling parameters of one signal with those of another, cleaning up of degraded source material by echo removal and spectrum reshaping, extraction of wanted signals from background noise or signals, etc. In fact, one has in a digital studio a complete sound processing laboratory, capable of supporting scientific research in many areas of audio.

### Editing

Editing facilities, although essential to recording, cannot easily be discussed without a good understanding of the digital tape recorder's formation of the audio signals on the tape. However, procedures have been suggested which permit editing of digital tape not only using techniques similar to those in current use (tape splice editing and 'punch-in') but also techniques with far more complexity and precision<sup>11,12,13</sup>. For example, at the juncture of two different signals, the actual signal waveforms may be manipulated to make a smooth join or the best portions of several 'takes' may be easily combined to form one track. Moreover, regardless of how many times a signal is copied in digital editing, it will suffer *no* degradation!

One facility offered on the 3M/ITX digital editing system is display of the actual recorded waveform enabling visual identification of the edit point. Fig 12 shows a zoom in on an edit providing individual 20µs samples enabling the null point to be located.

### PROCESSOR ARCHITECTURE AND CONTROL

We are now able to consider more general features of digital processor design, architecture, and control which would not have been readily apparent in our examples so far.

#### The need for Specialised hardware

First, there is a wide spectrum of possible ways to build any digital processor with available integrated circuits—each will have certain advantages and disadvantages. The final choice of how it is done will usually be application and cost dependent<sup>10</sup>. A few of the possibilities are as follows:

- 1 The processor can be completely *hard-wired* so that it is only capable of performing a *fixed* process at a very high speed;
- 2 It can be *adaptable* in the sense that although the processing structure remains constant, coef-

ficients (such as RC in fig 9a) can be changed during processing by externally (or internally) generated commands. This, in turn, alters characteristics of the process (eg gain, frequency response, time delays, input or output channels, etc);

- 3 The processor can be totally *programmable*. In this case a general purpose digital processor (such as a minicomputer) is used which can be programmed to perform any arbitrary process that can be specified within its instruction set and capabilities. There are virtually no restrictions as to what may be altered in such a device.

This last case, while appearing to offer the best solution (owing to apparent unlimited flexibility) is often unsuitable in time-critical processing. This perhaps surprising result can be understood better by considering that a general purpose digital computer might typically have 100-200 different instructions which generally must communicate with all of its memory (usually many thousands of words), perform numerous logical and manipulative tasks, while concurrently keeping track of its own

performance. Most of these features are totally useless for signal processing and unfortunately slow down processor speed.

Given that as little as 20µs are available per sampling interval for processing high quality audio signals, a general purpose processor (which typically requires 1µs to complete one instruction) has little chance of completing even a modest processing programme in this time period. Consequently it is most practical, efficient, and usually most economical to build *programmable* 'real-time' audio processors with highly specialised processing hardware. This approach can easily decrease the average instruction time by a factor of 10 or more, making say around 200 instructions per sampling interval possible in most instances.

However, besides increasing processing speed (and hence power), there are other very important reasons for building specialised, programmable processors. Two reasons are:

- 1 Programmes (and not hardware) can be easily modified as processing algorithms improve or processing needs change;
- 2 Programmes (once they have been made to work) do not break down.

### Multiplexing

Although instruction cycle time is generally a critical measure of a processor's speed, there is yet another factor (unique to sampled-data processors) which adds a further dimension to the possible variations in processor architecture. This factor comes from being able to share one element of a processor between several different possible inputs and outputs during one sampling period. This sharing of processing elements is known as 'time-division multiplexing', and there is no real counterpart to it in analogue processing. Multiplexing can be employed at virtually any or all levels of a processor's construction. Thus, its use can influence the processor's programmability, adaptability, flexibility, speed and cost.

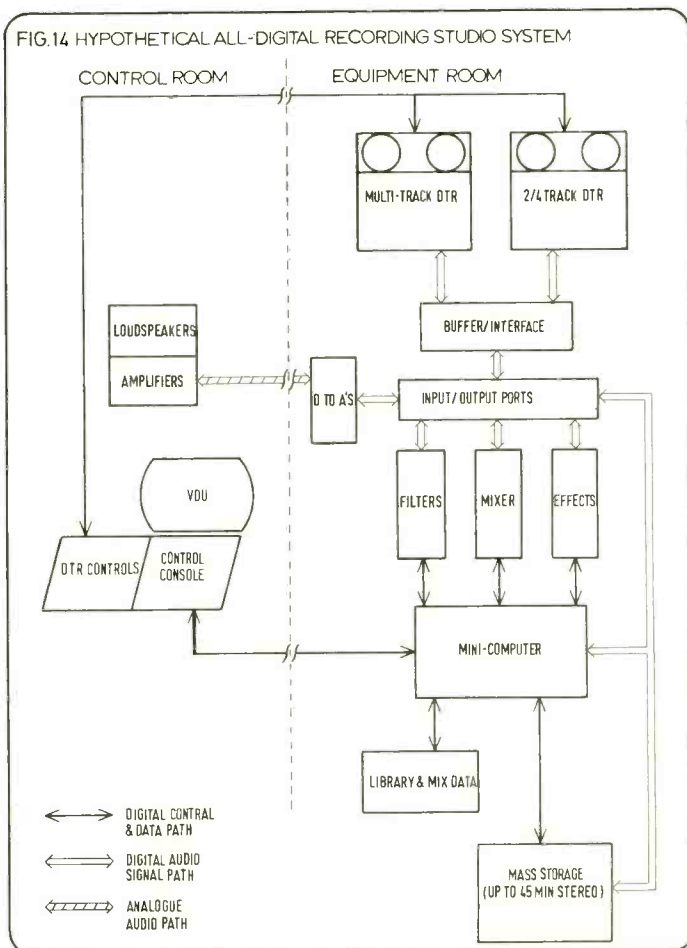
Consider implementing the second-order digital filter shown in fig 10b: you must do five multiplications and several other less complex operations. At the component level, two extreme design variations are to either use five hardware multiplier chips and build the hardware to resemble the filter diagram, or use one multiplier and share it within the circuit, doing the multiplications sequentially (which requires supplying new coefficients as necessary). In the latter approach, the multiplier must at least be able to do five multiplications per sampling interval whereas in the first, one multiplication per sampling interval is sufficient.

At a higher structural level, one can multiplex the entire 2nd-order filter section, in many ways, two of which are shown in fig 13. Although hardware multiplier chips can carry out as many as 150 multiplications per 20µs sampling interval, a purpose built filter processor working at this rate could provide 30 (150/5) different 2nd-order sections per sampling interval—using only one multiplier. This is like having a 'box' of 30 2nd-order filter sections to be distributed in any way we wish—provided the data paths and controls are available.

#### Control of processing hardware

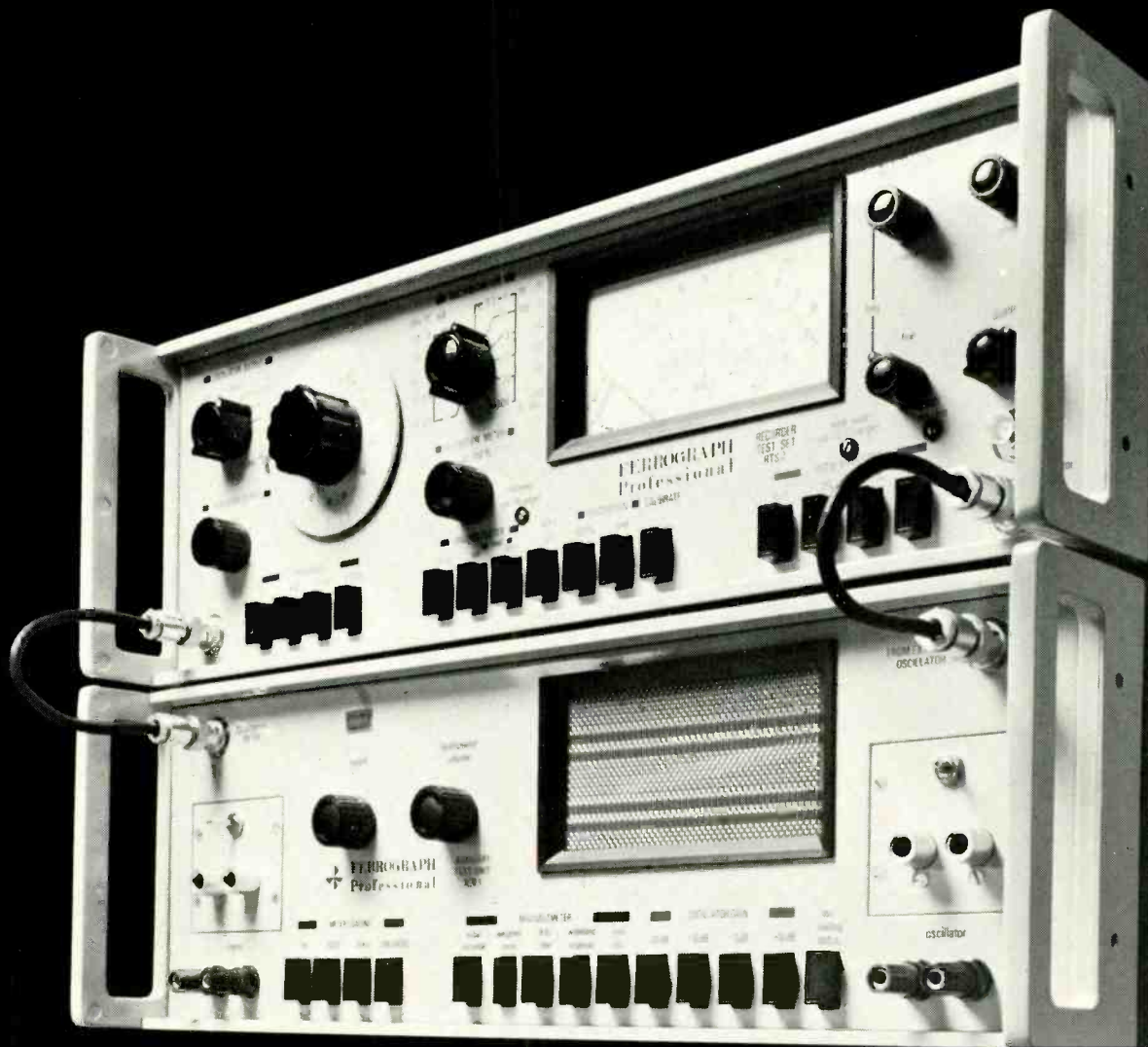
The issue of control is extremely important and complex and, unfortunately cannot satisfactorily be dealt with here. However, in this section we briefly touch on some of the major relevant issues.

It is one thing to have one or more efficient, high speed signal processors operating on audio signals, but how can you change parameters of the process or indeed replace one process by another? One of the best answers is to use programmable processors and alter the contents of the





# NEAL FERROGRAPH



*Yours precisely*

**FERROGRAPH RTS2 & ATU1. Recorder Test Set and Auxiliary Test Unit:**  
Complete calibration check of tape recorder, audio equipment, etc.  
North East Audio Ltd, Simonside Works, South Shields, Tyne and Wear NE34 9NX  
Telephone: South Shields (0632) 566321 · Telex: 537227

## Into the Digital Studio Domain

processors' instruction and/or co-efficient memory. This could be done 'by hand' in the same tedious way one writes computer programs, but it is far more practical and efficient to employ a general purpose commercial computer to do all the 'dirty work' under orders from either a human operator, a prearranged sequence of commands, or from a mixture of both.

Perhaps the best way to illustrate this is by way of an example in which we present a complete view of a hypothetical all-digital studio. In this example we will show how a general purpose minicomputer can be used in conjunction with special purpose, high speed, programmable processing modules.

### A LOOK AT THE NEAR FUTURE

Fig 14 is a block diagram of a hypothetical studio system. Because digital equipment is run most reliably with a cooling system which can be relatively noisy, the control room should be isolated acoustically and environmentally from the rest of the equipment as indicated in the diagram. This also allows a more reasonable treatment of the control room acoustics which is especially desirable considering we wish to be able to hear a 90dB range of dynamics.

Contained in the control room (as shown on the left of fig 14) are the controls and level indicators for the digital tape recorders (DTR's), the mixing 'console' (which would have a relatively small number of physical control devices), and some form of visual display unit (VDU). Regarding the control console, it is not necessarily desirable to replace *all* controls by, for example, a typewriter like keyboard, because this would not be very practical. What controls do remain are in fact not that important as long as the system works and is reliable. One very acceptable and proven approach might be to follow the example set by Allison Research in the USA, who have drastically reduced the number of filter controls by sharing one 'set' of filter setting controls among all the channels.

Generally, however, all available control devices could be assignable in function so that for example fader type controls could operate channel levels, filter parameters, special effects parameters, or all of these simultaneously. Precisely how many and what type of controls there could be is a matter of taste and imagination; but a serious assessment of requirements should eventually be made to minimise

the total number as much as possible in order to decrease console size and increase reliability.

The signal processing hardware in this example can roughly be divided into special purpose modules which perform either filtering, mixing, or special effect functions. However, the most efficient use could be made of these modules if they are completely programmable since they could then become other 'devices'. As one might expect, the studio's overall processing capacity would be limited by the speed and processing power of the processing modules—but by increasing the number, one could increase the processing capability of the studio.

The slower minicomputer has several functions which run concurrently. By itself it should do the following:

- 1 Sense and interpret commands from the control console and generate the appropriate control words or data for the processors;
- 2 Synchronise the tape machines with the automated mix records;
- 3 Control all display functions on the VDU or other display devices; With the medium-size disc storage the mini should also:

- 1 Calculate filter coefficients for implementing arbitrary filters;
- 2 Act as a 'bookkeeper' and make accurate records of the operator's 'performances' or (when required) play back his previous mix-

ing 'performances' or play back a mix and allow any parameter to be modified in real time or in non real time (ie before or after a mix is made). Parameters modified before or after a mix is made could be specified as to when and for how long they are to be in effect. Changes in console configuration and in device functions could also be made to take place during a mix.

- 3 Access and install any program contained in a library of predefined programs providing such things as commonly used console 'configurations', special effect algorithms, common filter parameters, etc. Installations should take place with a single command, and be nearly instantaneous.

With the addition of an optional mass storage device one could perform:

- 1 Complex non real time signal processing;
- 2 Electronic micro-editing and waveform envelope reshaping.

And with the addition of a second computer-linked terminal, one could 'carry on program development and studio bookkeeping at a low level of priority when mixing sessions demand little computer time.

### A BRIEF LOOK AT A NEW AUDIO PROCESSOR

The preceding hypothetical example of an all-digital studio is just one of a multitude of possible approaches (which, in fact, is

similar to one currently used in an all digital (music) synthesiser system<sup>14</sup>). Another possible approach is being explored in this country by the BBC. Their work on digital studios currently centres around probably one of the only existing digital audio processors designed specifically for digital audio recording. This device, dubbed COPAS (the acronym for Computer for Processing Audio Signals), has only recently been publicly announced<sup>15</sup> and is shown in fig 15.

A block diagram of COPAS connected in a typical operating environment is shown in fig 16. The COPAS module itself (shown within the dashed lines) has two digital audio inputs and up to 16 digital audio outputs. The most striking feature of this device is that *two* processors are contained in every COPAS module: a high speed processor (HSP) which has been designed specially to be programmable, fast, efficient for digital audio processing, versatile (because it can be microprogrammed), and relatively inexpensive; and a slower, commercial microprocessor (MPU) which serves several diverse functions:

- 1 It provides operational support and communication links between the HSP and the switches, keyboards, and visual displays used by the operator or programmer;
- 2 It communicates with the digital audio recorder, for timing and controlling automated mixing and editing operations;
- 3 It accesses or stores processing coefficients, programs, and status information, from external sources or COPAS's internal memory.

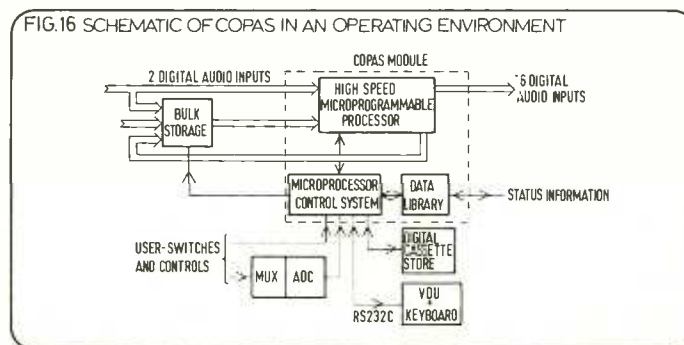
This processing system has been designed to be sufficiently flexible (at the expense of faster speeds) so that in an all-digital studio it could be employed:

- 1 As an audio 'channel processor' for one or two input channels providing all the traditional functions of analogue mixing consoles (fading, equalisation, limiting, compression, muting, etc) as well as many other desired programmable processes;
- 2 As a group or master channel processor;
- 3 As a signal synthesiser;
- 4 As a variable reverberation and echo unit (in conjunction with an additional memory unit);
- 5 As a variety of other devices (spectrum analyser, vocoder, etc).

In addition to all this, the MPU supports program development including editing and testing. There are many advantages to this system. First, there is no reason that COPAS modules cannot be used in series or parallel operation on a



Fig. 15. BBC COPAS digital audio processor with two inputs and up to 16 outputs.



# VOCODER TALK:

The vocoder has become one of the most intriguing and powerful sound processors in a short period of time during which Synton acquired a leading position on a very fast expanding market.

Synton specially designed Syntovox Triple Two to be an easy-to-use unit for live sessions on stage or in the studio.

One of the most impressive features of Syntovox 222 is that it can add an extra dimension to a musical performance by means of the direct vocal control over each played note.

Syntovox 222 is the new way to avoid fiddling with knobs, kicking foot switches and pumping foot pedals or stringing noisy effect boxes in quest of the creation of the personal touch.



The price will make you nervous. £525.00

# SYNTOVOX 222

TRIPLE TWO'S THE ONE

**synton**<sup>®</sup>

P.O.B. 83 • 3620 AB BREUKELEN • HOLLAND • ☎ 03462 3499

# Into the Digital Studio Domain

single audio input channel to provide almost unlimited processing capabilities. Secondly the user controlled inputs shown in fig 16 could conceivably be replaced by an additional general purpose computer. Such an arrangement would possibly allow co-ordination and automating virtually every COPAS module within a mixing facility. Thus, a single command from a user to a high level 'executive' computer could, for example, instantly order the reconfiguration of the entire mixing system, thereby eliminating console set-up time between sessions. Similarly such co-ordinated control would be invaluable for automated mixdown and editing.

## A SUMMARY OF ADVANTAGES OF DIGITAL AUDIO PROCESSING AND RECORDING

Now that the reader is somewhat familiar with many of the practical *how's* of digital signal processing, it is worthwhile to present a summary of some of the old (as well as a few new) *why's*:

- 1 Audio quality can be substantially improved and maintained (see Part One);
- 2 Because the signals are sampled, one can achieve enormous flexibility in specifying processes (in programmable processing modules) and in specifying how modules and processes are interconnected;
- 3 Manual and fully automated control can be maintained over any programmable or switchable

function;

- 4 A well-designed system's processing capacity may be increased by adding to existing hardware, rather than only by replacing.
- 5 Digital modularity and relatively few mechanical connections and switches increases reliability;
- 6 Digital equipment can be made self diagnostic;
- 7 Cost of hardware components is constantly decreasing while performance and speed increases;
- 8 Savings in studio time will result from the high degree of automa-

tion and reconfigurability.

