

# studio sound

February 1982 £1

AND BROADCAST ENGINEERING

LINK HOUSE PUBLICATION



**Metering  
Interconnection  
Test equipment & maintenance**

# SOUNDCRAFT SERIES 800 MORE FOR LESS

The Soundcraft Series 800 is the answer for any pro who's always wanted more console... but didn't have the space. A Series 800 can give more console in less space to the recording engineer... the sound-mixer... or performing musician. And, with the new emphasis on sound for mobile video recording, a Series 800 can be the perfect fit in a cramped van!

The Series 800 is a compact 8 buss console available in 18, 26 or 32 input mainframes and can be configured for recording, sound reinforcement or stage monitoring... with no compromises in performance or quality. In fact, the Series 800 is built using the same quality components that go into the Series 2400.

Compact usually means a little board with no features. But, the Series 800 with 18 inputs and 8 outputs, 4 band EQ on all inputs, and a host of other features you want, can fit in the smallest 16-track studio or production van, because it takes just 3 1/2 feet of space. The 32 in/8 out frame takes less than 6 feet!

Naturally, the compact size of the Series 800 makes it ideal for sound reinforcement or stage monitoring, too. You don't need a Summo wrestler to haul them around like some of the Oriental brands. Besides savings roadies' backs, they save stage or audience space, too.

See one of these selected Soundcraft dealers today and have him demonstrate a Series 800 for you. It will give you more of everything you want... for less.

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**FRANCE:** Publison, Tel: 01 357 6408

**GERMANY:** Hausmann Concert Electronic,

Tel: 030 433 6097; Thum & Mahr Audio,

Tel: 021 734 1600; GTC Studiotechnik,

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**SOUTH AFRICA:** Tru-fi Electronics S.A., Tel: 838 4930

**SWEDEN:** Tal & Ton Gothenburg, Tel: 80 36 20

**SWITZERLAND:** Professional Audio Systems A.G.,

Tel: 504151

**THAILAND:** Bangkok Cine/Graphic Center,

Tel: 02 75387

**U.K.:** Turnkey, Tel: 01-440 9221



## Soundcraft

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# studio sound

## AND BROADCAST ENGINEERING

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PUBLICATION



MEMBER OF THE AUDIT  
BUREAU OF CIRCULATIONS

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### Keeping it all going . . . and more

With the seemingly ever-increasing sophistication of modern audio equipment, it must be very difficult being a maintenance engineer. It's all very well if a channel on your nice, standard console or multitrack goes down: at the very least you (or the recording engineer even) can simply swap modules to keep the session going. But what do you do when the gala computer-based automation system goes out to lunch in the middle of the master mix? At least modern systems of this type do not have the habit of taking your ears out as well by turning *all* the VCAs up to full gain when data is lost, but there's still the problem of what to do to keep things moving and avoid losing the client after the dreaded event. Some mixes these days are so complex that it could well be impossible to do a decent job without the automation. And while it would not be foolish to suggest that if this is the case, you should have planned the session better in the first place, so that those synthesiser tracks didn't suddenly turn into recorders, tubular bells and syndrums every few moments, this does not get you out of the immediate problem of what the hell to do next!

'What the hell you do next', of course, is to pick up the internal phone and shout "Help!", and this is where you discover that the maintenance department is also out to lunch or, more common these days, there isn't one. It is a sad fact that, in the name of economy—nay, survival—many studios, even top-class ones, have been forced to lose their maintenance staff, relying instead on freelancers to come along and do the dirty work every so often as required. Engineers are relied upon to line up the machines for the session and at least know how to produce a fault report (otherwise known as white *Chinagraph* marks on the offending knobs). Engineers lining up tape machines is no bad thing, of course, and they should also be capable of isolating and

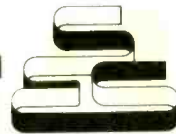
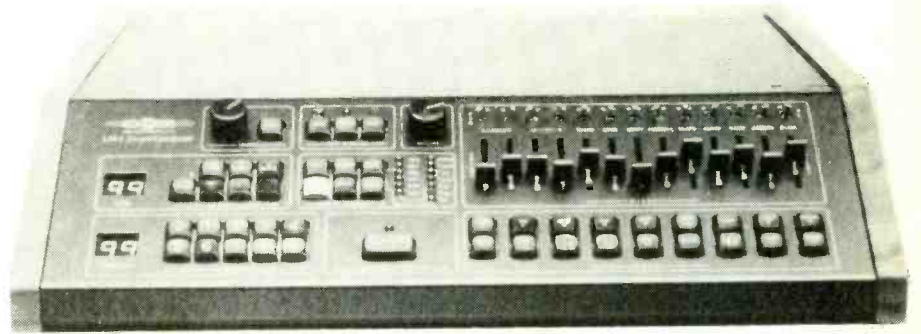
replacing a duff module. But they cannot be expected to repair the automation, and even if they know where the 'isolate' switch is, this may not actually help very much. More than ever, therefore, manufacturer backup is a necessary prerequisite, because as Murphy and his corollaries well know, everything that can go wrong, will, and the more sophisticated the equipment, the more 'wrong' it can go. It pays to be very friendly to your manufacturers and distributors, so that you can sneak their home phone numbers and call them up at 3.30 in the morning to come down and repair your ailing Z-80 (6502s, 6800s and 6809s, by the way, also go wrong, they just do it *faster*). Until all studios work normal office hours, you will need that 24-hour 'faultline' which your manufacturer, I hope, can offer you in your area.

Even if you haven't lost your maintenance staff yet, it still pays to have gear whose maker or distributor offers this kind of backup. Quite simply, Mr Maintenance is unlikely to be an analogue audio expert *and* a computer expert, and even if, as is likely, he has a microcomputer at home with which he dabbles, like as not his little ZX81 bears nothing more than a passing resemblance to your studio's InterGalactic MacroGoogolplex-based automation system.

Despite this, the passing of the good old maintenance department is rather sad, and roll on the day when economics permit them to darken the studio doors with 1kHz tones, soldering irons and the hallowed words 'Ampeg Reproduce Alignment Tape Zero-One-Dash-One . . . ' once again. A good maintenance department in the Old Days didn't just keep it all going: it also made those nice little boxes which all the engineers love to have at 45 minutes notice. Apart from making sure that sound came out at all, and that clients were happy with it, they also contributed a vital part of your studio's Sound. We still need them today, more than ever.

Richard Elen

# Drum Kit wi fingertap



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The new Linn Drum machine's better. Still no sticks attached. But then you don't need them. You let your fingers do the drumming. Just tap a button, even for the clash of the cymbals or the rap of the rimshot.

And it's all in real time. The Linn has real drum sounds digitally recorded and stored in memory. No synthesised sounds either - they're real drum beats, like actual congas, toms, snare, hihat,

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Operating the Linn is surprisingly simple. Unpack it, plug it in and you're ready to play. You'll be laying down rhythm tracks in a matter of minutes. All you do is hit 'record' and let your fingers do the drumming.

Come to 20 Conduit Place and try the Linn. You'll find it's fingertappin' good!



Syco Systems Ltd 20 Conduit Place London W2 Tel 01-723 3844 for an appointment.



## ELECTRO-VOICE RE 20. THE MICROPHONE MOST HIGHLY PRAISED IN RECORDING STUDIOS.

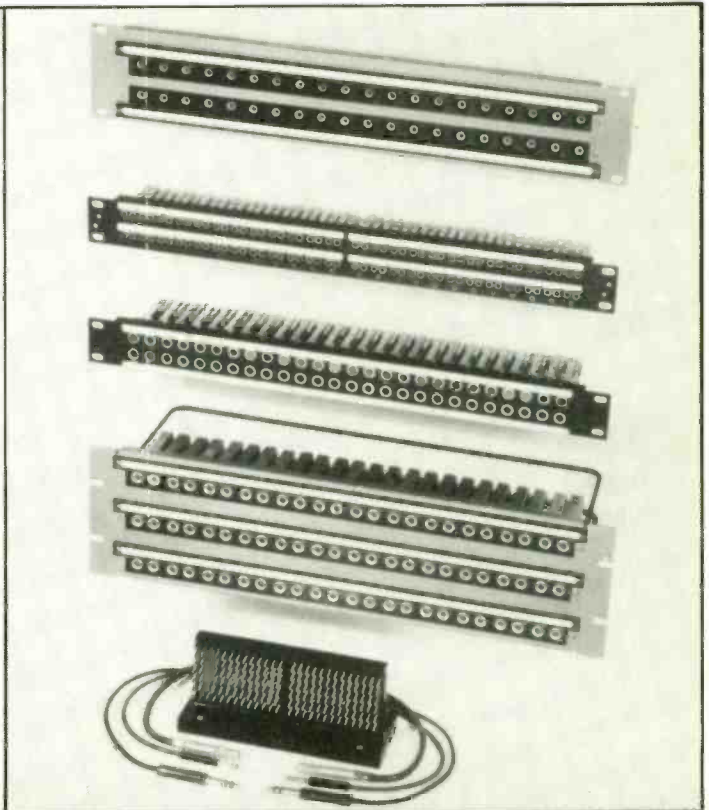
The studio-microphone RE 20 is a cardioid microphone of the variable-D-series, i. e. incorporating the patented system that avoids proximity effect and reproduces the true sound. It was especially developed for broadcasting, recording studios and sound reinforcement applications and therefore features an essentially flat frequency response, a very wide frequency range, an excellent transient response and numerous further sophisticated qualities appreciated in recording studios. It is, therefore, not surprising that more and more recording studios so highly praise the various Electro-Voice microphones. Why not ask for further particulars from Gulton Europe Ltd., Electro-Voice Division, Maple Works, Old Shoreham Road, HOVE BN3 7EY.

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# MUSIC LAB HIRE

## TAPE RECORDERS

	DAY	WEEK
Revox B77	15	45
Revox PR99	20	60
Uher Report 4200	10	30
Teac A3440	20	60
Tascam 80-8	40	120
Soundcraft 382-8	75	225
Tascam 85-16	80	240
Soundcraft 762/16	150	450
Teac M144 Portastudio	12	36
Tascam 122	10	30
Teac 133AV	10	30

## MIXERS

Alice 828	10	30
Alice 1228	12	36
Soundcraft 1S	25	75
Teac 2A	8	24
Tascam M35	15	45
Studiomaster 8-4	15	45
Allen & Heath 16-4-2	15	45
Soundcraft 800	60	180

## NOISE-REDUCTION

Dolby 361	10	30
DBX 150	8	24
Bel BC3-2T	8	24
Bel BC3-8T	15	45
Teac RX9	10	30

## COMPRESSOR-LIMITERS

DBX 160	8	24
DBX 165	12	36
MXR Dual Limiter	10	30

## DIGITAL DELAY

Delta Lab DL1	10	30
Delta Lab DL4	15	45
Lexicon PCM 41	15	45
Lexicon 93 Prime Time	20	60

## ANALOGUE DELAY

MXR Flanger/Doubler	10	30
Roland Space Echo	10	30
Roland Chorus Echo	12	36
Bell Multi Adt	4	12

## REVERBERATION

Master Room XL-305T	15	45
Lexicon 224	75	225

## SPECIAL EFFECTS

Bel BF 20 Flanger	12	36
MXR Pitch Transposer	12	36
Delta Lab DL5	15	45
Eventide H949 Harmonizer	25	75

## EQUALISERS

Klark Teknik DN 30/30	10	30
Klark Teknik DN 22	10	30
Klark Teknik DN 27	10	30
MXR 2 x 15 Graphic	8	24
MXR 1 x 31 Graphic	8	24

## AMPLIFIERS

Quad 405	8	24
Bose 1800	18	54

## MIXER-AMPLIFIERS

Bose PM 2	20	60
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## CROSSOVERS

Brooke Siren 320	10	30
Brooke Siren 340	15	45

## LOUDSPEAKERS

Auratones Cubes	2	6
Portawedge Monitors	3	9
Bose 802'S	15	45
Mega 12-10	15	45
Tannoy LRM	15	45
Tannoy Super Reds	18	56

## Microphones (Dynamic)

AKG D12	3	6
AKG D222	3	6
AKG D330	3	6
Shure SM57	3	6
Shure SM58	3	6
Sennheiser 421	3	6
Sennheiser 441	3	6

## MICROPHONES (CONDENSER)

AKG C451/CK1	3	9
AKG C451/CK8	5	15
AKG C451/CK9	6	18
AKG VR1 Extension Tube 18"	1	3
AKG VR2 Extension Tube 36"	2	6
Neumann U47	10	30
Neumann U87	10	30
Neumann KM84	5	15

## MICROPHONE SUNDRIES

Table Stand	1	2
Upright/Boom	1	3
Microphone Combiner	1	3
Microphone Splitter	1	3
Direct Injection Box	1	3
Neumann Power Supply/1 Way	1	3
Neumann Power Supply/2 Way	2	6
AKG N66E Power Supply/6 Way	5	15
Additional Microphone Leads		1
Stage Box 12 Inputs/3 Returns	5	15
Stage Box 24 Inputs/3 Returns	6	18
Cable Drums	2	6

## VIDEO RECORDERS

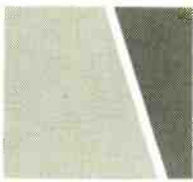
Sony 'U' Matic 2631	25	75
Sony Betamax C7	15	45
JVC VHS	15	45

## VIDEO MONITORS

Sony KV 1400	10	30
Sony 7210 72" Projector Screen	75	225

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# 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

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- WIDE RANGE SIMPLEX POWERING includes DIN 45 596 voltages of 12 and 48 Vdc.
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# OTARI MX 5050 Mk III-8



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## 1/2" 8 Track

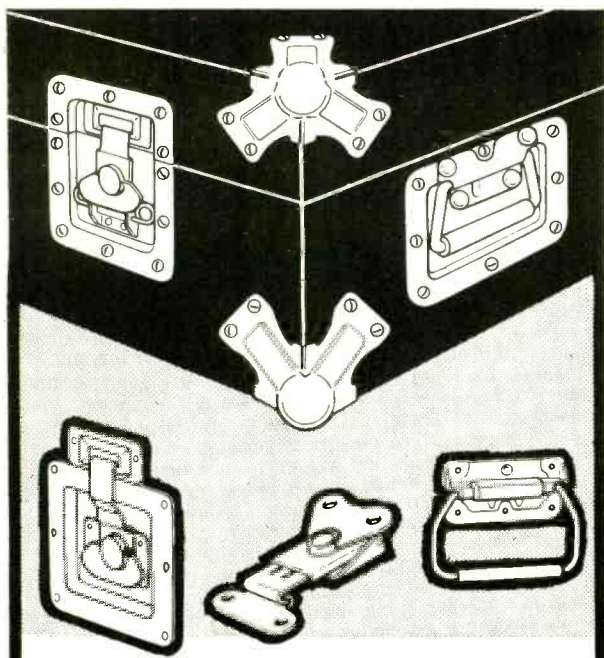
**From Otari a new, fully professional compact 8 track recorder. Bearing the Otari hallmark of superb performance and reliability, this is truly the ultimate 1/2" 8 track — at a non-ultimate price!**

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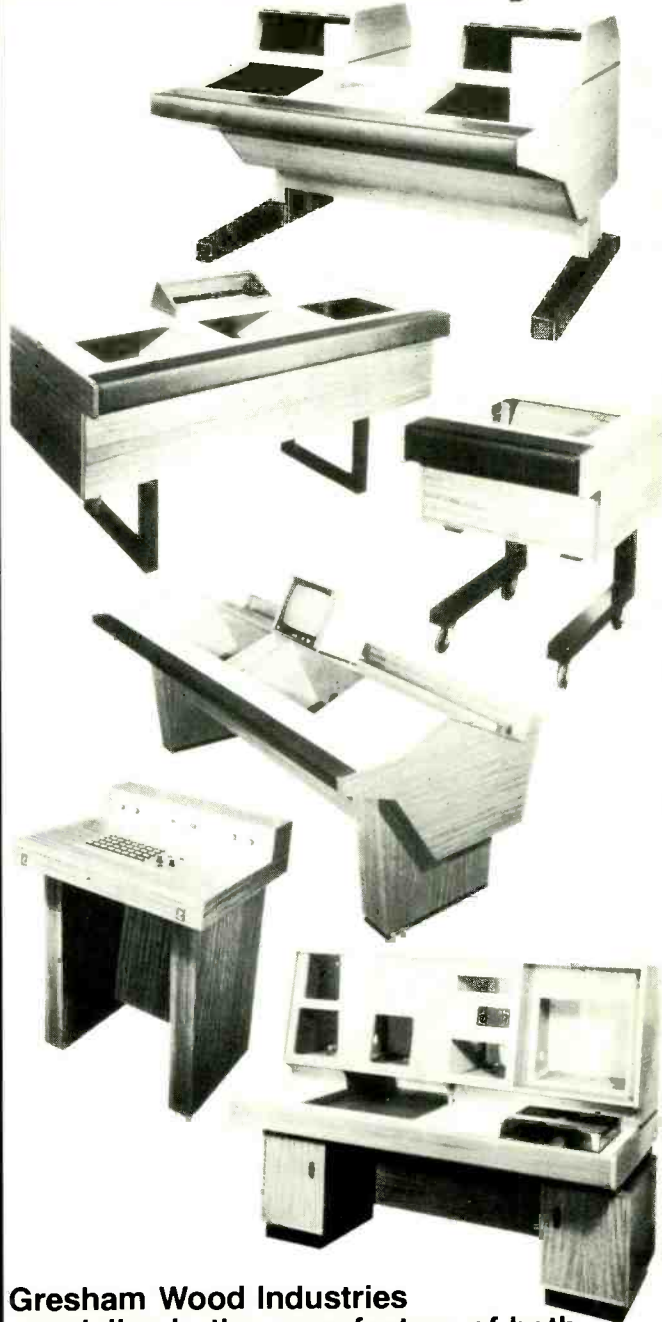
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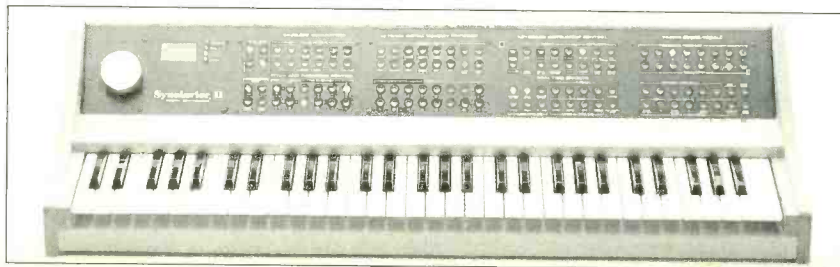
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And you'll be pleased to hear that all these innovations have resulted in a system which is about half the price of our competitors.

The AEG-Telefunken MX80 and MX80a — the new breed of PCM recorders.



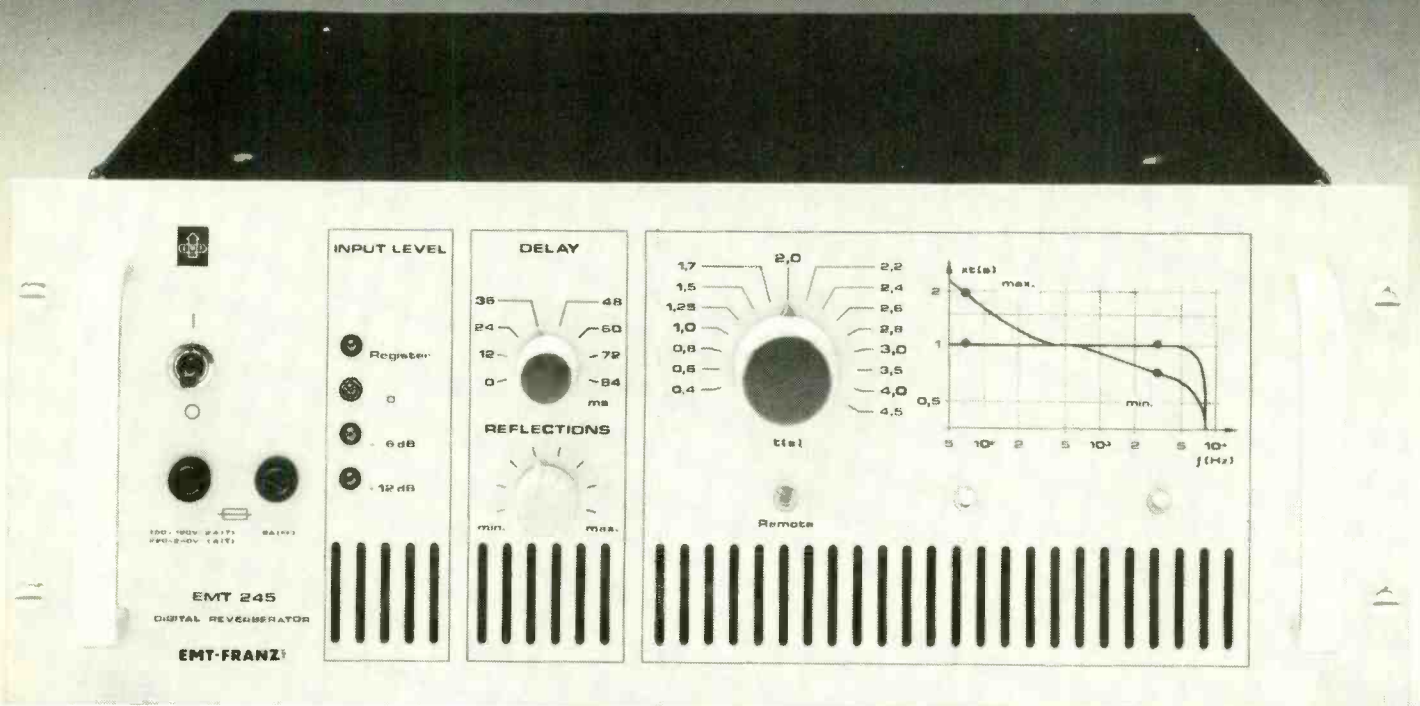
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### MX 80 MX 80a

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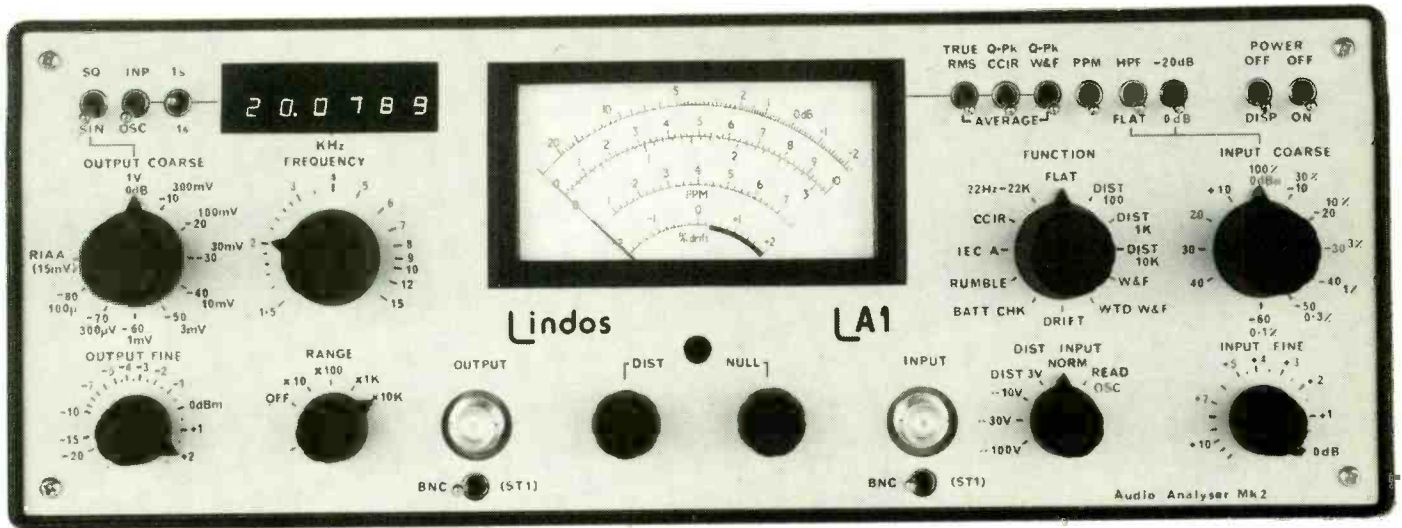
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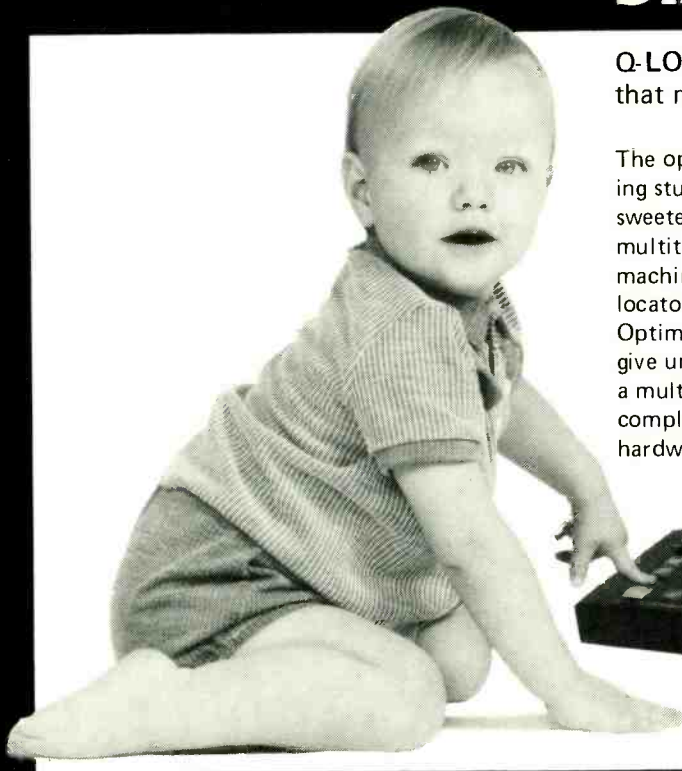
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Console version



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- Precision five L.E.D. level indicator on each input module.

- Eight group outputs plus separate stereo master outputs.
- Long throw conductive plastic faders on both inputs and outputs.
- Comprehensive monitoring facilities including monitor pan, monitor level and mute for each group output/machine return.
- Full sub-grouping facilities.
- V.U. metering as standard, L.E.D. column P.P.M.'s available as an option.
- Can be 'Fadex' automated at any time.
- Frames can be joined together both electrically and mechanically to make larger systems.
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#### Trident Worldwide Representation:

**U.S.A.** Studio Maintenance Services, Los Angeles. Tel: 213-877-3311  
Wilson Audio Sales, Nashville. Tel: 615-794-0155  
Trident (U.S.A.) Inc., 652 Glenbrook Road, Stamford, Connecticut 06906 U.S.A. Tel: 203-348-4969

**Australia** John Barry Group, Sydney. Tel: 2-439-6955

**Belgium** A.S.C. Professional Audio Consultants, Brussels. Tel: 2-520-0827

**Canada** Heintl Electronics Inc., Markham, Ontario. Tel: 416-495-0688

**France** Lazare Electronics, Paris. Tel: 1-878-62-10

**Holland** Dick Swaneveld, Hilversum. Tel: 35-17722

**India** Kapco Sound Studio, New Delhi. Tel: 43718

**New Zealand** Mandrill Recording Studios, Auckland. Tel: 9-793222

**Norway** Protechnic A.S., Oslo. Tel: 2-46-05-54

**S.E. Asia/China** M.B.L. Audio Ltd., Hong Kong. Tel: 5-931006

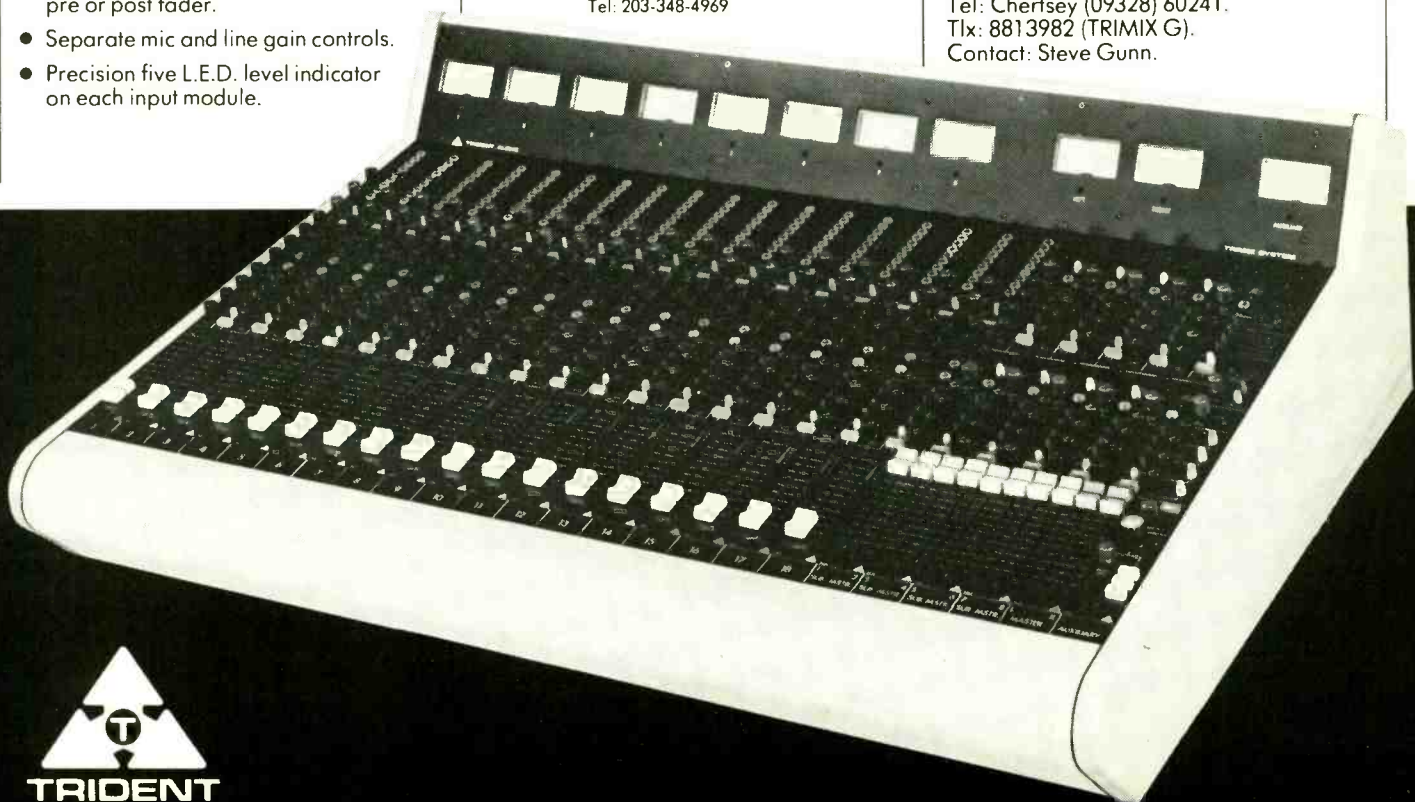
**S Africa** Leephy (Pty) Ltd., Blairgowrie 2194, Johannesburg. Tel: 11-789 2424

**Sweden** Stoge & Studio, Gothenburg. Tel: 31-22-40-90

**Taiwan** Linfair Engineering & Trading Ltd., Taipei. Tel: 3214454-7

#### Trident Audio Developments Ltd.

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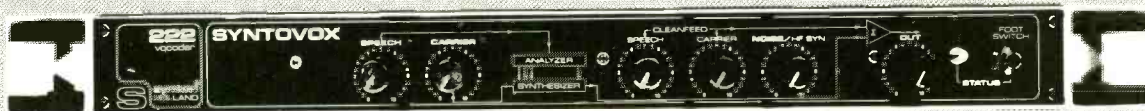
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# the future of 4 track

The Fostex Multitracker is a Personal Recording Studio, that challenges the quality and facilities of open reel.

## Separate but together?

Mixer and recorder work as one but you can use them independently. The mixer is four in, four out, with gain, tone, echo and pan. The four track tape deck has remarkable features.

## How about noise?

Sound quality is astonishing. The latest Dolby 'C' circuitry achieves a drama-



tic 71dB signal to noise ratio. It's performance you would expect from open reel. And there's more. Dolby's new system has side benefits that result in tighter, more transparent recordings.

## Full function four track?



There are no restrictions, all four tracks can be recorded at once. Any input can be switched to any track. Or plug into the recorder direct, from another mixer, to add more channels or to capture a live performance.

## Is ping-pong possible?

Selsync is fully automatic, and you can bounce adjacent tracks with quality. With a little forethought, you can perform the ten track bounce with hardly any noise build up.

## It's a solenoid transport?

The high speed, two motor design is microchip



controlled, with varispeed and a digital counter plus return to zero. It's all there to speed your creativity.

## Why a footswitch?

Have you ever tried to work a tape recorder while playing an instrument? With the Multitracker you simply preselect the tracks you want to overdub or correct, then run the machine in 'record ready' and hit the footswitch on cue.

## Are four inputs enough?

The whole point of multitrack is to record a tune a part at a time. With one or two musicians, four is plenty. When you overdub, the inputs are used over again.

## Is monitoring complicated?

An automatic 'monmix', switches between live and signal already on tape, depending on which tracks you select for record. All you adjust is level. You can also check the stereo mixer output for quality and balance.

## How about effects?

Your echo unit connects to the 'aux' send and return sockets. You can

also use limiters, equalisers etc or existing pedal effects.

## Why Personal Multitrack?

The Fostex Multitracker, and each product in the range is designed for musicians and songwriters. Easy to use and own. We don't believe you need to go into the studio business to own the tools of your trade.

**Visit a Fostex Dealer and discover the remarkable Multitracker for yourself. It will make you think twice about open reel.**

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## Castle Containers

Vulcanised Fibre (TR) Ltd has supplied us with details of a range of custom built vulcanised fibre containers suitable for use with audio equipment. The containers are claimed by the manufacturers to be "as tough as old boots" despite their light weight; have reinforced bases and heavy duty end and front carrying handles: are non-static; and are



impervious to petrol, oil and grease. For added protection of equipment the Castle containers also feature girth straps and snap fasteners, plus foam padded interiors. Full details of the container range are obtainable from: Castle Containers, Vulcanised Fibre (TR) Ltd, Bridge Mills, Hadfield, via Hyde, Cheshire, UK. Phone: 04574 3184/5. Telex: 668761.

## ILR news

The IBA has released details of planned improvements to the ILR radio service to be financed from the 'secondary rental' payments accruing from the current financial year. From the total budget resources of some £3.07 million, the bulk of expenditure (some £2.1 million) is to be devoted to the task of expanding the ILR system, with the forward transmitter building programme and associated site and equipment costs accounting for this sum. The remaining budget is to be allocated as follows: £233,000 to general projects, including contributions to the cost of sharing programmes within ILR, support for the Parliamentary broadcasting service, and various bursaries; and £738,000 for the provision of live and specially recorded music, the provision of educational coverage, the provision of management and broadcast training, and for local community service coverage.

A number of new ILR stations have recently commenced broadcasting, bringing the total number of ILR stations on air to a total of 33. New additions are Essex Radio (Southend/Chelmsford) which commenced broadcasting on September 12; Chiltern Radio (Luton/Dunstable) commencing on October 15; West Sound (Ayr/Kilmarnock) commencing on October 16; and Radio West (Bristol) which commenced broadcasting on October 27. Looking to the future, two applications have been received for the Newport (Gwent) franchise from Gwent Area Broadcasting and ISCA Radio Ltd. A decision on the award of this franchise is not expected until the early part of 1982.

## Altec restructure

Altec has announced that the Corporation is to offer for sale its facility and associated real estate located at Anaheim, California. This move which is designed to give the company a sounder financial base and more modern facilities and equipment, will entail relocating the bulk of the company's activities to its newer manufacturing plant in Oklahoma City. This plant will combine the Anaheim loudspeaker assembly and associated machining

## Swedish contract for Calrec

Calrec Audio has received a contract worth over £70,000 from Swedish Television for two communication sound control desks utilising digital control of the audio functions. These custom designed desks are 16-channel, 16-group film dubbing desks with VCA channel faders and a central microprocessor logic system designed around an *Exorset 30* computer. Features of the desks include an in-built self-testing program allowing instant checking of all processor and automatable functions; new style ergonomic design of the panel configuration; and the ability to operate with multitrack tape machines via timecode synchronisation. Calrec say that these desks will form the design base for a new standard range of sound control desks, termed the *M Series*, to be introduced during the coming year.

operations with the automated manufacturing techniques already at the Oklahoma City production facility. Altec will still retain a base in southern California, however, as its electronics fabrication and assembly, engineering, marketing and other support functions will be relocated to a smaller facility some ten miles from its present headquarters. Additionally, the company's warehousing and customer service departments are to remain at Orange, California.

## NEAL-Ferrograph developments

As many of our readers will know, North East Audio Ltd was put into the hands of a Receiver earlier this year, with the result that the future availability of the NEAL range of cassette machines and the Ferrograph range of tape machines and test equipment was put in some doubt. Readers will, however, be pleased to learn that the product ranges will continue to be available following the setting up of a number of new companies staffed by ex-NEAL-Ferrograph employees.

With regard to the Ferrograph range, a new company, Ferrograph Spares and Service, has been formed to manufacture and supply spare parts for all Ferrograph products, a service department additionally having been set up. A further company, Ferrograph Recorders, is now manufacturing the tape machine range, while the Ferrograph test equipment range has been acquired by Park Naval Engineering Ltd of Blackburn, Lancashire. Although

the test-equipment range is being manufactured in Blackburn, it will be sold and marketed through a new company, Ferrograph Instrumentation.

With regard to the NEAL range, this has been purchased by Lee James Electronics Ltd, a new company formed by Alan Helliwell and Duncan Mitchell to continue to manufacture the current range. Sales and marketing of NEAL products is being undertaken by yet another new company, Audio Video Marketing Ltd.

Addresses for the following companies, Ferrograph Recorders, Ferrograph Instrumentation, Ferrograph Spares and Service, and Audio Video Marketing Ltd, are identical: Unit 21, Royal Industrial Estate, Jarrow, Tyne and Wear NE32 9XX. Phone: 0632 893092. Telex: 537227.

The American distribution of the NEAL and Ferrograph ranges remains unchanged: NEAL-Ferrograph (USA) Inc, 652 Glenbrook Road, Stamford, Connecticut 06906, USA. Phone: (203) 348-1045. Telex: 643678.

## Digital standards breakthrough

The first step towards an industry standard for digital recording has been taken with an agreement between major digital manufacturers on sampling rates. Agreement was reached between the major manufacturers, including Soundstream, Sony, Studer, 3M and Ampex, at the recent AES 70th Convention in New York. The present agreement, which has also been sanctioned by the EBU and SMPTE, covers only sampling rates, but this is regarded by many observers as a key factor in the acceptance or otherwise of digital recording techniques and equipment, although some commentators have suggested that it is too early to crystallise digital parameters in view of the rapid development of this field. The two sampling rates decided upon are 44.1 and 48kHz; the latter is recommended because of its apparent compatibility with film, video and broadcasting, while 44.1kHz has been adopted additionally, no doubt a contributory factor being that this frequency has been decided upon for the Philips/Sony *Compact Disc*. Many of the technical research chiefs present at the meeting, on November 2, hailed the agreement as a breakthrough, leading to the true establishment of the 'digital age'.

