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June 1981 £1

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# studio sound

## AND BROADCAST ENGINEERING

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### Jobs for the future

We receive quite a large number of enquiries, by letter and by telephone, from all over the world, from young people who are interested in entering the recording and broadcasting industries, and sometimes it is very difficult to advise as to the best course of action. When I entered the industry as an assistant engineer, I had the distinct impression that the way in to such a position was based more on *who* you knew than *what* you knew, and that the secret lay in developing contacts within the industry and keeping your ears open. Vacancies appeared to be announced largely by word of mouth, unless you were interested in the maintenance side, which does not concern us here.

Choosing future engineers simply by word of mouth would not appear to be the most effective way of selecting the best applicants, however, if this practice still continues (assuming, that is, that it was ever significant). A lot of good prospective engineers can be missed. Every studio I have ever worked in receives a large amount of mail. All too often, such letters have to be left unanswered, simply because of lack of time.

In an economic climate such as we are experiencing today, jobs are obviously more scarce than previously, but new engineers must come from somewhere. It would be very helpful, therefore, if we could have some kind of indication from studios as to exactly how new staff are employed, what you look for in an applicant, at what level you employ new staff, and the best way an applicant should approach a studio. This will help us give useful data to people who ask us, and ultimately it will help you in the studios find the right kind of people. It would only take a few minutes to jot down the details.

As an extension to this, it would be interesting to hear from studio associations all over the world on the subject of employment and training. Would there be any chance of such organisations drawing up a document to assist those who wish to make a career in the industry? Perhaps it would be possible for such groups to co-ordinate the handling of applications to member studios, and assist in placing applicants, maybe also issuing a list of vacancies on a regular basis? We may be able to help in such arrangements, if the organisations would like to get in touch. It might require a fair amount of work to operate successfully, but it would be well worth the effort in the long run, and the industry as a whole would benefit. Your comments?

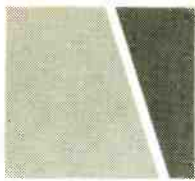
### What future?

In any industry like professional audio, which relies heavily on high technology, there must be a certain degree of awareness that we receive only the 'spinoff' of modern technological development, and a knowledge that modern devices and systems were not originally designed for us. All too often, that awareness does not go deep enough, and it is often ignored. It is a fact, however, that technology is a product of the culture from which it springs: it is not value-free, but directed most efficiently by those in power. The microprocessors that are today appearing in our consoles and other audio devices were originally designed for far more sinister purposes, for example, notably as the guts of guidance systems for weaponry which, we well know, is capable of destroying the earth several times. And although the professional audio business is not in such a good position to influence such developments directly as are other parts of the electronics industry, we must become more aware of the original purposes for which our toys were designed. We have a duty as individuals, which we share with everyone else who uses the fruits of the technology of destruction, to speak out against such dangerous applications. We share with all other people on the earth a duty, to the human race and the planet as a whole, to do all we can to make sure that the Four Horsemen do not ride again. We as an industry are responsible for recordings, for TV and radio broadcasts, and for the equipment that produces them. We must ensure that there will be people left to listen to the music, and to make it.

Richard Elen

Cover photograph  
by Roger Phillips

ISSN 0144-5944  
JUNE 1981 VOLUME 23 NUMBER 6



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

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

## SM81 Cardioid Condenser Microphone



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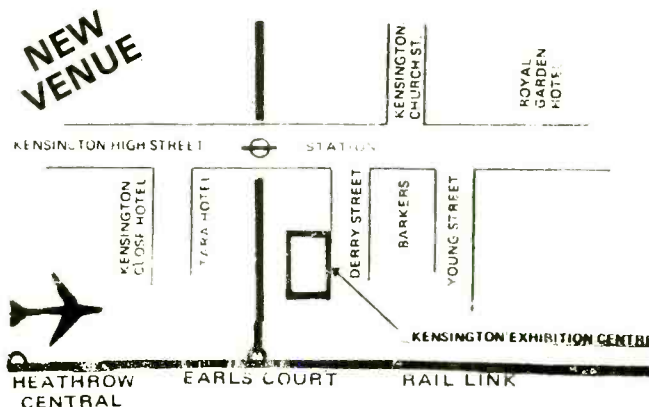
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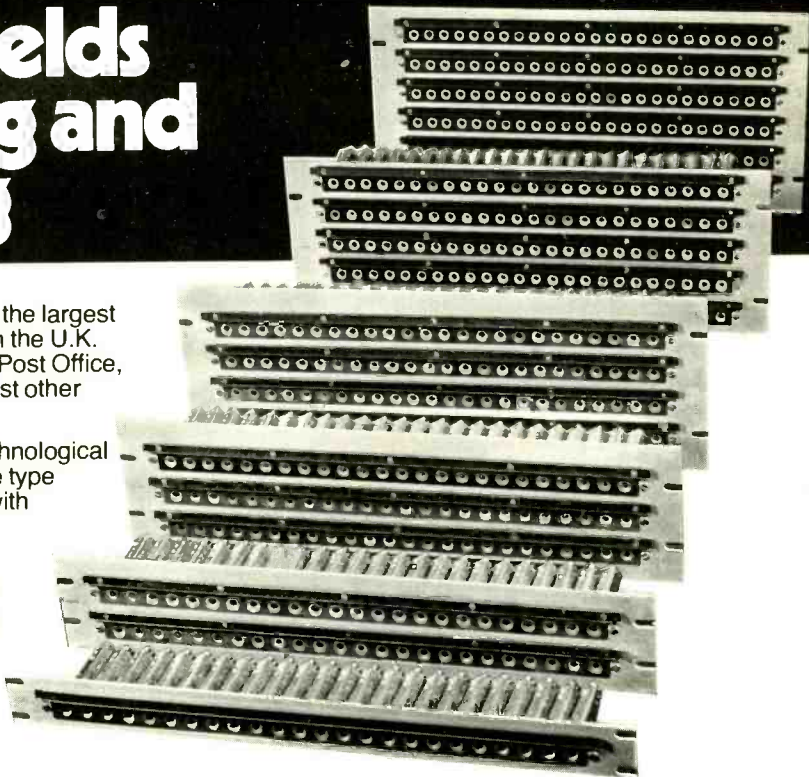
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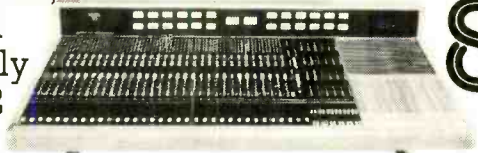
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# SERIES 80



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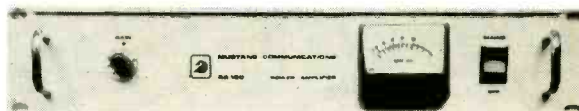
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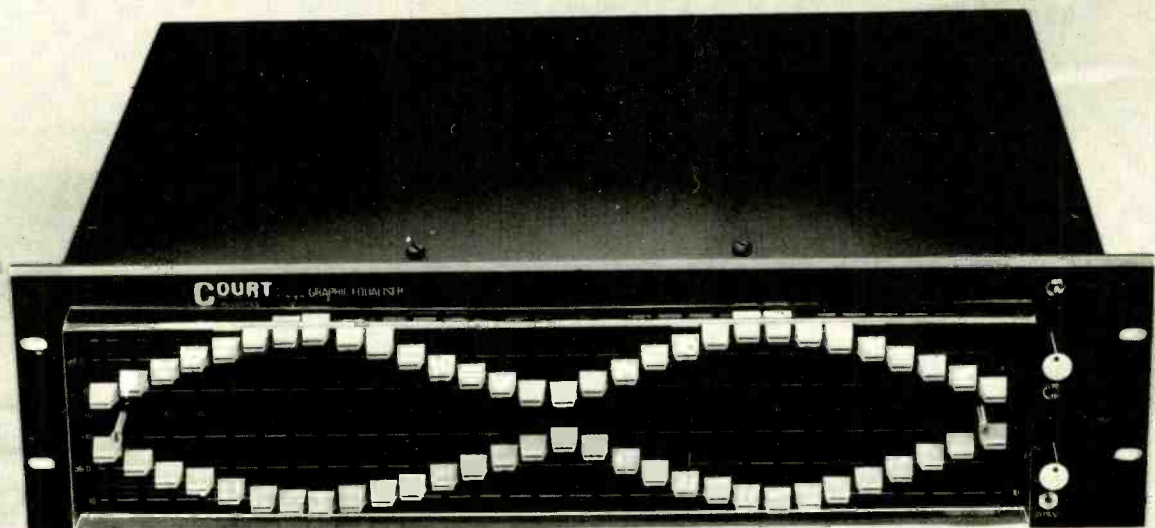
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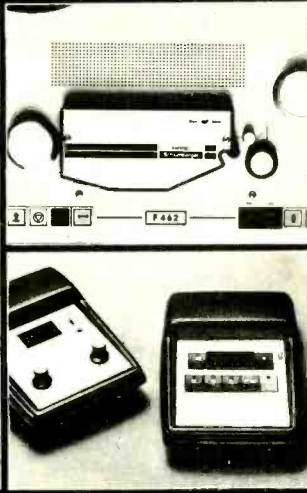
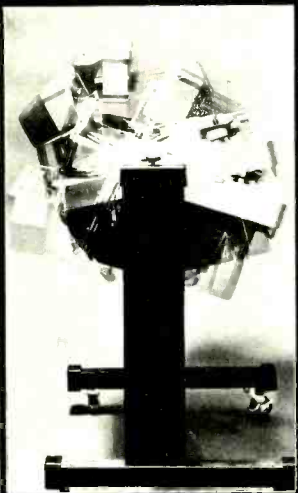
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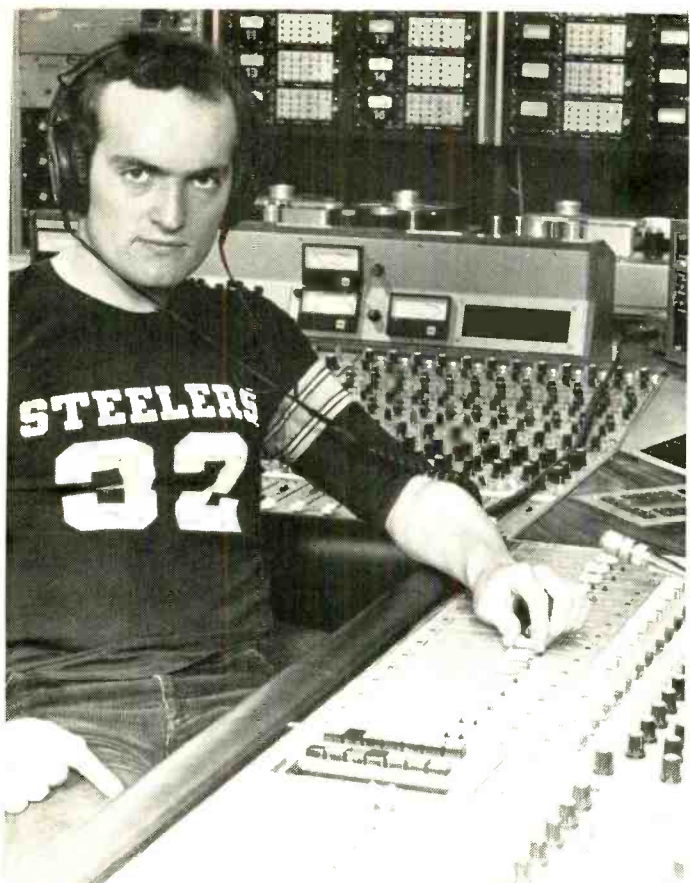
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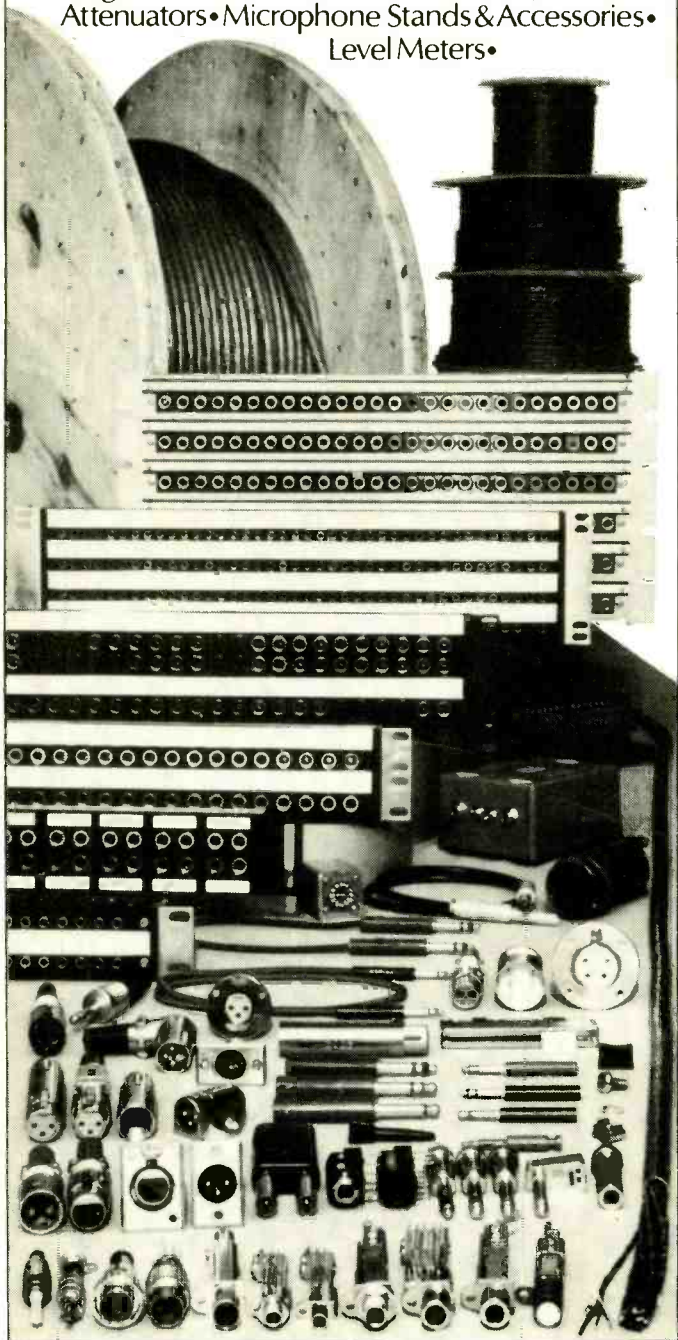
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 A collection of Protex fasteners and latches. The top half shows several corner pieces and handles, some with multiple mounting points. The bottom half shows a latch mechanism and a handle. The items are arranged in a grid-like pattern against a dark background.
 

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## **F.W.O. Bauch Limited**

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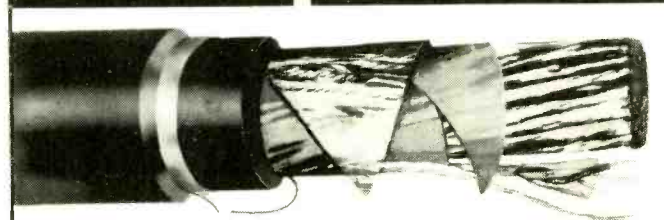
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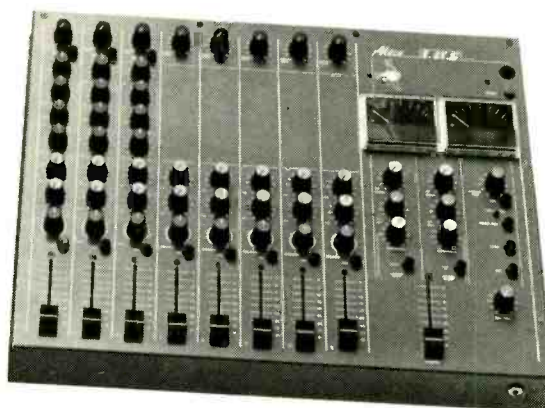
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**The 828**, a high quality stereo output mixer with 8 or 12 mono mic/line inputs, HF, MF & LF equalisation, echo and foldback sends, PFL on headphones, limiters on outputs. PPMs & phantom power optional.



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# TEAC

UPDATE

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## 85-16

Now there's no excuse for buying a used machine. This precision engineered 16-track offers integral dBx, the economy of one-inch tape and, of course, TEAC reliability. Someone in Japan really worked this one out, it's TASCAM's finest hour.



## One for the road



Custom Portastudio systems, road-cased or racked, with speakers, amps and effects, can be tailored to your requirements. Call for details, and remember that the 144 is available now at lower prices.

## Baby 15

The other half of TEAC's 16-track package is the massive Model 15 mixer. Specs and facilities outshine anything they have made before. Our mini performance comparator is available on free loan to anyone seriously interested.



## Better service

Bigger workshops and more staff enable us to offer fast turnaround on all pro-audio service.

## 8 Track record

The 80-8 is the world's best selling 8-track machine, producing hits in thousands of studios.

Working systems available at package prices.

## Specs & prices

All the TASCAM range is covered in the new, 30 page, full colour booklet, available on request. As this ad is written two months before you read it, please call or write for the latest prices and offers.

If you would like to learn more about multitrack, we can supply copies of TEAC's "Are you ready for Multitrack?" and "Multitrack Primer" at 60p and £3.30 respectively, incl.

## Free with four

We have helped many multitrackers on their way with our offer of the 1478 mixer with every 3440 that we sell. It features treble, bass pan and fader on each of four channels, ideal for bouncing or mixdown.



## 32-2B Immediate Release

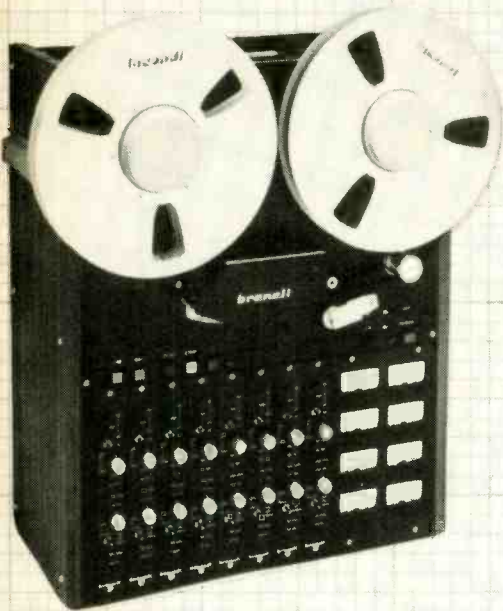
The latest version of TEAC's remarkable, low priced, 2-track mastering machine now features separate left and right record switches extending its already versatile performance. In stock now.



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## BRENELL MINI 8

A truly professional machine within the reach of anyone seriously considering 8 track. I.C. logic transport control, sync facilities, silent drop in/drop out record functions, and everything that makes this 1 inch machine probably the best value for money on the market.



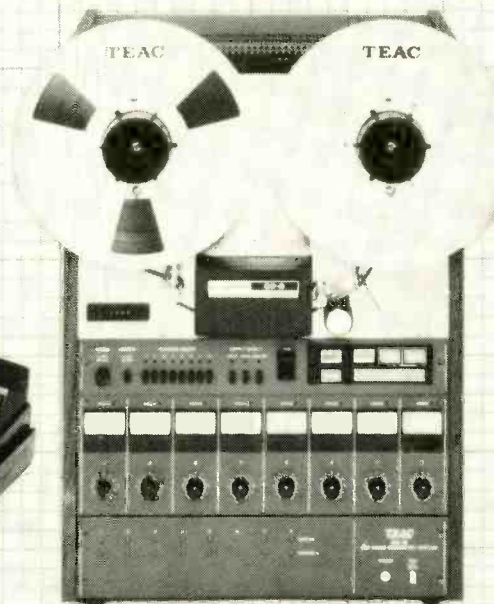
## REVOX B77

The ideal mastering machine for the small studio giving really excellent results at a reasonable price. And for those who want to go even better we also stock the Revox A700.



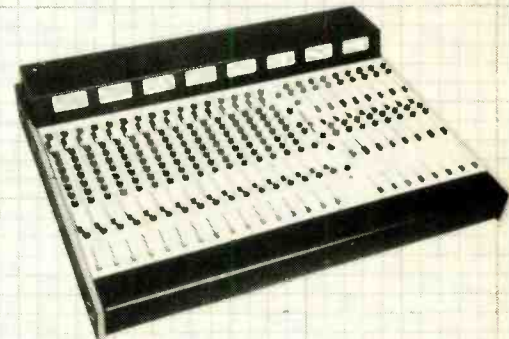
## TEAC A3440

The new four channel machine replacing the famous A3340S. Now with even more facilities: — I.C. logic control, built-in pitch control, improved function select layout with auto sync for silent drop ins/drop outs, and a new monitor select system for easy monitoring in any mode direct from the tape machine.



## TEAC 80-8

The 1/2 inch 8 track for the budget conscious studio. Giving high quality at a very reasonable price. The 80-8 has all the facilities normally associated with a machine of this calibre. And with the optional DBX unit gives excellent results.



## A&H MODEL III

The high quality modular mixer for the quality 4, 8 or 16 track studio. Available in virtually any configuration up to a maximum frame size of 24/8. This mixer is available together with the Brenell Mini 8 at a special package price.



## ALICE 12-48

The quality mixer for the 4 or 8 track studio. 12 inputs (16 input version also available) 4 outputs but wired for 8 track recording and monitoring. The standard model includes line up oscillator, talk-back and 48V phantom powering. Long throw conductive plastic faders available to special order. All in all a high quality mixer with all the facilities needed at a very reasonable price.



## JBL MONITORS

We can supply the full range of JBL Monitor speakers from the small 4301 broadcast monitor; the 4311, popular with the smaller studio, through to the 4343 for more critical monitoring purposes.

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# Soundcraft introduce a 24 track without an optional autolocator.

**MOVE** up to 24 track and you won't find the time to let anything get in the way of the music. The latest technology should be at hand to free you for creative work.

That's why the new Soundcraft SCM382-24 comes complete. We don't believe that essentials should be options.

Your full control is in the remote. This powerful device selects record and monitor status for all tracks in manual or auto modes, and contains the varispeed and tape motion controls. The integral autolocator was developed in conjunction with Audio Kinetics, pioneers of intelligent tape movement control. This microprocessor based system will search to any one of nine memory locations or to a keypad entered position. As you use it, you will find more ways to speed your sessions. Like the programmable sub-grouping for complex record punch-ins, and the cycle function that enables you to repeat mixes,

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**Japan:** Hibino Electro Sound Inc. Tokyo (03) 8544961  
**Norway:** Tal and Ton Oslo (02) 20 97 05  
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Masters of Quality**

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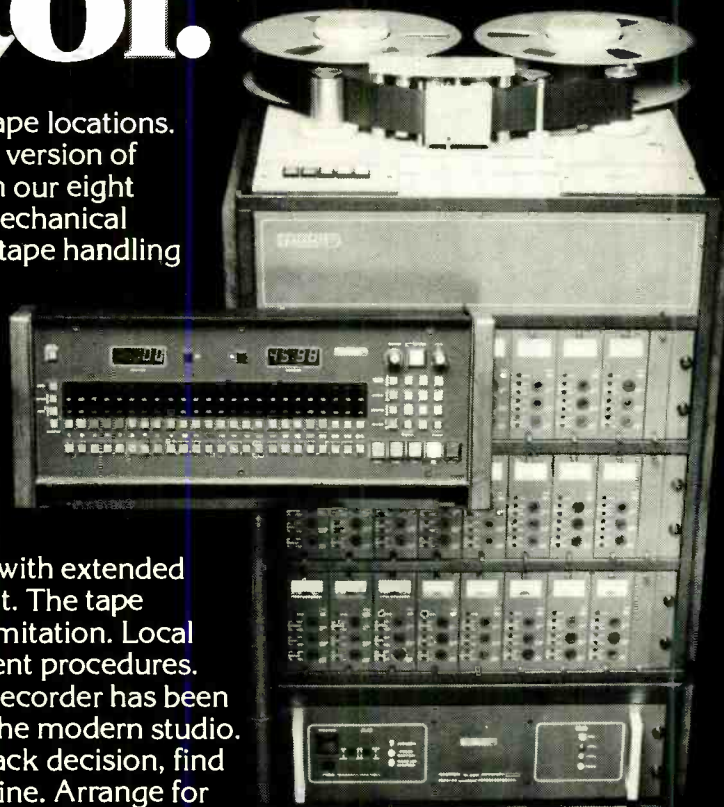
effortlessly, between any two tape locations.

The transport is the latest version of the proven design employed in our eight and sixteen track machines. Mechanical simplicity and careful, precise tape handling were prime objectives from both cost and maintenance standpoints.

Design of the modular electronics reflects the same degree of integrity that has been associated with Soundcraft for almost a decade. Quiet, fast amplifiers, with extended headroom are used throughout. The tape medium becomes your only limitation. Local metering simplifies all alignment procedures.

In every way this rugged recorder has been designed for efficient work in the modern studio.

Before you take the 24 track decision, find out more about our new machine. Arrange for a demonstration, and see and hear it for yourself. Then, take a closer look at your alternatives and see if you wouldn't be paying more, for less.



**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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# MICROCHIP ORCHESTRA



Become an instant musician with this revolutionary new product

It's a new kind of musical instrument. A computer controlled synthesiser that helps you create, play and arrange compositions that normally take years of musical training

A melody, played, or picked out slowly on the keyboard is recorded in a solid state memory. The length and tempo of keystrokes is captured, or you simply reset the entire timing using the unique 'one key play' facility. Then autplay the tune with one of five instrumental sounds and to one of ten rhythm backings or make subtle changes during playback to the melody sound and the percussion pattern.

Even if you have never played an instrument before, you can move to a level of musical ability that you never thought possible.

#### Digital recording and control

The breakthrough that makes it possible is the development of a dedicated VLSI. This Very Large Scale Integrated circuit contains the digital melody sound synthesiser, rhythm generator and note sequencing memory. As many as a hundred individual notes can be stored, even when the unit is switched off. Record the notes of your music, in real time, or one at a time. If you make a mistake, the delete key lets you edit quickly, using the numerical LCD display reference. On replay, the timing is simply altered to strict tempo or tap out the notes, one at a time, for live performance. Octave Shift lets you move pitch up or down and the Tempo control lets you speed the music up or slow it down. Nothing could be easier. The day of the one fingered musician has arrived!

#### Create new sounds

The five preset voices for the keyboard, range from percussive piano and guitar to the gliding tones of a fantasy, flute or violin. And in case you find that not enough, you can create your own instrumental sound in the ADSR mode. This gives you direct control over the digital synthesiser enabling the Attack, Decay, Sustain and Release characteristics, as well as vibrato and tremolo intensities to be programmed directly by entering an eight digit number. Over eighty million permutations are available. The possibilities of new sounds are only limited by your imagination.

#### Auto rhythm

A percussion combo, to complement your melody, is generated by the VLSI. There are ten rhythm patterns under your control. From a strict march to the nuances of a beguine. You can even change patterns mid music, creating a unique accompanying rhythm for your melody. And because the entire synthesiser is locked to the overall Tempo control, when you step this up or down, your recorded melody and the rhythm stay in time. Within a matter of minutes you can produce exciting arrangements to suit the mood of your music.

#### A personal recording studio

Playback through the built in speaker or take a lead from the output jack to a stereo system and you get a richer, fuller sound. Or connect it to a tape recorder, and mix in the sound of a microphone. Play along with your digital composition and produce jingles, demos or simply realise your

undiscovered musical talents.

Create on it, learn on it, even do maths on it. Anywhere. The VL-Tone heralds a new era in personal music.

#### Try it for yourself

The most remarkable feature of this breakthrough product is its £35.95 price, which includes a complete manual, soft vinyl cover and a Song book full of easy to play melodies. The VL-Tone is manufactured by Casio, a world innovator in digital musical and number crunching products. Each unit is backed by their warranty, and also Turnkey's own guarantee of satisfaction; if within two weeks you are not completely delighted with what the VL-Tone can do, return it to us for a prompt and courteous refund.

To order a VL-Tone, send a cheque or money order for £35.95, (which includes VAT, post and packing) or call us with your Visa or Access credit card number.

Discover the sound of the future, by putting a microchip orchestra in your pocket. You can own the most amazing personal music instrument ever made. Order a VL-Tone at no obligation today, and awaken the creative music inside you.

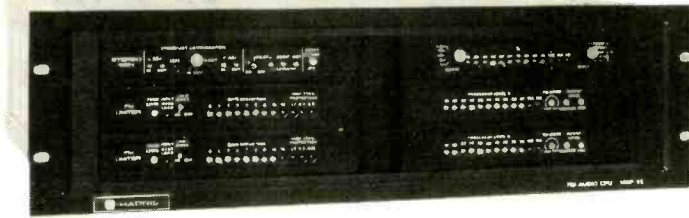
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Herts. EN4 8RW.  
Telephone 01-440 9221.

## Harris Broadcast Products

The Broadcast Products Division of the Harris Corp has over the past few months added a number of new products to its range. On the transmitter front Harris has introduced the *FM-100K* transmitter incorporating a solid-state 100W broadband amplifier and the *MS-15* exciter. Designed to meet the needs of low power, Class D educational broadcasters, the transmitter features a 4in front panel meter capable of indicating PA collector voltage, PA collector current, forward power, VSWR, and input drive level; while the RF amplifier module incorporates two LED status indicators monitoring each PA transistor. Other new transmitters comprise the *MW-50B* (50kW), *MW-10A* (10kW) and *MW-5B* (5kW) AM broadcast transmitters, featuring improved squarewave and complex wave response. These transmitters also feature new high speed op-amp audio input stages giving improved transient response, and lower harmonic intermodulation and distortion.

Moving on to broadcast consoles, Harris are to introduce a new range of modular audio consoles, with protected memory control of vital functions being an exclusive feature of the new  $\mu$ MAC (*MicroMac*) modular console. This console is a digitally controlled console available



in a number of configurations capable of being supplied with up to 16 input channels, three stereo and mono or sum outputs, plus automatic logging in a live operation. Official launch for the new console is the NAB Convention when further details will be available.

Turning to ancillary units, Harris have introduced several new units. First off is the *AM-90*, AM modulation monitor which uses a neon bar display with a choice of display ballistics including FCC specified or peak reading, plus rms value of the absolute value of modulation. Features of the unit include an internal AGC to maintain accuracy even with carrier drift, a digitally programmable selectable peak flasher, built-in carrier and modulation alarm units, and an optional remote display panel. Second new unit is the *MSP-95* FM audio composite processing unit incorporating an integrated design specifically suited to FM stations using an STL link, and capable of driving composite studio/transmitter

links or the wideband input of any FM exciter. This unit features digitally synthesised modulation and a dynamic transient response filter to hold programme overshoot to 2% or less. A 2dB to 6dB increase in loudness from the stereo generator is claimed for the unit. Mono mode switching allows front panel or remote selection of L + R, left or right. The limiter section of the unit features split band dual function FM processing with a soft syncing recovery system to maintain stereo imagery. Pre-emphasis is switch selectable for 0 $\mu$ s, 25 $\mu$ s, 50 $\mu$ s and 75 $\mu$ s.

The final new unit is the *MSG-95* remote SCA generator. This is designed for use with most exciters or STL links and is equipped with two input terminals: one ac coupled and the other dc coupled. The unit incorporates a programmable lowpass filter, plus selectable pre-emphasis of 150, 75, 50 $\mu$ s or flat response. Other features include adjustable muting delay between 0.5s and 20s, and adjustable threshold level between 0 and -30dBm.

Harris Corp, Broadcast Products Division, PO Box 4290, Quincy, Illinois 62301, USA. Phone: (217) 222-8200.

UK: Dynamic Technology Ltd, Zonal House, Alliance Road, London W3 0BA. Phone: 01-993 2401. Telex: 935650.

## AKG BX 25

AKG has produced a new 2-channel reverb unit, the *BX 25*. Based on the earlier *BX 20* unit and using the torsional transmission line principle, the new unit is much more compact than the older model.

Features include an independent channel operation facility; a remote control unit; the facility to shape the frequency response at both the input and output of the reverb section; a built-in limiter for reverb drive signal with LED indication on the front panel; and the separation of the reverb section from the electronics for ease of servicing. Decay time of the *BX 25* is between 1.5 and 3.5s with a switchable frequency range of either 50Hz to 4kHz or 50Hz to 8kHz. Bass control range is  $\pm 10$ dB at 150Hz, while the treble control range is  $\pm 5$ dB at 5kHz. The input limiters have a range of 30dB approx with the threshold level being 6dB above the nominal input level which is adjustable to -22, -6, 0 (0.775V), +6 and +12dBm. Input impedance is 10k $\Omega$ /channel transformer balanced. Nominal output level is adjustable to -6, +6 and +12dBm with output impedances of 15, 100 and 300 $\Omega$  respectively.

AKG GmbH, Brunhildengasse 1, A-1150 Wien, Austria. Phone: (0222) 92.16.47. Telex: 11839.

UK: AKG Acoustics Ltd, 191 The Vale, London W3 7QS. Phone: 01-749 2042. Telex: 28938.

USA: AKG Acoustics Inc, 77 Selleck Street, Stamford, Connecticut 06902. Phone: (203) 348-2121.

## Roland (UK) Ltd

Following the receivership of parent company Brodr Jorgensen in Denmark, the position of subsidiary company Brodr Jorgensen (UK) Ltd, who import Roland equipment into the UK, has now been resolved. The existing UK management team headed by managing director Brian Nunnery has purchased the UK company including all assets and liabilities, and has changed the company name to Roland (UK) Ltd.

As a result of this action UK distribution, continuity of supply, and continuity of spares and service has been assured. The new company which is a joint venture with the Roland Corp of Japan, will however no longer be handling Audio Technica mics, these now being handled by Sondice Ltd. All enquiries regarding Roland equipment should be directed to: Roland (UK) Ltd, Unit 6, Great West Trading Estate, 983 Great West Road, Brentford, Middx. TW8 9DN, UK. Phone: 01-568 4578.

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## Kepex and Gain Brain

Bob Todrank of Valley People has announced that the original Allison Research *Kepex* and *Gain Brain* signal processing units are to be discontinued. As from June 1, 1981 these units and the *CM-001* console mount unit will no longer be available. Similarly, the *RM-160* and *LX-100* power supply units are also to be discontinued. Anyone requiring these units is urged to contact Valley People at once. Although after 12 years in production the original units will no longer be available, the recently introduced *Kepex II* and *Gain Brain II* will carry on the tradition established by the original units. Valley People Inc, PO Box 40306, 2820 Erica Place, Nashville, Tennessee 37204, USA. Phone: (615) 383-4737. Telex: 558610.

## New Recording textbook

A new textbook entitled *Sherman Keene's Practical Techniques for the Recording Engineer* has come to our attention. Although we have not received a review copy, the textbook appears to offer a rather unique means of learning as it is designed as a complete course of study for the student of audio engineering, the professional engineer, and studio personnel. In addition to the textbook, a complete curriculum service (available only to schools) is obtainable including a teacher's manual and a student's workbook. The textbook has 24 chapters on audio engineering and incorporates four chapters on computer assisted mixdown, an in-depth explanation of tape machine alignment with or without Dolby, details of recording techniques, and thorough

explanations of instrument amp and other grounding problems and their solutions. The textbook which costs \$37.50 plus \$3.00 for shipping and handling, is available from Op Amp Technical Books, 1033 N Sycamore, Los Angeles, Cal 90038, USA. Phone: (213) 464-4322.

## British Music Fair

The British Music Fair due to have been held at the National Exhibition Centre, Birmingham from August 14 to 18, has been postponed. The decision reflects the rather parlous state of the UK music instrument market at the present time. Although this year's show has been postponed, active discussions are taking place to decide the format, timing and venue for future Fairs.