Lastly, one of the most remarkable facts about an all-digital studio is this: if all the switch routings, equalisation and level parameters are 'recorded' in a digital medium during a mixing session, then there is actually no need to record the processed audio mix on a master tape until such time when a master audio tape is needed. In other words, in an all-digital studio, listening to the original multitrack tape being automatically processed according to the 'recorded' operations made by the engineer would be exactly the same as listening to an audio

recording of the mixed output. Consequently, one could easily put the 'recording' of only the engineer's operations on a fast access digital medium (such as magnetic discs) and be able to 'splice' together segments of any mixes that one wished in real time, to permit comparison of any of the possible final products. Furthermore, because one only needs the multitrack source tape and the recorded mixing parameters to recreate the entire mixing session, the amount of information that physically must be archived is considerably reduced

## AND THE FUTURE

Progress being made in all areas of digital signal processing technology—that is hardware, theory, and accumulated practical experience—leads one to conclude that it will only be a few years before all-digital recording studios will be in operation at the level of complexity suggested in this article.

Beyond this lie even more exciting and fascinating possibilities. We can easily predict that the signal carrying wiring in a studio will eventually be replaced by optical fibre cables. This would enable completely noise free signal transmission from an ADC in the microphone to the mixing console. Moreover, as bulk storage techniques improve and become less expensive, you could envisage digital multitrack 'recorders' with virtually no moving parts and near instantaneous access to its contents.

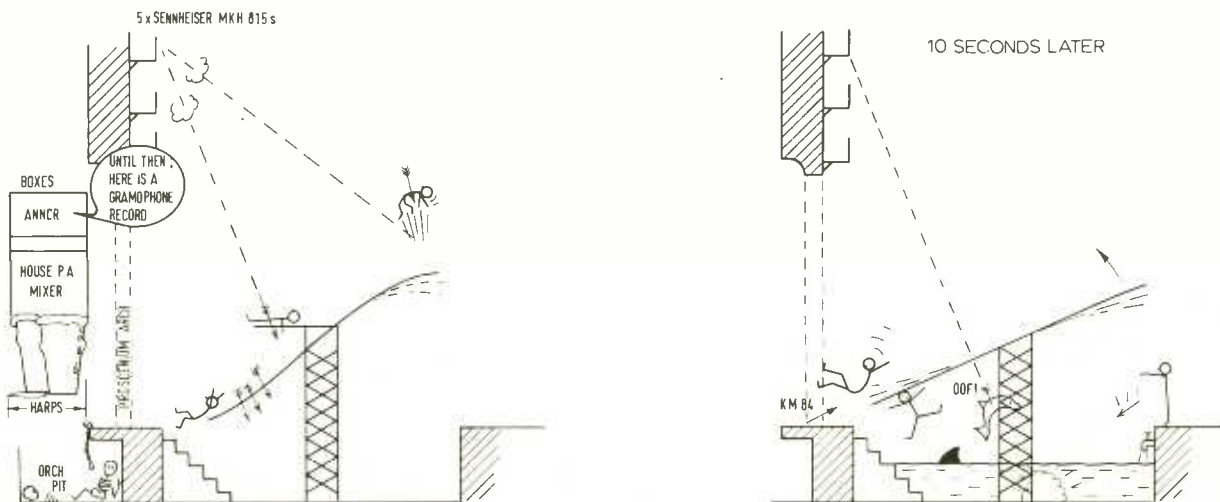
When will this all happen?—It is only a matter of *time*! ■

## REFERENCES

- (6) K. Steiglitz, *An Introduction to Discrete Systems*, John Wiley & Sons, New York, 1974.
- (7) B. Blesser, K. Baeder and R. Zaorski, "A Real-Time Digital Computer for Simulating Audio Systems", *J. Audio Eng. Soc.*, vol 23 pages 698-707, 1975.
- (8) L. Rabiner and B. Gold, *Theory and Application of Digital Signal Processing*, Prentice-Hall, New York, 1975.
- (9) K. V. Mina, V. B. Lawrence and J. J. Werner, "Tutorials on Signal Processing for Communications: Part I—Digital Techniques for Communication Signal Processing", *IEEE Communications Society Magazine*, pages 18-22, January 1978.
- (10) S. K. Tewkesbury, R. B. Kiebert, J. S. Thompson and S. P. Verma, "Tutorials on Signal Processing for Communications: Part II—Digital Signal Processing Architecture", *IEEE Communications Society Magazine*, pages 23-27, January, 1978.
- (11) R. B. Ingebretsen, "A Strategy for Automated Editing of Digital Recordings", presented at the *58th Audio Engineering Society Convention*, November 4-7, New York, preprint no 1303 (M-1) 1977.
- (12) D. Davis and R. Youngquist, "An Editing System for Multichannel Digital Tape Recorders", presented at the *61st Aud Eng Soc Convention*, November 3-6, New York, preprint no 1423 (H-7), 1978.
- (13) E. Engberg, "A Digital Audio Recorder Format for Professional Applications", presented at the *61st Aud Eng Soc Convention*, November 3-6, New York, preprint no 1413 (F-1), 1978.
- (14) H. Alles, "A Portable Digital Sound Synthesis System" presented at the *58th Aud Eng Soc Convention*, November 4-7, New York, paper E-1, 1977.
- (15) G. W. McNally, "Microprocessor Mixing and Processing of Digital Audio Signals", presented at the *International Broadcasting Convention*, 25-29 September, London, 1978.

# agony

Having read our February article How the ring was rung, Norman McGadie of BBC Scotland Audio Unit has somewhat modified Fig 2, which is a side view of the Covent Garden orchestra pit and stage showing hydraulically movable platform with microphone placement . . .





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

Angus McKenzie (March 1978)

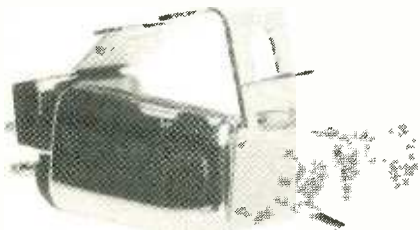
# REVOX

For the full story contact F.W.O. Rauch Ltd, 19 Trenchard St, Boreham Wood, Herts, WD6 4PZ

[www.americanradiohistory.com](http://www.americanradiohistory.com)

# reviews

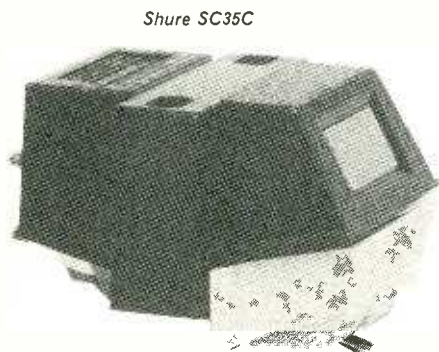
## Empire BC1, Shure SC35C, Shure V15 MkIV, Stanton 500AL and Stanton 680EL cartridges



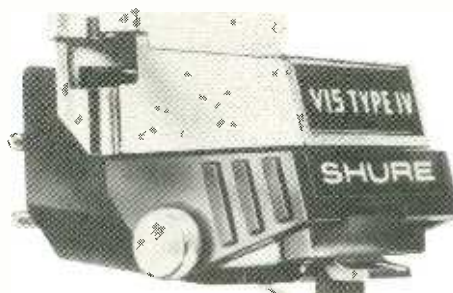
Empire BC1



Stanton 500 AL



Shure SC35C



Shure V15 Mk IV



Stanton 680 EL

### MANUFACTURERS' SPECIFICATIONS

	EMPIRE BC1	SHURE SC35C	SHURE V15 IV	STANTON 680 EL	STANTON 500 AL
<b>Frequency response:</b>	20Hz to 20kHz ±1½dB	approx* 20Hz to 20kHz +1, -3dB	10Hz to 25kHz +1, -2dB	20Hz to 18kHz ±2dB	20Hz to 20kHz ±2dB
<b>Channel balance:</b>	1dB at 1kHz	2dB	2dB	2dB	2dB
<b>Tracking force range:</b>	2 to 3½g	4 to 5g	½ to 1½g**	2 to 5g	3 to 7g
<b>Optimum tracking force:</b>	3g	4½g	1g**	—	—
<b>Channel separation:</b>	20dB at 200Hz 25dB at 1kHz 15dB at 10kHz	20dB at 1kHz 10dB at 10kHz	25dB at 1kHz 15dB at 10kHz	30dB —	35dB —
<b>Tracking ability:</b>	at 2g force 32cm/s at 1kHz	at 4g force 14cm/s at 400Hz 27cm/s at 1kHz 33cm/s at 5kHz 20cm/s at 10kHz	at 1g force 29cm/s at 400Hz 42cm/s at 1kHz 47cm/s at 5Hz 37cm/s at 10kHz	—	—
<b>Optimum load:</b>	47kΩ	47kΩ 450pF	47kΩ 200/300pF	47kΩ 275pF	47kΩ 275pF
<b>Output voltage per cm/s peak velocity:</b>	0.9mV	1.0mV	0.8mV	1.1mV	1mV
<b>Resistance:</b>	—	975Ω	1380Ω	1300Ω	800Ω
<b>Inductance:</b>	—	425mH	500mH	930mH	550mH
<b>Stylus:</b>	18µm spherical	15µm spherical	Hyper elliptical	10µm x 18µm elliptical	18µm spherical
<b>Net weight:</b>	—	6.2g	6.4g	5.5g	5g
<b>Price of cartridge:</b>	£13.20	£18	£80.70	£34.35	£16.60
<b>Price of replacement styli:</b>	£4	£6.60	£30.90	£24.30	£9.75

\* Taken from manufacturer's graphical data

\*\* Arm is set ½g higher when stabiliser is in use

Manufacturers: Empire Scientific Corporation, Garden City, NY 11530, USA. Shure Brothers Incorporated, 222 Hartley Avenue, Evanston, Illinois 60204, USA. Stanton Magnetics Incorporated, Terminal Drive, Plainview, New York, USA.

UK Agents: Hayden Laboratories Ltd, Churchfield Road, Chalfont St Giles, Bucks. Shure Electronics Ltd, Eccleston Road, Maidstone, Kent. Wilmex Limited, Compton House, New Malden, Surrey.

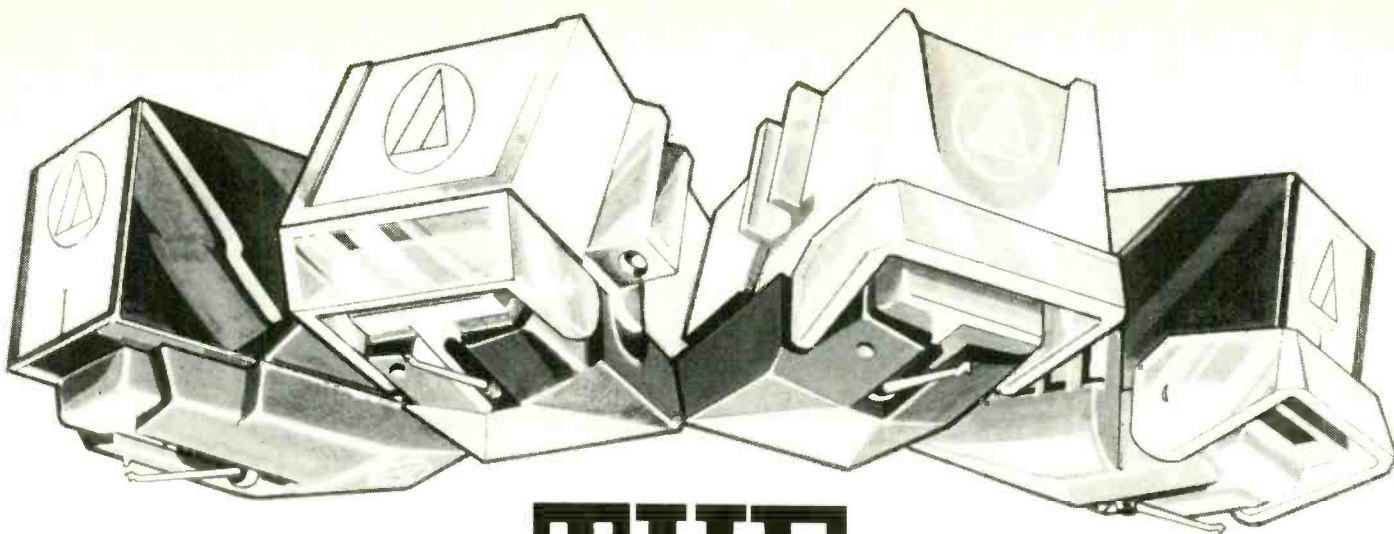
DISC REPRODUCTION techniques vary considerably between broadcast and studios. In the broadcast field a sturdy pickup arm and cartridge are essential in order to cope with rough daily use, whilst in the home more fragile equipment can be tolerated; the domestic user is usually far more concerned with record wear than the broadcaster.

Consequently the broadcast arm is usually far heavier than its domestic counterpart necessitating a lower compliance cartridge which in itself is less fragile and works at a higher tracking force. The ability of a pickup to track high levels of modulation is controlled by the compliance of the cartridge and the tracking force—a high compliance cartridge being able to work at a lower tracking force and giving less record wear.

However, the resonant frequency of the arm and cartridge combination is controlled by the effective mass of the arm, the cartridge mass and its compliance. Sideband generation, wow and flutter, record warp, vibration sensitivity and other considerations indicate that the resonant frequency of the cartridge and arm should be around 10Hz as calculated from the following formula:—

$$f = \frac{1}{2\pi\sqrt{C(M+m)}}$$

where C is the compliance, M the effective mass of the arm and m the mass of the cartridge. A little homework with this formula and the



# THE THOROUGHBREDS

In the complex and often confusing world of hi-fi it's becoming harder to find a company that specialises in what it knows best.

At Audio Technica, however, we find that specialisation keeps us ahead of the field and ensures that state-of-art technology and high quality micro-engineering combine to produce the best range of transducers available anywhere, at any price.

Take our phono cartridges. See how closely our and only our construction resembles the original cutter head used to cut the master disc. Our patented designs of Dual Magnet and Dual Moving Coil cartridges embody many unique

features designed to minimise moving mass and ensure superior stereo reproduction.

The same kind of success is evident in the development of our other products, which include stereophones, microphones, precision tone-arms and accessories.

Sixteen years of continual research has placed us today as leaders and innovators of a truly thoroughbred line of audio components. Many of these are still hand assembled with the same skill and enthusiasm for high-fidelity that created our reputation back in 1962.

The 'form' on our thoroughbred range is now yours for the asking.



**audio-technica**<sup>®</sup>

THE THOROUGHBREDS

Hunslet Trading Estate, Low Road, Leeds 10. Tel. 0532 771441.

Please send details on the latest Audio Technica developments.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# THE GREAT BRITISH SPRING

Spring Reverbs are notorious for the odd sounds that they tend to produce. Many manufacturers have tried to remedy this with limiters, equalisers and the like. In the design of 'The Great British Spring' we took a different approach. We started out with a custom spring unit that sounds good without any fancy electronics. The unit simply has a variable line input and a stereo output. The six spring paths produce a natural sounding reverberation that is full at the low end and sparkling on the highs. But don't take our word for it. Fifty pence brings you our demo cassette, or drop in and hear it live.



£187.92  
including VAT

Exclusively from ;  
TURNKEY.  
8, East Barnet Road  
NEW BARNET  
Herts EN4 8RW  
01-440 9221  
REW.  
114 Charing Cross Rd  
LONDON WC2  
01-836 2372

## REVIEWS

compliance of some cartridges shows that taking into account their mass it is impossible for any arm/cartridge combination to meet the 10Hz resonant frequency requirement.

The dynamic compliance in the horizontal plane was determined for the review cartridges by plotting the frequency response from 5Hz to 125Hz using the DIN test disc 45 541 to determine the resonant frequency when mounted in an SME 3009 series II arm of known effective mass, this arm being used for all the cartridge tests.

Each cartridge was very carefully aligned in the arm which was set to the manufacturer's recommended tracking force for each cartridge and loaded into 47kΩ in parallel with 300pF as a typical load. The output was fed to a Bruel and Kjaer response test unit type 4416 (via an attenuator for high level tests) to provide equalisation and channel switching.

Frequency response and crosstalk were plotted on the level recorder using Bruel and Kjaer type QR2009 test discs with a synchronised 1/3-octave filter being used for the measurement of crosstalk. The same setup was used to plot second harmonic distortion but with the 1/3-octave filter being replaced by a Bruel and Kjaer type 1901 tracking frequency multiplier driving the type 2010 heterodyne analyser.

These plots were made for both channels with plots of the balance between the two channels in the vertical and horizontal (R = L and R = -L) modes whilst alternatively switching from left to right once per second. The vertical tracking angle which is standardised at 20°, was measured by means of the CBS STR-160 calibration disc with a double check being made with the DIN 45 542 disc.

The CBS STR-111 disc was used to examine the squarewave performance of each cartridge, the oscillograms in the reviews being the reproduced squarewave without any equalisation in the replay chain. The same disc was also used to determine the tracking ability by playing the 300Hz lateral and vertical high level bands and noting at which level the

reproduced waveform broke-up. The same procedure was adopted with the 400Hz and 200Hz intermodulation bands on the other side of the STR-111 disc.

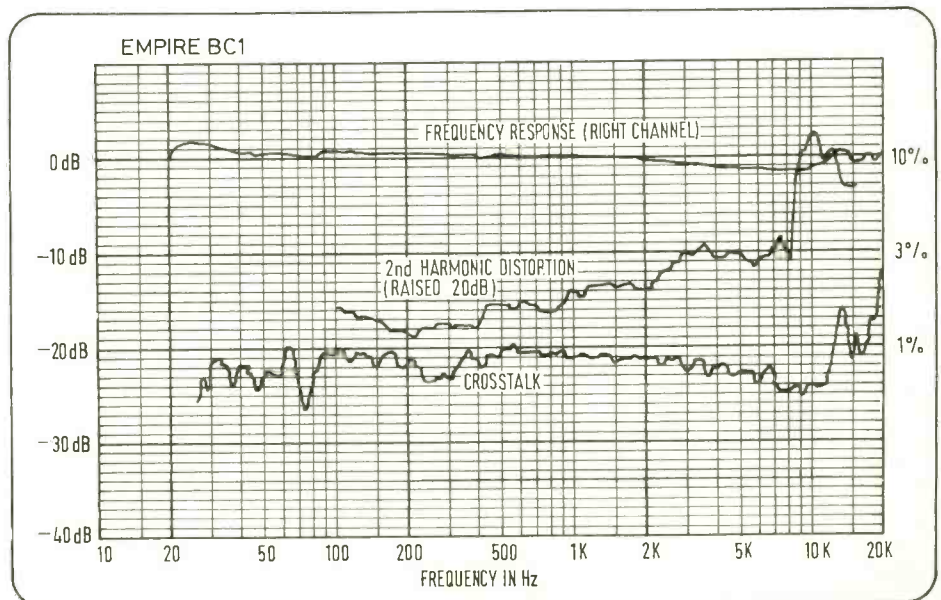
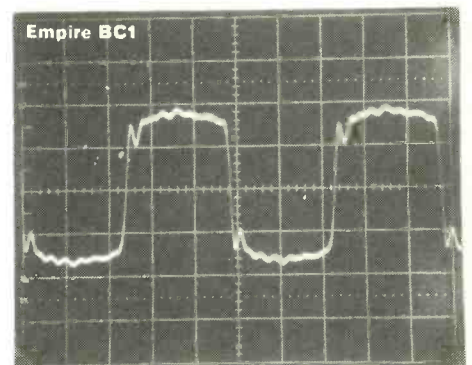
Finally each cartridge was weighed, its DC resistance and inductance measured and also its sensitivity to external magnetic fields, such as those from turntable motors, measured by placing the cartridge into a coil of wire carrying a known 50Hz current.