Several manufacturers are making arrangements to adjust their equipment to the 48kHz professional standard, including Sony, with their 24-track digital recorder, currently running at 50.4kHz. Soundstream and 3M are also ready to move from the early 50kHz rate to the new standard, while Mitsubishi have yet to decide on a change from 50.4kHz, although they are likely to follow suit. It should be remembered, however, that more than sampling rate standardisation must be achieved before direct interconnection of different makes of machine becomes possible.

## Soundfield loan

Calrec Audio has announced that Whitetower Records are now operating a *Soundfield* mic loan service. This service it is hoped will encourage producers and engineers to try out the mic system for coincident stereo recording or to explore the possibilities of UHJ 2-channel Ambisonic recording. Prices for the loan package are approximately £30 per day, and full details of the service are available from Mike Skeet, Whitetower Records, 2 Roche Gardens, Bletchley, Milton Keynes, UK. Phone: 0908 73969. 22 ▶

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Judge for yourself. Some swear it's a trick, others swear by it. Aural excitement is a patent psychoacoustic process that corrects for generation loss. If you programme or produce music, you should discover how the EXR improves separation, enhances music and adds loudness.

## Auratones

Listen on a legend. A compact British amplifier is now available to drive Teak and Road versions for personal monitoring.

## Goldline Analyser

A price breakthrough in hand held analysers. Built in microphone displays signal on a 10 by 10 LED matrix. Kit includes a white/pink noise for rapid alignment of equipment and sound systems. Now you can trim controls and see the results.

## Annis Magnetometer

Play safe. Point the base of this precision instrument at tape path components and any residual magnetism registers on the scale. It's the only way to be sure you are not damaging precious masters.

## Wright Microphone

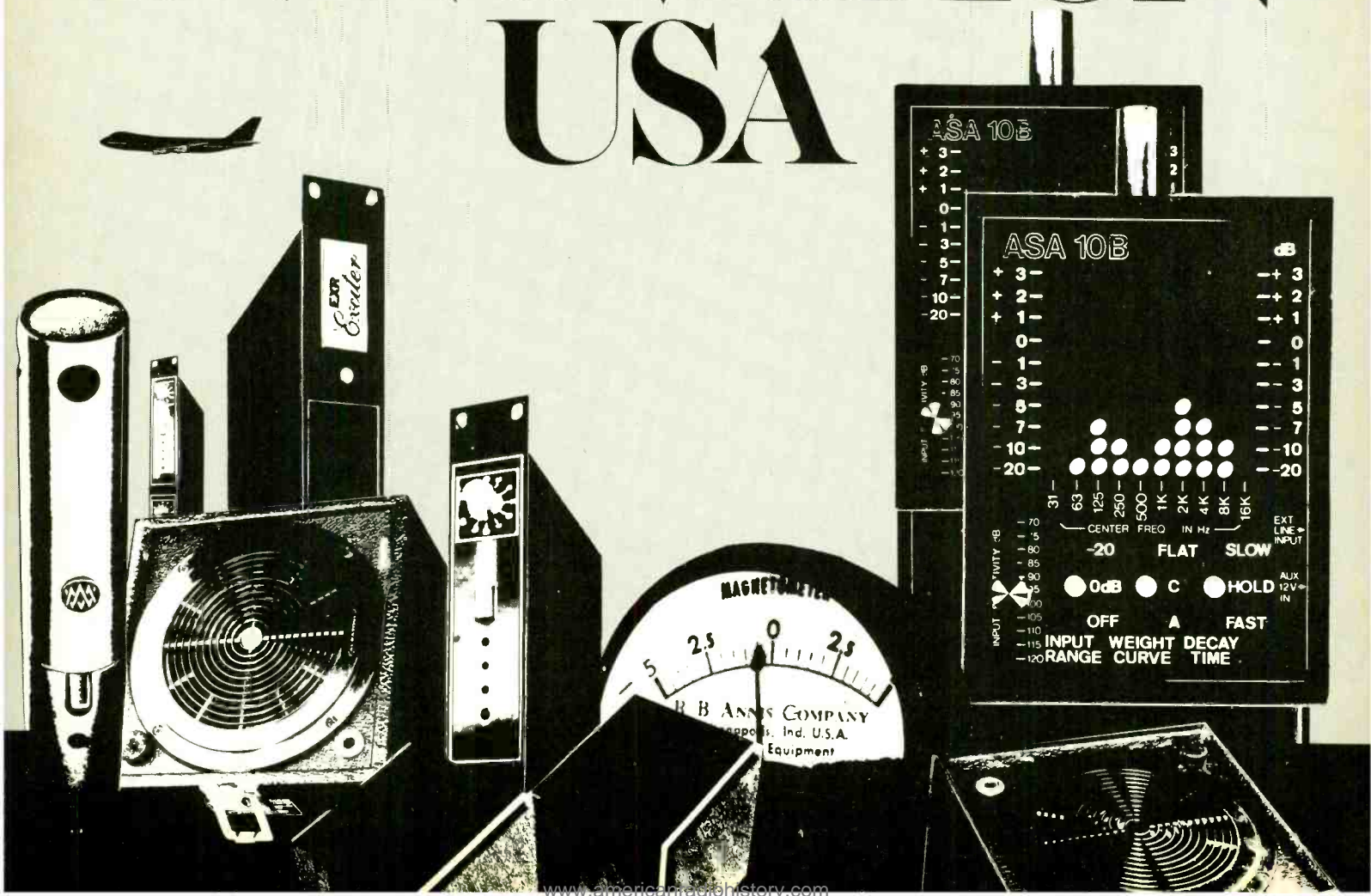
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# INNOVATION USA



## DRC consumer digital

The Digital Recording Corporation and its subsidiary, Soundstream, have announced the successful testing of a laboratory prototype domestic digital playback system which could ultimately become a strong competitor to the Philips/Sony Compact Disc. The system, which sounds as if it was developed in 1991 rather than today, is based on a photographically-produced film-like record, in the form of a card 3 x 5in in size. A laser is used to scan the card, the beam being modulated by the stored information. This is then converted into an audio signal. The card offers 1hr of playing time 'per layer'—whether this means a single layer per card, modulating the beam by transmission through the card, or a reflective

system where both sides may be used, is uncertain. Either two or four audio channels are available. The preliminary information received indicates a 50kHz sampling rate, with the proviso that the system can be adapted to any future standard frequency; in view of recent developments, we may expect a final sampling rate of 48kHz (see *Digital Standards Breakthrough*). The coding is 16-bit linear, in common with most other manufacturers, and dynamic range is quoted as greater than 90dB. The frequency response is given as 0-22kHz although this will, of course, depend to a certain extent on the sampling rate. THD is quoted as 0.004%, although all these specifications must be presumed to be preliminary, as DRC do not expect to market the system until the

autumn of 1983. At present, the company is seeking joint development arrangements with other companies, and preliminary discussions have already taken place.

The primary selling points of the system, besides its somewhat futuristic concept, obviously include the reduction in mechanical complexity offered by a fixed record—which will make for easy manual or 'auto-changer' operation and design—and the potential for low-cost mass-production. One can even contemplate an 'instant camera' for copying... The 'postcard digital record' is an exciting idea, but it will remain to be seen whether or not sufficient marketing pressure and multi-manufacturer agreements will be developed to give it a fair hearing and consumer acceptance.

## Paramount Pictures

Paramount Pictures Corp has announced the establishment of a technology division to concentrate on the research and development of new techniques and equipment for its motion picture and television activities. Headed by Edgar Johnson and Charles Conaty, the new division is already involved in a number of research projects including motion picture sound, computer graphics, satellite distribution, digital editing and high resolution video.

## Lindos Electronics

In our November 1981 issue (*New Products*) we gave an incorrect phone number for Lindos Electronics. The company can be contacted on: Eyke (03947) 432. Our apologies to Lindos for the error.

## Agencies

● Melkuist Ltd has appointed two overseas agents for its *GT800* automation system. In the Western USA, Studio Maintenance Services, North Hollywood, California has been appointed with Electro-Media Systems appointed as sub-agents. In Europe, Cadac (Holland) BV has been appointed as Melkuist's Dutch agents.

● Brooke Siren Systems has announced that Klark Teknik Electronics Inc, 262A Eastern Parkway, Farmingdale, NY 11735 (Phone: (516) 249-3660), are now handling the company's products in North America.

● Eastmill Ltd has been appointed UK agent for the range of power amplifiers produced by French manufacturer Sertec. Eastmill Ltd, Unit 8, Worton Hall Trading Estate, Worton Road, Isleworth, Middx TW7 6ER, UK. Phone: 01-568 4646.

● The King Instrument Corp which manufactures audio tape cassette loading machines has extended its sales and service coverage to all Asian countries. Westrex Orient, headquartered in Tokyo, has represented the company in Japan and Korea but has now expanded its operations to cover the additional countries of the Philippines, Singapore, Malaysia, Indonesia and Thailand. In addition to the above Westrex Asia continues to represent King in Hong Kong and the Peoples Republic of China, while Linfair Engineering and Trading Ltd, based in Taipei, has been appointed as the company's agents in Taiwan.

● The Travis fader and digital attenuator produced by Sphere Electronics are to be made available in the UK through London-based distributor, Feldon Audio. Feldon Audio Ltd, 126 Great Portland Street,

London W1N 5PH. Phone: 01-580 4314. Telex: 28668.

## Address changes

● Audicord Records has moved to 59 Mayfield Way, Barwell, Leicester LE9 8BL, UK. The company's telephone number remains unchanged: 0455 47298.

● Eastmill Ltd has moved to Unit 8, Worton Hall Trading Estate, Worton Road, Isleworth, Middx TW7 6ER, UK. Phone: 01-568 4646.

## Contracts

● Brabury Electronics has received a contract worth approximately £35,000 to install video distribution and interface equipment and high level audio distribution equipment at the Royal Opera House, Covent Garden.

● Philip Drake Electronics has installed a complex studio talkback system, built to BBC specifications, at the BBC's Glasgow Studio B television studio.

● Aphex has supplied its first *Aphex II* broadcast aural exciter units to the following American radio stations: WLUP-FM Chicago; KDAY-AM Los Angeles; KVIL-FM Dallas; and WRKS-FM New York.

● Aphex Systems has announced the sale of its *Aural Exciter* to the China Central Broadcast System in the People's Republic of China.

● FWO Bauch recently equipped Radio Aire, the new Leeds ILR station, with *EMT 948* turntables, ITC cart machines, and a variety of Studer and Revox tape machines, plus a Studer *Telephone Hybrid*. Similar equipment has also recently been supplied by the company to Centre Radio (Leicester), Chiltern Radio (Luton/Bedford), Essex

Radio (Southend/Chelmsford), Radio West (Bristol) and Radio Ayrshire.

FWO Bauch has also supplied The Manor Studios with Melkuist VCA controlled faders to update the Manor's Helios console.

● Melkuist has supplied Goldstar Recording, Hollywood, with a VCA fader system for the studio's Trident *TSM* console. Melkuist has also just installed its first *GT800* console automation system in Japan, on a 32-input Trident *Series 80* console fitted with a *Fadex* fader system, at Tokyo Kohgakuin Studio.

● The Bee Gees and their co-producers Karl Richardson and Albhy Galuten have purchased a Sony *PCM-1610* digital audio processor and two Sony *BVU-200B* recorders for use at their Middle Ear recording studios.

● Cetec Gauss has supplied cassette duplication systems to CBS UK; EMI South Africa; CBS Mexico; KGC Magnetics, Australia; Tapecom, Stamford, Connecticut; Golden Cassette, Taipei; and PT Metro, Jakarta, Indonesia.

● Calrec Audio has just completed the installation of a complete programme sound system for television studio B at BBC Manchester's New Broadcasting House. The contract worth £500,000 included installation, a 28-channel sound desk, the PA system, ancillary equipment and studio wiring.

## People

● The Otari Corp has appointed John Carey to the position of product manager with particular responsibility for the technical training of Otari's sales representatives and dealer networks.

● Martin Luddington has been

appointed marketing manager of 3M UK's Recording Materials division.

● EECO has appointed Karen Mills as product specialist, broadcast and video products marketing, with responsibility for new product planning, and sales and technical support.

● The Sony Corp has appointed Philip Stack as senior vice president, Sony Video Products Company, with responsibility for the sales, servicing and merchandising divisions of the Sony Video Communications division, Professional Audio division and Special Projects.

● Fostex Electro-Acoustic Systems, a division of Interlake Audio Inc, has appointed Paul Gardocki as vice-president, marketing and development.

● Geoffrey Mendenhall has been appointed vice-president, engineering with responsibility for research and development, by Broadcast Electronics Inc.

● Octopus Audio, the Canadian recording studio service organisation, has appointed Frank Morrison to head its new sales division.

● Robert Tourkow has been appointed sales engineer for RTS Systems.

● Derek Roughton formerly with Ferrograph and AKG Canada, has joined the sales team of AKG Acoustics.

● Peter Clark formerly with MCI in London, has left to become a freelance maintenance engineer. Peter can be contacted on either 01-380 1125 or Epsom 23074.

● Capital Radio has appointed Peter Jackson as its new chief engineer with Clyde Martindill as deputy chief engineer. Former chief engineer Gerry O'Reilly has left Capital to set up IMCP, a company promoting concerts for Independent Local Radio. ■

# For Altec it's all systems go!

Altec, the greatest name in professional loudspeaker systems is now exclusively distributed in the U.K. and Ireland by Rank Strand Sound.

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Rank Strand engineers can help you plan and install total sound, lighting, a/v and cinema systems incorporating amplifiers, mixers, projectors and all associated control equipment.

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# Studiofile:1

## Windmill Lane, Dublin

A government grant of over £¼ million for a recording studio — is such a thing possible? Yes, in Ireland. We first reported on Windmill Lane studios in Dublin two years ago (*Studio Sound*, February 1980). Their 24-track studio had then been open a year. Lombard Sound was the first 24-track in Dublin, Windmill was the second. Windmill was opened on money raised from the banks by the three partners, Brian Masterson, James Morris and Meiert Avis. This followed an unsuccessful bid for financial aid from the Southern Ireland Industrial Development Authority. But after two more years of negotiation Windmill Lane persuaded the IDA that they really were 'manufacturing' and thus eligible for a capital grant to aid further expansion. Windmill is now to get 25% of £1.3 million, their original estimate. Although the estimate has now inflated to £1.5 million the grant stays at the previously agreed level.

The IDA is a go-ahead body, set up by the government and financed by public money but not part of the Civil Service. The IDA brief, since 1958, has been to stimulate an industrial revolution in Ireland. Remember that the South has been independent from Britain for more than fifty years, and is still predominantly an agricultural country but Ireland has the fastest



Current video editing suite—not yet broadcast standard but soon to be upgraded with the help of an Irish Government grant

industrial growth in Europe. This has been stimulated by the generous tax relief and capital grants available from IDA. It pays to manufacture in Ireland; and record, as well.

Windmill Lane finally persuaded the IDA to come up with the grant because the studios had proved they could survive the hard way. The original £½ million borrowed from the banks is still being paid off. They also convinced the IDA that improvements to the Windmill Lane facilities, especially bringing the video editing facilities up to broadcast standard, would keep valuable work in Ireland.

Currently around 50% of Windmill's vision work turnover goes to the

UK, in bills paid for film editing services. This is because the Dublin studio so far only offers off-line (standard *U-Matic*) facilities which the British and Irish TV companies won't accept for broadcasting. The £1.5 million improvement scheme will include transfer to a new building in nine months' time and installation of 1in C-format video and Rank Cintel tele-cine equipment. Currently Windmill are using an old 35mm projector where it used to be used to screen films for the British royals!

The sound studio and control room remain pretty much as described in our previous piece. Business, they

say, is good, with the studios in use for 80 or 90 hours a week. This follows a clever policy of charging £45 an hour for normal peak rate recording but £20 an hour for demo recording throughout the night, with a tape op engineering. The band doesn't get to keep the tape, so there's no hidden charge here. The studio provides a cassette or 7½in/s copy. If the band wants to issue the demo commercially, they pay the difference (£25 per hour) and buy the tape. The studio is also used for film dubbing during two hours early each morning, when most musicians are still in bed.

The only puzzle is why Windmill Lane still has no plans to install a disc cutting room. The upgrade to on-line or broadcast quality video is intended to keep pre-production work in Ireland, because a lot of work now handled on film with the aid of British lab facilities can in future be transferred to video and handled in-house. But Windmill send all their disc cutting work to Britain, because there is only one cutting facility in Ireland which they seldom use. So why not install a cutting room as well as broadcast video? The answer is that: "It's too hard to earn money that way — it's even hard to earn money out of sound recording." Is this a pointer to the future for other studios?

**Windmill Lane Studios, 4 Windmill Lane, Dublin 2, Eire. Phone: 01-713444. Barry Fox**

## The Chicago Recording Company, Chicago

In many ways, Chicago is a city of contradictions. It is the third largest city in the US (Los Angeles beat it out of second place only in the last census), with a thriving folk and blues scene, a healthy rock community, and what is arguably the finest symphony orchestra in the country. Yet, little major-label recording goes on in Chicago, as compared with much smaller towns like Nashville or San Francisco.

In spite of that fact, the city manages to support a large number of recording studios, some of which, like The Chicago Recording Company, can compete in quality and sophistication with the best facilities in the world. How? Well, the Chicago metropolitan area is home for some of the largest consumer-oriented corporations in the Western world, and they just love to make commercials.

"The jingle business supports lots of local musicians", explains operations manager and engineer Hank Neuberger, "so even though most of our work is in advertising, we do a lot of local record business with some great musicians." The two 24-track rooms devote about half of their time (mostly evenings) to

record projects, and the rest to commercial clients, while the four 4-track production studios are used almost entirely for advertising, industrial, and audio-visual work. McDonald's, Bisquick, Coca-Cola, Schlitz, United Air Lines, and Kellogg's are among the giant companies that do much of their media work here, and some of the major music clients that have passed through have been Steve Goodman, John Prine, The Ohio Players, and Ramsey Lewis.

Chicago Recording is the brainchild of Alan Kubicka, 31, a local wunderkind who started his own jingle and production company in his bedroom at the tender age of 14. By the early '70s, Kubicka had built a Hidley-designed, MCI-equipped, 16-, then 24-track studio on to his parents home in the Chicago suburbs. In August, 1975, he opened what is now Studio A at the present location in the heart of Chicago, making it the first 24-track studio in the city.

That first room featured a Flickinger console, which now resides in Studio B, probably the best-equipped 4-track room in the world. "Actually," Neuberger says, "we plan to update B to 24-track this fall, and add another small 4-

track room. Even though we replaced the Flickinger with an automated MCI *JH-532* in A, we still love the old board. It's a discrete console, which has all sorts of advantages. One of the reasons we can keep it going is that our chief engineer, Cleon Wells, was one of the original Flickinger designers."

Studio A was originally a Hidley design, but it has been extensively modified. The original quad monitoring system has been taken out, and the 'duck lips' were removed from the remaining speakers to cut down on dispersion and tighten the imaging. The control room in A is now totally MCI-equipped. "Our supplier, Jerry Milam, tells us that we have more MCI equipment than anyone else in America," notes Neuberger. The studio features a Bosendorfer 92-key *Imperial* grand piano, which is a favourite of artists like Earl 'Fatha' Hines and Jerry Butler.

Studio B, where the Flickinger board now lives, was originally set up as a 'European' room, with a Cadac desk and monitors, and a Studer tape deck. The monitors and tape machine are still in place.

Between the studios is a dubbing room, in which, boasts Neuberger, "... we can go from anything to

anything." There are four Teac cassette decks, a high-speed open-reel duplicator, four Teac open-reel machines with ¼-track heads, two MCI decks with both half- and full-track heads, and a 35mm mag stripper. "All of our MCI stereo machines have extra mono heads and an extra set of electronics", notes Neuberger. "This saves us from having to keep dedicated mono machines around, and also from realigning every time we switch into mono."

Studio C was built in August, 1977, and broken up into two 4-track post-production rooms, C1 and C2, in December, 1980. The suite is in the same building as A and B, but has a separate entrance at the rear. This can be advantageous, particularly when all of the rooms are in use, as it avoids that 'traffic-jam in a factory' feeling. The two Studio C's are similar, featuring the ubiquitous MCI tape decks and JBL *4311* and *Auratron* monitors. One of the rooms has a Neotek console, the other a custom board with Omni-Craft modules.

The amount of auxiliary equipment, much of which floats between the various studios in the building, is breathtaking. The music

26 ▶



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**Mike Llewelyn-Jones** Francisco de Rojas 9, 2DER, 9 Madrid 10 Tel: Madrid 445 1301  
**Audio Vertrieb Peter Strüven GmbH** Hamburg Tel: Hamburg 5245151

# Studiofile:2

## Chicago Recording cont'd

rooms, according to Neuberger, average about ten limiters each at anyone time, and include units by Allison, UREI, A&D (both *Scamp* and *Complex*), Omni-Craft, and some old Fairchild stereo tube limiters. Other equipment includes a full range of Eventide and Lexicon gear, as well as custom built panners and other goodies. Reverb is handled by *EMT 140s* and *240s*, Master Room springs, and *AKG BX-20s*. There are also several stairways that can be used as live chambers.

Dolby is rampant, and Neuberger explains that all of the jingle sessions are recorded at 30in/s with noise reduction. At record sessions, the Dolby is usually pulled out. The microphone collection, as one might expect, is extensive, and features such golden oldies as *AKG C12s* and *C12As*, Neumann *U47* tubes, and some very rare Neumann *U249s*.

A block away from Studios A, B, and C, located in what used to be a film theatre, are the relatively independent studios D and H, which opened in October, 1980. H is a very well furnished production room, featuring a Sphere discrete 24/16 console, Altec 604 monitors, and banks of MCI 4- and 2-track decks. The engineer sits between the console and the tape machines, at right angles to, and several yards away from, the overdub booth. The producers have a desk immediately in front of the glass, so that they can communicate directly with the performers without stumbling over the engineer, who whirls around between decks and desk on a wheeled chair.

Studio D is Chicago Recording Company's showplace. The board is a 32-input Cadac, set up for automation, but so far lacking the computer. It has 4-band parametric eq on each channel, eight group masters, six effects sends and eight returns, and comprehensive internal rerouting capability. There are eight (count 'em) cue feeds, and the studio has designed a fleet of portable mixing boxes so that each musician can set up his own headphone mix, complete with channel localisation.

Monitors built in the wall are Cadacs and UREI *813 Time Aligns*. There is a Panasonic 1/2in video cassette deck with plenty of monitors and Panasonic's video controller, which allows for frame-by-frame scrutiny, both in forward and reverse. "We don't do any final video lock-up here," Neuberger explains. "We do have SMPTE capability, but we use it mainly for 46-track audio. Using it on video would be overkill for us, and we'd have to pass the costs along to the clients.

"When we do post-scoring on a film, we just line up the cue marks



Control room (inset) and studio D showing drum booth and bassists' platform

and go. We have instant-start machines, so we rarely run into any sync problems with a 60s spot. As a matter of fact, after the rhythm tracks are done, we often don't even look at the picture any more.

"We try to stay in the audio end of things, and let the composites be

handled by somebody else who can specialise in that."

The music room in Studio D actually consists of two large rooms and three isolation booths. Furthest from the console is the string room, a very live rectangular space, with mirrors covering one wall. The rear

wall of the room is slightly more absorbent, and is used as a 'cello alcove'.

A set of glass sliding doors and a set of heavy drapes separates the string area from the main room, which is trapezoidal in shape. The big room has areas of carpet, wood-tile, and stone flooring, with extensive trapping in the walls and ceiling. The drum booth is a hemioctagon, and it is surrounded by a bass player's platform.

"The bass platform was suggested to us by one of the bassists who works here a lot," explains Neuberger. "The floor is coupled to the floor of the drum booth, so that he can not only hear the drums in his headphones, he can feel them through the floor." Both areas float separately from the rest of the room.

Unlike New York and Los Angeles, most working engineers in the Chicago area are on staff at the various studios, and The Chicago Recording Company is no exception. There are four production engineers, five music mixers, five second engineers and apprentices, two full-time maintenance engineers, and three secretary/receptionists.

"We almost started building a facility in New York last year" says Hank Neuberger, "but we decided it would be too risky going into a market we know nothing about, and where the rents are so high, so we'll stay here for the time being."

The Chicago Recording Company, 528 North Michigan Avenue, Chicago, Illinois 60611, USA. Phone: (312) 822-9333. ■

Paul D Lehrman

## Low-power television in the US?

For close to three years, the United States Federal Communications Commission has been trying to institute a new broadcast service known as low-power television, or LPTV. The service would 'drop in' a couple of thousand new transmitters, limited in power to 1000W or less, in rural areas currently underserved by conventional broadcasters, as well as in urban areas. It was hoped that LPTV would develop into a truly democratic broadcast service (a promise that UHF and cable were once thought to hold) in that the cost of setting up such a station would be a small fraction of the millions of dollars required for a normal TV station. Existing translators, which relay the signals of current high-power stations to normally inaccessible areas, would be incorporated into the new service, but both translators and the new stations would be allowed to originate their own programming. The FCC indicated that preference in the granting of licences would be given to minority, non-profit, and educational groups. The number of stations that a single licensee could apply for was unlimited, but the three American TV networks were barred from participating.

Now it appears that the service is even further away from realisation than when it was first proposed, and there is a distinct possibility that it may not happen at all. Besides the applications from small groups, the FCC found itself deluged with requests from corporations like courier service Federal Express and giant retailer Sears, Roebuck, as well as evangelical religious programmers, some of whom filed for upwards of 200 channels all over the country, which would be linked together by satellite. The flood of competing applications paralysed the Commission, even before the mechanism of deciding between them had been drafted. Even ABC and CBS joined the fray, hoping to overturn their exclusion in an eventual court battle. By last April, when the Commission slammed the door on further applications, more than 5,200 had been filed, of which only 57 were uncontested, and hence grantable.

To make matters worse, federal spending cuts under the new Reagan economic plan threaten to force the FCC to fire nearly 20% of its staff. A spokesperson for the Commission says that \$100,000 is needed to buy a computer program just to sort out the technical aspects of the applications, but that money is not in the current budget.

Paul D Lehrman

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### R.D. 770 MONSTERMAT

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### 1745M DELAY LINE

Up to five outputs, each with a maximum of 320 ms of delay (640 ms in the double mode) selectable in 20  $\mu$  steps. Optional modules available include a pitch changer, and a remote control module which controls the delay line with a micro-computer. Frequency response: 16 kHz (8 kHz in 'double' mode). Dynamic range: 90 dB.



U.K. Distributors

**Feldon Audio Ltd.,**

126 Great Portland Street, London W1N 5PH Tel: 01-580 4314. Telex: London 28668.

Harmonizer, Instant Flanger, Monstermat and Omnipressor are trade marks of EVENTIDE CLOCKWORKS Inc

# new products

## Audio Envelope Systems

Audio Envelope Systems Inc, of Phoenix, Arizona, exhibited for the first time at AES New York, taking the opportunity to unveil two systems for audio processing.

The major system is the *axrac*, a modular rack-mount signal processing system designed both for recording or performance applications. The modules are all switchable to optimise impedances and levels, operating at line or instrument levels to suit the application. RCA phono sockets are used on the rear of the modules, normalised to 1/4in jack sockets on the front panels, so that the system provides its own patchbay as the system is built up. An optional extra is a powered 8-position rack frame. A pedalboard is also optional, as is a module case to contain and power (battery or mains) two modules.

The first phase of issue of *axrac* modules includes a preamp; paragrahic equaliser; noise gate/compressor/limiter/de-esser; LED bargraph meter; auto-panner; stereo synthesiser; insert unit; patch bay; output amp; electronic crossover; pedalboard; analogue time processor; and cases.

The other unit is the *TC 101 tubecube* active DI box. This features a valve-sound synthesis circuit which is also used in the *axrac ar-100* preamp. The principle is undisclosed. The *tubecube* is powered by two 9V batteries or by console phantom power.

**Audio Envelope Systems Inc, 2109 West Campbell Avenue, Phoenix, Arizona 85015, USA. Phone: (602) 279-3613.**



## Broadcast and communications receiver

Surrey Electronics has produced a modified version of the Yaesu *FRG7700M* synthesised all mode communications receiver, modified to make the unit suitable for rebroadcast purposes or checking transmitter performance in addition to its communications applications. Principal modifications to the receiver include radically redesigned front-end stages yielding improved noise performance and better overload levels; a flat audio frequency response on both AM and SSB; balanced audio line output; buffered IF output for monitoring transmitted modulation envelope via an oscilloscope; and improvements in the mains safety of the unit. The receiver is available in free standing or rack mounting format and all the original features of the receiver are retained including 12 memory channels; mains or battery operation option; IF bandwidths 2.7k, 6k and 12kHz; digital display of frequency and time; squelch facility on all modes including narrow band frequency modulation; advanced noise blanker; and timer facility for unattended recordings or external switching.

**Specifications:** frequency range 150kHz to 30MHz in 30 bands of 1MHz; overspill 40kHz at either end of each 1MHz band; noise 10dB, 50Ω, 1MHz to

## Lexicon 224X

In addition to the new *Super Prime Time*, Lexicon introduced yet another new unit at AES New York, the *Model 224X* digital reverb. This unit which is derived from the standard *Model 224* digital reverb unit, combines all the features of that unit and adds the following facilities: full 15kHz bandwidth (8kHz on the *224*), a variable bandwidth control (15kHz to 170Hz) allowing the *224X* to reduce its bandwidth with a natural 6dB/octave slope; a dynamic decay facility whereby the unit can automatically switch to a different reverb time when the music pauses or stops, allowing long sustain or decay without muddying continuous music; a paging system allowing the six sliders on the *224X* remote control panel to be redefined to control additional features; and non-volatile register storage and extended ROM storage allowing 36 completely user defined pre-sets to be stored in the non-volatile register storage, plus the facility to accept at least 32 basic program algorithms in the ROM store. The *224X* retains all the standard features of the *224* including the capability for field program updates, true stereo operation (two inputs and four outputs), and reverb times from



0.6 to 70s. Lexicon intend marketing and supporting both the *224* and *224X* and the new model will not replace the earlier unit.

**Lexicon Inc, 60 Turner Street, Waltham, Massachusetts 02154, USA. Phone: (617) 891-6790. Telex: 923468.**

**UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.**

**This section includes products premiered at the November 1981 AES 70th Convention, New York, and this is indicated in the text where appropriate. Limited space dictates that we cannot guarantee to cover all such items in this issue. Where items have appeared in this section previously, they have not been repeated. In the unlikely event that we have omitted a particular new product from this or future issues, we request that manufacturers contact us with the relevant details as soon as possible, for future inclusion.**

## The Organizer

Audio Accessories Inc and Patchways Inc have teamed up to produce a novel unit termed the *Organizer*, a high quality, completely normalised, rack mountable patch bay. Available in a variety of standard models and also with the facility for custom built models, the *Organizer* greatly simplifies patching as it incorporates logical signal flow paths which are clearly marked on the front panel. The unit can use either tip-ring-ground or *XL R* 1-2-3 wiring; the back panel has clearly marked terminations with screw terminals and wiring ducts to avoid the usual tangle of cables; lighting via edge-lit plexiglass allows for ease of viewing; headphone monitoring of any point may be accomplished without interrupting the signal flow; and every device connected to the *Organizer* has input, output and monitor jack access. Although primarily designed with the needs of sound system installations in mind, the system may be customised to meet a variety of applications.

**Audio Accessories Inc, Mill Street, Marlow, New Hampshire 03456, USA. Phone: (603) 446-3335.**

## Studio Optimod

On show for the first time at the New York AES was the new Orban *424A* gated comp/limiter/de-esser, described by the company as 'the studio optimod'. The device is based on the successful broadcast processor, *Model 8100A*, and offers separate control loops for the comp/limiter and de-esser sections. The gate features a 'gain-freezing' facility, preventing 'noise rush-up', pumping or breathing during pauses in the programme material. The de-esser section is similar to the *526A* unit, and better than 25dB de-ess gain reduction is available, in addition to up to 25dB of comp/limiter gain reduction. The gain reduction and output meters are both true peak reading, and linear or exponential release curves are selectable. Mono or stereo units are available.

**Orban Associates Inc, 645 Bryant Street, San Francisco, Cal 94107, USA. Phone: (415) 957-1067. Telex: 171480.**

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

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# new products

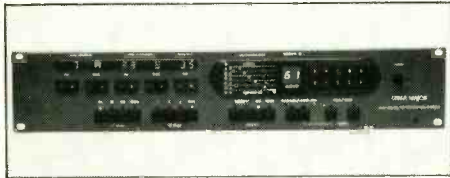
## Ursa Major remote

On show at AES New York for the first time was a remote control unit for the Ursa Major 8X32 digital reverberator. The compact unit features duplication of the main unit's clear and informative display functions, offering full control of reverberation parameters available with the unit. The 8X32 is now available with or without the remote, which is available separately. In addition, an 8X32 may be purchased with a blank front panel and remote if required.

**Ursa Major Inc, Box 18, Belmont, Massachusetts 02178, USA. Phone: (617) 489 0303. Telex: 921405.**

**UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.**

8 x 32 reverb unit



## UREI CX encoder/decoder

Whatever we may feel about the compatibility or otherwise of CX-encoded software on non-CX-equipped replay equipment, there is no doubt that CX, when used as an encode-decode system, gives good results. A professional standard CX encode-decode unit was offered by UREI for the first time at the New York AES. The stereo unit is 2U high and 19in rack-mounting and provides preview, programme and 'audition' facilities in stereo.

The Model 1181 features selectable thresholds, determining the level below which signals are not compressed in the encoding process. The CX20 position sets the threshold at -40dB ref 0VU (where 0VU corresponds to 3.54cm/s groove modulation at 1kHz), while the CX15 position offers a -30dB threshold. Above this level, a straight 2:1 compression ratio is applied. The 1181 offers encoding for both programme and preview cutting lathe signals, plus a decoder which may be switched between any line level input, programme, or preview monitoring. Highest-quality tracking between encode and decode aspects is produced by utilising identical gain-control circuitry in both sections of the unit, and the mode switching may be remotely controlled if desired. Full metering is provided, allowing stereo monitoring of all signals. A tamper-proof cover hides the calibration section of the unit which utilises screwdriver presets and LED setup indication with 0.1dB resolution. The unit may be relay-bypassed by means of an 'out' button, this occurring automatically when power is off. Encoder noise is given as -95dB (programme) and -85dB (preview), while the weighted decoder noise is also -95dB. THD is better than 0.1% worst case.

**United Recording Electronics Industries, 8460 San Fernando Road, Sun Valley, Cal 91352, USA. Phone: (213) 767-1000. Telex: 651389.**

**UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.**

## Gauss introduce studio monitors

Cetec Gauss has introduced a new range of studio monitors to complement its current ranges of loudspeakers, the two models being introduced marking a departure for the company in as much that they are the first such monitors produced by the company.

The first new model, type 7480, uses an 18in bass woofer in a 12.5cu ft enclosure, is a 4-way system, and utilises a type 4081 compression driver with a phenolic diaphragm. Features of this monitor include aligned drive units to minimise time delay and phasing problems, and foam panels and barriers mounted on the loudspeaker baffle to minimise reflections in the crossover region.

The second new monitor, Model 7350, is a 3-way system using a 15in bass woofer in a 6cu ft enclosure and utilises the new type 2080 compression driver with a constant directivity horn and with power compensation built into the crossover network. Crossover frequencies for this model are rather unconventional at 200Hz and 1.6kHz, Gauss claiming that these take advantage of fundamental music frequencies from one loudspeaker for a smoother sound. Both models use fourth order crossover networks to minimise frequency dependent radiation pattern tilt due to non-coincident drivers; have HF rolloff controls in addition to the usual HF level controls; utilise 4Ω bass drivers to take advantage of the maximum output power from solidstate power amps used in a bi-amp system; and both are ducted port designs with the port in the base of the cabinet.

**Specifications: Model 7480** — nominal impedance 4Ω LF, 5 to 8Ω HF; rated power 400W RMS LF, 300W RMS HF; sensitivity at 1W at 1m, 96dB SPL; usable bandwidth 20Hz to 20kHz, -3dB; radiation pattern 100° horizontal, 30° vertical; LF crossover (Bi-amp) 140Hz acoustic, 18dB at 80Hz, 6dB at 320Hz; MF crossover 1.2kHz, low pass

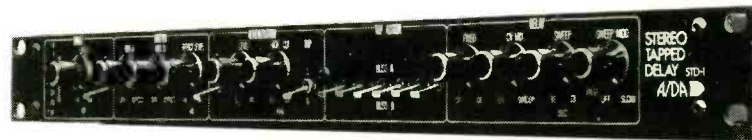


Gauss Model 7480

24dB/octave variable, high pass 12dB/octave variable; HF crossover 6.3kHz, 24dB/octave variable; HF roll-off 2.5kHz, max attenuation -12dB at 10kHz. **Model 7350** — nominal impedance 4Ω LF, 8Ω HF; rated power 400W RMS LF, 200W RMS HF; sensitivity at 1W at 1m, 93dB; usable bandwidth 35Hz to 18kHz, -3dB; radiation pattern 90° horizontal, 20° vertical; LF crossover (Bi-amp) 200Hz acoustic, 12dB at 160Hz, 12dB at 400Hz; MF crossover 1.6kHz, 24dB/octave variable; HF roll-off 4kHz, max attenuation -12dB at 10kHz.

**Cetec Gauss, 9130 Glenoaks Boulevard, Sun Valley, Cal 91352, USA. Phone: (213) 875-1900. Telex: 194989.**

**UK: Cetec International, Unit 15, Northfield Ind Estate, Beresford Avenue, Wembley HA0 1YB. Phone: 01-900 0355. Telex: 935847.**



## Stereo tapped delay

Analog/Digital Associates has introduced a new stereo tapped delay, the STD-1, a voltage controlled analogue delay which produces six delays simultaneously. A 19in rack mount unit, the STD-1 is capable of producing effects such as stereo high flanging, low flanging, highly resonant flanging, doubling, multi-voice chorusing, echo, reverb, machine gun reverb, multiple doppler effects, vibrato, and '3-D' spacial placement which moves the sound source forward and backward in the stereo field. Each of the six non-harmonically related taps can be assigned and mixed into either of two stereo output channels, the taps not being equally spaced apart or multiples of each other. Delay time of the STD-1 varies from 1.3 to 55.5ms and is continuously variable over a 1 to x5 range; sweep rate varies from 0.1 to 25s for a complete cycle; and a sweep modulation control is provided which can superimpose a higher frequency sweep pattern over the regular sweep allowing vibrato sweeps to random 'sample and hold' sweeps to be produced. A regeneration level control determines the decay time at long delays (up to 15s) and the amount of resonance at short delays (up to +12dB). Also provided is a high cut control adjustable from 12kHz to 800Hz which

reduces the HF content in the feedback signal for a natural decay, plus a regeneration tap selector which selects either tap 1, 3 or 6 as the regenerated signal source. The STD-1 is fitted with an 8-step LED headroom indicator, while options include balanced line in/out, voltage control footpedal, remote dual footswitch for effect and regeneration in/out, and a 240V AC power supply.