# six of the best!

---

## from Orban



### 111B Dual Spring Reverb

A professional reverb with an excellent price/performance ratio

### 245E Stereo Synthesizer

Creates a seductive, mono-compatible pseudo-stereo effect from mono sources

### 418A Stereo Compressor/Limiter

For smooth, undetectable level and high frequency control in recording

### 526A Dynamic Sibilance Controller

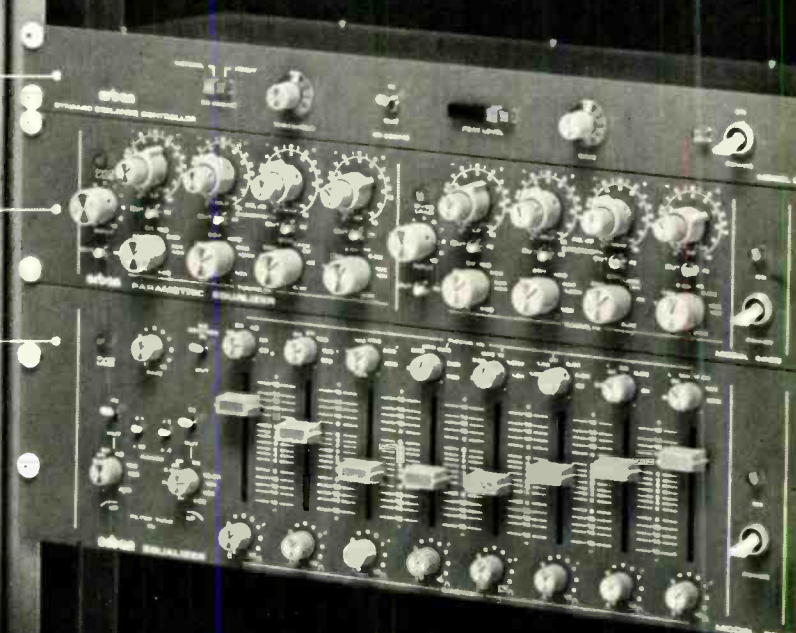
Clean, inaudible de-essing of vocals with consistent action regardless of levels

### 622B Dual Channel Parametric EQ

Constant-Q design makes it an exceptionally versatile EQ

### 672A Equalizer

A Parametric EQ with graphic controls, including variable high and low-pass filters usable as an electronic crossover



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Italy Audio Products International (Milano) Spain M. Llewellyn-Jones (Madrid) Sweden Tal & Ton (Gothenburg)

## Maintenance aids

UK distributor Variohm Components has supplied us with details of two American manufactured units which maintenance engineers may find of interest. Manufactured by Phipps & Bird, the units are respectively resistance and capacitance substitution units. The *Model 236A* resistance substitution unit allows any resistance value between 1 and 11,111,110Ω to be selected, with selection being carried out by means of slide switches. Similar operation is also used on the *Model 237* capacitance substitution unit which has a range of 100pF to 11.1μF. Both units are compact and of rugged construction with prices being £32.50 for the RSU and £52.00 for the CSU. Phipps & Bird Inc, Richmond, Virginia 23228, USA.

UK: Variohm Components, The Barn, Wood Burcote, Towcester, Northants NN12 7JR. Phone: 0327 51004.

## ProTech faders

ProTech Audio has introduced a new conductive plastic *Rotary-Slider*



attenuator suitable for stereo or mono fader applications. The design features two sealed conductive plastic rotary pots driven by a rugged slide mechanism. The fader is available either as a 1kΩ log/audio taper suitable for use with IC Op-amp circuitry, or as a 10kΩ linear taper for dc remote control applications. A cue microswitch is optional and includes mixing resistors deriving a mono Cue buss from left and right stereo channels, while maintaining stereo channel separation of programme material. The fader is available with a standard front panel size of 1½ × 7 × ¼in thick and features a black anodised finish with a white filled etched scale. Audio attenuation range is a minimum 70dB before Cue; 85dB minimum at 'off'. Tracking between channels is within +1dB, while maximum power channel.

ProTech Audio Corp, Flowerfield Building, 1, St James, NY 11780, USA. Phone: (516) 584-5855.

## New tape head range

UK manufacturer Monolith Electronics has introduced a comprehensive range of record/replay and erase heads designed for use with ¼in tape. Designated the *R Series*, heads for full and half track mono and stereo as well as four, six and eight channel heads are available. Head contour is hyperbolic in outline with head gaps being 2.5 μm for the R/P heads and 2 × 127 μm for the erase heads. Individual mounting assemblies with azimuth adjustment are available for all heads in the range. Outline dimensions of the heads are 12.7mm × 12.7mm × 16.5mm deep.

Monolith Electronics Co Ltd, 5/7 Church Street, Crewkerne, Somerset TA18 7HR, UK. Phone: 0460 74321.

## New Fane loudspeakers

UK loudspeaker manufacturer Fane Acoustics Ltd, best known for its drive units used in PA and discotheque systems, has launched a range of units for professional PA applications. These comprise the *Studio 12L*, a 12in drive unit; the *HF250* bullet tweeter unit; and two new filter networks the *HPX4* and *HPX5*. The *Studio 12L* has a cast alloy chassis, is suitable for front or rear mounting, and has a power rating of 200W. Useful frequency response of 5 to 20kHz, uses a 2in coil on an annular aluminium diaphragm, and has a power rating of 250W. The *HPX4* is a high pass filter network operating at 5kHz and is designed for use with the *HF250* tweeter. Finally, the *HPX5* is a high and low pass filter operating at 500Hz, with power handling capacity of 500W, and is designed for use between bass and midrange cabinets.

Fane Acoustics Ltd, 286 Bradford Road, Batley WF17 5PW, Yorks, UK. Phone: 0924 476431. Telex: 556498.

## Mitsubishi PCM

At a demo session with musician George Duke held at Wally Heider Studio 4 on Monday, March 9, Mitsubishi debuted its pre-production 32-track digital *X-800* PCM studio tape recorder in Los Angeles. The *X-800* recorder uses 1in tape running at 30in/s with a sampling rate of 50.4kHz and 16-bit linear quantisation. These figures being standard to Japanese recorders "as a matter of convenience" stated Louis Dollinger, sales manager for Mitsubishi PCM. The advantage of this format is that it conforms to American video standards, and material recorded on one Japanese machine can be handled on another. However, material mastered on machines with a 50kHz sampling rate can not be processed with 50.4kHz units. The 32-track *X800* which was shown as a prototype machine at last year's New York AES Convention, is to be offered for sale in the autumn of this year, and its expected selling price will be in the region of \$200,000 dependant on currency fluctuations of the yen. The machine shown in Los Angeles is to be used to record the new Journey LP.

The current 2-track cut-and-splice *X80* and *X80A* recorder/editors are now available at a cost of \$25,000 and \$27,000 respectively. Incidentally, CBS New York has purchased two machines for use with Sony PCM equipment.

Looking to the future, Mitsubishi plan to debut the *XE-1* 32-track electronic editor at the Los Angeles AES Convention and the unit's projected cost is around \$36,000. This unit which can lock two *X-80* or *X-80A* machines for synchronous record

and three master tape recorders for editing, will according to Louis Dollinger be built to order, with two units being kept in stock. Expected American sale date for the CRT-display editor, which offers switchable crossfade, both digital cueing and realtime monitoring and hard copy print-outs is autumn 1981.

Mitsubishi is throwing its full weight behind its complete 'digital chain'—which also includes the *DDL-1* digital delay unit—in anticipation of readily available home digital audio disc (DAD) playback equipment. According to Sonny Kawakami, marketing manager of Mitsubishi's PCM division, '1982 will be the year of DAD'. He noted that some 20 companies including Matsushita are committed to the 4½in Sony/Philips digital Compact Audio Disc format, and while the official line is 'wait and see' unofficially almost everyone has a prototype unit ready to go. Additionally, some companies are readying manufacturing lines. An immediate launch for DAD is anticipated for the Japanese market and an American launch is likely in the autumn of 1982. Sonny Kawakami expects DAD home replay hardware to retail for a 'few hundred dollars' and pointed out that some 500 digitally recorded master tapes are now available worldwide. Mitsubishi feel that full digital recording and DAD playback is 'just a matter of time', and as Sonny Kawakami put it, 'it's not if, it's when!'

Beth Jacques

Mitsubishi Electric Sales America Inc, 7045 N. Ridgeway Avenue, Lincolnwood, Illinois 60645, USA. Phone: (312) 982-9282.

## MILAB mics

Many of our readers who are acquainted with Pearl and PML mics will be interested to know that these professional mics are now to be marketed under the trademark MILAB. The reason for the change of name being that the Pearl and PML trademarks were not available for use throughout the world by the new company which is producing the mics, CTAB. CTAB is the new company name of the reorganised AB Pearl Mikrofon Laboratorium which is headed by Hans Rosander, son of Pearl founder Rune Rosander. CTAB is at Knutsgatan 6, S-26500, Astorp, Sweden. Phone: 42 515 21. Telex: 12442.

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

## BBC Radio London goes stereo

Commencing mid-February, BBC Radio London (along with other BBC local radio stations) was converted to stereo operation. Broadcasting on 94.9MHz VHF, Radio London's stereo service is being broadcast from the BBC's Wrotham transmitter, although we understand that later this year the BBC will be moving the Radio London VHF transmitter to the Crystal Palace television transmitting station. To accommodate the changeover to stereo operation, control cubicles 1A and 1B have been modified and their BBC designed Mark III control desks altered. The alterations include the addition of a B chain to make all channels stereo capable; conversion of two of the 24 outside sources to stereo; and

the installation of new monitoring modules. Other changes include the provision of BBC designed LS3/5A monitors; the installation of specially modified Studer *B67* stereo tape machines; and the addition of further facilities to the apparatus bays containing the power supplies and ancillary equipment. During the period that control cubicles 1A and 1B were out of commission, Studio 2 and its control cubicle remained in service; however, now that these are stereo operational the latter are undergoing conversion. In addition to broadcasting its own programmes BBC Radio London will be able to broadcast either BBC radio 1 or 2 programmes in stereo on VHF when these are only being transmitted on the BBC's main shared network, on medium-wave, in mono. 30 ▶

# AKG

ACOUSTICS



### **AKG – the ideal partner for professionals**

AKG is an Austrian company engaged in basic research, development, manufacture and marketing of sophisticated and mostly professional audio products.

Sheffield Lab is an American company engaged in direct disc recording and acquired an excellent reputation in this field. Consequently, Mr. Doug Sax, the President of Sheffield Lab, made the following statement:

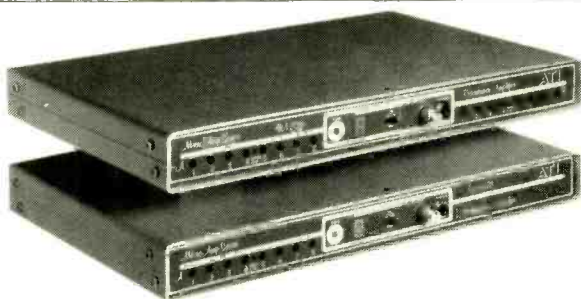
“For the demanding standards of our custom microphone electronics, Sheffield Lab uses microphone capsules manufactured by AKG. On many of our recordings, the professional microphone of choice is also AKG”.



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191 The Vale, London W3 7QS.  
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TF: (43 222) 92 16 47, TX: 131839 akgac a

AKG Acoustics Inc.  
77 Selleck St., Stamford  
Connecticut 06902 U.S.A.  
TF: (203) 348 2121 TX: 84451121



**Audio Technologies Inc**

A recent addition to the ranks of manufacturers producing ancillary equipment for the broadcast market is Audio Technologies Inc, a venture formed by the former president Edward Mullin, and vice president operations Sam Wenzel, of Ampro Broadcasting.

First products from the new company are a range of line, mic, turntable, monitor and distribution amps known as the *MicroAmp Series*. The range includes the *L-1000* dual line amp; the *M-1000* dual mic amp; and the *P-1000* stereo turntable amp. These are available with transformer or balanced differential outputs, and all models offer output levels of +22dBm. In addition ATI produce a switchable stereo 10W,

bridged mono 25W monitor amp, the *MA-1000*.

The distribution amps comprise six models offering +22dBm or +30dBm output levels, transformer or balanced differential outputs, and configurations in single and dual one input by eight output versions. Features of the distribution amps include individual level adjustments for each output; three colour peak LED metering; switchable meter calibration (+4, +8, or +16dBm at 0VU); membrane button meter scanning of all outputs; and a built-in headphone amp.

Audio Technologies Inc, 328 W. Maple Avenue, Horsham, Pennsylvania 19044, USA. Phone: (215) 443-0330.

**Name Change**

● Redifon Telecommunications Ltd has changed its trading name to Rediffusion Radio Systems Ltd as part of a major programme to strengthen the corporate image of the Rediffusion group of companies. The company inform us that the change of name will not affect its contractual obligations, and its product range and management structure will also be unaffected.

**People**

● AKG Acoustics Ltd, London, has appointed Jim Hallington formerly of Goodmans Loudspeakers as its new sales director.

● Wayne Freeman formerly with BGW has been appointed VP sales and marketing for the new Soundcraft American office.

● Electro-Voice Gulston Europe has appointed Brian Latham as its sales office manager.

● Ampex has announced the appointment of Francisco Boluda Manzanara as general manager of Ampex Trading Company in Spain.

● The Harris Corp has appointed Andrew Juettner as VP of engineering for the Broadcast Products Division.

**Contracts**

● Feldon Audio has supplied Unicorn Records with a Sony *DAE 1100* digital editing system. In addition Feldon are to supply Chandos Records with a complete Sony PCM digital recording system comprising a *PCM 1600*, three *BVU*

*U-matic* recorders and a *DAE 1100* editor.

● Tannoy is to supply Hungarian Records with more than 20 *Classic Monitor* loudspeakers and electronic crossovers. In addition RTV Novi Sad, Yugoslavia, has ordered several *Buckingham* and *Classic* monitors, while RTV Ljubljana, Yugoslavia, has ordered several *Buckingham* monitors. All these orders were procured through Denis Tyler Ltd.

● Rank Strand Sound has designed and installed a number of sound systems which include the *MMSI* console. The installations are at the Royal Theatre, Northampton, the new Birmingham Repertory Theatre, the London Central School of Speech and Drama, and the Guildhall, Portsmouth.

● Middle Tennessee State University has received a Harrison 2824 console with Allison 65K programmer for its multitrack studio utilised for the university's recording industry management course. Installation of the console was by Studio Supply of Nashville.

**Address Change**

● Scopex Instruments Ltd has moved to new premises at Pixmore House, Pixmore Avenue, Letchworth, Herts SG6 1HZ, UK. Phone: 04626 72771.

● Allen and Heath/Brenell has informed us that it will be transferring its production facility to new premises in south-west England during the summer of 1981. The new

**Pro-Co cable**

American company Pro-Co Sound has announced the availability of a new type of cable suitable for mic and line level applications. The cable designated *Pro-Co 2B* is a 2-conductor, braided shield cable produced by Belden for Pro-Co.

This custom design utilises 20 gauge inner conductors, each comprising 26 strands of 34 gauge tinned copper wire, to provide flexibility and tensile strength, with these conductors being insulated with rubber and twisted together to enhance common-mode

rejection. Additional strength is provided by the provision of twisted jute fillers on the inner conductors. The cable also features a nylon wrap to provide an electrostatic shield. Other features are a braided copper outer shield and a black neoprene outer jacket. The cables are available in a wide range of lengths and configurations suitable for low-Z mic and line level applications.

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

**Singer Broadcast Products**

Arthur Singer, chairman of Singer Products Co has announced the formation of Singer Broadcast Products Inc, which will manufacture both CCA and Sintronic transmitters. The new company has purchased the assets of CCA Electronics Corp and will produce the complete range of CCA AM and FM broadcast transmitters and VHF and UHF television transmitters at the former CCA plant at Cherry Hill, New Jersey. The

Sintronic AM and FM range will also be manufactured at this plant. Announcing the formation of the new company Mr Singer stated that there will be a major investment in research and development, and that customer service will be improved with Singer Broadcast Products being able to offer parts and service for all CCA and Sintronic transmitters.

Singer Products Co Inc, 875 Merrick Avenue, Westbury, New York 11590, USA. Phone: (516) 333-2000.

factory address will be Allen and Heath Brenell Ltd, Kernick Industrial Estate, Penryn, Falmouth, Cornwall TR10 9LU, UK. The sales and design departments will remain at the company's head office at Pembroke House, Campsbourne Road, London N8. Phone: 01-340 3291. Telex: 267727.

**Agencies**

● Soundcraft, the British console and tape machine manufacturer, has opened a new North American office. All American enquiries should now be directed to Soundcraft Inc, 20610 Manhattan Place, No. 120, Torrance, Cal 90501, USA. Phone: (213) 328-2595.

● Wescorp, the American manufacturer and supplier of antistatic products, has opened a European office in Bristol. Address is: Wescorp Europe Ltd, 2 Wellington Terrace, Clevedon, Avon BS21 7PS, UK. Phone: 0272 872863. Telex: 449752.

● Hardware House (Sound) Ltd have been appointed sole UK distributors for the Nady range of VHF radio mic systems. Hardware House (Sound) Ltd, 1-7 Britannia Row, Islington, London N1 8QH. Phone: 01-226 7940. The company also offer a sales and theatre and concert rental service on other mics including AKG, Crown *PZM*, Beyer, Electro-Voice, Sennheiser and Shure.

● Electro-Voice has expanded its UK professional dealership network with the addition of Formula Sound, Stockport; Kelsey Acoustics, London and Studio Equipment

Services, London to the network. Additionally, Rosetti (EMI) Ltd, London are to distribute the company's *Pro-Line* range of mics including the newly improved version of the *PL91* dynamic vocal mic, the *PL91A*.

● AEG—Telefunken has announced that Hayden Laboratories are no longer the UK agents for the *Telcom C4* noise reduction system, although the company will remain the UK agents for the tape recorder division of AEG-Telefunken. All UK enquiries regarding *Telcom C4* hardware should now be directed to AEG-Telefunken (UK) Ltd, AEG-Telefunken House, Market Street, Maidenhead, Berks SL6 8AE. Phone: 0628 39171. Telex: 848696/847136.

● Walter Luther Ltd has been appointed sole UK agents for the range of reference and master processing discs produced by Allied Recording Products of New York. Walter Luther Ltd, 102 Chaldon Road, Caterham, Surrey CR3 5PH. Phone: 22 48666.

● Martin Audio Ltd has been appointed sole UK distributor for the range of power amps manufactured by AB Systems of California. Martin Audio Ltd, 54-56 Stanhope Street, Euston, London NW1 3EX. Phone: 01-388 7162/7164.

● Allen and Heath Brenell Ltd has announced the appointment of Studio Equipment Services, 100 Hamilton Road, London NW11 (phone: 01-458 9133) as its main London service centre for the entire AHB product range. ■



# TOOLS...NOT TOYS

Already well known for its musicality and ultra low noise, the EQF-2 Equalizer/Filter packs 3 bands of sweep EQ with peak/shelf and 12 dB of reciprocal boost or cut as well as an independent sweep hi and lo pass filter section in an A.P.I. sized module. With +30dBm output capability, the EQF-2 can fix that impossible part without adding any coloration of its own.

The CX-1 Compressor/Expander offers performance beyond any similar device previously available. Total transparency, headroom to spare, up to 100 dB of expansion/gating without clicks, smooth acting "soft knee" compression and unique multi-function LED metering. It is simple to use, compact, powerful and effective.



Apex Systems Ltd. 7801 Melrose Ave., Los Angeles, Ca. 90046  
(213) 655-1411 TWX 910-321-5762 or: Apex offices worldwide

Also available through: AKG Acoustics (U.K., Germany, Austria) Sound Genesis (San Francisco) Cramer Video/Audio (Boston) International Equipment Reps (La Jolla)

# studio diary

## Hotline, Frankfurt

Situated to the north of Frankfurt city centre near the main Ring Road, Hotline Studios is a complete balance/remix complex offering a comprehensive array of necessary recording technology. The studio was opened in late 1977 by Norbert Friedl, Peter Hauke and Wolfgang Auer. Tucked away behind apartment blocks just off Nordenstrasse, Hotline is housed in the same building as Rockoko Productions (Nektar, Wolfgang Ambrose, Michael Wynn Band) and WEA, Frankfurt Division, although there is but a loose connection between them.

Access is through a large courtyard direct to the front door up a couple of wide flights of stairs that are fairly roadie proof. Operated 24 hours a day, Hotline is self-contained with amenities including kitchen (choice of menus), well stocked fridge, TV and rest room. Echoes of my youth, there is also a still popular football plus, of course, the Space Invaders. If the food doesn't suit, there is a hamburger stand and 'pub' within 50 yards and varied restaurants within 100 yards.

Hotline has two studios, Studio One handling mainly balance and Studio Two remix. Both were designed by Wolfgang Auer on the 'no-two-walls-parallel' principle.

One of the first things to strike you about Studio One control room is the massive safe set into the wall which defies removal. Having exhausted all efforts, the control room was built around the beast which is now used as an effects rack.

The desk is an *Acorn 32/24*, one of the prototype Solid State Logic desks now so much in evidence. Monitoring is via *UREI Time-Aligned* driven by *BGWs* or *JBL 4311s* and *Auratones* powered by *Quad 405* and *303* respectively. As befits an *Aphex* distributor, Hotline have the *Aural Exciter* hard-wired

into the system so that any return can be instantly patched via the *Aphex*.

Being a hard-working bunch, Hotline's resident engineers have installed a couch in front of the desk and designed, as standard equipment, 'producer' chairs made from custom car seats that recline up to 90° (*real laid back music?*—groan). A Lyrec multitrack, with remote Lyrec 2-tracks, old *Revox A77s* and a *Telefunken T9* complete the scene. The *Telefunken* deserves a special mention as it is something like 15 years old, extremely stable and seems to go on and on; these decks are real workhorses that have earned the respect of all the engineers.

Studio access is controlled via an illuminated 'Stop' sign over the door (seems more to the point somehow). Measuring about 710sq ft (66sq m), the studio is predominantly oblong in shape; there is a drum booth at one end which has a hydraulically raised or lowered ceiling for varying the acoustic. The floor is of the 'floated' wooden variety with a usefully sized live area and lots of removable ceiling baffles complete the picture.

All cables in the studio run around the 'hotline'—a red stripe painted throughout the complex giving it its name—with a studio mother board having total interconnect for tying

together foldbacks/sends, etc, to or from any part of the facility.

Another interesting technical innovation at Hotline is the cue boxes which carry foldback and have spaces for lunch, drink and ash tray. Each is totally mobile with its own castors. Finally there is a small smattering of acoustic screens. The array of mics include *Neumanns* five *U87s*, two *U67s*, three *U47s*, two *KM84s*, *Shure 320* ribbon mic and *SM58*, *Sennheiser 441*, a family of *Electro-Voice* starting with the *RE20*, two *Sennheiser 416* shotguns, *Shure SM7* and *SM76*. Mounted strictly for playback are a pair of *JBL 4311s*.

Studio Two's control room features, as 'remix' should, easy-to-access auxiliaries built-in piggyback style to an *Amek 28/24*. Used mostly for overdubbing and mixdown. Hotline Two collects work from as far afield as Los Angeles. As with Studio One, *Aphex* is patchable to any remote and an *ADR Scamp* rack is installed to one side.

From an engineering point of view, the control room has been laid out with everything to hand in order to obviate the 'left-ear-to-the-monitoring' syndrome, even the air-conditioning has its own remote. Another side benefit of the auxiliary equipment arrangement is that you cannot see the musicians unless you

sit up or stand. Thus clients are less inclined to suffer the 'goldfish bowl' feeling. Monitoring in Control Room Two is again *JBL 4311s* with *Auratones*; two more *Telefunken T9s*, Lyrec 2-track and a multitrack Lyrec with remote, provide the tape handling. Size is about 270sq ft (25sq m) with power amplification again courtesy of *BGW* and *Quad*.

Comprising about 57sq ft. (9sq m), Studio Two is used mainly as an overdub booth, and features the Hotline wiring interconnect, removable ceiling baffles and a removable screen for visual contact between the two studios.

Hotline can and will hire in any extra items which might be required in addition to providing the following auxiliary equipment. Reverb is provided by *EMT 240 Gold Foil*, *250* and *140* plate, and *Quad CP R16*. Signal processing is via *ADR Complex Limiter F760X-RS* and *Scamp* rack, *Aphex*, *MXR* digital delay, *Eventide Harmonizer* and delay *1745a*, *UREI 175B* valve limiter, *Systech* voltage controlled flanger and phasers and dual phase shifter, *Orban* de-essers and stereo synthesiser.

On the staff side, chief engineer Nigel Jopson and engineer Armin Bannach have recently been joined by Andy Lunn (ex of *Olympic*) and maintenance engineer Giovanni Blasi (ex of *Britannia Row*). Studio bookings are handled by *Carstens Heyn*.

Recent clients of Hotline include *Supermax*, "Pin-Ups", *Tony Carey* (ex-Rainbow keyboardist), *Chi Coltrane*, *Blackjack*, *Einstein*, *Stripes* and, judging from the number of people milling around, no let up in bookings (thank goodness).

**Harry Mangle**  
Hotline Studios, Nordenstrasse 30,  
D-6000 Frankfurt, West Germany.  
Phone: 010 49 611 556566. Telex:  
414073. 34 ▶

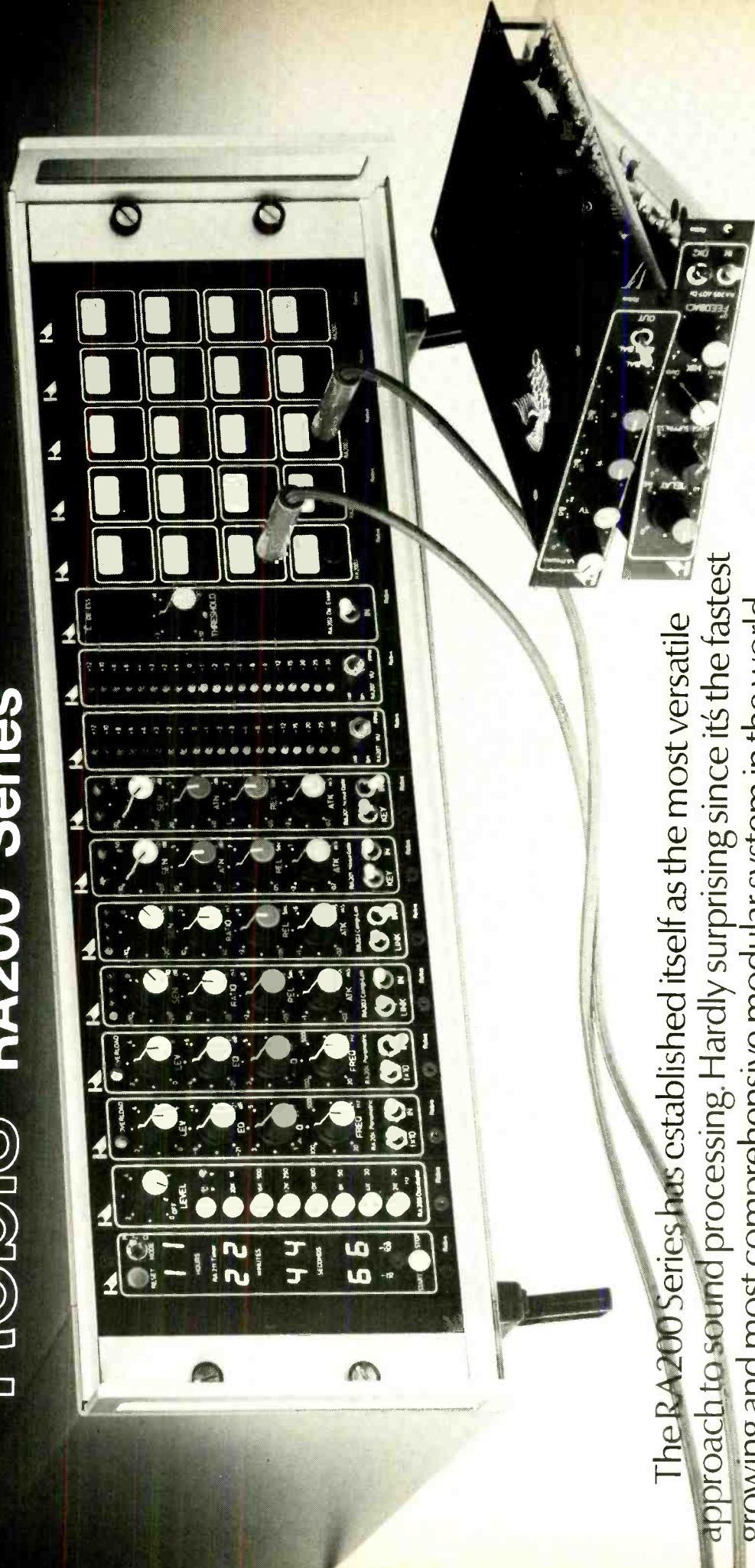
Studio 2 control room



Two views of Studio 1 control room (above and right)



# Rebis RA200 Series



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| RA202 De-esser           | RA205 ADT/Delay            | RA208 Modulator | RA211 Timer         | RA214 Stereo MDA. |
| RA203 Compressor-Limiter | RA206 Oscillator           | RA209 Mixer     | RA212 Mic/Line Amp. | RA200J Connector  |



For further information contact: Rebis Audio Ltd., Kinver Street, Stourbridge, West Midlands DY8 5AB. Tel: 0384 71865. Telex: 335494

**Belgium;** S.E.D., Brussels 522 7064. **Netherlands;** SAP, Amsterdam 797055. **Japan;** Continental Far East, Tokyo, Tlx. 72 22498. **Spain;** Mike Llewellyn Jones, Madrid 637 0752. **U.S.A.;** Klark-Teknik Electronics Inc., Farmingdale, N.Y. 249 3660. **Sweden;** Tal & Ton, Gothenberg 130216. **France;** Lazare Electronic, Paris 8786210. **Finland;** Studiotec, Espoo 520 604.

La Basilica—a studio?

A view of the studio



### La Basilica recording studio, Milan

One would hardly expect to find a recording studio inside a Renaissance style church, or would one? Expect what you like, this is the case with the very aptly named La Basilica studio in Milan. In fact the present occupants are not the first as EMI Italiana were in residence for quite a time when the 'studio' was used for a lot of classical recording. The church is situated pretty near the historical city centre so sightseeing between sessions is no problem, also the side streets are full of interesting little restaurants! The building itself is, not surprisingly, a classified monument and at the time of my visit the outside was being renovated. In fact there were some doubts as to whether the studio could remain open as it was planned to restore the whole church so that it could be opened to the public. However, funds being a bit short in the municipal caisse it was decided to just do the outside, leaving the studio what they reckon will be between seven to 10 years' lease of life. Owner of the studio is well known Italian singer Mina and in fact the studio is mainly used for her proper productions though some outside work is also done. Now that the future is secure for a reasonable length of time, there are plans to modernise the equipment with a view towards making the studio more commercial.



Control room

being the parquet floor and some drapes along the walls and in the ceiling—plus the lighting and electricity, of course! The acoustics can only be described as something that most of us dream about with a perfect reverberation unmarred by any flutter echoes and with a wide range frequency response. This latter was very noticeable as there appeared to be a complete absence of nasty resonances, especially in the bass end, and speech was very clear indeed. There is enough room to accommodate a full orchestra and risers are available should the various sections wish to be staggered. Microphones for the studio floor consist mainly of those left over from the EMI days and are a princely collection of Neumann U67 and U87. Piano, either the Steinway or Yamaha grands, is usually recorded out in the studio but can be separated off in an isolation booth should it be necessary. Once again the 'little houses' are in evidence as isolation booths and consist of one for drums, where a selection of Sennheiser, Neumann and AKG mics are used, one for electric guitars, etc, and one half open for piano. Amongst other keyboard instruments are a Hammond C3 with Leslie. The general technique used in the main studio is stereo pairs with some spot mics though some recording is also done just using a straight pair and with excellent results. I later heard some of their tapes where the strings and brass were put down straight, no eq or anything, and the definition coupled with the natural reverb was incredible. The architecture no doubt plays a considerable part and though the walls are parallel in the general

plan, the alcoves and pillars hardly make for opposing flat surfaces! The ceiling is also curved and the top of each wall curves into the ceiling thus effectively eliminating floor to ceiling standing waves. In fact, the part of the church that forms the studio is where in days past the nuns used to sing during the services and since contact with the outside world was to be as limited as possible, the church was effectively divided into two, with the rear part for the nuns and the front forming the church proper containing the altar and congregation with a communicating passage between the two sections. When told this, I had to go and see the other half and found that it exhibited exactly the same acoustic characteristics but with, if anything, an even brighter response. Remarkable that it would make a marvellous second studio—or even an extra echo chamber! I was told that they had thought about it but that traffic noise from the main road running in front of the building was a problem. Perhaps in the future.

Returning to the rear, it was time to look at the control room which has been built as a very large cabin against the dividing wall, space is really no problem here. Acoustic treatment is simple but effective, consisting of tiles, panel absorbers and small polycylindricals. The equipment, though now rather elderly, consists of a Trident B series 32/16/24 desk with Ampex M1000 16- and 4-track recorders and two Telefunken M10 stereo machines. However, the equipment is lovingly maintained and gives first class results. All machines have

Dolby. Monitoring is by four JBL 4320 speakers in a quad disposition with further 4320s and all powered by HH amplifiers. Ancillary equipment at present is fairly limited and consists of Lexicon Delta T ddl, Eventide Instant Flanger, two UREI 527 graphics with extra reverb and echo effects via a Roland 201 echo, AKG BX20 and EMT 140. The desk itself includes 16 Trident compressor/limiters and 8 quad panners.

Basilica have been very pleased with the console and in their plans for updating intend to improve the eq facilities and one or two other things rather than buy a new console. As far as multitrack is concerned, 32-track is on the shopping list. A wide range of special effects is also planned.

La Basilica also possesses its own cutting room and two guesses for where it is! The vestry? No, down the steps and into the crypt, which serves principally as maintenance and stocking area, with a small room housing the Neumann/Telefunken disc cutting equipment. The Neumann amplifiers are particularly beefy, I was told, and were a special order. As well as in-house cutting, quite a lot is done for the smaller labels, especially in the jazz field.

La Basilica is certainly a studio out of the ordinary and it will be interesting to see how it fares with its new lease of life. Many thanks to Abramo Pesatori and Giuseppe Banfi for an interesting morning. Ciao!

Terry Nelson

La Basilica Recording Studio, Via San Eufemia, Milan, Italy. Phone: (2) 802 622. 36▶

# New realms of expression from MXR.

The Pitch Transposer is MXR's newest addition to our professional line. It is one of our most innovative products, and possibly the most revolutionary signal processor in the music industry today. It is a unique, high-quality unit which provides a cost effective and flexible package for today's creative artists.

The Pitch Transposer extends your musical boundaries by creating live instrumental and vocal harmonies. It has 4 presets which allow the artist to predetermine the intervals to be processed. Transposed intervals can be preset anywhere from an octave below to an octave above the original pitch. The chosen interval is activated by means of touch controls or a rugged footswitch. LED indicators display which of the four presets has been selected.

A mix control is provided, enabling the unit to be used in one input of a mixing console, or with musical instrument amplifiers. A regeneration control provides for the recirculation of processed signals, creating more and more notes, depending upon the selected interval. This results in multitudes of voices or instrumental chords. An entire new range of sound effects and musical textures, unattainable with any other type of signal processor, is suddenly at your fingertips.

With many other pitch transposition devices a splicing noise, or glitch, is present. The MXR Pitch Transposer

renders these often offensive noises into a subtle vibrato which blends with the music, and is, in some cases, virtually inaudible. The result is a processed signal which is musical and usable.

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## Compact Video Systems, Burbank

Optical transfer technician John Cunningham can do his job with his eyes shut.

In fact he does, permanently. Blind for the last ten years, he and his blonde Australian labrador Kent, have headed up the Optical Transfer Channel at Compact Sound Services—a division of giant video production and post-production operation Compact Video Systems in Burbank, California—for the last 18 months.

His specially modified console gives him all the information he needs, and both he and Compact Video president Emory Cohen insist the mods make the unit a better piece of equipment for anyone—even a sighted person. There is also a built-in dog house on the premises for Kent!

Cunningham is quick to stress that Compact's team of whizz-kid house engineers carry out mods for any technician who would like a new or more convenient wrinkle, and any engineer has to adjust to a new console, so breaking in for him was no more difficult than for any trained engineer.

"John's modified console is easily more accurate than any editing console in the world," says Cohen. "It's digital—that's more accurate to one decimal place than you can get with meters. His monitor and lamp current are constant in real time. Any other technician could now do a better job."

In addition to digitising the console, which features such simple mods as filed UREI 565 peak and notch filters, the console—a Compact Video custom house design—also sports a speech vocoded footage counter. "It's more convenient for anyone," said Cunningham, "and it uses a readily available component that costs about \$100."

The engineering department also came up with two level meters. The first is pre-set to a 0 tone reference and to the specific level required: sweeping above or below triggers the tone. Accurate to 0.1dB, the meter is more precise than a visual read-out. The second black box is tied to an LED display, which is tied in turn to specific tones. Zero here is a two-note complement.