### The results

Table 1 shows the basic results for the five different cartridges with an oscillogram showing the reproduced squarewave for a single channel. Similarly the performance of a single channel with respect to frequency response, crosstalk and harmonic distortion is shown in a single plot for each cartridge, both channels having been examined. In order to present this data on a single graph the level of the second harmonic distortion (which always predominated over other harmonics) has been raised by 20dB.

The tabulated results show the significant differences between the two channels of individual cartridges with the trackability tests

74 ▶



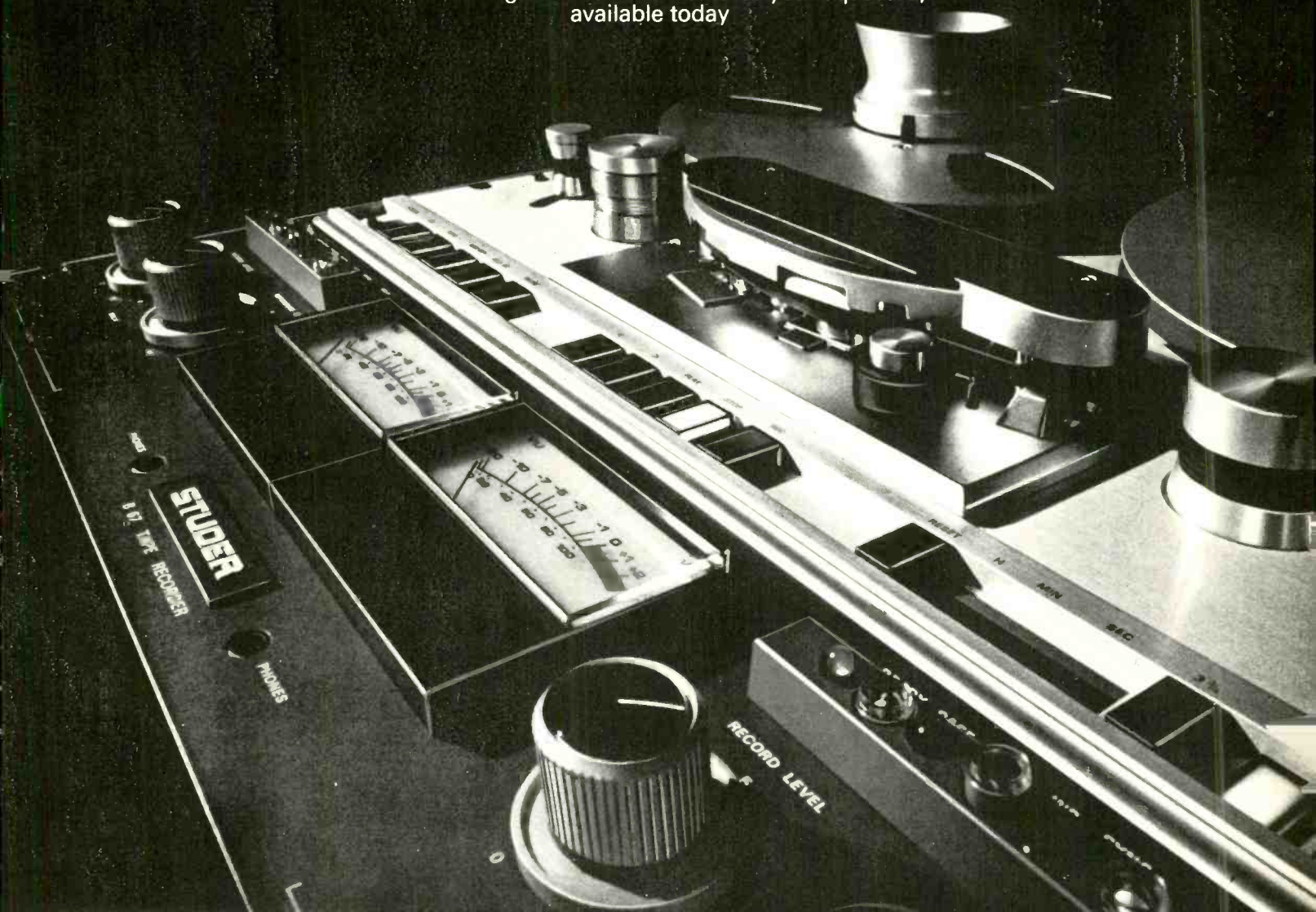




**STUDER B67**  
**Professional Tape Recorder**  
Respected STUDER quality at attractive prices.

# Performance — we guarantee it...

tomorrow's generation with features you requested,  
available today



# STUDER INTERNATIONAL AG

CH-8105 Regensdorf, Phone (01) 840 29 60, Telex 58489

STUDER REVOX AMERICA INC., Nashville, Phone (615) 329-9576, Telex 55-4453

STUDER REVOX CANADA LTD., Toronto, Phone (416) 423-2831, Telex 06-23310

STUDER FRANCE S. à r.l., Paris, Phone 533 58 58, Telex 24-744

F.W.O. BAUGH LTD., Boreham Wood, U.K., Phone (01) 953-0091, Telex 27502

# WHAT HAS TWO ENDS

- variable gain from 0 to 30 dB
- inverting or non inverting input
- high input impedance, 100k
- low output impedance, 600ohms
- single or dual rail powering
- Supply range 9 Volt to 30 Volt
- low distortion
- low noise
- replaces an existing input or output jack socket and can be used as
- a microphone amplifier
- a line booster
- a mixing amp
- an impedance buffering stage
- and comes in a cardboard tube with your name and address on it?



The Jack with Gain Exclusively from;



TURNKEY,  
8, East Barnet Road  
NEW BARNET  
Herts EN4 8RW  
01-440 9221  
REW.  
114 Charing Cross Rd  
LONDON WC2  
01-836 2372

## reviews

referred to a peak recorded amplitude of  $1.12 \times 10^{-3} \text{cm}$ .

### The Empire BC 1

A peculiarity of this cartridge is the very large vertical tracking angle and the manufac-

turers are looking into this odd feature which was confirmed with both CBS and DIN test discs.

While the frequency response was the best of the samples, the crosstalk performance and

76 ▶

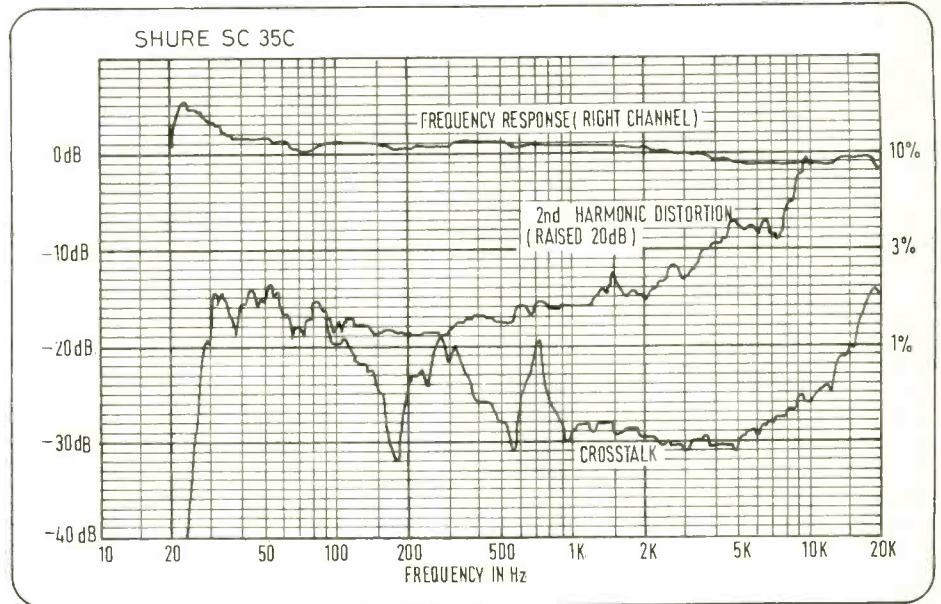
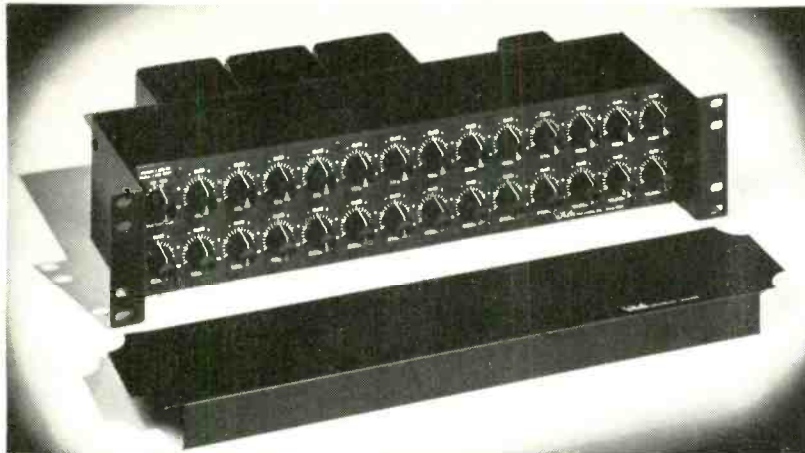


TABLE 1

	EMPIRE BC1	SHURE SC35C	SHURE V15 MkIV	STANTON 500 AL	STANTON 680 EL
<b>CARTRIDGE</b>	BC1	SHURE SC35C	SHURE V15 MkIV	STANTON 500 AL	STANTON 680 EL
Weight:	7g	6.3g	7g	5g	5.6g
Mounting screws:	Short	Long	Short	Short	Short
Inductance:	707mH	472mH	530mH	476mH	970mH
Resistance:	1120Ω	912Ω	1370Ω	679Ω	1320Ω
Output voltage for 1mV/cm/s rms:	1.03mV	1.11mV	0.71mV	0.93mV	1.33mV
Compliance x 10 <sup>-6</sup> dyne/cm:	14.5	7.1	30	11.0	16.7
Vertical tracking angle:	32°	18°	21°	23°	18°
Sensitivity to magnetic fields mV/Oe:	0.12	0.05	0.04	0.10	0.12
300Hz lateral trackability:	+18dB	+12dB	+18dB	+15dB	+18dB
300Hz vertical trackability:	+12dB	+12dB	+12dB	+12dB	+12dB
<b>TRACKABILITY OF IM BANDS</b>					
Lateral 400Hz:	+15dB	+12dB	+15dB	+15dB	+15dB
Vertical 400Hz:	+12dB	+12dB	+12dB	+12dB	+12dB
Lateral 200Hz:	+18dB	+12dB	+18dB	+18dB	+18dB
Vertical 200Hz:	+12dB	+12dB	+12dB	+12dB	+12dB
Frequency response 20Hz to 20kHz ref 1kHz:	±1dB	+5, -1dB	+0.5, -2dB	+5.5, -3dB	+1.5, -3.5dB
Crosstalk L/R at 1kHz:	24/21dB	40/30dB	28/29dB	30/26dB	32/26dB
at 10kHz:	26/23dB	28/25dB	26/33dB	30/30dB	24/28dB
Second harmonic distortion L/R at 100Hz:	2/1.6%	1.3/1.1%	1.3/1.3%	1.3/1%	1.6/1.3%
at 1kHz:	1.4/2%	1.1/1.4%	1/1.8%	2.2/2.2%	1/2%
at 10kHz:	20/13%	10/10%	5.6/7.1%	3/3%	7.1/7.1%
Channel balance 20Hz to 20kHz vertical:	2dB	0.5dB	0.5dB	1dB	0.5dB
horizontal:	3.5dB	3.0dB	1.0dB	3dB	0.5dB



## SERIES 4000 ACTIVE EQUALISER

### FEATURES:

- 27 1/3 octave bands on ISO centers from 40 Hz through 16 kHz.
- 10 dB boost or cut on continuous control. Equal Q in both boost and cut conditions.
- Variable high-pass filter from 20 Hz to 160 Hz with 12 dB/octave roll-off.
- Filter Q optimized for best summation with adjacent bands.

- Noise guaranteed to be -90 dBm or better.
- Sealed Mil-Spec pots.
- EQ IN/OUT switch on front panel
- PLUS OPTIONAL CROSSOVERS FOR BI-AMPING!
- Dual buffered outputs for bi-amp operation.
- Accessory socket to permit insertion of 12 dB/oct. or 18 dB/oct. low level crossover for bi-amp outputs.

# MONITOR EQUALISER!

### ALSO:

#### ANALYSERS

- MODEL 140 1/3 OCTAVE ANALYSER FOR ROOM EQ
- MODEL 142A SIGNAL MONITOR
- MODEL 150 OCTAVE BAND ANALYSER

*White*

**instruments,  
incorporated**

P. O. Box 698 AUSTIN TEXAS 78767  
PHONE AREA 512/892-0752

Scenic Sounds Equipment,  
97-99 Dean Street, London W1. Tel: 734 2812

Belgium  
S. E. D. Rue Bara Straat 146  
1040 Bruxelles Tel: 522 7064  
A. R. C. SPRL Rue 1<sup>re</sup> Decuvrier 134  
1200 Bruxelles Tel: 771 3063  
Denmark  
Lake Audio APS  
Arthursvej 4B  
DK-2300 Copenhagen S  
Tel: 570 600

France  
3M France SA Mincome Div  
Boulevard de Duse  
95000 Cergy  
Tel: 749 0275

Sweden  
Tul & Ton Musik & Elektronik AB  
Kungsgatan 5  
411 19 Gohemborg  
Tel: 130 216  
Spain  
M. Llewellyn-Jones  
AP Postal 8178  
Madrid B. Spain  
Tel: 637 0752

Norway  
Siv Ing Benum AS Skovvn 22  
Oslo 2 Tel: 565 733

## May we introduce ourselves...

We have been well established as an important domestic Hi Fi and Video supplier for some years and we have now finalised a formidable professional audio section designed to cater for studios and professional users like yourselves.

To give you some idea of the standard we set, look at the company we keep.

We are main agents for:

- JBL (we are the only place to have 4343, 4315, 4301, 4380 monitors on dem and available, and a full stock of drive units).
- KEITH MONKS, complete range in stock:
- TEAC & TASCAM • AKG • QUAD • ALICE • REVOX • ALLEN & HEATH • NEAL • BRENNEL.

We also supply:

- Beyer • DBX • Amcron • Studer • Rusco
- Master Room • SIS • EMI • EMT
- Dolby • MCI • Shure • 3M • Sennheiser
- BGW • Orban/Parasound • A&R • Klark • Teknik • Agfa to name but a few.

Pricing:

very, very competitive with (proper) professional discount structure.

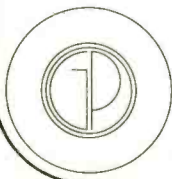
Stock:

big and getting bigger for fast delivery times.

Delivery service, demonstration facilities, consultancy service, and account facilities.

As you can see, a large percentage of your equipment requirements (splicing tape to 24tk masters) can be obtained from one source at your normal pricing. We do the running around and paperwork, you just phone.

...give us a try, you have nothing to lose, - you could gain a lot!



**GRAHAMS**  
PROFESSIONAL

86-88 Pentonville Road, London N1.  
Tel: 01-837 4412 Ext. 66 Telex: 299446

# COURT

# JBL

# TANNOY

For JBL and Tannoy.

For components and complete systems, we're main agents. For accurate and powerful reproduction, JBL and Tannoy monitor systems have an international reputation.

For expert advice on matching components and building your own systems, you can draw on our extensive experience of professional acoustics.

For studio monitors, stage monitors and complete PA systems (from 1kW upwards) our own equipment, using JBL and Tannoy drive units, is unrivalled, and complements their existing range.

For more details, contact  
Court Acoustics Ltd  
35/39 Britannia Row  
London N1  
Telephone: 01-359 0956  
Telex: 268279 Britro



# THE 8 HOUR 6 IN 2 OUT

PROKIT 62 is a stereo mixer designed for professional PA and recording applications. Gain, treble, bass, folback, echo and pan are featured on each channel. Slide level faders are used for inputs and main outputs. Echo returns and VU meters feature on the outputs.

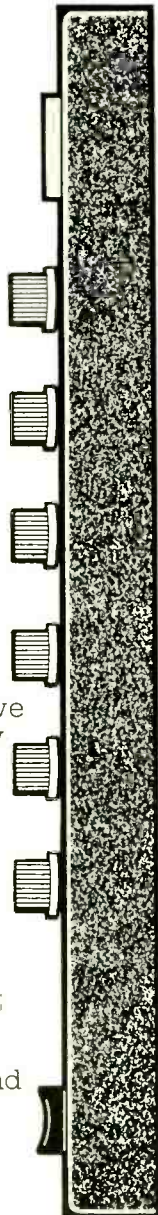
PROKIT can be built in about 8 hours with the minimum of tools, following the comprehensive 32 page assembly and fault finding manual.

Phone or write for the 12 page illustrated leaflet. Exclusively from ;

TURNKEY,  
8, East Barnet Road  
NEW BARNET  
Herts EN4 8RW  
01-440 9221

REW.  
146 Charing Cross Rd  
LONDON WC2  
01-836 2372

Kit £99.95  
Assd £149.95



## reviews

distortion did not show this cartridge in a good light, there also being evidence of tip mass resonance in the 15kHz area.

The stylus assembly, which was easy to replace, had a clear mark for cueing on the hinged stylus guard, however, no alternatives are offered to the standard 18µm spherical stylus.

### Shure SC35C

If the boost in frequency response at low frequencies is not of consequence, this cartridge exhibited a satisfactory frequency response and a most excellent crosstalk performance. The low frequency boost varied from 5dB in one channel to 3dB in the other leading to a rather poor tabulated figure for the balance between the channels; however, in the vertical mode the balance remained at 2dB at up to 200Hz.

The low compliance of this cartridge makes it suitable for heavier pickup arms and indeed its use in lightweight arms with low effective mass is undesirable.

Trackability at the recommended force of 4.5g left something to be desired and it is thought that an increase in force to the recommended maximum of 5g would do little to improve the performance.

An alternative 63×13µm diamond stylus is

available for 78rpm records, both types having a coloured stylus tip for cueing, but this is not too easy to see when fitted in some arms.