**Specifications:** dynamic range 93dB unweighted; equivalent input noise -112dBV; bandwidth, dry 10Hz to 20kHz, delay 10Hz to 13.5kHz; THD at 1kHz dry 0.05% at 0dBV, wet 0.55% at 0dBV; inputs 40kΩ, single ended, ¼in phone jack or 600Ω active balanced XLR; outputs two 600Ω ¼in phone jacks or two 600Ω transformer balanced XLRs; max input level +20dBV, 40kΩ or +6dBV, 1MΩ balanced; max output +20dBm; gain range -15dB to +27dB; delay time, tap 1 1.3 to 6.5ms, tap 2 2.2 to 11ms, tap 3 4.6 to 20ms, tap 4 5.8 to 29ms, tap 5 8.3 to 46.5ms, tap 6 11.1 to 55.5ms; sweep rate 0.1 to 25s; sweep modulation 0.01 to 0.5s; delay time and sweep speed control voltage inputs 0 to +5V; control voltage mix output 0 to +5V.

**Analog/Digital Associates, 2316 Fourth Street, Berkeley, Cal 94710, USA. Phone: (415) 548-1311.**

# TRAD

Marshall 5002 Time modulator **£700.00**  
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 reverb (new) each **£350.00**  
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 Roland DC10 Analog echo **£120.00**  
 Tradeq Spring reverbs with limiters  
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 Master Room CSREQ 23 Reverb **£800.00**

AKG Mics: D190e New each **£36.00**  
 D202E1 New each **£66.00**  
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 D224E New each **£98.00**  
 D222 New each **£62.00**  
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 Beyer M260 New each **£68.00**  
 Boom stands from **£15.00**

Lyrec 16-1 Cassette duplication unit  
 master and 4 x slaves **£8,000**  
 Decca duplication desk, phasing scope, etc. **£800.00**  
 Otari semi automatic cassette loaders each **£1,000**  
 Bluthner Grand Piano **£1,850**  
 2" tape 10½" reels at empty reel price each **£10.00**  
 Selection of Scamp and Rebis racks,  
 modules in stock **P.O.A.**  
 Neuman M49 **P.O.A.**  
 Neuman KM54 **P.O.A.**  
 Neuman U48 **P.O.A.**  
 R.C.A. BX77 **P.O.A.**  
 R.C.A. BX44 **P.O.A.**

## A selection of used equipment available from our showrooms

Lyrec 24T T/Rec with 30 memory  
 autolocate **£13,000**  
 Lyrec 24T T/Rec with A/Locate **£11,000**  
 3M M79 24T T/Rec with Sonoplan  
 A/Locate **£11,000**  
 3M M79 24T T/Rec with 16T H/Block **£11,000**  
 Ampex MM1200 24T T/Rec with  
 zero locate **£10,500**  
 3M M79 16T T/Rec **£8,500**  
 3M M23 8T T/Rec **£2,750**  
 Scully 8T T/Rec **£2,500**  
 Scully 8T T/Rec with syncmaster **£2,900**  
 Teac 3440 4T T/Rec **£600.00**  
 Scully 4T T/Rec with DC motor drive etc. **£1,900**  
 MCI JH110 Stereo T/Rec **£1,800**  
 Ampex AG440B Stereo T/Rec **£1,000**  
 Studer C37 T/Rec - Stereo **£600.00**  
 Studer A62 Stereo T/Rec **£750.00**  
 Leavers Rich E200 Stereo T/Rec **£400.00**

Trident B 24-16-16 Mixing console **£6,000**  
 Trident B 24-16-16 Mixing console **£5,000**  
 MCI JH436 36-24 Mixing console **£15,000**

Neve 32-24-24 Mixing console **£30,000**  
 Neve 32-16-24 Mixing console **£23,000**  
 Soundworkshop 1600 28-24 Automated  
 Mixing console - 3 months old **£18,000**  
 Teac 5 8-4 Mixer **£500.00**  
 Alice 828 8-2 Mixer - "mint" with extras **£500.00**  
 Decca 12-2 Large desk, Phasing scope etc. **£2,250**  
 P.E.P. 12-4-8, as new with remotes **£1,850**

Dolby M16H noise reduction each **£5,000**  
 Dolby M24H noise reduction each **£7,000**  
 Dolby a360 noise reduction each **£280.00**

JBL L200 Loudspeakers **£1,000**  
 JBL 4331A Loudspeakers **£900.00**  
 2 x Pultec EQP 1A3 Prog 'EQ' **£450.00**  
 Teletronix LA2A Level amp. **£220.00**

Quad 405 amp **£175.00**  
 Quad 50E amp each **£60.00**  
 DBX 155 Noise reduction **£200.00**  
 DBX 122 Noise reduction **£220.00**  
 Synton 222 Vocoders (New) each **£350.00**

# TRAD

## ELECTRONICS SALES LTD

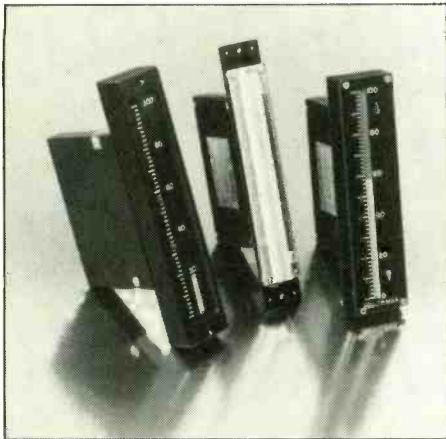
149b. St. Albans Road, Watford, Herts, WD2 5BB, England

Tel: Watford 47988/9

Telex: 262741

# new Metering products

For address details see product guide

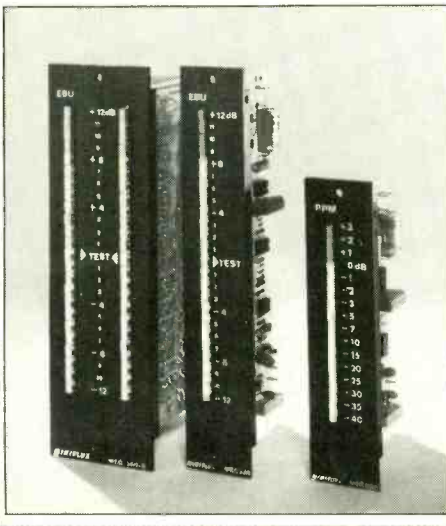


## Bowmar analogue panel meters

Three new series of solid state analogue panel meters, types *APM 500*, *600* and *700*, have been introduced by Bowmar/ALI. Designed for high visibility and readability, the meters feature bright 51-segment bargraph displays; a rapid 2.5ms response (full scale); and low power requirements. The series are available in voltage or current types, models that accept 7-bit binary signals, or AC meter types. Model options include centre-zero, voltmeters or ammeters, control or alarm outputs, single or dual setpoints, flashing bargraph, damping, differential input, high input impedance, and yellow or green bargraph display. Standard bargraph display colour is red.

## Miniflux bargraph meters

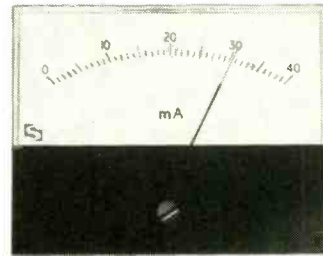
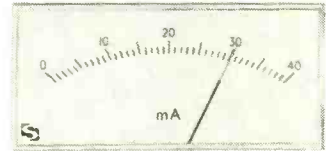
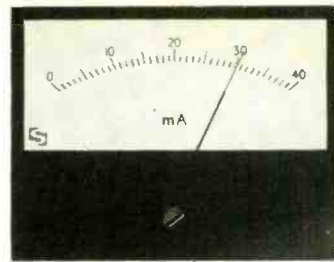
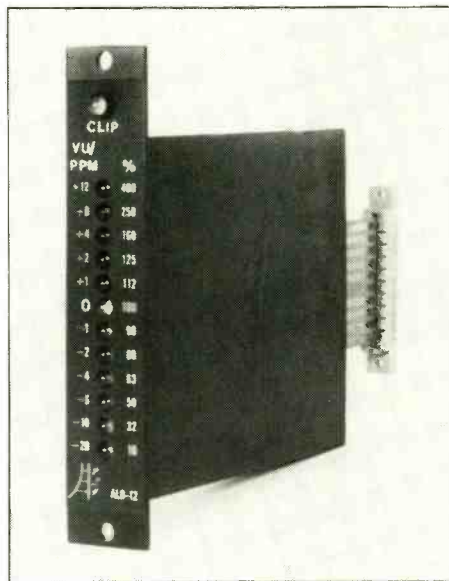
Miniflux Electronics has introduced a new series of light column indicators which meet the revised EBU standard relating to PPMs, EBU 3205-E 2nd Edition November 1979. Three meters are available, the *MEG 360* (2-channel) and *MEG 330* (single channel) units which incorporate



facilities for remote increase of sensitivity by +12dB, plus the *MEG 300 PPM* which has a VU-type scale and a remotely controlled extra sensitivity range of +20dB. All the new meters employ special LED lamps having diffusing reflectors which provide a continuous light column with colour changes according to the EBU standard.

## ALD-12 audio level display

American manufacturer Project Synthesis International has introduced the *ALD-12* audio level display, a new three-colour LED-column level indicator with electrically selectable VU or PPM characteristics. This new meter operates from 10 to 35VDC single or bipolar supplies; features balanced or unbalanced 47KΩ input, DC-isolated to 50VDC; and uses a wide-angle visibility moving-point format with increased drive current to attract operator attention. The meter's characteristics include a 12μs peak capture; a response of 18Hz to 22kHz ±0.5dB; and a permanently calibrated accuracy of ±0.3dB at 1kHz. An additional facility is the provision of an amber 'Clip' indicator which flashes whenever level exceeds a value preset by the user. The *ALD-12* is available as a plug-in module which mounts in standard card racks or panels, or alternatively 2-, 8- and 16-channel complete display systems in enclosures with power supplies are available.



## Sifam Presentor meters

Sifam has developed a new range of panel meters, termed the *Presentor* range. The new meters combine the presentation characteristics of the established *Clarity*, *Clarity Focus*, *Director* and *Monitor* types in one meter, adaptable for back-of-panel presentation or front-of-panel with mask or bezel. The meters utilise a core-magnet movement design and are available in four sizes with scale lengths of 34, 60, 78 and 100mm. The range is suitable for use on DC supplies up to 600V and from 50μA upwards. The four sizes are designated 19, 29, 39 and 49 with the suffix letters W, M or B signifying the presentation style. The meters are fitted with knife-edge pointers; dial markings are available for zero left-hand, right-hand or centre; all except the smallest size can have illuminated dials provided by back-lighting through the translucent body, and may be fitted with mirror dials; and a zero adjuster is fitted which may be positioned at the rear if required. All front-of-panel types only require a 27mm diameter cut-out, plus holes for fixing studs. Accuracy of the *Presentor* is claimed to be to BS89, IEC 51 and ANSI C39.1; typically ±1½% for scale lengths of 50mm and above, or ±2½% for lengths less than 50mm.

# STEREO DISC AMPLIFIER 2

THE MOST THOROUGHLY RESEARCHED DISC AMPLIFIER THERE IS  
for broadcasting, disc monitoring and transfer with the highest quality  
1 kHz at 5mV set for 0dBV.7 output. Loaded 600 ohms.

**Total harmonic distortion:**  
Output +10dBV.7 30Hz-20kHz below noise 0.004%  
Output +20dBV.7 1kHz 0.008%  
30Hz-20kHz 0.008%

**Static intermodulation distortion 50Hz +**  
Output +10dBV.7 -90dB, 0.001%  
30Hz-20kHz

**Dynamic intermodulation distortion 3.18kHz square**  
wave (single pole -3dB at 100kHz) + 15kHz sine wave,  
4:1. Relative to 15kHz components.  
Pre-emphasised input 500mV pk-pk -70dB, 0.03%

**Frequency response RIAA accuracy**  
30Hz-20kHz Within 0.5dB

**Cartridge impedance interaction on frequency response**  
High inductance cartridge, 1H + 1kΩ Less than 0.2dB

**Clipping at 1kHz** Output +24dBV.7  
**Clipping point complementary to RIAA curve** Within 1dB  
30Hz-20kHz Within 1dB  
Clipping determined by onset of peaky distortion products  
Clipping -80dB.

**Differential phase shift**  
50Hz-20kHz Within 0.5°  
Worst error at Lr Within 5°  
turnovers

Ring or write for full specifications of this or: 10 Outlet Distribution Amplifier 3 \* Moving Coil Amplifier \* Stabilizer  
\* Frequency Shifter Circuit Boards \* PPM Drive Circuits and *Ernest Turner* Movements \* PPM Boxes \* Peak Deviation  
Meter \* Programme and Deviation Chart Recorders \* Broadcast Monitor Receiver 150kHz-30MHz.

**Surrey Electronics** The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG. Tel. 04866 5997



# BROADCASTING VERSATILITY

## The fully modular, expandable Series 24A stereo mixing console

The Series 24A with its wide choice of modules and variable frame size permits the console to be used in a range of functions including 'on-air', production, outside broadcast, drama, network switching, audio visual production etc.

## mbi studio construction

A cost-effective turnkey service incorporating:

- Architectural and Interior Design  
(with RIBA supervision of builders)
- Acoustic Design and Construction
- Studio Equipment Selection and Installation

Consultancy, construction, installation and commissioning—an effective, integrated facility.

- Wide selection of input modules
- Self-operation or engineer driven capability
- EQ available (if required) on mono and stereo inputs
- Sophisticated metering and monitoring
- Equipment remote starts
- Comprehensive talkback and intercom
- Logic controlled telephone-in and o.b. modules
- All inputs and outputs fully balanced



Economically priced,  
ergonomically built

*Meets or exceeds  
broadcast authority  
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England, BN1 1AE  
Tel: (0273) 24928

*broadcast imagineering*

# product Metering guide

## ALICE (UK)

Alice (Stancoil Ltd), 38 Alexandra Road, Windsor, Berks. Phone: 07535 51056. Telex: 849323.

PPM775: PPM drive circuit for analogue meter movements.

## ALPS KEIKI

UK: Servo and Electronic Sales Ltd, 24 High Street, Lydd, Kent TN29 9AJ. Phone: 0679 20252. Telex: 965265.

VU meters: analogue meters standard 600Ω circuit in series.

## A & R (UK)

Amplification & Recording (Cambridge) Ltd, Denny End Industrial Centre, Waterbeach, Cambridge CB5 9PB. Phone: 0223 861550.

PLM14: LED column level indicator; switchable VU or PPM characteristics; 38dB dynamic range.

MC16: channel case and power supply for 16 PLM14 modules.

## AUDIO & DESIGN (UK)

Audio & Design (Recording) Ltd, North Street, Reading, Berks RG1 4DA. Phone: 0734 53411. Telex: 848722.

Scamp S14: LED display with four 12-section columns; ±10dB calibration PPM characteristics modifiable to VU.

## BACH-SIMPSON (UK/Canada)

Bach-Simpson (UK) Ltd, Trenatt Estate, Wadebridge, Cornwall, UK. Phone: 020881 2031. Telex: 45451.

Bach-Simpson Ltd, PO Box 5484, 1255 Brydges Street, London, Ontario, Canada. Phone: (519) 452-3200. Telex: 064 5843.

USA: Simpson Electric Company, 853 Dundee Avenue, Elgin, Illinois 60120. Phone: (312) 697-2260. Telex: 722416.

Wilbac, Excalibur and Designer ranges: analogue VU meters with instrument construction.

## BOWMAR (USA)

Bowmar/ALI Inc, 531 Main Street, Acton, Massachusetts 01720. Phone: (617) 263-8365.

APM 500/600/700: series of solid state analogue panel meters.

## BURROUGHS (USA)

Burroughs Corp, PO Box 1226, Plainfield, New Jersey 07061. Phone: (201) 757-5000.

UK: Walmore Electronics Ltd, 11-15 Betterton Street, Drury Lane, London WC2H 9BS. Phone: 01-836 1228. Telex: 28752/25177.

Self-scan Bargraphs: high readability gas plasma vertical bargraph display devices with neon orange segments. Dual-Reset bargraphs allow reading of set points and actual measurement.

## CAPITAL COMPONENTS (UK)

Capital Components, 28 East Street, Rochford, Essex SS1 1PY. Phone: 0702 547252.

UK: Cliff Electronics Ltd, 97 Coulsdon Road, Caterham, Surrey CR3 5NF. Phone: 0883 47713. Telex: 8813346.

Bargraph visual displays: 12- or 20-segment LED column level indicator; bar or segment display; switchable PPM or VU with optional peak hold. VU meters: with semicircle of 11 LEDs.

## COMPONEX (Japan)

Componex Ltd, 48-56 Bayham Place, London NW1 0EU, UK. Phone: 01-388 7171. Telex: 27364.

Regal, Kestrel and L ranges: analogue VU meters, some available as PPMs.

VU Mini-Meters: low cost microammeters with VU scales, suitable for portable equipment. Fluorescent Bargraph Peak VU meters.

## CROMPTON (USA)

See Ernest Turner/Crompton

## DIXSON (USA)

Dixson Inc, PO Box 1449, Grand Junction, Colorado 81501. Phone: (303) 242-8863.

VU meters: range of analogue meters.

## ESE (USA)

Ese, 142 Sierra Street, El Segundo, Cal 90245. Phone: (213) 322-2136.

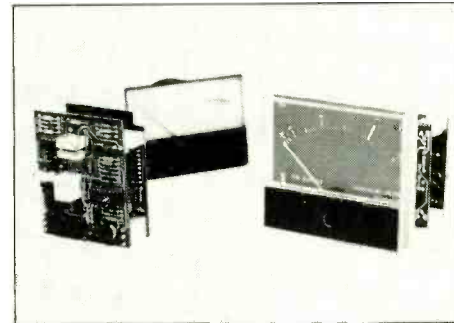
ES211, ES214: 14-LED column level indicators.

## INOVONICS (USA)

Inovonics Inc, 503-B Vandell Way, Campbell, Cal 95008. Phone: (408) 374-8300.

UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.

Gordon Headroom Meter: peak reading audio level indicator, responds to peaks as PPM (UK/EBU standard, BS4297: 1968) but has 'VU-style' ballistics for easier reading of the display. GHM-00 is a complete metering system including meter and electronics; GHM-01 is retrofit electronics kit for standard VU meter, with additional VU/PPM switched characteristics. Electronics assemblies may be meter or rack-mounted.



Gordon Headroom Meter

## JEWELL (USA)

Jewell Electrical Instruments Inc, Grenier Field, Manchester, New Hampshire 03108. Phone: (603) 669-6400.

VU meters: range of analogue meters.

## MCCURDY (Canada)

McCurdy Radio Industries Ltd, 108 Carnforth Road, Toronto, Ontario M4A 2L4. Phone: (416) 751-6262. Telex: 06963533.

USA: McCurdy Radio Industries Inc, 1711 Carmen Drive, Elk Grove Village, Illinois 60007. Phone: (312) 640-7077. Telex: 910-222 0436.

UK: Seltech Equipment Ltd, Rose Industrial Estate, Cores End Road, Bourne End, Bucks SL8 5AT. Phone: 06285 29131. Telex: 848960.

PPM02: peak programme meter movement with electronics on rear mounted PCB.

## MINIFLUX (UK)

Miniflux Electronics Ltd, 8 Hale Lane, London NW7 3NX. Phone: 01-959 5166.

MEG Series: range of LED peak level column indicators using separate close coupled large diameter LEDs in a vertical column.

Bargraph meters: light column indicators meeting revised EBU standards.

## MODUTEC (USA)

Modutec Inc, 18 Marshall Street, Norwalk, Conn 06854. Phone: (203) 853-3636.

VU meters: range of analogue meters.

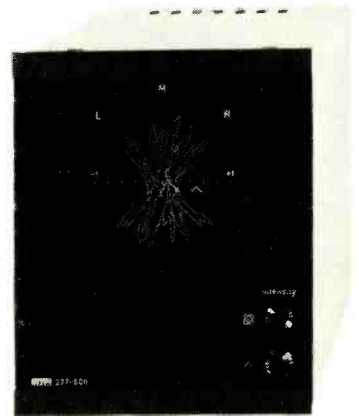
## NEVE/CHROMATEC (UK)

Chromatec Video Products Ltd, 10 Barley Mow Passage, London W4 4PH. Phone: 01-994 6477. Telex: 8811418.

UK: Neve Electronics International Ltd, Cambridge House, Melbourn, Royston SG8 6AU. Phone: 0763 60776. Telex: 81381.

USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, Conn 06801. Phone: (203) 744-6230. Telex: 969638.

Multichannel Monitor/Spectrum Analyser: modular rack-mounted unit providing colour TV display, simultaneous 56 audio channel monitoring switchable to spectrum analysis of any single channel, bargraph level indication switchable to PPM or VU.



NTP 277-500 stereo display unit

## NTP (Denmark)

NTP Elektronik A/S, 44 Theklavej, DK-2400 Copenhagen NV. Phone: 01 10.12.22. Telex: 16378.

177-210/300/310: light spot PPMs, self contained with built-in log amps and input transformers.

177-400/410/800: gas discharge display stereo PPM with 100 individual orange elements.

177-700B/710: LED column mono PPMs with 64 LEDs.

177-750/780: LED column PPMs with 24 LEDs.

177-900/950: gas discharge stereo VU meter with 100 orange elements in each bar. 950 has one VU column and one PPM column.

M-900: analogue PPM using Sifam movement with electronics contained on back of meter mounted PCB.

M-920/177-600: analogue PPM using edgewise movement.

277-100: 8-channel PPM based on 200-element bargraph plasma displays.

277-500: stereo display instrument based on 70mm CRT.

377-500: video PPM superimposing meter scale on side of a TV picture to provide level indication.

377-100: multichannel PPM displaying up to 28 channels on colour TV monitor.

506-100: 1/3-octave analyser for 377-100.

## PSI (USA)

Project Synthesis International, 561 Carrick Court, Sunnyvale, Cal 940787. Phone: 9408 733-0065.

ALD-12: LED column level indicator using 12 LEDs in three colours.

## RACAL/BPL (UK)

Racal-British Physical Laboratories, Radlett, Herts WD7 7HJ. Phone 09276 4844. Telex: 25312.

Wide range of analogue meters and can supply VU meters to order.

## REBIS (UK)

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

RA207/RA207R: 20-LED column meter with switchable VU and PPM characteristics, 207R has switch for remote selection of VU/PPM.

## SEW (Japan)

UK: ITT Instrument Services Edinburgh Way, Harlow, Essex CM20 2DF. Phone: 0279 26811. Telex: 81146.

VU meters: analogue meters available in two styles and a number of sizes. 36 ▶

# More time on your hands from MXR.

Providing extended delay times at an affordable price, the new MXR Model 151 Delay System II gives you over three full seconds of delay (three times that of similarly-priced digital devices). Specifically, the Delay System II can offer you up to 800 milliseconds of clean, quiet delay at a full 16 kHz bandwidth (over 200 milliseconds more than the closest competitor). As a digital recorder, the Delay System II's exceptional memory capability lets you capture entire musical phrases or obtain a wide variety of dynamic and *musical* studio-quality effects from flanging and chorus to echo and doubling in one rugged package.

And it's easy to use in real time. The large front panel and simple control format make it a snap to quickly select from a vast range of time delay effects. The Delay System II's high-resolution four digit readout displays the precise amount of delay and the bandwidth is indicated by LED's, so there's no "squinting & thinking" to find out exactly where you are. Level-indicating LED's let you set up the optimum level in seconds.

The Delay System II fits right into your rack, looks great and provides clean, noise-free performance. A level switch is provided to optimize signal-to-noise for professional/home recording and onstage applications. The Delay System II also features easy access with both XLR and phone jack connectors (inputs and outputs) on the rear panel for instant interfacing with your patch bay.

MXR Delay System II—More time on your hands and more ways to use it as a creative tool on stage and in the studio. Hand-assembled in the U.S.A. with the finest components available in a compact, easy-to-use rack-mountable package.

**MXR**

Professional  
Products Group

**MXR Innovations (Europe),**  
1 Wallace Way,  
Hitchin, Herts. SG40SE, Eng.  
Phone 0462 31513 Tlx 826967



**MXR**



**MXR**



# product Metering guide

## SIFAM (UK)

Sifam Ltd, Woodland Road, Torquay, Devon TQ2 7AY. Phone: 0803 63822. Telex: 42864.

USA: Selco Product Co, 7580 Stage Road, Buenapark, Cal 90621. Phone (213) 921-0681. Telex: 655457.

**Monitor range:** analogue VU meters available in three sizes.

**Director range:** analogue VU and PPM (requiring external electronics) meters in four sizes.

**Clarity and Clarity Focus ranges:** analogue VU and PPM (requiring external electronics) meters in several sizes. Made with modified spec with heavier damping and faster rise time than standard.

**Presenter:** panel meters combining characteristics of other three types.

## SOUNDEX (UK)

Bulgln Electronics Soundex Ltd, Park Lane, Broxbourne, Herts EN10 7NQ. Phone: 09924 64455.

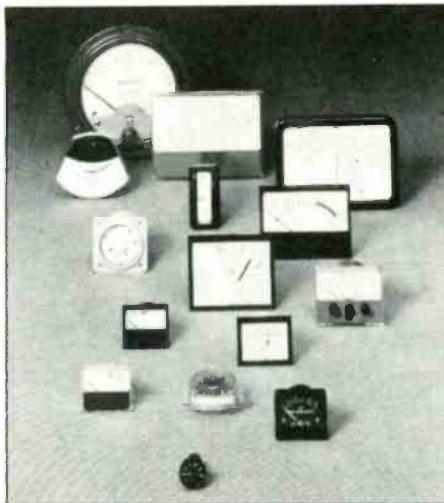
**PPM 100 Series/BS5428:** PPM meters incorporating Ernest Turner and Sifam analogue movements and Soundex electronics, meeting BS5428 specs with BBC-style 1 to 7 scale.

**PPM 300 Series/DIN 45406:** PPM meters incorporating Sifam analogue movements conforming to DIN 45406 standard.

**PPM 400 Series/Soundex Standard 400:** economy standard range of PPM meters.

## STUDER (Switzerland)

Studer International AG, Althardstrasse 150, CH-8105 Regensdorf. Phone: 01 840.29.60. Telex: 58489.



A range of meters offered by Ernest Turner

UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

USA: Studer Revox America Inc, 1819 Broadway, Nashville, Tennessee 37203. Phone: (615) 329-9576. Telex: 554453.

**Dual programme meter:** dual plasma display meter with 200 segments; PPM or VU characteristics; console or rack-mounted.

## SURREY (UK)

Surrey Electronics, The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG. Phone: 04866 5997.

**PPM2:** PPM drive circuit for analogue meter movement.

## ERNEST TURNER/CROMPTON (UK/USA)

Ernest Turner Instruments, Totteridge Avenue, High Wycombe, Bucks. Phone: 0494 30931. Telex: 83444.

USA: Crompton Instruments Inc, 1562 Parkway Loop, Tustin, Cal 92680. Phone: (714) 731-2333.

**VU meters:** wide range of analogue meters conforming to ANSI C16.5-1954.

**Peak programme meters:** wide range of analogue meters with scaling and performance conforming to BS4297.

**Twin PPM:** similar to standard PPMs but twin movement with separate pointers on same dial.

## UREI (USA)

United Recording Electronics Industries, 8460 San Fernando Road, Sun Valley, Cal 91352. Phone: (213) 767-1000. Telex: 651389.

UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

**Model 70 Vidigraf:** 16- or 32- bargraph display generator using TV monitor.

## WESTON (USA)

Weston Instruments, 614 Frølinghuysen Avenue, Newark, New Jersey 07114. Phone: (201) 242-2600.

UK: The Radio Resistor Co Ltd, 4 Trust Industrial Estate, Wilbury Way, Hitchin, Herts SG4 0TN. Phone: 0462 4072. Telex: 826251.

**7500 Series:** analogue VU meter movements.

## WESTREX (USA)

Westrex, 2629 West Olive Avenue, Burbank, Cal 91505. Phone: (213) 846-3394. Telex: 698254.

UK: Westrex Co Ltd, Bilton Fairway Estate, Long Drive, Greenford, Middx. Phone: 01-578 0957. Telex: 923003.

**RA-1558B:** light bar recording meter with 42in horizontal scale, ideal for film dubbing and theatre applications.

**Large projection meters:** VI or VU analogue audio meters projecting image on to 24 x 12in face.

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FROM ABBEY ROAD STUDIOS TO ZELLA STUDIOS -  
YOU'LL FIND BEL EQUIPMENT WORKING EVERYWHERE



## B.E.L. BF-20 Stereo Flanger

50 Cheapside, Luton, Beds.  
Tel: Luton (0582) 26693 or 27195 daytime, Ampthill (0525) 403528 evenings  
Telex: 825488 DONLAR

## BEL. Agents

ITALY Professional Equipment, 20135, Milano, Via Anfossi, 6, Italy. Tel: 02 8353514/02 581650 HOLLAND Professional Audio Centre (P.A.C.), Strijpsestraat 94, 5616 GS, Eindhoven, Holland. Tel: 040 520662 W.GERMANY Peter Struven GMBH, Bargweg 45b, 2000 Nordstedt, Hamburg, W.Germany. Tel: 040 524 5151 DENMARK Audiopower, Smaaland 1,2300 Copenhagen S, Denmark. Tel: 571223 SWEDEN Stage and Studio AB, S:T Olofsgatan 35, S-41728 Gothenburg, Sweden. Tel: 031 224090 U.K. S.E.S. 100 Hamilton Road, London N.W.11. Tel: 01-458 9133 MUSIC LABORATORY 72-74 Eversholt Street, London N.W.1. Tel: 01-388 5392 Turnkey, 8 East Barnet Road, New Barnet, Herts. Tel: 01-440 9221

# *Alice* 2000 SERIES

## VERY QUIET MIXERS



2008P-PPM

Stereo limiters, full talkback and monitoring facilities, sweep oscillator,  
48v phantom power.

From 4 to 20 channels, two group or stereo output, standard or  
conductive plastic faders, VUs or PPMs.

*Alice* (STANCOIL LTD.),

Alexandra Road, Windsor, England. Telephone Windsor 51056/7 Telex AEGIS G 849323.

# new Test equipment products

For address details see product guide

## Radio transmission test system

A system developed in Australia has been produced which can perform standard audio transmission tests for a television or radio station in just 3.7s. Until now such tests involved a skilled audio engineer using complex test equipment for long periods of time. Developed by Amalgamated Wireless (Australasia) Ltd, the *ST100* system will cover 43 audio transmission test parameters for mono, stereo, AM and FM sound. Whereas manual testing is prone to error, the *ST100* automatically follows the selected sequence of tests with microcomputers calculating and presenting the results in the required form. Test results, time, date and generator source code data are stored within the receiver and these can be presented as a printout or transmitted via the data interface. Using only one generator and the necessary receivers, the system can test an entire transmitter network and it can operate between countries as it can be remotely controlled by telephone link or satellite.



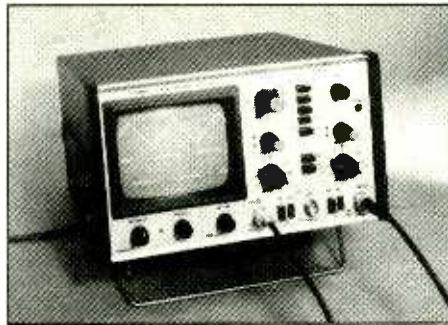
## Bach-Simpson test equipment

Bach-Simpson (UK) Ltd has introduced a new function generator, the *Model 420*. The new generator provides sine, triangle and square waveforms, DC and TTL output and covers 0.1Hz to 1MHz in seven ranges. Other features include voltage controlled generator input for sweep; continuously variable DC offset with off position; and rechargeable battery operation allowing the unit to be used as a compact portable signal source.

A second new unit from Bach-Simpson is the *Model 461-2R* true RMS digital multimeter which measures AC/DC voltage, current, and resistance over 26 ranges. Features of the multimeter include HF response to 50kHz; overload protection to 750V; and rechargeable battery powering.

## New Farnell test instruments

Farnell Instruments has added several new test instruments to its range of test equipment. First new unit is the fully bussable *DSG2* digitally synthesised signal generator with a frequency range of  $1 \times 10^{-4}$  to  $11 \times 10^4$ Hz. This unit generates its waveshape in 120 steps by means of a PROM which is controlled via a VCO phase



locked to a crystal. The unit also has facilities for external control via an IEEE 488 buss controller for amplitude, function (sine or squarewave) and frequency. Frequency accuracy is claimed to be  $\pm 10$ PPM when used via the buss or with the front panel thumbwheel switches. The signal generator features unbalanced outputs of 20V peak to peak into open circuit and 10V peak to peak into 50 $\Omega$ , plus a 3.5V RMS balanced output into 600 $\Omega$  and a front panel TTL output. An additional rear panel TTL output is also provided at 120 times selected frequency.

Second new unit is the *DTV12-14* 12MHz oscilloscope, a dual trace unit with an  $8 \times 10$  division screen. This unit features a fully variable timebase between switched positions; fully variable gain control and sum and invert facility; and a fully passive attenuator.

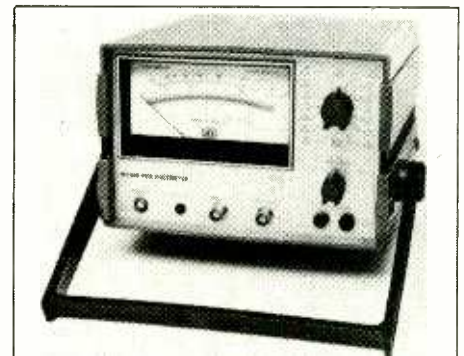
The final new unit from Farnell is the *TM10* battery powered 'through-line' power meter with single detector head. This meter has a frequency response of 25MHz to 1GHz and can display power levels from 20mW to 100W.

## Goldline audio spectrum analysis systems

Anglia CB Ltd, an associate company of Webber Tapes Ltd, has introduced the American manufactured Goldline range of audio spectrum analysis systems to the UK. Three systems are available, the *ASA-10* and *ASA-10B* hand-held, battery-powered, spectrum analysers and the *ASA-10C* 19in rack-mount realtime analyser. All the units are 10-octave spectrum analysers and feature LED matrix displays, with the *ASA-10* having a measurement range of 65 to 100dB SPL, the other units having a measurement range of 30 to 123dB SPL. Centre frequencies of the analysers are 32, 63, 125, 250, 500Hz, 1k, 2k, 4k, 8k and 16kHz. The *ASA-10* features IEC A-weighting, while the others additionally offer IEC C-weighting.

## Acoustic test signal generator

American manufacturer, Hall Engineering has introduced a new acoustic test signal generator, the *Model ATG-301*, suitable for applications such as adjusting equalisers, optimising loudspeaker placement, and testing loudspeakers. The generator can provide white noise, pink noise and finite bandwidth (fractional octave) pink noise with variable frequency and bandwidth. In the finite bandwidth pink noise mode the centre frequency can be varied continuously from 20Hz to 20kHz in three overlapping ranges. Bandwidths of 1,  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{6}$  or  $\frac{1}{8}$ -octave can be selected; output level can be varied from 0dBm (relative to 600 $\Omega$ ) to below -40dBm; and the unit is mains powered (120VAC).



## IET true RMS voltmeter

American manufacturer IET Labs has introduced a new true RMS voltmeter, the *Model MV-800*, capable of measuring the range -105dB to +53dB. The meter features 15 ranges from 30 $\mu$ V full scale to 300V, and from -90dB full scale to +50dB in decades. Other features include rechargeable battery operation; separate AC and DC outputs; a front panel bandwidth switch allowing a choice of wide band measurements, standard first order audio bandpass (20Hz to 20kHz), or external filter; and a range of standard or custom plug-in bandwidth filter modules to accommodate specialised measuring functions.

## Kikusui oscilloscopes

Japanese manufacturer Kikusui, who produce a wide range of test instruments and in particular a wide variety of oscilloscopes, has announced the introduction of two new oscilloscopes, Models

40 ▶

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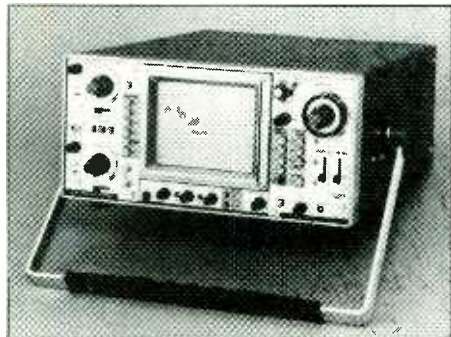
Past projects include over 70 Eastlake Rooms, 6 Sierra Audio Rooms and the entire Molinare Video Complex in London. Alangrove also designed and re-built the Electric Lady Studio, New York; the control room and studio for Kenny Rogers in Los Angeles in conjunction with Lakeside. Other constructions include 4 music rooms for Trafalgar, video facility at Tube Investments, control and studio for Atlas Photography. Present projects include 'live' rooms at Studio 1, Maison Rouge, London. The design and construction of Molinare video editing rooms at Craven House; Frank Farion, Far-Ton studio, Frankfurt.

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**new**  
Test equipment  
**products**

For address details see product guide

5650 and 5531. The 5650 is a 50MHz dual channel oscilloscope with dual time base and features calibrated sweep delay of the vertical amplifier at 5mV per division with the capability of 1mV per division sensitivity at a restricted bandwidth of 10MHz. Other facilities include alternate time base, alternative trigger, 500kHz



chop frequency, auto level (lock) circuit, one touch triggered delay, variable hold off and one touch XY operation. The 5650 incorporates an illuminated internal graticule, but the 5650E an economy version of the oscilloscope whilst

having an internal graticule provides graticule illumination via a separate external graticule.

The Model 5531 is a dual channel 35MHz oscilloscope offering 5mV per division sensitivity at 35MHz with a Y magnifier on both channels giving 1mV per division at 15MHz bandwidth. The 5531 has two time bases giving sweep modes of A, A intensified, and B. The instrument also incorporates an uncalibrated trigger delay. Other features include automatic, alternate chop (200kHz) and chop only mode; one touch trigger delay; variable hold off; one touch XY operation, internal graticule; and a high brightness (non-illuminated) CRT.

### Levell test instruments

New from Levell Electronics Ltd is the TM10 electronic null detector with two logarithmic ranges enabling null detection to be made throughout an 80dB change of voltage level without range switching. On the mV log range  $\pm 10\%$  FSD equals  $\pm 5\mu\text{V}$ ;  $\pm 50\%$  FSD equals  $\pm 5\text{mV}$ ; and  $\pm 100\%$  FSD equals  $\pm 500\text{mV}$ . In addition the TM10 features linear ranges from  $\pm 30\mu\text{V}$  to  $\pm 300\text{V}$  and  $\pm 30\mu\text{A}$  to  $\pm 300\text{mA}$ ; a large meter with 120mm scale; and an output of  $\pm 1\text{V}$  at FSD is available to drive a pen recorder.