The critical lamp current function is monitored by entering the figure required—determined by processing tests on each roll of film—on a numerical, calculator-like keyboard mounted on the console. A test mode emits tones for adjustments, and the monitor is accurate to within  $\pm 0.01A$ .

On a normal console a lamp indicates whether a sync-lock pulse is present—but not whether it's



John Cunningham at his specially-modified console

locked. Cunningham's console lamp has been modified to light only when the track is locked to sync. In addition, a tone has been added as a sonic alert if sync is ever dropped, both for short term glitches and longer term fall-outs. The tone

sounds initially as the signal works up to sync, and then goes silent as long as it is maintained.

Cunningham has added a few tricks from his personal funds.

Also John uses a large metal template to cover work order sheets to

help him find his place, an extension of the template idea many blind people use for cheque books. And he's bought an Optacon RID, a small hand-held camera scan device which converts ordinary printed letters into physical pulses.

With the Optacon John can 'read' work orders with his fingers, and even books. The unit costs \$4,000, and he plans to incorporate an interface mod that further translates the scan into vocoded computer speech at the rate of 300 words/minute.

Much of the work Cunningham does requires a mix, a factor which Cohen thinks eliminates boredom from what could be a routine job. He further feels that a non-sighted person does a better job in this area, both for reasons of increased audio perception and the ability to focus complete attention to the task.

A former television photographic technician, Cunningham says he learned most about sound recording after losing his sight. "Being blind doesn't interfere with doing my job—only with finding one." **Beth Jacques**

## One Pass, San Francisco

Elliot Mazer, designer and owner of studios from the tiny broom cupboard Quadraphonic in Nashville to the giant His Master's Wheels, is at it again. This time he's joined forces with film/studio video production and post-production house One Pass in San Francisco to realise his dream of getting the sibilance off the nine o'clock TV news.

As the managing director of One Pass Audio, he's the kid in the tuck shop, happily designing another broom cupboard to supply audio support for One Pass Video work.

"I have this fantasy," he says, "that God gave us SMPTE time code so that audio can stay on the audio machines and video on the video machines. I'm not convinced video machines can handle audio and I know audio machines won't handle video."

With time code, he feels, you can run your 16-track tape unit in sync with different video units, treat the sound, and wind up with separate audio and time code tracks. Transferring up the LV system would be done as a double-act—VTR with time code and ATR with time code.

He cites the 'indignities' video machines present to audio: extremely stressed tapes due to high-speed slew against the heads; infrequent degaussing, compared to audio maintenance; tape storage head-out and high-speed winds, which deliver echo when the tape is broadcast.

There's a huge difference in audio quality between channel 1 and channel 2 when channel 1 is an edge track, he claims. VTR edge tracks

can be difficult if the tape isn't handled correctly. "In VTR audio heads aren't considered important—the tape is falling around like crazy, smashed against the heads. Then they ask that outside track to produce high-quality audio: it's impossible."

He still feels it's worth bothering about audio quality for broadcast material. Good stereo televisions capable of interfacing with a high quality hi-fi system are only separated from the American market by a pile of papers on an FCC bureaucrat's desk. People watching television have a better chance of hearing something good, according to Mazer, because more people are line-of-sight with their TV than with their hi-fi set-up. As television is a broadband medium, top-end television audio is every bit as good as FM radio. According to Mazer, television as a high quality audio medium has more potential than most people's record playing systems.

The heart of Mazer's crusade to clean up video sound is the Sony 1in Type "C" recording system coupled with CMX 600 light pen editing.

The CMX 600 is a 10 year old system that stores video pictures on computer discs. It provides a random access via light pen to any scene—or part of a scene—in any order. At One Pass Mazer will record dialogue, music and effects separately. The 600 will then be set up to create an infinite loop of any given scene or sequence of scenes. An actor, for instance, will be put in front of a video monitor to match the dialogue. When it's a take, a

signal saying it's a take goes onto the time code. Then the tape is played to the computer, which extracts all the material called takes and hey-presto, dialogue or effects.

When mixing, the video system will follow 16-track audio cueing. The 16-track is engaged, the time code played to the CMX 600 which plays whatever picture it has associated with that time code. "We rehearse and indicate a take," says Mazer. "We can record direct or even just operate autolocate on ATR and the whole system will follow you."

Other equipment at One Pass includes a custom desk, which will have bits and pieces of a Neve desk Mazer used to own. The processing equipment is by ADR. There are two Scamp systems and a lot of out-board gear. Audio will be kept on Ampex ATRs as much as possible, and Mazer will reluctantly use as much Dolby noise reduction as possible. "I'm not a great exponent of noise reduction," he says, "but I know in a situation where you have multiple generations, you have to have it to keep the quality. Dolby on VTR gives you four generations."

But the CMX 600 adapted for audio use will run the show. It can automate the desk, turning channels on and off, inserting ambience, bringing up special effects on cue and operating other machines on cue.

This raises the question of whether studio personnel are redundant. "Well, someone's got to make sure the clients have enough tea," he says.

**Beth Jacques**

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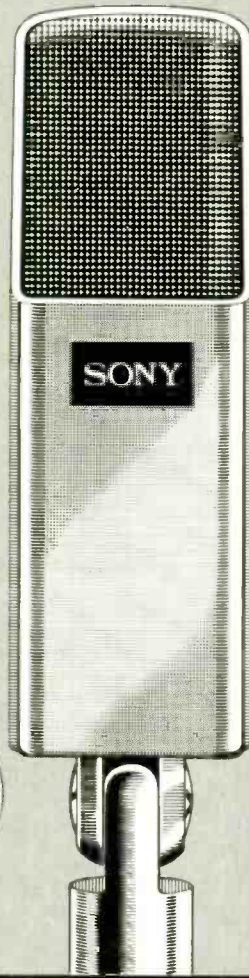
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# AES 68th Convention, Hamburg - a report

Richard Elen    Noel Bell

Once again, Noel Bell and Richard Elen take a look at the papers and exhibition respectively, on the occasion of the 68th Audio Engineering Society Convention, held at the conference centre adjacent to the Hamburg Plaza Hotel.

**T**HIS YEAR'S European AES exhibition seemed somewhat smaller than in previous years, no doubt reflecting the still slightly shaky state of the pro-audio industry resulting from current economic pressures. However, there were still several new products of interest. We have attempted to list here all the new products on show, but if we have omitted any items, we would be grateful if manufacturers could let us know, for inclusion in our next News section.

**ASC Electronic** introduced their new *AS3000* cassette recorder, featuring a 3-motor, dual-capstan drive system, microprocessor-controlled functions and *High Com* noise reduction, plus an infra-red remote option. In addition to the *High Com*, *Dolby NR* is also available on replay for those who already have *Dolby*-encoded tapes. A major feature of this unit is the *RALF* line-up system, which offers six independent settings of bias, level and eq for various tape types, each of which may be fully adjusted very simply. The *ASC* range also includes the well-known *AS6000* reel-to-reel machine, plus a tuner and power amp.

Another primarily hi-fi manufacturer exhibiting at AES was **Audio-Pro**, who were showing the *A4-14 PRO* and *B4-200 PRO* speaker systems. The former is a compact bi-amped full range monitor speaker, while the latter is a professional subwoofer system, designed for use with the *SAB* subwoofer interface unit.

**Brüel & Kjaer** exhibited a number of new measurement and analysis systems, and offered a pair of useful publications: one, a new short form catalogue, and the other a very useful booklet on electroacoustic measurements. The latter gives full details and philosophy behind a wide range of professional audio measurements, including

which of the B&K range are suitable for each purpose: an essential guide to all those interested in high-quality audio experimentation. The new catalogue includes several new systems, notably the *Building Acoustics Analyzer* type 4417. This is a portable, battery-powered microprocessor-based system designed for such purposes as noise measurement, reverb time measurement, sound insulation experiments, and determination of audio power according to ISO 3741/42. The unit needs only one mic and speaker system, and features two input channels with selectable automatic switching between the two. The device can measure level, 20 to 120dB, with various averaging systems; reverb time, 0.25 to 20s below 315Hz and 0.08 to 20s above 400Hz, with selectable sample rate and decay range.

Besides their wide range of microphones, and their digitally-controlled attenuator, **Calrec** were showing a new device for use with the NRDC-backed Ambisonic surround-sound system. The *UHJ Encoder* takes a 3-channel B-format signal, such as that produced by a *Calrec Soundfield* mic control unit or a B-format mixdown from multitrack, and processes it to provide a 2-channel UHJ-encoded signal at the output. This signal may be cut on to disc or broadcast in the normal way, and as the UHJ Ambisonic system is fully stereo compatible, listeners will get fine stereo results. If the source is played through a UHJ Ambisonic surround-sound decoder, however, full horizontal surround-sound will be reproduced. The *Calrec* unit is the first commercially-available device to enable a 2-channel encoded UHJ signal to be produced, and the unit should find a wide market among recordists as the Ambisonic system continues to enhance its reputation. There are currently over 100 albums available in 2-channel UHJ, primarily recorded with the *Calrec Soundfield* mic and five domestic decoders are on the market. In addition, experimental recordings have been made by the IBA with their Ambisonic console, mixing down from multitrack. A further possibility is to use the *Calrec* encoder as the basis for a 'transcoder' system, which can take a 'discrete quad' mix from

a multitrack console and encode it into 2-channel UHJ. Personal experience here indicates that transcoding, whilst not as flexible as a true mixdown into B-format, can offer quite acceptable results for a lower cost than the construction of a complete Ambisonic console.

**Dolby** were very much in evidence, showing their 255 and 155 cards for use in the audio channels of *Ampex VPR-2* and *Sony BVH-1000/1100* video recorders, and offering information on *Dolby HX* and the new *Dolby C*. This latter system, designed for domestic use, operates in a similar fashion to the well-known 'B-type' NR system, but offers up to 20dB NR by using a new, dual-level processing technique using two sliding-band stages operating at different levels to avoid the possible problems of large amounts of noise reduction with conventional compansion systems. *Dolby* claim that the new system has no side-effects.

Two additional developments assist *Dolby-C* in its operation: 'Spectral Skewing' and anti-saturation circuitry. The former reduces the possibility of encode-decode errors by reducing the sensitivity of the system to frequency response variations above 10kHz. The latter operates at high signal levels to prevent tape saturation and its side-effects.

**Ela Audio** were showing their *EA 800* series of units, comprising the 802 distribution amplifier, 803 telephone balancing unit, 804 phono preamp, 805 mixer power supply, 806 4-output phantom-power unit, and the 809 phase-meter. Also exhibited was the *S41* minimixer. This is a physically compact and ultra-robust 4-input mono unit designed for ENG and location film work. The features include line/mic switching; balanced inputs; 48V phantom power (switched); 70mm conductive plastic faders, recessed to prevent accidental movement; switchable gain (in 15dB steps); 3-frequency highpass filter; headphone PFL; internal line-up oscillator; built-in broadcast-quality limiter with choice of two release characteristics and LED indicator; output switchable to mic or line-level; headphone amp

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narrow head block that cuts the travel distance between the erase and record heads to 66 milliseecs at 30 ips (now available as a conversion for existing A80/VU models). And both are available in several tape width/channel number configurations.

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A80/VU Mk III and the A800 won't be easy. But then Studer never have been in the habit of taking the easy way out when it comes to performance.

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## AES report

with level control; variable output level control with 'cal' position and switches for power on/off and battery test. All the inputs and outputs are via XLR-style connectors, and the built-in power-pack containing NiCd cells includes a charging circuit and phantom-power converter. An ASA standard VU meter is fitted, with a peak-reading LED. Altogether an impressive unit.

EMT showed a couple of new digital systems: the 245 digital reverb unit and the 450 *Digiphon*. The latter was also covered in a paper at the Conference (see Noel Bell's report). The 245 reverb includes adjustable predelay and amplitude control of early reflections, plus a wide range of reverb time settings with variable eq. The unit may be rack-mounted or free-standing, and features a 15-bit data structure, including 128K of RAM. Predelay may be in the range 0-84ms, while the reverb time is variable between 0.4 and 4.5s in 16 steps. The unit is a simplified version of the EMT 250.

The 450 *Digiphon* uses a 300MB hard disk system to offer up to 35min of stereo audio information, using a 16-bit linear digital code sampled at 32kHz. Frequency response is quoted as 30Hz to 15kHz, +0.5, -3dB, and 40Hz to 14.5kHz, ±0.5dB. Rms dynamic range is 80dB below clipping. A control unit for the system allows the unit to operate on up to 24 'tracks', the total time available per disk system depending on the number of tracks required. The 'autolocator' functions enable a desired point to be found within 50ms, to 5ms accuracy, and offer 10 built-in registers which may be assigned as 'Exit' or 'Entry' points. These points may be looped back on each other for effects purposes, as well as being used for editing. A display offers minutes, seconds, hundredths of seconds, and 5ms steps. The entire system is very solid, weighing 992lb!

**Future Film Developments**, the London-based suppliers of cables, jackfields and accessories for the broadcast, recording and electronics industries, took the opportunity to announce at the show the founding of a West German subsidiary, **FFD Vertriebsges. für Electronic-Komponenten GmbH**, based at Rumfordstrasse 10, D-8000 München 5, telephone 089/22.53.56. The company has been founded by FFD in collaboration with the German company GTC Studiotechnic GmbH in Munich.

An interesting new console from **Harrison**, on show for the first time, is the *MR-3*. This is essentially an 'economy model' of the well-known *MR-2*, the most noticeable innovation being the limitation of the unit to 24 routing busses. This alone makes the console very compact; it must be the first Harrison unit where all the routing buttons are accessible from a sitting position! Routing is via two rows of six buttons which may be assigned to tracks 1-12 or 13-24 via a 'transfer' button on each channel. The console is built to accept either 28 or 36 input modules, and offers a choice of metering options, including the new CRT system, analogue meters or plasma display types. Altogether a most versatile unit, and one which offers the traditional Harrison quality and smooth sound, at a very reasonable price. Also on show at the Harrison stand was an *MR-2* fitted with the **Melkuist GT-800** automation package. The combination is a very impressive one, adding a great deal of versatility to an already eminently flexible console. The Melkuist system is about the easiest of all to use, in my opinion, and it may be

fitted to almost any console. It has rapidly made a name for itself by virtue of its excellent 'user transparency'—you hardly have to think about it in operation!

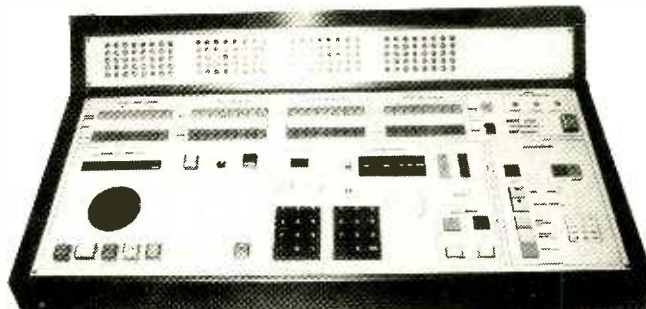
A number of new items were on show from **Ivive Electronics**: notably the new *Gold Standard* air-condenser mic system and the 5000 modular sound system. The *Gold Standard* is a new calibration microphone system featuring, in the mic head itself, a high-reliability gold-deposited diaphragm material, enabling it to withstand hostile operating environments. The mic is driven by the 1300 power supply/preamp which may be mains or battery powered. The mic head also features thread-for-thread compatibility for international use. The complete range includes the 1100 series air-condenser mic, 1200 mic preamp, and 1300 power-supply/low noise amplifier.

The Ivive 5000 series modular sound system features a universal mainframe into which may be fitted a wide range of modules in any position within the rack-mountable frame. Security is a major feature of the system, with key-operation options on many facilities, and tamper-proof covers available for many units. The system also offers superb serviceability, with signal presence indicators and test points available at the front of every module panel. An interesting innovation in the amplifier department is the use of master high-impedance output drivers to power a number of slave units. A single master amp can drive up to eight slaves, thus improving both flexibility and cost-effectiveness. The module range currently available includes: 5101 power module, featuring master ac on/off switch, system on/off switch, 110/220V selection, on/off status memory, remote on/off switching option, 2-speed fan, and front panel keylock; 5202 2-way crossover, with continuously variable crossover points, 200Hz to 2kHz, independent adjustment of high and lowpass crossover point, switchable crossover slopes, 12 or 18dB/octave, optional eq for hf drivers and Thiele tuned lf enclosures, phase

reverse switch, signal output indicators and security cover option; 5203 3-way crossover with 2 to 8kHz range, independent adjustments, test points for audio RTA; 5303 1/3-octave equaliser, featuring 27 ISO standard filters covering 40Hz to 16kHz, 4-position HPF, ±10dB adjustment, hardwired bypass, gain control, LED output and bypass indicators, audio test point, remote eq in/out option; 5306 notch filter, offering six tunable 1/10-octave notch filters, 0 to 12dB notch depth, 50Hz to 3.2kHz range, compressor to sustain feedback during tuning, hardware bypass, temperature drift compensation; 5506 mixer, with six low-Z inputs, including two switchable mic/line, two mix busses, 40dB gain trim per channel, 20dB pad on each input, phantom power, remote control options, 'precedence' control, LF roll-off switch on each input, buffered tape outputs, prefade outputs; and the 5805/5806 amplifier combination, with independent PSU, dc crowbar protection, digital I/O ports for remote monitoring, thermal overload protection, and parallel and bridging options.

**Kajaani Electronics** of Finland were showing their broadcast *Kajac* console for multitrack operation, a version of **Clive Green's** impressive studio console systems. The *Kajac* console is an in-line type with VCA faders and dc subgrouping, offering a choice of 24 or 36 input channels. The console incorporates different modules, with the following facilities: 1001 input-output-monitor channel, offering mic and two line inputs with ±10dB gain trim, 6-section eq, 24-track routing, 4 mono/1 stereo aux groups, 4 mixdown/monitor groups, PFL and solo, channel and monitor muting; 1063 echo return module, comprising one mic/line input with gain control, 6-section eq, full routing, and full aux and mixdown/monitor sends; 1050 mixdown/monitor group module, with four record/broadcast group mix trim controls, 4-way main monitor level fader, second monitor system 4-way monitor pot, loudspeaker level trim switches, stereo/mono compatibility

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EMT 450 formatter and autolocate unit

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## AES report

checking, adjustable dim; 1057 studio listening module, with 2 stereo main faders, speaker trim, compatibility checking, auto monitor-cut when mic in use, source selector switches for playback from 10 stereo inputs (disc or tape) and several other sources; plus a full range of monitoring and cue send channel modules.

An important difference between the Kajaani desk and the studio consoles exhibited by Clive Green on the **Enertec Schlumberger** stand is in the routing: the *Kajac* desk uses numerical thumbwheels, while Clive Green's consoles generally offer two multiway rotary switches, although there are several options. A common feature of both console systems is their transformerless design and very low lf phase shift. The Clive Green consoles are generally built to order from a wide selection of modules optimised for studio use. They are automation-ready, and are easily interfaced to both the Melkuist and Allison 65K systems. Extensive hand-wiring allows a high degree of customisation.

**Keith Monks** introduced a new loudspeaker, the *LS1/9* which is a new version of the *LS1/8* powered mini-monitor with built-in amp. The only difference between the mini-monitors is that the *LS1/9* has an external dc powered input as well as ac mains. Also new from the company is the *KMAL/POL* producers turntable listening unit developed for the BBC. This unit comprises a Technics *SLB2* servo belt driven turntable with integral low mass arm and high compliance phono cartridge, plus a base mounted stereo preamp and two 10W power amps. Inputs are either XLR or stereo line jack with provision for a balanced line 10k $\Omega$  input, while DIN loudspeaker outputs are also provided. In addition to the above Keith Monks also informs us that the company's range of mic stands will be produced in extra colour schemes.

**Klark-Teknik** featured three new additions to their range of high-quality outboard equipment. The *RT60* reverb analyser links into the *DN60* RTSA and allows either wide-band or any one of the 30 1/3-octave frequencies to be selected and the relevant decay response displayed. A digital display of the *RT60* value is also given. The most accurate calculation can be made with the use of a variable window facility and three memories, plus an 'accumulate' facility. The *DN27A* is the successor to the original *DN27* 1/3-octave graphic,

and offers improved headroom, an earth-lift switch, and power-down automatic bypassing. The *DN30/30* offers two channels with 30 1/3-octave eq controls in a 3-unit high rack-mounting package, with fail-safe system bypass, switched  $\pm 6$  or  $\pm 12$ dB ranges, and computer-designed filters.

**Klark-Teknik** also showed its *DN72* memory bank which is designed to accompany the *DN70* digital time processor. This unit allows up to 18 different delay settings to be stored with the facility that these settings can be instantly recalled at the push of a button. This makes the *DN72* particularly useful for studio mixdown.

**Lyrec** debuted its new *TR55* 2-track tape machine at the exhibition. Full details of this machine appeared in the news section of *Studio Sound* in the May issue, however, a number of points bear re-iteration. The recorder is of extremely compact design, offers comprehensive facilities including logic control and remote operation, and deserves particular mention for its modular design concept which is especially helpful with regard to servicing. Overall an impressive new design, which should generate a great deal of interest.

**MCI** were present in force at the exhibition with not only a display stand but also a mobile recording truck parked on the main concourse of the Congress Centrum. While the company's stand had the usual comprehensive selection of consoles, tape machines, etc—the mobile boasted a new recording console specifically designed for use in OB vehicles. This console, the *JH-636* is available with 36 or 72 inputs in a frame size requiring a floor space only 36in wide by 62in long. The console on show was a 36 input version and its features include 24 output busses with VU metering, in-line monitoring with stereo/mono outputs, simultaneous multitrack recording and stereo output mix capability with no interaction, 3-band equalisation with high and low pass filters on each input, six effects/foldback sends, VCA grouping with four dedicated group master faders, a PFL system with built-in loudspeaker and amplifier, and eight auxiliary communication input/outputs capable of use with external intercom systems. Other features of the console include all inputs/outputs accessible from the front; the provision of five echo (line) returns; a built-in oscillator with pink/white noise source; and monitor source selections with level controls.

**Mondial Electronique** offer complete systems for local radio, based around three elements: a

mixer, line processing unit and power supply. The system was designed by a Radio France research team, and is manufactured by **Mondial** for all the new French local radio stations. The system design criteria required that the system be flexible, easy to operate, compact, and suited to local broadcasting needs, and the results are very impressive.

The mixer accepts up to 10 stereo inputs, which are selected by means of three keypanels, and it may be linked to an automatic cartridge system for automated programming. The processing unit can be used to switch predetermined sequences of events, and includes timing circuitry, line amps and switching, plus various monitoring and master control options. In addition, specially-modified turntables and tape machines have been developed to complement the systems.

**Ortofon** were exhibiting their new *TC3000* pick-up cartridge testing computer. This easy-to-use system features a short measuring time and incorporates a printer which produces a test card for permanent record purposes. The unit tests important aspects of both the cartridge and the playback system, with the use of a pair of special test records. The cartridge tests include output, balance, separation, tracking ability, real phase, frequency response, load, tracking force, antiskating and operating temperature, while the playback system test checks turntable speed, load, tracking force, tonearm resonance and cable capacitance. The *TC3000* is based around the 6802 microprocessor, including 12K of ROM space and 1K RAM, with 100 I/O lines. Separate programs incorporated in the machine handle measurements and calculations, operational programming, self-testing and servicing routines.

**Penny & Giles** exhibited their new 3000 series fader, which replaces their previous 900 model. It is specifically designed for use in portable consoles and anywhere small-space, robust faders are necessary. Standard versions offer 10K linear and 5K audio taper tracks with one or two ganged conductive elements. Connection is via flying leads and various options include switch contacts, knob colour variations, and different resistance values. The units are 93mm long with 65mm movement. Other P&G devices were also on show, including their 8-bit Gray-code digital output model.

**RTW** showed their range of metering equipment and small mixing desks. RTW meters are of the plasma-display bar type, and offer a resolution of up to over 300 display elements. Meters are available with single, dual, or multiple channel displays, for horizontal or vertical operation, and each include standard PPM characteristics, plus a long-term peak memory store. RTW mixers, such as the *TR 10* and *TR III* offer a compact modular construction, primarily for broadcast purposes, with a wide range of modules available for the majority of standard sources.

Drawing a lot of attention on the **Raindirk** stand was the new stereo control unit in the **Status** line of professional amplification. The *S500* FET power amp has gained a wide reputation since it first appeared, and has now undergone some cosmetic changes and a certain amount of circuit upgrading, including an interesting system for including the speaker cables within the amplifier feedback loop to attain remarkable damping factor values. The *S20* control unit continues **Barry Porter's** ultra-high quality approach, and the system is likely to find great success not only in the professional field, but also at the top end of the hi-fi market. This unit features a modular disc



MCI mobile with the JH-636 console

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# MR-2

MR-2 delivers more usable console for the money. Efficient design has reduced the labor and material content, while improving features, signal handling, and reliability.

MR-2 offers a full range of options and features, allowing you to specialize your console to your functional and budgeting needs.

MR-2 expansion frames and module update kits continue to keep your console matched to your future needs.

Resale prices of Harrison-designed-and-built consoles demonstrate that MR-2 will continue to protect you even at trade-in.

## More Usable Console for the Money?

Somehow that sounds like cheating—as though you could get something for nothing. NOT SO!!

The secret is to eliminate things that cost money but do not add any function or "quality" to the console.

The console designers at Harrison Systems have identified many traditional inefficiencies and have eliminated these in the design of MR-2.

Printed-circuit boards have been made smaller (thus, less expensive) through the use of double-sided artwork and a more meticulous, time-consuming design process.

Almost all hand-wiring in the frame has been eliminated. Mother-board-mounted multi-pin connectors are used for inputs and outputs.

Seldom-used features (like Quad) have been eliminated and replaced with more desirable and useful features.

Module width has been reduced to 40.6 mm (1.6"), thus reducing metal-work cost for a given console size.

In other words, every small detail of the MR-2 design has been critically optimized for efficiency. This efficiency does not mean, however, a reduction in signal-handling quality or reliability. In fact, just the opposite is true.

A radical new multiple-ground system is at work to even further reduce induced noise.

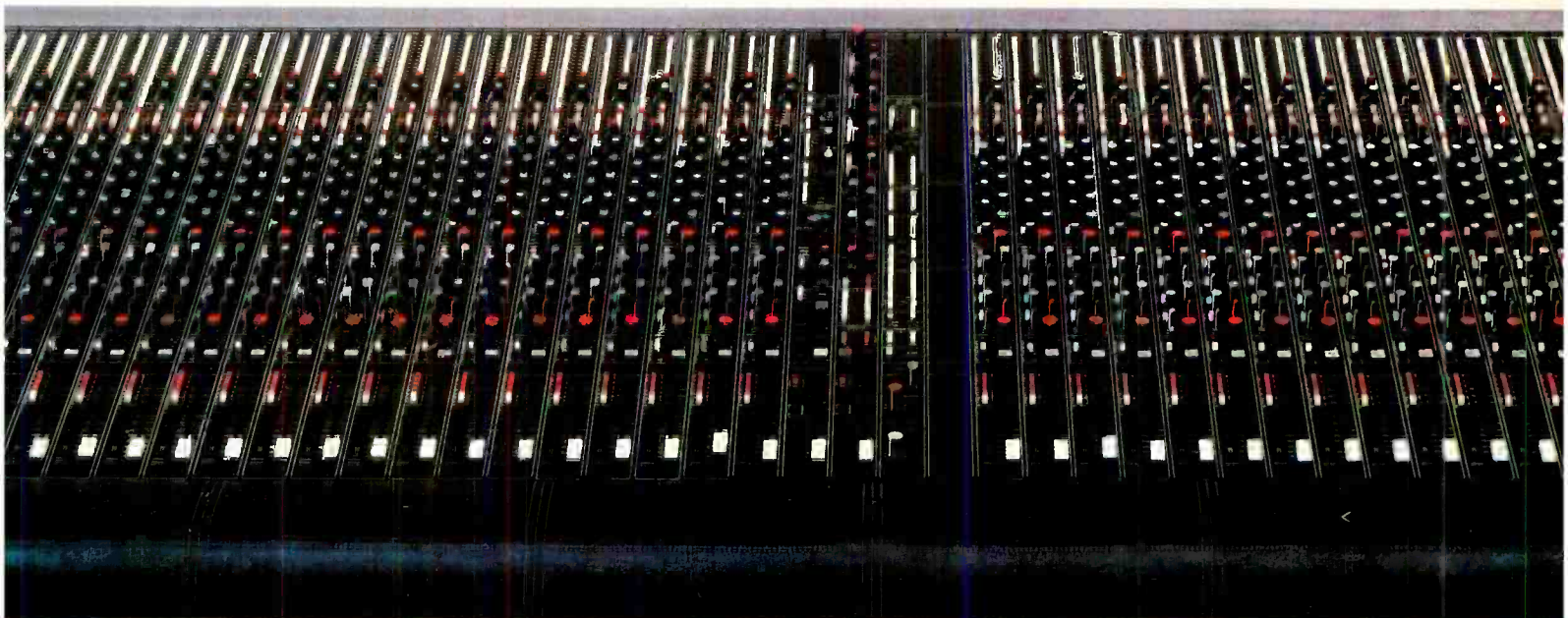
Modern "dielectrically isolated" switches are used for all logically controlled switch functions.

Patch points now operate full line level (+4 dBu or +6 dBu) and are isolated and balanced.

These are only a few of the reasons that allow us to confidently say that MR-2 is the most efficient, cost-effective console ever offered by anyone to the industry.

We think you will agree and make it your choice as well.

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## AES report

preamp unit which may be remotely located, electrically balanced output stages and a separate power unit. Inputs are provided for disc, tuner, two tape machines and two auxiliary units. It may be free-standing or rack-mounted. The equaliser features a unique semi-parametric design, similar to those found on modern mixers. Three controls offer  $\pm 10$ dB of adjustment over wide frequency ranges, with shelving top and bass. An eq bypass switch is provided. Also featured is a Butterworth highpass filter. The level control is a very precise and smoothly graduated 22-position rotary attenuator, and there is also a 20dB dim switch. Four disc amp modules are available, for different purposes and cartridge types.

New from **Sennheiser** is the *S40* condenser mic. This electret unit has been specifically designed to handle the extremes of dynamic range and low noise requirements of modern digital recording techniques. It is phantom-powered from 24-48V dc, and has a response of 40Hz to 20kHz.

Sony were demonstrating their digital audio processing equipment, both 16 and 14-bit, emphasising the practicality of converting between the two. Monitoring on headphones, it appeared that the 16-bit system did have a clear edge, but this was due mainly to the fact that different headphones were used on each system. In reality, the quality difference is almost undetectable, we are told. This demo also gave a good opportunity to check out the range of Sony lightweight headsets. Many people will be acquainted with the ultra-light *MDR-3* headphones, as supplied with the *Walkman* portable stereo cassette machine, but there are in fact two other headphones in the range, the *MDR-5A* and the *MDR-7*. Both are a great improvement on the *MDR-3s*, but, of course, they cost more. A pair of *MDR-7s* on a *Walkman* is quite stunning. Sony were also showing their new *DRE-2000* digital reverb unit, which was generating a great deal of interest. This unit offers four modes of operation, with a basic reverb time of anywhere between 0 and 9.9s, in 100 steps. Pre-delay time and early reflections may also be adjusted, and the unit may additionally be used for echo and delay purposes. The unit is controlled by a touch-sensitive remote keypad with LED readout of the current parameters, and the sound of the unit was superb. Ten memories are featured, all non-volatile. The device uses a 16-bit serial system at a sampling rate of 32kHz.

An interesting document available at the stand describes the development of digital audio both professional and domestic, with special emphasis on the collaboration between **Philips** and **Sony** on the *Compact Disc*. While the laser-scanning system is obviously the right way to do it, I am worried that the small disc diameter will produce error-correction problems. In addition, the small size severely limits the amount of music which may be contained on a disc. Being single-sided, an hour or so of stereo is OK, but a mere half-hour between disc-changes would be a little tedious with 4-channel Ambisonic material. Have **Philips/Sony** given any thought to this? **Pioneer**, who were exhibiting a laser-disc system, offer 40mins per side of 4-channel music on a double-sided, larger disc, and this would seem to be a better system for the future.

An interesting new development on show from **Soundcraft** was their new automation system. Using Allison tape I/O cards (the rest being Soundcraft's own design), the system stores data on two tape tracks, but there the similarity ends.



Teac Tascam System 20

Great care has been taken to make the system as simple to operate as possible, with the use of only one button per channel. Each channel includes a dedicated microprocessor which handles all routine analogue and digital conversions, anti-dither processing and channel mode changes. Software-controlled automatic nulling enables the channel to be cycled between modes simply by pressing the mode button without audible level change. Mute data is written separately, enabling mutes to be altered without having to rewrite channel level data, resulting in an unusually simple operational sequence.

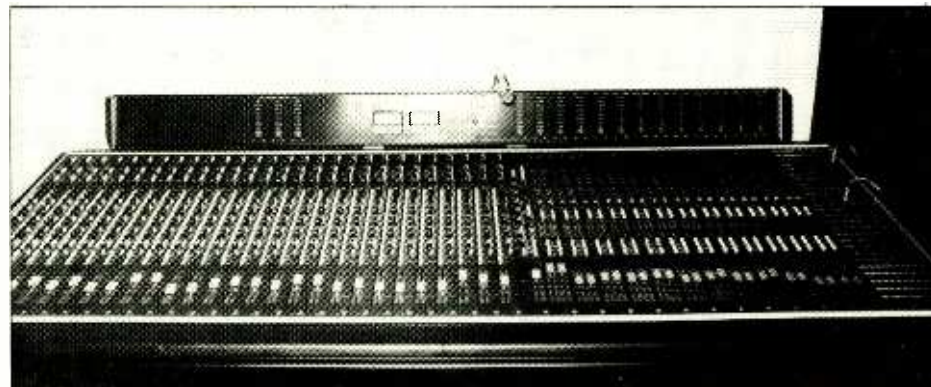
The operating system hardware is contained in a single card rack beneath the console, interfaced to each VCA fader with a ribbon cable. This cable carries no high speed data, thus rendering the system immune to data breakthrough into the audio path. Each plug-in control card handles two channels of audio and is independent of the other system channels. Thus a failure will cause the minimum of disruption, and the faulty card can easily be located and replaced.

Also on show from Soundcraft was the new 2400 series console, a development of the 1624 system. This offers a number of novel operational features, and as with the 1624, combines high quality audio design with an unusually well-thought-out ergonomic layout. A version of the 1624, designated the 1624A, will offer these improved facilities on the lower-cost console.

New from **Stanton Magnetics** is the 980LZS cartridge. This low impedance pickup is designed to combine all the advantages of a moving-magnet unit with the openness and crispness of a moving coil design.

TTS Electronic exhibited the **Studio Electronic**

Soundcraft 2400 Series console



range of equipment, notably the *PM-2* VU/peak switchable metering system with peak hold. The system has a 500ms sample and hold and integrates measured peaks. Resolution is 0.25dB per LED. Also shown was the *CM-2* phase meter, *EQ-2* 2-channel eq unit with virtually no phase shift, the *NG-2* expander/noise gate, *AG-2* digital tone generator, and *VS-2* series power supplies. TTS also manufacture the *MC-20* 20-channel in-line console.

**Standard Telephon und Radio AG** of Zurich, an ITT company, exhibited their range of broadcast audio gear, their automatic on-air control desk being of particular interest. Microprocessor control enables the console to perform automated sequence programming including fades, cueing of tape sources, automatic recording and even rewinding of used tapes. The operation of the mic input can also be pre-programmed, with manual overrides, and sections of a preprogrammed sequence may be skipped without problems. A pre-programmed sequence can be altered at any time. To use the system, the operator enters the local time at which the sequence has to go on air. Then the sequence of the different program sections is entered (for example, tape machines, cartridges, mics, lines, turntables) followed by their start times. A printer informs the operator of the status of the selected sources. As the programme goes out on air, the desk monitors the operation of each of the pre-programmed events, automatically skipping to the next section if a tape is not ready or breaks during transmission, for instance. Additional material may be brought in manually with a pair of faders in addition to the automatic system.

**Studer** featured their new 900 series console for the first time. A major feature of the design is a concept allowing the manufacture of standard versions for broadcast applications plus special versions on customer request. Parametric equalisers, manual or VCA faders, optional transformerless mic inputs, VU/PPM meters or bargraph displays are among the features of this range. The 901 includes up to 13 inputs, while the 902 accommodates up to 28. Special versions may include up to 50 inputs and 24 master units.