### Shure V15 Mk IV

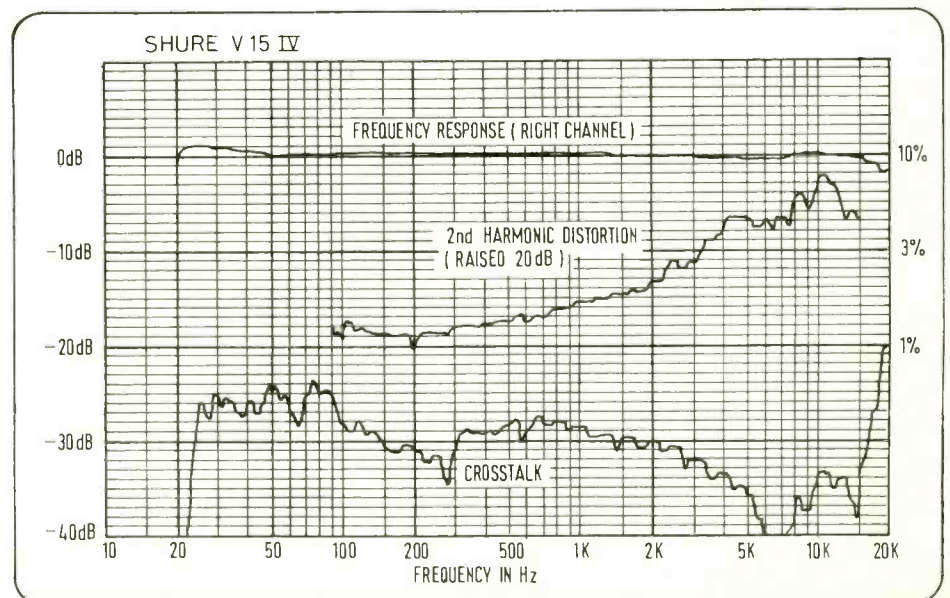
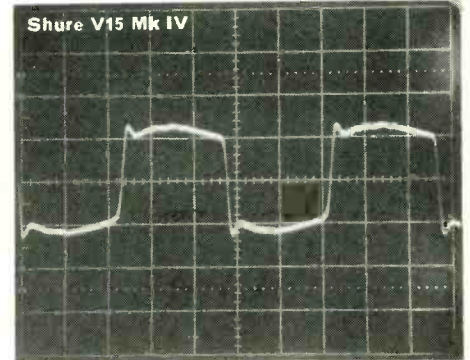
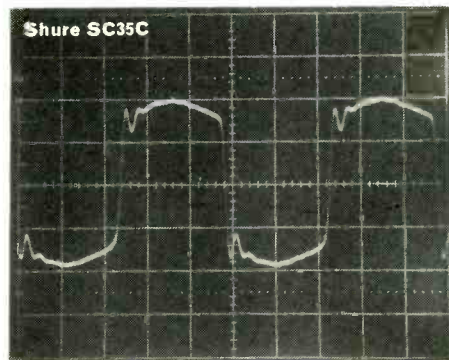
The Shure V15 series are generally regarded as top quality domestic cartridges but as can be seen from the performance data, this cartridge has much to offer and particular note should be taken of the low high frequency distortion and the clean squarewave reproduction. Trackability was excellent at the very low tracking force of only 1g and in common with the Shure SC35 the sensitivity to external magnetic fields was low.

Although a cartridge of this type is generally thought to be prone to accidental damage, this one has a 'dynamic stabiliser' which in addition to affording a degree of protection against damage cleans the record and also is claimed to reduce static charge problems.

This stabiliser which has three positions, out of operation, in action and stylus guard, is equipped with a clear cue marker in the form of a white line.

In addition to the standard hyper-elliptical nude diamond stylus a 15µm spherical diamond

78 ►



### URGENTLY REQUIRED

All types of recording equipment, particularly Dolbys, EMT plates, multitrack machines, all Studers

#### USED

CADAC 24 x 16 x 16 installed at Luton showroom ...	£10,000
HELIOS 32 x 24 x 24 ... .. .	£18,000
HELIOS 32 x 24 x 24 alternated ... .. .	£32,000
NEVE 20 x 4 x 16 ... .. .	£13,000
NEVE 12 x 4 x 8 ... .. .	£8,000
NEVE 10 into 2, one year old ... .. .	£6,000
ALICE ACM 20 x 8 x 16, one year old ... .. .	£5,750
TRIDENT A Range 32 x 24 x 24, one year old ... .. .	£31,000
TRIDENT B 28 x 12 x 24 ... .. .	£14,000
TRIDENT A 30 x 16 x 24, three years old ... .. .	£26,000
AUDIO DEVELOPMENTS 8 into 4 ... .. .	£1,000
AUDIO DEVELOPMENTS 30 x 8 x 2, 4 CPEE, 4 Comp/ Limiters, P.A. Console, very good condition ... .. .	£5,000
MCI JH10 16-track+8TH/B Sutoee Autolocate ... .. .	£9,500
3M M79 16-track+8TH/B Remote and Autolocate, unused ... .. .	£12,000
STUDER A80 Mk 2 8-track ... .. .	£9,000
STUDER J37 4-track, immaculate. Offers	
STUDER J37, 4 tracks of electronics, convert above to 8-track ... .. .	£350
AMPEX AG350 4-tracks, half inch ... .. .	£200
MCI 24-track+16-track H/B ... .. .	£18,000
AMPEX AG440 Transports fitted with Studer B62 head and electronics replay, only ... .. .	£700
OTARI MX7000 Stereo in Console ... .. .	£1,200
SCULLY 280 Stereo in Console ... .. .	£1,200
<b>EVENTIDE DELAY LINE, THREE DELAY MODULES AND ONE HARMONIZER MODULE ... .. .</b>	<b>£2,300</b>
LOCKWOOD Major Reds, pair ... .. .	£400
PYE two Comp/Lums/Gates, 9 inch Rack ... .. .	£350
REVOX A77 30/15 Varispeed, as new ... .. .	£500
REVOX A77, 7 half/15 ips, internal Amps and Speakers ... .. .	£480
DBX 160 Comp/Limiters ... .. .	£200
CROWNS, various	
CROWN EQ2 ... .. .	£375
EMT Mono Plate ... .. .	£1,900
NEUMANN Valve Microphones, various	
CADAC Monitors with Amps ... .. .	£1,000
JBL 4333, walnut ... .. .	£1,000
SOUND TECHNIQUES 35 watt MEE Amps ... .. .	£30
EVENTIDE Flanger ... .. .	£350
EVENTIDE Phaser ... .. .	£200
EVENTIDE Omnipresser ... .. .	£375
MASTERROOM B ... .. .	£500
TRIAD Parametrics, each ... .. .	£270
3M M79 24-track, H/B, very good condition ... .. .	£2,750
SCULLY Mono Cutting Lathe, complete ... .. .	£1,000

ALL PRICES EXCLUSIVE OF V.A.T.

**Don Larking**  
Audio Sales

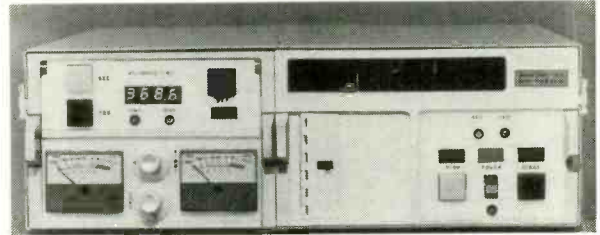
50 CHEAPSIDE, LUTON, BEDS.

Telephone: Luton 27195, 26693, 422387

Telex No. 825488

**THE PROFESSIONALS SHOP**

## MODEL I26 CARTRIDGE MACHINE



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

#### FEATURES

- ★ MEETS IBA, NAB, IEC CARTRIDGE SPECIFICATIONS
- ★ FLUTTER 15% WEIGHTED
- ★ NOISE AND HUM LESS THAN -47dB (STEREO)  
-50dB (MONO) RE I60 nWb/m
- ★ HIGH AND LOW EQUALISATION
- ★ HINGED FRONT PANEL AFFORDS ACCESS TO  
ALL MAINTENANCE CONTROLS
- ★ COMPATIBLE WITH NEW HIGH OUTPUT TAPE

### LEE ENGINEERING LTD.

NAPIER HOUSE, BRIDGE STREET,  
WALTON-ON-THAMES,  
SURREY, ENGLAND KT12 1AP

TEL: WALTON-ON-THAMES 43124/5/6

TELEX: 928475

# COURT



For studio monitoring.

For mastering, use our new 4-way JBL-based system specially designed for British and European studios.

Several great names have got it already including Gus Dudgeon, De Lane Lea, and Britannia Row Studios.

And for complete monitoring installations from top to bottom and wall to wall, as well as accurate and sensitive alignment using spectrum analysis, contact

Court Acoustics Ltd  
35/39 Britannia Row  
London N1  
Telephone: 01-359 0956  
Telex: 268279 Britro



## reviews

is available together with a  $13 \times 16 \mu\text{m}$  stylus for 78rpm records.

The very high compliance of this cartridge

dictates the use of pickup arms with an extremely low effective mass, indeed, even without an arm the low frequency resonance is in the

order of 11Hz.

### Stanton 500 AL

The Stanton 500 AL demonstrated a rather poor frequency response in comparison with other samples reviewed with an unbalanced bass boost and a 3dB dip in the 6/10kHz region the shape of which varied with the mode, being worst in the vertical (L = -R) mode.

As is to be expected from this, the squarewave performance was not good but crosstalk and tracking ability were both good.

Seven different styli are available in the 500 series covering 78rpm requirements and heavy duty usage, both spherical and elliptical types being available for microgroove use.

No stylus guard is fitted and the coloured tip of the stylus was not very easy to see for cueing.

### Stanton 680 EL

The sample showed a far better performance than the 500 AL but still showed a boost in frequency response at low frequencies and a mild droop at high frequencies in all modes, being worst in the vertical (L = -R) mode, this droop being apparent in the squarewave performance.

Tracking ability was very good but the high frequency distortion was high and low frequency distortion above average. The balance between the two channels was excellent in all modes and overall the price of this cartridge makes it attractive.

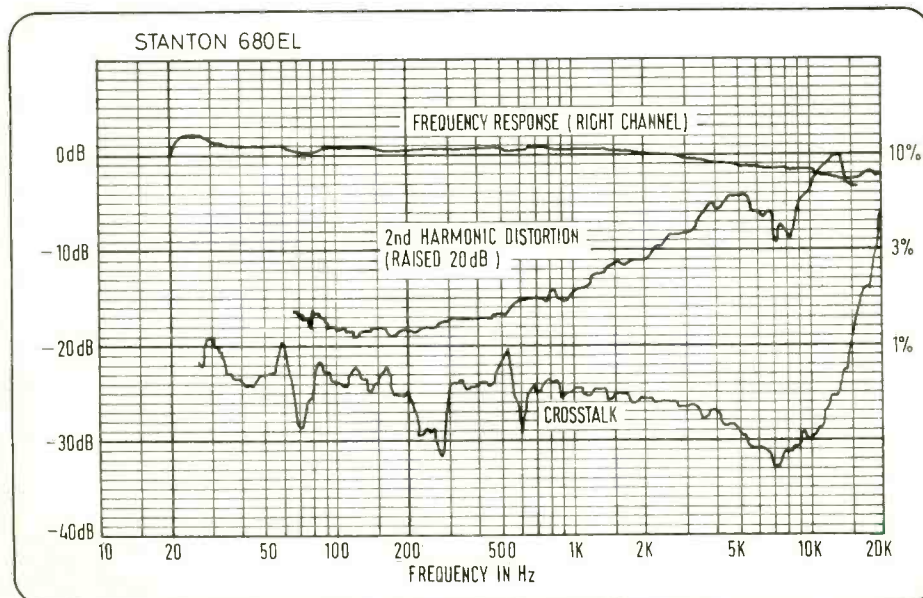
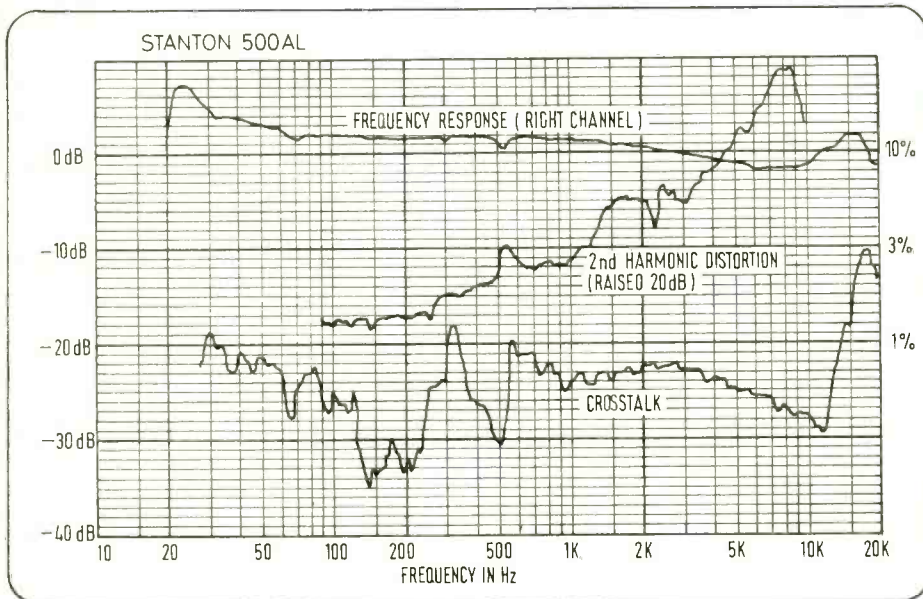
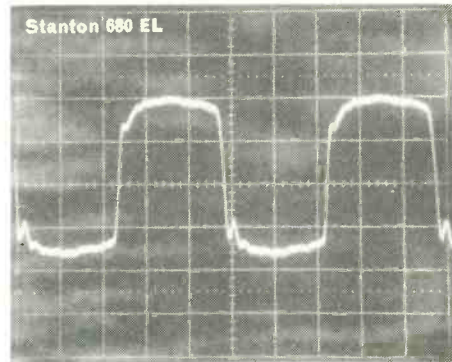
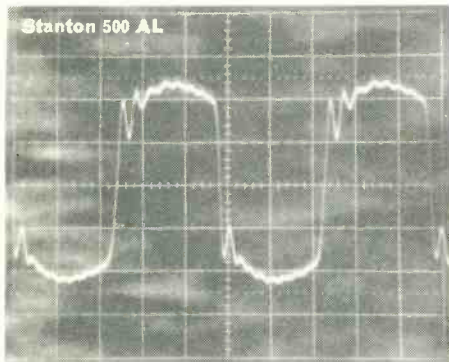
In addition to the standard elliptical stylus a  $15 \mu\text{m}$  spherical stylus and a  $68 \mu\text{m}$  spherical stylus for 78rpm use are available, but the lack of any cue mark other than the well buried stylus tip was not very satisfactory. No stylus guard is fitted.

### Summary

The large difference in the specifications of the cartridges reviewed makes a direct comparison very difficult because the types of use differ to a large extent and dictate the types of arm used.

Clearly some cartridges are much better performers than others, but this does not mean that they are necessarily better suited to a particular requirement and I have to leave it to the reader to consider the salient points for his or her particular application.

Hugh Ford



# agony

The press office of a famous independent record company noted for its good business sense and signing of artists, who no one else will touch, received a call from a member of the public with a problem about a single he had just purchased.

The company in question, situated not a million miles from Portobello Road, has its records pressed by a well known major, not unrelated to an equally well known US broadcasting corporation. This caller had a query about a hit single which was then in the charts on this particular independent label.

To cut a long story short, it transpired that this fellow's copy of the record (by a popular band) was backed, not with a B-side but with an A-side, namely a punk version of a very MOR number performed by an artist with no small connection with a South American resident (recipient of, and escapee from, Her Majesty's Prison). Needless to say, the record company in question were more than slightly astounded, and it prompts us to wonder if any readers have encountered similar recorded curiosities . . .

# elektroimpex

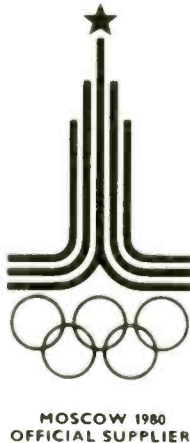
BUDAPEST

THE OFFICIAL SUPPLIER TO THE MOSCOW OLYMPIC GAMES OFFERS

- automation-ready, all-IC mixing consoles for stereo, quadraphonic and multitrack sound recording
- servo controlled tape recorders
- direct drive studio turntables



ELEKTROIMPEX · HUNGARY



- solid state switching and routing systems
- field commentator's units
- complete audio systems for Radio and TV studios, including design, supply and installation



H-1392 Budapest, POB 296

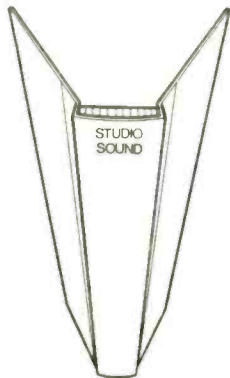
## SOUND COMMUNICATION FOR DUPLICATION

DEWSBURY, W. YORKS. TEL. 0924 469436

Cassette and reel to reel

### Get binding!

Keep your copies of STUDIO SOUND in smart black binders (each holds 12 copies) with title in golden block letters on the spine. Price: £2.00 each which includes inland and overseas postage. Send your order with cheque or postal order to: Modern Book Binders Ltd, Chadwick Street, Blackburn, Lancs. (state clearly your name and address)



LINK HOUSE GROUP

# COURT

## BGW SYSTEMS

For the superb range of BGW amplifiers come to Court: we're sole UK agent and distributor.

For outputs from 60 Watts to 1000 Watts.

For efficient service: because we manufacture our own professional audio equipment and have lots of experience distributing other people's, our servicing arrangement for BGW is unbeatable.

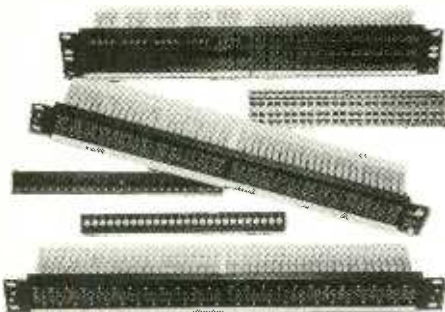
For very reasonable prices: £320 buys the 250D, £530 the 750 (list prices). And those prices include built-in cooling fans, delay turn-on, input-output connectors and full protection—making BGW equipment excellent value for money.

For more details, contact

Court Acoustics Ltd  
35/39 Britannia Row  
London N1  
Telephone: 01-359 0956  
Telex: 268279 Britro

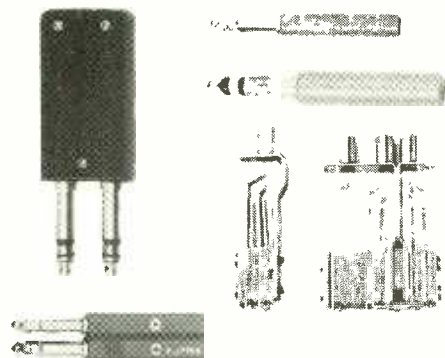
**COURT** ACOUSTICS

# IF YOU NEED JACKFIELDS WHY NOT TALK TO THE SPECIALISTS?



## PANELS AND ASSEMBLIES

No supplier offers a wider range of panels, inserts and accessories for just about any configuration. And you can get them in any stage of assembly . . . individual components, sub-assemblies, or complete pre-wired and connectorised assemblies ready to install. Our Bantam range gives a space saving of up to 50 per cent.



## JACKS AND PLUGS

Singles, twins, back-to-back, 2+1, patch and switchboard cords, in long frame and Bantam, and our new Printed Circuit Board Jacks. Most standard types are available for immediate off-the-shelf delivery.

For further information on these and our range of B.P.O. type components, telephone or send the attached below to:

## C.A.E. LIMITED

70/82 Akeman Street, Tring, Herts. HP23 6AJ

Tel. (044 282) 4011 Telex: 82362 BATECO G

Please send us copy of current catalogue

NAME .....  
 COMPANY .....  
 POSITION ..... Tel. ....  
 ADDRESS .....