A further new unit from the company is the TG301 function generator which provides sine, square, triangle, pulse, sawtooth ramp and asymmetrical sine waveforms over the wide frequency range of 0.02Hz to 2.1MHz. Features of this generator include the capability of sweeping the frequency over three decades by an external voltage; 20V peak to peak main output from a 50 $\Omega$  source; a TTL output suitable for

triggering an oscilloscope; and a variable DC offset facility enabling up to  $\pm 10\text{V}$  to be superimposed on the main output signal.



### Wayne Kerr AMS1

Wayne Kerr recently introduced a new audio measuring test set, the AMS1, designed to provide all the test facilities a recording studio could require at a reasonable cost, ie under  $\pounds 1,000$ . The new unit, which is a compact piece of equipment yet remarkably comprehensive and very logically laid out, includes facilities to make over 15 different types of measurements. The facilities provided include a low distortion oscillator; multi-frequency distortion meter; multi-frequency crosstalk meter; phase meter; peak programme meter; true RMS voltmeter; wow and flutter meter; drift meter; rumble meter; noise meter (with facilities for optional plug-in CCIR, DIN, IEC or NAB standard filters); power meter; and a digital frequency counter. The facilities of the unit are almost too numerous to detail, but suffice to say that the unit is capable of meeting the needs of virtually every test requirement likely to be met in normal recording or broadcast studio usage. The AMS1 is available in two versions, one a standard rack-mount version and the other a free-standing portable version.

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MODEL 3020

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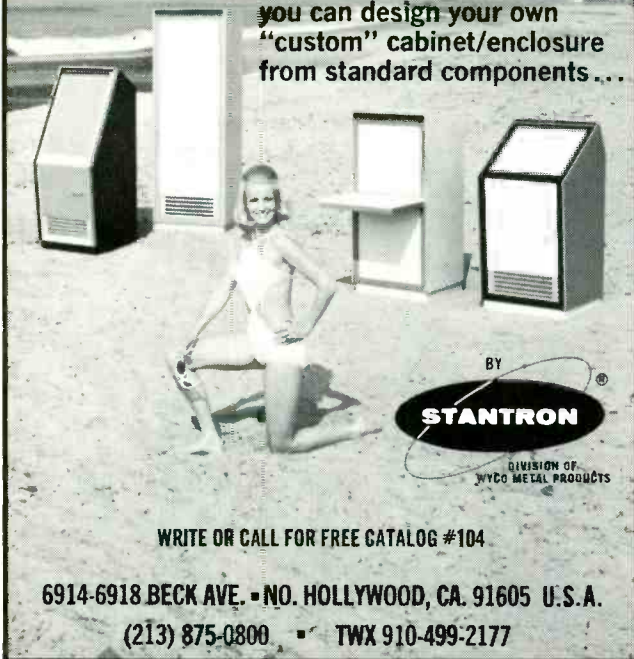
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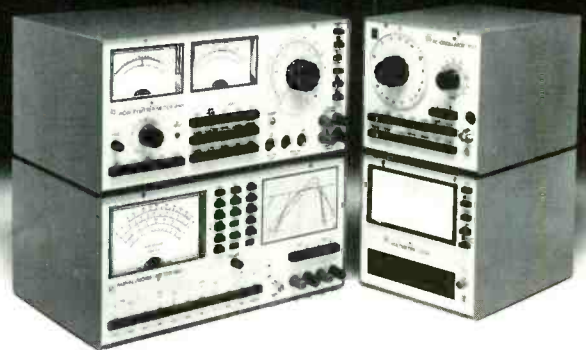


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Crowthorne, Berkshire  
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# product Test equipment guide

## ABACUS (UK)

Abacus Electronics, 10 Barley Mow Passage, London W4 4PH. Phone: 01-994 6477. Telex: 8811418.  
UK: Kirkham Electronics, Mill Hall, Mill Lane, Pulham Market, Norfolk IP21 4XL. Phone: 037976 594/639.

**ARTA 8000:** 27-band 1/2-octave realtime analyser with CRT display and built-in pink noise generator.

## ACOUSTILOG (USA)

Acoustilog Inc, 19 Mercer Street, New York NY 10013. Phone: (212) 925-1365.

**232A:** reverb timer providing digital LED display of time; shows room decay time to be displayed for each of 19 switchable frequency bands on 1/2-octave intervals; provides 10ms resolution of reverb time up to 9.99s with 20dB x 3 or 30dB x 2 to measure RT<sub>60</sub>. Built-in pink noise generator.

**The Impulser:** available separately or as an option for 232A, permits polarity, phase alignment and impulse response to be checked.

## AEC (West Germany)

Audio Engineering Components GmbH, Obertshausen, D-6053 Geleitstrasse 11. Phone: 610 44.23.24.

**Export:** Audio International Vertriebs GmbH, Box 560229, Gonzenheimstrasse 2B, D-6000 Frankfurt 56, West Germany. Phone: (61) 50.47.33. Telex: 413039.

**ARA414-27G:** 27-band 1/2-octave realtime analyser with CRT display. Display range 27dB; three selectable release times; built-in pink noise.

**AFA415SG/B:** dual channel frequency response measurement unit with CRT display.

## ALTAIR (USA)

Altair Electronics, 1694 Calle Zocalo, Thousand Oaks, Cal 91360. Phone: (805) 529-2496.

**TDS:** tape/transport diagnostic system. Measures flutter over a frequency range 20 times wider than the NAB/IEC standards; detects in-phase and quadrature sidebands.

## AMBER (Canada)

Amber Electro Design Ltd, 4810 Jean Talon West, Montreal, Quebec H4P 2NS. Phone: (514) 735-4105.

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

**4400A:** multipurpose audio test set; digital meter section reads narrow band level or wide band and frequencies from 10Hz to 100kHz; receiver section provides differential or dual channel input and enables four digital plots (256 x 256) to be stored and displayed on a normal scope or a plotter. Provides plots of amplitude or phase versus time or frequency.

**4400AXY:** similar to 4400A but with X and Y DC signals and pen drop contact closure for plotters.

**4405:** accessory for 4400A which allows distortion to be measured and plotted.

**Model 444:** weighting network kit, five dedicated weighting filters, 400Hz highpass, 10kHz lowpass, ANSI A, B and C, and five blanks for custom networks.

**3500:** portable distortion measuring set includes an ultra low distortion sine wave oscillator; total harmonic distortion analyser and noise meter; true RMS meter; low or fast, linear dB scale; narrow band filter internally adjustable 1 to 1/2-octave tunable over full range; automatic operation for null and set levels; option for IM distortion measurement.

## ANNIS (USA)

RB Annis Co, 1101 N Delaware Street, Indianapolis, Indiana 46202. Phone: (317) 637-9282.

**UK:** Leevers Rich Ltd, 319 Trinity Road, London SW18 3SL. Phone: 01-874 9054. Telex: 923455.

**Pocket Magnetometers:** range of magnetometers.

## AWA (Australia)

Amalgated Wireless (Australasia) Ltd, PO Box 2516, Sydney 2000. Phone: 20233. Telex: 21515.

**UK:** Marconi Instruments Ltd, Longacres, St Albans AL4 0JN. Phone: 0727 59292. Telex: 23350.

**G232:** low distortion oscillator with four ranges covering 10Hz to 110kHz.

**G233:** ultra low distortion oscillator with four ranges covering 10Hz to 110kHz.

**F242A:** distortion and noise meter; provides automatic tuning on the fundamental rejection frequency; for distortion and level measurement.

**E247:** Level meter psophometer; with true RMS or quasi-peak reading meter.

**A248:** wow and flutter meter; measures wow and flutter plus drift to DIN, IEC, IEEE and ANSI standards, weighted or unweighted.

**S1100:** broadcast audio test transmission.

## BACH-SIMPSON (Canada/UK)

Bach-Simpson Ltd, PO Box 5484, 1255 Brydges Street, London, Ontario. Phone: (519) 452-3200. Telex: 0645843.

**UK:** Bach-Simpson (UK) Ltd, Trenant Estate, Wadebridge, Cornwall PL27 6HD. Phone: 020 881 2031/3. Telex: 45431.

Wide range of test equipment including digital and analogue multimeters, function generators and frequency counters.

## B & O (Denmark)

Bank & Olufsen, DK-7600 Struer. Phone: 07 85.11.22

**UK:** Bang & Olufsen (UK) Ltd, Eastbrook Road, Gloucester GL4 7DE. Phone: 0452 21591. Telex: 32315.

**WM1:** wow and flutter meter with drift and frequency analyser.

**WM2:** similar to above but without analyser.

**AM1:** audio monitor with watt- and voltmeter.

**NM1:** noise and voltmeter.

**RWM4:** stereo wattmeter.

**TF2:** tunable filter with three measuring ranges.

**TG7:** sine/square wave low distortion oscillator, 10Hz to 1MHz.

## B & K (Denmark)

Bruel & Kjaer A/S, DK-2850 Naerum. Phone 02 80.05.00. Telex: 37316.

**UK:** B & K Laboratories Ltd, Cross Lances Road, Hounslow, Middx TW3 2AB. Phone: 01-570 7774. Telex: 934150.

**USA:** Bruel & Kjaer Instruments Inc, 185 Forest Street, Marlborough, Mass 01752. Phone: (617) 481-7000.

**Measuring microphones:** wide range of capacitor types with 1/8, 1/4, 1/2 and 1in diameters. Free field or linear pressure responses. Numerous accessories.

**4220/4221/4230 mic calibrators:** 4220 Pistonphone is battery driven with 124dB level and barometer for pressure corrections; 4221 is high pressure calibrator up to 164dB SPL; 4230 is pocket-sized battery powered unit giving 94dB at 1kHz.

**4204/4205 sound sources for room measurement:** 4204 is a reference source of 70dB, range 100Hz to 10kHz with less than 6dB directivity. 4205 can be used for A-weighted or octave band, etc, comprising generator and separate radiator.

**7507 power processor:** digital display of level and frequency in octave or 1/2-octave bands.

**1023/1027 sine and sine/noise generators:** 1023 covers 10Hz to 20kHz in one range, linear or log, variable FM, external sweep control. 1027 generates sinewaves, narrow bands of random noise, white noise and pink noise; range 2Hz to 200kHz in three lin/log bands, external sweep.

**2610/2607:** measuring amplifiers with meter.

**2429:** psophometer for noise measurement.

**2971/6202:** phase meter and phase delay unit.

**6203:** wow and flutter meter.

**1617/B:** bandpass filters.

**2010:** heterodyne analyser.

**2020:** heterodyne slave filter.

**2120:** frequency analyser.

**1902/1901:** distortion measurement control unit and tracking frequency multiplier.

**2031:** narrow band spectrum analyser using 11in display screen, generates and displays 400 channels (bands) with different frequency ranges.

**2131:** digital frequency analyser using 11in display screen. Uses digital filtering detection and averaging, displays 42 1/2-bands from 1.6Hz to 20Hz or 14 octave bands from 2Hz to 16kHz.

**2306:** portable, battery powered chart recorder, log recording in range 1.6Hz to 20kHz, linear and log recording of DC signals, RMS detector; eight paper speeds, four writing speeds, chart width 2in.

**2307:** versatile chart recorder for range 2Hz to 200Hz, recording as a function of time or frequency, chart widths 2in or 4in. 15 writing speeds. 12 chart speeds. polar plotter.

**2308:** X-Y chart recorder; plots chart for fast linear DC signals, fast slewing speed of 1,000mm/s<sup>-1</sup> and max acceleration of 1000mm/s<sup>-2</sup>; takes A4 sized paper, built-in sweep generator, remote control.

**2309:** 2-channel portable, chart recorder similar to 2306 but two separate writing systems, pen lift.

**3922:** motorised turntable designed to rotate test objects for polar diagram responses in synchronism with 2307 level recorder.

**4416:** response test unit. Designed for

measurement of tape recorders, cartridges and turntables, contains necessary amplifiers, filters, de-emphasis (RIAA) chopper for balance measurements. A and B rumble filters and synchroniser which operates with 1kHz bands recorded on B&K test discs, and provided by 1023/27 generators for test tapes.

**4712:** audio frequency response tracer using 14in display; provides frequency response curves on CRT when used with sweep generator.

## CONSILIU (SWEDEN)

Consilium Industri AB, Birger Jarlsgatan 15, S-11445 Stockholm. Phone: 08 32.21.33. Telex: 11083.

**UK:** Dawe Instruments Ltd, Concord Road, Western Avenue, London W3 0SD. Phone: 01-992 6751. Telex: 934848.

**RTA11:** realtime 31-band 1/2-octave analyser using external scope for display. Three integrating time constants.

**RTA12P:** similar to RTA11 but with 32nd wideband; three selectable memories.

**CI111:** realtime audio analyser with LED display.

**CI1812A:** similar to RTA12P but with LED matrix display with 16 levels and 1, 2 or 3dB/octave selection.

**CI1818:** sweep generator and curve tracer.

**CI1820:** psuedo noise generator; uses 39-bit long shift register to generate pink or white noise.

**CI1823:** realtime audio analyser, phase monitor, signal level and balance monitor, with CRT display.

**CI1824:** sweep generator/curve tracer with digital display memory.

**CI1825:** X-Y-Z memory scope.

## CROWN/AMCRON (USA)

Crown International, 1718 West Mishawaka Road, Elkhart, Indiana 46514. Phone: (219) 294-5571. Telex: 810-295 2160.

**UK:** HHB Hire & Sales, Unit F, New Crescent Works, Nicoll Road, London NW10. Phone: 01-961 3295. Telex: 923393.

**RTA-2:** realtime 32-band 1/2-octave analyser using 5in CRT display.

**Badap 1:** audio microcomputer, programmable audio measurement system; 9in colour TV displays a wide number of audio parameters depending on software. Provides line and mic inputs, displays offer 1, 3, or 6dB/division, while the 6dB/division shows +20 to -60dB range, plus providing 0.25dB resolution on 1dB/division. Five software packages at present: realtime 1/2-octave analysis, 20Hz to 20kHz, with rapid plot or memory analysis option; RT<sub>60</sub>, Acoustic Distance Measurement indicates distance between loudspeaker and mic for determination of critical distance and delay line setting; chromatic spectral decay shows reverberant decay in 31 bands optional 32-channel hardware input multiplexer level display peak or average, and two simultaneous 1/2-octave analysis displays. Future software will include 64 channel multiplexer, disc tracker, 1/2-octave analyser, harmonic distortion, intermodulation distortion, weighting curves, digital filtering wow and flutter spectral analysis, loudspeaker phase alignment.

## DALELCO (DENMARK)

Export: Hammer Trading Co ApS, Dallen DK-3060, Espergerde.

**UK:** Telonic/Berkeley UK, 2 Castle Hill Terrace, Maidenhead, Berks SL6 4JR. Phone: 0628 28057. Telex: 849131.

**SAW 3150:** wow and flutter meter. 3,150Hz oscillator, four ranges for flutter from 0.1 to 3%; four ranges for drift from ±0.1 to 3%. Measures to DIN and CCIR, optional JIS/NAB.

**SPM100:** 2-channel LF wattmeter; provides indication for two channels. 10 ranges from 10µW to 100W, true RMS; A-weighting, response 20Hz to 20kHz, load resistance 4, 8 or 16Ω.

## DOLBY (UK)

Dolby Laboratories Inc, 346 Clapham Road, London SW9. Phone: 01-720 1111. Telex: 919109.

**USA:** Dolby Laboratories Inc, 731 Sansome Street, San Francisco, Cal 94111. Phone: (415) 392-0300. Telex: 34409.

**CAT98A:** noise weighting filter, designed to apply CCIR noise weighting to circuits under test.

## EMT (West Germany)

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

# The Synergy. At £2975 it makes other synths sound like a waste of money.



Let's face it, a 48-voice digital synthesiser at £2,975 is good value for money. Especially as the Synergy is a totally digital polyphonic performance synthesiser. Its six octave dynamic keyboard controls 48 voices - 24 preset and 24 on interchangeable cartridge. In total over 1000 sounds are available.

That's comparable to machines over four times its price! And if that sounds good, listen to some of its other features - different performance characteristics may be assigned for each voice; key

sensitivity with respect to volume, timbre and modulation; vibrato rate, depth and delay; speed of portamento (three modes - smooth with retrigger, smooth with no retrigger of envelopes and semi-tone quantization).

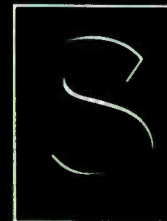
Each voice may be panned to left or right outputs, both outputs, or alternating left and right.

Each voice may be assigned to the keyboard in one of four modes, polyphonic, monophonic, keysplit or rolling mode and the keyboard can accommodate up to four sounds simultaneously.

A four function joystick offers further performance control: pitchbend up and down, and leadline or global vibrato. A four channel sequencer may be used monophonically or polyphonically and recalls all phrasings, pitchbends, nuances and key velocity; tracks may be repeated and transposed independently.

If you think all this sounds good, send for a free demo tape.

**Syco Systems Ltd 20 Conduit Place London W2. Telephone 01-723 3844 for an appointment.**



# product Test equipment guide

**EMT424:** wow and flutter analyser; equipped with manual or automatic tunable bandpass filter.

**EMT425:** similar to above, but uses 25.2kHz, 50.4kHz and 100.8kHz for high speed duplicator measurement.

**EMT422:** wow and flutter meter; two presettable threshold limits, various weighting functions, shows flutter and drift on separate meter, built-in 3.15kHz generator.

**EMT423:** wow and flutter chart recorder, six speeds. Includes an audio monitor function.

**EMT160/161:** acoustic polarity tester; 161 is mic preamp.

## EVENTIDE (USA)

**Eventide Clockworks Inc, 265 W 54th Street, New York, NY 10019. Phone: (212) 581-9290.**

**UK:** Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.

**Realtime Spectrum Analyser:** realtime 31-band 1/3-octave analysers for PET, Apple and TRS80 home computers; the analysers comprise a board of electronics with filters, detectors, A/D and ROM, all control through the computer's keyboard. Displays via the computer CRT, displays 31 1/3-octave filters from 20Hz to 20kHz on ISO centres (but not to ISO standards), with extra wide band level channel.

## FARNELL (UK)

**Farnell Instruments Ltd, Sandbeck Way, Wetherby, Yorkshire LS22 4DH. Phone: 0937 63541.**

**LFM3:** sine/square oscillator; covers 10Hz in six ranges for sinewaves, and to 1MHz for square.

**PRI1/PRI2A:** chart recorder with one or two pens; various input modules; 10in wide paper, 21 chart speeds, pen response 800mm/s.

**X-Y recorders:** X-Y chart recorders with single pen; available in A3 or A4 paper size having optional time-base module, electrostatic paper hold, pen lift.

**DTV12-14:** dual trace 12MHz oscilloscope with 5in screen.

**DSG2:** digitally synthesised signal generator, range  $1 \times 10^{-2}$  to  $11 \times 10^4$  Hz.

**TM10:** power meter, frequency response 25MHz to 1GHz, power levels 20mW to 100W.

## FEEDBACK (UK)

**Feedback Instruments Ltd, Park Road, Crowborough, Sussex TN6 2QR. Phone: 08926 3322. Telex: 95255.**

**USA:** Feedback Inc, 438 Springfield Avenue, Berkeley Heights, New Jersey 07922. Phone: (210) 464-5181.

**FG600/601:** function generators; generate sine, square and triangle waveforms, FG600 0.01Hz to 100kHz in seven ranges, FG601 0.001Hz to 1MHz in nine ranges.

**VP0602:** variable phase oscillator; covers range 10Hz to 100kHz with phase adjustable over full 360°.

**SS0603:** sine/square oscillator; generates sine and squarewaves from 10Hz to 1MHz in five ranges.

**EW604:** electronic wattmeter covers power range 250mW to 10kW, voltage 5V to 1kV, current 50mA to 10A, frequency range DC to 20kHz.

## FERROGRAPH (UK)

**Ferrogram Instrumentation, Unit 21, Royal Industrial Estate, Jarrow, Tyne & Wear NE32 9XX. Phone: 0632 893092. Telex: 537227.**

**USA:** NEAL-Ferrogram (USA) Inc, 652 Glenbrook Road, Stamford, Connecticut 06906. Phone: (203) 348-1045. Telex: 643678.

**RTS2:** tape recorder test set; includes 4-range oscillator covering 15Hz to 15kHz with variable output, millivoltmeter covering -60dBm to +40dBm fsd, LF cut filter, distortion meter reading down to 0.1% FSD with manual tuning, wow and flutter measurement down to 0.1% and drift.

**ATU1:** accessory for use with RTS2 which provides balanced inputs and outputs, monitor loudspeaker, meter loading, weighting network, oscillator amplifier and attenuator.

## FIDELIPAC (USA)

**Fidelipac Corp, 109 Gaither Drive, Mt Laurel, New Jersey 08057. Phone: (609) 235-3511. Telex: 710-897 0254.**

**65-390:** portable wow and flutter meter, internal 3.15kHz oscillator, range 0.1% and 0.5% fsd, drift  $\pm 5\%$ .

## FORMULA SOUND (UK)

**Formula Sound Ltd, 3 Waterloo Road, Stockport SK1 3DB. Phone: 061-480 3781.**

**SG19GA:** 2-channel, 20-band 1/2-octave graphic equaliser and analyser using 2 LEDs per band.

## GENRAD (USA)

**GenRad Inc, 300 Baker Avenue, Concord, Mass 01742. Phone: (617) 369-8770. Telex: 923354.**

**UK:** GenRad Ltd, Norreys Drive, Maidenhead, Berks SL6 4BP. Phone: 0628 39181. Telex: 848321.

**Measuring microphones:** range of microphones, preamplifiers and accessories.

**1987:** minimal sound level calibrator; produces 1kHz at 94 or 114dB, adaptors for various mics.

**1562-A:** sound level calibrator; produces five frequencies between 125Hz and 2kHz with  $\pm 0.3$ dB accuracy at 500Hz, at 114dB, fits various mics.

**1995:** integrating realtime 1/3-octave analyser using 5in display screen; 25Hz (or 2.5Hz) to 20kHz with 50dB display range on a CRT which shows bargraph or numerical values; A-weighting or flat, sound exposure level integration times.

**1985:** chart recorder accepting DC inputs and designed for use with GenRad sound level meters or noise analysers, but may also be used with many other devices; provides 50dB dynamic range, chart speeds from 2cm/hr to 60cm/min, battery operated.

**2512:** narrow band spectrum analyser using 5in display; DC to 100kHz with 400 lines of frequency resolution real time analysis up to 20kHz, optional full and 1/3-octave filters.

**1840-A:** output power meter.

**1381/1382:** random noise generators. 1381 generates noise flat from 2Hz to 2.5 or 50kHz with adjustable clipping, while the 1382 provides white, pink or ANSI spectras.

## GOLD LINE (USA)

**Gold Line, PO Box 115, West Redding, Connecticut 06896. Phone: (203) 938-2588.**

**UK:** Anglia CB Ltd, Yew Tree Farm, Brockford, Stowmarket, Suffolk IP14 5PE. Phone: 04494 345. Range of audio spectrum analysis systems. ASA-10 and ASA-10B battery powered, handheld units with various weightings; ASA-10C rackmount realtime analyser with LED display.

## GOULD ADVANCE (UK)

**Gould Advance Ltd, Roebuck Road, Hainault, Essex. Phone: 01-500 1000. Telex: 263785.**

**J3B:** test oscillator 10Hz - 100kHz in four ranges.

## HEATH (USA)

**Heath Co, Hilltop Road, Benton Harbour, Missouri 49022. Phone: (616) 982-3411.**

**UK:** Heath Electronics (UK), Bristol Road, Glous GL2 6EE. Phone: 0452 29451. Telex: 42179.

**SG-5218:** generates sine and square waves from 1Hz to 100kHz (square only down to 5Hz) in four ranges with linear frequency selection. switched attenuator, -62dB to +22dB.

**SG-1272:** low distortion audio frequency oscillator; generates sinewaves from 5Hz to 100kHz with push button frequency selection, 10 to 70dB attenuator.

**SM-5258:** harmonic distortion analyser with auto nulling, range 5Hz to 100kHz, also AC millivoltmeter.

**SM-5248:** intermodulation distortion analyser, using 60Hz and 7kHz frequencies, external oscillator input for different frequencies, distortion ranges from 0.1 to 100%, AC millivoltmeter can be used separately with 12 ranges from 10mV to 300V.

**ID-5252:** audio load 2, 4, 8, 16 and 32 $\Omega$ .

**IR-18M:** strip chart recorder; allows plotting on 10in wide paper linearly scaled, 1mV or 10mV sensitivity, 12 chart speeds from 5s/in to 200min/in.

**SR-207:** X-Y chart plotter; uses standard 8 1/2 x 11in graph paper, calibrated ranges of 1mV per inch, or to 10V in variable mode, electric pen lift, balancing time less than 1s, TTL remote control.

## HEWLETT-PACKARD (USA)

**Hewlett-Packard Corp, 1501 Page Mill Road, Palo Alto, Cal 94304. Phone: (415) 493-1501. Telex: 348461.**

**UK:** Hewlett-Packard Ltd, Kings Street Lane, Widdershall, Nr Wokingham RG11 5AR. Phone: 0734 784774. Telex: 847178.

**3311A:** function generator; sine, square, triangle and pulse functions from 0.1Hz to 1MHz in 10 ranges, 3% distortion, DC offset pulse output.

**3312A:** function generator; provides sine, square and triangle waveforms from 0.1Hz to 13MHz, the output of which may be modulated by a second function generator covering 0.01Hz to 10kHz AM, FM, swept, triggered or gated. Internal sweep for main generator over two decades, DC offset, external frequency control.

**239A:** low distortion oscillator; generates 10Hz to 110kHz in four ranges.

**339A:** distortion measurement set; true RMS distortion analyser, ultra low distortion and AC millivoltmeter in one package, auto frequency tuning and set level, tracking oscillator, directional range and frequency indicators, highpass and two lowpass filters, normal or VU meter characteristic.

**7563A/7562A:** log voltmeter/amplifier and voltmeter/converter; provides 110dB dynamic range, positive or negative DC inputs, output scaling, allows inputs from 0.3mV to 100V (-100 to 0dB) to be displayed logarithmically on a single range meter, or fed to a chart recorder. The 7562A has 80dB dynamic range (1mV to 10V) but also accepts AC signals over the range 0.5Hz to 100kHz, provides 0.25dB accuracy, switchable to cover 10mV to 100V, switchable lower frequency limit.

**3581A:** wave analyser; separates and measures the amplitude and frequency of spectral components over range 15Hz to 50kHz.

**3585A:** spectrum analyser using CRT display; covers 20Hz to 40MHz with 3Hz minimum resolution bandwidth.

**Strip chart recorders:** four strip chart recorders using paper roll; 680 is compact and versatile with 5in wide charts, 10 ranges from 6mV and 8 speeds from 20cm/min to 2.5cm/hour, stainless steel or disposable pens, 7155B is similar but portable, 16 ranges from 0.1mV to 10V/cm, 7 speeds, disposable pens on coated paper. 7132A has two pens (option one) writing on 10in wide paper, 8 chart speeds, thermal or ink pens, various inputs. 7100B series is plug-in adaptable, 10in wide paper and many options.

**7101B:** X-Y recorder plotter; with A4 or 8 1/2 x 11in charts, single input range 0.1V/in, slewing speed 50cm/s.

## INOVONICS (USA)

**Inovonics Inc, 530B Vandell Way, Campbell, Cal 95008. Phone: (408) 374-8300.**

**UK:** Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.

**Model 500:** realtime 1/3-octave analyser and reverberation analysis; uses 30 1/3-octave filters from 25Hz to 20kHz and one wideband channel, 13-step LED matrix switchable for 0.5, 1, 2 or 3dB per step, various decays, dBA-spl, dBm and RT60 measurement. Two separate memories, auto level pink noise generator, digital readout. Decay plot for reverberation.

## IVIE (USA)

**Ivie Electronics Inc, 500 West 1200 South, Orem, Utah 84057. Phone: (801) 224-1800. Telex: 910-971 5884.**

**UK:** FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

**IE-10A:** handheld full octave real time analyser using LED matrix display; battery powered, 10 band from 32Hz to 16kHz real time analyser with 16 step display, switchable 45, 30 or 15dB dynamic range, built-in capacitor measurement mic, 80dB preamp, switchable to operate as sound level meter with A or C weighting.

**IE-20B:** battery powered, handheld pink and white noise generator, covers 20Hz to 20kHz  $\pm 0.5$ dB, digitally generated. Attenuation to -58dBm.

**IE-30A:** battery powered, handheld 30-band 1/3-octave 25Hz to 20kHz analyser using LED matrix with 16 steps, and switchable 15, 30 or 45dB dynamic range, also displays octaves, or weighted 1/3-octaves. Reference level selectable and displayed switchable decay including peak holding, two non-volatile memories, precision sound level meter operates simultaneously with direct readout in 0.1dB resolution of dB SPL and dB  $\mu$ V, digital hold, fast slow, impulse and peak readings, A, C, or flat weightings. Electret measuring microphone.

**IE-17A:** microprocessor audio analyser; accessory which clips onto IE-30A; allows reverberation time to be measured for full and 1/3-octaves, also displays reverberation plots (on the IE-30A), and provides tracking filters; measures room delays, frequency marker to provide 0.1dB measurements from any band on the IE-30A tone burst and auto gating, automatic plotting on chart or X-Y recorders; takes power from IE-30A.

**Gold Standard range:** range of calibration microphone capsules, preamps and power supplies.

**KENWOOD (Japan)**

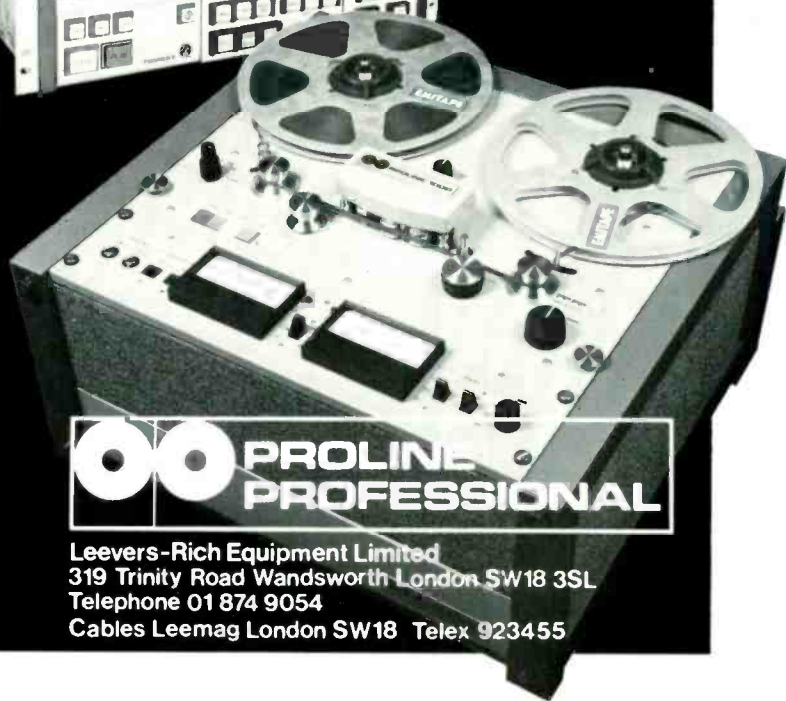
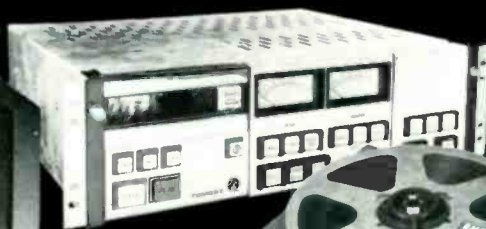
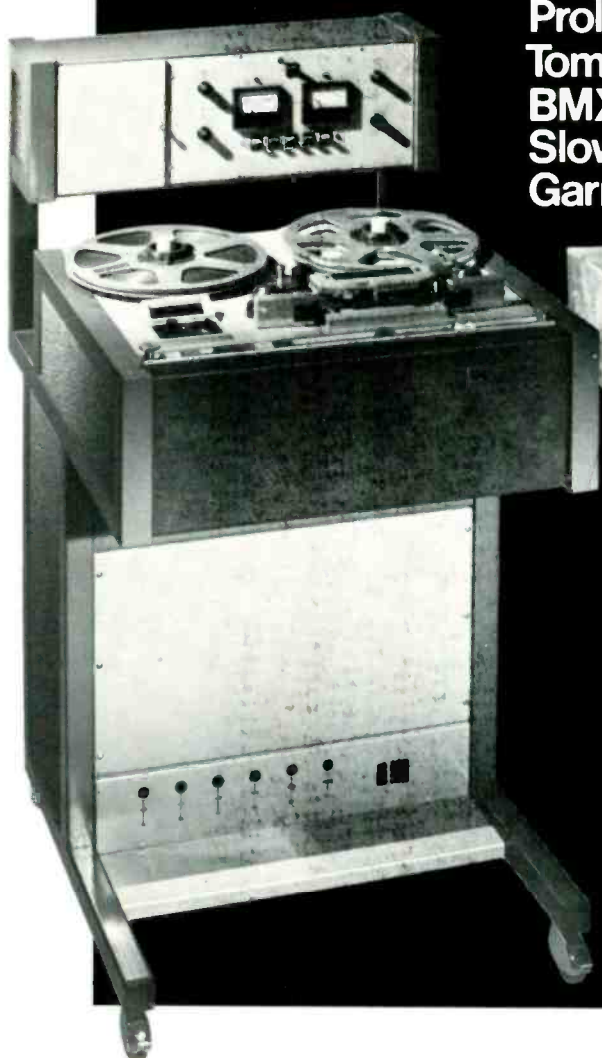
**USA:** Kenwood Electronics Inc, 1315 E Watsoncenter Road, Carson, Cal 90745. Phone: (213) 518-1700. Kenwood Electronics Inc, 75 Seaview Drive, Secaucus, New Jersey 07094.

**UK:** Harman (Audio) UK Ltd, Mill Street, Slough SL2 5DD. Phone: 0753 76911. Telex: 849069.



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319 Trinity Road Wandsworth London SW18 3SL  
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# product Test equipment guide

**SE-9000:** suitcase-mounted acoustic measuring system includes chart recorder, level meter; electret mic; mains powered.

## KIKUSUI (Japan)

UK: Telonic/Berkeley UK, 2 Castle Hill Terrace, Maidenhead, Berks SL6 4JR. Phone: 0628 28057. Telex: 849131.

**4045:** low distortion oscillator; covers 5Hz to 500kHz in five ranges, with sine or square wave outputs.  
**458A:** function generator; generates sine, square and triangle waveforms. Covering 0.01Hz to 100kHz in seven ranges.

**462:** sweep generator; covers 2Hz to 200kHz in a single sweepable range, sinewave output.  
**1631A:** AC millivoltmeter; covers 0.1mV to 300V in 14 ranges, -80dB to +50dB with a response from 20Hz to 200kHz.

**6702:** wow and flutter meter; measures with either 3k or 3.15kHz, input level 0.1mV to 10V, digital indication of wow and flutter, tape speed, frequency counter and frequency ratio, memory function built-in, selection of integration time. Measuring range 0.002% to 3% in six ranges.

**677C:** wow and flutter meter; 3k or 3.15kHz, input level 5mV to 10V, digital tape speed indication, measures 0.005% to 3% in four ranges.

**630:** automatic distortion meter; measures distortion at 400Hz and 1kHz (or with external filter), measures 0.1% to 30% in six ranges, auto level setting, level meter 10mV to 100V with response from 20Hz to 100kHz, separate meters for level and distortion.

**860:** voltage and insulation resistance tester.

**Oscilloscopes:** a wide range.

## KLARK—TEKNIK (UK)

Klark-Teknik Research Ltd, Walter Nash Road West, Coppice Trading Estate, Kidderminster, Worcs DY11 7HS. Phone: 0562 741515. Telex: 339821.

USA: Klark-Teknik Electronics Inc, 262A Eastern Parkway, Farmingdale, NY11735. Phone: (516) 249-3600.

**DN60:** realtime  $\frac{1}{2}$ -octave spectrum analyser LED matrix display; uses bands from 25Hz to 20kHz on  $\frac{1}{3}$ -octave intervals, 16-steps providing 15dB or 31dB steps, internal pink noise generator, three memories, peak and average reading, three time constants, sound pressure level readout on 31st band, peak hold, mic or line inputs with phantom powering, variable intensity display. Optional RT60 facility and outputs for plotter and scope.

## LEADER (Japan)

Leader Electronic Corp, 2-6-33 Tsunashima Higashi, Kohoku-Ku, Yokohama 223.

UK: Cybervox Ltd, 105/107 Oyster Lane, Byfleet, Surrey KT14 7JH. Phone: 09323 51051. Telex: 262525. Martron Ltd, 20 Park Street, Princes Risborough, Bucks. Phone: 08444 4414.

**LSA-5500:** audio system analyser containing signal generator, attenuator, AC millivoltmeter, dummy load, wow and flutter meter and oscilloscope.

**LAV-191:** audio tester with signal generator and AC millivoltmeter.

**LFR-5600:** frequency response chart recorder with sweep oscillator.

**LEA-5610:** equalising amplifier for LFR-5600; provides 40dB amp, and either linear or B&K EQ for cartridges.

**LDM-170:** distortion meter.

**LFM-39A:** wow and flutter meter; two versions for either 3,000Hz (JIS, CCIR) or 3,150Hz (DIN).

**LFM-30:** tape speed checker. Uses operating frequencies from 1 to 9kHz to measure speed or drift with  $\pm 3\%$  indication.

**LAG-26:** audio generator, sine and square waves.

**LAG-125:** low distortion audio generator, sine and square wave outputs.

**LMV-182A:** AC millivoltmeter. Covers frequency range 5Hz to 1MHz, measures -90 to +42dB, or 30 $\mu$ V in 12 ranges.

## LEVELL (UK)

Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SQ. Phone: 01-440 8686/449 5028.

**TG301:** function generator providing sine, square, triangle, pulse, sawtooth ramp and asymmetrical sine waves.

**TG152:** RC oscillator. Generates sine and square waves from 3Hz to 300kHz in five ranges.

**TM3A/B:** AC microvoltmeters. Cover bandwidth 1Hz to 3MHz and measure -100 to +50dB or 15 $\mu$ V to 100V in 16 ranges. TM3A 83mm scale TM3B 127mm scale.

**TM10:** electronic null detector.

**TM14:** battery powered insulation tester.

## LINDSAY (UK)

Lindsay Electronics Ltd, Ifton Hill House, Portskewett, Newport, Gwent NP6 4TT. Phone: 0291 420517.

UK: Scenic Sounds Equipment Ltd, 97-99 Dean Street, London W1V 5RA. Phone: 011734 2812. Telex: 27939.