Teac featured a new mixer system in the Tascam range: the *System 20*. This is very much like an electronic patchbay, in which a master module is used with various other modules patched in as required. The *MM-20* master module has six inputs and six output busses (stereo line, monitor and cue), plus 4-track monitoring options. The add-on *PE-20* parametric eq unit has four channels, each offering three-band control, bass  $\pm 12$ dB at 60Hz to 1.5kHz, midrange from 1.5 to 8kHz, while the top control is at 10kHz. Additional inputs may be added in groups of four

46 ▶

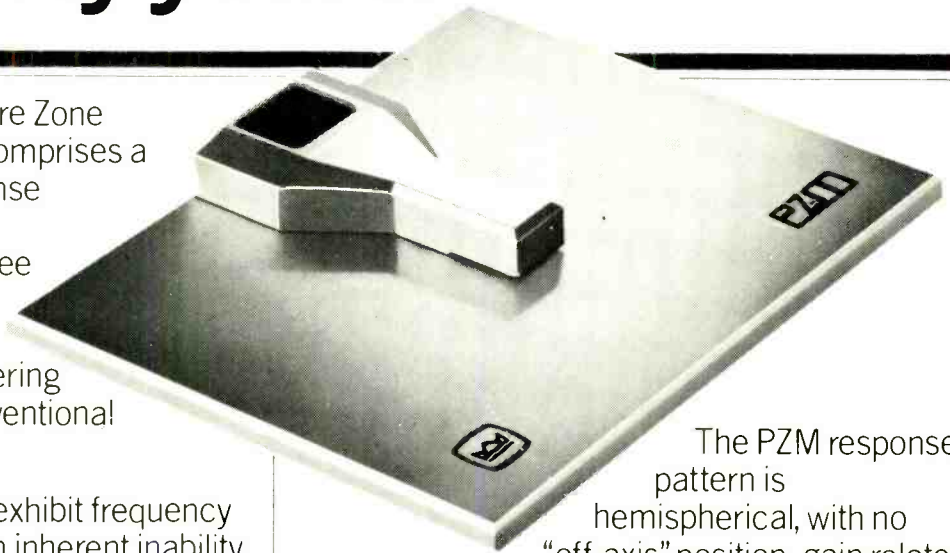
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Traditional microphones exhibit frequency response anomalies, due to an inherent inability to satisfactorily combine direct and reflected signals, thus leading to phase-induced amplitude cancellations and reinforcements, or comb filtering.

Amcron PZMicrophones™ eliminate this effect because they detect sound by means of a new process. This takes advantage of the fact that, as a sound wave approaches a boundary (such as a wall, table or floor), there is formed at this boundary a pressure field four or five mm. deep, within which the direct signal and its reflection from the boundary remain in phase and add coherently.

The Amcron PZM places a small pressure transducer inside the primary boundary pressure zone, facing the boundary. This prevents any direct signal reaching the microphone, thus eliminating the possibility of phase-induced interference and providing a significant improvement in signal quality.



The PZM response pattern is hemispherical, with no "off-axis" position: gain related to distance will change, but not tonal quality. The PZM responds accurately to up to 150 db spl, yet hears a whispered conversation in an ordinary room at ten metres.

Engineers are finding that the PZM continually suggests new miking techniques. And that in many applications fewer PZM's are required than traditional microphones. In fact, the PZM is changing ideas about how a microphone should look, sound, and be used. Don't you think that it's time you got in on the act, and gave the PZM a listen?

Details of available models, prices, and suggestions for applications are obtainable from the sole UK importers and distributors, HHB Hire and Sales, Unit F, New Crescent Works, Nicoll Road, London NW10 9AX. Tel: 01-961 3295. Telex: 923393.



## AMCRON

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## AES report

with the *EX-20* expansion unit, while the system is completed by the *MU-20* metering unit containing four analogue VU meters with peak LEDs.

Also on show from Teac was their new *Z-80*-based *Compute mixer*, an 8/4 unit with VCA-controlled faders responding to data stored on tape tracks, and the *CHR-34* Character Recording Processor, a kind of 'electronic notebook' which can be used to dump data on various aspects of a session on to a tape data track. This data can then be displayed when the tape reaches the correct point, to give information on cues, etc, or to enhance an audio-visual presentation.

Turnkey introduced a new unit at the show: the *Time Processor*. This unit allows the reverb time of a simple reverberation unit (eg a spring) to be altered in four preset steps. This device interfaces with any mono or stereo reverb unit, and is rack mounted or free-standing, interfacing with both the sends and returns between desk and reverb unit. The system utilises dynamic range processing techniques controlled by a hand-held or console mounted remote unit. The system will be available from June at about £250.

Zoot Horn showed some of their interesting range of broadcast and PA mixers. Of particular interest in this range is the *R1/2* unit designed for small OB applications and conforming to European IRT Category II specifications. The unit offers eight mic and eight line inputs, balanced, two aux inputs, a PFL input and external input, all balanced, and provides a PFL speaker output, aux out, three oscillator outputs at different levels, two group outs, two main outputs, and two PTT outputs. Three-band eq is featured and the unit has very good response, noise and distortion characteristics. Also on show were the *Link 16/6* and *24/6* monitor mixing consoles for PA applications, which enable the operator to generate six separate on-stage monitor mixes with independent operator monitoring on speaker or headphones and full talkback facilities; the *VM series 8/3* outside broadcast submixer; and the *R4/1* trolley-mounted mobile VTR system audio mixer designed in conjunction with West German TV.

### Convention

This year's European convention was a less hectic affair than the American events, with thankfully little overlap between the technical sessions and workshops, this allowing interested participants more opportunity to sit in on technical papers and to take in the exhibition. A feature of the Hamburg Convention was that the number of papers presented was lower than usual, and as a

now hard-bitten convention attendee it appeared to me that the quality of some papers was not to the usual high standard. This I understand was partially due to a lack of papers being offered for presentation, it additionally being noted that several papers were repeats of previous presentations. Despite the above, however, several papers were of interest.

Prior to reporting the newly presented papers, brief mention should be made of a repeat from the 67th AES Convention in New York. Following my report on the paper entitled 'Audio restoration and transfer technology' given by Tom Owen of the Rodgers and Hammerstein Archives of Recorded Sound, New York, many readers enquired as to whether a preprint was available. Unfortunately, this was not the case; however, at Hamburg where the paper was repeated a preprint was published (AES Preprint No 1737). This paper gives full details of the techniques Mr Owen uses to restore and preserve audio 'archival material, and is a comprehensive shortform report of current techniques likely to be of use to anyone involved in this rather specialised field.

Another interesting repeat presentation, which I had attended in London during the week prior to Hamburg, was a presentation by Alastair Heaslett of Ampex covering the broad topic of digital audio. Mr Heaslett has been involved in the development of digital audio for a lengthy period of time, hence his presentation which was a factual overview of the current state of the art provoked a lively interest and response. Basing his views on the work of not only Ampex (which includes computer peripherals, high data bit recorders, digital video recording processes, and digital audio), but also the work undertaken by other manufacturers—Mr Heaslett discussed the topics of formats, systems, operational problems, digital versus analogue, and the future of digital audio. Confining himself largely to the task of disseminating information, Mr Heaslett explained the origins of the currently used sampling rates with their video and film interface properties; outlined the argument for a 50kHz sampling rate; discussed the major features of current tape formats; reviewed the existing 2-channel and multi-channel systems; highlighted the operational problems of error propagation and channel codes, multipass tape deterioration, and user awareness of impending tape death; and discussed the potential for further improvement of analogue recording vis-a-vis the potential of digital audio.

To summarise a lengthy presentation and the concluding question-and-answer session, it is clear that many studio engineers are not aware of the design and cost considerations which govern the present and proposed digital audio systems.

The lack of knowledge of digital audio was reflected by an almost fanatical dedication to analogue audio and a questioning attitude as to whether digital was needed at all. In reply Mr Heaslett stated that analogue recording processes were unlikely to be substantially improved, due to purely engineering factors, and that future improvements in the recording process would only come from the use of digital audio. While acknowledging that manufacturer/user interplay would be of great importance in deciding formats, etc, Mr Heaslett stated that manufacturers had to start somewhere in producing digital audio equipment and that a feasible point from which to launch digital audio had been reached. Additionally Mr Heaslett stated that although present techniques and technology were imperfect the potential for advancement of the digital audio recording process was the key to the future.

As a pointer to the future for Ampex, Mr Heaslett gave brief details of the system he is currently working on. This is a 2-channel digital machine utilising two tracks per channel and using ¼in tape at an operating speed of 30in/s. Sampling rate is 50kHz with data packing being 25Kbit/in. Channel code is of the Miller type. Unlike other digital systems Ampex switch their machine into and out of record in the interblock gap to avoid error propagation, with the block gap rate being 100Hz.

As a follow up to the paper presented at the New York Convention, Karl Bäder of EMT gave further details of the *EMT 450 Digiphon* 300MByte hard disk drive digital multitrack recorder which was on show at the exhibition. This unit uses a Control Data Corp *BXX-6* disk system with an interchangeable disk stack and will record up to 32 channels of digital audio. Two disk units can be used to record the digital information with the length of recording time depending on the number of channels being recorded. Hence, while a mono record mode allows 140 minutes maximum recording time, stereo allows a maximum 70 minutes, and 32-channel allows approximately 4½ minutes. The system uses a 32kHz sampling rate with 16 bit uniform data words, and has a buffer memory facility to allow for disk stack transfer. The disk system is operated by a microprocessor-based formatter and controller with standard tape recorder controls and includes a 32 register auto-locate function. An additional facility is a variable time/shuttle function. Editing in the EMT system is in 5ms edit increments, and while the editing system gives instantaneous edits at the moment, a crossfade facility is to be provided in the near future.

Staying with digital audio matters M Griffiths and P J Bloom of the Polytechnic of Central London, described and replayed examples of 'A flexible digital sound editing program for mini-computer systems' (AES Preprint No 1733). This paper described a FORTRAN-based program for digital sound recording, editing and playback, which operates in a minicomputer environment with disk storage and dual channel A/D and D/A converters. Through an interactive operation facility rapid sound editing (via visual and aural monitoring) is accomplished. Additional facilities include the ability to carry out estimation and display of waveform parameters, and the facility to display the output of signals in a variety of flexible formats using a library of software routines. While the presented paper gives full details of the author's approach to handling digital audio, it is worth noting that the short replayed examples gave a more than adequate

Zoot Horn Link 16/6 PA mixer



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potential of the program despite... Of particular interest was... analogue style 'tape-echo'... intervals of between 1ms and 20s.

Following on from a previous paper, JVC gave details of the further progress the company's design team have made on its electronic editor for use with the company's professional 2-channel digital audio mastering system using U-type VTRs. The JVC editor (type *AE-90*) stores 6s of data including the edit points in two memories and utilising a search mode with varispeed, high accuracy (180µs) editing may take place. Multiple rehearsal of the edit point is possible and the JVC editor features four modes of crossfade plus a digital fader to accommodate various types of edit. Operator controls comprise various command keys, address displays of the tape location and editing point, a digital fader, and a search dial. Full details of the processing techniques used in the JVC electronic editor are given in the paper (AES Preprint No 1725).

A further paper presented by JVC, in conjunction with Hitachi, (AES Preprint No 1726) described an effective method to control RAM accessing for PCM processing systems using VCRs. Using a newly developed RAM control method, termed 'corn type', the presenters of the paper claim to have reduced the necessary RAM size to half that required conventionally. The new method complies with the EIAJ signal format, and retains the necessary RAM functions of interleaving and de-interleaving data during playback and recording, plus the absorption of time base data error caused by VCR jitter. Although primarily designed for use with PCM systems utilising VCRs, the new method is also applicable to PCM disc players and general digital data interleaving/de-interleaving processors.

A paper with a certain similarity to the first of the JVC papers was a Sony presentation on the editing system and electronic processing methods used in the company's *DAE-1100* digital electronic editor (AES Preprint No 1743). This editor which operates in conjunction with the Sony *PCM-1600*, *PCM-1610*, or *PCM-100* digital audio processors and *BVU-200B* VTRs; stores the edit points in a 5.95s memory and uses a search dial to locate the edit points. Editing accuracy is 363µs and the unit uses SMPTE timecode as the reference standard for all editing controls. The rehearsal and editing facilities include a digital fader for fade level control and a choice of crossfade times between 1ms and 99ms. Full details of the editor's operation and the factors which influenced its design are included in the paper.

Digital circuitry and digital I/O interfacing were subjects on which a number of papers were presented. Foremost amongst these was a presentation by Roger Lagadac of Studer which reported the preliminary results of the AES technical committee study group on digital interface techniques for studios. The details of this presentation are too complex to go into here, however, we hope to be able to publish these preliminary investigations in a future issue of *Studio Sound*. Other papers presented on these topics include: 'A proposal for an adaptive error correcting system for a tape cut editing digital audio recorder' given by AEG-Telefunken; 'A new approach to digital sampling frequency conversion' (AES Preprint No 1749) given by Studer; 'Design factors of digital filters for audio signals' (AES Preprint No 1744) given by Paul Skritek of the Technical University of

Vienna; 'A digital I/O interface suitable for broadcasting use' (AES Preprint No 1738) given by Mr Weisser of Telediffusion de France; and a paper entitled 'Design and realisation principles of digital audio editing memories' from a design team at the Technical University of Vienna. Rather than attempt to briefly summarise these papers, I would ask any interested readers to obtain copies of the preprints. However, for the two papers which were not preprinted, brief details follow.

AEG-Telefunken's proposal for an adaptive error correcting system for a tape cut editing digital recorder is based on the results of extensive research into the types of errors such editing causes. From this research a simple 2-state channel model was developed and the proposed error correcting scheme is based on an interleaved t-error-correcting binary BCH code. This scheme operates such that according to the channel state the appropriate correction procedure—random-error or burst-error correction—is chosen. In addition the proposed system allows tape-cut editing to be achieved independently from the block length of the error correcting code.

The design team from the Technical University of Vienna presented a paper on the design and realisation principles of digital audio editing memories and gave details of a realised version with a modular structure. Using hardware modules capable of storing 16k memory, any capacity of storage memory can be accommodated by adding further modules. The data I/O formats are 16 bit serial and parallel, plus a single bit access facility for error correction. The described memory system fulfils the design criteria which called for a high storage capacity (4 to 8Mbit) and a short access time (500ns).

Otfried Stephani of Polygram has presented many papers concerning audio disc production and reproduction at AES Conventions, and at Hamburg Mr Stephani gave a paper entitled 'On disc record echo phenomena' (AES Preprint No 1735). This paper addressed itself to an investigation of the formation of pre- and post-echoes on analogue audio discs during the three disc manufacturing steps of transcription, electroforming and pressing. Parameters investigated include the influence of the three groove modulation modes—lateral, vertical and 45° stereo—plus the influence of signal frequency on pre- and post-echoes. The results of these investigations pointed to three conclusions. Firstly, echo level and its series character increases with relation to storage time of a lacquer. Secondly, storage at temperatures above 0°C accelerates the increase of echo level on cut lacquer discs. Thirdly, as it is impossible to evaluate the echo content of a transcription by playing back the master acetate after separation from the original nickel negative, because the acetate has been exposed to the electroforming bath temperature plus the metallic pressure of the nickel deposit, Mr Stephani recommends that the electroforming process of a transcribed acetate be commenced within half an hour of cutting.

Finally, Mr Hertz of Danish Broadcasting presented a paper entitled '100 years with stereo—the beginning' (AES Preprint No 1724). This paper which is mainly in German, describes the equipment and installation details of Mr C Ader's *Stereoscopic* telephone system which was used at the 1881 Electrical World Exhibition in Paris to relay performances in stereo from the Paris Opera 3km away from the exhibition. This system, which was well reported at the time, will be the subject of an article in *Studio Sound* later this year. ■

# Budget monitor



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# 400 WATTS WILL YOUR SPEAKERS HANDLE IT?

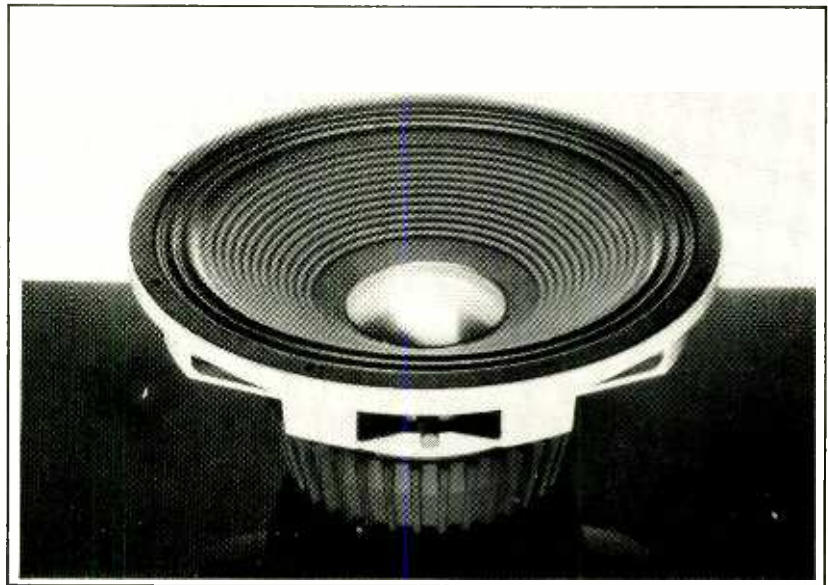
If they will they're probably GAUSS. This is no idle boast, for each and every Gauss transducer is tested for ten minutes with pink noise to its full rated power (up to 400 watts RMS!) before it leaves the factory. And if it will take *that*, then it will take a music signal with no trouble.

Such power handling capability places extreme physical demands on the mechanics of a speaker, especially on the 'spider,' the suspension that supports the voice-coil, attaches it to the chassis and keeps it in its correct position in the magnetic gap.

To cope with the cone excursions that 400 watts will produce, Gauss speakers have two 'spiders' instead of the usual one, thus keeping the backwards and forwards motion of the coil linear, even at the extremes of its travel. So rugged is this construction that, even if the speaker should be overdriven so as to cause the coil to jump the gap, the 'double spider' can return to its proper place.

All of this goes to make a professional loudspeaker, which will not only handle extremely high power levels, but will continue to do so, even after most other makes would be on the recone bench or worse. Needless to say, the reproduction quality of Gauss loudspeakers is superb, bringing out every nuance of your sound – whether you're using them for bass or lead instruments, PA, or whatever.

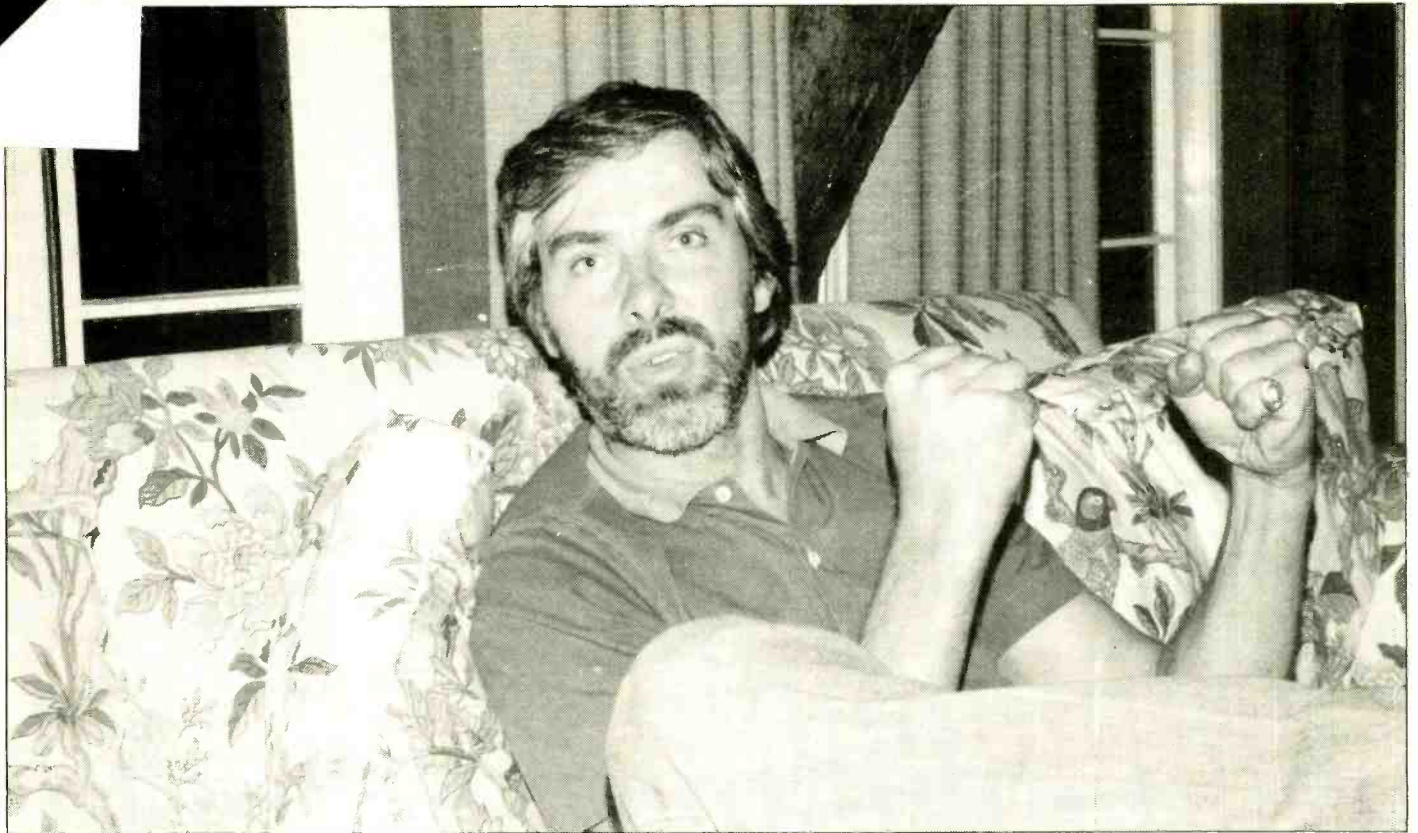
So, if your needs call for a high power, high quality loudspeaker, doesn't it make sense to choose GAUSS?



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by Cetec



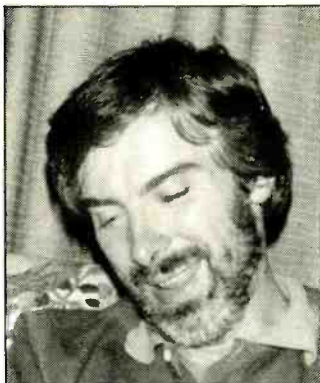
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# Glyn Johns

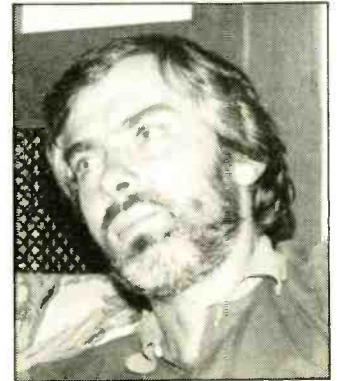
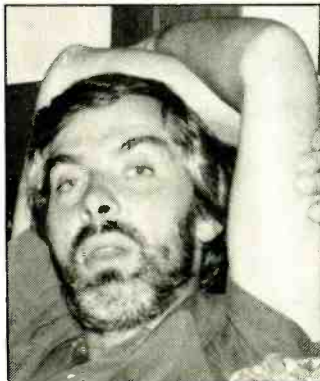
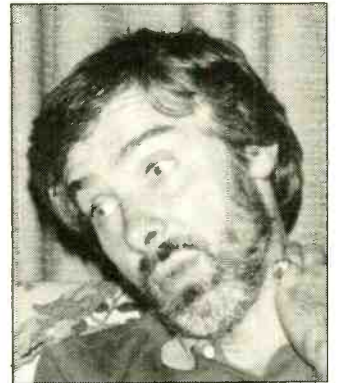
interviewed by

Mel Lambert



There is no doubt that Glyn Johns is one of the best-known engineer/producers in the world. Having entered the business as a tape-op at London's IBC Studios in 1958, he has gone on to work with dozens of innovative artists on both sides of the Atlantic. During the past two decades he has, therefore, amassed a great deal of experience in all kinds of recording environments, and has developed some very individual approaches to recording, generally based around simple mic techniques and used to record a more musically-integrated whole. In this rare interview Glyn Johns gives his views on the way recording technology is going, and what he, as an engineer, believes is wrong with our present direction. While he is not against the use of new technology in the recording industry, he feels that nobody is offered alternatives to current methods, and certainly no-one is *trained* in other than conventional, close-mic, multi-multitrack recording techniques.

Many of Glyn's comments are highly controversial, and will no doubt generate a large amount of comment, both positive and negative. And while we don't necessarily agree with all he says, these arguments *must* be considered and respected. We invite comments on this article from readers and manufacturers, and whether you agree or disagree with Glyn's sentiments, there is no doubt that we must think very carefully about the direction the recording industry is taking: this article is a valuable contribution to that discussion.



**H**AVING been trained, at the beginning of my career, to record sessions in mono, and then use 3-, 4-, 8- and 16-track, obviously I have a completely different grounding in my approach to recording than most engineers around today. I feel that the advent of 24-track, computerised mixing, and all the rest has been as a direct result of equipment manufacturers and acoustic designers needing to sell more hardware.

What concerns me is that *quality* seems to have gone out of the window as a result of what's being offered to us by equipment manufacturers. And that, I feel, is based very much on ignorance on the part of the people who are buying and using equipment. Invariably a studio will buy a piece of gear because it feels it has to have the very latest equipment in order to get a client in the door; the client invariably wants it because it looks pretty, or because of an insecurity which feeds on the desire not to have missed out on the latest piece of equipment. The fact of the matter is that I believe there are still a great number of people working in the industry today who, if they were actually shown a slightly different approach, would learn and benefit from it greatly.

More to the point, I would suggest, is how much the modern method of recording has to do with music as most musicians want to play it. Although some highly respected musician friends of mine may have used modern techniques to make *the* most extraordinary records, in a way that I would possibly never have encouraged if I had worked with them as a producer, I believe that there are an inordinate number of rhythm sections, let's say, that would benefit from a far more relaxed attitude in the studio. A drummer, for example, is put in an enclosure that simulates a cardboard box with *no* natural sound in it at all. His drum kit—for which he probably paid an enormous amount of money and is very proud—is immediately taped up, has things stuffed inside it, on top of it and all round it, so that it ends up no longer sounding like drums. The drummer has to hit the skin within half an inch of a given area in order to get *any* sound out of it whatsoever, and is then so totally surrounded by microphones that if he so much as farts he's going to blow something up in the control room. Surely this is not the most relaxed way to record, unless the guy is a session musician and does it every day of his life.

I can't see the point; to me it's simply taking what we used to do years ago to a ridiculous extreme. Of course we had to come up with new methods of recording drums: musicians were constantly looking for new sounds from their instruments.

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Contrary to the popular belief that engineers and producers in the 60's and 70's created all these new sounds, in my experience that wasn't true. Very often I was forced into achieving new sounds on instruments by the person actually playing them. Sometimes it was a mutual arrangement, and possibly I've done it on my own, but that's a healthy development.

### **Mic techniques**

Unfortunately I think it's just gone too far these days. We used to work with maybe three or four mics on the drums. Now I believe some people use as many as a dozen or more microphones on a kit, which is *totally* ridiculous. Apart from anything else you're insulting the drummer by doing that; you're taking away the right of a drummer to play with any dynamics of his own. Because if you're splitting the kit up to that extent, it wouldn't matter whether it was going down in stereo or on to several tracks, the engineer still has total control over the drum kit—the drummer might as well be a bloody machine!

If I work for the first time with a drummer who's familiar with the recording process, quite often he can't understand what the heck is going on when he walks into the studio and sees only three mics. So you explain to him the principle of what you're going to do—and would he please mind taking all that tape crap off his drums—and invariably he'll look at you very strangely. I explain that the drum sound is down to him; how would *he* like his drumkit to sound? OK, I say, make it sound like that and I'll record it.

It is perfectly feasible to get an extremely present sound from a kit with just three microphones. In fact, the closer you put a microphone to any instrument—within reason of course—the more you *decrease* the presence of it; in essence you lose the *apparent* level almost entirely. A case in point: most people seem to mic guitar amps, acoustic guitars and that sort of thing much too closely. If the mic is backed off another foot or so you'll get far greater apparent level on the tape, providing, of course, that you have a room that has not been treated like a female's boudoir, with light blue shag-pile carpet on the walls, ceilings

and floor, interspersed with eiderdowns!

In the same way, sound leakage is actually very desirable sometimes. Studios are being built today where you couldn't achieve leakage if you wanted to, simply because sound doesn't travel in the room. Again, it is very disturbing for musicians to have the sound from their instruments stop within a foot or so. It's something of a novelty now to walk into a room and for somebody to be able to hear what you are saying more than 10ft away!

There is a studio that has been built in Nassau by Chris Blackwell (founder of Island Records) which is the first in this decade of which I'm personally aware, that's actually a really *live* room. So far I've done two albums in there and have talked with other musicians who've used the studio—they are all absolutely amazed by the fact that they can play without headphones. It's quite extraordinary how most musicians, once they have worked in studios for any period of time, no matter what room they are in, will automatically put cans on—even if they can hear perfectly well what's going on around them!

### **Best studios**

The best studios I've ever used, with very few exceptions, have been converted buildings of some age, and not purpose-built. Usually they were put together by people who did not have a deep knowledge of acoustics, and invariably hadn't a great deal of money either. London's Olympic Studios is a very good example of that approach. Keith Grant, who built Olympic twenty years ago, is a very knowledgeable and extraordinarily good engineer. While I don't think that Keith's knowledge of acoustics is superlative at all, with what little knowledge he had, plus a lot of common sense, he managed to build a remarkable room. The room is also very versatile; you can record just about anything in there, from a rock trio to an eighty-piece orchestra, with excellent results. I liked the place so much that I ended up using Olympic exclusively for some 12 years.

People seem to pick a studio—there was a phase of this not so long ago which still hasn't died out—because of how it looks and

not how it sounds. They don't really appreciate the fact that what they're actually doing is recording music. I don't really see how many of the studios built over the last ten years would actually do any business at all, if anybody thought about what they were really built for. There's no sound to them; they often have very little to do with music. Some of them, I suppose, are less repulsive than others, as far as the decor is concerned: some of them are extraordinary to walk into. But there are very few that have actually managed to combine the two things, a room that sounds good and is comfortable to work in as well.

I'm currently building a studio at my house and there is *no way* that I would allow an 'acoustics expert' near it. It seems to me that first of all acousticians are in rather an awkward position. They are employed by somebody setting up a studio, but who probably has little or no knowledge of the science of acoustics. So they are required by their clients to deliver the goods. Therefore, the 'expert' is going to take whatever precautions he can to make sure he does a reasonable job. He'll perhaps over-cook it more than a little to safeguard the end result. Because the acoustician is under a lot of pressure, and the client doesn't usually know what he wants, the designer could go out on a limb and create a room with 'character' only to discover that it was not the character the client really wanted. They think it's better to play safe and make the room maybe deader than it ought to be. So instead of a room with a specific sound and character, the room you end up with is simply characterless. It's really a communications problem more than anything else.

My main problem with it all is that I feel the art of building recording studios has gone beyond music. Acousticians are given the job of designing a studio that will operate within certain parameters. You see rooms that are divided down the middle, and one side is incredibly live—which is useless—and the other end is incredibly dead—which is equally useless! And somebody thinks they've done a job of covering all that's necessary to correct the acoustics for different jobs. You can pull curtains, or you can lower a ceiling and so on. Most of them end up looking like boutiques, and have nothing *whatsoever* to do with making music. More thought and money is spent on decor—shag-pile carpets and so on—than on anything else. There may be a lot of people who love it, and more power to them. But I just don't see what the hell it's got to do with recording.

I feel very strongly that Tom

## Glyn Johns



Hidley has done more damage to the design of recording studios than any other individual. Hidley has taken the industry by the ears and it has been convinced that his approach is the studio norm. I think that a lot of people are now beginning to realise that this sort of attitude underlines the general amateur state of the people currently making records these days. To my mind Eastlake studios have very little to do with the accurate recording of music at all. And, to cap it all, I recently heard that Tom Hidley has decided to build rooms with about 3½ seconds of mid-frequency decay in them. Having completely bugged up the whole industry for the last ten years, he's now got the liberty to say that he's come up with a new sound—and it's a semblance, in my view, of what recording studio acoustics should have been all along!

### Tracks

But studio design is just one aspect of how people are being conned into using more and more complex—and expensive—recording hardware. I see no need for any more than 16 tracks for most of my sessions. Apart from preferring the wider track format of 16-track, and hence a vastly improved quality off-tape, I think it's very much a case of if there's a track open you'll use it, or opt for the lazy way out and do several takes of an overdub. In the days of 4- and 8-track, if you recorded the guitar solo, vocal or whatever else, you had to decide there and then whether it was 'the one'. If a musician wanted to do the track again or the producer decided he could do better, you had to erase what had preceded it. I actually like to make the decisions like that; I don't like the idea of a week later during a remix having to go note for note through a solo, picking out the best from half-a-dozen takes. You can guarantee one of them is better than the others; admittedly a particular lick might be slightly tighter, but really it hasn't got a great deal to do with anything as far as the end result is concerned. It's

the *feel* of what is played that *really* counts.

If a musician is honest with himself, an album is about what he is *capable* of doing at *that time*. If you've only got one track left and a musician goes in to repeat a particular solo, he's going to make sure he does it better—or not bother. With four or five spare tracks you could be there all night with him saying: I just want to do one more, and so on. Invariably the take you did in the early part of the sessions is the best, simply because of the spontaneity. Which, to me, is what the performance of music is all about.

And the more tracks you use, the more complex it's going to be to remix. I find it very difficult to

result of mistakes! I'd forgotten something, overdone an effect or tried with a fresh approach.

The way in which I record simplifies the mixdown stage. I'll lay drums down on to two tracks, which gives me just a pair of faders to play with when I want to lift the kit. As far as the sound of the instruments is concerned, I don't use very much outboard equipment. The musician provides me with the sound in the studio and I just try and get it on the tape. So when I come to mix the tape it's just a refinement of what I've done already during track laying. To me, if you are recording a piece of music which is being played by a group of instruments, it is futile to listen to each section of that

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## ...the 'section' way of recording and mixing has been formulated by the 'average' engineer.

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understand how anybody can work on a given song or a piece of music for more than say three or four hours, without going totally beyond the beyond. I don't see how anybody can be that perceptive about what they are doing; it's difficult enough, if you have got any ego at all, when you are engineering or producing to be objective about what you are listening to. Rather than worrying whether you can hear the hi-hat within the first beat of the bridge, what's important is the *feel* of the song.

I don't understand why people need to take too long to mix a tape. In reverse, I can possibly be accused of mixing something too quickly, and perhaps not going back and doing it again until I have actually got it right. These days I very rarely take longer than three days to mix an album. When I worked with the Stones, we would mix for days on end. On occasions I would dig out a mix that I'd done in half an hour on my own, two weeks earlier, and play it to them and invariably they'd prefer it to what we had achieved after days of mixing.

I have found that by repeating four of five mix attempts I will build up to it just like a musician will during a performance. It has to retain a degree of spontaneity. Sure, I'll have a knowledge of the arrangement, and will remember that there is a lick here I want to pull out, or that the vocals are low on a particular line. Of course you plan that, but the overall dynamics of the piece of music—beyond the way you've recorded it and the way the musicians have played it—is something that *happens*. Some of the better mixes I have done were the

orchestra under a microscope without hearing anything else. Once you put them together they are going to alter, because different areas of the sound are being taken care of by each other.

The idea of computer mixing—'We'll just mix the rhythm sections, get that right; forget about it and then do the next bit'—to me that is alien, because I don't hear music in discrete sections like that. It's rather like asking a drummer to play on his own for half an hour while you get a drum sound; there's absolutely no way you're going to get a decent sound out of him while he is sitting playing on his own. After all, that sound won't have anything whatsoever to do with the way he'll be playing with the rest of the band. And as soon as you add other instruments the drum sound will alter. Different areas of sound that you hear might sound wonderful on their own, but when you put a bass guitar with them, they'll end up totally different.

### 'Average'

To me, the 'section' way of recording and mixing has been formulated by the 'average' engineer. Admittedly, some people can get great sounds by doing it piecemeal, but I don't work like that. The sort of music that I am recording is invariably more to do with *feel* than anything else.