# Reviews

## EMT 950 turntable system



### MANUFACTURER'S SPECIFICATION DRIVE SYSTEM

**Speed:** 33 $\frac{1}{3}$ , 45, 78rpm  $\pm 0.1\%$ .

**Turntable diameter:** 330mm.

**Wow and flutter:** max  $\pm 0.05\%$  to IEC weighted quasi-peak.

**Run-up time:** max 0.2s.

**Rumble:** to DIN 45539 better than 56dB unweighted or 70dB weighted.

**AC mains power connection:** 100 to 130V or 200 to 240V, 50/60Hz.

**Power consumption:** approx 100W.

**Dimensions:** standard model, chassis alone 693x462x332mm. With floor supports (free standing) 697x575x332mm.

**Required mounting recess depth below table top:** 245mm.

**Weight:** approx 70kg.

### AMPLIFIER (plug-in cards)

**Equalisation:** IEC 75/318/3180 $\mu$ s or 0/318/3180 $\mu$ s.

**Input sensitivity:** 0.2 to 1mV for EMT 7 series pickups. 2 to 10mV with 47k $\Omega$  version.

**Output level:** +6dB (1.55V), max 4.4V, min 0.775V.

**Maximum output level:** +22dB (10V).

**Frequency response:** 40Hz to 15kHz  $\pm 0.5$ dB. 30Hz -3dB approx. Below 30Hz approx 20dB/octave rolloff. Above 25kHz approx 12dB/octave rolloff.

**Total harmonic distortion:** less than 0.1% 30Hz to 12kHz.

**Signal-to-noise ratio rms unweighted:** min 75dB.

**Signal-to-noise ratio, peak, weighted:** min 70dB.

**Crosstalk:** better than 55dB.

**Headphone output:** stereo, max 2V into 200 $\Omega$ .

Stereo/mono switch: remote controlled (24V DC or from internal voltage).

### CARTRIDGE TYPE TSD 15

**Output level:** 0.15mV per cm/s.

**Frequency response:** 20Hz to 20kHz.  $\pm 2$ dB from 40Hz to 12.5kHz.

**Distortion:** frequency intermodulation less than 0.5%.

**Vertical tracking angle:** 15 $^\circ$ .

**Crosstalk:** less than 25dB at 1kHz.

**Compliance:** 12x10 $^{-9}$  cm/dyne.

**Stylus:** 15 $\mu$ m diamond.

**Tracking force:** 2-3g.

**Price:** basic unit £2510. As reviewed £2750. Cartridge £128.

**Manufacturer:** EMT Franz GmbH, Postfach 1520, D-7630 West Germany.

**UK Agent:** FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Hertfordshire.

**US Agent:** Gotham Export, 741 Washington St, New York 10014.

THE EMT 950 turntable unit is available in two versions either of which can be fitted with legs so as to be a free standing unit. The standard version has pushbutton controls and a monitor loudspeaker option to the left of the turntable platter, whilst the alternative version designed for use in restricted space has smaller pushbutton controls mounted to the front of the turntable platter and does not include the monitor loudspeaker option. However a monitor amplifier may be incorporated for use with a remote loudspeaker.

The turntable chassis is of very heavy construction and is mounted on four isolation bushes of special design such that their vertical and horizontal compliances differ, this system giving excellent isolation from external vibration. An ingenious locking device allows the turntable chassis to be locked within the main chassis by turning a single screw whilst the motor and platter assembly can be locked for transport by means of a knurled knob underneath the unit.

A DC servo motor is used to drive the turntable directly with a tachometer disc and disc brake also being mounted on the motor shaft.

An unusual feature is that the platter is constructed from fibreglass in the form of a very thin disc with 16 ribs for re-inforcement, thus being a very light and strong construction aiding a fast start time and accurate speed control. An adaptor for 45rpm records is built into the turntable.

Cartridge mounting is similar to the standard method used by SME and many others, however, the 4-pin connector has its contacts displaced by 45 $^\circ$  and the locating spigot on the cartridge is displaced by 180 $^\circ$  such that alternative headshells cannot be used. A lifting arm is attached to the cartridge which incorporated a magnifier for precise groove location with the aid of a lamp located to the left of the turntable.

The final feature of the turntable unit is one red and three green lamps located adjacent to the turntable rim. These lights are for cueing with the red light and one of the green lights being illuminated when the turntable is stopped so that the turntable may be reversed by hand, through the required angle according to the speed which selects the appropriate green light.

At the far end of the control panel there is the



## Probably the best cassette sound you've ever heard

Large runs for record companies and smaller runs for studios all given the same precise attention with regard to quality and speedy turnround. **Blanks wound any length.**

Collection and delivery service door to door for both cassette and master tape copying.

**SOUND  
RECORDING  
PLANT**



Contact  
Dave Rees  
at  
061-795 7666 to  
discuss your  
requirements.

# Trust James to match your masterpiece

We allow ourselves a Mona Lisa smile when you compare our duplicated cassettes with your masters. It may be due to technical brilliance rather than artistic genius, but we challenge you to hear the difference.

You can enjoy an exhibition of our talents without moving out of your studio. Send in a track or two and you'll have our copy by return – free of charge. Bulk runs may take just a little longer.



**James Yorke Limited**  
Oak House Northleach Cheltenham Glos Tel: 04516 509  
We have a lot to live up to . . . and we do.

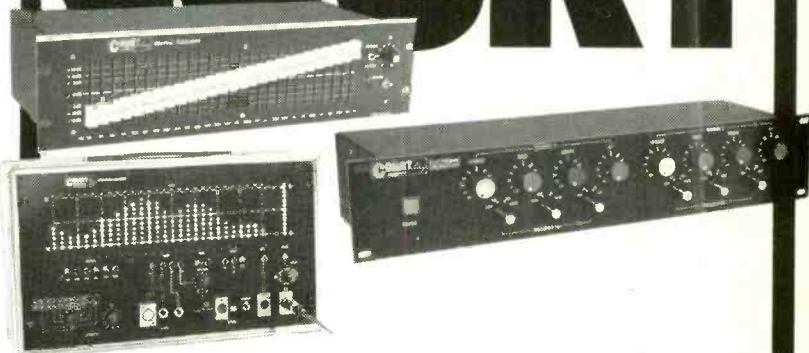
# Are you legal, decent, honest and truthful?

**Advertisers have to be.**

The Advertising Standards Authority  
Write to: The Advertising Standards Authority  
15/17 Ridgmount Street London WC1E 7AW



# COURT



For specialised electro-acoustic equipment.

For broad tone control, use our 27-way  $\frac{1}{3}$ -octave mono graphic equalizer: 40Hz to 20KHz with  $\pm 12$ dB of correction.

For the ultimate in tone control we've just introduced a new 30-way  $\frac{1}{3}$ -octave stereo graphic equalizer.

For flexibility in multiway monitor systems, you need our 2, 3 or 4 way switchable stereo crossover. High slew rate and low noise IC's reduce phase shift to an inaudible minimum.

And for extremely accurate assessment of audio signals there's our world famous spectrum analyser with every facility you could ask for. It's available in digital form, too, in a much smaller package.

For more details of these and other instruments, contact  
Court Acoustics Ltd  
35/39 Britannia Row  
London N1  
Telephone: 01-359 0956  
Telex: 268279 Britro



illuminated power on/off switch together with three large pushbuttons for selecting the speed of 78, 45 or 33 $\frac{1}{3}$ rpm and further pushbuttons for selecting monophonic or stereophonic operation, the selected buttons being illuminated. Mono/stereo selection may be operated at any time and is corrected for level such that silent switching may be done 'on air' while a link on the printed circuits allows speed selection to be inhibited in the run mode.

Near the front there is a grille for the monitor loudspeaker and then its potentiometer volume control and pushbuttons for reverse operation at the correct speed and for illuminating the light on the turntable. This light remains illuminated for about half a minute and then switches itself off.

To the front, six further pushbuttons actuate arm up/arm down, start/stop and local/remote with the selected function having its push-button illuminated. Sensibly the design of the arm lowering device is such that the arm cannot touch the turntable thus eliminating this way of damaging the cartridge. A remote interface connector to the rear of the unit allows remote control of start/stop, mono/stereo and reverse plus fader start and the three indicators REMOTE, RUNNING and MONO.

Further connectors to the rear accommodate the two floating line outputs in the form of 3-pin XLR connectors, the monitor output with left, right and mono unbalanced connections on a 6-pin XLR socket and finally the monitor loudspeaker connection in the form of a locking 3-pin DIN socket. A further feature is the ability to separate the mains earth, the chassis earth of the zero volt line by means of rear panel links.

A number of pluggable links in the electronics permit various options including muting of the line output until start is pressed, muting of the internal monitor in remote or muting of the monitor and cue output in remote. In addition the 75 $\mu$ s time constant in the equaliser may be removed for use with Bruel & Kjaer test discs.

The audio electronics and those associated with the phase locked loop servo system are

accommodated on 13 plug-in printed circuit boards of good quality with the manual giving excellent layout diagrams and circuits. 11 boards are mounted in the card cage to the front of the unit with the PCB connectors being on a mother board. To the rear are two further boards and the screened power supply which is fully stabilised.

**The mechanical aspects**

Although not being excessively heavy, the solidity of construction in conjunction with the care taken over the turntable suspension gave amazing vibration immunity, so much so that it was possible to measure the very good rumble performance without disturbance from passing traffic. Referred to a recorded velocity of 5.42cm/s at 315Hz, the measured rms rumble to the IEC 98A 'A' rumble weighting curve was a creditable -58.5dB or -69.5dB to the 'B' weighting (not to be confused with noise weighting curves). As with the wow and flutter, it is likely that the measured performance is that of the test discs, a DIN disc being used for rumble measurement and a special acetate for wow and flutter measurement. IEC weighted wow and flutter to the quasi-peak method at 33 $\frac{1}{3}$ rpm was the lowest that I have ever measured for a turntable at 0.03% after carefully centering the disc.

The diameter of the centre pin of the turntable measured 0.2808ins which in round figures is 0.004ins or 100 $\mu$ m greater than the maximum disc hole diameter specified by IEC. Clearly the pin diameter could well be larger for minimum operational wow and flutter, but many broadcasters like records to be an easy fit on turntables.

The start time at 33 $\frac{1}{3}$ rpm to speed was in the order of only 200ms with a further 200ms being required to reach minimum wow and flutter. This very rapid start made the pickup cartridge visibly vibrate and this may well be the reason for the longer time to reach minimum wow and flutter. Whilst the rapid start time is preset the stop time can be adjusted over a wide range by

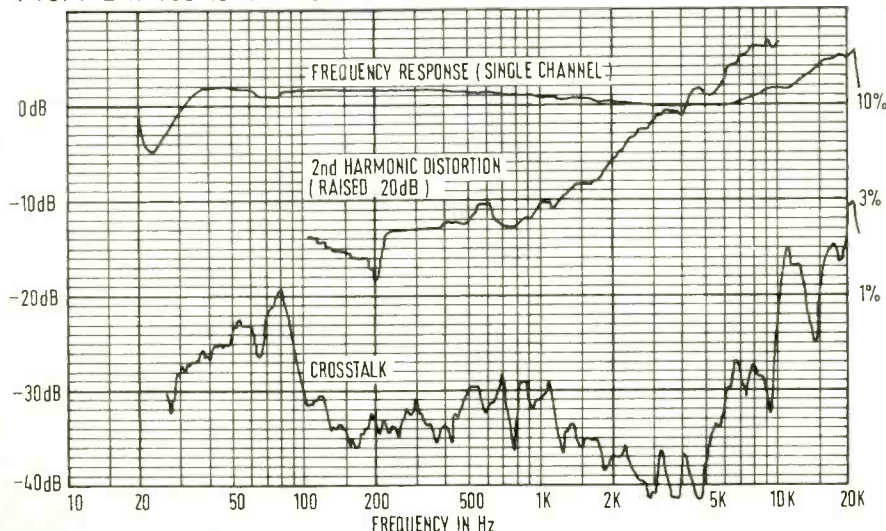
84 ►

# audio & design recording worldwide

- Australia**  
Audio & Recording, Tel: 261 1383
- Austria**  
Peter Muller, Tel: 229 9 444 233
- Brazil**  
Serion Ltd, Sao Paulo. Tel: 34 8725
- Canada**  
BCB Electronics Ltd., Ontario. Tel: (065) 24478
- Caribbean**  
Dynamic Sounds Recording, Jamaica Tel: 933 9138
- Denmark**  
Audiophil, Copenhagen. Tel: (01) 341 622
- Eastern Europe**  
Denis Tyler Ltd., UK. Tel: (089 54) 43681
- Finland**  
Harold Burgen, Helsinki. Tel: 692 5308
- France**  
3M France, Paris. Tel: (1) 031 6161
- West Germany**  
Elmus GmbH, Berlin. Tel: (030) 312 2012
- Greece**  
Audiolab Hellas, Tel: 822 5222
- Holland**  
Pieter Bollen, Eindhoven. Tel: (040) 512 777
- Italy**  
Roje Telecomunicazioni, Milan. Tel: 415 4141
- Japan**  
Nissho-Iwai Co. Ltd., Tel: (03) 544 8311
- Korea**  
Yushin Co. Ltd., Tel: 69 3261
- New Zealand**  
General Video Co. Ltd., Tel: 872 574
- Norway**  
Siv. Ing. Benum & Co., Tel: (02) 56 57 53
- South Africa**  
Eltron (Pty) Ltd., Tel: 23 0018
- South East Asia**  
O'Connor's (Pty) Ltd., Singapore 5  
Tel: 637 944
- Sweden**  
KMH ljud Ab, Tel: (08) 690 120
- Switzerland**  
Audiocom Tel: 031 955 742
- United States of America**  
Audio & Design Recording Inc.  
Nigel Branwell  
PO Box 902, Calif. 93933 Tel: (408) 372 9036

UK and All Other Territories  
**audio & design (recording) ltd.**  
 Reading, UK. Tel: (0734) 53411  
 Telex: 847605 a/b Tillex G

FIG. 1 EMT TSD-15 CARTRIDGE MEASUREMENTS



# George Martin's choice...

SCAMP

## — The F 300 Expander/Gate System

**‘W**HEN I originally sat down to plan the equipment installation for my new studio, *Air Studios Montserrat* my initial inclination was to draft a list of, shall we say, ‘established’ names. But then other, equally important, factors like price, performance, reliability, and availability have to be considered. That’s why I personally opted for the **Audio & Design SCAMP F 300 Expander/Gate** system for the new venture. Very competitively priced, I believe that the **Audio & Design SCAMP F 300 Expander/Gate** system offers performance and flexibility that is hard to match.



George Martin of AIR Studios London, internationally successful record producer, arranger and musical director is presently producing and arranging the musical soundtrack and album of the forthcoming RSO film ‘Sergeant Pepper’s Lonely Hearts Club Band’ in his London Studios and Los Angeles.



To the  
19" PARKING SPACE



The F 300 Expander/Noise-Gate system is simple to operate yet highly sophisticated in its dynamic performance with an unequalled flexibility for effects use.

In the AUTO mode really smooth dynamic characteristics are obtained with freedom from ‘hunting’ on the most difficult of signals. This means that these units can be used with confidence on multi-track mix-down to provide noise reduction and a degree of automation.

As non contributing tracks are being automatically attenuated, added tape noise is kept to a minimum, and in most applications involving limited dynamic range signals (ie pop), the noise will be masked by the signal.

Perhaps most important, especially to systems already equipped with a complementary noise reduction system, objectionable source noise (ie instrument amps, hiss from electronic devices, general studio ambient noise and crossmic pickup) will be eliminated — a very significant area in which established noise reduction units can do nothing.

### Technical Specification

**INPUT:**  
10KΩ balanced.

**OUTPUT:**  
<1Ω source balanced clip level +24dBm.

**DISTORTION:**  
<0.1% THD at line levels for unity gain.

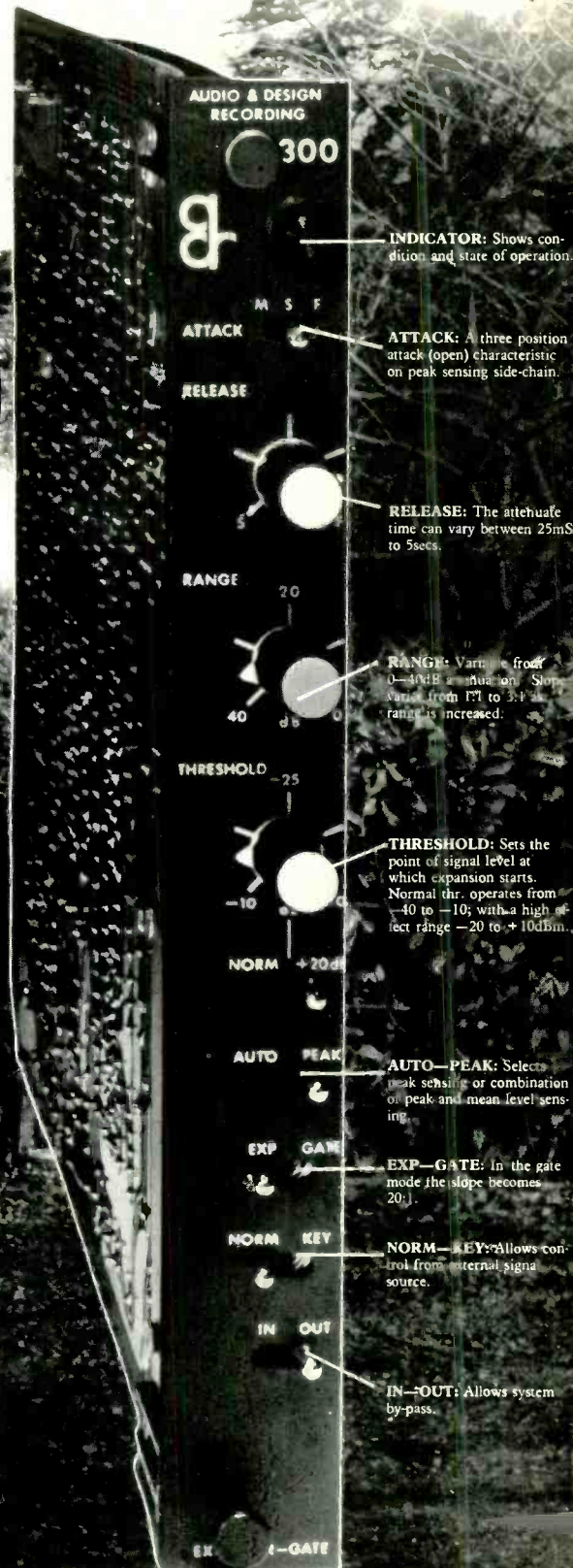
**FREQUENCY RESPONSE:**  
±0.5dB, 30Hz — 20kHz.

**NOISE:** (Ref. +8dBm)  
Normal: < -103dB  
Effect: < -86dB

**RANGE:**  
0 — 40dB variable

**SLOPES:**  
Expand: 1:1 to 3:1 variable  
Gate: 20:1 with hysteresis

- \* Auto-Dynamic Characteristics
- \* Expander & Noise Gate slope options
- \* Keyable from external signal
- \* Variable release, Range & Threshold
- \* Superb performance
- \* Ultra compact (17 units to a rack)



**INDICATOR:** Shows condition and state of operation.

**ATTACK:** A three position attack (open) characteristic on peak sensing side-chain.

**RELEASE:** The attack/release time can vary between 25mS to 5secs.

**RANGE:** Variable from 0—40dB expansion. Slope varies from 1:1 to 3:1 as range is increased.

**THRESHOLD:** Sets the point of signal level at which expansion starts. Normal thr. operates from -40 to -10; with a high effect range -20 to +10dBm.