**Model 7634:** realtime  $\frac{1}{3}$ -octave spectrum analyser. 27  $\frac{1}{3}$ -octave bands from 40Hz to 16kHz, 10 step LED matrix with 10 or 20dB display ranges, flat or A weighted, over range indication on each band, fast or slow decay, mic and line inputs, mic input displayed directly in dB SPL for level measurement, two memories, internal noise generator.

## LINDOS (UK)

Lindos Electronics, Sandy Lane, Bromeswell, Woodbridge, Suffolk IP12 2PR. Phone: (Eyke) 03847 432.

**LA1:** portable audio analyser. Includes signal generator covering 15Hz to 100kHz in four ranges (includes RIAA equalised output), frequency meter covering 10Hz to 200kHz, wow and flutter meter to DIN/IEC/NAB, residual reading 0.006%, millivoltmeter covering 100 $\mu$ V to 100V, intrinsic noise 4 $\mu$ V, weighting filters for CCIR/ARM, DIN audio band DIN A rumble, DIN B rumble, option for IEC A and C, distortion meter and spot frequencies of 45Hz, 1kHz and 10kHz, min resolvable reading 0.005%. Additional facilities oscilloscope output, external weighting, battery check, power outputs, high-pass filter. Versions with BNC or DIN connectors.

**ST1:** studio interface extending the capabilities of the LA1 analyser, with balanced line interfaces using differential amps, output amp provides +26dBm output into 600 $\Omega$ , input 1M $\Omega$  impedance.

## LYONS (UK)

Lyons Instruments Ltd, Ware Road, Hoddesdon, Herts EN11 9DX. Phone: 09924 67161. Telex: 22724.

**SQ10:** sine/square oscillator; waveforms from 10Hz to 1MHz in five decade ranges.

**D10:** distortion meter; 0.3% to 10% in four ranges, tunable over 10Hz to 100kHz in four ranges, manual nulling.

## MARCONI (UK)

Marconi Instruments Ltd, Longacres, St. Albans AL4 0JN. Phone: 0272 59292.

USA: Marconi Electronics Inc, 100 Stonehurst Court, Northvale, New Jersey 07647. Phone: (201) 767-7250. Telex: 710-991 9752.

**TF2000:** AF signal source. 20Hz to 20kHz in six bands with 0.1% distortion; three decade, 111dB in 0.1dB steps, monitored attenuator.

**TF2005R:** two tone signal source. Similar to TF2000, but two oscillators for IM measurements.

**TF2102M:** AF oscillator. Similar to TF2000, but no stepped attenuator, and range from 3Hz to 30Hz in four bands.

**TF2330A:** wave analyser; covers range 20Hz to 76kHz, measures amplitude of individual frequency components, suitable for FM stereo encoded signals, and also harmonics, 7Hz bandwidth for closely spaced components, 15 ranges of sensitivity from 30 $\mu$ V to 300V, auto frequency.

**TF2331A:** distortion factor meter. Range 20Hz to 20kHz, input frequencies to 100kHz, measures distortion and noise from less than 0.05%, weighting filter, noise measurements to -72dBm.

**TF2337A:** automatic distortion meter. Separate meters for level and distortion, fixed fundamental frequencies of 400Hz and 1kHz, distortion measurement from 0.01% to 30% in six ranges.

**TF893A:** AF power meter. Measures 1mW to 10W in five ranges over frequency range 20Hz to 20kHz, impedance 2.5 $\Omega$  to 20k $\Omega$  in 48 steps, bal or unbal, direct calibration in watts and dBm.

## MCCURDY (Canada)

McCurdy Radio Industries Ltd, 108 Carnforth Road, Toronto, Ontario M4A 2L4. Phone: (416) 751-6262. Telex: 06963533.

USA: McCurdy Radio Industries Inc, 1711 Carmen Drive, Elk Grove Village, Illinois 60007. Phone: (312) 640-7077. Telex: 910-222 0436.

**SA14023:** audiometer, two ranges from -50 to +10dBm in 2dBm steps, or -30 to +30dB, VU meter standard, optional PPM.

## MJS ELECTRONICS (UK)

MJS Electronics, Kenward House, Hartley Wintney, Hants. Phone: 025126 3535. Telex: 858733.

**Model 401:** noise and level test set. Measures noise to the IBA 'code of practice' using standard PPM 1 - 7 scale, or special dBm and V calibrated scale, measures audio level from -90 to +30dBm, or 30 $\mu$ V to 30V, switchable in 10 and 1dB steps, input level accuracy  $\pm 0.02$ dB in 1dB steps, equivalent input noise 30kHz bandwidth -115dB rms, -112dB peak input filter, hi and lo pass filters, CCIR filter, external filter sockets, phones output, normal PPM scale (with 4dB between divisions) or expanded scale (with 0.5dB between divisions).

**Model 402:** precision oscillator providing 12 spot frequencies with variable tuning facilities.

## 3M/MINCOM (USA)

3M/Mincom Division, 3M Centre, St Paul, Minnesota 55101. Phone: (612) 733-1110.

UK: 3M UK Ltd, PO Box 1, Bracknell, Berks RG12 1JU. Phone: 0344 26726. Telex: 849371.

**Model 8155A:** wow and flutter meter. Measures with 3,000, 3,150 and 1,000Hz tones, input level 100mV min, six ranges from 0.03% to 10% rms (NAB) or peak (IEEE/DIN).

**Model 8100A-W:** wow and flutter meter which measures with 3kHz tone; input level 5mV min; six ranges from 0.03 to 10% flutter; drift measurement and wave analyser from 0.5 to 600Hz tunable in three decade bands.

**Model 610A:** wideband sweep generator providing single continuous frequency sweep from 400Hz to 2.2MHz and is ideal for alignment of high speed duplication equipment. Various options.

**Model 6100:** audio test set including sinewave generator; AC millivoltmeter and wave analyser.

## NAKAMICHI (Japan)

Nakamichi Research Inc, 1-153 Suzukicho, Kodaira, Tokyo. Phone 04233 42-1111. Telex: 2832610.

UK: Natural Sound Systems, 10 Byron Road, Wealdstone, Harrow, Middx HA3 7TL. Phone: 01-863 8622. Telex: 922573.

USA: Nakamichi USA Corp, 220 Westbury Avenue, Carle Place, NY 11514. Phone: (516) 333-5440. Telex: 144513.

**T-100:** audio analyser providing voltage measurement, weighted noise measurement, distortion measurement at 400Hz, speed measurement and weighted/unweighted wow and flutter measurements.

## NEPTUNE (USA)

Neptune Electronics Inc, 934 NE 25th Avenue, Portland, Oregon 97232. Phone: (503) 232-4445.

UK: Court Acoustics Ltd, 35/39 Britannia Row, London N1 8QH. Phone: 01-359 0956/5275. Telex: 268279.

**Model 2709:** realtime  $\frac{1}{3}$ -octave spectrum analyser with LED matrix display; uses 27  $\frac{1}{3}$ -octave bands from 40Hz to 16kHz; nine steps per band switchable 1 or 3dB per step; internal pink noise generator.

## NEUTRIK (Liechtenstein)

Neutrik AG, FL-9494 SCHAAN. Phone: 075 263.83. Telex: 77771.

UK: Eardley Electronics Ltd, Eardley House, 182 - 184 Campden Hill Road, London W8 7AS. Phone: 01-221 0606. Telex: 299574.

USA: Philips Audio Video Systems Corp, 91 McKee Drive, Mahwah, New Jersey 07430. Phone: (201) 529-3800.

**3201 Audiotracer:** portable automatic level recorder comprises a voltage controlled oscillator covering either 20Hz to 20kHz, or 200Hz to 200kHz; 0.5% distortion from 200Hz to 5kHz; warble tone modulator with 5Hz swing. Input amplifier has 5mV sensitivity, switchable ranges for linear, 25 or 50dB, three writing speeds, variable paper speed, thermosensitive recording paper, pen lift, mains powered.

## NTP (Denmark)

NTP Elektronik A/S, 44 Theklavej, DK-2400 Copenhagen NV. Phone: 01 10.12.22. Telex: 16378.

177-520: stereo monitor oscilloscope showing phase and amplitude between two stereo channels.  
507-100: gate/burst generator allowing dynamic characteristics of PPMs to be checked.

## PHILIPS (Netherlands)

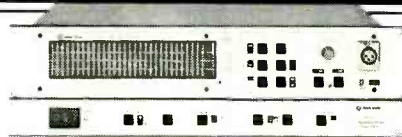
Philips, Eindhoven, Netherlands. Phone: 040 79.11.11. Telex: 511121.

UK: Pye Unicam Ltd, York Street, Cambridge CB1 2PX. Phone: 0223 358866. Telex: 81215. 48 ▶

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## DN60 REAL TIME SPECTRUM ANALYSER

The DN60 Real Time Spectrum Analyser is a new audio measurement system. It is capable of performance checks on virtually any audio equipment, and is especially well suited for aligning audio tape recorders. On site performance verification, whether of a 10,000 seat arena, or a studio control room, is easily effected with the DN60.

The microprocessor based circuitry makes the DN60 very cost effective and with the inclusion of Three Memories, and a Peak-Hold function, you can expand the scope of your sound check and provide that extra edge of excellence.

## RT60 REVERBERATION ANALYSER

The optional RT60 unit further extends the capabilities of the DN60, facilitating accurate and comprehensive reverberation time analysis. RT60 figure is displayed for any one of 30 1/3rd octave frequencies or 'wide band' and the reverberation decay curve is automatically plotted on the DN60 L.E.D. matrix display.

The RT60 features a variable decay window, three memories, selectable display times and curve accumulate function. Both impulse and gated noise methods are automatically recognised.

An XY plotter and hard copy printer is available for the DN60 and RT60.



**KLARK TEKNIK**  
*sound science*

U.K. and worldwide **Klark-Teknik Research Limited,**  
Coppice Trading Estate, Kidderminster,  
Worcestershire DY11 7HJ, England.  
Telephone: (0562) 741515 Telex: 339821

U.S.A. **Klark-Teknik Electronics Inc.**  
262a Eastern Parkway, Farmingdale, N.Y. 11735  
Telephone: (516) 249-3660

# product Test equipment guide

**USA:** Philips Test and Measuring Instruments Inc, 85 McKee Drive, Mahwah, New Jersey 07430. Phone: (201) 529-3800.

**PM802/22:** Stepper-motor driven single and 2-pen chart recorders, input sensitivity 1mV to 50V, 11 chart speeds, 0.25s response.

**PM8110:** portable, single-line chart recorder, 120mm chart width, 2-speed, battery operated.

**PM813/32:** single and dual pen X-Y chart recorders. 0.25% accuracy, vector speed 1m/s, 50 $\mu$ V sensitivity.

**PM5107:** LF generator, sine and square waves, 10Hz – 100kHz in four ranges, 20dB attenuator.

**PM5165:** sweep generator, sine square and triangle waveforms, four decades per sweep, 0.1Hz – 1MHz, variable sweep width and speed, also internal sawtooth generator and digital freq. display.

**PM6307:** wow and flutter meter, 3,000 or 3,150Hz tones, crystal controlled, separate drift and flutter.

## POTOMAC (USA)

**Potomac Instruments Inc, 932 Philadelphia Avenue, Silver Springs, Maryland 20910. Phone: (301) 589-2662.**

**AG-51:** audio generator with low distortion 20Hz to 200kHz sine wave generator; SMPTE standard inter-modulation signal generator; fixed 3.15kHz frequency for wow and flutter.

**AA-51:** audio analyser. Automatic multipurpose system; THD distortion meter covers fundamentals from 20Hz to 20kHz with 100kHz bandwidth; internal distortion and noise 0.04%; IM distortion meter accepts 60Hz and 7kHz SMPTE frequencies; AC voltmeter 1mV to 100V range; phase meter has  $\pm 54^\circ$  and  $\pm 180^\circ$  full scale with 3 $^\circ$  resolution; ratio meter has  $\pm 6$ dB range; wow and flutter meter.

**AT-51:** combined AA-51 and AG-51.

## PYRAL (France)

**Pyral SA, 47 rue de l'Echat, F-94001 Creteil. Phone: (1) 207.48.90. Telex: 23742.**

**UK:** Pyral Magnetics Ltd, Courtlands Road, Eastbourne, Sussex. Phone: 0323 638965.

**USA:** Gotham Audio Corp, 741 Washington Street, New York, NY 10014. Phone: (212) 741-7411. Telex: 129269.

**ASA3:** realtime 28-band  $\frac{1}{3}$ -octave analyser using bargraph displays; bands from 40Hz to 20kHz; 0.25dB resolution on 25dB scale; two memories; option for pink noise generator or sine sweep generator; 25dB or 50dB ranges.

## RACAL-DANA (UK)

**Racal-Dana Instruments Ltd, Duke Street, Windsor, Berks SL4 1SB. Phone: 07535 69811. Telex: 847013.**

**USA:** Racal Dana Instruments Inc, 18912 Van Korman Avenue, Irvine, Cal 92715. Phone: (714) 833-1234.

**9083:** 2-tone signal generator covering 10Hz to 100kHz; two alternate or mixed tones.

**9300:** true RMS voltmeter; 5Hz to 20MHz; range 10 $\mu$ V to 300V.

## RE (Denmark)

**Radiometer Electronics A/S, Frederikssundsvej 254, DK-2700 Bronshoj.**

**USA:** Radiometer Electronics US Inc, 811 Sharon Drive, Cleveland, Ohio 44145. Phone: (216) 871-7617.

**UK:** Danbridge (UK) Ltd, Sherwood House, High Street, Crawthorne, Berks RG11 7AT. Phone: 03446 2369.

**RE402:** wow and flutter meter; crystal controlled oscillator with 3k or 3.15kHz; digital display of drift in %; sensitivity 3mV; six ranges for flutter covering 0.03 to 10% DIN, NAB and JIS standards.

**RE403:** wow and flutter analyser using LED matrix display; realtime frequency analysis using digital filter equivalent to 30  $\frac{1}{3}$ -octaves over range 0.2 to 200Hz with 10 steps in each band.

## RCF (Italy)

**Radio Cine Forniture, 43029 S Maurizio, Via Notari, Milan. Phone: 0522 24.01.42.**

**UK:** Covemain Ltd, Dunchurch Trading Estate, London Road, Dunchurch, Rugby CV23 9LL. Phone: 0788 815020. Telex: 837537.

**AFA51:** realtime  $\frac{1}{3}$ -octave spectrum analyser using LED matrix display; 27 bands from 40Hz to 16kHz providing 12 steps (3-colour to provide level indication) with total 24dB dynamic range; +3 to -4dB in 1dB steps then four steps to -20dB; internal pink noise generator; stereo line inputs.

## SENNHEISER (West Germany)

**Sennheiser Electronic, D-3002 Wedemark 2, Hanover. Phone: 05130 8011. Telex: 0924623.**

**UK:** Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St Peter, Gerrards Cross, Bucks SL9 9UG. Phone: 02813 88447/89221. Telex: 84969.

**USA:** Sennheiser Electric Corp, 10W 37th Street, New York, NY 10018. Phone: (212) 239-0190.

**UPM550:** universal level meter covering bandwidth 10Hz to 1MHz with 15 ranges to measure -98 to +52.5dBm. Includes peak or RMS rectification and a variety of weighting filters.

**ZP-2:** portable, battery operated impedance tester.

## SOLIDYNE (Argentina)

**Solidyne SRL, Tres de Febrero 3254, 1429 Buenos Aires. Phone: 701-8622.**

**900A:** audio frequency generator covering 15Hz to 150kHz in four ranges.

## SOUND TECHNOLOGY (USA)

**Sound Technology Inc, 1400 Dell Avenue, Campbell, Cal 95008. Phone: (408) 378-6540. Telex: 357445.**

**UK:** Precision Audio Marketing, Bimini House, Christchurch Road, Virginia Water, Surrey. Phone: 09904 4416.

**1500A:** tape recorder test system with CRT display; explanatory alphanumeric; optional hard copy; measures frequency response, 2nd and 3rd harmonic distortion relative to record level, wow and flutter, wow and flutter spectral components, noise and noise spectrum, speed accuracy and drift, channel separation v frequency, and head azimuth accuracy. Noise measurement is to NAB, ANSI or CCIR/ARM - flutter to NAB, JIS or DIN/ANSI. Automatic measuring with left and right channels. Various options available.

**1410A:** ultra low distortion signal generator; pushbutton tuned over range 10Hz to 110kHz with 0.001% distortion; provides both sine and SMPTE IM signal.

**1400A:** as 1410A but no IM output or dB attenuators; only variable voltage 1mV to 3V.

**1700B:** distortion measurement system; pushbutton tuned oscillator over range 10Hz to 110kHz; fully automatic nulling; measures 30 $\mu$ V to 300V; provides distortion measurement down to 0.002% in 5s; measures power across 8 $\Omega$ . Options for automatic set level when measuring distortion; IM distortion analyser and switch selectable meter response.

**1701A:** similar to 1700B but lower residual distortion and noise; average or true RMS or peak meter reading; 6V output; 10dB/step attenuator.

**1710A:** similar to 1700B but oscillator output adjustable from -89.9 to +26dBm in 0.1dB steps; sensitivity 100 $\mu$ V to 100V; measures power -80dBm to +40dBm; balanced inputs.

**1020A:** FM alignment generator.

## JE SUGDEN (UK)

**JE Sugden & Co Ltd, Carr Street, Cleckheaton, West Yorks BD19 5LA. Phone: 0274 872501.**

**453:** signal generator covering 13Hz to 30kHz in six ranges; sine and square waves; battery operated.

**451:** AC millivoltmeter; five ranges.

**452:** distortion measuring unit; input sensitivity 300mV to 3V; notch tunable over 15Hz to 20kHz; manual tuning of notch filter for null; LF cut filter; requires external oscillator and millivoltmeter.

## TEKTRONIX (USA)

**Tektronix Inc, PO Box 500, Beaverton, Oregon 97077. Phone: (503) 644-0161.**

**UK:** Tektronix (UK) Ltd, Beaverton House, PO Box 69, Harpenden, Herts. Phone: 05827 63141. Telex: 25559.

**AA501:** bandpass filter/amplifier for the TM500 system. Tunable bandpass filtering 10Hz to 100kHz; sine wave generation to 35kHz; up to 500x gain.

**SG505:** oscillator for the TM500 system; covers 10Hz to 100kHz sine wave.

**SG502:** oscillator for the TM500 system; covers 5Hz to 500kHz sine and square waves.

**5L4N:** spectrum analyser with CRT display; covers range 20Hz to 100kHz; dynamic range on screen 80dB; auto resolution; built-in tracking generator; 20Hz to 20kHz log sweep; may be plugged into any 5000 Series oscilloscope mainframe.

## UREI (USA)

**United Recording Electronics Industries, 8460 San Fernando Road, Sun Valley, Cal 91352. Phone: (213) 767-1000. Telex: 651389.**

**UK:** FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

**Model 200:** mainframe X-Y plotter designed by UREI and Hewlett-Packard; accepts 200 series modules for various applications; uses electrostatic paper holddown; disposable or felt tip pens; vertical range 1V/in; horizontal 0.1V/in; 20in/s slewing speed. Modules include the Model 2000 frequency response module; Model 2010 level and frequency detector module; Model 2020 DC input module; and Model 20 warble generator module.

## WAYNE KERR RADFORD

**Wayne Kerr Radford Ltd, Durban Road, Bognor Regis, West Sussex PO22 9RL. Phone: 0243 825811. Telex: 86120.**

**AMS1:** audio measuring test set with comprehensive facilities including low distortion oscillator; multi-frequency distortion meter; multi-frequency crosstalk meter; phase meter; peak programme meter; true RMS voltmeter; wow and flutter meter; rumble meter; noise meter with plug-in filter options; and digital frequency counter.

**ANM3/ANM4:** ANM3 switchable quasi-peak or true RMS noise meter with DIN, IEC A and CCIR weightings; ANM4 average responding noise meter with modified CCIR filter. Sensitivity of both selectable in 16 ranges from -100dBm to +50dBm.

**RA200/ADS1:** frequency response analyser with CRT display featuring variable sweep generator; various sweep modes; and variable I/O levels. ADS1 is an optional display store allowing four different curves to be stored and simultaneously displayed.

**LD04/5:** low distortion oscillators covering the range 10Hz to 100kHz in four ranges; generate sine or square waves. LD04 mains powered, 10V output; LD05 battery powered, 3V output.

**DMS4/5:** battery powered harmonic distortion measuring sets for use with the LD04/5.

## WHITE (USA)

**White Instruments Inc, PO Box 698, Austin, Texas 78767. Phone: (512) 892-0752.**

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

**Model 140:** realtime 27 band  $\frac{1}{3}$ -octave spectrum analyser with an LED matrix display; range 40Hz to 16kHz; built-in pink noise generator.

**System 200:** realtime 30 band  $\frac{1}{3}$ - or  $\frac{1}{2}$ -octave spectrum analyser with microprocessor control and LED matrix display. Range 25Hz to 20kHz ( $\frac{1}{3}$ -octave), 40Hz to 1.12kHz ( $\frac{1}{2}$ -octave); eight microprocessor controlled memories for storing filter levels. Options include standard response curve memory for comparison purposes and an RT60 analysis option.

## WOELKE (West Germany)

**Woelke Magnetbandtechnik GmbH, Woelke-Strasse 2-3, D-8069 Schweitenkirchen. Phone: 08444 394. Telex: 55547.**

**UK:** Lennard Developments Ltd, 206 Chase Side, Enfield, Middx EN2 0QX. Phone: 01-363 8238.

**USA:** Audicon Inc, 1200 Beechwood Avenue, Nashville, Tennessee 37212. Phone: (615) 256-6900. Telex: 554494.

**ME105:** wow and flutter meter with 3,000 or 3,150Hz oscillator; input sensitivity 3mV to 20V; drift measurement  $\pm 0.1\%$  to  $\pm 10\%$ ; flutter from 0.03% to 3%; to DIN, IEC and ANSI standards.

**ME106 Series:** wow and flutter meters with 3,150Hz oscillator; input sensitivity 3mV to 30V; drift 0.5% to 5%; flutter 0.1% to 3%; to DIN, CCIR, ANSI and IEC standards.

**ME108 Series:** similar to ME106 but only single drift range of 5%.

**ME110 Series:** similar to ME108 but with single meter switchable to read single ranges for either drift or flutter.

**ME301C:** wave analyser with six range tunable filter covering 1Hz to 1kHz; used in conjunction with external meter or plotter.

**ME401:** automatic distortion meter with built-in 333Hz oscillator; single scale covering 0.2% to 10%; level from -20dB to +10dB.

## XEDIT (USA)

**Xedit Corp, 133 South Terrace Avenue, Mt Vernon, NY 10550. Phone: (914) 668-0388.**

**Model 20P/16P/15P:** portable drift and flutter meter with three ranges for 0.05% to 5%, and drift  $\pm 5\%$ ; oscillator either 3,000 or 3,150Hz. Model 20P DIN and JIS (RMS); 16P JIS (RMS); 15P DIN.



# analogue or digital master tapes?

## ½" STEREO

Although digital audio recording will eventually become commonplace, it is as yet beyond the pockets of most studios with the result that users and manufacturers alike are looking again at the analogue recorder and wringing more performance from the technique. The result is that masters running at 30ips wound on 14in. spools and wider track formats such as stereo on ½in. tape are becoming popular.

Why is this happening? In recent years, digital audio and in particular digital audio recording have been looked upon as the ultimate goal, the crock of gold at the end of the rainbow, but at what cost? A stereo system using PCM recording on U-matic format VTR costs in the region of £20,000 for the basic unit. In addition, because a cartridge is used in which physical access to the tape is impossible, electronic editing becomes imperative. This virtually doubles the cost (and a razor blade costs 10p!)

## SIGNAL-TO-NOISE RATIO

Financial constraints therefore force most recording studios to look for an alternative which will get acceptably close to what can be achieved with digital equipment. That crock of gold has been glimpsed, but what can be done to at least get nearer to it, using what we have already? The half-inch stereo format seems to be the way to go, since signal to noise ratios in excess of 75dB can be achieved depending on recording level chosen. Peaking, for argument's sake, at 6dB above 510 nWb/m which the MCI 2-track machine will allow, if used with Grand Master tape, signal to noise ratios close to 80dB can be reached without the distortion exceeding 1%.

In fact many engineers have been very surprised at the subjective changes they have detected which are not necessarily revealed in bold performance figures. All over the USA the industry has been talking about the move to ½ inch stereo. The word is spreading—"The sound is bigger"—"The top end is effortless"—". . . the trend is taking off . . ."—and, perhaps most revealing—"The sound is very close to digital" are typical comments. One company executive is quoted as saying—"It's going to give analogue a new breath of fresh air for some time, especially compared to what it takes to go digital."—"Once the word spreads about how good it sounds, the demand is going to get even stronger."

## REVISED TECHNOLOGY

As more and more US recording studios switch to this revived recording format, and as the word spreads in the UK, MCI, always with the leaders, announces the introduction of the JH110B-2½ half-inch stereo mastering machine. At the same time, a conversion kit enabling existing ¼ inch JH110B users to update to ½ inch, is made available.



MCI JH110B-2½

The JH110B-2½ is at present the only machine with three speeds and 14in. spool capability—the latter absolutely essential to hold one complete album side at 30ips. Surprisingly enough, choosing ½ inch format, rather than ¼ inch, adds less than £200 to the bill.

These developments are merely hypothetical if a disc cannot be cut from a tape that has been recorded in the new format. The disc mastering machine is as important as any other step in the recording chain. MCI has for some years been able to meet this demand with its Disc-mastering machine, the JH110M. This mastering machine manufactured by MCI is unique in that it is again the only one to take 14in. spools and also is a three speed machine (19/38/76 cm/sec). The features do not end there, however. Another standard feature is the RTZ111M, a micro-processor controlled tape position indicator, auto-locator and tape velocity indicator with 20 extra scratch-pad memories for such functions as expand, band and lead-out for automatic control of all currently available lathe systems.

## THE FUTURE

Until such time that we will have consumer electronics available to the ordinary man in the street, whereby he will be able to hear the advantages of digital recording, one can argue the advantages of inserting a digital link in what has been hitherto a totally analogue chain. Maybe we shall have to look at a different system, which does not need expensive clocking in and out of the information, before society as a whole can go digital.

In the meantime, at MCI, efforts are being made and research carried out to carry the industry forward to better and more economical ways of recording sound. No one in the industry will deny that digital recording will eventually be with us, but until such time as equipment can be manufactured (and serviced!) at a more realistic cost, the ½ inch format does represent a significant step forward in quality.

# MCI

**MCI (PROFESSIONAL  
STUDIO EQUIPMENT)  
LTD.**

**MCI House,  
54-56 Stanhope Street,  
London NW1 3EX.**

**Telephone: 01-388 7867  
Telex: 261116**

# product Interconnection guide

## ALPHA (USA)

Alpha Wire Corp, 711 Lidgerwood Avenue, Elizabeth, New Jersey 07207, USA. Phone: (201) 925-8000.  
UK: Alpha Wire Ltd, Central Way, North Feltham Trading Estate, Feltham, Middx. Phone: 01-751 0261. Telex: 8813660.

Extensive range of wire and cables suitable for audio and transmission use.

## AUDICON (USA)

Audicon Marketing Group, 1200 Beechwood Avenue, Nashville, Tenn 37212, USA. Phone: (615) 256-6900.  
UK: Trad Electronic Sales Ltd, 149b St Albans Road, Watford WD2 5BB. Phone: 0923 47988. Telex: 262741.

Range of multicore cable available in 32, 24, 10, 8, 4 or single pair configurations.

## BELDEN (USA)

Belden Corp, PO Box 1331, Richmond, Indiana 47374, USA. Phone: (317) 966-6661.  
UK: Leonard Wadsworth & Co (Electronics) Ltd, Warehouse Block F, Imber Court Trading Estate, Orchard Lane, East Molesey, Surrey KT8 0DA. Phone: 01-398 4288. Telex: 264028.

Vast range suitable for most electrical and electronic applications.

## BICC (UK)

BICC General Cables Ltd, Helsby, Warrington, Cheshire WA6 0DJ, UK. Phone: 092-82 2700.

PVC and polythene insulated cables including multipairs, mic and loudspeaker leads.

## BOFA (Sweden)

Cliff Electronic Components Ltd, 97 Coulsdon Road, Caterham, Surrey CR3 5NF, UK. Phone: 0883 47713. Telex: 8813346.

Low cost aluminium foil screened cables with integral drain wire (not flexible) and overall screened multicore cables and stranded conductors.

## BIW (USA)

Boston Insulated Wire & Cable Co, 65 Bay Street, Boston, Mass 02125, USA. Phone: (617) 265-2102. Telex: 940604.  
UK: Boston Insulated Wire (UK) Ltd, 1 Canbury Park Road, Kingston-upon-Thames, KT2 6JY. Phone: 01-546 3384. Telex: 21885.

Specialist manufacturer of cables for OB and studio use.

## CANFORD AUDIO (UK)

Canford Audio, Stargate Works, Ryton, Tyne and Wear NE40 3EX, UK. Phone: 089422 4515. Telex: 537792.  
USA: Canford Audio (USA) Inc, 652 Glenbrook Road, Stamford, Conn 06906, USA. Phone: (203) 324-2889. Telex: 643678.

Automatic cable tester Mk2: 3-way audio cable tester with seven test sequences.

## DAVU (UK)

Davu Wire & Cables Ltd, Harrow Manorway, Abbey Wood, London SE2 9AA, UK. Phone: 01-310 7036. Telex: 896767.

Mic and subminiature cables.

## EDCOR (USA)

Edcor 16782 Hale Avenue, Irvine, Cal 92714. Phone: (714) 556-2740.

Multiplex Snake: mic cable transmission system accepting up to eight audio signals over a single mic cable. Available in balanced or unbalanced encoder/decoder versions.

## EMT (Switzerland)

EMT Franz GmbH, Postfach 1520, 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: 12969.

Specially designed range for audio applications with 'Reusen' shielding which gives high degree of sound protection.

## FUTURE FILM (UK)

Future Film Developments, 36/38 Lexington Street, London W1R 3HR, UK. Phone: 01-437 1892. Telex: 21624.

Durable mic cables with 'Reusen' shielding and multipair cables—*M Series* to 51 pairs and *J Series* to 32 pairs.

## GOTHAM (West Germany/Austria)

Gotham Audio Corp, 741 Washington Street, New York, NY 10014, USA.  
Phone: (212) 741-7411. Telex: 129269.  
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

High quality mic cables with double layer 'Reusen' shielding.

## ILLINOIS (USA)

Illinois Cable Company, 8225 N Christiana, Skokie, Illinois 60076, USA. Phone: (312) 679-0160.

2- and 3-conductor shielded cable, and multipair cable available in three to 27 pairs in 7 x 30 or 16 x 30 gauge.

## LECTRIFLEX (UK)

Lectriflex Cables & Accessories Ltd, The Paddocks, Frith Lane, Mill Hill, London NW7 1PS. Phone: 01-349 2011. Telex: 28915.

Instrumentation cables in single to 100 pairs.

## LEMO (UK)

Lemo (UK) Ltd, 12 North Street, Worthing, Sussex BN11 1DU. Phone: 0903 34543.

Range of coloured tapered cable sleeves and socket identification washers for standard and B range connectors.

## 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) Ltd, 652 Glenbrook Road, Stamford, Conn 06906. Phone: (203) 348-4969.

CD1, CD2, CD3: stackable cable drums.

## NEK (Norway)

Norsk Elektrisk Kabelfabrik, Etterstadkroken 9, PO Box 23, Bryn, Oslo 6. Phone: (02) 67.41.80. Telex: 18001.  
UK: NEK (UK) Ltd, 88 Easton Street, High Wycombe, Bucks. Phone: 0494 447024.

Wide range of mic and multipair cables from two to 10 pairs.

## NEUTRIK (Liechtenstein)

Neutrik AG, Obergass 16, FL-9494 Schaan. Phone: 075 2.63.83.  
UK: Eardley Electronics Ltd, Eardley House, 182/4 Campden Hill Road, London W8 7AS. Phone: 01-221 0606.

K-Check: mic cable tester.

## PANDUIT (UK)

Panduit Ltd, Lordswood Ind. Estate, 61/65 Revenge Road, Chatham, Kent ME5 8YT. Phone: 0634 660811/5.

Range of cable ties, cable ducting, wiring aids and accessories.

## PLAN AUDIO (UK)

Plan Audio, 27B Bell Street, Reigate, Surrey. Phone: Reigate 22249.

Powerline: range including instrument cables with jacks and mic and speaker cables.

## PRO-CO (USA)

Pro-Co Sound Inc, 135 E Kalamazoo Avenue, Kalamazoo, Michigan 49007. Phone: (616) 342-0269.

Mic and line level cables using Belden cable.

## PRO SOUND (USA)

Pro Sound, 13717 S Normandie Avenue, Gardena, Cal 90249, USA. Phone: (213) 770-2330.

Coloured mic cables with Switchcraft *XLR*-type or miniature *QG* connectors.

## PROPHON (UK)

Prophon Sound Ltd, 90 Wilsden Avenue, Luton LU1 5HR. Phone: 0582 30726.

MX8A, MX16A: active stage boxes with jack or *XLR* connectors; 15Hz to 20kHz bandwidth and 20dB gain.

## SGAL (UK)

Steve Graham Audio Ltd, 20 Victoria Road, New Barnet, Herts EN4 9PF, UK. Phone: 01-449 3663/4044. Telex: 8955127.

USA: Canford Audio (USA) Inc, 652 Glenbrook Road, Stamford, Conn 06906. Phone: (203) 324-2889. Telex: 643678.

Musiflex, Studioflex and Phonoflex: coloured mic cable and multicore cable for stage boxes.

Modular stage link systems including cables, connectors and stage boxes; multipair cables available in six to 31 pairs.

## SOUND APPLICATIONS (USA)

Sound Applications Ltd, 342 Lexington Avenue, Mount Kisco, NY 10549, USA. Phone: (914) 241-0034.

Coloured audio cables 20- or 24-gauge, for guitars, headphones, mics and speakers.

## STATESIDE (USA)

Peavey Electronics Corp, 711 A Street, Meridan, Mississippi 39301, USA. Phone: (601) 483-3565.  
UK: Peavey Electronics (UK) Ltd, Unit 8, New Road, Ridgewood, Uckfield, Sussex TN22 5SX. Phone: 0825 5566.

Straight or curled stage leads using Belden cable and Switchcraft jacks.

## TECHNICORD (UK)

Technicord Ltd, Melbourn House, 2 Black Bank Road, Little Downham, Ely, Cambs CB6 2TZ, UK. Phone: 035387 721.

Coloured audio leads with Switchcraft *XLR*-type connectors; 'Reusen' screened ultra-flexible equipment cable; equipment lead.

## TROMPETER (USA)

Trompeter Electronics Inc, 8936 Comanche Avenue, Chatsworth, Cal 91311. Phone: (213) 882-1020.  
UK: Lee Engineering Ltd, Napier House, Bridge Street, Walton-on-Thames, Surrey KT12 1AP. Phone: 09322 43124.

Range of patch cords, cable assemblies, plus twinax, triax, and quadrax cables.

## WHIRLWIND (USA)

Whirlwind Music Inc, PO Box 1075, Rochester, NY 14603, USA. Phone: (716) 663-8820.  
UK: Atlantex Music Ltd, 34 Bancroft, Hitchin, Herts SG5 1LA. Phone: 0462 31511. Telex: 826967.

Straight or curled instrument and mic cables with high quality jacks; patch cords from 1ft length.

Medusa multiple wiring system: multiway systems with stage boxes, multicores and multiple connectors for mixer.

## WIREWOKS (USA)

Wireworks Corp, 380 Hillside Avenue, Hillside, New Jersey 07205, USA. Phone: (201) 686-7400. Telex: 710-985 4675.

TE-2: mic cable tester with *XLR* and  $\frac{1}{4}$ in jack sockets.

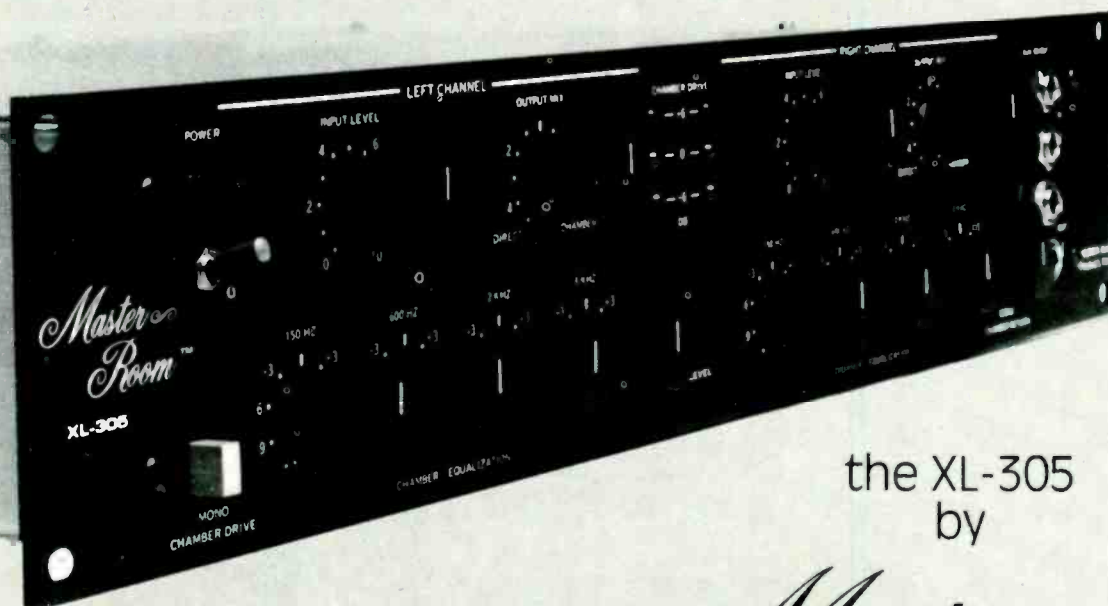
Range of hardwired mic multicable systems comprising stage box, multicore and individual tails for mixer; mic cables with *XLRS*.

Bandits: cable marking system range.