The main thing for me is to be in decent rooms where I can really hear what's going on. Trouble is, most control rooms are built in such a way that the monitoring system has to be equalised to suit what some idiot has

done to the acoustics. Usually the room has been made far too dead, and it has no natural colouration at all. What the hell is a flat room? The description of being flat according to these people is a fair assessment of how most of the rooms sound: bloody awful! I disagree with the principle of equalising an amp and loudspeaker combination to suit a room; you should alter the room acoustics to make it sound right rather than add extra eq. It strikes me that the spectrum analysis technique that's used does not particularly relate to *music*, although it might have its uses in diagnosing some technical problems.

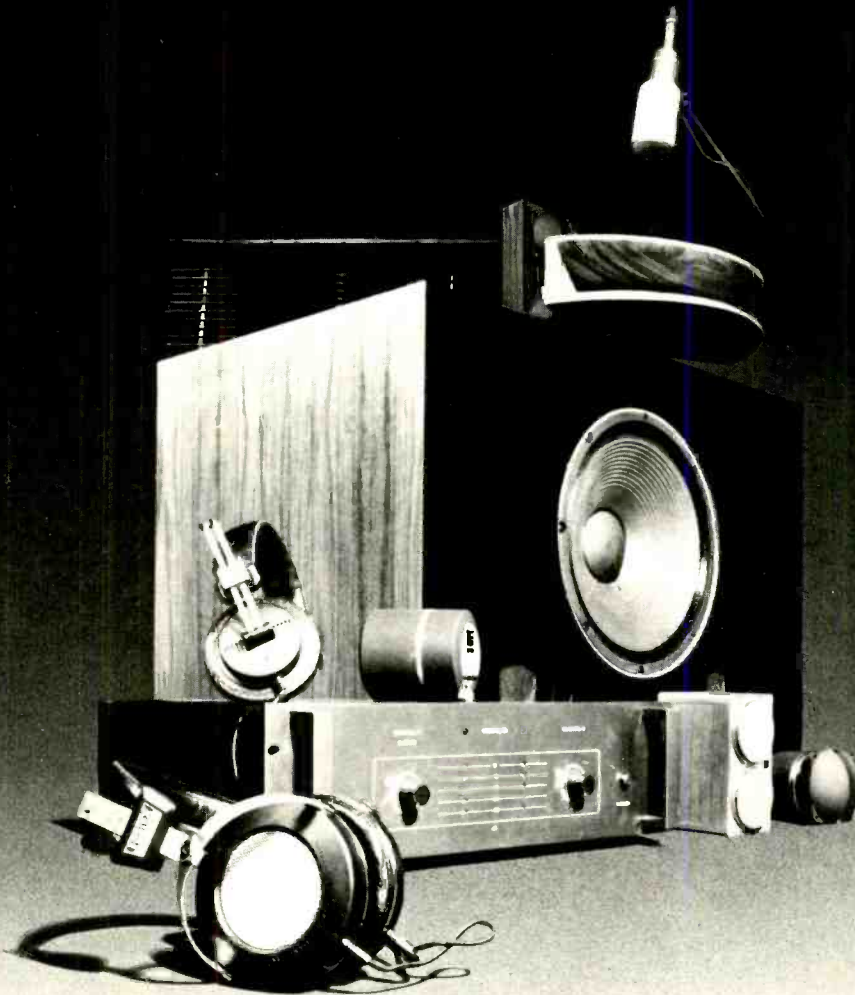
Also, I often come across a situation where the monitor loudspeakers have been mounted incorrectly in a control room, and you can't hear any *perspective* in the sound. There again, if you're working with a microphone up the gazoo of everything being recorded, then any perspective one achieves is done by faking it with echo or whatever else. In fact, that technique of close-miking doesn't give you much depth to the sound. During recording, I'll use more distance miking and will really be putting the control-room acoustics to the test. If the acoustics are heavily damped, the mix ends up sounding virtually mono; there's little or no distinction, in the stereo spread, of depth. It *may* be there, but I can't hear it because of the acoustics in the room.

So immediately I'm in terrible trouble; I don't know what I'm listening to and cannot make the refinements in the sound that I want and since I like to check everything and make adjustments as I'm going along, rather than later during the mix, it puts me at a great disadvantage. I actually hate to mix in a room where I haven't recorded, since I have very rarely found two rooms which are that compatible.

### Eq

When I'm remixing I very rarely eq. I might put a touch of echo on something or tivate it a little, but it's basically all there already on the track. All I need to be able to do is sit and concentrate, and get the balance exactly the way I want it. To do that I really need to be able to hear what's being laid on tape.

The way that I record is really such a complete opposite from the ever-popular multimic technique that I don't expect anyone else to be in sympathy with it, or even to agree with me. However, I do think there's a mid-way compromise that people could adopt; something a bit simpler, and which relies more on room acoustics to let them know what's going on.



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## Glyn Johns



One of my main complaints is—and this has gone on for years—that there doesn't appear to be any dialogue between the manufacturers and the people who operate the equipment. I've asked a lot of well-known engineers in the States and I haven't met anybody yet who's ever been approached, or had any dialogue with any of the manufacturers. It seems there's a brick wall thirty feet high between the people who use the equipment and the people who make it, and that is totally absurd. We're being dictated to by hardware manufacturers.

To a certain extent we have to be, of course. In the first studio I ever worked in, IBC, there was a very large maintenance department, much larger than you'll find in most modern studios: five or six blokes looking after three studios and what they were doing was research and development; you know, making limiters, new pieces of equipment and so on, which I believe is what a good studio should do. The people were employed specifically to do not only maintenance, but also R&D. The point is, there was a totally different approach to recording from the two factions, the maintenance and the operational. It's always been the same, throughout all the studios I've been to: the technical man has one kind of mentality, if you like, and the operational has another, and very seldom do the two ever mix, meet and converse; and it's an inherent problem, the two different mentalities. Very rarely you'll meet an engineer who actually knows a lot about maintenance. It isn't very often, and, frankly, I think it's a disadvantage. Anybody who's that technically orientated, in my opinion, invariably becomes bound up by their knowledge of the equipment, and therefore the way they use it. They're too busy applying their brains to what that particular piece of equipment is doing in order to achieve the end result. You may come up with remarkable new sounds that way, but the musical application of them is often not particularly wonderful.

Because there isn't the dialogue, the communication, between the

technical and the operational sides—in this case, the manufacturers and the users—we're being dictated to by the manufacturers. Mind you, if I was a manufacturer and I heard someone say that, I'd probably say: 'Well, bullshit, we form our own opinions', 'We get feedback from our people on the road who sell these things' or 'We send out forms for people to fill in' or something like that. But the lack of communication is a problem, particularly with things like tape machines and microphones (consoles, for example, are a different matter altogether). As far as I'm concerned, the sound of any of the tape recorders on the market today, the musical, reproductive sound of them, is largely a matter of luck. If they're all working to the same sort of specifications, the same s/n ratio, the same whatever—lack of distortion in their reproduction, for instance—why, then, do they sound so completely and utterly different?

### Flexibility

As far as recording equipment is concerned I think that the hardware manufacturers are actually degrading the industry at present, rather than improving it. Young kids have been trained as engineers and producers and are being shown one way to work, and are being given facilities that are not nearly flexible enough. The net result is the whole thing is becoming incredibly bland.

Consoles are far too complex these days; so many knobs and

buttons to find—even without automation. When working with in-line desks, in particular, you can't see a bloody thing, and to get to the eq section you need to have a neck like a giraffe. I much prefer a wrap-around style with angled sections—like the earlier Helios desks built by Dick Swettenham—simply because everything is within easy reach of a central mix position.

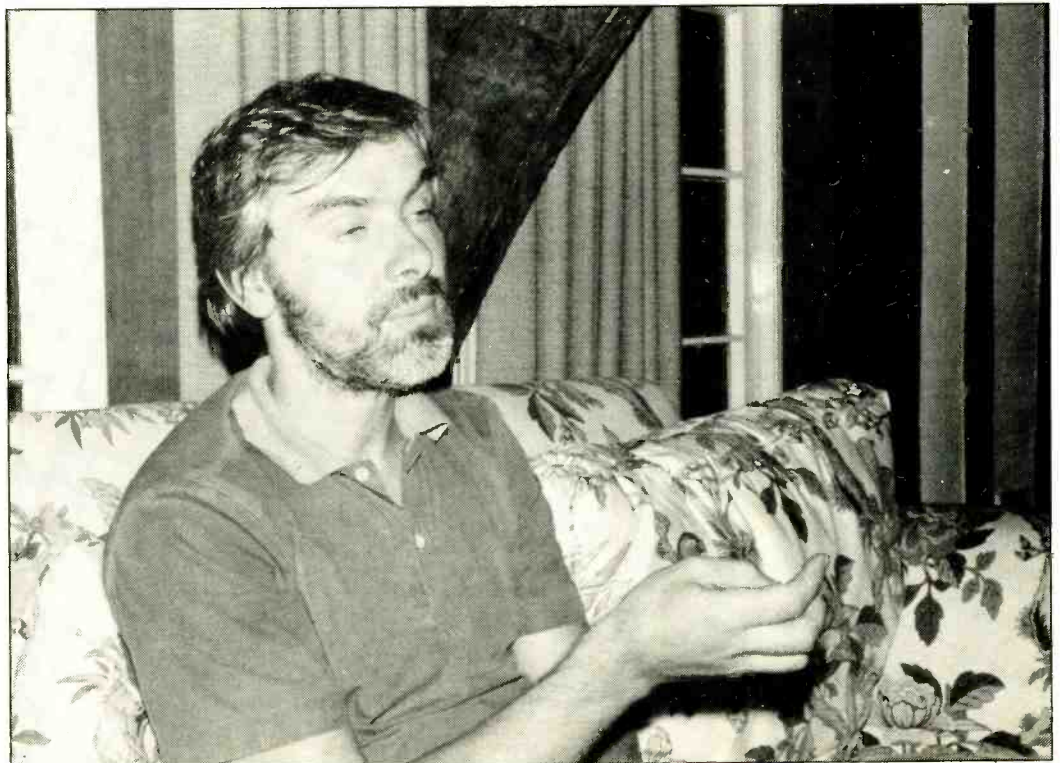
Because of my frustration as to what is available today in the way of consoles, I've actually turned to making one myself, because I didn't have the confidence in current equipment, to get the sound that I wanted. Geographical layout is something separate—something you can usually deal with but I'm talking about the consistency of the sound, and it's based more on the fact that I loathe transformers, and transistors—the front and end stages of my desk will have valve stages available. Added to that is another problem, that's become more and more important over the last ten years, and that is the fact that every time you bring the sound up the desk to mix, you get the inherent sound of the desk twice. There are some desks where, by pure fluke, it actually enhances the sound—Dick Swettenham's first desk at Olympic, for example.

### Valve mics

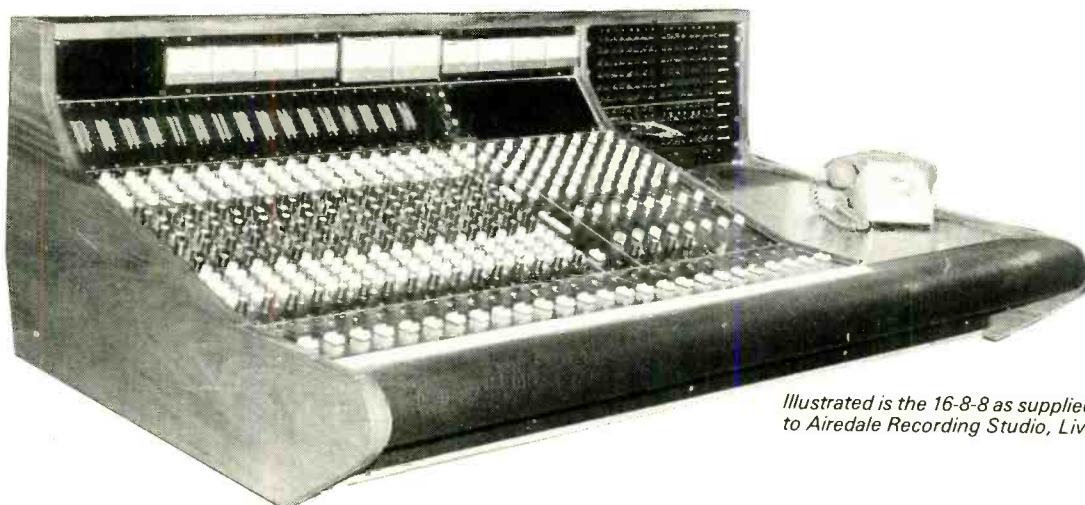
Being so dependent on letting the mics do most of the work for me, another frustration I have is that valve mics are becoming more and

more scarce. It recently took me two years to find three Neumann valve U47s; I only need one but had to buy three to keep just one of them operational. For years now there's been all this talk about valve versus solid-state; there really is such a hell of a difference as far as mics are concerned, that I'm absolutely amazed that nobody has started to make valve mics again. I think a lot of engineers would use them if they could get their hands on them. The extraordinary thing is that valve mics have become something of a novelty; there are a lot of older established studios in America that have got one or two tucked away for discerning clients. To me Neumann and AKG are turning out diabolical mics these days. Their mics have got worse and worse, ever since the use of FETs. I don't think that companies producing these mics pay enough attention to what they are used for—to record music. The 'art' of building equipment has become so scientific that it has gone beyond the musical sound, which is *not* a 10kHz tone and never will be.

It's about time that engineers and producers called a halt to this technology spiral in which we—the users of all this gleaming hardware—have found ourselves. Manufacturers that introduce 'new and improved' consoles, microphones, theories of acoustics, etc, simply for the sake of bringing out more complicated product lines—which they can then argue studios into buying—are doing the recording industry at large a great disservice. Innovation is one thing; change for change's sake is something else again. ■



# AIREDALE studio mixer



*Illustrated is the 16-8-8 as supplied to Airedale Recording Studio, Liversedge*

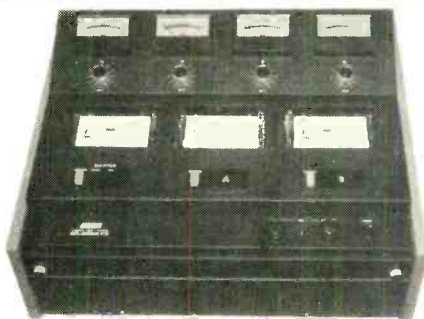
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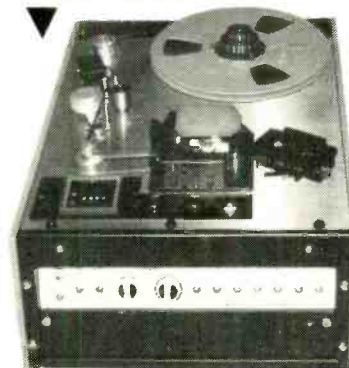
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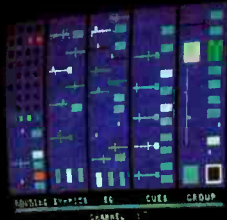
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TUBES: 0  
MIXING: 0  
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REV	REV	COPY
PREP	SETUP	JUMP
LOAD	COPIE	DRIVE IN
SAVE	PEAK	CYCLE
DELETE	MAPE	DEL. RTE
TRAC	TRAC	TRAC
AT	AT	AT
CC	CC	CC

1 2 3 4 5 6 7 8 9 0  
Q W E R T Y U I O P  
A S D F G H J K L  
Z X C V B N M

MONITORS

STOP

PLAY

READY TAPE

47

18

10

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5

10

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OUTPUT

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OUTPUT



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To the recording executive who must meet the imminent needs of an aware and creative clientele; and to the film, video and broadcast specialists confronted by increasingly sophisticated live and post-production audio requirements; and to the producers, directors and performers who rightly insist on subtler perfection and bolder invention; to all of these professionals, one good thing is becoming increasingly clear.

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#### Enlightened Professionals

American Broadcasting Company  
British Broadcasting Corporation  
CGD Records - Milan, Italy  
Country Lane - Munich  
Danish Broadcasting System  
Eden Studios - London  
Golden Age - Los Angeles

Europa Film - Stockholm  
Hansa Tonstudios - Berlin  
Kendun Recorders - Burbank  
Larrabee Sound - Hollywood  
Le Studio - Montreal  
Nidaros Studios - Trondheim

Olympia Studios - Munich  
Onkio Haus Studios - Tokyo  
Pete Townshend - London  
Power Station Studios - New York  
Producers Colour - Detroit  
RCA Records - Mexico City  
Ridge Farm Studios - Surrey, UK

Record Plant - Los Angeles  
Splash Studios - Naples  
Tocano Studios - Denmark  
Townhouse Studios - London  
Union Studios - Munich  
Yamaha Studios - Los Angeles

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#### North & South America

Musicworks International  
2352 Wisconsin Avenue NW  
Washington, D.C.  
U.S.A. 20007  
(202) 333-1500  
Telex 440519

#### U.K. & Europe

Solid State Logic  
Churchfields Road  
Stonesfield, Oxford  
England OX7 2PQ  
(099) 389-8282  
Telex 837400

**Solid State Logic**

**Master Studio Systems**

# Survey: microphones

This survey covers microphones used in studios and for music PA, but excludes many small mics designed for public address purposes. Where possible, mic variations are given, but where there are numerous versions with different sockets, clamps, carrying cases, etc these are not detailed. Next month's survey will cover mic stands, booms and radio mics.

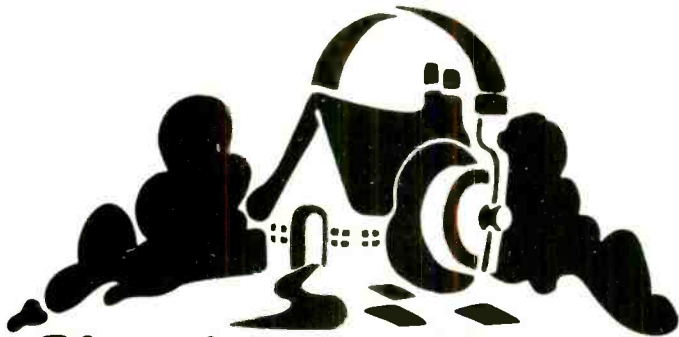
## KEY

**Transducer type:** D – dynamic moving coil; R – ribbon; DR – double ribbon; C – capacitor; E – electret; PG – pressure gradient.  
**Polar response:** O – omnidirectional; C – cardioid; HC – hypercardioid; SC – supercardioid; 8 – figure-of-eight; V – various; VS – various switchable; S – special.

Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
<b>AKG (Austria)</b>						
AKG GmbH, Brunhildengasse 1, A-1150 Wien. Phone: (0222) 92.16.47. Telex: 11839.						
UK: AKG Acoustics Ltd, 191 The Vale, London W3 7QS. Phone: 01-749 2042. Telex: 28938.						
USA: AKG Acoustics Inc, 77 Selleck Street, Stamford, Connecticut 06902. Phone: (203) 348-2121.						
D12	D	C	200	0.22	£95	
D58	D	HC	200	0.072	£31.50	Talkback microphone
D110	D	O	200	0.10	£48.80	Lavalier microphone
D130	D	O	200	0.17	£45	
D140	D	C	200	0.23	£63	Bass cut switch
D160	D	O	200	0.12	£63	
D170	D	C	200	0.19	£72	
D190	D	C	200	0.23	£51.50	
D202F1	D	C	200	0.16	£97.70	2-way system, bass cut switch
D222EB	D	C	250	0.15	£90	2-way system, bass cut switch
D310	D	C	200	0.12	£52	
D320B	D	HC	200	0.14	£70	3 position bass cut switch
D330BT	D	HC	200	0.13	£88	3 position bass cut switch
D900	D	SC	200	0.30	£96.60	Shot gun microphone
D1200	D	C	200	0.23	£66	Bass cut switch
D2000	D	C	200	0.23	£78	Bass cut switch
C501-10	E	C	200	0.35	£60.90	
C505-10	E	C	200	0.35	£75.60	
C535EB	E	C	200	0.9	£118	4 position bass cut and attenuator switch
C567E	E	O	200	0.6	£92	Tie clip microphone
C34 comb	C	VS	200	0.45	£890	Stereo microphone
C414EB	C	VS	150	0.6	£284	Bass cut switch, 2 position pre-attenuator switch
C422 comb	C	VS	200	0.6	£985	Stereo microphone
C424 comb	C	C	200	1.1	£890	Quadrophonic microphone
CMS range of	pre-amplifiers, capacitor capsules and accessories					
C451	amp only	200	—	—	£63.70	Pre-amp for 9 to 52V power supply
C451EB	amp only	200	—	—	£78.30	Same as C451 but with 2 position bass cut switch
C452EB	amp only	200	—	—	£78.30	Pre-amp for 48V power supply with 2 position bass cut
CK1	C	C	200	0.95	£41.40	Standard capsule
CK1S	C	C	200	0.95	£41.40	Presence boost
CK2	C	O	200	0.8	£41.40	
CK4	C	8	200	0.5	£118	
CK5	C	C	200	0.95	£78.40	Built-in windshield
CK8	C	SC	200	0.5	£78.40	Short shotgun
CK9	C	SC	200	1.1	£95	Long shotgun
CK22	C	O	200	0.8	£48	Built-in wind and pop screen
All output values are in units mV/μB at 1kHz.						
<b>ALTEC (USA)</b>						
Altec Corp., 1515 South Manchester, Anaheim, Cal 92803. Phone: (714) 774-2900. Telex: 655415.						
UK: Theatre Projects Services Ltd, 10 Long Acre, London WC2E 9LN. Phone: 01-240 5411. Telex: 27522.						
D60	D	O	200	—	60dBm	lavalier
D80C	D	C	200	—	59dBm	grey metallic finish
D81	D	O	200	—	54dBm	satin chrome
D90P	D	O	200	—	58dBm	satin chrome
C61L	E	O	200	—	54dBm	miniature lavalier
C70C	C	C	200	—	40 to -70dBm	satin chrome
C71	C	O	200	—	40 to -70dBm	satin chrome
<b>ASTATIC (USA)</b>						
Astatic Corp, PO Box 120, Conneaut, Ohio 44030. Phone: (216) 593-1111. Telex: 980712.						
950S	D	C	150	—	54dB	£58.90 Contoured, switch
925S	D	C	150	—	54dB	£58.90 Flat, switch
855S	D	C	150	—	54dB	£61.23 Contoured, switch



AKG C422



## Hardware House

### Sales:

Exclusive distribution of Nady, Nasty Cordless Systems for use with guitar, bass, sax and hand held microphones. Distributors of the revolutionary PZM microphone. Amcron Power Amplifiers, JBL speakers, Beyer, Electrovoice, Shure, Sennheiser and AKG microphones. Custom built communications and Tannoy systems for Theatre and Clubs.

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PA Systems for Theatre and the Music Industry using Amek mixers, Amcron Amplifiers, JBL and ATC speakers. Full range of effects available.



For further details please contact Richard Kershaw on 01 226 7940  
Hardware House Sound Limited  
1-7 Britannia Row, Islington, London N1 8QH



## Rycote Microphone



## Windshields

for capacitor microphones  
SENNHEISER  
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beautifully made — to last

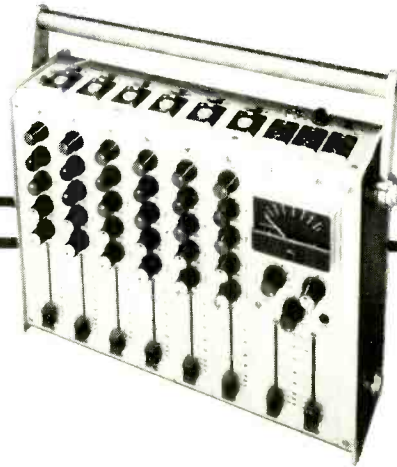
as used by the BBC,  
Samuelson Film Services,  
and all leading European  
Broadcasting Organisations

Rycote Microphone Windshields, New Mills, Slad Road, Stroud, Gloucestershire GL5 1RN, England.

Tel. 04536 79338

# DID YOU KNOW

THAT



**ADO45 PICO PLUS MIXER** can now be supplied with Penny and Giles 3000 series faders (6 some slot and fixing centres Ruwido faders).

These can also be retro-fitted to existing mixers.

Please telephone Anthony Levesley for details.



Developments

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

# Survey

Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
<b>Astatic cont'd</b>						
852S	D	C	150	-54dB	£61.23	Flat, switch
850A	D	C	150	-54dB	£58.90	Flat
850SA	D	C	150/40k		£65.88	Flat, switch
857H	D	C	40k	-57dB	£46.50	Peak, free
857HS	D	C	40k	-57dB	£50.38	Peak free, switch
857L	D	C	150	-57dB	£46.50	Peak free
857LS	D	C	150	-57dB	£50.38	Peak free, switch
815S	D	C	150	-54dB	£51.93	Contoured, switch
812S	D	C	150	-54dB	£51.93	Flat, switch
810A	D	C	150	-54dB	£49.60	Flat
810SA	D	C	150/40k		£63.55	Flat, switch
1070	D	O	150	-54dB		

**AUDIO-TECHNICA (Japan)**  
**Audio-Technica Corp. 2206 Naruse, Machida, Tokyo 194.**  
**Phone: 0427-22-7641. Telex: 2872-357.**  
**USA: Audio-Technica US Inc, 33 Shiawassee Avenue, Fairlawn, Ohio 44313.**  
**Phone: (216) 836-0246. Telex: 986411.**  
**UK: Audio Technica Ltd, Unit 6, Hunslet Trading Estate, Low Road, Leeds, Yorks.**  
**Phone: 0532-771441. Telex: 557991.**

AT801	E	O	600	-48dB	£37.56	XLR
AT811	E	C	600	-56dB	£41.61	XLR
AT802	D	O	600	-56dB	£37.56	XLR
AT812	D	C	600	-60dB	£45.47	XLR
AT803S	E	O	600	-57dB	£30.08	Submit lavaliere
AT813	E	C	600	-55dB	£49.43	XLR

**BEYER (West Germany)**  
**Beyer Dynamic, PO Box 1320, D-7100, Heilbronn.**  
**Phone: 071 31.82.348. Telex: 728771.**  
**UK: Beyer Dynamic (GB) Ltd, 1 Clair Road, Haywards Heath, Sussex RH16 3DP.**  
**Phone: 0444 51003.**  
**USA: Burns Audiotechnics Inc, 505 Burns Ave, Hicksville, NY 11801.**  
**Phone: (516) 935-8000.**

Beyer M600NCS



M160N	DR	HC	200	-60dB	£165.99	DIN
M160C	DR	HC	200	-60dB	£170.48	XLR
M260NS	R	HC	200	-61dB	£76.59	DIN, switch
M260NCS	R	HC	200	-61dB	£76.59	XLR, switch, clamp
M500N	R	HC	200	-61dB	£87.96	DIN
M550C	R	HC	200	-61dB	£93.52	XLR, clamp
M69N	D	C	200	-52dB	£58.64	DIN
M69C	D	C	200	-52dB	£62.65	XLR, clamp
M88N	D	HC	200	-52dB	£125.38	DIN

Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
M88C	D	HC	200	-52dB	£129.48	XLR, clamp
M101N	D	O	200	-58dB	£78.85	DIN
M101C	D	O	200	-58dB	£85.07	XLR, clamp windshield
M111N	D	O	200	-62dB	£93.36	Lavaliere, lead
M201N	D	HC	200	-59dB	£75.53	DIN, clamp, windshield
M201C	D	HC	200	-59dB	£78.01	XLR, windshield
M600NCS	D	HC	250	-56dB	New models	XLR, hum-bucker, inbuilt 'pop' filter, 3-way bass atten

MC series comprises CV710 pre-amp for 48V phantom powering, CV720 for 12V phantom powering and the CK701/2/3/4/6/7 range of capsules. With DIN or XLR connectors.

MC711/721	C	O	200	-41dB	£165.99	Modular
MC712/722	C	O	200	-41dB	£179.83	Modular, pop shield
MC713/723	C	O	200	-39dB	£183.28	Modular
MC714/724	C	C	200	-39dB	£197.12	Modular, pop shield
MC716/726	C	SC	200	-39dB	£257.95	Modular, short shot gun
MC717/727	C	HC	200	-39dB	£324.95	Modular, long shot gun

**B & K (Denmark)**  
**Bruel & Kjaer, DK-2850 Naerum.**  
**Phone: 02 80.05.00. Telex: 37316.**  
**UK: B & K Laboratories Ltd, Cross Lances Road, Hounslow, Middx TW3 2AE.**  
**Phone: 01-570 7774. Telex: 934150.**

**USA: B & K Instruments Inc, 185 Forest Street, Marlborough, Mass 01752.**  
**Phone: (617) 481-7000.**  
 The company is better known for its instrumentation microphones, but points out that several are suitable for music recording.

4133	C	O	25	12.5		3.9kHz to 40kHz
4165	C	O	25	50		3kHz to 20kHz

A suitable pre-amplifier for these capsules is model 2619. Output figures are in units of mV/PA.

**CALREC (UK)**  
**Calrec Audio Ltd, Hangingroyd Lane, Hebden Bridge, Yorks HX7 7DD.**  
**Phone: 0422 842159. Telex: 51311.**  
**USA: Edcor, 16782 Hale Avenue, Irvine, Cal 92714.**  
**Phone: (714) 556-2740. Telex: 685557.**

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

CM1001C	C	O	1k	0.8	£80	hand-held
CM1050C	C	C	1k	0.8	£80	—
CM1051C	As	CM1050C	with bass roll-off		£80	—

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

CM2001C	C	O	1k	0.8	£90	CC01 capsule
CM2003C	C	O	1k	0.8	£90	CC03 capsule
CM2050C	C	C	1k	0.8	£90	CC50 capsule
CM2051C	C	C	1k	0.8	£90	CC51 capsule
CM2056C	C	C	1k	0.8	£90	CC56 capsule

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

CM2101C	C	O	1k	0.8	£106	CC01 capsule
CM2103C	C	O	1k	0.8	£106	CC03 capsule
CM2150C	C	C	1k	0.8	£106	CC50 capsule
CM2151C	C	C	1k	0.8	£106	CC51 capsule
CM2156C	C	C	1k	0.8	£106	CC56 capsule

CM10 7.5 to 50V phantom-powered talkback mic on 320mm non drop stem £128.66

Output figures are in units of mV/µB.  
 CM600 series of professional entertainment microphones, DIN connectors with unbalanced outputs requiring 45 to 50V, not phantom.

CM602D	C	O	500	-127dB	£44	Vocal/instrumental
CM652D	C	C	500	-127dB	£44	Instrumental
CM654D	C	C	500	-127dB	£46.30	Vocal compensated
CM656D	C	C	500	-127dB	£54.70	Vocal comp, windshield

CM4050 Soundfield microphone. This comes complete with the Soundfield Control Unit CS5014/3 and is designed primarily for surround sound and ambisonic recording, and allows post session control of stereo microphone operational mode and position. Greater rigging flexibility reduces setting up time.  
**Price: £2,600.**

**CROWN/AMCRON (USA)**  
**Crown International, 1718 West Mishawaka Road, Elkhart, Indiana 46514.**  
**Phone: (219) 294-5571. Telex: 810-295 2160.**  
**UK: HHB PA Hire, Unit F, New Crescent Works, Nicoll Road, London NW10.**  
**Phone: 01-961 3295. Telex: 923393.**

**PZM Series**  
**PZM-6LP/30GP**  
 Pressure zone microphones using the Pressure Recording Process, offering improved sound quality resulting from the lack of phase interference within the pressure zone the microphone operates in. Both models are similar in appearance, being a plate assembly and cantilever/transducer assembly mounted on the plate — the PZM-6LP is 2½ x 3in with cable output, while the

# Like Father...

How many times have you listened to playback in the main control room (or mobile), then moved to a re-mix suite and heard a totally different sound because the monitors in each location possessed totally different sound characteristics?



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**The Name for Loudspeakers**

**Tannoy Products Ltd.**

77/79 High Street, Watford, Herts WD1 2DT  
Telephone: Watford (0923) 48868

# Survey

Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
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## Crown/Amcron cont'd

PZM-30GP is 5x6in with an XLR socket output. Both require either a PX-18 transformer or PA-18 transformer or PA-18 active power supply, being battery or phantom powered. For best results, both mics should be mounted on a much larger flat surface (4ft square or larger).

Prices: on application.

## C-TAPE (UK)

C-Tape Developments, 97 Blackberry Lane, Four Marks, Alton, Hants.  
Phone: 0420 63623.

### C-ducer System

Contact transducer system in the form of tapes, that are fixed to musical instruments and available in three sizes, 3in, 8in and 30in. The manufacturer claims a virtual absence of spill and feedback. The type of instrument determines the choice of tape. Power supply/pre-amp available in several formats — mono, stereo, two channel, six channel with mixer (for drums) mains, battery or phantom powered versions.

Prices: from £59.

## D.I. TAPES (UK)

D.I. Tapes Ltd, 107 Park Street, London W1Y 3TA.  
Phone: 01-629 6223. Telex: 298404.

### Magnasound contact condenser mic

Sensitive condenser contact mic designed to be attached to the soundboard of a musical instrument and picks up only the vibration of the instrument and no spill. Mic contains own pre-amp circuitry and requires the use of the Powerpack which supplies balanced or unbalanced outputs. Battery or phantom powered.

Price: approx £150.

## EAGLE (Japan)

UK: Eagle International, Precision Centre, Heather Park Gate, Wembley HA0 1SV.  
Phone: 01-902 8832. Telex: 922131.

PROM20	E	C	600	-62dBV	£48.35	—
PROM40	E	HC	600	-54dBV	£36.50	'Rifle' mic
PROM60	E	O	600	-62dBV	£39.95	Tie-clip mic
PROM70	E	C	600	-62dBV	£39.95	10dB f to b
PROM80	D	C	200	-64dBV	£42.50	Body as M70
PROM90	D	C	600	-64dBV	£49.95	—
SME900	E	O	600	-70dBV	£27.50	Stereo mic
CO-96	E	O	600	-62dBV	£27.95	'Pencil' mic

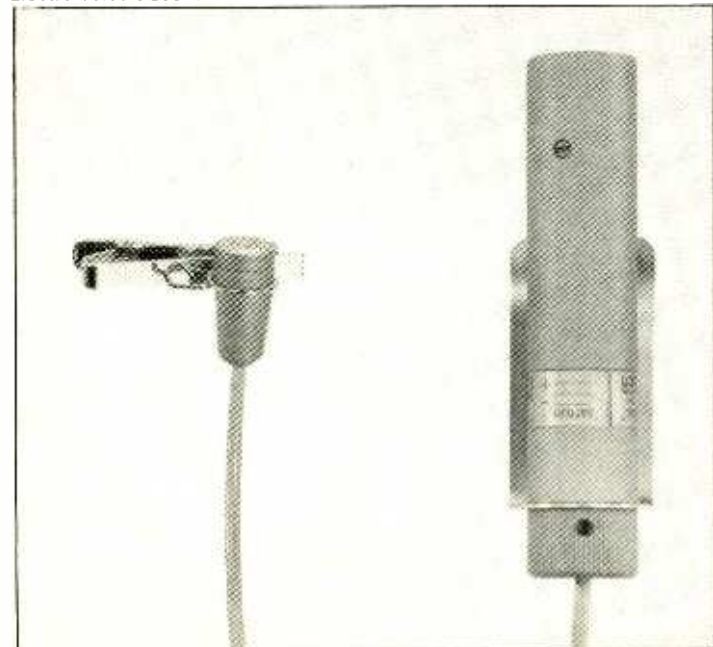
All output values are in units of dBV/Pa ( $\pm 3$ dBV).

## ELECTRO-VOICE (USA)

Electro-Voice Inc, 600 Cecil Street, Buchanan, Michigan 49107.  
Phone: (616) 695-6831.

UK: Electro-Voice (Gulton Europe) Ltd, Maple Works, Old Shoreham Road, Hove, Sussex BN3 7EY.  
Phone: 0273 23329/778401. Telex: 87680.