**AUTO—PEAK:** Selects peak sensing or combination of peak and mean level sensing.

**EXP—GATE:** In the gate mode the slope becomes 20:1.

**NORM—KEY:** Allows control from external signal source.

**IN—OUT:** Allows system by-pass.



**audio & design (recording) ltd.**

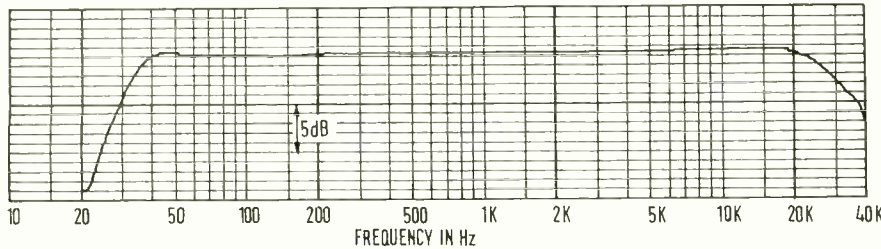
84 Oxford Road, Reading, Berks. RG1 7LJ England

Telephone: Reading (0734) 53411

Telex: 847 605 a/b Tillex G



FIG. 2 EMT 950 AMPLIFIER FREQUENCY RESPONSE



a potentiometer in the electronics. Similarly the absolute speed can be fine adjusted by potentiometers, there being the option of variable speed operation.

Investigating the tone arm resonance with a frequency sweep record going from 5Hz to 125Hz showed that the system was well damped with an indication of some resonance at 15Hz which is well placed and use of the Shure *TTR 115 Audio Obstacle Course* section on arm resonance did not reveal any visible movement of the cartridge.

Further searches for resonances with a slow frequency sweep from 20Hz up to 1kHz suggested mild resonances around 60Hz and 800Hz, the latter appearing to be in the vertical plane.

With the exception of the turntable brake which made a slight noise, the unit was absolutely silent in operation and the turntable suspension was so good that the main chassis could be hit quite hard without any audible effect on reproduction.

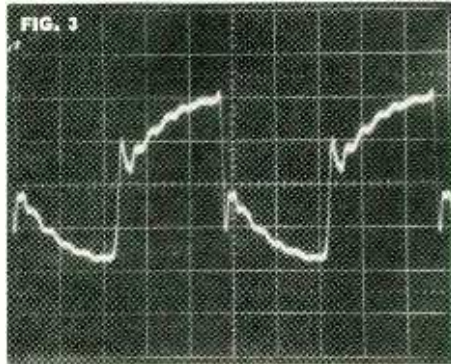
The accuracy of the stylus force calibration was within the readability of the scale and balancing the pickup arm was quick and simple as were all aspects of operation particularly including cueing and groove location.

**The electronic aspects**

All measurements were undertaken at a tracking force of 2.5g as recommended for the EMT cartridge with bias compensation set for this tracking force. Checking the vertical tracking angle with the CBS *STR 160* vertical tracking angle test disc showed it to be 18° which is slightly higher than the manufacturer's specified angle, but this is of little consequence.

Using the Bruel & Kjaer test record *QR 2009* produced fig 1 showing frequency response, crosstalk and distortion for a single channel, the results for the other channel being virtually identical for the three parameters. It is to be seen that the frequency response rises rapidly from 10kHz to 20kHz where it is around +4dB reference 1kHz. On the other hand the crosstalk performance is outstandingly good but the second harmonic distortion is at a rather high level.

As far as the amplifier performance is concerned the overall frequency response, when fed by an inverse RIAA network, is shown in fig 2 which shows a sensible roll-off above 20kHz and also a bass roll-off which can be varied by a preset potentiometer on the equaliser circuit board. Measurement of amplifier distortion in terms of harmonic distortion or intermodulation distortion to either the CCIF twin tone method or the SMPTE method showed that this was at a very



low level below 0.01%.

Whilst the gain is variable for all outputs, the standard setting is such that a recording of 3.16cm/s lateral gives an output of 0dBm in either the stereo or mono modes of operation with a maximum output of +20dBm at the onset of clipping.

Returning to the cartridge performance, fig 3 shows the squarewave reproduction when playing the CBS *STR-111* disc but without the 75µs equalisation—there being a fair amount of overshoot and ringing. Using the same test disc for checking the tracking ability showed that the cartridge could track the vertical tracking and intermodulation bands at +12dB reference 1.12x10<sup>-3</sup> cm peak amplitude and the lateral bands up to +15dB but failing the +18dB levels at 2.5g tracking force—a good performance.

While there were no problems with hum, the cartridge was rather sensitive to external magnetic fields giving an output from the amplifier of 60mV/0e which could be troublesome if it is used with other turntables. Amplifier noise was excellent being with reference to 0dBm output -75.5dB rms unweighted, -66.5dB CCIR peak weighted or -70.5dB rms CCIR weighted.

**Summary**

The mechanical design of this turntable unit can only be described as superb, leading to a rumble and wow and flutter performance which cannot be measured by conventional means. In addition the performance and flexibility of the electronics is excellent, but, whilst the cartridge has many good points it does have shortcomings.

Operationally it is clear that much practical thought has gone into the overall design and the unit is a pleasure to use permitting quick and accurate cueing with a minimum of effort.

Hugh Ford

JBL PROFESSIONAL DEALERS  
IN THE U.K.



FORMULA SOUND  
LIMITED  
FORMULA SOUND LIMITED  
3 Waterloo Road  
Stockport Cheshire  
Telephone 061-480 3781



**Kirkham Electronics**

Mill Hall, Mill Lane,  
Diss, Norfolk, IP21 4XL  
Telephone (037 976) 639



PROFESSIONAL AUDIO SYSTEMS  
35 Britannia Row  
London NI 8QH  
Telephone 01-359 0956



P. A. Hire & Sales  
Unit F New Crescent Works  
Nicol Road  
London NW10 9AX  
Telephone 01-961 3295



8, East Barnet Road  
New Barnet  
HERTS  
Telephone 01-449 2344  
Telex 25769



Graham's Electrical  
86/88 Pentonville Road  
London NI  
Telephone 01-837 4412



REW Audio Visual  
126 Charing Cross Rd.  
London WC2  
Telephone 01-836 2372/7851

For further information contact  
Harman (Audio) U.K. Ltd.

St. John's Road  
Tylers Green  
High Wycombe  
Bucks HP10 8HR  
Telephone  
0494-815331



GET IT ALL

## HEAR FROM US BEFORE YOU HEAR FROM THEM.

Today's broadcasting equipment and standards let you transmit things you never could before.

Like tape hiss, cue tone leakage and turntable rumble, to name a few.

And that's precisely why you need the JBL 4301 Broadcast Monitor.

It lets you hear everything you're transmitting. All the good stuff. And, all the bad. So you can detect the flaws before your listeners do.

The 4301 is super-compact, so it fits all EIA Standard racks. 19" h x 11½" d x 12¼" w.

And it's made by JBL. The recognized leader in professional sound equipment.

Just give us your name and address and we'll send you all the 4301's very impressive specs.

Along with the name of your nearest JBL Professional Products Dealer.

He'll tell you everything you need to hear.



**JBL**

GET IT ALL.



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

[www.americanradiohistory.com](http://www.americanradiohistory.com)

# reviews

## Macinnes S-220 tone arm



### MANUFACTURER'S SPECIFICATION

**Total length:** 310mm.  
**Effective length:** 220mm.  
**Overhang:** 15mm.  
**Offset angle:** 22°.  
**Lateral balance:** adjustable, all cartridges.  
**Stylus pressure:** adjustable, 1-6g recommended, depending upon cartridge.  
**Tracking error:** +4°, -1°.  
**Price:** £41.40 professional plus VAT.  
**Manufacturer:** Macinnes Laboratories Ltd, Carlton Park Industrial Estate, Saxmundham, Suffolk.

**T**HIS ARM, which is equipped with a plug-in headshell with the standard 4-pin connector, is based on a 9.8mm diameter alloy tube which is formed into an 'S' shape to provide the 22° offset angle. The headshell, which is compatible with the SME type but weighs 3g more at 8g, is provided with a lifting arm and has slots on the standard 12.7mm spacing, this providing a 12.7mm range of overhang adjustment.

The arm itself is pivoted by a yolk which contains two adjustable pins as bearings in the vertical plane with a ball bearing mounted within a vertical tube providing movement in the horizontal plane. To the rear of the yolk, the alloy tube is extended 60mm for mounting the balance weights which are secured to the tube by means of Allen grub screws. Unfortunately these screws are hard and damage the tube whenever they are reasonably tightened.

Main balancing is done by a large weight with a smaller weight assembly permitting fine balancing. Attached to the latter is an 'L' shaped arm to which a lateral balance weight is attached. As no calibration means is provided, the arm must be balanced with a stylus force gauge.

The range of adjustment of the balance weights is such that between an upward force of 9g and a downward force of 2g balance can be achieved at the stylus position without a cartridge. In this respect the arm is compatible with any reasonable cartridge.

Measurement of the effective mass of the arm and headshell showed that this was rather high at 17g thus dictating the use of very low compliance cartridges if the resonant frequency of the assembly is to be kept within sensible bounds. However, the use of a lighter headshell would improve the situation.

Examination of **fig 1** which results from replaying a very slow frequency sweep disc reveals that there are several marked arm resonances particularly around 200Hz and this

is not surprising as there is no damping in the arm.

Reverting to the mechanical construction, the tubular section supporting the arm has a 5-pin connector built into its base, the leads to the amplifier plugging into this connector. The leads provided are 1.5m long with a reasonable capacitance of 110pF between the inner and the shield with the ends terminated in phono plugs and a free earth wire. Within the headshell the leads are connected to pins adjacent to the connector and terminated in clips for connection to the cartridge, but the diameter of these was too large for normal cartridges and they had to be squashed for a good connection.

Mounting of the arm onto the turntable is by means of a tubular section into which the arm assembly is secured by means of two Allen grub screws giving a large range of height adjustment. The tubular section is threaded on

its lower end and fitted with a nut (but no washer!) such that it can be secured into up to 20mm thick motor boards requiring a single 22mm diameter hole.

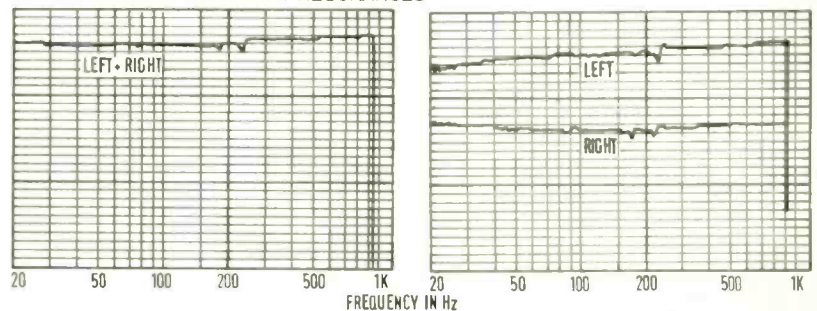
A separate arm rest is supplied consisting of a plastic clip into which the arm fits snugly. The rest is adjustable in height in a similar manner to the arm and is mounted into a single 9mm diameter hole and secured with a nut—no washer being provided with this either.

### Summary

This is a well finished arm assembly of solid construction which should prove to be a reliable workhorse for disco and similar applications. Once the arm has been adjusted for a particular type of low compliance cartridge, it can be solidly locked and is tamper-proof unless you have the right sized Allen key as supplied with the arm.

Hugh Ford

FIG.1 MACINNES S220 ARM RESONANCES



### ANNOUNCING STEREO DISC AMPLIFIER 3

A reference amplifier for disc monitoring and transfer when replay signals of the highest quality are required.

Based on the Surrey Electronics Disc Amplifier 2 and manufactured under licence, this unit offers the same unmatched technical performance. Intended for situations where the ability to drive balanced lines is not required, two equalised outputs are provided enabling Line and DIN level inputs to be driven simultaneously.

To facilitate cartridge matching, a wide range of independently switchable load capacitance and resistance values are provided, together with left and right 20 turn gain presets.

Price: cash with order, UK postage and VAT inclusive £165

**DOMINUS**  
 P.O. Box 1, Cranleigh, Surrey.  
 Tel. 04866 6477



High (Line) Output, loaded with 10kΩ: 1kHz at -44dBV.7 (5mV) set for 0dBV.7 output.

**TOTAL HARMONIC DISTORTION**

-22dBV.7 output 20Hz-20kHz  
 -80dB, 0.008%

**STATIC INTERMODULATION DISTORTION**

50Hz-7kHz, 4:1 +22dBV.7 output  
 -80dB, 0.008%

**DYNAMIC INTERMODULATION DISTORTION**

3.18kHz square wave (single pole -3dB at 100kHz) +15kHz sine wave, 4:1.

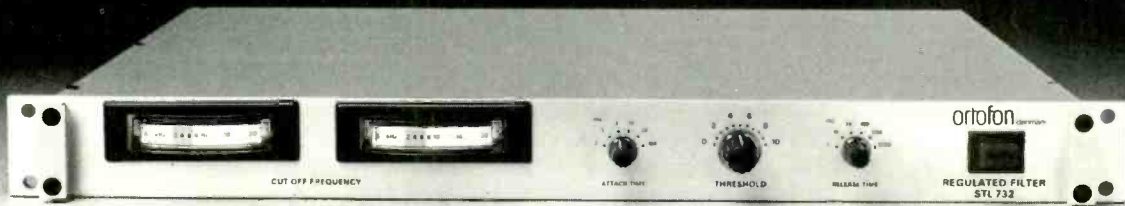
Relative to 15kHz component.

Pre-emphasised input 500mV pk-pk  
 -70dB, 0.03%

**To all recording studios...**

**Make your master tape suitable for cutting right from the start.**

**When recording, use an Ortofon de-esser STL 732 for softening sibilants by dynamic treble peak limiting, thus avoiding distortion.**



The advantages are obvious. By connecting the Ortofon STL 732 at the time of recording you need only use it on the channels where there are high levels at high frequencies. If you wait until the cutting process it has to be used on the whole signal.

If your records are cut in a studio not using Ortofon cutting equipment, other means of limiting the level of high frequencies will be used, as the cutting engineer must ensure that the record can be tracked by the pick-up cartridges available on the market.

The advantage of using an Ortofon STL 732 as opposed to other de-essers is that it is possible to see on your instruments how the signals are dealt with. The STL 732 has variable attack and release times, and the level at which it starts to regulate can also be varied.

Finally, the STL 732 has been designed for the human ear. Special attention has been paid to the sensitivity of the ear and its masking abilities. For example, the STL 732 allows the start of a high frequency pitch to come through before the filter goes into operation. This parallels the action of the ear, which is particularly sensitive to transients which at the same time mask the succeeding sounds. As the STL 732 is active after the transients, its effect cannot be heard on the signal which includes the transient.

**For further details, ring or write requesting our special brochures.**

Please send brochures for:

- STL 732 de-esser
- Cutting equipment
- LS 76 cutting lathe

Studio \_\_\_\_\_ Town \_\_\_\_\_

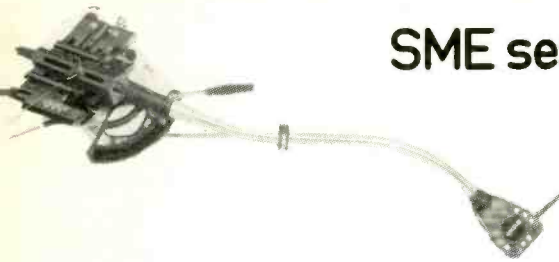
Address \_\_\_\_\_ Country \_\_\_\_\_

**ortofon**  
accuracy in sound

**Return this coupon to:**  
Ortofon Manufacturing A/S  
Mosedalvej 11 B,  
DK-2500 Valby, Denmark

# reviews

## SME series III tone arm



### MANUFACTURER'S SPECIFICATION

Nominal length, pivot to stylus: 229mm.  
 Distance from bedplate to centre of turntable: 215.4mm.  
 Tracking adjustment:  $\pm 12.7$ mm.  
 Height above mounting surface: adjustable 82.6mm to 60.3mm.  
 Height of turntable surface above mounting surface: 41.3mm maximum, 25.4mm minimum.  
 Depth required below mounting surface: 47.6mm.  
 Clearance required for balance weights: 63.5mm radius.  
 Clearance required between turntable surface and cabinet lid: 44.5mm.  
 Price: £113.85 plus VAT.  
 Manufacturer: SME Limited, Steyning, Sussex.

**T**HE SME Series III pickup arm is the successor to the well established Series II but offers a large number of new features which are a distinct improvement on the already excellent predecessors.

Although the headshell itself is not detachable, the arm and head plug into the body of the unit as an assembly thus giving the best of both worlds—an interchangeable head without the extra mass involved with a detachable headshell, the complete detachable arm weighing less than 10g including its inbuilt lifting finger.

Reference to fig 1 shows the adjusting controls for the novel balancing system in which the position of the weights is almost entirely controlled by knob operated leadscrews, thus providing a very smooth and accurate adjustment. The main balance weight consists of a number of lead weights and spacers which pack the weight chamber. This feature means that pickup cartridges from effectively zero mass up to 13g can be balanced while adding the minimum of mass to the arm by adding or subtracting lead weights from the chamber—a number of spare weights being supplied with the arm.

Initial balance is obtained by moving the complete balance system relative to the arm by means of the control shown as BALANCE I which gives a quick and very accurate balance with the minimum of effort. The tracking force is then set by two means. For cartridges requiring 1.5g or less force the tracking force leadscrew is rotated until a small pointer indicates the desired force on the calibrated scale from zero to 1.5g in 0.25g increments. The calibration accuracy of this control proved to be within the readability of the scale.

For cartridges requiring more than 1.5g tracking force, the position of the two position weight shown in fig 1 is changed to its second position which adds exactly 1g to the calibrated tracking force, thus giving a maximum available force of 2.5g which covers the range required for most high compliance cartridges.

Damping of the arm is achieved by means of an interchangeable paddle attached to the arm and which dips into a semicircular tray of silicone damping fluid. Three sizes of paddle are supplied for damping cartridges of different compliances, less than  $20 \times 10^{-6}$  cm/dyne, between 20 and  $30 \times 10^{-6}$  cm/dyne and over  $30 \times 10^{-6}$  cm/dyne.

Loosening an Allen screw allows the arm to be rotated and adjusted in height whilst the position in the slotted base is set by means of a spanner which moves the arm by means of a rack and pinion in the slotted base which is secured to the turntable by means of four screws.

Attempts to find arm resonances by means of a slow frequency sweep from 20Hz to 1kHz failed to reveal any resonances when using a

Shure V15 MkIV cartridge, and using this cartridge with the recommended damper gave no resonant peaks from 5Hz upwards using the DIN test disc.

The effect of this damping system is illustrated in fig 2 using a relatively low compliance cartridge tracking at 2.5g it being seen that the damper has a substantial effect upon the resonant frequency of the arm/cartridge assembly and also on the Q of the resonance.

So good was the damping with the Shure V15 MkIV, that the effective mass of the arm was close to zero and even using the arm resonance test section of the Shure TTR115 Audio Obstacle Course disc failed to show any movement of the cartridge.

The raising and lowering device on the arm did not displace the arm to one side as in earlier arms, but the operation of the device was rather slow and it was found preferable to lower the pickup by hand if starting at the beginning of a disc.