52 ▶

# Incredible...

the "Acoustic Chamber Synthesizer"™



the XL-305  
by

*Master  
Room*™

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

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

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



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

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

# product interconnection guide

Jack plugs  
Jack sockets  
Jack panels  
Jackfields  
Phono plugs  
XLR-type sockets  
XLR-type connectors  
Screw connectors  
Patch cords  
Patch panels

<b>ADC (USA)</b> ADC Products, 4900 W 78th Street, Minneapolis, Minn 55435. Phone: (612) 835-6800. Telex: 290321. UK: Atlantex Music Ltd, 34 Bancroft, Hitchin, Herts SG5 1LA. Phone: 0462 31511. Telex: 826967.	●	●	●	●	●	●	●	●											
<b>AMPHENOL-TUCHEL (West Germany)</b> USA: Amphenol Connector Division, Buker Ramo Corp, 2801 S 25th Avenue, Broadview, Illinois 60153. Phone: (312) 345-9000. Telex: 910-226 1974. UK: Future Film Developments, 36/38 Lexington Street, London W1R3HR. Phone: 01-437 1892. Telex: 21624.								●	●	●									
<b>AUDIO ACCESSORIES (USA)</b> Audio Accessories Inc, Mill Street, Marlow, New Hampshire 03456. Phone: (603) 446-333. UK: Technicord Ltd, Melbourn House, 2 Black Bank Road, Little Downham, Ely, Cambs CB3 2TZ. Phone: 035387 721.	●	●	●	●														●	●
<b>CAE (UK)</b> Communication Accessories & Equipment Ltd, 70/82 Akeman Street, Tring, Herts HP23 6AJ. Phone: 044282 4011. Telex: 82362.	●	●	●	●														●	
<b>CANFORD (UK)</b> Canford Audio, Stargate Works, Ryton, Tyne & Wear NE40 3EX. Phone: 089422 4515. Telex: 537792. USA: Canford Audio (USA) Inc, 652 Glenbrook Road, Stamford, Connecticut 06906. Phone: (203) 324-2889. Telex: 643678.										●									
<b>CANNON (USA)</b> ITT Canon Electric, 666 East Dyer Road, Santa Ana, Cal 92702. Phone: (714) 557-4700. UK: Future Film Developments, 36/38 Lexington Street, London W1R3HR. Phone: 01-437 1892. Telex: 21624.										●	●								
<b>CLIFF (UK)</b> Cliff Electronic Components Ltd, 97 Coulsdon Road, Caterham, Surrey CR3 5NF. Phone: 0883 47713. Telex: 8813346.	●	●																	
<b>DELTRON (UK)</b> Steve Graham Audio Ltd, 20 Victoria Road, New Barnet, Herts EN4 9PF. Phone: 01-449 3663/4044. Telex: 8955127. USA: Canford Audio (USA) Ltd, 652 Glenbrook Road, Stamford, Conn 06906. Phone: (203) 324-2889. Telex: 643678.										●	●								
<b>FUTURE FILM (UK)</b> Future Film Developments 36/38 Lexington Street, London W1R 3HR. Phone: 01-437 1892. Telex: 21624.	●	●	●	●	●													●	●
<b>MOSSER &amp; MITCHELL (UK)</b> Mosses & Mitchell Ltd, Wydon Lane, Farnham, Surrey GU9 8QL. Phone: 0252 721236. Telex: 858820.		●		●														●	
<b>NEUTRIK (Liechtenstein)</b> Neutrik AG, Obergass 16, FL-9494 Schaan. Phone: 075 2.63.83. Telex: CH-77771. UK: Eardley Electronics Ltd, Eardley House, 182/4 Campden Hill Road, London W8 7AS. Phone: 01-221 0606. Telex: 299574. USA: Phillips Audio Video Systems Corp, 91 Mckee Drive, Mahwah, New Jersey 07430. Phone: (201) 529-3800.										●	●								
<b>RENDAR (UK)</b> Willmot Breeden Electronics Ltd, Durban Road, Bognor Regis, West Sussex PO22 9RL. Phone: 0243 825811. Telex: 86120.	●	●																	
<b>SWITCHCRAFT (USA)</b> Switchcraft Inc, 5555 North Elston Avenue, Chicago, Illinois 60630. Phone: (312) 792-2700. Telex: 910-221 5199. UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.	●	●	●	●	●	●	●												
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<b>TECHNICORD (UK)</b> Technicord Ltd, Melbourn House, 2 Black Bank Road, Little Downham, Ely, Cambs CB3 2TZ. Phone: 035387 721. USA: Audio Accessories Inc, Mill Street, Marlow, New Hampshire 03456. Phone: (603) 446-3335.	●	●		●														●	
<b>TRIMM (USA)</b> Trimm Inc, 400 Westlake Street, Libertyville, Illinois 60048. Phone: (312) 362-3700. UK: Future Film Developments, 36/38 Lexington Street, London W1R3HR. Phone: 01-437 1892. Telex: 21624.	●	●	●	●															
<b>TROMPETER (USA)</b> Trompeter Electronics Inc, 8936 Comanche Avenue, Chatsworth, Cal 91311. Phone: (213) 882-1020. UK: Lee Engineering Ltd, Napier House, Bridge Street, Walton-on-Thames, Surrey KT12 1AP. Phone: 09322 43124.	●																	●	●
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# Standard

# what standard?

Ken Dibble

Connectors from ITT-Cannon, Neutrik and Switchcraft

**T**HIS is all very well and standardisation is a highly desirable objective in any industry. But is it in fact standard?

The answer unfortunately is no—not by a long way—and it is the aim of this article to try to air some of the problems, difficulties and misunderstandings that have arisen since the XLR-type connector came into widespread use.

### History and chaos

The XLR-type of connector was originally conceived in America by Cannon Electric many years ago to meet a demand for a reliable, heavy duty, general purpose connector for audio and communications applications that was physically smaller than the already widely used Cannon EP series connectors. The new connector was immediately seized upon by broadcasting and studio organisations in America and Europe but unfortunately, the two continents adopted quite different methods of wiring and usage which has led to considerable difficulty and confusion over the years. Initially, many American manufacturers used the three contact male connector (ie the one with protruding pin contacts) as the input receptacle into equipment while in Europe, the female connector (ie the one with shrouded sockets) was adopted for this same purpose. So immediately, there was a problem of mechanical non-interchangeability across the Atlantic. To make matters worse, the Americans went for a pin con-

**Whereas only a few years ago only the broadcasting stations and professional recording studios were using the XLR-type connector for their microphone and other low level audio signal circuits, today they are used throughout the audio industry worldwide as a general purpose connector. Almost every studio and PA installation is equipped with them and even amateur recording enthusiasts at home are using small mixing desks and microphones which come fitted with XLR-type connectors as standard equipment.**

figuration whereby increasing potential follows increasing pin numbers (ie for a balanced audio circuit, contact 1 is screen, contact 2 is return and contact 3 is signal), while in Europe, a system whereby contact 1 is screen, contact 2 is signal and contact 3 is the return, was adopted. So the wiring is also different. Little wonder that there is all this confusion!

Before long however, the Americans did change over to using the female connector as the input receptacle—not only because this system was by then in widespread use in Europe and that American manufacturers were finding difficulty in selling their products in Europe for this reason, but also because it was common sense to have it that way round. If you think about it, it makes much more sense to protect the very sensitive input circuits to a desk by shrouding than to leave them exposed on protruding pins where they can inadvertently come into contact with anything that happens to be lying around—especially with the increasing likelihood of

there being a 50V phantom power supply wired across microphone circuits. The female versions of the XLR-type connectors make inadvertent access to the live contacts very difficult indeed thereby reducing the possibility of damage to equipment or even of electric shock.

So in one sense things began to improve with manufacturers on both sides of the Atlantic at least using the connectors the same way round if not using a compatible wiring configuration, but this remaining difference has been the cause of widespread confusion and irritation. With remarkable rapidity, the European wiring system was adopted by the BBC in all their studios throughout the UK and by many other broadcasting authorities throughout Europe. This meant that in order to be compatible, manufacturers and suppliers of equipment (and private studios working for the broadcasting authorities) also adopted the same system.

The industrial and commercial public address industry followed suit due largely to the foresight of the

Association of Public Address Engineers (as it then was) in publishing a recommended practice fairly early on which, due to the Association's work on various standards committees and the presence of BBC engineers on its own council, turned out to be in line with the international standards that followed soon after.

But meanwhile, in the music industry and in many commercial recording studios, a lot of new equipment was being imported from America with the American wiring system. Also, many European manufacturers were trying to export equipment to America, so the studio and music industry generally formed the nucleus of a European-based faction using the American system for reasons of commercial convenience. As new manufacturers and new users appeared on the market, they adopted one system or the other according to which faction of the market they found themselves in—all of course quite convinced that their system was the right one and often totally unaware that any other system existed.

### Standardisation at last

In an attempt to come to an international agreement and to end all this confusion, the Electro-acoustics Technical Committee of the IEC (International Electrotechnical Commission) meeting in Stresa in 1969 set the wheels in motion to arrive at an internationally agreed standard. After further meetings in Oslo during 1971, a draft standard was submitted

to the various national committees of the IEC in 1973 and was finally adopted and issued as IEC standard No 268 part 12 under the title *Circular Connectors for Broadcast and Similar Use* in 1975. The signatories to the agreement were Australia, Belgium, Canada, Denmark, Egypt, Hungary, Israel, Japan, Netherlands, Norway, Romania, South Africa, Sweden, Switzerland, Turkey, the UK and USA, so in theory at least, it should be a truly international standard.

To add further credence to its use in the UK, the IEC standard was adopted by the British Standards Institution in 1980/81 and has now been issued in the UK as BS 5428, part 5, section 3.

The standard adopts the 3-contact XLR-type connector for mic and low level audio lines for single-channel (mono) circuits and the 5-contact XLR-type connector for 2-channel (stereo) circuits. The input receptacle to equipment is given as the female half having socket contacts, which is in agreement with generally adopted practice as we have already discussed. The contact usage is given in **Table 1**.

The IEC 268 standard also makes provision for two common forms of phantom powering for capacitor mics to be incorporated into the balanced circuit wiring configuration: *Phantom powering*: positive supply voltage on *both* signal and return contacts

Negative supply voltage on screen contact

*A-B powering*: Positive supply voltage on signal contact(s)

Negative supply voltage on return contact(s)

### Did someone say standardisation?

Setting out a standard is all very well and very much needed, but getting a fragmented industry to accept it is a different matter altogether—or so it would seem. Certainly, the standard has been adopted almost universally by the broadcasting industry and in industrial and commercial public address, but in studios and the music industry, and the manufacturers and suppliers involved primarily with that sector of the market, some are using the standard, but many—seven years after its introduction—are either totally unaware that any standard exists at all, or choose deliberately to ignore it in preference to what is assumed to be the American 'standard'—ie with pin 3 'hot' instead of pin 2.

In fact—or at least as far as my researches have been able to establish—there is no such thing as an American standard in published form; there is simply an established practice amongst manufacturers. Also of course, America and Canada were both signatories to the IEC 268 standard, and it is unlikely that these

**TABLE 1**

### CONNECTIONS FOR XLR/3 AND XLR/5 TYPE CONNECTORS ACCORDING TO IEC-268 PART 12 AND BS 5428 PART 5/3

Single-channel circuits using XLR/3 type connector		
Contact	Balanced	Unbalanced
Contact 1	Screen	Screen and return
Contact 2	Signal	Signal
Contact 3	Return	No connection*

Twin-channel (stereo) circuits using XLR/5 type connector		
Contact	Balanced	Unbalanced
Contact 1	Screen	Screen and common return
Contact 2	Left-hand channel signal	Left-hand channel signal
Contact 3	Left-hand channel return	No connection*
Contact 4	Right-hand channel signal	Right-hand channel signal
Contact 5	Right-hand channel return	No connection*

\*If it is intended that an unbalanced input should also be able to accept an input signal from a balanced source then contacts marked as 'No connection' above should be commoned to 'contact 1' on the equipment input receptacle.

**TABLE 2**

### Contact 2 'hot' (IEC standard)

Amek	UK
Alice Stancoil	UK
Canary	UK
HH Electronics	UK
Turner	UK
Yamaha	Japan
Electrovoice	USA
Sennheiser	Germany
AKG	Austria
Roland	Japan

### Contact 3 'hot' ('American standard')

RSD (Studiomaster)	UK
Allen & Heath Brenell	UK
Midas	UK
Soundcraft	UK
Klark Teknik	UK
Shure	USA
EV-Tapco	USA
Audio & Design Recording	UK
MXR Innovations	USA

countries would agree to support a standard that was different from another standard already in force, nor would they be likely to introduce a new national standard that was different from the international standard they had already agreed to! So in effect, we are not really any better off than we were before the standard was introduced.

Just to illustrate this point, **Table 2** shows the results of a very brief survey of manufacturers to find out who is using which system. The survey is not exhaustive, but is sufficient for the purpose. The country of origin is also shown.

### As a loudspeaker connector

Just to add further to this absurd state of affairs, many manufacturers of power amps and loudspeaker systems have more recently adopted the XLR/3 as a connector for loudspeaker circuits, generally using contact 1 as earth and contact 2 or 3 for the signal according to whether

they are using the 'American' or 'European' system. Those manufacturers that are using whatever system for their low-level input connectors are generally using the same configuration for their loudspeaker connectors and in order to differentiate between input and output connectors on a power amp, the male connector is being used as the output connector from an amp and the female as the input receptacle to a loudspeaker system.

It must be said that there is some degree of logic in this development. The XLR/3 is a robust and durable connector and has a current rating of 15A—which is quite sufficient even for today's ever insatiable demand for more and more amplifier power, and in keeping with this, it can accept the fairly large diameter cables necessary for the interconnection of high power amps and loudspeaker systems.

There are, however, two important drawbacks. Firstly there is the obvious one of mechanical interchangeability between low-level and

high-level circuits and the attendant possibility of damage to equipment through inadvertent wrong connection. The second is that although the signal is coming out from pin contacts as recommended in the IEC document, the IEC recommendation is concerned with low-level signal circuits and *not* power circuits. The practice in power engineering is that all live power outlets are shrouded and invariably shuttered as well for obvious reasons. It is clearly little short of folly to permit the output from a 700 or 800W power amp to appear on exposed pins of a male connector where AC voltages of anything up to 80V at currents of up to 10A are present. Any outlet carrying that sort of signal should clearly be protected by having the contacts enclosed within an insulated shroud—as is the case with the XLR-type female receptacle for instance.

So what alternatives are available: In the absence of any recommendation from any of the standards authorities, a number of users and one or two professional associations have in the past proposed various alternatives.

Back in 1974 the APAE as it then was, now the Association of Sound and Communication Engineers, issued a technical information sheet *TIS:2* in which the use of the XLR/4 was advocated, with the shrouded female receptacle as the amp output connector and with contacts 1 and 2 commoned as the return circuit and contacts 3 and 4 commoned as the signal circuit. This makes a good deal of logical sense as it overcomes the interchangeability problems between low-level signal circuits and loudspeaker circuits, it maintains the leading earth contact concept which is common to all XLR-type connectors and it also, of course, retains all the mechanical advantages of these. Also, by paralleling of contacts it provides an increased current rating

### Terminology

*For the purposes of this article the term 'XLR' will be used as a generic term for any and all connectors from any manufacturer that are of the general type, and compatible with, the XLR range of connectors as originally designed and manufactured by messrs ITT-Cannon. Of the two terms in general use, ie 'Cannons' and 'XLRs', the latter seems the more appropriate as, whilst it is a proprietary catalogue reference number, at least it avoids constant reference to one particular manufacturer by name throughout the article and in the absence of a generic type designation by any of the standards authorities, it is, in the opinion of the author, the most appropriate under the circumstances.*

*The references to contact numbers on these connectors are again those as marked on the actual connector inserts by ITT-Cannon on their XLR series and which has been adopted by all other manufacturers known to the author at the time of writing. In referring to the contact usage, the term 'signal' will mean the 'phase', 'hot' or 'positive' wire of a balanced pair and 'return' will mean the 'anti-phase', or 'negative' wire. In the case of an unbalanced circuit, it will be assumed that the 'return' wire and screen are combined.*

## Standard?

of 20A, as each contact in the XLR/4 is rated at 10A, not 15 as in the case of the XLR/3.

Unfortunately, however, at about the same time the Association of British Theatre Technicians, also recognising the need for rationale in this area, published a recommendation to the theatre industry also based on the XLR/4 but using a completely different wiring configuration whereby if a loudspeaker wired to the ASCE recommendation is connected to an amp wired to the ABTT recommendation, the amp output terminals are shorted out! The ABTT system had 100V line loudspeaker circuits connected across contacts 1 and 2, and low impedance loudspeaker circuits across contacts 3 and 4—which, apart from the fact that it does not satisfy various British and international safety requirements for use at 100V line level, was doubtless a very useful arrangement for a fixed installation inside a theatre, and many theatres are in fact wired in this way. However, realising the problems created, the ABTT recommendation was withdrawn in 1979 pending further consultation, but at the time of writing no alternative was forthcoming.

Another system employs the XLR/3 used the other way round so that the female receptacle is on the back of the amplifier, but wired with the return wire on contact 1 and the signal on contacts 2 and 3 linked. Whilst this arrangement provides no mechanical differentiation between input and loudspeaker connectors, it does offer the safeguard that should a balanced mic or other transformer-coupled balanced input be inadvertently connected to the loudspeaker output socket, the actual signal circuit is shorted out by the link, and the amp will see an open circuit—so at least no damage will result. However, the arrangement provides no protection to the inadvertent connecting of an unbalanced signal source to a loudspeaker output connector, as whether the signal is wired contact 2 'hot' or contact 3 'hot' the amp output will be fed straight up the line and into the desk output stage or whatever!

So the present system is unacceptable because of the exposed contacts carrying high power levels, the use of the present system in reverse is unacceptable because there would then be no differentiation between input and output connections on power amps, and the old ASCE system using the XLR/4 does not seem to have caught on for some reason. Nor do there seem to be any moves amongst the various standards authorities to find a remedy.

What is wanted, in the opinion of the author, is a totally new connector designed specifically for the

purpose, with all the mechanical advantages of the XLR-type design. How about an XLR/2 with two really solid, high current contacts set in a resilient rubber shrouding and with a larger than usual cable entry gland to permit the use of 2.5mm and 4mm csa twin cables—do you read me over there in the ITT-Cannon laboratories in the States?!

### Commercial aspects

As was implied at the start of this article, the one aspect that the IEC have not yet agreed upon in their endeavours to provide an international standard is that of assigning an IEC designation number, either for the family of connectors or for the individual types. In the absence of a universal, generic form of reference, the industry at large continues to use the terms 'Cannon'

of screws altogether. In an attempt to meet some of their competitors on prices, Cannon have also now introduced the *XLP* series, which is identical to the *XLRs* except that the use of a plastic insert instead of rubber has enabled the prices to come down.

### Conclusions

The problem is one of annoyance more than anything else. If equipment having balanced ins and outs and wired to the IEC standard is interconnected with equipment wired to the 'American' system, the result is simply a phase reversal across the balanced line. Whether this is important or not is up to the individual to decide and it is not proposed to get into that argument here. If all the equipment in the signal chain is the same way round—

connection between equipment wired on the two configurations simply means that the system will not work as there will be no circuit continuity between equipment. It is extremely annoying having to rewire all the leads immediately before a session or before a sound check in a concert hall because one or two newly delivered items of equipment are wired the wrong way round. Also of course, the fault is not immediately obvious and it takes a few minutes before the offending leads can be identified—especially when you don't know which item of gear is wired which way round anyway.

Moving on to the loudspeaker connector problem, it is suggested that for power amps intended for fixed installation, the simplest immediate remedy is to fit heavy duty insulated screw terminals to the rear panel of the amp—a practice already being adopted by many manufacturers—until such time as the industry can agree on an acceptable loudspeaker connector. Even amps used on the road are usually housed in flight case racks and have their input and output terminations brought out to a separate plugging panel anyway and it is then up to the user to decide on the way he will interconnect his particular loudspeaker system. Many systems built up in this way are actively crossed over with one bass amp, one mid and one hf or whatever housed in each rack with a special multiway cable and connector system feeding the loudspeaker stacks, and there is no way that will ever be standardised anyway. In most instances, it would seem that the adoption of screw or spring-retaining terminals would provide an expedient and cost effective solution—even if only on a temporary basis until Mr Cannon or whoever can come up with an acceptable alternative.

To finish, it is felt that the reader should know the author's interests in all this—basically, there are none other than professional concern. The author is a consultant in audio systems and acoustics and a writer, and has no commercial interests whatsoever. In consultancy, standards are important. A great deal of time, money and energy is put into the preparation of standards and those standards that do finally see publication are not arrived at lightly. We are fortunate in that as far as low level audio interconnections are concerned, we do have an internationally agreed standard and ready access to the hardware to implement it. So for goodness sake, let us as an industry adopt the IEC 268/BS 5428 standard and end all this messing about.

Remember, Pin Two Hot! ■



Neutrik 3-, 4- and 5-contact female connectors

or 'XLR' [much to the annoyance of ITT-Cannon—Ed] despite the fact that connectors of this general type are now manufactured by many companies around the globe.

The *XLR* series of connectors as actually manufactured by ITT-Cannon are considerably more expensive than their competition, but they are also exceptionally robust and generally reliable due to the use of a resilient rubber mounting for the socket contacts of the female receptacle and a particularly robust mechanical design. However, they also have the disadvantage of being very fiddly to assemble, with several small screws and clips which are easily lost—especially when leads are having to be repaired or made up on the road without the luxury of a workshop bench. All the other manufacturers use solid moulded plastic inserts of one sort or another, some of which unfortunately have a tendency to crack and fall apart when subjected to hard usage. The Switchcraft *QG* series are particularly easy to assemble and wire as all the screws etc. are captive within the housing. The Neutrik *Latchlock* series are also of a good overall design and feature a collet type of cable clamp which eliminates the use

whether it be IEC or 'American', it is surely of little consequence anyway. The difficulty however is in knowing which equipment is wired to which standard. In conducting my survey of manufacturers for this article I was amazed to discover that several manufacturers did not even know which system they were using on their own products! More than one manufacturer had to visit his factory production line to actually look at a desk in the course of manufacture before he could answer my enquiry and several had to go into the drawing office and look at circuit diagrams. Some manufacturers greeted my enquiries with considerable enthusiasm, with the comment that it was about time someone took the matter up in the hope of airing the confusion, while others were not even aware that a problem existed—being totally convinced that their own configuration was the only one. Very few indeed were aware that there was in fact an international or British standard. So even if you took the trouble to telephone your supplier, it is unlikely that you could immediately find out which way round your new processor or whatever was wired.

With unbalanced circuits, inter-

For further information purposes, see the survey and reviews of connectors in *Studio Sound*, November 1980.



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4 Track Budget Studio	Teac A3440, Seck 10-4 Mixer, DBX RX9 noise reduction	1138	Package C	Rebis rack with 2x noise gate, 2x comp/limiter, MXR Graphic, GBS reverb	950
4 Track Audio-Visual Presentation	Otario MX5050BQII, Teac 133, Alice 828S Mixer	2465	Package D	Rebis rack, delay package, 2x noise gate, 3x comp/limiter, de-esser, para EQ, Klark-Teknik reverb	1545
8 Track Budget Studio	Fostex A-8, Fostex 350 Mixer, Teac V9	1680	Cassette Duplication	Otari DP4050C2, Teac C3X deck, Bulk eraser	1825
8 Track Recording Studio	Otari MkIII-8, Studiomaster 8x4 Mixer	3100		Otari DP4050 OCF reel to cassette, Otari loader, Teac C2X, Bulk eraser	7224
8 Track Recording Studio	Otari MkIII-8, Studiomaster 16x8 Mixer, Otari MX5050B stereo	4940	Microphone Package A	2x AKG D190E, D222EB, D310	195
8 Track Video Production	Otari MkIII-8, Omni-Q Synchronizer, Alice 12-4 Mixer	5658	Package B	AKG D12, D222EB, D190, D224, 2x C451/CK1, 2 Calrec CM1000	696
16 Track 1 inch	Itam 1610, Itam Sigma 16-8-16 Mixer	8250	Package C	AKG D12, D330, 2x D224E, 2x C451/CK1, Neumann U871	983
16 Track 2 inch	Otari MTR90, Syncon B Mixer 20x20	19864	Monitoring	Spendor BC-1, Quad 405, AKG K160 headphones	499
24 Track	Otari MTR90, Soundcraft 2400 Mixer, Otari MTR-10 Stereo	32825		Tannoy Little Red, HH V-200, Auratone 5C, Quad 303, 4x AKG K160	983
16 Track Video Production	Otari MTR90, Audio Kinetice Q-Lock, Otari MTR-10 Stereo	22900			

ITA, 1-7 Harewood Avenue, Marylebone Road, London NW1.  
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## Red Herring campaign continues

A fly on a Whitehall wall tells me that a professional lobbyist, working on behalf of the record companies, was recently cornering MPs and extolling the virtues of a tax of £2 on every blank cassette. What the record company lobbyist didn't bargain for was that the idea would get picked up, and revised, by the Liberal party. The Liberals are now entranced with the idea of putting a tax of 10% on tapes to subsidise all live arts events.

The next government could well be a Liberal/SDP alliance, so this idea might well become law. Although it would enable theatres, opera houses and concert halls to put on unpopular, non-commercial, non-viable shows (which may or may not be a good thing, depending on your point of view) it certainly isn't what the record industry had in mind when they started lobbying for a tax on blank tape.

Likewise there was some confusion over the support offered by John Morton, general secretary of the Musicians Union for a tax on blank tape. Morton was reported to be urging the government to tax both tapes and recorders to protect the employment of musicians and actors, by funding subsidy schemes. This is more attractive than splitting the levy between already-successful recording artists. But it's all starting to sound very much like road tax. Originally levied to pay for new roads, the proceeds of road tax very soon started to get siphoned off for other less worthwhile causes, like stock-piling for the holocaust or paying people more for staying at home than they can get for working.

Sadly it seems that the BPI has learned nothing from the lessons of the Government Green Paper which rejected the idea of a tax on tape, even though the Government justified rejection by concluding that "the sales lost as a direct consequence of private copying cannot be precisely quantified". Two months later the BPI cheerfully issued a categorical but completely unsubstantiated statement that "at least one third of the industry's potential market will remain lost to home taping until some measure of protection is afforded to copyright owners". The italics are mine. The unproven dogma is theirs. So also is the continuing loss of credibility.

The BPI has also been advising people on how best to write to their MPs supporting the idea of a tax on blank tape. So presumably British MPs will now be receiving a flurry of curiously similar letters. Isn't that a bit like hyping the charts, by getting people to write into request programmes, all asking for the same record?

## Getting it straight

It may not have escaped the notice of regular readers that *Studio Sound* in general, and this column in particular, does not show too much respect for the people running the record industry. In particular I have criticised the BPI's campaign for a tax on blank tape. For the record, if you'll pardon the expression, this isn't because I am in the pay of the tape manufacturers, or want to see artists deprived of rightful royalties and studios go out of business. It's simply and solely because although there is without doubt a case to be made for a licence or

levy scheme to help new talent in the performing arts, the BPI's campaign has seemed so inept and shot full of holes that it raises the hackles of anyone in the business of reporting facts. If all the BPI's unsubstantiated claims and religiously obsessive dogma were to go unchallenged, only uncritical reports would find their way into print. These are then re-cycled by the popular press and become self-perpetuating folklore fact. Someone, somewhere, *has* to put some questions on to the public record.

Significantly the record industry has never answered the critical points made and questions raised, for instance with a letter for publication. Equally significantly, no one else does so on their behalf. We know that the record industry has on several occasions encouraged its top brass to prepare a response to published criticism. But so far every response has taken so long to prepare, and read so clumsily, that the industry has wisely decided that its publication would do more harm than good. Instead the industry opts for the easier approach. Money is thrown at the problem, with half-page adverts in the top people's newspapers. I have had industry snoops digging around for possible skeletons in the cupboards of my personal life. They've complained to the publishers who employ the editors who employ me. But there's still never any factual rebuttal of what I've written.

The record industry as we have known it is now fighting for survival. It sees a tax on tape as the only life line, and will do virtually anything to secure it. If, as seems highly unlikely after the errors of judgement made in the current campaign, the industry were to win a tax on tape, the record industry would become like the horse racing industry, ie "... hopelessly addicted to subsidy." If this Government, and subsequent governments, refuse to levy a tax on tape then the record companies will be forced to restructure. They will be forced to throw passengers overboard without compensation, cut

back on overheads, and work harder to make the public want to buy more of their products. This is of course exactly what the rest of British industry is already having to do.

There is a largely forgotten third, and chilling, possibility. Instead of taxing tape to subsidise the industry, a left wing government might seriously consider nationalising it.

## Surrounding confusion

It must sometimes be very depressing to work as a producer, or engineer, at the BBC. For several years now the 'Beeb' has had the technical expertise and equipment necessary to produce radio programmes in surround sound using Ambisonics UHJ coding. Some producers have been anxious to exploit the new medium. But the BBC has been worried about being seen to spend money on surround sound while cutting back elsewhere. As a useful compromise Radio 3 recently started a 'Quad Season' based on repeats of previous productions. (It would have been nice if they'd called it a 'Surround Sound Season', but let's let that quibble pass.)

The publicity material put out by Broadcasting House for the press puffed *Moby Dick* as being in 'quadrophonic sound' but made no mention of the coding system used and thus gave no indication of the reception equipment needed to decode it. It could have been SQ, QS, Matrix H, binaural or IBA 3-channel MSC. Remember that the material put out by the BBC Publicity Department is intended for the national press and general interest magazines who are almost without exception totally ignorant on technical matters. There was also no mention of mono and stereo compatibility, just several proud references to 'quad' and 'quadrophonic'. I phoned BBC Radio 3 publicity. "I don't understand anything about the technical side," said publicity girl number one, "try the producers". I did, but neither was available. Neither phoned back. So back to Radio 3 publicity where another girl also hadn't a clue but said her boss would phone me back. He did and he also didn't "understand the intricacies". In fact he seemed quite proud of his ignorance and simply shunted me to the engineering information department. They did of course understand and were able to confirm that both *Moby Dick* and *Milk Wood* were repeats, which had started life in discrete 4-channel form and later been transcoded into UHJ.

But such is life in Broadcasting House, that the first the engineering information department had heard about the quad season was when they read about it in the *Radio Times*.

Exactly the same thing happened a couple of years ago when the BH publicity department press-released a binaural stereo broadcast without having a clue what it meant. Fleet Street regurgitated the announcement with advice that listeners would need special reception equipment.

The *Sunday Times* referred to the latest broadcasts as "Squad versions"! Aren't the BH publicity persons bothered? "We simply write what the producers tell us," they told me.

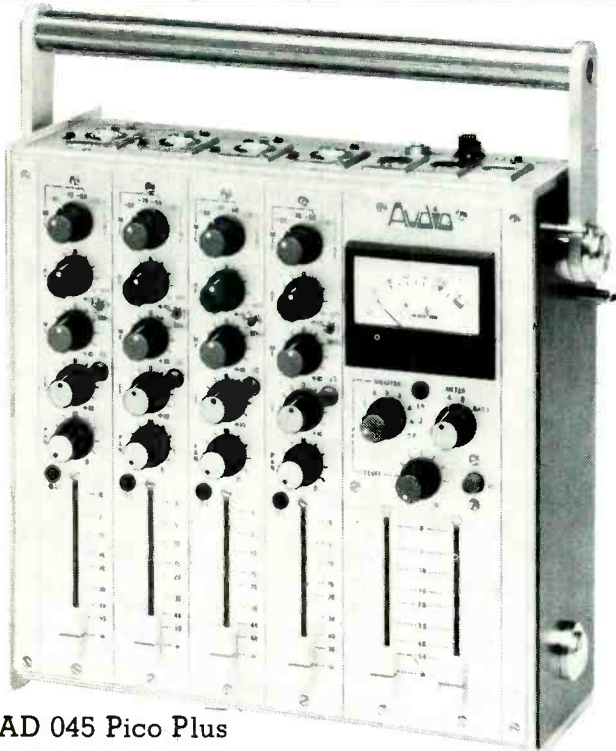
What would happen, I wonder, if a producer told the publicity people that his programme had been recorded on spaghetti?

## Woof . . . woof!



*Around 500 people turned up for the hands-on recording show held over two days at the Clive Hotel in North London last November. Correction: 500 people and a dog. When not chasing paper aeroplanes thrown by the exhibitors, the pooch practised Nipper impersonations.*

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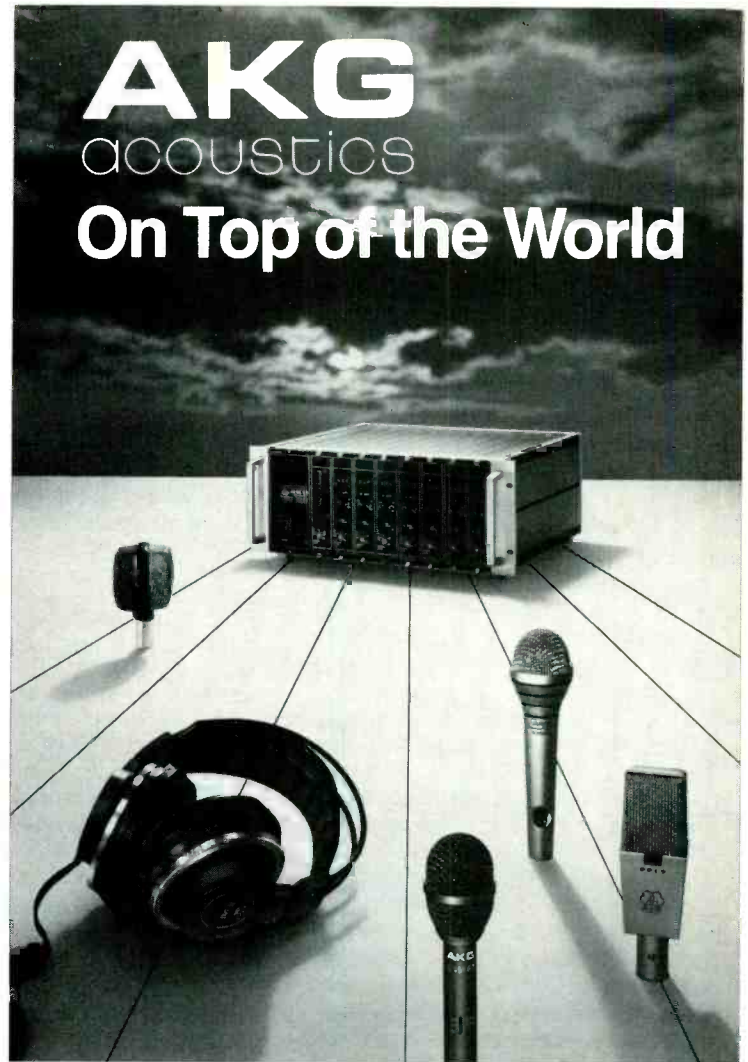
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# A life on the radio waves

Pippa Lewis

***This interview is the first of a three-part series held with Andy Gemmell-Smith, former chief engineer of Radio 210, Reading's local commercial radio station. The series covers his early experiences in pirate radio, his move to independent local radio after the pirate ships were outlawed, and the setting up and launch of a new local radio station, Essex Radio, where he has now taken up the post of chief engineer.***

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**T**HE mention of 'pirate ships' immediately conjures up the memory of the days when pop music was not so easily available to teenagers as it is today, and Radio Luxembourg had the monopoly until the advent of the radio ships, which added more than a touch of excitement and romance to pop music if you were fortunate enough to be able to tune in to one of them. Andy's involvement with a pirate ship came about in quite a bizarre fashion, and overnight his life took a completely different direction.

I started off working for a small recording studio in Kent, and then moved to R G Jones in London, working on the PA side. After this I set up with a partner in Kent making disco equipment. This and other work that I had been doing was a good foundation for a career in radio. One of our customers was a disc jockey who had previously worked on one of the pirate stations and was due to start work with a new pirate station. He recommended me to the Dutch and Belgian backers of the station as a possible engineer; much to my surprise one evening a strange Dutchman called Gerard appeared on the doorstep who turned out to be the managing director of the new pirate radio station—he had come to collect me to start work on installing the equipment on the ship! To begin with I thought he must be mad—this was the first I'd heard of it *at all*—I didn't even know that I'd been recommended to them! The Dutchman, however, thought the whole thing had been completely arranged. To begin with I refused his offer, wanting to have



time to think about it, but my mind was very quickly made up for me when he placed several hundred pounds in my hands, saying 'here's your first month's wages!!'. So I agreed to go to Cookshaven in Germany which was the port where the radio ship was being built—I had agreed to go for one month to see if I liked it and to help them out. That very evening I phoned my partner and told him I wanted to take a month's holiday. We were short of orders at the time and he agreed that this was no problem and so with a complaining girlfriend I left for Cookshaven. I decided to stay. 9

**So began Andy's life with Radio Atlantis. The year was 1973 and he was 'a raw 21-year-old'.**

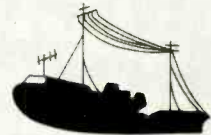
When I first arrived at the radio ship I was a bit surprised, having always thought that radio ships would have been fairly luxurious; this was far from the case—the ship was a rusty old Icelandic trawler, 150ft long and 30ft wide, about 500 tons displacement. There were no engines in the engine room and no wheel in the wheelhouse. These had been sold off for scrap; the ship had been bought for about £8,000 and had a buckled propeller shaft which was the reason the ship had been scrapped—it was renamed *The Jeannine*, after the boss's wife, and the first night I joined the boat in Cookshaven one of the Dutch crew managed to set fire to the mess room with the diesel boiler which was our only form of heating! The only form of lighting on the boat at that stage was by paraffin lamp, which we were running on diesel with smoke going everywhere; there were few mattresses on the boat, and even fewer blankets, and I wondered

what the hell I had let myself in for! It was like a camping holiday gone wrong; but things did get better—we managed to get a power line from the harbour which gave us electric light at least for the time when we weren't rewiring the ship and a couple of weeks later some generators were delivered which were fitted on deck at the bow of the ship. No studio equipment was on board but there were a couple of old transmitters, both of which had been bought secondhand from defunct pirate radio stations. The first transmitter was an RCA BTA 10J 10kW transmitter which was bought secondhand from radio 270, the pirate radio station that broadcast to Yorkshire in the '60s, and the second transmitter was an RCA BTA 1R1 1kW transmitter which came from a Dutch pirate radio and TV station also from the '60s, TV and Radio Nordzee.

These came without manuals and with many parts of both transmitters

missing. I began to try and figure out how to make at least one of these transmitters work. The 10kW had the most parts missing so I decided to concentrate my effort on the smaller transmitter; in this transmitter it was the oscillator/driver section which was missing and I made one up using parts from the other transmitter and from the ship's television set, much to the dismay of the rest of the crew! The end product was tested into a dummy load consisting of fire bars in Cookshaven itself and with just the generators and the transmitter working and still very few blankets we sailed for the coast of Belgium—we had to leave in a hurry because we had been tipped off that the German authorities had learnt of our existence and were about to raid the ship! The penalty that we paid for this was having to put the aerial up at sea, sailing without the ship being painted and without having the studio built. There were very few crew members—just myself, two disc-jockeys and one Dutchman on board. We were towed to an anchorage about 12 miles from the border of Belgium, off Ostend, and the day after we arrived the supply boat arrived with the studio equipment that I had ordered, food, fuel and water, and the wood that I needed to build the studio—except that instead of being plywood it was 4 x 1in floorboarding planks! Also a message came with the equipment from the owner of the station saying that he wanted to hear test broadcasts from the station within the week in order to convince potential advertisers that the project was serious. So we had arrived off the Dutch/Belgian

border with a week to get the station on air. We put up the aerial system and were able to prove the transmitter worked; original test transmissions were put out using the station mixer on the floor of the wheelhouse with a few nails around it to prevent it flying across the floor when the ship rolled. Music that our early listeners heard originated from a cassette machine which belonged to one of the disc jockeys and a few pre-recorded cassettes, mostly James Last; and an AKG D202 microphone handheld by the announcer saying: 'This is a test transmission being made from the motor vessel *Jeannine* anchored in international waters 12 miles from the coast of Belgium on the medium wave band'. The original test transmissions were carried out with a power of ½kW which gave us a range of about 30 or 40 miles inland although reception reports were received from Essex and Kent; the power would have been greater but we didn't have many of the insulators that we had required for the aerial system. However, the test transmissions did the trick and we closed down for a few days whilst we completed the building of our studio.