Electro-Voice CO90 and CO90E



Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
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RE10	D	SC	150	-56dB	£99.50	Bass tilt switch
RE11	D	SC	150	-56dB	£109.50	Bass tilt switch
RE15	D	SC	150	-56dB	£159.50	Bass tilt switch
RE16	D	SC	150	-56dB	£169.50	Bass tilt switch
RE18	D	SC	150	-57dB	£169.50	Bass tilt switch, shock mount
RE20	D	C	Several	-57dB	£274.50	Shock mounting
627C	D	O	Lo/Hi	-58dB	£54.50	Bass emphasis
631B	D	O	Lo/Hi	-56dB	£54.50	—
660	D	SC	Lo/Hi	-56dB	£69.50	Close use
671A	D	C	Lo/Hi	-57dB	£59.50	General purpose
DO54	D	O	150	-58dB	£69.50	Boom or stand
DO56	D	O	150	-61dB	£89.50	Shock isolated
DS35	D	C	150	-60dB	£74.50	Blast filter
RE50	D	O	150	-55dB	£109.50	Noise-free
RE55	D	O	150	-57dB	£149.50	40Hz to 20kHz
1776	E	C	150	-50dB	£79.50	Blast filter
1777	E	C	150	-54dB	£95	Close use
CS15P	E	C	150	-45dB	£194.50	40Hz to 18kHz
CO90	E	O	150	-57dB	£85	Lavalier mic
CO94	E	O	150	—	New model	Upgraded CO90
CO85	E	O	150	-56dB	£104.50	Mini mic
RE85	D	O	50/250	-61dB	£89.50	Lavalier mic
RE51	D	O	50/250	-54dB	£119.50	Headset
644	D	C	Lo/Hi	-53dB	£119.50	Gun mic
DL42	D	C	150	-50dB	£309.50	Gun mic
CL42S	E	C	250	-33dB	£450	System C
CH15S	E	HC	150	-40dB	£350	System C
PL77AA	C	C	150	—	poa	B/Cast vocal mic

## EPM (Canada)

RD Systems of Canada Ltd, 2 Thorncliffe Park Drive, Unit 28, Toronto, Ontario M4H 1H2.

Phone: (416) 421-5631.

UK: John Page Ltd, Wesley House, 75 Wesley Avenue, London NW10.  
Phone: 01-961 4181. Telex: 24224.

P650 A parabolic microphone with a clear plastic reflector, built-in equaliser, pre-amp and speech/music. Also provided is a headphone output for onsite monitoring. Power from two 9V batteries.

Prices: \$399.

S1000 Similar to P650 but with twin microphone capsules side-by-side for stereo pickup.

P200 Non-electronic version of P650.

Price: \$199.

S300 Non-electronic version of S1000.

Price: \$299.

These EPM parabolic microphones were developed in conjunction with Dan Gibson.

## FRAP (USA)

FRAP, PO Box 40097, San Francisco, Cal 94140.

Phone: (415) 431-9350.

UK: Peavey Electronics (UK) Ltd, Unit 8, New Road, Ridgewood, Uckfield, Sussex TN22 5SX.

Phone: 0825 5566. Telex: 957098.

### Flat Response Audio Pickup Type F Professional Series

System containing 3 piezoelectric pickups in one transducer to respond to vibration in 3 dimensions. Range of pre-amps with balanced and unbalanced outputs, two and single channel systems, various output levels and impedances with battery or mains models.

## KEITH MONKS (UK)

Keith Monks (Audio) Ltd, 26-28 Reading Road South, Fleet, Hants GV13 9QL.

Phone: 02514 20568. Telex: 858606.

USA: Keith Monks (USA) Inc, 652 Glenbrook Road, Stamford, Connecticut 06906.  
Phone: (203) 348-4969.

C133D	D	O	200	-71dB	£49.84	Hand or stand
C133K	As C133D	with on/off switch			£54.40	
C133SU	As C133K	with XLR connector			£63.65	

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

MO97D D O 200 -55dB £64.30 DIN and switch

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

## MELODIUM (France)

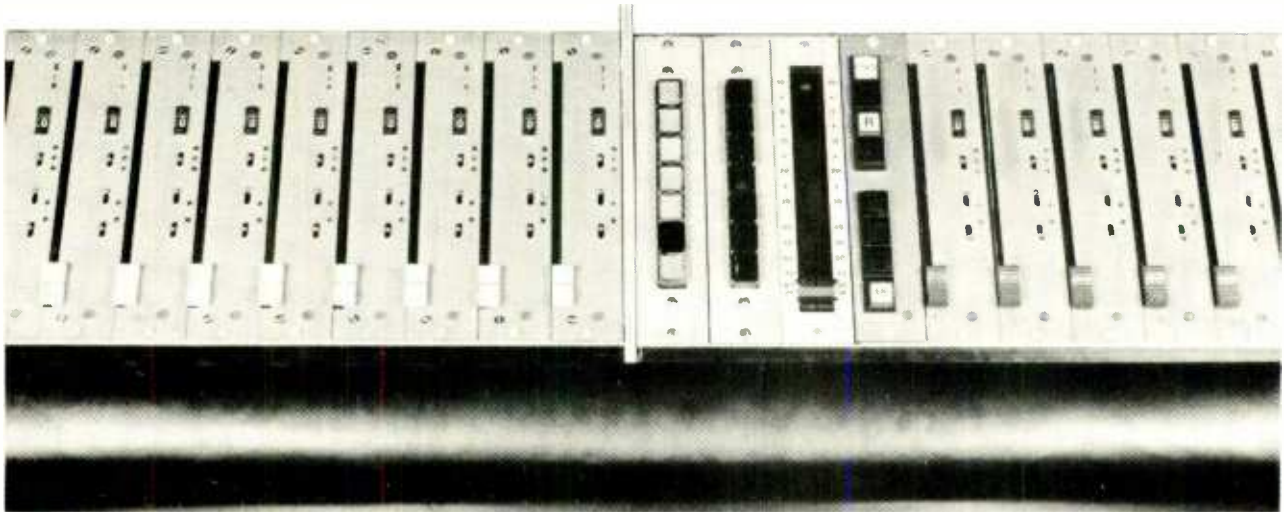
UK: Amdio Ltd, 26-28 Reading Road South, Fleet, Hants GV13 9QL.

Phone: 02514 20568. Telex: 858606.

C133	D	C	10/200	—	£49.84	General purpose, DIN/XLR
M110D	D	C	—	—	£21.86	PA, on/off switch
M121E	E	C	600	—	£49.28	On/off switch
M097D	D	C	200	—	£64.30	On/off switch, DIN/XLR
79A	D	O	200/50k	—	£35.50	Lavalier



# Melkuist GT800 Automation System



## MELKUIST GT800 AUTOMATION SYSTEM

IT IS BY FAR AND AWAY THE EASIEST TO USE AND ECONOMICAL DISK BASED AUTOMATION SYSTEM CURRENTLY AVAILABLE.

UP TO 64 CHANNELS AND 64 SEPARATE CUT FUNCTIONS PER FRONT END MODULE CAN BE AUTOMATED.

IT USES SMPTE/EBU TIMECODE AS ITS TIME SIGNATURE AND ACHIEVES DOUBLE EBU SCAN RATE.

THE VOLTAGE INPUT-OUTPUT SCALE CAN BE ADAPTED FOR ALMOST ANY DC CONTROLLED APPLICATION.

FRONT END ADAPTOR PACKAGES ARE AVAILABLE AS STANDARD FOR HARRISON TRIDENT, AND ALLISON EQUIPPED AUTO-READY CONSOLES.

RETROFIT MELKUIST FADER MODULES ARE ALSO AVAILABLE FOR NEVE 35 MM & 40 MM WIDE CHANNELS, CADAC LONG THROW FADERS AND ALSO AS A STAND ALONE FADER-ONLY CONSOLE FOR INSERTION INTO JACKFIELDS.

ANY CURRENT, AUTO-READY CONSOLE CAN INTERFACE WITH GT800 AND VIRTUALLY ALL SEPARATE FADER CONSOLES CAN BE UPDATED TO USE IT.

AS A THIRD GENERATION SYSTEM, GT800 IS UNIQUE IN THAT THE LEVEL OF AUTOMATION HAS BEEN EXTENDED TO COVER ALL THE FILE HANDLING ETC., THAT PREVIOUSLY HAD TO BE DONE MANUALLY BY THE ENGINEER.

SPECIAL INTERFACE PACKAGES ARE AVAILABLE TO RUN VIDEO SWEETENING IN A TOTALLY TRANSPARENT MANNER, GT800 FUNCTIONING AS AN EXTRA SLAVE MACHINE.

THE DISK MEMORY IS SPECIALLY SILENCED TO OPERATE IN THE CONTROL ROOM TO AVOID THE NEED FOR SPECIAL COOLING SYSTEMS ETC.

'BUSY' 10 MINUTE TAKES OCCUPY ABOUT 15% OF ONE OF THE EIGHT STORAGE AREAS AND FACILITIES ARE EVEN AVAILABLE TO DOUBLE THE AREA IF REQUIRED.

INSTALLATION DOES NOT REQUIRE SPECIAL TRUNKING SINCE ALL MAJOR DATA HIGHWAYS RUN IN STANDARD SINGLE SCREENED CABLES.

CUSTOMISING OF INSTALLATIONS IS SIMPLE SINCE SPECIAL SOFTWARE PACKAGES CAN BE SUPPLIED AS OPTIONS TO THE STANDARD AUTOMATION OPERATING SYSTEM. THUS IF SYSTEM USE ALLOWS AND TERMINAL / PRINTER OPTIONS ARE INSTALLED, BUSINESS AND WORD PROCESSOR PACKAGES CAN BE RUN.

COMPREHENSIVE SELF TESTING SOFTWARE IS INCLUDED AS STANDARD.



**Melkuist Ltd.**  
**AUTOMATION SYSTEMS**

35A Guildford Street, Luton,  
Bedfordshire, England LU1 2NQ

**F.W.O. Bauch Limited**

49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ  
Telephone 01-953 0091 Telex 27502

# Survey

Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
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Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
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## MILAB (Sweden)

CTAB, Knutsgatan 6, S-26500, Astorp.  
Phone: 42 515 21. Telex: 12442.

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

USA: Cara International Ltd, 4145 Via Marina, No. 120, Marina del Rey, Cal 90291.

Phone: (213) 821-7898.

D44	D	SC	200	2.8	\$47	Hand held
LD18	D	O	200	2.0		Robust
HM47	D	O	200	1.5	\$139	Lavalier mic
HM49	D	O	200	2.0	\$199	Robust
RD16	D	C	200	2.0		Light weight
RD34	As	RD16	with longer body			
RD36	As	RD34	with 200/HI-z			
RD34S	As	RD34	with switch			
F67	D	C	200	2.0		On/off switch
F69	D	C	200	2.0	\$216	Anti-feedback
DC20	C	O	200	5.0	\$278	Mini mic
DC21	C	C	200	6.3	\$278	As DC20
DC63	C	VS	200	4.0 to 6.3	\$895	See below*
DC73	C	C	200	5.0	\$336	Bass cut
DC73/12	As	DC73	with SYMSI 12			
DC96	C	C	200	6.3	\$526	180° capture
DC96/12	As	DC96	with SYMSI 12			
FP92CO	C	C	Lo/Hi-z	12.6/126		15V battery
FP92KO	C	O	Lo/Hi-z	8.0/80		As FP92CO
SP84	C	O	200	8.0	\$453	Variable eq
SP85	As	SP84	with cardioid		\$453	
MSXY-8	C	VS	200	5.0	\$2,495	Complete system. See below**
XY-82	C	VS	200	20	\$1,495	Two capsules. See below***
TC4V	C	V	200	10		+ 120V power, remote control
VM40	C	O	200	4.0 to 8.0	\$395	SYMSI 48/12
VM41	As	VM40	with cardioid		\$395	SYMSI 48/12
CL4AD	E	O	200	6.3	\$245	Lavalier mic
CL4BD	As	CL4AD	with internal battery		\$245	
PB35	E	O	200	6.3	\$136	15V battery

Capacitor mics are powered by SYMSI 48: + 48V ( $\pm 6V$ ) unless stated otherwise (SYMSI 12: + 24 to 52V) (SYMSI 24: + 24 to + 52V).

\*Model DC63 is fitted with two ring switches and a 5-position attenuator, giving 44 possible combinations of output/polar response.

\*\*Model MSXY-8 is essentially two variable pattern condenser microphones built into one body. Pick up pattern is remote controlled (+ 120V power).

\*\*\*Model XY-82 is smaller than MSXY-8 with both capsules fixed cardioids which can in a mono recording be remote controlled from mixing desk (SYMSI 24).

## NEUMANN (West Germany)

George Neumann GmbH, Charlottenstrasse 3, D-1000, Berlin 61.  
Phone: 030 251-4091. Telex: 184595.

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

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

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

KRM82MTi	C	HC	150	21mV/Pa	£293	Shotgun
KM83i	C	O	200	- 131dBm	£175.15	10dB cut
KM84i	C	C	200	- 131dBm	£175.15	10dB cut
KMS84i	C	C	200	- 131dBm	£315	Pale finish
KMS84iMT	C	C	200	- 131dBm	£315	Dark finish
SRM84i	C	C	200	- 131dBm		
KM85i	C	C	200	- 133dBm	£175.15	Bass roll-off
KM86i	C	VS	200	- 133dBm	£338	Switchable responses
U87i	C	VS	200	- 133dBm	£352	Switchable responses
KM88i	C	VS	200	- 133dBm	£360	Switchable responses
U89	C	VS	200	8mV/Pa	£396	Switchable responses
U47FETi	C	C	150	- 133dBm	£340	Bass roll-off
SM69FET	C	VS	150	- 125dBm	£791	Stereo
USM69	C	VS	150	10mV/Pa	£881	Stereo, local switchability
QM69	C	VS	150	- 125dBm	£1,004	Quad
KMA	C	O	800	5mV/Pa	£117.31	Lavalier

KU80i Dummy head system comprising two KM83 mics for binaural recording, complete £1,269.

## PANASONIC (Japan)

Matsushita Electric Trading Co Ltd, PO Box 51, Osaka Central 530-91, 1006 Oaza Kadoma, Osaka 571.

Phone: 06 908-1121. Telex: 847652.

UK: Technics National Panasonic (UK) Ltd, 300-318 Bath Road, Slough, Berks SL1 6JB.

Phone: 0753 34522. Telex: 847652.

USA: Technics by Panasonic, One Panasonic Way, Secaucus, New Jersey 07094.

Phone: (201) 348-7000.

## RAMSA Series

WM-8000	D	C	250	—	\$232	For vocal use
WM-8050	D	C	250	—	\$200	For vocal use
WM-1850	E	C	250	—	\$240	Instrument use. Battery or phantom power

## PASO (Italy)

UK: Amdio Ltd, 26-28 Reading Road South, Fleet, Hants GU13 9QL.

Phone: 02514 20568. Telex: 858606.

M8	D	C	200	—	£37.15	PA, speech/music, lo cut
M103	D	C	200	—	£21	Elastic suspension
M300	D	C	200	—	£78.53	Pop shield

## PEAVEY (USA)

Peavey Electronics Corp, 711 A Street, Meridan, Mississippi 39301.  
Phone: (601) 483-3565.

UK: Peavey Electronics (UK) Ltd, Unit 8, New Road, Ridgewood, Uckfield, Sussex TN22 5SX.

Phone: 0825 5566. Telex: 957098.

PBL	D	O	250	- 52dB	£62	
					\$113.50	
PBH	D	O	50k	- 52dB	£62	PA mic
					\$113.50	

## PHILIPS (Netherlands)

NV Philips, Electro-Acoustics Division, HBS-2, Eindhoven.

Phone: 040 79.11.11. Telex: 51121.

UK: Pye Business Communications Ltd, Cromwell Road, Cambridge CB1 3HE.  
Phone: 0223 45191. Telex: 81547.

USA: Phillips Audio Video Systems Corp, 91 Mckee Drive, Mahwah, New Jersey 07430.

Phone: (201) 529-3800.

LBB9003/05	D	O	200		£45	Lavalier
LBB9020/35	D	C	200		£75	General purpose
LBB9020/45	D	C	200		£82	Switch, speech/music filter
LBB9031/05	D	C	200		£54.50	With cable
LBB9101	D	O	200		£86	Speech/music filter
LBB9032/05	D	C	200		£53.50	Switch, gooseneck
LBB9033/05	D	C	200		£49.50	Gooseneck
LBB9018/07	D	SC	200		£52.50	Restricted sensitivity

## SCHOEPS (West Germany)

Schalltechnik Dr-Ing Karl Schoeps, Karlsruhe 41, D-7500 Spitalstrasse 20.  
Phone: 0721 42016/42011.

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

Phone: 01-734 2812. Telex: 27939.

USA: Posthorn Recordings, 142W 26th Street, 10th floor, New York, NY 10001.  
Phone: (212) 242-3737.

Neumann U89

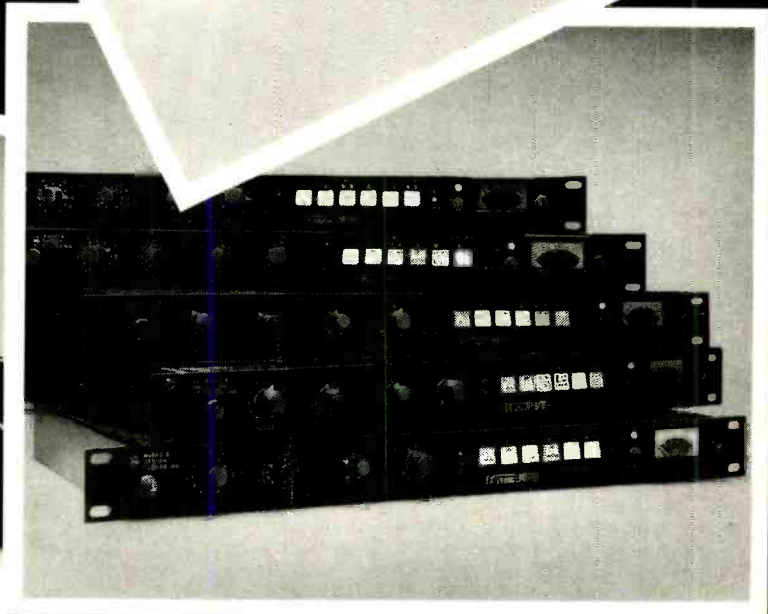
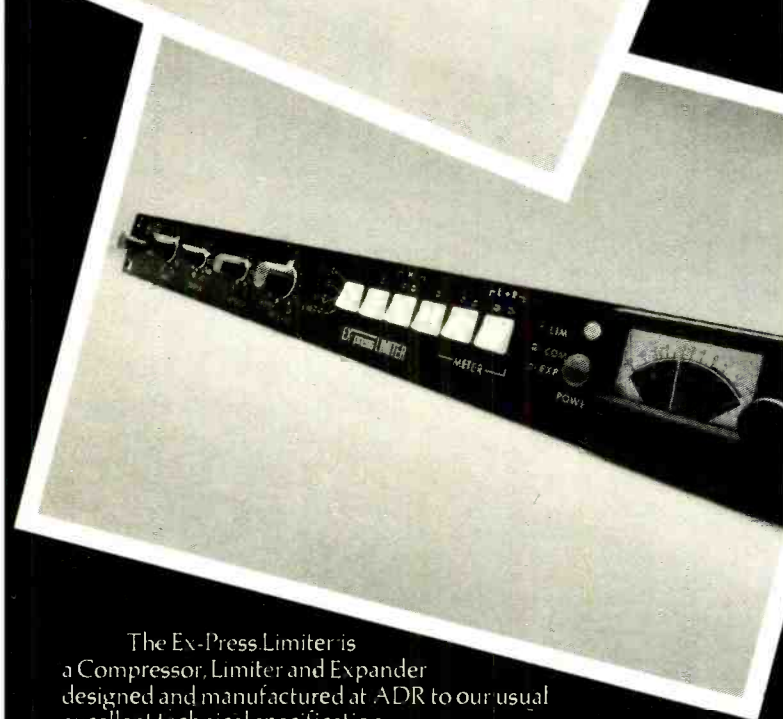
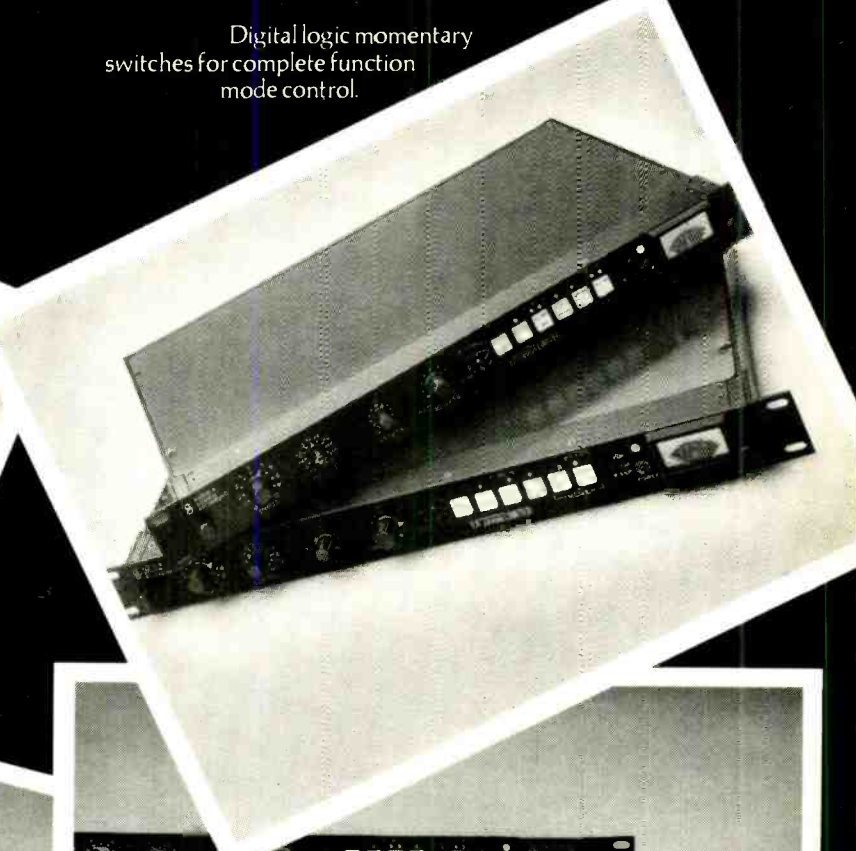
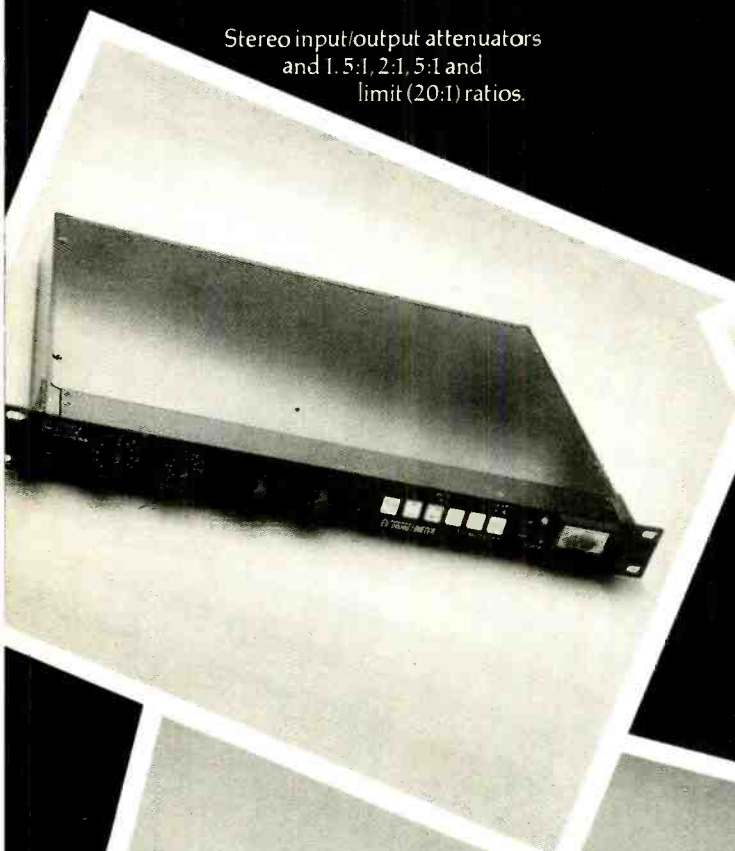




# Glowing praise and flattering photos about the Ex-Press Limiter from ADR.

Stereo input/output attenuators and 1.5:1, 2:1, 5:1 and limit (20:1) ratios.

Digital logic momentary switches for complete function mode control.



The Ex-Press Limiter is a Compressor, Limiter and Expander designed and manufactured at ADR to our usual excellent technical specification.

Function Control is by digital logic switches and Led indicators show options in use as well as remembering 'last use settings when the power is cut.

The Ex-Press also has stereo input/output attenuators, variable attack and release times and an auto release network for maximum in-studio versatility.

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**Audio & Design (Recording) Ltd.,**  
North Street, Reading, Berks, RG1 4DA.

Telephone: Reading (0734) 53411.  
Telex: 848722 a/b ADR UK.  
Cable: Scamp Reading



Audio & Design Recording Inc.  
PO Box 786 Bremerton WA 98310 U.S.A.  
Telephone: (206) 275-5009. Telex: 152420 a/b ADR USA

Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
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## Schoeps cont'd

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

CMC52U	C O	40	1.2	£299	Flat response
CMC53U	C O	40	1.0	£299	Hf boost
CMC54U	C C	40	1.2	£299	—
CMC540U	C C	40	1.6	£320	Close use
CMC541	C HC	40	1.3	£315	—
CMC55U	C VS	40	various	—	Two patterns
CMC56U	C VS	40	various	—	Three patterns
CMC58U	C 8	40	1.0	—	—
CMTS501U	stereo VS	200	various	£890	—

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

MTSC54 stereo C 40 1.3 —  
A stereo (110° ORTF-principle) twin-capacitor mic with two MK4 capsules mounted at either end of a T-bar. Axial separation is 170mm. Pre-amplifier module is 48V phantom powered; other modules for 12V powering are also available.

CMH52C	C O	40	1.0	—	'Pop' filter
CMH54C	C C	40	1.2	—	'Pop' filter

All output figures are in units of mV/μR.

## 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 Electronic Corp, 10 W 37th Street, New York, NY 10018.

Phone: (212) 239-0190.

MD211	D O	200	0.13	£74.66	Flat response
MD214	D O	200	0.10	£68.74	Lavalier
MD408	D SC	200	0.13	£38.34	Integral gooseneck
MD431	D SC	200	-55dB	£80.61	Musicians mic
MD416	D C	200	0.13	£62.18	Hand held
MD418	D SC	50	0.13	£39.53	Integral gooseneck
MD421	D C	200	0.20	£64.08	Switched bass eq
MD430-2	D SC	200	0.18	£35	Close use
MD441	D C	200	0.20	£96.09	Shockmount
MKE10	E O	47k	1.00	£34.45	Mini lavalier
MKE883	E HC	200	—	£76.59	—
MKE803	E SC	200	0.50	£64.73	—
MKE403	E C	200	0.30	£54.61	—
MKE203	E O	200	0.30	£47.51	—

The MKE883/803/403/203 mics use a common powering module with interchangeable capsules which are also available separately at £47.13, £35.27, £25.15 and £18.05 respectively, powering module £29.46.

MKE2002	E O	1k5	1.00	£98.26	Dummy head pair
MKH106	C O	200	2.00	£149.87	12V a-b
MKH125	C O	200	0.32	£210.37	Lavalier
MKH126P48	C O	200	2.00	£210.37	As MKH125
MKH406P48	C C	200	2.00	£175.77	48V phantom power
MKH406	C C	200	2.00	£175.77	12V a-b
MKH416P48	C SC	200	2.50	£183.96	48V phantom power
MKH416	C SC	200	2.00	£183.96	12V a-b
MKH816P48	C HC	200	4.00	£247.58	48V phantom power
MKH816	C HC	200	4.00	£247.58	12V a-b

Output figures are in units of mV/μB. MKH125 and MKH126P48 share a common capsule (MK12) with different power unit. The former is 12V a-b powered while the latter is 48V phantom powered.

## SHURE (USA)

Shure Brothers Inc, 222 Hartrey Avenue, Evanston, Illinois 62024.

Phone: (312) 866-2200. Telex: 724381.

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

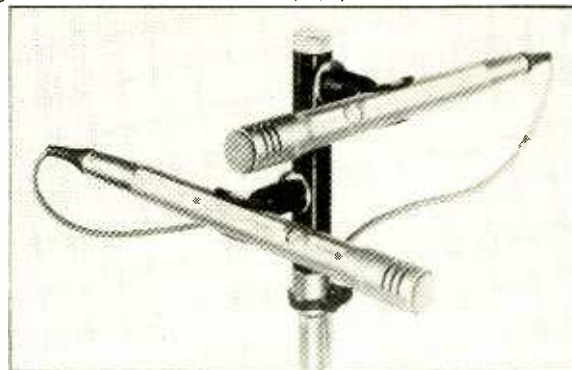
Phone: 0622 59881. Telex: 96121.

SM7	D C	150	-79dB	£248.80	Bass presence
SM10	D C	200	-87dB	£57	Headset mounted
SM12	As SM10	with built-in ear piece	—	£76.20	—
SM11	D O	200	-85dB	£47.80	Lavalier mic
SM17	D O	200	-85dB	£45.60	Mounting for guitar etc
SM33	R HC	38/150	-76.5dB	£142.20	Bass switch
SM53	D C	150	-81dB	£145.20	Wide range
SM54	As SM53	with 'pop' filter	—	£154.20	—
SM57	D SC	38/150	-82dB	£70.80	Presence boost
SM58	As SM57	with 'pop' filter	—	£90.60	—
SM59	D C	150	-83dB	£94.20	—
SM61	D O	150	-82dB	£63	'Pop' filter

Model	Transducer type	Polar response	Impedance	Output	Price	Remarks
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SM62	D C	150	-82dB	£72	'Pop' filter
SM63	D O	150	-76dB	—	Vocal use
SM81	E C	150	-64dB	£146.40	10dB atten, switchable LC
SM82	C C	260	-19dB	£139.80	Line amps and limiter

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



Shure SM81

## SONY (Japan)

Sony Corp, PO Box 10, Tokyo Airport, 149, Japan.

Phone: 03 448-2111. Telex: 22262/24666.

USA: Sony Corporation of America, 9 W 57th Street, New York, NY 10019.

Phone: (212) 371-5800. Telex: 424595.

UK: Sony (UK) Ltd, Pyrene House, Sunbury-on-Thames, Middlesex.

Phone: 09327 89581/876441. Telex: 266371.

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

Phone: 01-580 4314. Telex: 28668.

C-47	C	C/O	50	57dB	£560	High quality instrument use
C-48	C	C/O	—	37.8dB	—	Dual diaphragm, bass cut
C-38B	C	C/O	250	48dB	£250	Instrumental use
C-37P	C	C/O	250	50dB	£250	Broadcast use
C-55P	C	C	250	50dB	£215	Vocal use
C-76	C	SC	250	38dB	£370	Long shot gun
EC9P	E	C	250	-56dB	poa	Low-cut filter
EC12B	E	O	250	-52dB	poa	Tie-clasp or boom
EC15P	E	O	250	-52dB	poa	Mini tie-clasp
EC33S	E	C	'low'	-46dB	poa	Coincident stereo
ECM-989	E	S	600	-68dB	New model	Stereo mic, remotable head
ECM-50	E	O	250	-74dB	—	Micro lapel mic

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

## TECHNICS (Japan)

Matsushita Electric Trading Co Ltd, PO Box 51, Osaka Central 530-91, 1006 Oaza Kadoma, Osaka 571.

Phone: 06 908-1121. Telex: 847652.

UK: Technics National Panasonic (UK) Ltd, 300-318 Bath Road, Slough, Berks SL1 6JB.

Phone: 0753 34522. Telex: 847652.

USA: Technics by Panasonic, One Panasonic Way, Secaucus, New Jersey 07094.

Phone: (201) 348-7000.

RP3850E	E	SC	600	-72dB	—	Low-cut filter
Also incorporated is a 10dB pad network enabling use with SPLs up to 128dB.						
RP3200	E	C	600	-72dB	—	—
A coincident stereo mic designed primarily for radio reporting.						

## TURNER (USA)

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

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

UK: Canadian Instruments & Electronics Ltd, Harris-Bass House, Station Road, Ilkeston, Derbyshire.

Phone: 0602 302331. Telex: 377755.

SE11	D	C	150 to 200	77dB	\$99	Isolated from handling noise
SE13	D	C	150 to 200	77dB	\$99	Differs from SE11 in casing
SE16	D	C	150 to 200	77dB	\$90	Gooseneck mounted version SE13
TC20	D	C	200	77dB	\$156	Principally for vocal use
SE14	D	O	150 to 200	80dB	\$84	Switch
SE15	D	O	150 to 200	81dB	\$60	Robust
SE16	D	O	150 to 200	84/62dB	\$78	Lavalier with accessories

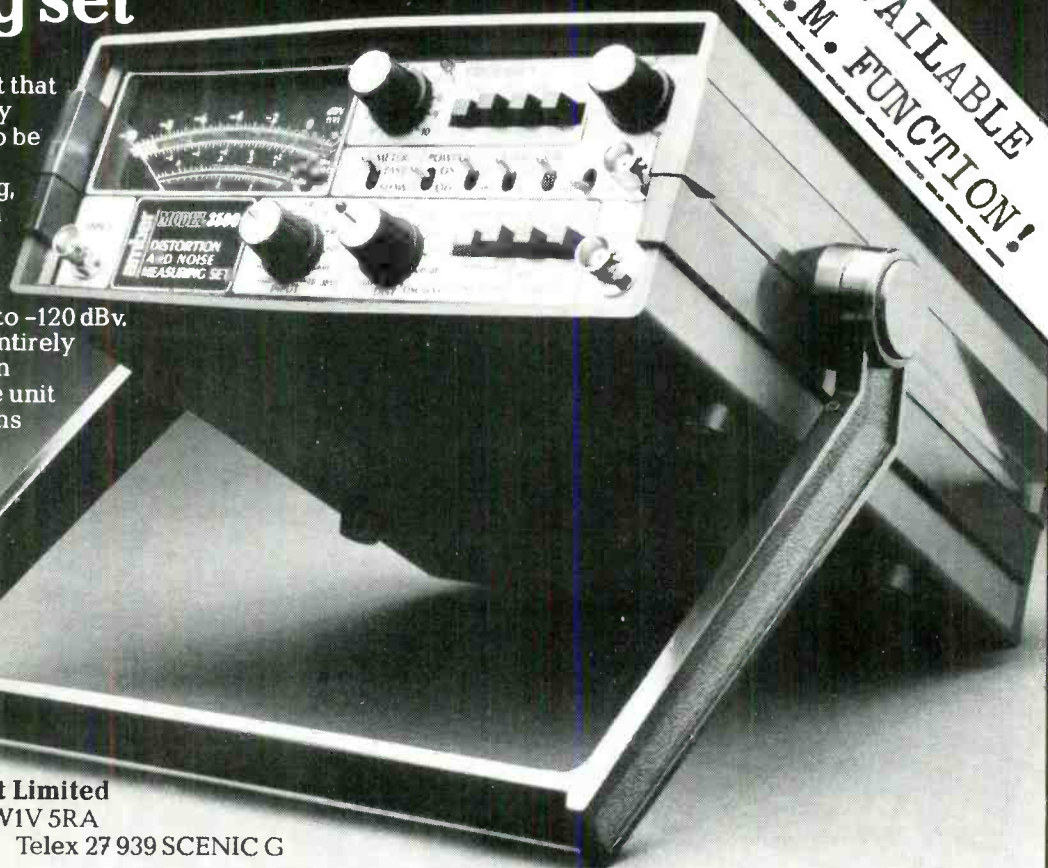
# Amber 3500 distortion measuring set

The piece of test equipment that no-one working with quality audio products can afford to be without. £950.00 buys an auto nulling, auto level setting distortion analyser measuring THD to below .002% and a noise meter capable of narrow band measurements down to -120 dBv. In the same package is an entirely new design of low distortion signal generator. The whole unit is highly portable and weighs less than 3.5 kgs. Do not be misled by price - this is the state of the art distortion measuring system of the 80's. For full information contact:



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- ★ All programmed parts remain in memory when power is off.
- ★ Readout of speed in beats-per-minute

- ★ Versatile editing
- ★ Programmed data may be stored on cassette tape to be loaded back in later
- ★ May be synced to tape

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Available from:  
Scenic Sounds Equipment Ltd.  
97-99 Dean Street  
London W1 (01) 734-2812

### Divided they fall—part I

Thorn-EMI is planning to close down its tape production plant at Hayes. Of course this is bad news for the 270 workers who will lose their jobs and concern is spreading in the record industry that perhaps Thorn, now having such tight and profitable ties with JVC of Japan over video matters, would like to close down the EMI record business altogether. Who knows? But some apparently unrelated facts bear reporting, without comment.