The audio leads within the arm which are

FIG.1 SME SERIES III

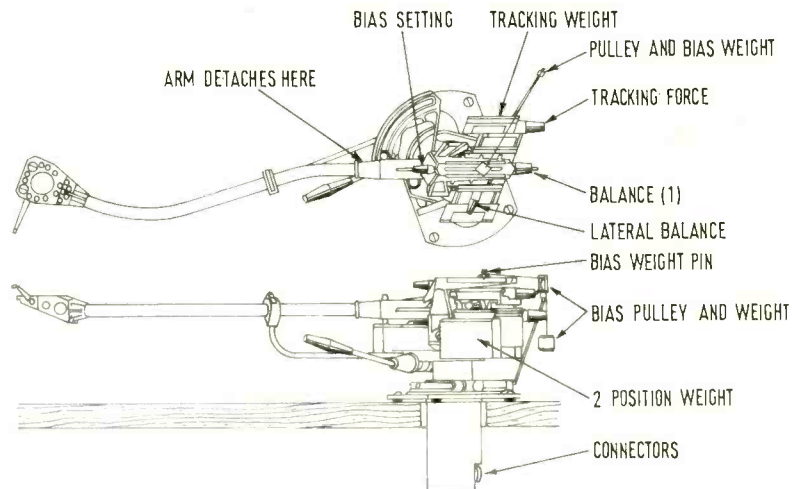
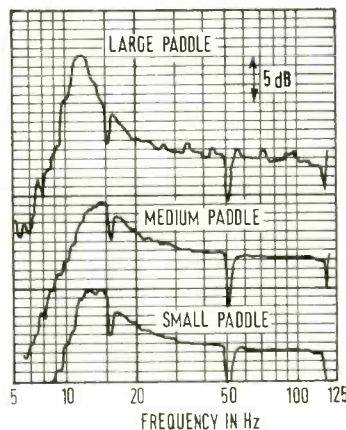


FIG.2 SME SERIES III DAMPING



terminated in phono sockets at the bottom of the assembly, had a capacitance of approximately 15pF. In combination with the supplied leads (which are trimmed with capacitors) gave a lead and arm capacitance of 300pF which is normally desirable. For CD4 use or other applications requiring a lower capacitance, the trimming capacitors can be removed. The supplied audio leads are just under one metre long and terminated in gold plated phono plugs of SME manufacture and of very good quality, there being a bared wire for grounding. Alternatively leads are available with a DIN connector on one end.

### Summary

This is a beautifully finished arm of complex design but is extremely simple to set-up very accurately. When used with a high compliance cartridge the performance is quite remarkable and indeed the maximum tracking force of 2.5g limits the arm to relatively high compliance cartridges.

Hugh Ford



*40 Channel Remix Console supplied recently  
to Olympic Sound Studios, London.*

The Series III De Luxe range of mixing console represents a high quality versatile system. A fully detailed colour brochure, including price lists, is available direct from the factory or agents.

**AGENTS:**

**Canada**

C.O.R.A. Inc.  
131-18eme Rue, 1046 Quebec P. Q.,  
Canada Tel. 418-522-1397

**Denmark**

Audiophil  
Howitzel, 49-1, 2000 Copenhagen,  
Denmark Tel. 134 1622

**Netherlands  
& Belgium**

Pieter Bollen, Geluidstechniek bv,  
Hastelweg 6, Eindhoven,  
Holland. Tel. 40 51 2777/520662

**South Africa**

Prosound,  
Elkham, Upper Level Pretoria Street,  
Hillbrow, Johannesburg 2001,  
South Africa. Tel. 642-8721/1209  
Telco Sociedad Limitada, Grevina 27  
Madrid, Spain. Tel. 1 231 7840

**Spain**

**France**

Reditec,  
62-66 Rue Louis Ampere,  
93330 Neuilly/Marne, France  
Tel. 300 96 30

**W. Germany**

Elmus GmbH,  
D1 Berlin 12,  
Henderstrabe 16,  
W. Germany. Tel. 030 312 20 12  
Acoustics Audio Import  
Curtiusstrabe 85  
4300 Essen 1. Tel. 0201 70 17 34

**U.S.A.**

(Brochure Service Only)  
Keith Monks Audio (USA),  
652 Glenbrook Road,  
Glenbrook CT 06906  
Tel. (203) 348-4969

**Raindirk Limited**

Downham Market Norfolk Tel. 03663-2165 Telex No. 817737

### Inovonics Model 500 Acoustic Analyser

Last month we published Hugh Ford's technical review of the Inovonics Model 500 Acoustic Analyser, and here we cover operational aspects of the unit in the recording studio environment.

IT HAS always been my belief that it is one's initial reaction to a piece of new equipment that provokes fair judge of it's worth. The Inovonics Model 500 Acoustic Analyser presents itself in a very pleasing buff coloured metal case with carefully finished rounded edges, a welcome consideration for those who have to transport this piece of equipment by hand. All the accessories are contained in the lid section, to which a carrying handle is attached, thus making it a completely self-contained tool.

With the lid removed it shows an uncluttered fascia incorporating the controls and screen, all the input and output controls being at the rear. A signal source at line level or from a microphone is fed into the analyser and displayed via an LED matrix on the main screen as seems to have become so popular with many instruments these days—additional linkage at the rear provides connection to an oscilloscope. This is presented as a graphic  $\frac{1}{3}$ -octave analysis covering the bandwidth 20Hz to 20kHz split into 30 frequency stages with an additional column displaying the full bandwidth—the graph's 'x' axis registering level in dB, and the 'y' axis that of frequency. Each frequency stage indicates an instant appraisal of the information received, rather than a cycled sweep between the bandwidth already mentioned. One of the practical applications of this kind of display can be to transfer it directly to a graphic equaliser, or similar device, thereby diminishing the chances of error that might well be incurred following a purely subjective analysis.

The instrument utilises a display of 13 by 31, 5mm LEDs set behind a smoked plastic screen, thus rendering them unseen until illuminated. Despite my strong preference for the use of CRT presentation, this is one of the clearer LED displays that I have seen. Under certain circumstances I found problems, especially when accurate readings were required at speed and one's line of sight was at an angle to the fascia, the difficulties increasing when the display was registering a wide range of level response. Take, for example, an input full frequency signal that has a dynamic range of some 30-35dB. It is impossible to read off the display within a greater accuracy than 3dB as the range has to be set to this figure to fully cover the signal under scrutiny—when I needed to check the levels for a more accurate reading I had to reduce the display range, consequently losing the extremes of the full picture. I feel that the greater accuracy that would be gained by incorporating more LEDs in the display, thereby increasing the bandwidth capability, would be a most beneficial and welcome modification—additionally a heavily printed line showing the -5dB mark would

have been helpful. The full band noise level is indicated by a separate LED column which must register at 0dB to obtain a precise reading of the input level, the amplifier's gain being shown by a numerical display situated to the right of the screen. Because this is a calculation of the collective display screen readings, I found when I had adjusted its presence to the 0dB line, the rest of the display LEDs were only just registering their presence at the bottom of the screen when covering large dynamic variations. This, to my mind, is not the most suitable means of indication and for this reason I would like to see two numerical displays used, one indicating the full band input level, the other showing the level attained by those frequencies present along the 0dB line.

To the screen's right are the main controls, logically laid out, making recognition and operating conditions a pleasant task. They utilise micro, momentary action switches, the main functions having an LED insert. Two of these switch banks are required to provide dual functions, real time frequency analysis and measurement of reverberation time. I found the manual level changing switches nice to use and the clocking time chosen for character level changes easy to control. Whilst measuring reverberation time some variations were noticed, this I can only attribute to the fact that the electronic gate on the output appears not to be of the zero point switching type and tends to produce variations of decay response. The clocked decay time for 10 readings of the same room in the same measuring position was rather uncertain so that a calculated average was the best result possible. I think that if tone burst measurements were to be taken, then readings would be far from correct and left more to luck than accuracy. Gain setting can be achieved automatically by instructing the unit to seek the full-band noise level at the 0dB line, thereby establishing a reference figure. As mentioned in the instruction manual, this can only be used more effectively when making initial settings for any one test since the amplifier tends to keep track of a continually changing source leaving it with no final resting place—however once it has arrived at a suitable point, it is a very easy matter to revert to manual control.

The scaling up the side of the screen shows a range from -9dB to +3dB and is extended by being multiplied or divided by one of the four electronic level settings that is programmed by the control switches. Although this presents no major difficulties I would have preferred the four full scales to have been printed on the fascia, and the particular one in use to be appropriately indicated to save time and possible error in readings.

The facility of storing information in a memory makes the device most flexible when used for comparison work. Unfortunately I found it easy to erase unrepeatable information by accidentally pressing the CLEAR MEMORY switch and would suggest that a safety feature should be introduced to this function making it more difficult to erase a memorised reading.

The analyser can generate its own pink noise using digital techniques and I read the pink noise by measuring the analyser's own output which proved the compatibility of the calibration in both noise and display.

In order to fully establish its capabilities during the tests I took the spectrum analyser to some London studios, the acoustic properties and responses of which I already had a good working knowledge. When used with a good capacitor microphone, I was able to utilise the analyser to good effect and found it interesting to work with, given my aforementioned reservations concerning the spacing and cover of the display.

Unfortunately no microphone is supplied with the unit which means that the initial calibration of the unit with a locally supplied microphone can not be accomplished without another calibrated level measuring meter. Again, one can not use the analyser to provide accurate specific frequency measurements without a calibration curve for the microphone in use, enabling corrections to be applied for microphone deficiencies (unless you can afford a microphone with flat response from 25Hz to 20kHz!). All these problems would be much simpler if a microphone were optionally supplied with a calibrated analyser.

Finally, it might be helpful to mention one or two other uses to which this unit can possibly be put. When preparing a master tape for cutting onto disc, the analyser used in its peak programme state could present any frequency anomalies that may cause excessive excursions of the cutting stylus that is normally controlled by limiting or, in severe cases, compression. This, used in conjunction with the normal equalisation processes, could prove most effective. During recordings a reading can be taken from any one output, the picture presented providing the engineer with a clear working formula. Indeed for quick analysis of many forms of equalisation this type of spectrum analyser is most time saving, the production testing of input-output frequency levels being completed in a fraction of the time spent on other methods.

Generally speaking, I found this piece of equipment to be one of the most flexible and easily operated analysers on the market at present, taking into consideration the limitations of producing any piece of equipment that is aimed at a particular level of the market. With the help of the instruction manual, it requires little experience to make good use of its potential, and with a few simple modifications to its accuracy and clarity in certain areas, it could well prove to be a serious competitor within its own field.

My thanks to Robin Black of Maison Rouge and Ossie Byne of Village Way Sounds for their co-operation. **Peter Smith**

# Classified Advertisements

Advertisements for this section must be pre-paid. The rate is 22p per word, minimum £4.40. Box Nos. 60p extra. Semi-display rates on application. Copy and remittance for advertisements in **JUNE 1979** issue must reach these offices by **6th APRIL 1979** 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.

## STUDIO FACILITIES

★Your tapes to disc. Vinyl pressings, sleeves, labels. In our own pressing plant. Top quality. S.a.e. for photo leaflet. Deroy Records, Cove, Dunbartonshire G84. X

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

★Disc Cutting Masters and Demos, Pressings, Cassettes, Mobile Recording Studio. Free brochure. TAM Studio, 13a Hamilton Way, London N.3. Tel. 01-346 0033. K

★Tape/Disc Master, Demos (Neumann lathe), Pressings, Cassettes. Mobile Recording Studio. Free brochure. Tam Studio, 13a Hamilton Way, London, N.3. Tel. 01-346 0033. H

## IF YOU NEED . . .

Cassette Duplication	Empty Tape Spools
Blank Cassettes	White Tape Boxes
¼" Tape	8T Cartridge Bodies
Leader Tape	Lubricated Tape
Splicing Tape	Head Cleaner Tape

Why not ring us on 01-399 2476/7 and let us quote you for your next requirements.

**MEDIATAPE LIMITED, 29a Tolworth Park Road, Surbiton, Surrey.**

01-399 2476/7

## SHORT-RUN CASSETTE DUPLICATING

Fast service: cost of cassette included

C32—49p each	MINIMUM QUANTITY
C60—62p each	10 COPIES
C90—78p each	(p. & p. extra)

S.a.e. for FULL PRICE LIST to:

**SIMON STABLE PROMOTIONS**

46 West End, Launton, Oxon. Tel. 08692 2831

## SERVICES

★Direct Tape Copying. One to One copying (not high speed). Highest quality, low rates. Masters or Cassettes. The Playback Studio, 01-267 6752/3. E

### STOCK CLEARANCE

AKG D590 microphones, new and boxed, each	£29 00
SG Brown 600 ohm mono headphones, each	£5 00
7" Tape Spools—boxes of 50, box	£7 50
V.A.T. and p.p. extra.	

**EOS ELECTRONICS A.V. LTD.**  
Weston Square, Barry CF6 7YF  
Tel: 0446 741212

### TAPE COPYING SERVICES

We specialise in short run cassette duplication.  
**NO JOB TOO SMALL**  
Fast turnround, reliable service  
**LOW COST**  
**STEREO—MONO—PULSED**  
01-723 6301 (Baker Street)

★Tape copying service. Open reel and cassette available. The Music Laboratory, 01-388 5392. X

★Studio equipment insurance. Full "All Risks" cover. Most competitive rates and terms. Also "Pop Group" equipment. Ring (0682) 386022/384374. F

★Pressings of classical quality (colour also) promptly manufactured from your Master-tapes. Sleeve printing, mailing service. Studio or mobile units for Master recording. Specify requirements to Mike Bull, Sound News Studios, 18 Blenheim Road, London W4 1ES. Tel. 01-995 1661. E

The attention of advertisers is drawn to "The Business Advertisements (Disclosure) Order 1977", which requires that, from 1st January 1978, all advertisements by persons who seek to sell goods in the course of business must make that fact clear. From the above date, consumers therefore should know whether an advertisement relates to a sale by a trader or a private seller.

HIGH SPEED CASSETTE COPYING IN MONO OR STEREO AT COMPETITIVE PRICES

Long or short runs.  
Blank cassettes supplied in bulk.  
A growing reputation for reliability.

**MORARD SOUND PRODUCTIONS**  
THORNTON HEATH, SURREY  
Telephone 01-689 7424

## BROADCAST CARTRIDGES

Large selection available ex stock.  
Competitive prices. Standard lengths.



Custom winding. Lubricated tape.  
Also full range of tape cartridge storage systems.

**JOHN A. STEVEN**  
Professional Recording Equipment  
Brentwood (0277) 215485

## SAVE ON UHER

4000 Report IC	£215
4200 Report IC	£255
4400 Report IC	£259
CR210 Stereo and Case	£279
CR240 Dolby	£289
CR240 AV	£299
Stereo Mix 500	£75

All Accessories available at discount prices.  
Please add V.A.T.

**INTERPHOTO EQUIPMENT LTD.**  
11 Castle Street, High Wycombe,  
Bucks HP13 6RZ  
Tel. 0494 41919

**SPR**

SPEECH RECORDING  
CASSETTE DUPLICATING  
OPEN-REEL DUPLICATING  
LANGUAGES/AUDIO-VISUAL

**SPEECH-PLUS RECORDINGS LTD**

32, PAGES WALK, SOUTHWARK, LONDON SE1 4SB.

01-231 0961/2

**CASSETTE FAST-COPYING**  
Stereo or Mono. High Quality. Prompt Personal Service.  
Also bulk supplies of excellent virgin cassettes.

**SOUND CASSETTE SERVICES Ltd.**  
P.O. BOX 2, GERRARDS CROSS, BUCKS.  
Tel. 02813 84409

**WANTED**

★Wanted. A main drive belt for my Siemens Stereo Tape Recorder, Model No. 14. Serial No. 140054 Transistor. Ray, 16 Albert Terrace, Whitley Bay, Tyne and Wear NE26 2DX. E

★Wanted. Revox and Teac Tape Recorders. Best prices paid. R.E.W. Professional Audio. 01-836 2372. X

★Tannoy GRF corner horns, good price offered for one pair in good condition, damaged ones considered. Tel. Mike 0473 49541. X

★Pair of JBL 4350's or Lockwood Majors, 3M's M79 stereo machine and 3M's M79 P.C. boards. Tel. 0203-21000. X

**COUNTY RECORDING SERVICE**

From your tapes we cut master discs, demo discs, using our Scully lathe fitted with the latest ME/76 UK stereo disc-cutting system.  
Dolby 'A', Dolby 'B' and DBX Noise Reduction.  
Telephone Bracknell (0344) 54935.  
London Road, Binfield, Bracknell, Berks, England

**CASSETTE COPYING IN THE MIDLANDS**

Specialists in short run productions. Prices from 1p per minute, inc. cassette and library case. Label and Inlay card printing, plus services and supplies for film, disc and AV productions.  
Write or phone for rate card to:  
**AUDICORD RECORDS**  
10 The Chapel, Shilton Road, Barwell, Leics LE9 8HB. Tel. 0455-47298 (24 hr. answering service)

**SITUATIONS VACANT**

**LONDON TOWN DISCOTHEQUES**

AUDIO ENGINEER REQUIRED TO ACT IN EXECUTIVE CAPACITY FOR FAST EXPANDING DISCOTHEQUE COMPANY.  
Excellent salary and prospects. 01 385 5521

**FINANCE AVAILABLE**

for investments connected with the music industry. We offer the best terms available. We know the business and are sympathetic to all enquiries. Contact:  
**J. GOLDRING—01-636 6363**

**FOR SALE—TRADE**

★New high speed cassette copiers available at substantial discounts. Wollensak/Alpha/Recorder, etc. Also available cassette loading machines and similar equipment. Typical saving is £250 plus on Wollensak 2770. Contact Geoffrey Yates, 01-363 6125. F

**WOLLENSAK**  
CASSETTE FAST COPIERS  
2770 mono & 2772 stereo, meticulously aligned.  
REDUCED PRICES

**SOUND CASSETTE SERVICES Ltd.**  
P.O. Box 2, Gerrards Cross, Bucks. SL97PH  
Tel. 02813 84409

★One Triad A Range Desk 30 in/16 group output/24 track monitoring plus extras. Available 1st September, 1979. Offers to 0608 2684. E

★One Master Room MR111 £850. Phone 0608 2684. E

★Two Calrec microphones 1050C £40 each. Phone 0608 2684. E

★Teac-Tascam. Sales, Service and Hire. The Playback Studio, 01-267 6752/3. E

★Revox Sales, Service and Hire. The Playback Studio, 01-267 6752/3. E

★JBL Monitors. 4301, 4311, 4315, etc. The Playback Studio, 01-267 6752/3. E

★Teac 3340S, A3440. In stock now. The Playback Studio, 01-267 6752/3. E

★Technics HiFi, Reel-Reel, Cassette Decks and Turntables. In stock now. The Playback Studio, 01-267 6752/3. E

★Add accurate level control to your mixer with the Cathedral LA3 comp/limiter module. Excellent performance at moderate cost. Build your own mixer with Cathedral low noise channel modules dispatched post free to any part of the world. Cathedral Sound Ltd., Fourways, Morris Lane, Halsall, Lanes L39. Tel. Halsall (0704) 840328. X

★Yorkshire. Erricks of Bradford. Tascam, JBL, Bose, AKG, Beyer, Calrec, Revox, Ferrograph Sales, Service, Exchanges, Leasing. 1st floor 8 Channel Studio Hire. Bradford (0274) 22972 (Roger). X

**SITUATIONS WANTED**

★Young English recording engineer, trained in Chicago, seeks work in European studio. Experience in all types of music. Iain Burgess, 520 Olive Hoffman Estates, Illinois 60194, U.S.A. E

★Physics/Electronics Graduate with Music Diploma and Audio Design/Development experience seeks Studio Recording work. Keen, literate, intelligent and industrious. Paul, 01-8635717. E

**FOR SALE—PRIVATE**

★680EL Stanton with spare stylus. Brand new, unused disco cartridge. £35. Phone Crowborough (089 26) 4364. E

★Telex 235 CSI series reef to cassette copier, excellent condition, £1,750 o.n.o. (+VAT). Telephone Bob Gittus (Chelmsford (0245) 83351). E

★The astounding new four track TEAC 3440 is available NOW from C.A.V.S. Ltd., anticipated list price £1,400 plus VAT. Our price £1,150 plus VAT. Phone Geoff Yates, 01-363 6125. H

★Electrosound Cassette winders. Offers invited. 0367 20262. E

★Ampex MM1100 8-track conversion kit for a 16 or 24-track recorder. Tape guides, hub spacers and head block with only one hour's use. Offers. 031-229 9651. E

★Three AKG C12A's, immaculate condition with PSU's, leads manual, original calibration charts. Small amount of private use only. £1,050. Tel. 01-629 8494, ext. 56. E

★Two Russco broadcast turntables. Two tape-caster instant start cart. Players (IREC/REP) Neal cassette player. Alice STM 6 Desk all built on console. £2,500. Phone 01-734 8121, ext. 21. E

**BULK BLANK CASSETTES**

Packs of 25: C-5 £10; C-10 £10; 50: C-20 £1125; C-30 £12.50; C-60 £15.50; C-90 £19.50. P. & p. £1.25 per pack.  
Packs of 100: C-5 £36; C-10 £37.80; C-20 £40.50; C-30 £45; C-60 £55.80; C-90 £70.20. P. & p. £3.75 per pack.  
Pack of 25 pairs Blank Labels 90p. All prices include V.A.T. All cassettes are loaded with high quality SCOTCH or AGFA tape including labels and inserts.  
**AUDIOGENIC LTD.**  
33-36 Crown Street, Reading (0734) 595447  
Also cassette duplication service

For Further  
INFORMATION

for

**STUDIO  
SOUND**

contact

**MIKE STORMER**

on 01-686 2599



# Sound International

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

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

There is no doubt **SOUND INTERNATIONAL** is a lively forum in the world of music and recording.