When complete, the studio consisted of 2 Revox A77s, 2 Micro-Seiki belt-drive turntables (which had been selected for their fast start time) with Micro-Seiki arms and Shure M3D cartridges and a Rodec mixer made in Holland which was five stereo channels and a microphone channel, secondhand RCA cartridge machines and two AKG D202 microphones; one for the presenter and one mounted in the next room, which was later to become studio 2, but originally was our news reading booth. We had a switch which transferred the microphone channel that the disc jockey used over to the other studio so the two microphones shared the same microphone fader which made a bit of a nifty operation during the news jingle. Test transmissions were originally put out live from the ship, this time in a slightly more organised fashion and at a much higher power, as more of the transmission equipment and aerial system was working properly.

The station finally settled on a format of 12 hours Flemish programming a day from six in the morning until six in the evening and 12 hours of English programming from six in the evening to six in the morning; the total staff on board the ship numbered around six normally and were generally speaking English,

## radio waves

while the staff of our offices and land-based studios in Oostberg in Holland were mostly Dutch and Belgian. The radio station was a limited company in Holland, Atlantica BV, and ran much on the lines of any other commercial radio station, surviving on advertising as its main source of income, although we were able to pull in a fair amount of money by plugging records both for British and European record companies and for sponsored programming.



Life on board was good fun with everybody doing everything; the more tasks you could handle the better you got on. It was no good for a disc jockey to try to be a disc jockey only; he would have to learn something about diesel generators and bilge pumps and painting the decks or the side of the ship, and most people spent a good deal of effort making their cabins and the ship pleasant to live in. I guess a lot of them learnt a lot about transmitters and studio equipment, particularly as when I went off the ship it was up to them to keep the station going, as I was the one and only engineer.

Our anchorage proved to be not an ideal one in many ways, as we caught the winds both from the North Sea and the Channel and we suffered with many storms and rough seas which my stomach eventually got used to but the ship's anchoring system didn't! The ship's anchor was of the same type used on a cross-channel ferry, but one stormy evening one of the disc jockeys announced that a buoy had drifted past so we all went out on deck too—then we saw another buoy—we began to wonder whether we had broken anchor; we had no radar on board and we decided that we would just carry on broadcasting in the true tradition of 'the show must go on!'. So with five very frightened people on board at that time, we broadcast through the night with the lights on shore appearing to come closer and closer. When dawn broke we were on a sandbank about a mile and a half offshore and about 20 miles to the north of our normal anchorage, and well inside the Dutch 3-mile limit—we were still broadcasting. We decided to close down, telling the listeners it was for technical reasons as we didn't want to alert the authorities as to our real position. We let our office know as soon as we could raise them in the morning, and the owner of the station flew out in a

light aircraft to pinpoint our exact position. A tug was sent out which towed us off the sandbank back to our original position and a temporary anchor of thick steel wire was put down until a full new anchor system could be fitted. We were broadcasting more or less as soon as the tug started to tow us away as valuable commercial spots would otherwise have been missed.

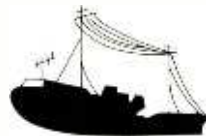
As I found it almost impossible to get spare parts, I became an expert at improvisation, so when an insulator which carried the feeder to the aerial system shattered due to the RF arcing over its surface, after scratching my head for a few minutes I decided that the wash-hand basin which was made of porcelain (and hence a good insulator) would make a good substitute until the correct insulator could be obtained. The studio's signal processing was by means of a home-made limiter/compressor made by me which I designed and built on board, consisting of a limiter with a dual release constant which then fed a small equaliser which was used to top up to add a little top to the signal, and a hard clipper which would clip its extra treble content if the programme material had a very high treble, in order to prevent over-modulation of the transmitter. The signal was always reasonably tightly-compressed and we would deliberately drive the compressor harder at night to try and obtain as much effective loudness as possible, as we considered this to be less of a sin than the interference which we were trying to overcome at night. The limiter was essential to even out some of the bad recording that came out of the Dutch studios—some of the quality of the tapes was less than good, particularly the levels, with one record driving the tape into saturation and the next record recorded on a level some 20dB lower!

The second studio built on the ship also had Revoxes, Rodec mixer and Micro-Seiki turntables, and we had improved our news gathering service. Twelve hours English programming a night was broadcast which included a news service, which was stolen from BBC Radio 2 on long wave and from various other radio stations. We would record Radio 2's news broadcast every hour on the hour and study it to see if there were any new stories, to add these to our news file along with re-scripting stories that we were carrying forward to make them sound fresh in time for our news broadcast on the half-hour! There were no specific news staff on board but the general rule was that whoever had come off air last was on news duty during the next guy's show, probably also cooking the dinner for him too! I also did programmes on the station and read news, which was good fun, and I remember that our early

morning man whose shift started at 3 am would be terrible to wake up if you were unlucky enough to have preceded him, and you would end up trying to do a programme whilst cooking his breakfast, tying the frying pan down to the gas stove with wire to prevent the frying pan going flying, and making him at least half a dozen cups of tea before he would go on air at 3.15 after you had segued in the first four or five records!

You had to be very careful where you left things on the ship: I went through three Avo meters in my time there; our first television fell on to the messroom floor and into many pieces and one of the crew members got chased around the galley by the deep-freeze which had become loose from its fixings in a storm! Cooking was very difficult as the eggs you were frying had a tendency to jump out of the pan, and if you made an attempt to hold the frying pan in a horizontal position above the flame, the chances were that *you* would go flying! On the whole it appealed to my sense of adventure. My girlfriend also joined me on ship—I got her a job as cook and we got married during that time; also the programme director had his wife on board and together the two girls would look after the domestic side of things and remind us when we hadn't had a shave for three days!

Getting off the ship was a very strange experience as you would have to leap between the radio ship and the tender, which had a bad habit of coming out during storms: this could sometimes be a bit dangerous.



Just occasionally the sea was so calm that it was like a mirror and a couple of times we took out our rubber dinghy which we had tied to a couple of hundred yards of rope, and sunbathed in it. We then decided that we would try and do a complete programme with the disc jockey in the rubber dinghy and we made up a very long microphone cable with waterproofed joints (at least as waterproof as we could make them), and we had a disc jockey and a couple of others in a rubber boat 200 yards from the ship while somebody else technically operated the equipment in the studio—this was the nearest we ever got to doing an outside broadcast!

All the Flemish programming was taped in our studios in Oostberg and came out to the ship in big plastic dustbins full of 7in double play tape recorded at 7½in/s, funnily enough

in stereo. The whole of the studios were stereo as we had later intended to broadcast stereo/FM from the ship, at least to the immediate coastline.

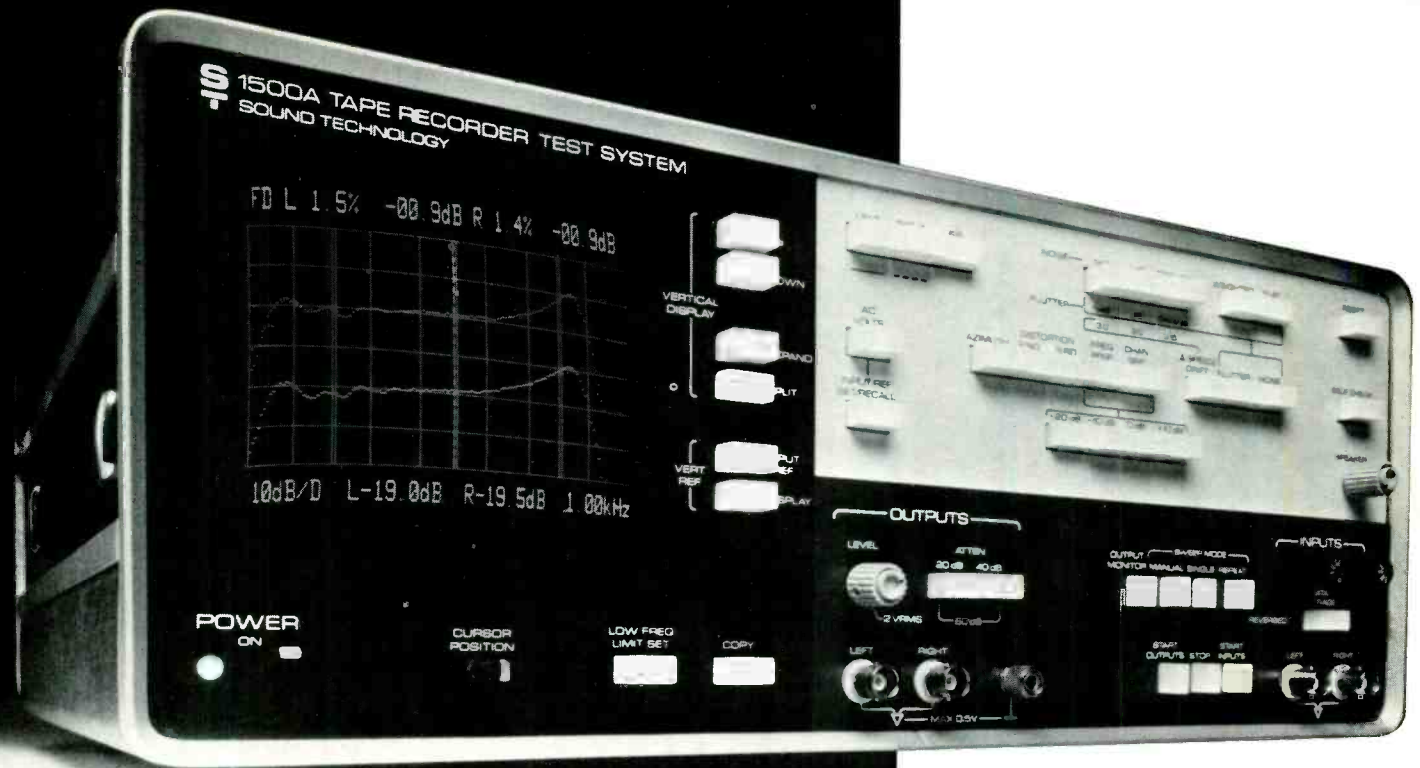
Leisure time was spent playing cards, answering listeners' letters, watching television, making love, chatting on a CB radio to other CB enthusiasts in Holland and discovering new ways of cooking spinach!

I look back on it as one of the most exciting times of my life. I worked with some of the nicest people I have ever worked with, and am still in touch with most of them. Many of the presenters involved in the station went on after its closure to get jobs in ILR and elsewhere. One of our Dutch disc jockeys got a job with Radio Luxembourg's Dutch service; our programme controller Steve England became commercial production manager at Piccadilly Radio, Manchester, and now runs his own studio, Alfa-Sound Tapetrix in Manchester, which has made the jingle packages for several ILR stations; another of our disc jockeys, Dave Rogers, became Keith Rogers and now works for Radio Orwell in Ipswich; another DJ, Dave Owen, got a job first of all with Piccadilly Radio in Manchester and later with Beacon Radio in Wolverhampton; and I got a job with Beacon Radio in Wolverhampton as an engineer, later moving to chief engineer of Radio 210 in Reading. I am not the only chief engineer of an ILR station with a 'watery wireless' start; John Lumsden of Radio Clyde, Martin Newton of CBC, and Russ Tollerfield at Radio Victory all share similar pasts.

Although I had no desires to make a career as a disc jockey, my presenting experience on the boat became useful at Beacon Radio where I used to double as a relief disc jockey to cover for holiday periods and presented a regular weekend programme on the station.

The station lasted until the end of 1974, by which time facilities on board had become very much better, but at the end of 1974 the Dutch Government followed the example of the English and Belgian Governments and passed a law forbidding advertisers in Holland to advertise with us and for Dutch citizens to supply us with food, fuel or water. Together with three out of the four pirate radio stations broadcasting off the coast at that time, with tears in our eyes we closed down, the day before the law came into force. We closed within hours of Radio North Sea and Radio Veronica, and the only station to carry on was Radio Caroline which was towed—by the same tug that had towed us back to our anchorage some months earlier—over to its new anchorage off the Thames Estuary. ■

To be continued



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Because of the modular plug-in design, the 1500A is designed to grow with you. The first plug-in option will be available soon: a spectral noise and flutter card. Other current accessories include a hard-copy printer, flight case, rack mounting ears, and our own test record for phono cartridge analysis.

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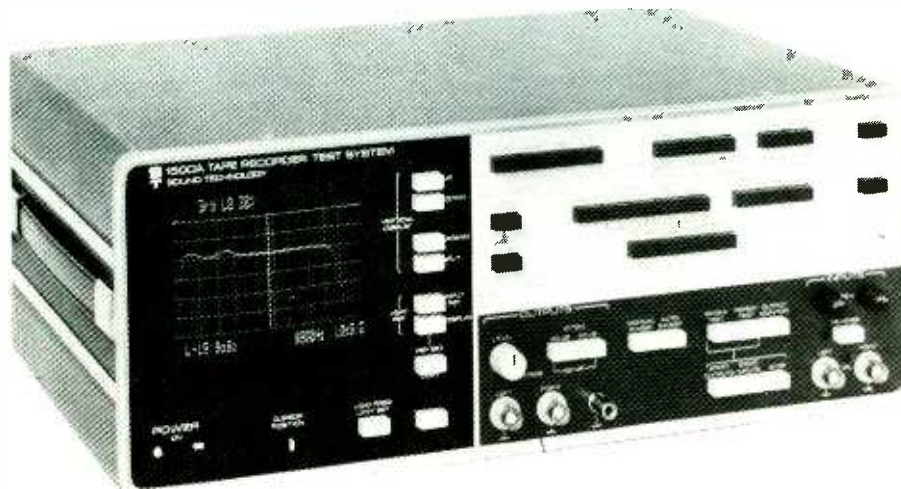
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# Sound Technology model 1500A



## MANUFACTURER'S SPECIFICATION

### Input/output

**Input impedance:** 100kΩ ±1% shunted by <250pF.

**Maximum input level:** 10V RMS.

**Output impedance:** 600Ω ±1%.

**Maximum output (open circuit):** 6.3V RMS on distortion, frequency response, channel separation; 2.0V RMS on AC volts, speed/drift, flutter.

**Output level control:** 0dB, -20dB, -40dB, -60dB ±0.5dB stepped attenuator; 20dB vernier.

**Input/output measurements:** left only, right only, or left and right.

### AC volts

**Channel selection:** left only, right only, or left and right measured alternately.

**Response/accuracy:** true RMS, 20Hz to 40kHz ±5% of reading with crest factor no greater than 6.

**Autoranging:** 1mV to 10V RMS full scale; 10dB steps.

**Residual noise:** <300μV.

**Display:** vertical bargraph; active channel indicated by marker; digital readout of AC V 3 digits, dBm 0.1dB steps.

### Azimuth

**Measurement frequencies:** 2.8, 5.7, 11.8, 15.8kHz.

**Cycle time:** 0.1s through noted frequencies.

**Measurement range:** ±180° of electrical phase.

**Accuracy:** ±5° electrical phase (equivalent to ±min of arc in cassette format).

**Display:** dynamic, shows instantaneous phase error between L and R channels, plus digital readout of error at measured frequencies.

### Distortion

**Measurement/display:** 2nd or 3rd harmonic versus input level.

**Fundamental frequency:** 400Hz (other frequencies available as options).

**Accuracy:** ±5% of reading.

**Residual distortion:** output <0.03%, input <0.03%.

**Input/output level:** input from recorder — display shows distortion versus input level in 1dB steps; output to recorder — +10 to -20dB in 0.5dB steps referred to preset output.

**Sweep time:** <40s, +10 to -20dB; can be terminated earlier with STOP button.

**Display:** trace shows plot of distortion versus input level; digital readout of distortion in percent and dB.

### Frequency response

**Frequency range:** continuous sweep from 40kHz to 20Hz; low frequency sweep limit or single frequency output obtainable within this range.

**Frequency accuracy/resolution:** ±5% of reading, ±3%.

**Amplitude accuracy/flatness:** ±0.5dB/±0.5dB, ±0.2dB; 100Hz to 20kHz.

**Minimum input S/N ratio:** 20dB.

**Maximum input signal slope:** 60dB/octave.

**Sweep time:** approximately 40s, 40kHz to 20Hz;

approximately 15s, 40kHz to 500Hz.

**Output level offsets:** +10, 0, -10, -20dB ±0.5dB.

**Display:** trace shows level at 123 discrete frequencies; Digital frequency readout; level readout references to input or display.

### Channel separation

**Frequency range:** continuous sweep from 20kHz to 20Hz with 1/3-octave resolution.

**Residual noise:** <100μV.

**Amplitude accuracy:** ±1dB.

**Output level offsets:** +10, 0, -10, -20dB ±0.5dB.

**Display:** trace shows separation at 3 steps/octave.

**Digital frequency readout:** level readout references to input or display.

### Speed/drift

**Measurement time/range:** 10s to 610s ±4%.

**Output frequency:** 3.0kHz (NAB, JIS) or 3.15kHz (DIN, ANSI), ±0.005%.

**Speed error accuracy:** instantaneous ±0.5%; 10s average ±0.005%.

**Display:** trace shows 10s averaged speed error versus time; digital readouts of both instantaneous and 10s averaged speed error.

### Flutter

**Output frequency:** as 'Speed/drift'.

**Autoranging:** 0.03 to 10% full scale.

**Accuracy/residual noise:** ±5% of reading/±0.005%.

**Detection:** weighting and display dynamics per NAB, JIS or DIN, ANSI standards.

**Display:** vertical bargraph; digital readout shows sigma signal (smoothed, 95% of peak).

### Noise

**Residual noise:** flat -85dB; weighted -90dB.

**Flat response:** -3dB points at 20Hz and 20kHz.

**Detection, weighting and display dynamics:** per NAB, ANSI or CCIR/ARM standards.

**Output:** floating, 600Ω termination.

**Accuracy:** ±0.5dB.

**Display:** autoranged vertical bargraph with digital readout, referred to input reference level.

### General

**Rear panel outputs:** composite video signal, 1Vp-p ±6dB, 75Ω, negative sync; demodulated flutter signal, autoranged, <15Vp-p, 1kΩ.

**Power:** 100, 120, 220, 240V, 48 to 66Hz, 120W.

**Dimensions:** 17.0 x 7.0 x 16.4in/430 x 180 x 420mm (whd).

**Weight:** 36lb/16.4kg.

**Environmental (90% RH):** +50° to +104° F/+10° to +40°C.

**Accessories provided:** stereo input and output cables with male phono plugs, power cord, user's manual.

**Price:** £4,085.

**Manufacturer:** Sound Technology, 1400 Dell Avenue, Campbell, Cal 95008, USA.

**UK:** Precision Audio Marketing, Bimini House, Christchurch Road, Virginia Water, Surrey.

**T**HE Sound Technology *Type 1500A* is a multifunction test unit specifically designed for the alignment of tape recorders. It may however be used for the test and alignment of other audio frequency equipment subject to certain limitations which will become apparent later.

The unit which is based on a microprocessor system of measurement and control, contains a sinewave oscillator which can be swept from 40kHz to 20Hz either manually or automatically. In the latter case the LF limit may be preset to increase the sweep speed.

Oscillator output voltage is nominally limited to 2V RMS for some tests and 6.3V RMS for others, this 10dB difference being introduced automatically for, for instance, distortion measurements.

Readout from the instrument is entirely by a green phosphor CRT display at the left of the instrument. This display is in either graphic or bargraph form, in both cases with annotations giving details of the test being done, scale factors, voltages in volts and dB, frequency, etc.

Twin (left and right) separately buffered outputs and twin inputs are selected by left, right, or left and right pushbuttons with the actual output terminal voltages being monitorable on the display as a bargraph plus voltage and dBm for either or both channels. Similarly the input voltage at either or both inputs may be monitored, in both cases the voltmeter being autoranging with a bargraph display of 0-10 or 0-3 (10dB steps) down to 1mV full scale for the outputs or 100μV full scale for the inputs.

The oscillator output level is controlled by pushbuttons for separate 20dB and 40dB attenuators plus a variable potentiometer permitting levels to be set down to 600μV.

An additional feature allows the unit to store a reference level (for instance a given fluxivity on tape) and to use this reference level for relative dB measurements which are very useful for distortion measurement, noise, frequency response, etc.

Turning to frequency response measurement, there are three basic modes of operation, manual,



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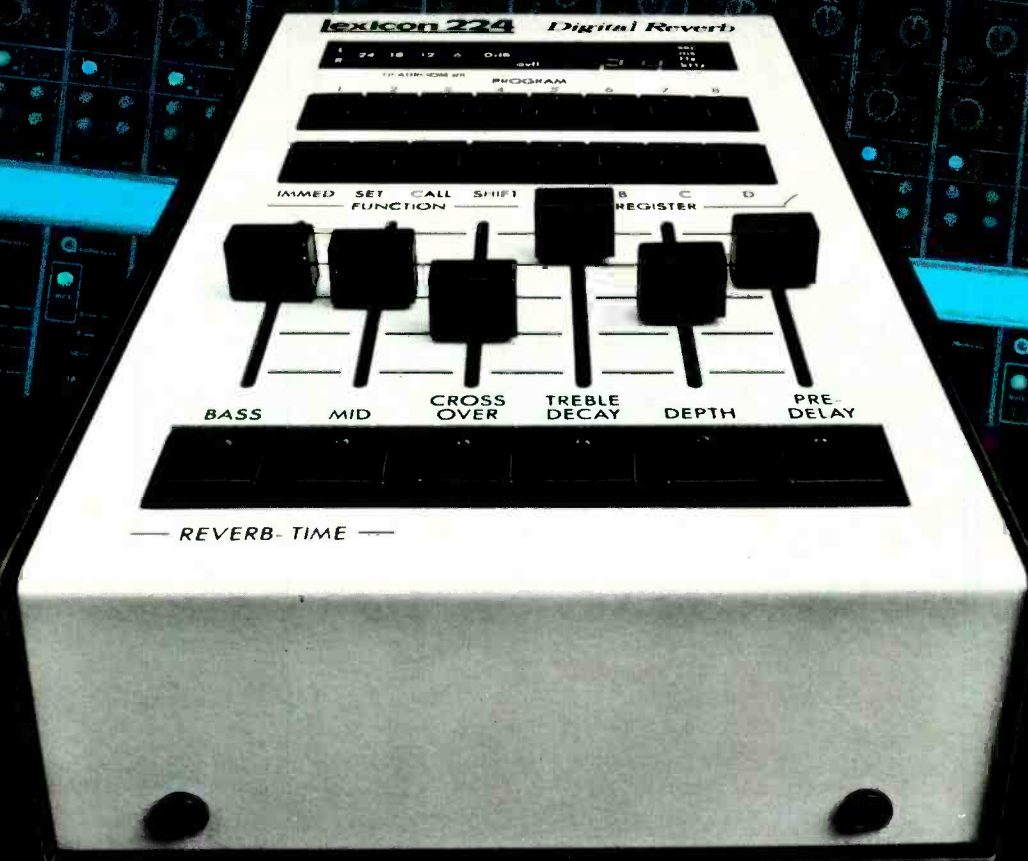
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single sweep or continuous sweep. Entering the manual mode places a conventional frequency response graticule on the display from 20Hz to 40kHz and with 10dB per vertical division. This may be expanded to 2dB per division.

Depending upon the selection of the left, right, or both channels, relative input level data is displayed in dB together with the operating frequency at a display position identified by a vertical cursor line which may be moved either way by a 3-position centre-biased switch below the display. The cursor also serves to set the LF limit in the sweep modes by setting the cursor to the desired frequency and pressing the 'low frequency limit set' button. Where a sweep mode is desired either single sweep or repeat are pressed. Depending upon the left, right or both settings the unit then either sweeps one channel or alternatively both channels proceeding from 40kHz downwards to the lower limit.

The repeat mode continues alternate sweeps for left and right if both are requested, whilst the single sweep mode terminates after the alternate sweeps or a single sweep. Once in this condition the cursor may be used to measure level at any given frequency for both channels. Furthermore the complete display may be shifted up or down by increments of one vertical division, being either 2dB or 10dB. These features allow the comparison of levels in 0.1dB increments at any frequency over a wide range.

So far as frequency response measurements and channel separation measurements are concerned, a final feature is four interlocked pushbuttons allowing the level of the sweep to be set to the reference level or +10dB, -10dB or -20dB.

The measurement of channel separation has similar features to that of frequency response except that one must measure one channel at a time, however the results for both channels may be individually or simultaneously displayed with the same measurement facilities as those for frequency response. Channel separation measurement is not however a selective measurement and noise can cause misleading results.

A feature of both frequency response and channel separation measurements is that it can be used with external frequency sources such as calibration tapes or discs, the unit tracking the display frequency according to the external frequency.

Unlike other measurements second or third harmonic distortion measurements are selective using a fixed frequency which is normally 400Hz with options of other frequencies such as the 1kHz of the review sample.

Either second harmonic or third harmonic is plotted on the display versus input level with the generator starting at 10dB above the operator set reference level and proceeding downwards to -20dB in 0.5dB steps. At the termination of the sweep of either or both channels as desired the display reverts to the cursor mode allowing any point in the display to be measured to within 0.1dB or 0.01% resolution, both being displayed for both channels as desired. Furthermore the display resolution can be 10dB or 2dB per division with the vertical shifting of the display still operative.

Neither the distortion mode nor the azimuth measurement mode can be used without special external sources, the azimuth mode outputting serial 2.8, 5.7, 11.8 and 15.8kHz tonebursts. The replayed tones produce a display of four vertical

bars the size of which corresponds to the azimuth error with the full scale display being  $\pm 180^\circ$ . Stopping the unit allows the cursor to be used on the display to give the precise frequency and phase error in integral degrees at each frequency. Output level in the azimuth mode is automatically set to 10dB below the operator set reference level.

The final measurement using the operator set reference level is that of noise, the display being an annotated bargraph for either or both channels giving the relative noise level in increments of 0.1dB. Noise may be measured to the NAB or ANSI A-weighted or unweighted standards or to the Dolby originated CCIR/ARM method using the CCIR Recommendation 468 weighting with an Average Reading Meter, the unity gain of the weighting network being at 2kHz. Further measurements possible include tape speed and wow and flutter.

Entering the speed/drift mode produces a graticule on the display with the vertical axis representing  $\pm 0.6\%$  error and the horizontal axis 0 to 10min in time. The unit then proceeds to draw a graph of speed error averaged over 10s versus time whilst also displaying the instantaneous speed error with a resolution of 0.01% and the 10s averaged speed error with a resolution of 0.001%. At the end of the scan or at any time when the display is stopped the cursor may be used to display the 10s averaged speed at any 10s interval with a resolution of 0.001%. In addition the display resolution may be changed between  $\pm 0.6\%$  and  $\pm 0.06\%$  and furthermore the speed drift between any display point and any reference point in the display can be directly measured.

The reference frequency for the drift measurement and wow and flutter measurement can be either 3kHz or 3.15kHz corresponding to the IEC and the NAB/JIS reference frequencies for wow and flutter measurement.

Wow and flutter may be measured weighted or unweighted to the IEC quasi-peak, JIS or NAB standards with the display being a vertical bargraph which autoranges down to 0.03% full scale. In addition to the bargraph the display includes the 2 sigma wow and flutter with a maximum resolution of 0.001%.

So far this is but a brief description of the facilities available in this comprehensive unit and whilst the layout of the controls is very uncluttered and well labelled it does take some time to fully appreciate all the possibilities.

## Front panel

Turning to the front panel, this is divided into three basic areas, the display, a cream coloured test select area and a buff coloured level and mode select area.

Considering first the display section, this is defined by an apparently black plastic section with the power on/off button, a green power indicator, the cursor movement switch, the LF limit set button and a 'copy' button below the display. In fact the copy button is for use with a hard copy video printer and was not operational in the review sample.

To the right of the display are the six pushbutton display controls. Two controls, 'up' and 'down' normally shift graphical displays up or down in the vertical axis, but, in the manual frequency response mode the controls act as incremental frequency controls. The next pushbutton is the vertical expansion control which selects 10dBm or 2dB per vertical division

normally or the speed/drift ranges.

A further pushbutton labelled 'split' is used when both the left and right channels are displayed. In these circumstances the left and right channel displays may coincide or overlap — the 'split' pushbutton is used to separate the left and right displays by one vertical screen division so that they can be separately examined.

Finally two buttons in the display section allow the selection of the mid screen vertical reference in the decibel display modes. This allows the centre of the display to correspond either to the operator preset reference or to any point in the display. The latter is achieved by placing the cursor over any point in the display and pressing the vertical reference 'display' button. The cursor may then be placed over any other part of the display whereupon the relative level is displayed with a resolution of 0.1dB.

Going now to the buff coloured level and mode select area this has the twin inputs and outputs in the form of BNC connectors, the instrument being supplied with four BNC to BNC leads and most excellent BNC to phono plug adaptors.

To the left of this section are the oscillator outputs with a variable level pot and locking 20dB and 40dB attenuator buttons. The left and right outputs are automatically switched on/off according to the measurement being performed for instance no output is present when measuring noise and only one output is present when measuring channel separation.

To the centre of this section are four interlocked pushbuttons for selecting the mode of the display. This allows monitoring of the terminal voltage at both outputs, manual sweep, single sweep or repetitive sweep. Below these buttons three momentary pushbuttons allow the instrument to be stopped, the outputs to be started and the inputs to be started. Finally to the right of the section there are the twin BNC inputs with the miniature protective fuses and a momentary 'data storage' pushbutton. This switch is used to reverse the data storage channels so that two sets of data can be stored from a single channel so that two adjustments of the same channel can be readily compared without any wiring changes.

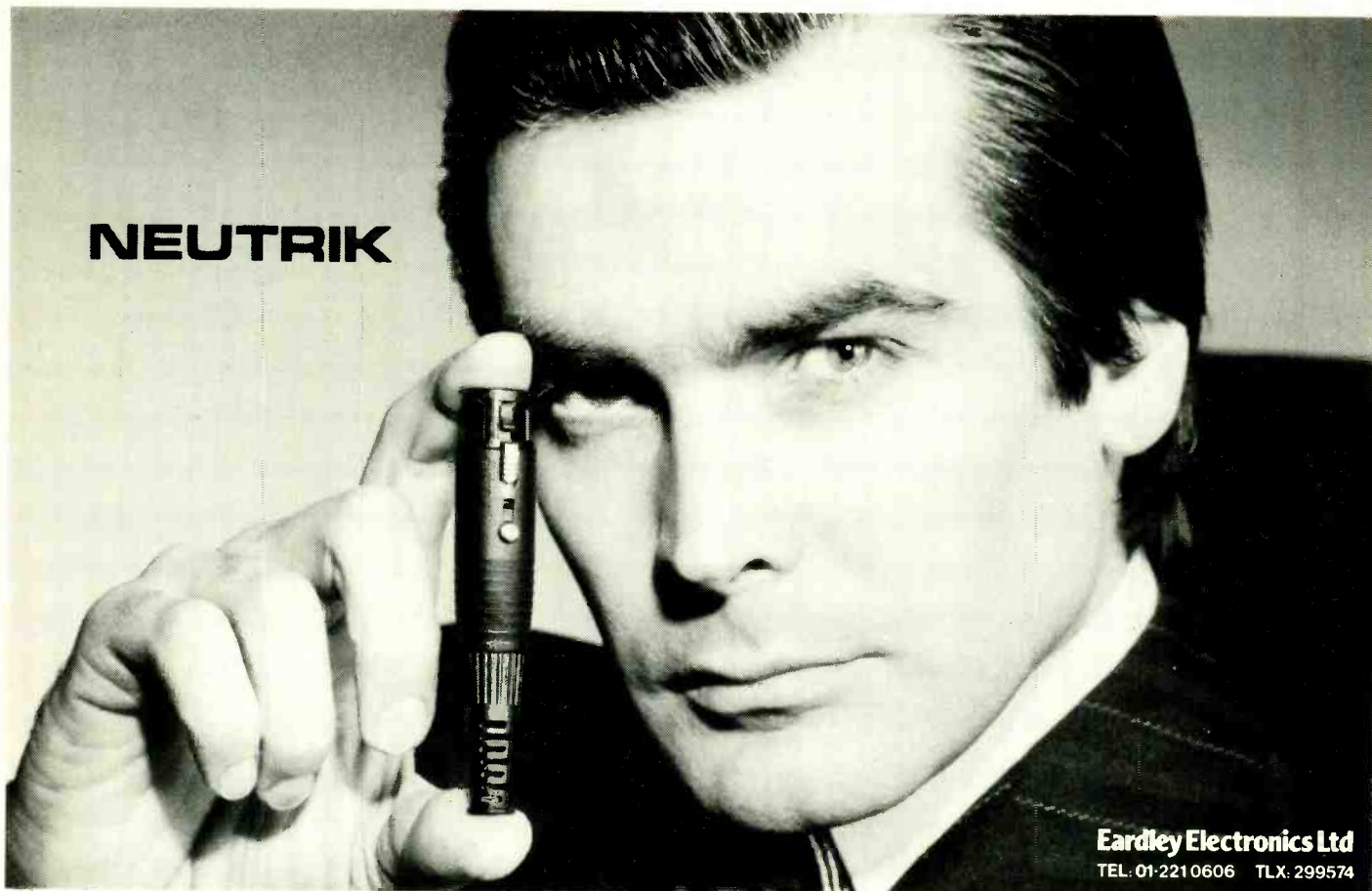
Referring now to the cream coloured section of the front panel this is logically laid out with effectively three horizontal rows of pushbuttons the centre row of which selects the test being performed. Proceeding from right to left this row has, AC voltage, azimuth, second and third harmonic distortion, frequency response, channel separation, speed/drift, flutter, noise and self check. The latter button initiates an internal self checking procedure which lasts just over a minute and results in a display 'I AM OK YOU ARE OK' if all is well.

The top row of buttons select left, right, or left and right; the noise and wow and flutter standard of measurement, weighted or flat; and provide a reset for the electronics.

Finally at the bottom one button sets the operator's reference level, four buttons set the level for frequency response and channel separation measurements to  $\pm 10$ dB, 0dB, -10dB or -20dB related to the operator's reference level and last of all a pot sets the reproduction level at a small inbuilt monitoring loudspeaker — a very useful feature.

At the rear of the instrument two BNC connectors provide a video output with syncs to feed

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an external TV monitor at 60Hz frame rate (which could cause troubles) and also provide a scaled replica of the audio input for an oscilloscope.

## Construction

Externally the unit is solidly made with a hinged stand at the front for tilting the instrument. Not being intended as a portable unit no protection is provided for the front panel controls.

Within the case the video unit is in a screened compartment with the power transformer to the rear.

Centrally mounted is the power supply unit which plugs into a mother board at the front of the unit behind a further printed circuit supporting all

the front panel controls. Either side of the power supply, four edge connectors are provided, (only three of each were used in the review sample) large PCBs plugging into these.

The overall standard of construction was found to be excellent with all integrated circuits being socketed and all parts readily removable for maintenance. However, no servicing information was provided (probably for good reason, as this is a very complex instrument) and it was felt that the operator's manual could be bettered.

## Oscillator performance

The two oscillator outputs were found to be separately buffered to eliminate interaction with

the grounds of the terminals having a 10Ω resistor to the instrument's chassis which has a separate earth terminal. The oscillator output impedances were satisfactorily low at 49.8Ω, remaining constant with output level setting.

Attenuation offered by the 20dB and 40dB attenuators was found to be very accurate the 20dB attenuator measuring 20.02dB and the 40dB attenuator 40.038dB. Using the attenuators and the full range variable control the output could be reasonably controlled down to 10μV or below. When using only one output the isolation of the unwanted output was excellent at greater than 100dB. Band limited 22Hz to 22kHz RMS noise in the outputs was 5.5μV in the noise measurement mode.

In normal modes of operation the maximum oscillator output was 2.056V RMS with the level difference between the outputs being less than 0.002dB at any level setting. In the distortion mode a further 10.5dB of output was available, but only at 1kHz.

When in the distortion measurement mode the frequency of the oscillator output was stable at 1.0024kHz with the second and third harmonic distortion being low at -80dB (0.01%) and -88dB (0.004%) respectively. However, in the swept modes it appears that the sinewave output is synthesised and the distortion tends to be high. A typical distortion spectrum is shown for 1kHz in Fig 1 where it is to be seen that the output is rich in harmonics at levels up to about 0.3%. For the intended purposes of the instrument this is not of consequence but the harmonic content could be troublesome when auditioning transducers such as loudspeakers.

The flatness of the oscillator output was good being better than +0, -0.1dB from 100Hz to 40kHz reference 1kHz and falling to -0.12dB at 50Hz and 20Hz.

Accuracy of the frequency indication, which applied to all measurements, was within the specified ±5% but varied widely with the frequency as shown in Fig 2 which plots the error of the actual frequency related to the indicated frequency.

## Voltage measurement

The voltage measurement system applies to both the oscillator outputs and to the inputs. At 1kHz the accuracy over the entire range from 2V to 1mV was within +0, -0.5%. The tolerance on frequency was such that the flatness was within ±0.1dB from 16Hz to 54kHz on the 1mV FSD range with the -1dB points being at 8Hz and 63kHz.

In practice the bandwidth varied little with the input level and the unit was found to have a true RMS rectifier.

## Frequency response

The overall input/output frequency response was measured as being within ±0.1dB from 330Hz to 40kHz reference 1kHz with the low frequencies falling off to -0.3dB at 20Hz.

In all frequency sweep modes the instrument starts at 40kHz taking 14s to sweep to 1kHz, 24s to 100Hz and 43s to 20Hz. It follows that considerable time can be saved if the low frequency limit facility is used.