The workers under threat at Hayes have formed a 'fight committee' to try to persuade the Thorn-EMI management to think again over closure of the plant. So far there has been failure to agree. Seven unions are involved. The AUEW (Amalgamated Union of Engineering Workers); the TGWU (Transport and General Workers Union); the EEPTU (Electrical, Electronic and Plumbing Trade Union); the GMWU (General Municipal Workers Union); the ASTMS (Association of Scientific, Technical and Management Staff); APEX (Association of Professional, Executive, Clerical and Computer Staff); and TASS (Technical Administrative and Supervisory Section).

South Wales has suffered badly over recent years with factory closures, lost jobs and general unemployment. Several Japanese companies, such as Matsushita (National Panasonic-Technics), Sony and Aiwa, are manufacturing successfully in South Wales with a British work force. At the Matsushita factory, 470 workers are employed to make colour TV sets and audio systems. The factory is a 'closed shop' ie only union members are employed, but a *single* union, the GMWU, is involved. As a result everyone at the Matsushita factory can do several different jobs. So sickness and holidays have no effect on the production line because workers are switched from one job station to another to cover for any absentee.

### Divided they fall—part II

After years of pretending that it's impossible, the record companies are now starting to issue more albums on pre-recorded music cassette—and at the same or a lower price than discs. Island Records have gone a stage further, and put the BPI's blood pressure up to unprecedented levels with the One-Plus-One scheme. For under £4, which is less than the price of most discs, the One-Plus-One cassette has a complete album recorded on one side, with the other side of the tape blank. To quote Island: "One side what you like. One side whatever you like".

Predictably the BPI "deplored" the scheme, because it encourages people to use the blank side to tape music off-disc or off-air. But what really put the wind up the BPI was the timing of Island's launch. A snowball commercial success of the One-Plus-One scheme could easily have coincided with publication of the government's Green Paper on copyright law reform and the possibility of a punitive tax on blank tape. It would plainly be as unfair to tax the pre-recorded half of a One-Plus-One cassette as it would be not to tax the blank half. With anomalies like that created by the record industry itself, what price the industry's case for a tax?

Interestingly, Island have also inadvertently got themselves in a terrible technical mess over One-Plus-One. The cassettes are loaded with

chrome, rather than ferric, tape "for guaranteed top performance". BASF provide the tape and duplicating is by Ablex (Decca). More and more pre-recorded cassettes are now being made on chrome tape which offers better audio quality but needs a higher bias (around 4dB) and is normally recorded with a different equalisation curve. Some companies are recording their chrome cassettes with chrome equalisation (70µs) and others are using standard ferric (120µs) equalisation. Needless to say this is pretty confusing for the customer, but the Island One-Plus-One approach has been even more confusing.

The first batch of One-Plus-One chrome issues (eg Steve Winwood's *Arc of a Diver*) were recorded with 120µs equalisation. There was advice on the blank side to use a "normal 120 setting" and the cassette housing didn't have any of the chrome identification notches which are sensed by a domestic recorder with automatic chrome switching. So anyone using the blank side of the Winwood tape would almost certainly record on the chrome coating as if it were ferric. This would mean under-biasing which in turn means a shrill top end, distorted lower frequencies and exaggerated dropout.

The next batch of One-Plus-One cassettes from Island and Ablex (eg Todd Rundgren's *Healing*) had a note saying that the music was recorded with normal ferric 120µs equalisation and a note on the blank side saying that it should be recorded with chrome 70µs equalisation. The chances of your average punter correctly following this confusing advice are minimal. To make matters worse the cassette still didn't have any chrome identification notches. So again anyone using the cassette on a recorder with automatic chrome switching would be trapped into using the ferric setting and under-biasing the tape.

The third batch of One-Plus-One cassettes (not available at the time of writing) may have a modified housing, with a chrome identification notch on one side but not the other. In theory this is the ideal solution, even though the use of different instructions on each side of the same cassette will inevitably confuse people who can't see why a cassette of chrome tape shouldn't just be treated like a cassette of chrome tape. But the real problem is that some cassette recorders have their chrome sensor lugs on the wrong side; so these machines will play back the pre-recorded half of the cassette with the wrong equalisation, and then switch to record on the blank half with the wrong bias and wrong equalisation.

The real pity of it is that Island was only trying to sell cassettes cheaply ("like paperback books" they say) and improve audio quality. For that they don't deserve the problems they've hit.

### BBC stereo radio

BBC Radio London, the local BBC station for the London area, has now finally crawled into the 20th century and gone stereo. This welcome move comes 23 years after the BBC first began stereo test transmissions, 10 years since Radio London first went on the air in mono and seven years after the commercial local radio stations, LBC and Capital, started serving the London area in stereo. Under the circumstances you would have thought that BBC Radio London would have made a little capital out of the event. But you would have been wrong. The letter sent

out to invite the press to a "photo call and press conference" to hear about "exciting new plans" for the station made no mention whatsoever of the transition to stereo. It also made no mention of the clever idea to win FM stereo listeners away from LBC and Capital. Radio London is now to transmit the overflow of stereo programmes from the national networks which currently have to be broadcast in AM mono only because the BBC hasn't enough national FM wavelengths for its needs.

So what did the Radio London publicity people do to alert the press to their announcement and discussion of such an interesting idea? In a word, nothing. In fact they did worse than nothing. They publicised the fact that "Tony Blackburn, who will be joining the station in early February to present his own daily weekday programme, will be there". Heaven knows how many people immediately tore up their invitations and threw them away at the first sight of those two magic words, "Tony Blackburn". I certainly did. So if it hadn't been for the initiative of some BBC engineers who phoned round to tell people about Radio London's stereo plans they would have passed even more widely unnoticed.

For the record, Radio London wasn't the first BBC local station to go stereo. The new BBC station Radio Norfolk was the first when it opened in stereo on September 11, 1980. Radio London wasn't the first conversion from mono to stereo, either. Radio Nottingham took that prize on September 10.

Prior to that there had been some unofficial local broadcasts in stereo when engineers in the North of England installed their own encoder. Their heinous crime was soon discovered and the station put safely back to mono. But by then they'd proved their point, namely that it was politics and bureaucracy rather than lack of money that was keeping the BBC's local stations stuck in mono.

This parallels the situation which used to exist when BBC TV and BBC Radio joined forces to transmit a simulcast of vision and mono from the TV transmitters and stereo sound from the FM radio transmitters. Rather than send SMPTE code down a line from TV Centre to Broadcasting House to synchronise the video recorder at one location with the stereo sound recorder at the others, the audio engineers would work with a start tone and manual control to pull the picture and sound together in sync!

A final thought. Overseas readers may well wonder why the magic words "Tony Blackburn" should cause people to tear up and throw away their invitations. TB used to work as a DJ on BBC national radio. For years he did sterling work in trivialising anything and everything. His schoolboy humour would have embarrassed even ex-President Carter. The chance to meet Tony Blackburn is definitely something to be missed.

**Noel Bell comments:** having attended the BBC Radio London press conference detailed above, I can confirm that no mention was made of the conversion to stereo. If it had not been for my fortunate conversations with the relevant press/technical personnel no details would have been supplied. However, details are given in our News column but perhaps the BBC should plan such press conferences more adequately in the future!

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# Interior design

## Part three

Between 12 and 50 technical (audio) circuits will have to be installed between studio and control room for loudspeaker feeds, talkback, fold-back, mics, ring main and similar facilities and it is essential that these be kept as far removed from the power circuits as possible. They are usually run in a special cable duct and in new studios this is often built into the floor so that the removable cover is flush with the finished floor surface.

Since this is frequently not possible where old buildings are being converted another solution has to be found. This takes the form of a hollow skirting built into the angle between the walls and the floor and normally running right round the studio, distributing the various circuits where required. The cable runs are thus unobtrusive, safe from damage, and additions can be made when required. Fig 10 shows a simple section of this form of skirting and is almost self-explanatory.

The internal dimensions should not be less than  $3\frac{3}{8}$ in (100mm) square, and if it is not convenient to let the bars supporting the top actually into the wall as shown, alternative L-shaped brackets can be used. There are no supporting uprights so that when the front covers are let down there is an unobstructed cable run right around the studio for maintenance purposes and the addition of any future circuits. The front let-down covers are not more than 4ft in length and held by magnetic catches.

This form of skirting can be seen in several of the photographs and being sited immediately under the bottom row of absorbers and the aforementioned pattress boxes it only remains to drill holes in the top of the skirting and in the bottom of the pattress box for the distribution of the circuits to take place as required.

### Technical wiring terminations

The technical cabling having been run and distributed into the various pattress boxes, which will, of course, be separate boxes from those containing the mains power supplies, the various cables can be taken directly to their individual sockets inset into the door, or terminated on the back of the box as before and flexibly connected to the sockets. Do not forget to leave sufficient loop for the door to be opened.

It is now almost standard practice to use an XLR or similar type of socket for terminating technical

**The final part of Norman Bone's insight into interior design continues his coverage of structural fittings with technical ducting and concludes with an overview of ancillary fittings.**

cables and these can be obtained in many types and pin connections sufficient to cater for almost any requirement. The type with the locking catch is recommended to avoid cables being pulled out of their sockets accidentally. This usually happens in the middle of a programme or recording!

### Ventilation terminations

The termination of the ventilation ducts inside the studio will be by some form of grille. The normal type has adjustable slats so that the incoming air can be directed as required, but a newer type has a foam pad behind a coarse metal mesh which acts as a filter. If a flush surface treatment is desired this can be achieved by use of a pattress box (remember!) with the ducting terminated on the back of the box, and the grille mounted in the door, but in this case the door will have to be made airtight or even replaced by a cover screwed to the box. There are two minor advantages in this method. The box acts as a small plenum chamber and helps to reduce airflow noise, and the cover is easily removable for cleaning the grille and

removing any dirt or fluff which might collect in the end of the ducts.

### Technical lighting units

Most studios utilise some form of signal lights both inside and outside

triple units, with up to five different coloured lenses—red, blue, green, amber and white. Standard practice has been to use red for transmission or recording, blue for rehearsal, green for cueing artistes, white for telephone and amber for any other purpose. The lamps illuminating the units are normally 240V, 15W pigmy bulbs, and can be operated directly

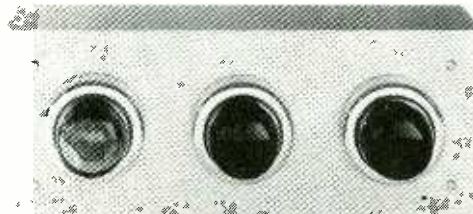
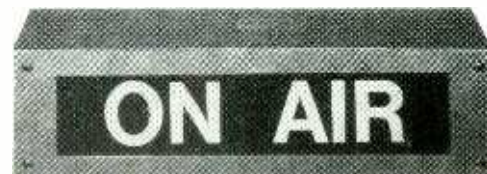


FIG. 11

FIG. 12



the studio to indicate that the studio is rehearsing, on transmission or recording, and for cueing the artistes. They can take the form of metal boxes, either surface or flush-mounted, on the front plate of which are mounted coloured light units. Commercially produced units are readily available in single, double or

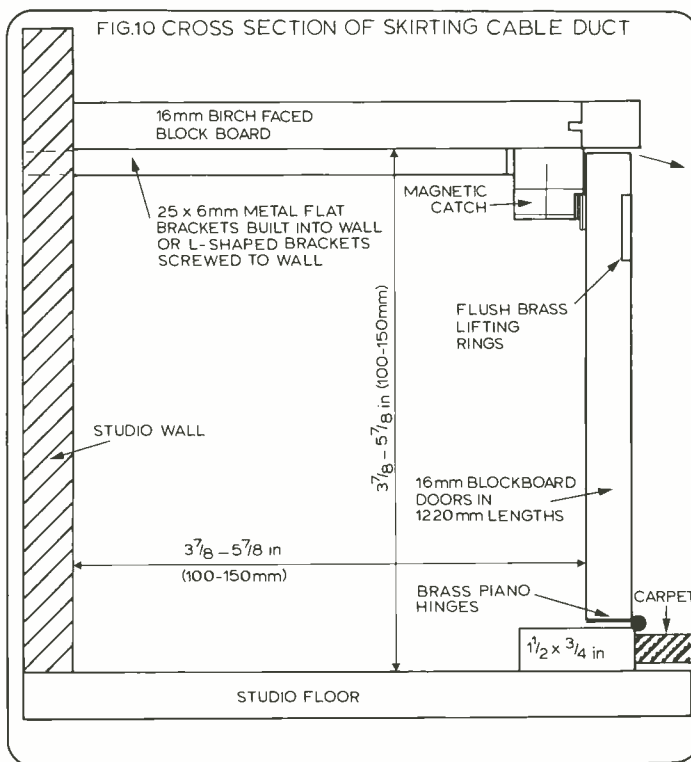
from the mains supply, or by means of a 24 or 50V relay contained within the unit. Fig 11 illustrates a typical commercially produced unit.

Some studios prefer to use an illuminated sign. These also are commercially produced in the form of a metal box similar to that mentioned above but with a cut-out in the front panel behind which is fixed a coloured perspex panel back-printed with the legend required. Normally these signs are blind until illuminated, usually by a 30W tubular lamp. Fig 12 shows an example of this type of sign. They are available in single, double and triple units with different coloured perspex panels.

Both types are permanently mounted on the walls of the studios at a height of 6 to 8ft above floor level, and wiring from the units is taken back to the control desk in the control room. Similar types but with larger lenses are available for use in television studios where the level of lighting is higher than that in sound studios.

Two other light units must be mentioned. The first is a 'Fire' sign usually of the second type mentioned above and with an all-red panel with the wording 'Fire' in either black or white lettering. A flashing sign operated by a flasher unit inside the box can indicate that there is a fire in the proximity, and a steady red calls for immediate evacuation of the studio.

Where members of the public are present in the studios or theatre,



special 'Exit' signs are required, and these have to be individually powered and permanently lit when the studio is occupied so that they remain illuminated should the mains supply fail. This is achieved by means of a small mains battery charger unit and battery contained within each unit with a changeover relay.

### Cyclorama fittings

In all television, film and video studios some form of background will be required and this is normally provided by scenery flats or sets, or by means of a cyclorama.

Scenery flats will be erected or dismantled in the studio as productions demand but a cyclorama is a permanent feature of the studio. It can be constructed of hardboard or plywood and extends round two or three walls of the studio, curving round the corners to present an unbroken line of background with no apparent angles, on which various scenes can be painted or applied according to the production requirement.

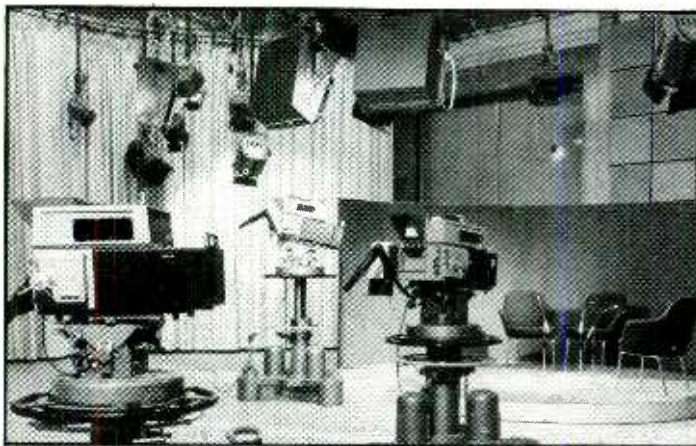
Such a construction will, however, cause serious reflections and give rise to many unwanted echoes which may even destroy the atmosphere of an intimate production, and a much better solution, where possible, is to use a curtain of suitable fabric. A curtain of this type would be suspended by a track attached to the lighting grid, and the curtain either fixed at intervals of about 9in or attached to runners on the track so that it would appear stretched or draped as required. Lightweight fabrics reflect inefficiently, even absorbing over some frequencies, and being more or less acoustically transparent, will not seriously affect the basic reverberation time of the studio as a whole.

It is quite possible to use back or front-projection on to such materials to present the scenic background required.

### Storage units

In small and medium sound studios a very useful provision is that of a small storage cupboard situated on one of the studio walls. A typical size would be about 4ft square and 9in deep. If modules are being used as the acoustic treatment it could take the place of four modules and thus maintain the flush appearance of the treatment.

A shelf or two would house spare microphones and other small items of equipment, and a number of pegs could also enable the spare microphone cables to be coiled up and



Typical TV studio

housed inside the cabinet. Nothing is more detrimental to the appearance of a studio than spare microphones and cables lying on chairs and tables. They are also subject to damage or even theft.

### Floor surfaces

Television studios require different floor surfaces to sound studios since a hard and absolutely level surface is necessary for the cameras to track upon, as they do not easily track on carpet. Most studio floors these days have a concrete base, and for television use these are normally covered with a 1/2in or 3/4in thick layer of material known as a self-levelling screed. Specialist contractors are employed to lay this screed, which flows, rather in the manner of a liquid, and sets to form a hard and perfectly level surface devoid of all bumps and hollows. In most cases this is again covered with heavy duty vinyl sheet again laid by specialist contractors who carefully weld all joints where they occur and thus provide a perfect tracking surface for the cameras.

Most speech studios are carpet covered and this is normally laid on an underfelt. Various types of carpet such as haircord, woolcord or *Wilton* are employed, and as each type has a different absorbent coefficient the type will have to be decided at an early stage so that the acoustic consultant can take this into account.

Small music studios can be partially or wholly carpet covered, or part of a whole carpet can be made removable to achieve different reverb times. Large music studios usually have a floor surface of parquet, wood-block or strip as less absorption and a higher reverb time is required.

Drama studios are usually carpet covered over the dead end, and have

a wood, vinyl or linoleum covering at the live end. Small sections of stone or cement are often inset to provide the various effects.

Self-adhesive carpet tiles are sometimes now used particularly as they have the advantage of being replaceable in sections where extra wear takes place, thus avoiding the cost of replacing the whole carpet. Regarding colour, it is advisable to choose a reasonably dark colour which will not show stains and dirt. A busy studio entails a great amount of wear and tear on the carpet and nothing looks worse than a light-coloured carpet which has become grubby and stained.

### Decoration

And to the last item in this section, and probably the most controversial—that of decoration, or more correctly—final appearance.

The question "What is the best form of decoration?" is almost analogous to asking "What is the best loudspeaker?". The answer in both cases is "It all depends on what you want."

Every studio owner will most certainly have his or her own ideas on this subject, varying from the clean but perhaps rather clinical appearance of painted modular absorbers through the mock Texas ranch house design to that resembling a forest glade complete with a ceiling with twinkling stars which, incidentally, was requested not so long ago.

What then are the requirements? Firstly, the final appearance must be restful and unobtrusive since the artistes and users must not be distracted in any way; it must be clean and not fussy; it must be complementary to the type of production envisaged so that the users feel comfortable and at ease, and finally it must be easy to maintain.

When Broadcasting House, London, was first built two studios on the third floor were designed for specific purposes. One was in the form of a library complete with book-lined shelves and a type of Adam fireplace, which was used for talks, and the second was designed in the form of a chapel complete with altar on the back of which was projected a lighted cross, from which the morning service was always broadcast. This was the studio in which, during one broadcast, the studio door was thrown open and one of the BBC charladies announced in stentorian tones, the famous Tommy Handley phrase "Can I do yer now, Sir", for all the world to hear. Sadly, both have now disappeared and have been replaced by the modern form of painted modular absorbers. They were both eminently suitable for their purpose.

It is not, in these times of financial restriction, economically possible to restrict studios to such individual use, and all that can be done is to lay down certain guidelines which may assist in agreement being reached on a final design acceptable to all concerned.

Small studios, suitable for use by four to six persons, for talks, interviews and discussions should tend to be rather intimate. If modular treatment is used for the acoustic response these can be wholly or partially covered by the use of lightweight fabrics either stretched on frames positioned 2 to 3in in front of the modules, or in the form of drapes suspended from battens mounted at ceiling level. Suitable colours can be introduced by the choice of fabrics now available, or vision-net will provide a very attractive material if draped.

In larger studios, hessian can be utilised in a similar manner and a pattern or even a mural applied to the surface, hand-painted or by use of a spray-gun, and, if executed professionally, can result in a most attractive appearance—a forest glade perhaps?

In music studios, where the wall surfaces tend to be farther away from the performers, it is quite normal to leave the modular absorbers uncovered and merely paint the front surfaces in a suitable colour. Pastel shades of green, cream or grey are quite popular—not blue which always presents a cold appearance—and the paint should always be applied by roller or paint-pad, never by brush, which will fill up the small

holes of the perforated panels and thus destroy the acoustic response.

Drama studios are veritable workshops, and the users under constant pressure, so that nothing must distract them, and the more unobtrusive the surroundings the better they will perform. In any case the dead end of the studio will normally be occupied by the various effects items such as staircases, water tanks, effects doors, etc, so that there will be very little wall surface remaining.

Pop studios have already been mentioned, and the final appearance can vary from straight modular treatment lit by coloured lights to hessian coverings with painted murals.

Television studios seldom require any decorative treatment whatever, other than the cyclorama already described. Generally so much of the floor is occupied by studio sets with scenery flats that virtually none of the wall surfaces are visible anyway. The acoustic treatment is functional only and is not there to provide a decorative surface.

So throughout the various types of studio, there is plenty of choice, and the final decision must be a personal one. The only criterion is that it must not upset the acoustic response and agreed reverb time.

Just one word of warning. Do not use large areas of *slotted* hardboard, particularly with fluorescent lighting. This combination produces a most peculiar spectroscopic effect which is most disturbing and distracting to the users.

## Ancillary fittings

The studio now being structurally complete and all services installed, it only remains to provide the various technical fittings and items of furniture to make it a working entity. Most of these are produced commercially in various forms and the final choice will depend on the particular studio usage.

### Talks tables

All studios designed for speech, talks, discussions, interviews etc, will require a correctly designed table. Tables with a hard top surface are not suitable since they reflect speech sound waves. These will reach the microphone momentarily later than the direct sound wave resulting in echo, and marring of the speech quality. Even a felt or cloth cover will

FIG. 13



not entirely remove this defect.

Correctly designed tables are known as 'acoustic tables' and the top is designed to be as acoustically transparent as possible commensurate with rigidity, to allow the sound waves hitting it to percolate through without reflection so that only the direct wave is picked up by the microphone. They are usually rectangular, nominally 48 x 36in or hexagonal, thus allowing up to six persons to sit around the table at the optimum distance of 2ft from the microphone. A centre hole in the top will allow the use of a floor stand isolating the mic from the table thus avoiding any knocks or vibrations being transmitted from the table. A cardioid type mic will serve up to six persons equally and the table top should be absorbent but firm enough to permit alterations to scripts, and above all the whole table must be rigid and free from squeaks or rocking. Timber construction is preferable to metal which tends to

'ring' if kicked, and a typical commercial design is illustrated in Fig 13. Headphone jacks can be fitted into the rim of the table.

### Chairs

The correct design and type of chair is most important. They should also be of wooden construction, free from squeaks or rocking, and both seat and back should be padded as they may be used for long periods. Chairs without arms are normally used by musicians and can be of the stacking variety, but when used in conjunction with acoustic tables, chairs with arms or better still the 'tub' type of chair, with an upright back will seat the speaker comfortably but firmly in the correct position and prevent him leaning back too far during the course of a transmission with consequent loss of speech quality or volume.

### Clocks

Two or three clocks will be required in any but the smallest studio and these should have a face diameter of at least 12in for smaller studios or 18in for larger music or drama studios. One clock is normally sited on the studio wall over the observation window to the control room so that it can be observed while talking to the producer prior to the transmission. Many programmes are commenced on a time cue, ie, "Go ahead in 10 seconds from now" and any studio personnel should be able to see at least one clock without turning round and thus changing microphone position.

FIG. 14

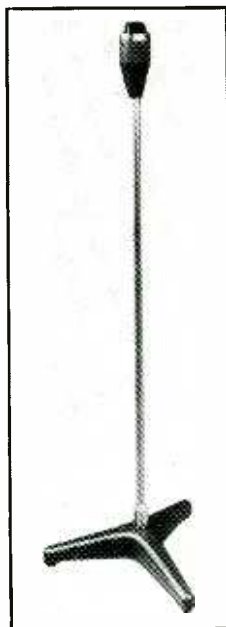
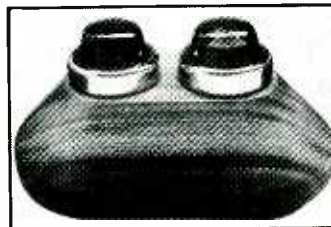


FIG. 15



The clocks can be of the synchronous type with a 'seconds' hand, or the 'slave' type driven from a master clock with a 1 or 2 second impulse. The latter type is preferable since ideally all the clocks should remain in step at all times. Quartz controlled clocks, either digital or analogue, are now coming into use but these also can vary one from another.

Whichever type is used clocks should have a clear and unfussy face for quick and easy observation. Black hands on a white face or the reverse are best since it is the correct time that is required not an example of the clock designers art. The clocks should be mounted at a height of 6ft in smaller studios and 8ft in larger studios.

### Cue and signal lights

Additionally to the wall mounted signal lights described under structural fittings, table cue lights will be required for talks purposes and floor-mounted lights for drama and music usage. Examples of standard commercial types are shown in Figs 14 and 15.

Usually only a single light unit is required for table use and it is placed on the table adjacent to the microphone as a visual 'go-ahead'. In drama studios the floor-stand light is similarly placed alongside the microphone stand and the cast grouped around in a circle. For music purposes where light cues are required the floor-stand light is placed near to the orchestral leader or conductor. There can, of course, be several individual cue lights for different sections of cast or performers or one master cue connected in parallel with the wall mounted signal lights.

In many broadcasting concerns a standard method of signalling is for the desk operator to 'flash' the cue-light for 'silence' or 'stand-by' and then give a steady light for 'go-ahead'.

### Microphone stands

Three types of mic stand are available commercially and the varieties are legion. Table stands, floor stands and the 'boom' type may all be required according to the studio usage.

The table type should be reasonably small but sufficiently heavy or weighted so that it is not pulled off the table by the weight of the cable during the middle of a broadcast or recording (Fig 16) as has



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happened on more than one occasion, and a floor-stand should be adjustable in height to suit the user but essentially firm and steady. A floor-stand with a heavy flat base is preferable to a stand with tripod legs as these often present a hazard to performers but sadly the former have tended to die out in favour of the latter.

Boom stands are available in all sizes with boom lengths of from 6ft up to 12ft for large music productions.

### Acoustic screens

These items are very useful for separating groups of performers or musicians—usually the drummers, singers or solo artistes—so that a better mic balance may be obtained. Full height 2m high x 1m wide or half height 1.3m x 1m are available and these can be obtained absorptive on both sides or with one side reflective, with or without windows or observation panels which should be of thick perspex and not glass for obvious reasons.

Most of these screens are fitted with castors or small wheels for ease of movement and are designed to be stackable, so that when not in use they can be pushed together against a studio wall and not take up valuable studio floor area.

Transmission loss can be up to 20dB particularly at middle and higher frequencies, and several screens can be placed together to form an enclosure with a roof as a temporary isolation booth. In music studios a permanent booth with a transmission loss of up to 35dB is often incorporated in the studio design.

### Rostra

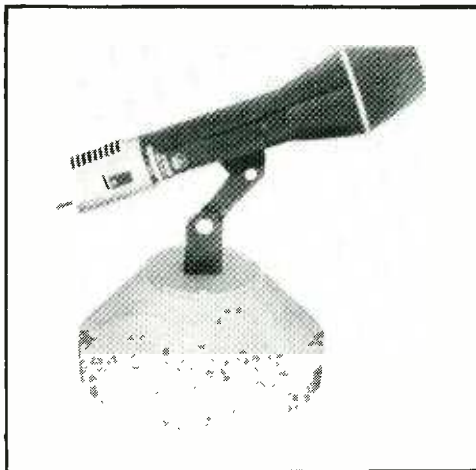
In large music studios it is quite normal to tier the orchestra on a full or half set of rostra so that a better musical balance may be obtained and to give all the orchestra a better view of the conductor. These are very stout wooden boxes, ie a top and four sides, about 4ft square and of varying height from 9in to 36in, which are pushed together to form the desired configuration.

The timber tops of these rostra must be very solid and of at least 1 or 1½in thick timber as they have to withstand a very considerable weight, even grand pianos, and must not flex or bend under the weight. Crossbracing of the top will help to prevent this.

### Safety transformers

The use of electrically powered musical instruments is becoming

FIG. 16



much more popular of recent years. Regrettably, either by bad design or misuse, some of these are almost lethal in use and present a severe hazard to the user, of which he is sometimes unaware. Many accidents and even deaths have occurred and it is the duty of the studio owner to see that such accidents do not occur on his premises. Should such an accident take place the least he can expect is much unwanted publicity. Indeed most professional studios now exhibit warning notices that such instruments must not be plugged into the studio mains sockets without reference to the engineer in charge.

Such accidents may be eliminated by the use of a safety transformer which is a specially designed unit with double windings, ie the separate secondary winding is entirely isolated from the primary and with an earthed shield between the two windings which will safely earth any fault destroying either primary or secondary insulation, and blow the protective fuse. Note that an 'auto transformer' is *not* a safety transformer and secondly that only one instrument should be fitted to each transformer. The transformers are interposed between the musical instrument and the studio mains sockets.

### Miscellaneous items

To complete the studio the following items will be necessary:

Ash trays if smoking is permitted; water jug with clean glasses and fresh water; fire extinguishers, carbon-dioxide or inert gas is necessary for electrical fires; wastepaper buckets; headphones for talkback during transmission or recording; script racks for use on the studio table which incline the script at a suitable angle

allowing the speaker to address the mic directly; piano stool; padded bass stools for bass and cello players as normal chairs are too low for their comfort; and bass blocks to accommodate the spikes fitted to basses, cellos, etc, to prevent them from damaging the floor, a 12in square of wood or blockboard or even *Celotex* should be provided so the spike can be dug into that instead of the floor.

### External areas

The studio is now complete and with the addition of the technical apparatus and microphones, ready to go to work, but perhaps a little thought might be given to ancillary areas outside the actual studio which are necessary if not essential to a well-run concern.

Rest rooms which can be separate rooms or an area where performers can sit, rest, enjoy a quiet smoke or perhaps a cup of tea or coffee when not performing in the studio. Some easy chairs and a few occasional tables are all that is necessary. Further recreational facilities can be provided in the form of a coffee bar or canteen. Not many studios will require a canteen, but the provision of a tea or coffee making machine, perhaps in the rest room, is almost an essential. Many performers will have travelled long distances to the studios, and have breaks between recordings. Nothing is more comforting than a cup of tea or coffee, albeit from one of the many machines on the market today.

Make provision for a public telephone, possibly coin-operated, adjacent to the studio. Nothing is more frustrating to a producer than to have one of the performers disappearing for some time just before the recording or transmission

to find out whether the expected new arrival has indeed arrived and that mother and baby are both doing well.

Toilet facilities with wash basins and towels should also be sited near to the studio and not at the other end of the building and should be well signposted for obvious reasons.

Where there are two or more studios, a practice room is helpful in which singers and solo artistes can rehearse in privacy and comfort. A well-lighted mirror and shelf is much appreciated for final make-up and hair-tidying purposes. Where public are admitted the performers may even wish to change their clothes for the actual recording or transmission. Do make provision for the safe storage of hats, coats and handbags and brief cases etc. These should not be brought into the studio and hung onto microphone stands, cue-lights etc. It does not do the microphone or cue light, or even the coat any good at all, particularly if the cue light is switched on accidentally.

A workshop, maintenance room, storage area, and, in television studios, scenery storage facilities, also need to be provided and all of these should be reasonably adjacent to the studio(s) for quick action should a studio fault develop.

### Conclusion

In the course of this series an attempt has been made to throw some light on the very many requirements and complexities inherent in the successful design of a modern studio. A studio can be used for so many purposes that many problems will invariably arise during the construction, but with common sense and a little patience these can always be overcome. It is of as much advantage to the design consultant as to the studio owner to produce a satisfactory result and if this article has brought to light or even jogged the memory of anyone concerned with the design of a new studio then its object will have been achieved. Undeniably, every design consultant will have his own ideas as to what constitutes a perfect studio and equally many designers will undoubtedly disagree with one or more of the items discussed in this article. However just remember 'one cannot please all of the people all of the time'. If this series results in some small way in better studios being built then it will have served its purpose. ■

Thanks to CTVC Studios at Bushey, Herts, UK, for the provision of studio photographs featured in this series.

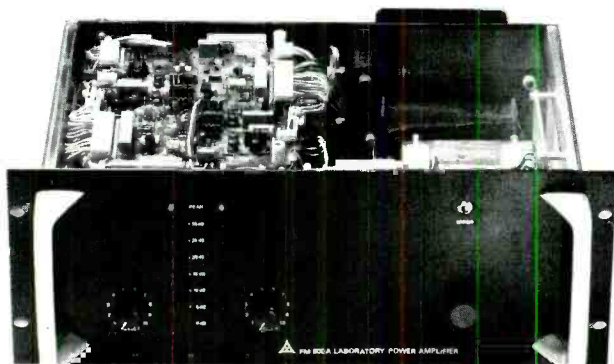
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# Designing a professional mixing console

Steve Dove

## Part Nine ~ Equalisers 3

**A**CHIEVING bald response shapes of whatever nature—high pass, low pass or bell-shaped bandpass or notch—does not really constitute a usable eq system. The shape—even if variable in frequency and bandwidth—is either there or not, in or out, no subtleties or shades, and some means of achieving control over the strength of effect is vital. By far the most common (but certainly not the only) control requirement and one easily understood by operators is 'lift and cut', where the frequency areas relevant to the various filters are required to be boosted or attenuated by any variable amount within known limits. Determining these limits alone is good for an argument or two, dependant on such disparate considerations as system headroom, operator maturity (!) and obviously, application. An eq created specifically for horrific effects is not a subtle beast: 20dB of adjustment is not unknown (and not, unfortunately, unheard). 6dB, though, is often far more than enough, particularly in self-op on-air control suites. A general median accepted by most manufacturers is to provide between  $\pm 12$  and  $\pm 15$ dB level adjustment on channel-type eq's.

### The Baxandall

Hi-fi type tone controls needed similar basic operational hf/lf lift and cut facilities and a design for this dating from the 50's by Peter Baxandall has since been an industry standard in assorted and updated forms. A development of the Baxandall idea is represented in Fig 45 based rather around today's more familiar op-amp technology rather than discrete transistors or valves. Fig 45a shows a 'virtual-earth' type inverting amplifier with the gain

Parts seven and eight were primarily concerned with detailing active filter techniques useful as amplitude and phase response shaping elements. This part deals with methods of applying these elements to practical eq design.

(being equal to the ratio of the feedback resistor  $R_f$  to the series resistor  $R_s$ ) continuously variable from infinite loss (min) to infinite gain (max) with unity sat in the middle. If a fixed gain determining leg is introduced and the variable leg made frequency conscious (Fig 45b), in this instance by crude single-order high pass filters (the series capacitors), the gain swing only occurs within the passband of those filters. The through gain for the rest of the spectrum is determined by the two fixed resistors—if this fixed chain is

replaced by a second frequency-conscious network that does not significantly overlap the original one in bandwidth, the two chains independently modify their frequency areas (Fig 45c). The fixed chain is only necessary where the gain is otherwise unpredictably defined by a frequency-conscious network.

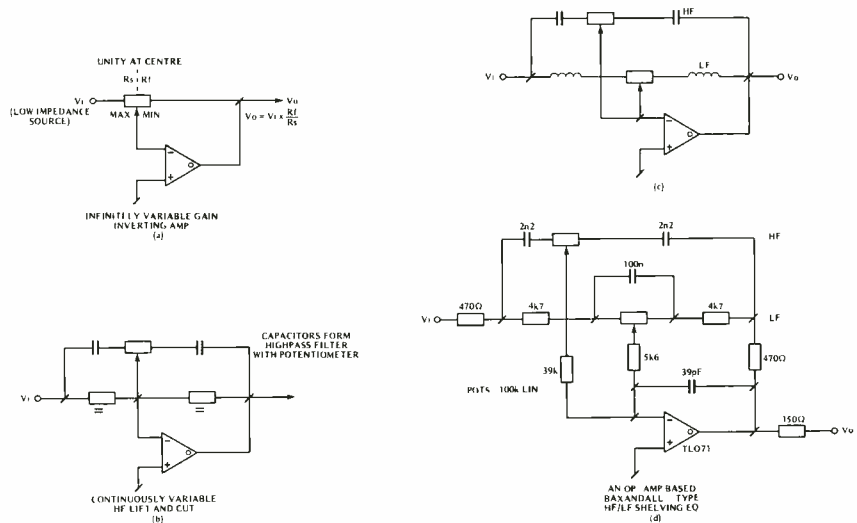
The belt - and - braces low - pass arrangement of Fig 45c can be simplified into the more elegant Fig 45d, which more closely resembles the definitive Baxandall circuit. Rather than isolating the lf lift/cut chain

with increasing inductive reactance, the control is buffered away with relatively small resistances and bypassed to high frequencies by capacitance. The control takes progressively greater effect at lower frequencies, as the rising capacitive reactance reduces the effective bypass. A further refinement is a pair of stopper resistors, small in value, that define the maximum lift and cut of the entire network.