I enclose cheque/International money order, made payable to The Link House Group (Subscriptions) to the value of.....

Name .....

Street .....

City .....

County/State .....

Country/Zip Code.....

**Annual Subscription Rates:** UK £8.20. Overseas \$25.00

To: Subscription Manager, Sound International, Link House Holding Ltd., Link House, 25 West Street, Poole, Dorset BH15 1LL SS 7

## Mail Order Protection Scheme (Limited Liability)

If you order from mail order advertisers in this magazine and pay by post in advance of delivery, this publication (*Studio Sound*) will consider you for compensation if the advertisers should become insolvent or bankrupt, provided:

- 1) You have not received the goods or had your money returned; and
- 2) You write to the publisher of this publication (*Studio Sound*) explaining the position not earlier than 28 days from the day you sent your order and not later than two months from that day.

Please do not wait until the last moment to inform us. When you write, we will tell you how to make your claim and what evidence of payment is required.

We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the advertiser has been declared bankrupt or insolvent up to a limit of £1,500 per annum for any one advertiser so affected and up to £4,050 per annum in respect of all insolvent advertisers. Claims may be paid for higher amounts, or when the above procedure has not been complied with, at the discretion of this publication (*Studio Sound*) but we do not guarantee to do so in view of the need to set some limit to this commitment and to learn quickly of readers' difficulties.

This guarantee covers only advance payments sent in direct response to an advertisement in this magazine (not, for example, payments made in response to catalogues etc., received as a result of answering such advertisements). Classified advertisements are excluded.

# AUDIO PROJECT ENGINEERS

Philip Drake Electronics have vacancies for Project and Development Engineers to work on Talkback, Intercom and Programme Quality Audio Projects. Applicants should have relevant experience in the Broadcast and Audio Industry, and a knowledge of digital techniques would be an advantage. We are a small expanding company offering a considerable variety of work and good career prospects. An attractive salary will be offered.

Contact Alan Brill at:

**PHILIP DRAKE ELECTRONICS LIMITED**  
23, Redan Place, London W2 4SA  
01-221 1476

Modern 16 Track Pop Recording Studio in the heart of Hamburg, West Germany, is looking for a young British

## RECORDING ENGINEER

with good knowledge of modern recording techniques, Audio Electronics and some experience in multi-track recording and mixing.

Freelance work with a high guarantee or fixed employment possible.

Box No. 804

A leading London recording studio requires a junior Technical Engineer to assist in the development and maintenance of its operation.

Position requires good technical background and practical abilities.

Box No. 803

## THE OPEN UNIVERSITY

# AUDIO VISUAL TECHNICIAN ASSISTANT SOUND RECORDIST



This post will involve the preparation of master tapes of tutorial material for subsequent distribution to students on mass produced cassettes or discs. There will also be a considerable amount of more general work in the field of audio such as the recording of seminars, etc., at locations remote from the Open University.

The successful applicant will be expected to have had substantial experience in the recording and editing of speech and music at a professional level.

Salary on the scale: £3,186-£3,720 p.a. (under review).

Application forms are available from **The Recruitment Office (MH3408/1), The Open University, P.O. Box 75, Walton Hall, Milton Keynes MK7 6AL** or telephone **Milton Keynes 63405**; there is a 24 hour answering service on 63868.

Closing date for applications: 27th April, 1979.

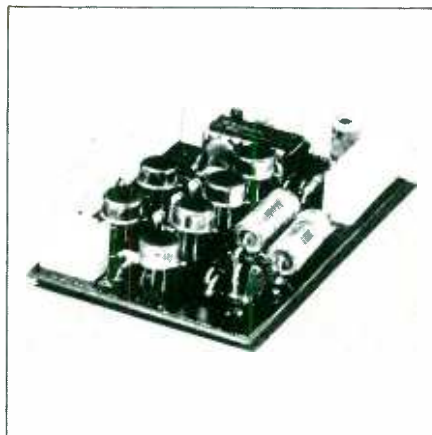
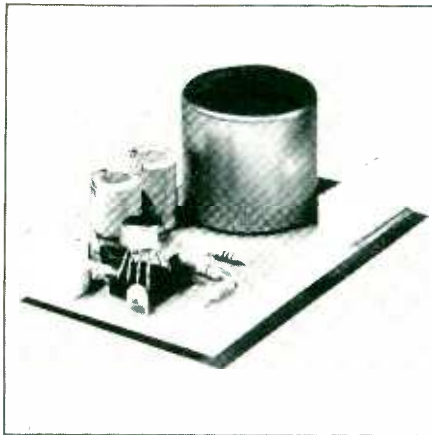
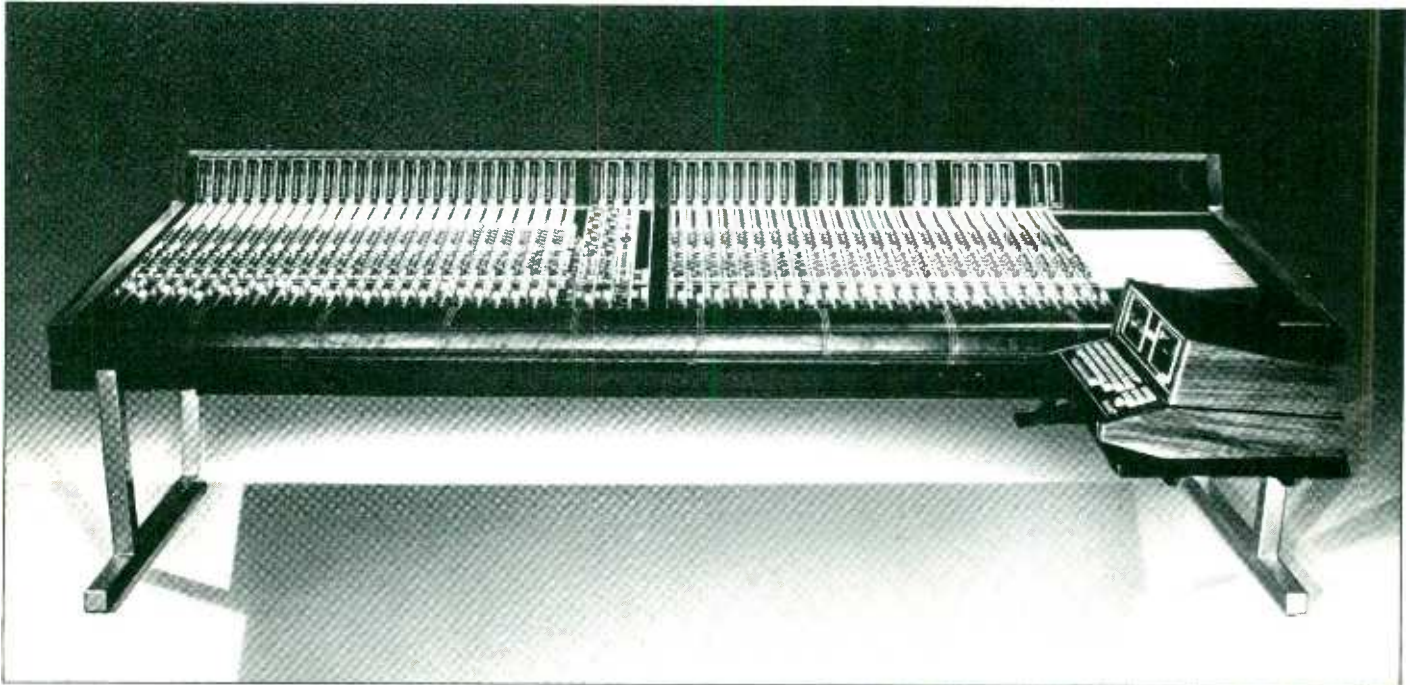
# INDEX

<b>A</b>		<b>G</b>		<b>P</b>	
Acoustical Manufacturing .. .. .	9	Grahams Electrical .. .. .	75	Plus 30 .. .. .	23
A.K.G. .. .. .	4	Granet Communications .. .. .	50	Protex Fasteners .. .. .	10
Alice .. .. .	18			Publison .. .. .	55
Allen and Heath Brenell .. .. .	29	<b>H</b>		<b>Q</b>	
Amity Schroeder .. .. .	20	Harrison .. .. .	IBC	Quad 8 .. .. .	43
Aphex .. .. .	48, 49	High Life Productions .. .. .	37		
APRS .. .. .	14	<b>I</b>		<b>R</b>	
Atlantex Music .. .. .	33	ITA .. .. .	11, 13, 15, 17	Raindirk .. .. .	89
Audio & Design (Recording) Ltd. 10, 82, 83				Revox .. .. .	23
Audio Developments .. .. .	19	<b>J</b>		REW .. .. .	6, 7
Audio Kinetics .. .. .	18	J.B.L. .. .. .	84, 85		
Audio Technica .. .. .	71	<b>K</b>		<b>S</b>	
Audix .. .. .	22	Kemble Organs .. .. .	39	Scenic Sounds .. .. .	25, 27, 33
		Klark Teknik .. .. .	OBC	Shure Electronics .. .. .	45
<b>B</b>				SME .. .. .	61
B.G.W. .. .. .	57	<b>L</b>		Solid State Logic .. .. .	41
		Larking, Don .. .. .	77	Sound Communications .. .. .	79
<b>C</b>		Lee Engineering .. .. .	77	Sound Recording Plant .. .. .	81
C.A.E. Ltd. .. .. .	80	Lennard Developments .. .. .	23	Sound Reinforcement Services .. .. .	12
Cathedral Sound .. .. .	23			Studio Equipment Services .. .. .	18
Chrom Audio .. .. .	8	<b>M</b>		Subjective Audio .. .. .	22
Court Acoustics .. .. .	75, 77, 79, 81	Magnetic Tapes .. .. .	12	Synton .. .. .	67
		Midas .. .. .	IFC		
<b>D</b>		Millbank .. .. .	35	<b>T</b>	
Dominus .. .. .	86	Mustang Communications .. .. .	10	Trad Electronics .. .. .	8
		MXR .. .. .	47	Trident .. .. .	16
<b>E</b>				Turnkey .. .. .	53, 72, 74, 76
Eardley Electronics .. .. .	21	<b>N</b>		<b>W</b>	
Elektroimpex .. .. .	79	Neal Ferrograph .. .. .	65	White Instruments .. .. .	75
				<b>Y</b>	
<b>F</b>		<b>O</b>		Yorke, James .. .. .	81
Feldon Audio .. .. .	5, 63	Ortofon .. .. .	87		
Formula Sound .. .. .	17	Otari .. .. .	51		
Future Film .. .. .	7				
F.W.O. Bauch .. .. .	73				

STUDIO SOUND is available without charge to qualified readers: these are directors, managers, executives and key personnel actively engaged in sound recording, broadcasting and cinematograph industries in any part of the world. The Publisher reserves the right to refuse applications considered inappropriate and restrict the number of free copies sent to any one company or organisation. Non-qualifying readers can buy STUDIO SOUND at an annual subscription of £9.50. All enquiries to: Subscription Department, Link House, Robert Rogers House, New Orchard, Poole, Dorset BH15 1LU. Tel. Poole (02013) 71171. Published by Link House Magazines (Croydon) Limited on behalf of the proprietors Link House Publications Limited, Robert Rogers House, New Orchard, Poole, Dorset BH15 1LU and printed by Arthurs Press Ltd., Woodchester, Stroud, Glos. GL5 5PB.

## SOME COMPANIES GIVE YOU A PRICE THAT SOUNDS GOOD. HARRISON GIVES YOU A CONSOLE THAT SOUNDS GOOD!

And "good sound" is what our business is all about. That's why we build consoles with *you*, the engineer and studio owner, in mind. We use the highest quality components and circuit designs in our consoles. These give you maximum reliability and the cleanest and quietest possible sound. The almost unlimited flexibility of a Harrison console gives the recording and balance engineers the opportunity to be truly creative. Quality, reliability and flexibility. Others talk about these features... Harrison delivers them in every console. Harrison consoles, a sound investment.



HARRISON Model 4832, 48 input channels, 32 output channels, with Harrison AUTOSET automation programmer.

Now, Harrison also gives you a choice. Console Models 4832, 4432, 4032 and 3232 are available with your choice of microphone preamplifiers: with or without input transformers.

For further information regarding the complete line of Harrison consoles and automation systems, please contact the Harrison professional audio dealer in your area:

**AUSTRALIA:** SONTRON INSTRUMENTS, MELBOURNE • **AUSTRIA:** STUDER-REVOX, WIEN • **BELGIUM:** SAIT ELECTRONICS, BRUXELLES • **BRAZIL:** LAREX ELECTRONICA, RIO DE JANEIRO • **CANADA:** J-MAR ELECTRONICS, TORONTO • **DENMARK:** QUALI-FI, KLAMPENBORG • **EASTERN EUROPE:** STUDER INTERNATIONAL, REGENSDORF, SWITZERLAND • **FAR EAST:** STUDER-REVOX, HONG KONG • **FINLAND:** INTO, HELSINKI • **FRANCE:** STUDER FRANCE, PARIS • **GERMANY:** EMT FRANZ, KIPPENHEIM • **GREECE:** ELECTRONICA, ATHENS • **ITALY:** AUDIO PRODUCTS INTERNATIONAL, MILANO • **JAPAN:** SHINDENSHI MANUFACTURING, TOKYO • **MEXICO:** ACCURATE SOUND, REDWOOD CITY, CALIFORNIA • **NETHERLANDS:** HEIJNEN, GENNEP • **NORWAY:** AUDIOTRON, OSLO • **SPAIN:** NEOTECHNICA, MADRID • **SWEDEN:** ELFA RADIO & TELEVISION, SOLNA • **SWITZERLAND:** STUDER INTERNATIONAL, REGENSDORF • **UNITED KINGDOM:** SCENIC SOUNDS EQUIPMENT, LONDON

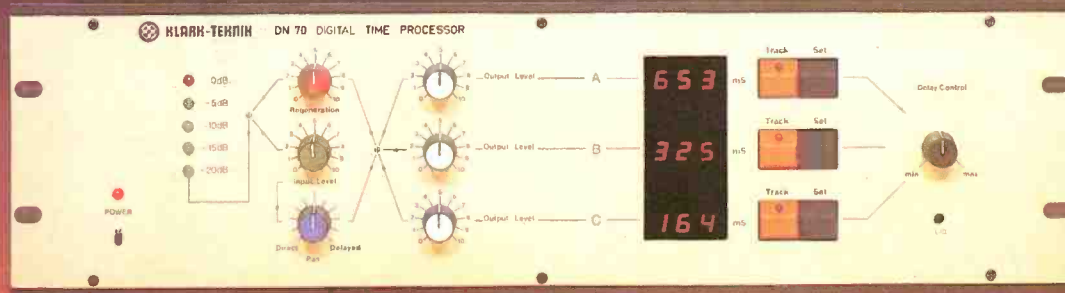
### EXPORT AGENT:

Audio Systems International  
128 North Highland Avenue  
Los Angeles, California 90036  
Tel: (213) 933-2210 • Telex: 686101

### FACTORY:

Harrison International Corp.  
Post Office Box 22964  
Nashville, Tennessee 37202  
Tel: (615) 834-1184 • Telex: 555133

# The new DN70 digital time processor.



## What a performance.

The DN70 is the first of a new generation of digital products from Klark-Teknik, designed for the discerning professional user.

It's years ahead of its time.

Miles ahead of all its competitors.

And offers a performance which cannot be beaten.

The secret lies in the A-D convertor, the heart of any digital system.

The DN70 is the ultimate in today's technology, the result of years of research and development.

- Digital readout in milliseconds of time delay of each output.
- Three maximum delay options. 163mS, 326mS and 652mS.
- In-house designed analogue-to-digital convertor, giving superior distortion and noise performance.
- High clocking speed of 50KHz, enabling frequency response to 15KHz on all delay options.
- High value digital word - quasi 15-bit using a 12-bit linear plus 2-bit instantaneous flying comma system, allowing the quantizing noise to be virtually eliminated.
- Mains fail-safe. The three main outputs are strapped directly to input in the event of power failure.

- Mixing and regeneration controls on the front panel are provided.
- Perpetual memory of delay settings for permanent or semi-permanent installations.
- Lockout switch - to stop tampering or accidental re-setting of delay times.
- Full control of digital processing available at remote socket.
- Any output can be momentarily set to zero delay time without affecting the actual delay settings.
- High technology semiconductor memory. The 652 option uses 28 x 16K bit Random Access Memories.
- Input level indication, allowing full use of dynamic range.



## KLARK-TEKNIK

You know it's the best.

For further information about the DN70, our new DN34 analogue time processor and also our DN27 & DN22 graphic equalisers:

Klark-Teknik Research Limited, Summerfield, Kidderminster DY11 7RE, England.

Telephone: Kidderminster (0562) 64027 Telex: 339821.

Worldwide Distributors: AUSTRALIA: Klarion Enterprises, S. Melbourne. BELGIUM: A.R.C. Sprl., Bruxelles. CANADA: Hammond Industries, Toronto. DENMARK: Teamsound, Helsingør. FRANCE: R.E.D. Studio Centre, Paris. GERMANY: Hausman Concert Electronics, Berlin. HOLLAND: Pieter Bollen, Eindhoven. ITALY: Laboacustica Srl., Roma. JAPAN: Continental Far East Inc., Tokyo. NORWAY: Siv. Ing. Benum, Oslo. NEW ZEALAND: General Video, Wellington. SINGAPORE: Ultralinear International. SOUTH AFRICA: Colosseum Acoustics, Johannesburg. SPAIN: Mabel Sdad., Barcelona. SWEDEN: SATT Elektronik, Stockholm. SWITZERLAND: Dr. W. A. Gunter, Zürich. TAIWAN: Yang's Audio Visual, Taipei. USA: Hammond Industries, S. Gosset, NY.