Using external frequency sweeps the instrument could follow remarkably fast sweeps, as fast as 3s from 100Hz to 1kHz. However when it ceased to

FIG. 1  
SOUND TECHNOLOGY  
MODEL 1500A  
DISTORTION SPECTRUM  
FOR 1kHz

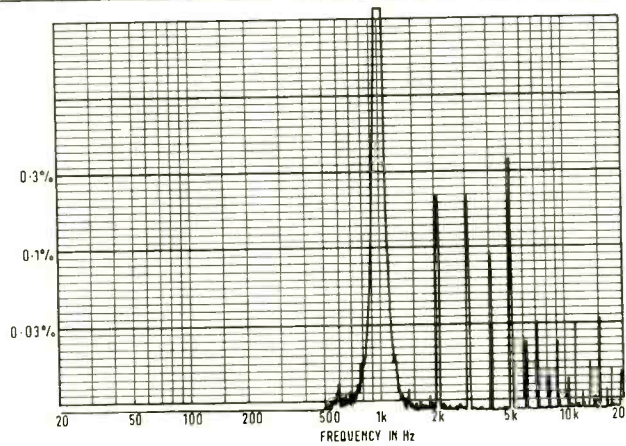


FIG. 2  
SOUND TECHNOLOGY  
MODEL 1500A  
ACCURACY OF  
FREQUENCY  
INDICATION

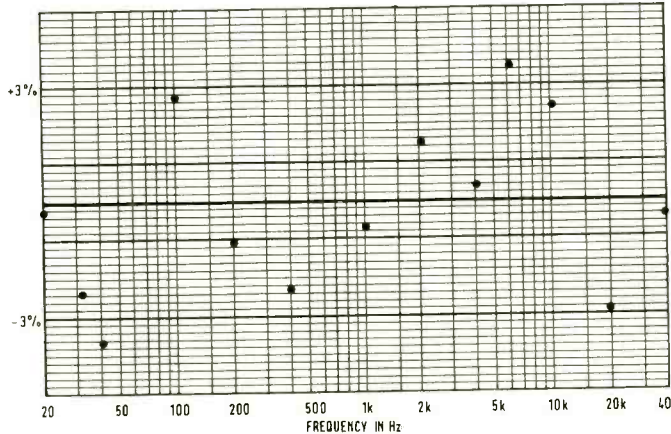
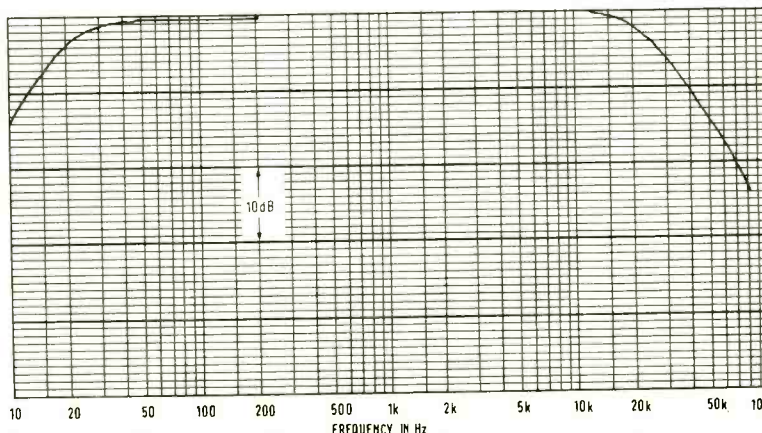


FIG. 3  
SOUND  
TECHNOLOGY  
MODEL  
1500A  
FREQUENCY  
RESPONSE-  
UNWEIGHTED



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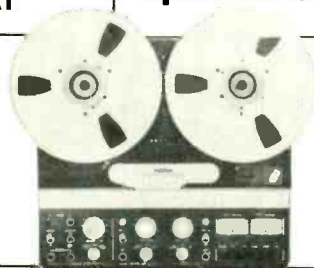


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be able to completely follow a sweep the display appeared as a series of dots.

In the crosstalk measurement mode the frequency sweep proceeds from 20kHz to 20Hz in steps of the standard 1/3-octave filter frequencies. Accuracy of the crosstalk (channel separation) measurement was found to be within 0.5dB at levels down to -60dB. At lower levels of crosstalk substantial errors occurred irrespective of the input level.

## Distortion

As the distortion measurement arrangement starts measurement at a level elevated by 10dB its use on equipment other than tape recorders (which are tolerant of overloads) must be treated with caution. However, the instrument's overall residual distortion of 0.02% second or third harmonic makes it attractive for use with other equipment. The sharpness of the selective distortion measuring filters was such that the 1kHz input could vary from 970Hz to 1.01kHz without significant errors, thus showing that wow and flutter are unlikely to interfere with the accuracy of the distortion measurement which was found to be within  $\pm 0.5$ dB.

## Noise measurement

The measurement of noise involves the use of two rectifier characteristics — true RMS for the ANSI measurement or 'average' for the CCIR/ARM and the NAB measurement. These characteristics were found to be correctly selected in both the weighted and the unweighted modes with the frequency response of the system being as shown in Fig 3 in the unweighted mode. It should be noted that the HF roll off at 12dB/octave should be adequate for bias frequency rejection when measuring the record/replay state.

The frequency weighting in the weighted modes is shown in Fig 4 which shows the CCIR weighting and the A-weighting used by NAB and ANSI. Tolerances were found to be well within the requirements of CCIR Recommendation 468 and IEC 179 for the A-curve. The unity gain point of

the A-curve was found to be correct at 1kHz with the CCIR/ARM curve reading 0.5dB too high at the nominal unity gain point at 2kHz.

The three measurement methods were contrived for use with mechanical meters with linear scales, it is therefore not possible for an autoranging logarithmic electronic system to precisely follow the dynamic metering requirements. However the bar display offered a performance not far from a VU meter.

Residual noise was good with the wideband residual being -95.5dB reference 1V using the average rectifier or 1dB worse using the RMS rectifier. In the weighted modes a 'SIGNAL TOO LOW' indication occurred at -90dB in the CCIR/ARM mode, -95dB in the ANSI mode or -96dB in the NAB mode — all reference 1V RMS. It was however found that the 'SIGNAL TOO LOW' indication occurred not far from the instrument's residual noise and that measurements in a 10dB range above the warning level could be several decibels in error.

TABLE 1

Indicated error	Actual error	Instrument error
+2.106%	+2.098%	0.008%
+1.127%	+1.121%	0.006%
-0.288%	-0.291%	0.003%
-1.327%	-1.330%	0.003%
-3.357%	-3.361%	0.004%

## Azimuth measurement

The accuracy of the phase error readout at the four test frequencies was checked at eight different phase errors and found to be within 10% of the actual phase error. This is generally better than the  $\pm 5^\circ$  of phase specified and certainly more than adequate for tape recorder alignment.

## Drift, wow and flutter measurement

Checking the frequency of the oscillator output in the drift or wow and flutter measurement modes showed the frequencies to be 3kHz or 3.15kHz (for US or European standards) at -0.0029%.

When checking the speed the instantaneous speed indication had a resolution of 0.04% and was accurate to within the resolution. Similarly the accuracy of the 10s averaged speed was excellent as shown in Table 1.

The instrument's residual wow and flutter was found to be 0.004% to the NAB standard, 0.005% to the JIS standard and only 0.001% to the DIN/ANSI (or more correctly the instrument should be labelled IEC Recommendation 386).

Whilst the unweighted wow and flutter indications were found to be accurate it was found that the HF section of the weighting curve was incorrect as shown in Fig 5.

When measuring the IEC (CCIR/ANSI) mode the ballistics of the display were close to the required standards when testing with unidirectional bursts of flutter and with the exception of the weighting network problem the performance was very good.

## Summary

This most complex instrument offers what must be the most comprehensive and accurate tape recorder test unit yet made. As a result it takes some time to master the measurement methods. However, once all the possibilities are familiar the instrument is very quick to use and undertakes all tests without any changes in cabling.

The levels usable at the inputs and outputs and the fact that they are unbalanced suggests that the design is aimed at domestic and semi-professional tape recorders, but this does not mean that its use on professional equipment is particularly restricted.

Overall this is an excellent instrument for tape recorder maintenance and many of its features can be used for general maintenance of audio equipment.

Hugh Ford

FIG. 4  
SOUND  
TECHNOLOGY  
MODEL  
1500A  
FREQUENCY  
RESPONSE -  
WEIGHTED

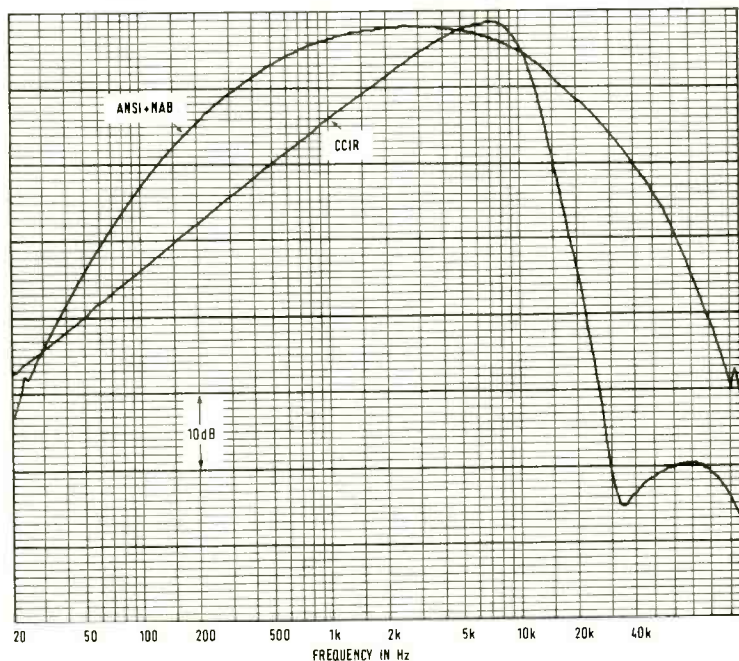
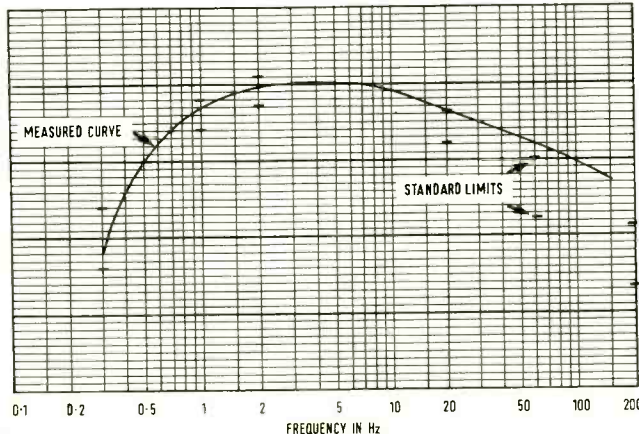
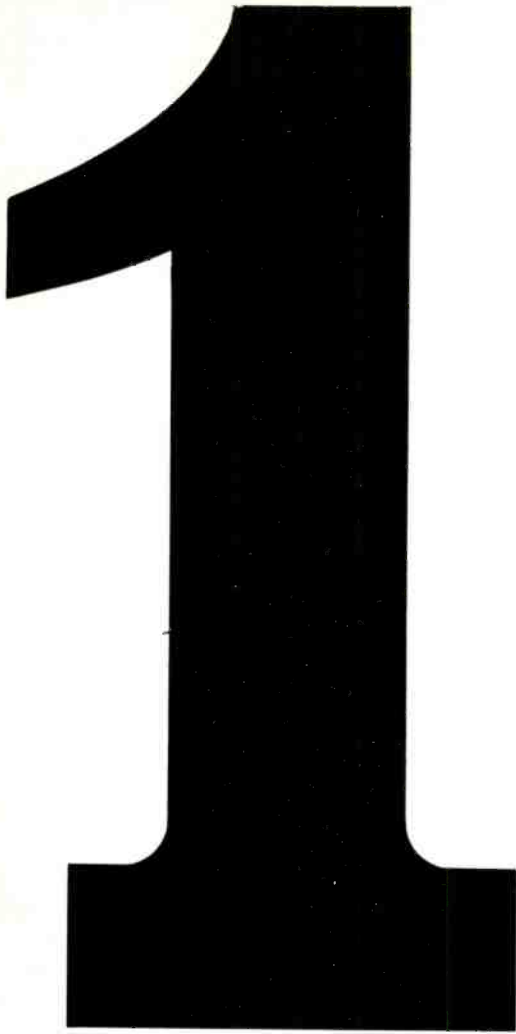


FIG. 5  
SOUND TECHNOLOGY  
MODEL 1500A  
WOW AND FLUTTER





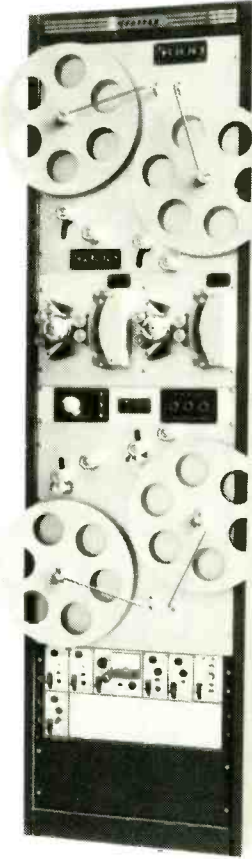
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Available on single or multiple channel recorders, 16mm or 35mm.

Record Head switches from output of record amplifier to input of reproduce amplifier to permit playback synchronously with picture or other tracks. Switching is automatic.

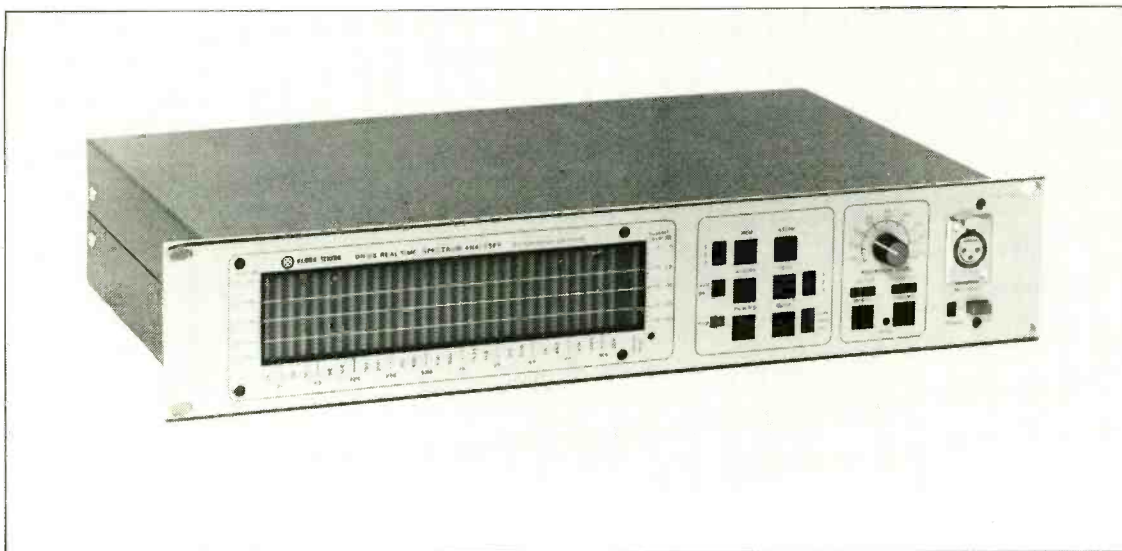
## **Pick-up Recording Option**

Available on single or multiple channel recorders, 16mm or 35mm. This facility makes it possible to switch into the record/erase mode and back out at any time in the recording process without discernible clicks, noises, or changes in recorded level. It is possible to insert correction, delete errors, add extensions and post-synch dialog. Selective record/erase on multiple channel units. The Pick-up Recording Option may be added to nearly all types of film mechanisms.

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## Klark Teknik DN60 real time spectrum analyser

### MANUFACTURER'S SPECIFICATION

#### Analysers section

**Functions:** selectable real time and peak hold can be displayed together. Peak/average — processor controlled averaging. Three separate memories. Three response times, processor controlled attack and decay times. Selectable A-weighting filter.

**Filters:** 1/3-octave filters on 30 ISO bands from 25Hz to 20kHz. Double section pole-pair filters meet requirements of IEC 225. Relative flatness  $\pm 0.5$ dB. Rectifiers — quasi-peak fast response (attack time frequency dependent).

#### Overall level section

**General:** all functions and performances as analyser section with the exception of:

**Frequency response:** 15Hz to 22kHz ( $-3$ dB points).  
**Rectifiers:** peak/average uses separate rectifiers.

#### Input section

**Microphone:** differential input with adjustable sensitivity from  $0.25\text{mV}/\mu\text{bar}$  to  $1\text{mV}/\mu\text{bar}$ . To suit most capacitor microphones. Phantom powering provided at 14VDC via  $2\text{k}\Omega$  resistors to suit AKG 457 Series microphones.

**Line:** differential input for balanced or unbalanced lines via XLR connector on rear panel. Input impedance  $47\text{k}\Omega$  (nominal unbalanced connection).  
**Attenuator:** reference level switchable in 10dB steps from  $+20\text{dBm}$  to  $-50\text{dBm}$  or 120dB spl to 50dB spl. Accuracy  $\pm 0.2$ dB.

**A-weighting:** selectable network meets IEC 651 type 1 requirements. Operates on both microphone and line inputs.

#### Display

31 x 16-LED matrix display with selectable resolution of 1dB or 2dB per LED. Variable brightness control. Multiplex (scanned) operation.

#### Pink noise source

**Generator:** digital pseudo random white noise generator and pink noise filter.

**Flatness:**  $\pm 1.5$ dB (20Hz to 20kHz) measured rms with 10s integration time.

**Output level:**  $+4\text{dBm}$  rms (nominal) via XLR connector on rear panel.

**Output:** gateable output amp. Output impedance  $1\text{k}\Omega$ .

#### Other features

**Converter:** fast logarithmic A/D converter covers 31dB in 1dB steps. Accuracy  $\pm 0.2$ dB at any level from reference level.

**Memory:** stores entire 31dB and all relevant switch information. Display can be 'expanded' when in memory recall mode.

**External display:** all accessories display entire 31dB range in 1dB steps and all switch information.  
**Interface:** intelligent talk and receive output available to suit automatic testing and control equipment.

**Connectors:** Microphone input — XLR D3F style. Line input — XLR D3F style. Noise output — XLR D3M style. Power — 3-pin CEE.

**Power requirements:** 110/120/220/240V (specify when ordering). 50-60Hz at less than 30VA.

**Dimensions:** (whd)  $19 \times 3\frac{1}{2} \times 10$ in ( $482 \times 89 \times 257$ mm). Complies with standard 19in rack mount-

ing requirements.

**Net weight:** 17.64lb (5kg).

**Shipping weight:** 11.03lb (5kg).

**Price:** basic DN60 £995. Internal communications interface £150. XY plotter interface £90. Paper Tiger interface £90. RT<sub>60</sub> reverberation analyser £200. Microphone preamplifier £70. Microphone capsule £45. Printer £600. XY plotter £900.

**Manufacturer:** Klark-Teknik Research Ltd, Walter Nash Road West, Coppice Trading Estate, Kidderminster, Worcs DY11 7HS, UK.

**USA:** Klark-Teknik Electronics Inc. 262A Eastern Parkway, Farmingdale, NY 11735.

**I**N ITS basic form the Klark Teknik DN60 is a microprocessor controlled 1/3-octave spectrum analyser covering the ISO standard centre frequencies from 25Hz to 20kHz. However various interfaces and accessories are available not only to provide a computer interface but also for X/Y plotters, printers and also for reverb time measurement in terms of RT<sub>60</sub>.

As standard the unit is designed for mounting into a 19in rack with the front panel having the correct mounting holes and the unit occupying two rack units in height.

To the left of the front panel is the level display comprising an array of red LED indicators in 31 columns each 16 LEDs high. The 30 left hand

74 ►



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columns cover the  $\frac{1}{3}$ -octave analysis with the right hand column giving a normally unfiltered display of level. In order to obtain a sensible display of sound levels the right hand unfiltered column is 10dB less sensitive than the remaining columns which cover the 30 ISO recommended centre frequencies.

The vertical resolution of the whole display can be either 1dB or 2dB giving a range from zero to either -15dB or -30dB in the right hand overall level display or -10dB to either -25dB or -40dB in the  $\frac{1}{3}$ -octave bands.

A screwdriver operated potentiometer behind the front panel controls the brightness of the complete display with the maximum brightness being more than adequate for easy reading in quite bright ambient lighting.

To the right of the display matrix six push-buttons together with associated LED displays control the overall functions of the unit. One button selects a choice of three separate memories for recording the matrix display and also the significant switch settings. The memories in fact store the full available dynamic range with 1dB resolution such that stored data can be displayed with either 1dB step or 2dB step resolution. When in the normal continuous display mode data is entered into memory by selecting the required memory number and then pressing the 'store' pushbutton at the desired instant.

A further pushbutton selects either an averaging rectifier characteristic or a quasi-peak characteristic with the adjacent button selecting a choice of three display time constants. When storing the display, the settings of these switches are stored and displayed adjacent to the switches in the memory recall mode.

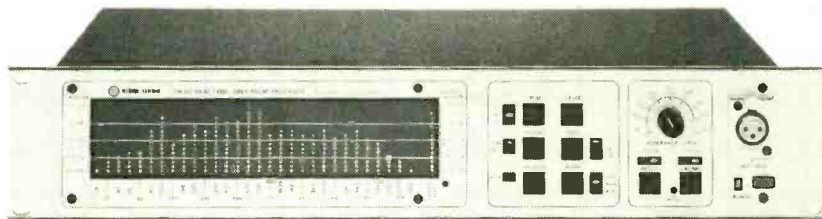
The remaining two pushbutton switches in this section of the instrument provide a fast peak hold function and select the instrument's mode from between the normal continuous mode, memory display and external: the status being displayed by three adjacent LED indicators.

To the right of this section is the input section which consists of a rotary attenuator switch and two pushbutton switches. One of the pushbutton switches selects the display resolution from either 1dB or 2dB step with the second switch performing two functions. Brief pressure of the switch changes between the line and microphone inputs with the selected input being displayed by a nearby LED. Prolonged pressure of the switch in either input selection switches a standard A-weighting network into circuit, the presence of the network being indicated by an LED.

Turning to the input attenuator switch, this provides 0dB indications in 10dB steps from +20dBm to -50dBm for the balanced line input or from -120dB spl to 50dB spl for the balanced mic level input. The latter is an XLR connector to the far right of the front panel above the power on/off switch with its nearby power indicator.

The balanced line input and the unbalanced noise output take the form of XLR connectors at the rear panel which also houses the IEC mains power connector and has apertures for external interface cables.

The removal of four securing screws give access to either the top or bottom of the internal parts, the bottom surface of the enclosure being covered by two good quality PCBs. To the right is the stabilised power supply with its cool running



toroidal power transformer and three clearly identified fuses.

On the left the PCB in the base of the unit acts as a mother board for the majority of the electronics which are mounted onto seven plug-in filter boards, a rectifier board and in the case of the review instrument three other boards. The LED display and the front panel controls are also mounted onto printed circuits which have flying leads which plug into the mother board.

All components on the printed circuits have clear identifications and integrated circuits were socketed for ease of servicing. Clearly the form of construction is designed to ease maintenance and repair, it being extremely easy to replace either PCBs or components.

Overall the standard of construction was excellent and the front panel layout proved excellent in use with all control settings being clearly shown.

### Display

As mentioned earlier the display consists of 31 vertical columns of 16 LED indicators all of which are controlled by a variable brightness pot behind the front panel. This control was found to have a useful range with the brightness of the LEDs remaining uniform across the display.

Switching on the unit illuminates all LED indicators for a short time and then initiates a self test routine at the end of which the LED display signals 'OK' if all is well. As with any spectrum analyser overload conditions can exist in individual  $\frac{1}{3}$ -octave columns and such a condition is

signalled by the two lower LEDs in a column being extinguished whilst the remainder remain illuminated — alternatively, when in the peak hold mode the top two LEDs remain illuminated under overload conditions.

Checking the centre frequency accuracy of the  $\frac{1}{3}$ -octave columns in terms of the square root of the multiple of the two -3dB frequencies showed that the maximum errors were +3.8%, -4% which is quite adequate for the purposes for which the analyser is intended. The shape of a typical passband is shown in Fig 1.

The accuracy of the indicated level steps was also carefully checked in both the 1dB/step and 2dB/step ranges and found to have a worst case error of only 0.05dB for the just illuminated point of the indicators.

### Level accuracy and frequency response

Using the wide band display the frequency response was to all intents and purposes flat from 20Hz to 20kHz with the -3dB points at 13Hz and 23kHz with the peaks of the  $\frac{1}{3}$ -octave filters also being to all intents flat in level.

In terms of absolute level using the line level balanced input the indicated 0dBm in the wide band display was found to be +0.12dBm for the just illuminated condition of the display — a creditable accuracy. When using the balanced mic input the 1 $\mu$ bar (74dB spl) indication is determined by a trimming pot within the unit with a nominal range from 0.25mV/ $\mu$ bar to 1mV/ $\mu$ bar to permit matching to common condenser microphones. 76 ▶

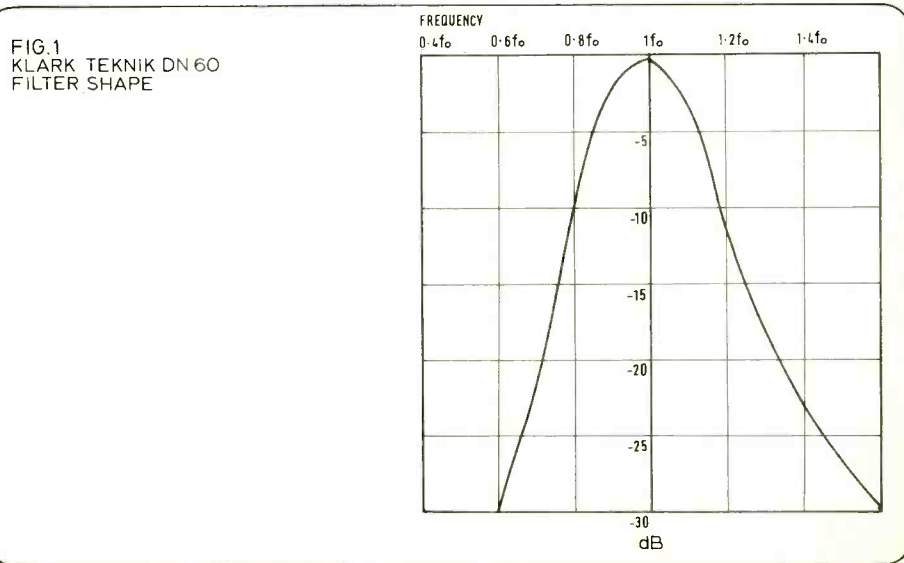
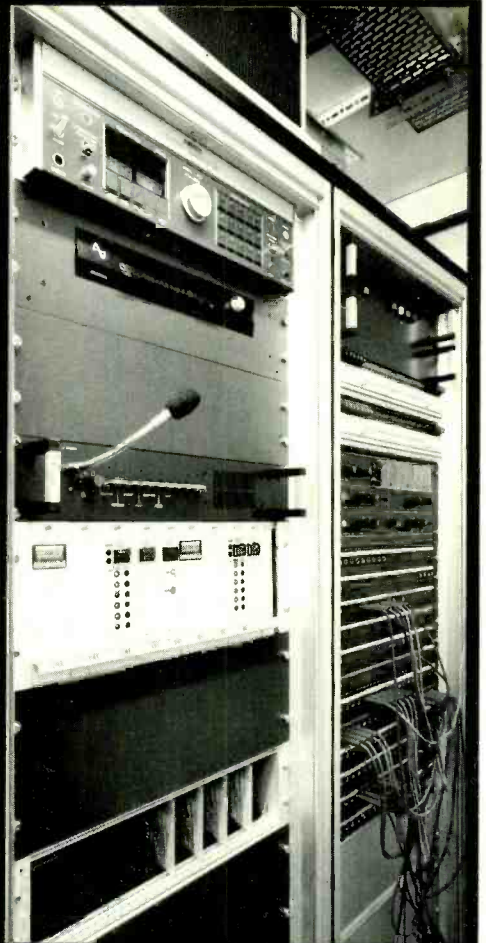


FIG. 1  
KLARK TEKNIK DN 60  
FILTER SHAPE



# Jacks & Jackfields for Recording and Broadcasting

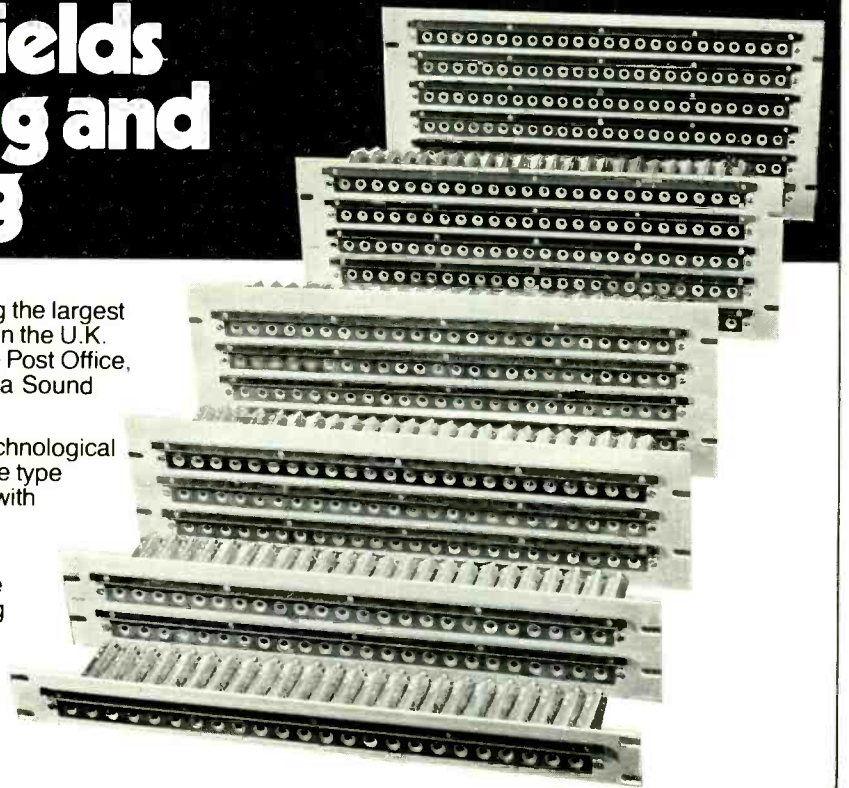
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As supplied the sensitivity was  $0.9\text{mV}/\mu\text{bar}$  to match the normally supplied AKG C451 preamplifier with an AKG CK2 omnidirectional capsule.

Measurement of the frequency characteristics of the internal A-weighting produced Fig 2 which shows that the instrument is very well within the IEC Recommendation 179 tolerances.

## Inputs and output

Investigating the mic input showed that it had a constant input impedance of  $2,621\Omega$  which is adequately high for any normal capacitor mics. The DC phantom powering was found to be  $12.59\text{V}$  which is a little below the nominal  $14\text{V}$  but should not cause trouble in normal operation. When powering is not required it may be readily disconnected within the unit.

Turning to the CMR ratio, this was found to be constant with frequency at  $58\text{dB}$  for the mic input or  $44\text{dB}$  for the line input which also had an adequately high input impedance of  $95\text{k}\Omega$  when operating balanced or  $55\text{k}\Omega$  when using the input unbalanced.

The fixed level pink noise output was found to deliver  $+4.6\text{dB}$  reference  $0.775\text{V}$  from a source impedance of  $979\Omega$  unbalanced. Whilst it is perhaps unusual to have a fixed level output the level is adequate for feeding most sound systems and these would normally have their internal attenuators and not overload at  $+5\text{dBm}$  input!

As shown in Fig 3 which is a constant bandwidth spectrum analysis of the pink noise output, the frequency distribution is very close to the required  $-3\text{dB/octave}$  and certainly far better than the manufacturer's specification would suggest.

## Other inbuilt features

Investigating the rectifier characteristics showed that a true average or true peak indication was shown with three time constant responses as follows.

In the peak rectifier mode the attack time for the equivalent steady state indication was fixed at about  $1\text{ms}$  with the fall time to  $-20\text{dB}$  indication being selectable by the response switch as  $0.5\text{s}$ ,  $1\text{s}$  or  $2.5\text{s}$ . In the average rectifier mode the response switch changes both the attack and fall times, the fall times being as for the peak mode with the rise times being  $300\text{ms}$ ,  $500\text{ms}$  or  $800\text{ms}$  respectively.

Operation of the three internal memories was found to be a delight with the original control settings (except for the input step attenuator) being displayed as each store is selected.

## LGB1 Oscilloscope and X/Y interface

This interface allows the display of the DN60 to be either continuously displayed on an oscilloscope or plotted on any general purpose X/Y plotter always with a  $1\text{dB}$  resolution. The interface comprises a small plastic box which connects to the DN60 analyser by means of a ribbon cable which plugs into the rear of the analyser.

On the top of the interface are two pushbuttons; one for calibrating the X/Y plotter and the other to tell the plotter to plot the current display on the analyser. When the latter is pressed the current display is stored for plotting and all LEDs in the display are extinguished and all control settings frozen.

FIG. 2  
KLARK TEKNIK DN60  
A-WEIGHTING ACCURACY

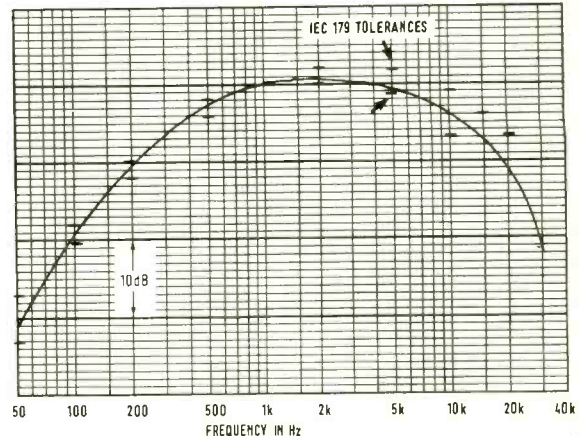
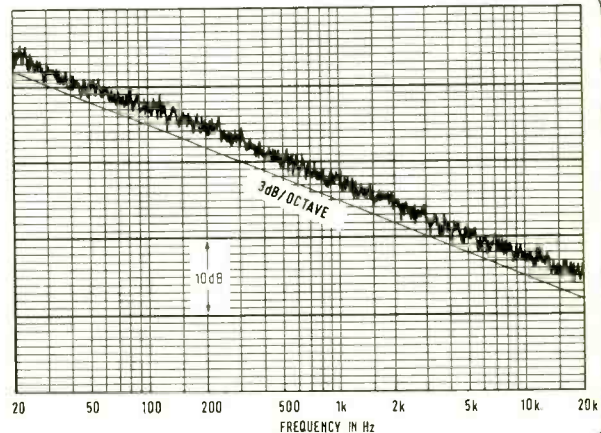


FIG. 3  
KLARK TEKNIK DN60  
PINK NOISE OUTPUT



On the side of the interface unit five pairs of  $3\text{mm}$  sockets on the standard  $\frac{1}{4}$  in spacing connect the oscilloscope and the X/Y plotter with two pairs of sockets providing  $0$  to  $1.5\text{V}$  X and Y outputs, and a third pair of sockets providing an automatic pen lift. The latter is an open collector output rated at  $100\text{mA}$  and  $+60\text{V}$ .

The remaining two pairs of sockets interface an oscilloscope giving a  $0$  to  $1.4\text{V}$  Y output and a negative trigger pulse output every display scan, the latter being a  $5\text{V}$  to  $0\text{V}$   $30\mu\text{s}$  pulse every  $15\text{ms}$ .

As shown in Fig 4 the oscilloscope displays all  $\frac{1}{3}$ -octave bands plus the overall unfiltered level at the right of the display with  $1\text{dB}$  resolution.

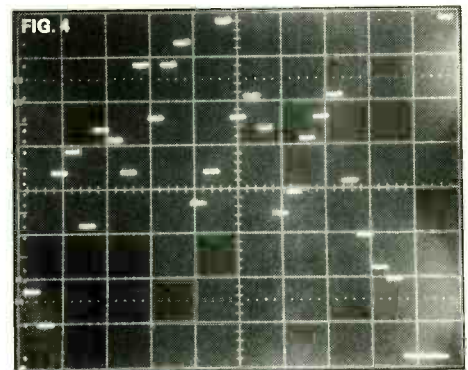
When using the X/Y plotter the oscilloscope display is inhibited whilst the plot takes place, this occupying just under a minute and the plotter only giving the  $\frac{1}{3}$ -octave bands with  $1\text{dB}$  resolution.

Clearly the interfaces provide for almost any X/Y plotter or oscilloscope and once a simple calibration has been done accurate permanent records of the current or the memorised displays may be obtained.

## Summary

The Klark Teknik DN60 is an excellent general purpose  $\frac{1}{3}$ -octave analyser for the alignment of sound reinforcement systems and general studio purposes.

Particularly nice features are the three stores



which not only store the display, but also control settings; and the peak hold function which works with both the peak and average rectifier settings.

The front panel controls are uncluttered and clearly identified and the display is easier to read than that of many units of this type.

Finally, the manufacturer provides a block of pre-printed transparent overlays for the display such that a writing instrument can record the display indications on to the overlay to provide a permanent record.

Alternatively one can of course purchase a plotter or printer which interfaces with the unit, another important accessory being the reverb time measurement unit.

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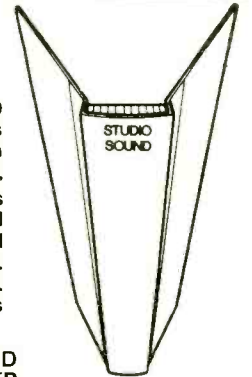
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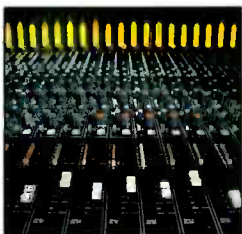
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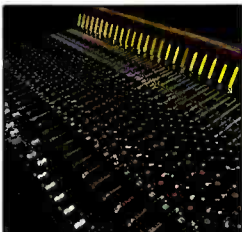
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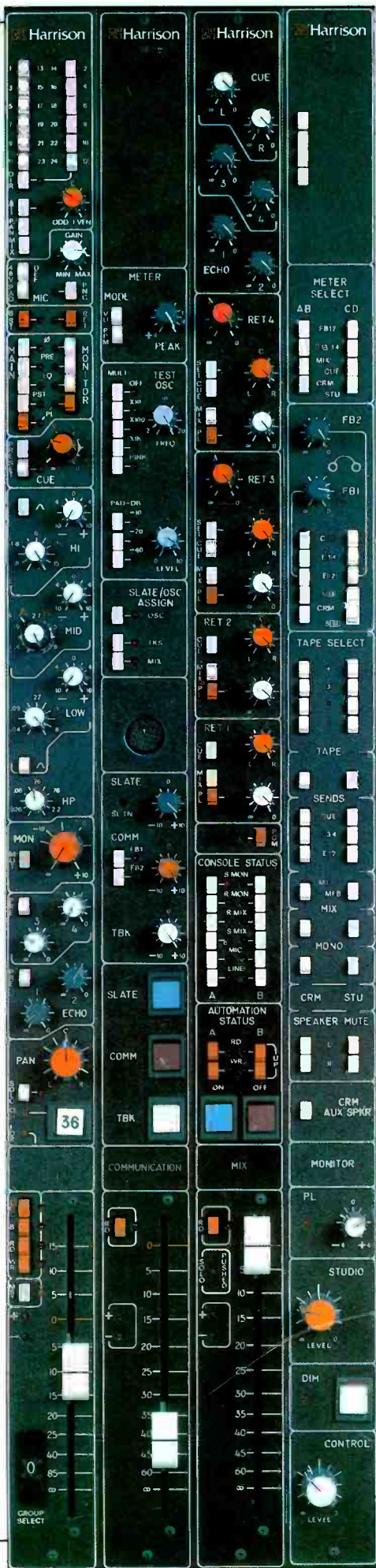


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