Naturally, more complex eq can be configured around the same arrangement. A mid-frequency bell curve is easily introduced by any of the means in Fig 46c, giving a good clue how to avoid having to use a 'real' tuned circuit using dreadful inductors.

A variable signal either positive or

FIG 45 DEVELOPMENT OF BAXANDALL STYLE EQ



negative in phase sense to the source  $V_i$  can be picked off from a pot straight across the existing hf and lf chains, taken to an active-filter arrangement to derive the needed amplitude response shape, then returned into the loop at either the virtual-earth point (to which the hf and lf chains are tied) or to the non-inverting reference input (Fig 46d) dependent on whether the absolute phase of the filter is positive or negative respectively. Industry favourites seem to be this approach using either a Wein-Bridge bandpass (Fig 42e in part eight was evolved specifically to such an end) or a state variable type (for better or worse) as in Fig 43e.

Any number of such active chains may be introduced, provided two Great Hangups don't intrude excessively.

**Hangup 1:** Interaction between frequency groups. Hanging on two control chains that operate at the same frequency either adjustably or through overlap can at best be deceiving or at worst self-defeating. In the Baxandall (as with most other arrangements as we shall see) if maximum gain (say 15dB) is attained at a given frequency by one control, a second similarly tuned chain, cranked for maximum, will not give the expected additional 15dB gain—the overall loop is already operating close to the maximum gain defined by the stopper resistors. A notable measured result is for a sweep-mid bell curves' maximum lift and cut capability to be restricted at the extents of its range where it overlaps into the shelving hf/lf curves. It's maybe fortunate that providing the overlap isn't really silly; this interaction is not subjectively obvious.

A rough rule born from hard experience of squeezing most eq from least electronics is to not allow overlap incursion beyond the point

where either curve has  $\pm 6\text{dB}$  eq effect individually. Overlapping is best achieved from the comfort of another eq stage, although that too invokes other compromises.

**Hangup 2: Noise.** The basic Baxandall, using purely passive frequency-determining components, is a delightfully quiet arrangement. With controls at flat, it is theoretically only 6dB noisier than the unity gain noise of the amplifier—probably in the  $-100\text{dBu}$  region. Noise character varies with the controls much as one would expect of an amplifier the gain of which is directly manipulated at the frequencies in question—hf lift, more hf noise etc.

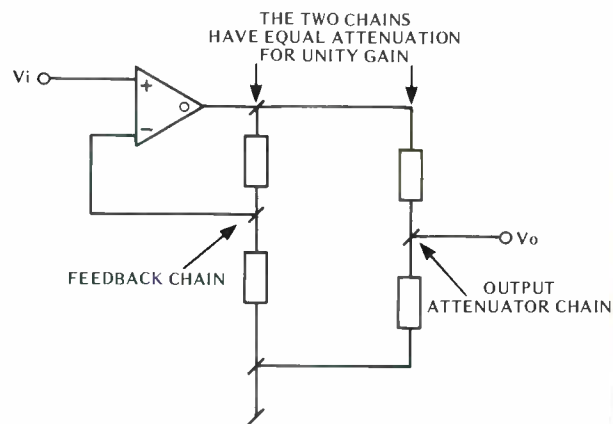
As soon as active filtering is involved, more noise is unavoidably introduced, often highly coloured and consequentially more noticeable. What is worse is that it's present all the time irrespective of control positions—even with its appropriate control at neutral centre, it is quite usual to hear a mid-sweep 'swoosh' in the noise changing with filter frequency. This is along with the strange spectral character of the noise emergent from some filters, notably the integrator-loop variety, resultant from unoptimised impedances and dubious stability almost inherent to the design.

### Alternatives

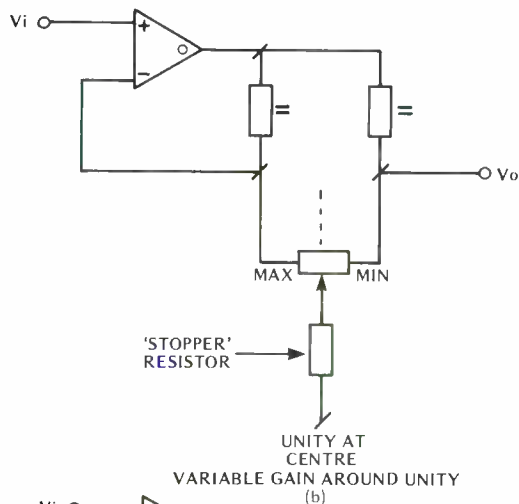
The source impedance versus feedback impedance ratiometric approach of the Baxandall is not the only way of achieving symmetrical lift and cut. A method enclosing the controls within the feedback legs of a non-inverting amplifier is developed in Fig 47. This has the advantage of leaving the op-amp's non-inverting input free, obviating the need for a preceding low-impedance source or buffer amplifier. Roundabout to

78 ▶

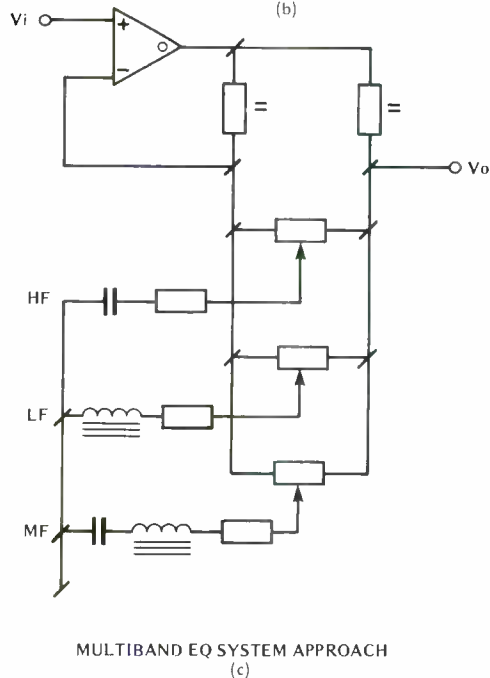
FIG 47 SWINGING OUTPUT EQ GAIN BLOCK



(a)

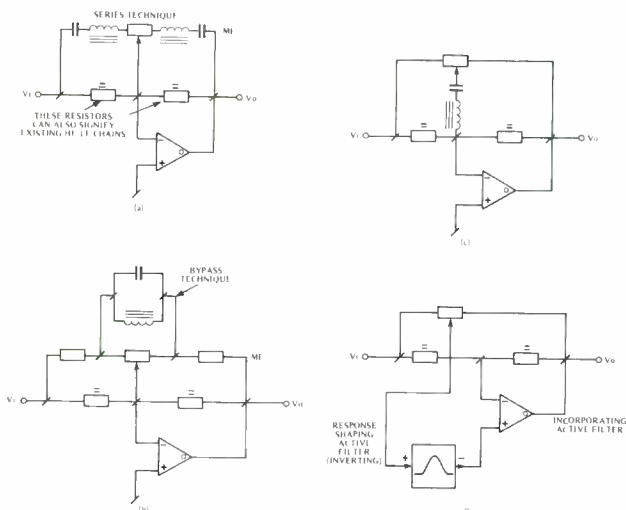


(b)



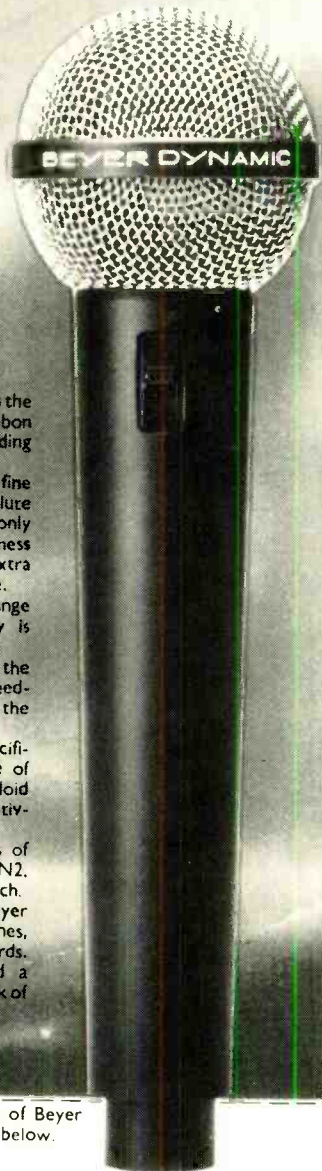
(c)

FIG 46 METHODS OF INTRODUCING RESONANT FREQUENCY SELECTIVE ELEMENTS TO THE BAXANDALL





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		15	380		200	200 or 320
½	12.5	7½	190		200	200 or 320
		15	380		200	200 or 320
		30	760	AES	200	-----
1	25	7½	190		200	200 or 320
		15	380		200	200 or 320
		30	760	AES	200	-----
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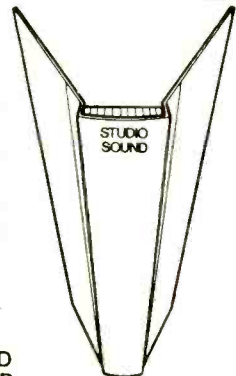
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# Mixing console

between 10dB and 20dB of fairly frequency-conscious background gain (ie with all controls 'flat') rendering it, at first sight, significantly noisier than a Baxandall. Two big BUTS.

But, the impedances around the amplifier are considerably lower—in the order of a decade lower—reducing thermal noise generation due to resistive elements and op-amp internal mechanisms considerably.

But, noise generated by the active frequency determining filters is, with the controls neutral, injected equally into the inverting and non-inverting inputs of the op-amp. Differential amplifiers being what they are, common-mode signals (such as this equally injected filter noise) get cancelled out and do not appear at the output. Fun, this, isn't it?

Interaction can still intrude, care being required to prevent excessive frequency band overlap. Centre-tapped pots (the tap being grounded) eliminate many interactive effects but at the cost of increased invariable background gain (noise) and peculiar, almost intractable, lift/cut gain variation linearity versus control rotation.

## A practical eq

A three section parametric eq with additional versatile shelving-type hf and lf controls has its circuitry detailed in Fig 49. It is designed to be easily shortened to hf, lf plus a single mid-band parametric section for applications that don't demand the full—and by any standards fairly outrageous—complement of facilities. Each individual selection is switchable in or out to allow preset controls and simple in/out comparisons with tie-down resistors maintaining the unused filters' dc

conditions to minimize switch-clicks. Even a brief gawp at the circuit reveals a major benefit—the signal path through the eq is via merely three op-amps, one (IC2) being an input differential amplifier and another (IC3) does duty as the output line-amp. In the shortened version this path is reduced to only two op-amps, IC1 and IC3 (which serves also as a swinging-input eq gain block). IC2 and its associated circuitry are unused. Most of the circuitry has been described elsewhere in this article or preceding ones so only fresh gruesome tit-bits will be explored now.

Perplexed by the strange-looking values around the differential input stage? Well, without lurching into tedious sums, those values provide unity differential in/unbalanced out levels whilst providing an identical impedance (with respect to ground) on each of the two input legs. Naturally, the more precise the component values, the better the common-mode rejection is likely to be.

## The first eq stage

IC2 is the first swinging-input stage which has two non-frequency-overlapping filters hanging off it, one section covering 25Hz to 500Hz; the other, 1kHz to 20kHz. Each filter network creates a complex impedance form against frequency that is a dead ringer (get it?) for a series L/C tuned circuit to ground. This fake tuned circuit (formed from two constant-amplitude phase-shift networks in a loop, named the CAPS-variable filter) reaches parameters proper filters cannot reach.

The centre frequency is smoothly variable, 'Q' remaining constant over the entire swing. The 'Q' itself is continuously variable between around 0.75 and 5 (very broad to pretty sharp, representing bandwidths of

1.5 to 0.2 octaves respectively). Positive feedback inside the loop (which defines the 'Q') is balanced against negative feedback (which controls minimum filter impedance, hence amplitude) interestingly enough relying on the input impedance of the 'swinging-input' stage as part of the negative feedback attenuator. Fortunately this is reasonably constant irrespective of lift/cut positioning.

In the absence of complementary square-law/reverse square-law dual gang potentiometers ideally required for the purpose, readily available log/antilog dual-gang pots slugged a bit to a reasonable approximation control the positive/negative feedback balance. As a result of this compromise, the crest amplitude due to the filter varies within  $\pm 1$ dB as the 'Q' control is swept—however, in comparison to the dramatic sonic difference from such a 'Q' variation, this tends to insignificance.

The result of all this, at the output of IC2, is a pair of somewhat beautiful resonant-type curves of continuously variable place, height, depth and width.

## Second eq/line amp

A reasonably hefty pair of transistors are hung on the end of IC3 to provide a respectable line-drive capability, in addition to the amplifier's use as a 'swinging-input' eq section. There is by far and away enough open-loop gain in the op-amp/transistors combination (over a much greater bandwidth than mere audio) to cope with 15-odd dB of eq lift and output stage discontinuities.

Differing from the last eq stage, this one only has a single mid-frequency bell curve creator, operating over a range of 300Hz to 3kHz, together with deceptively simple-looking but fascinatingly behaving hf and lf impedance generators.

Gyrating inductance to create a conventional lf shelving response (variable in turnover frequency by a

220K antilog pot) is achieved around IC11. A fairly large (2.2 $\mu$ F) series capacitor forming a resonance is switchable in and out, the capacitor's value being carefully calculated to work with the circuit impedances to provide an extreme lf response that falls back to unity gain below the resultant resonant frequency. The matched capacitor value also ensures virtually unnoticeable disturbance to the curve above the resonant frequency—reliance is placed on the characteristics of such a capacitor/variable gyrated inductance network: the 'Q' reduces proportionally to increasing frequency. Typical resultant response curves (Fig 50) show just what all this means, demonstrating an extraordinarily useful bottom end control.

Unusual—that's one way to describe the hf impedance generator and its eq effect. It is essentially a 'super-capacitor', or 'capacitive capacitor', and if both of those are meaningless, it's a circuit that when in conjunction with a resistor causes a second-order response as would normally be expected of an inductor/capacitor combination—a slope of 12dB/octave as opposed to a single-order effect of 6dB/octave. It utilizes negative-impedance conversion—if this is sounding a bit weird and sci-fi, don't worry it works and Fig 51 shows what it does at the eq output.

The response is 'hinged' about 1kHz, the control varying the frequency (between 5kHz and 20kHz) at which the gain reaches maximum (or minimum if the lift/cut control is 'cut'). The slope between 1kHz and the chosen maximum frequency is virtually a straight line representing a nearly constant dB/octave characteristic, with a nearly flat-top shelving characteristic.

In electronic terms, this is achieved by progressively disorganising the super capacitor until it gives in, eventually looking like a simple, single capacitor...

Unusual. ■

FIG 50 FREQUENCY RESPONSE OF LF SECTION (CONTROL AT MAX GAIN)

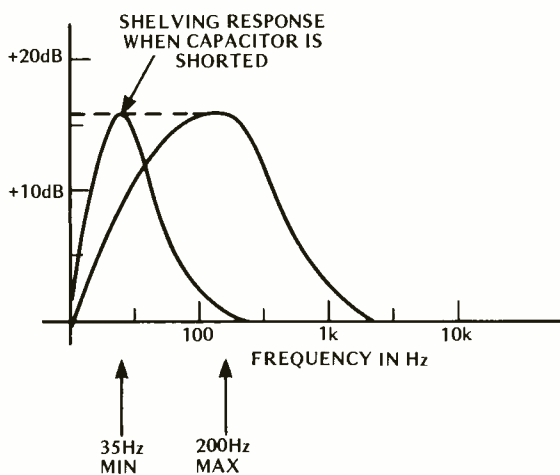
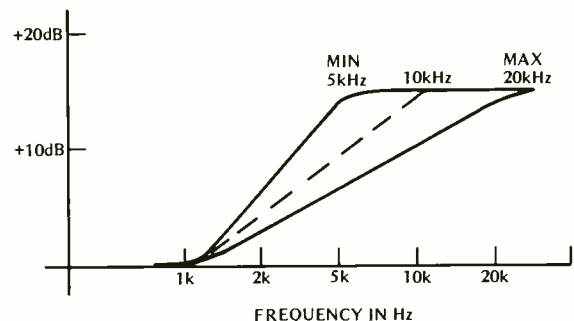


FIG 51 CHARACTERISTICS OF HF SECTION (LIFT CUT CONTROL AT MAX LIFT)





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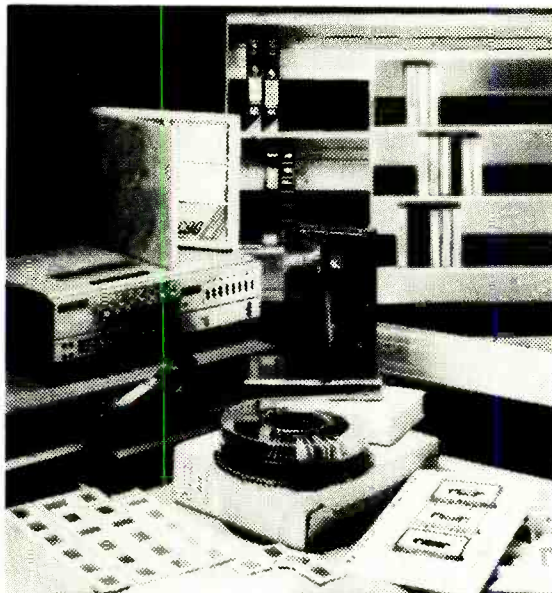
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## Amber 3500

### MANUFACTURER'S SPECIFICATION

#### Signal Source

**Frequency range:** 10Hz to 100Hz in four overlapping ranges.

**Output level range:** +22dBV to -60dBV (12.6V to 1mV) open circuit.

**Amplitude flatness (referred to 1kHz):** ±0.1dB, 20Hz to 20kHz; ±0.5dB, 10Hz to 100kHz.

**Output impedance:** 600Ω ±1%.

**Output level control:** 7 steps of 10dB and variable control of 12dB.

**Output configuration:** floating single ended (output ground isolated from input ground).

**Distortion and noise:** graphical data supplied.

**Distortion measurement (total harmonic distortion plus noise)**

**Fundamental frequency range:** 10Hz to 100kHz in four overlapping ranges.

**Input level range:** +40dBV to -30dBV (100V to 30mV).

**Residual noise and distortion:** graphical data supplied.

**Measurement bandwidth:** 10Hz to 300kHz ±3dB.

**Accuracy:** ±1dB 20Hz to 20kHz; ±2dB 10Hz to 100kHz.

#### Ac level measurement

**Input level range:** +40dBV to -60dBV full scale (100V to 1mV).

**Input sensitivity, band limited mode:** -110dBV full scale (3μV).

**Accuracy (for signals 1mV rms):** ±0.2dB, 20Hz to 20kHz; ±0.5dB, 10Hz to 100kHz.

**Residual noise (for input terminations of 1kΩ):** -100dBV (10μV); 300kHz BW, -110dBV (3μV); 50kHz BW, -120dBV (1μV).

**Narrow band mode:** constant percentage bandwidth bandpass filter with approximately one octave bandwidth. Tracks oscillator over full frequency range.

#### Distortion measurement (optional intermodulation distortion)

**Source:** low frequency (60Hz standard) and tunable high frequency mixed in a 4 to 1 amplitude ratio.

**Measurement:** SMPTE—measures modulation of hf signal by lf signal as a percentage of hf signal. CCIF—measures difference frequency component (f1 - f2) of externally generated twin tone signal as a percentage of composite signal.

**Frequency range:** SMPTE—lf 10Hz to 500Hz hf 2kHz to 100kHz. CCIF—f1 or f2 2kHz to 100kHz f1 - f2 (difference) 10Hz to 1kHz.

**Residual distortion:** 0.003% (-90dB) for 60Hz and 7kHz, 4:1 level ratio.

#### Common characteristics

**Input impedance:** 100kΩ shunted by ≤100pF.

**Meter characteristics:** true rms responding for signals with crest factor ≤3 and harmonic to 80kHz.

**Meter scales:** (standard) dBV (0dBV = 1V) — linear dBm (0dBm = 0.775V) — (linear volts, percent — logarithmic, (optional) watts (across 8Ω) — logarithmic.

**Indicators:** input level over and under LEDs to facilitate setting of input level. Tuning high and low LEDs to facilitate tuning analyser to external source (total harmonic distortion mode).

**Filters:** two filter positions provided standard filters supplied. Position 1: 400Hz highpass, 60dB per decade roll-off. Position 2: 50kHz lowpass, 60dB per decade roll-off. Optional 'A' weighting, 20kHz, 30kHz or 80kHz lowpass, CCIR.

**Monitors:** input monitor (rear panel) provides scaled presentation of input signal. Distortion monitor (front panel) provides scaled presentation of input signal with fundamental removed in total harmonic distortion mode, filtered signal in narrow band mode and lf residual in IM distortion mode.

#### General

**Temperature range:** 0°C to +50°C.

**Power requirements:** 14Vac at 14VA max provided by supplied ac mains transformer. Ac mains (standard) 115Vac +5%, -10% 50 to 60Hz. (Optional) 100, 120, 220, 240Vac +5%, -10% 50 to 60Hz. Optional internal rechargeable battery provides approximately one hour operation. May also be powered by external source of 14 to 20Vdc at 1A max.

**Dimensions:** (excluding tilt stand/handle) (whd) 8.8 x 3.7 x 10.3in (224 x 94 x 262mm).

**Weight:** (instrument less battery) 4.8lb (2.2kg). With battery, IM distortion option and adapter/charger 8.5lb (3.9kg).

**Price:** Basic + battery £985 IM £225. As review £1,277.

**Manufacturer:** Amber Electro Design Ltd, 4810 Jean Talon West, Montreal, Canada H4P 2N5.

**UK:** Scenic Sounds Equipment Ltd, 97/99 Dean Street, London W1.

THE Amber 3500 distortion and noise measuring instrument consists of two parts, a very low distortion sinewave oscillator and as standard a total harmonic distortion measuring section. Within the latter section two filters normally provide a highpass and a lowpass function for use when measuring distortions, but, a number of optional filters can replace these to give noise weighting to the CCIR recommendation 468 or the IEC 'A' characteristics. Whilst the highpass filter is tuned to 400Hz the lowpass filters can be chosen to give -3dB points at 10kHz, 20kHz, 50kHz (as standard) or 80kHz.

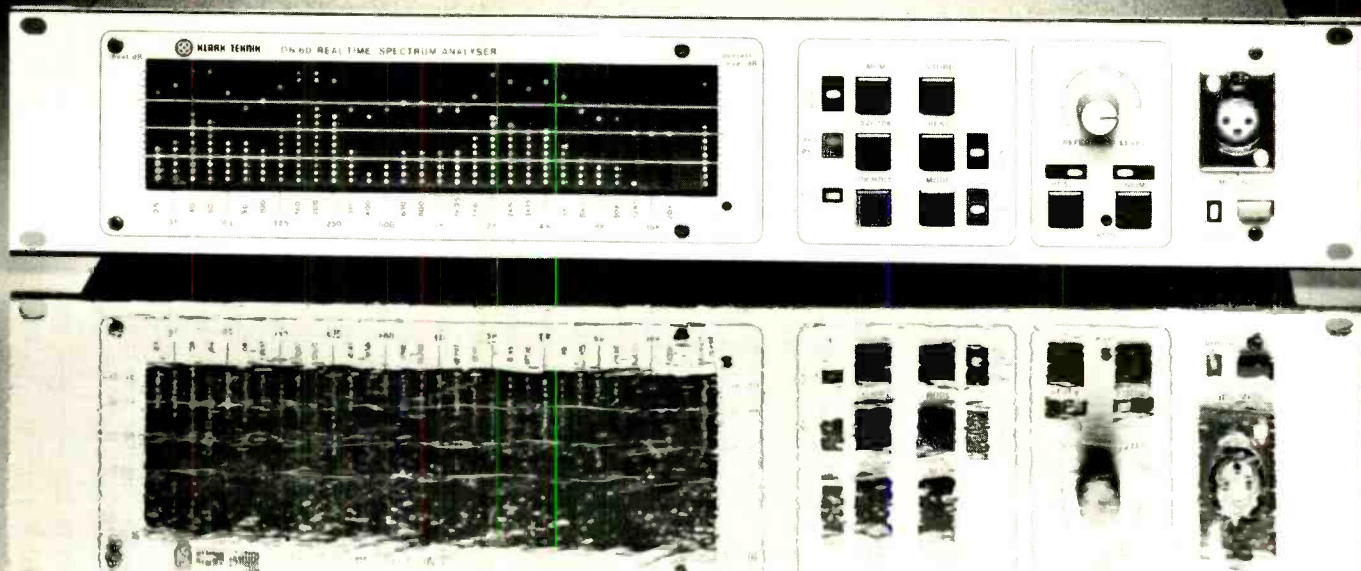
Powering is as standard from 120Vac with a 100/120/220/240V 48/440Hz version available with either version being able to be equipped with a rechargeable battery; alternatively the instrument may be powered from 14Vac or 16Vdc in one version.

Further options relate to the scaling of the internal moving coil meter and the front panel. Normally the meter has a linear dBV scale from +2dBV to -10dBV together with two harmonic distortion percentage scales (which are also used to read voltage) and a dBm scale. Alternatively meter scales allow measurement of total harmonic distortion with dBV, dBm or W into 8Ω with the remaining panel options being as above but also with the ability to measure IM distortion to the CCIF twin tone method and the SMPTE method.

Finally there is the choice of two special features which allow the meter to be manually or automatically offset to read relative decibels from any level.

The review instrument was fitted with a large combination of options allowing both total harmonic and IM distortion measurement in addition to high and lowpass filters and the manual relative decibel feature.

The form of construction of the instrument is



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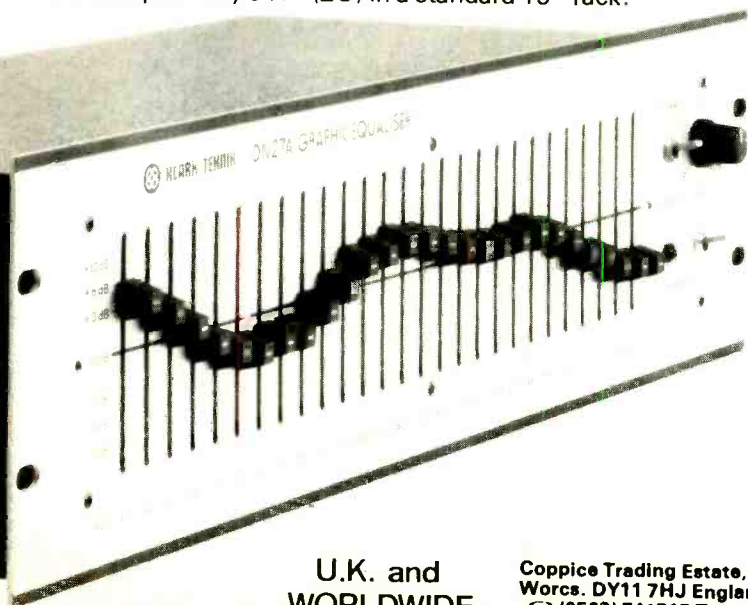
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novel with the top and bottom covers being plastic mouldings between which the sides, the front panel and the power pack at the rear are sandwiched. Within the instrument all audio circuits are contained on two good quality pcbs, one accessible from the top and the other from the bottom. All components are clearly identified for servicing and the owner's manual includes alignment instructions in addition to good user instructions. However, no circuit diagrams are provided in spite of the inclusion of a comprehensive parts list.

Overall the standard of construction was good with the connections to the pcbs and the rear power supply being by means of plugs. The separate power supply and battery charger connects to the instrument via a 2-core lead which plugs into the instrument and is fixed to the power supply which accepts its mains input from a standard IEC connector which forms part of the voltage selector and mains power fuse, the output from the power supply being isolated from earth to avoid ground loops.

Being fitted with a tilting foot/carrying handle the instrument is readily portable and easy to use on a bench with additional feet under the instrument securing a card carrying abbreviated operating instructions.

Further instructions are to be found on the battery supply at the rear of the instrument pointing out that over an hour's use can be got out of the batteries with the instrument automatically switching off when the battery voltage is too low. Included to the left of the battery section is the external power connector, a battery test pushbutton which activates the front panel meter, the relative dB pot and a BNC connector for monitoring the buffered input signal.

All the remaining features are on the twin tone yellow front panel which has clear black legends and includes the mirror scaled meter reading true rms voltage in volts, dBV and dBm plus percentage distortion. Within the meter a green LED indicator is illuminated when power is on with a red LED also being illuminated when the relative dB facility is in use, the latter LED being identified as UNCAL.

To the right of the meter at the top of the instrument is the oscillator section with tuning controls which also rough-tune the distortion section which can also measure narrow band level (or alternatively, by changing an internal link, may act as a variable lowpass filter). Frequency is set by means of four interlocked multiplier push-buttons and a single pot control calibrated from 1 to 10, providing frequencies from 10Hz to 100kHz. Above the frequency pot two yellow LED indicators show if the distortion section requires an increase or decrease in frequency setting when external signal sources are in use.

The oscillator's output, which is fed to a BNC connector, has the level set by four toggle switches and a pot calibrated from -10dB to +2dB. One toggle switch offers an oscillator on/off function with the output impedance remaining constant at 600Ω with the other three switches setting the output level in dBV to 0 to -10, 0 to +20 and 0 to -40dBV, the maximum output being +22dBV and the minimum -60dBV (1mV) the latter being too high for sensitive inputs and thus requiring the use of an external attenuator for some measurements.

Below the oscillator section two red pushbuttons set the unit's function to measure oscillator level, input level at the BNC input

connector, distortion or narrow band level. Two further grey buttons switch the two filters which, in the review instrument, were a 400Hz highpass filter and a 50kHz lowpass filter with an adjacent BNC connector permitting the distortion residual to be monitored.

There remain two toggle switches and two 11-position rotary switches. The former are the power on/off switch and a distortion switch which switches the distortion section to measure either total harmonic distortion or IM distortion to the CCIF method or the SMPTE method with the internal oscillator being switched to include 60Hz in a 4:1 ratio for SMPTE type measurements. However an external twin tone source has to be used for CCIF type measurements which are limited to measuring the difference frequency.

One of the rotary switches controls the input level in 10dB steps from a maximum permitted input of +40dBV (100V rms) down to -60dBV (1mV) with the distortion measuring capability extending from +40dBV down to the -20dB (100mV) range. Two red LEDs at the periphery of the input level switch request a range change up or down when measuring distortion with the fine level setting being completely automatic and the frequency nulling being remarkably fast in action.

The second rotary switch selects the distortion full scale range from 100% (0dB) to 0.003% (-90dB) full scale meter reading.

Measuring distortion with this instrument was found to be very quick and simple: all that is required is to set frequency and level as desired, switch to distortion measurement and adjust the input switch as shown by the adjacent LED indicators and turn the distortion switch until a steady meter reading is obtained! With external signal sources the only additional requirement is to set the frequency as shown by the LED indicators around the frequency control!

#### Connections

The oscillator output was found to have a drive capability of 13.03V rms into an open circuit with the output impedance remaining constant with output level setting at 598Ω increasing to 604Ω with the oscillator switched off. Whilst there can be reasons for having a 600Ω output impedance I would personally have preferred a lower impedance output.

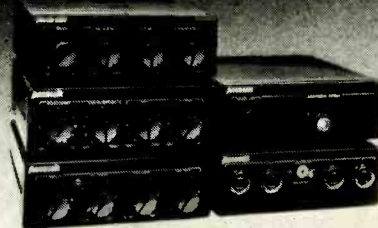
At the signal input the impedance was found to be adequately high for most applications at 99.4kΩ in parallel with 46pF it being a very valuable feature that the oscillator output ground is isolated from the signal input ground, the latter being the common ground with other connections.

The distortion monitor output was found to have an output level of 95mV from a source impedance of 993Ω corresponding with full scale meter indication, this output not only being useful for monitoring the distortion products on an oscilloscope but also for frequency analysis of the distortion products.

The final connection at the rear of the instrument provides a buffered, but never filtered, source of the input signal with 359mV rms corresponding to full scale level meter reading from a source impedance of 990Ω.

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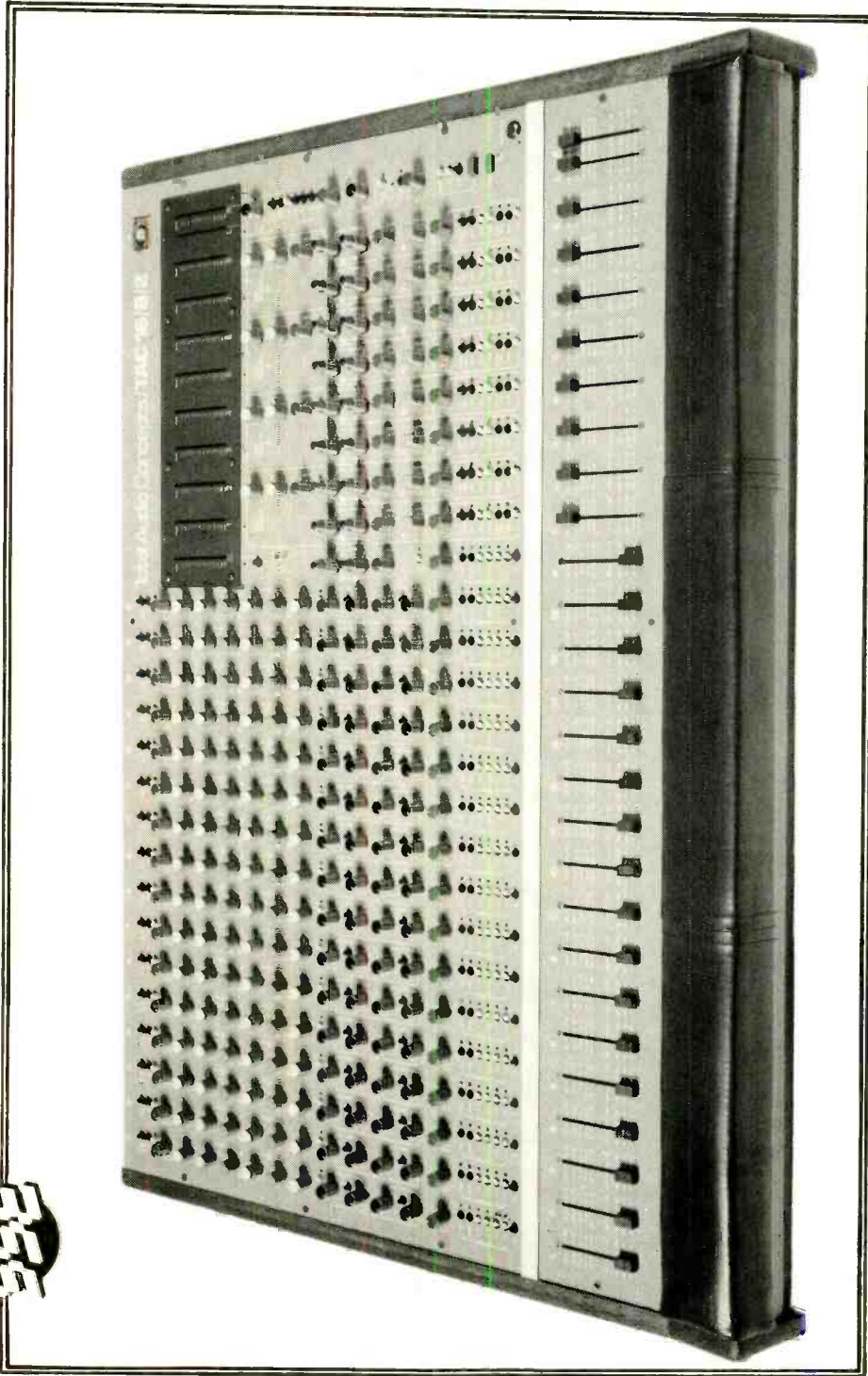
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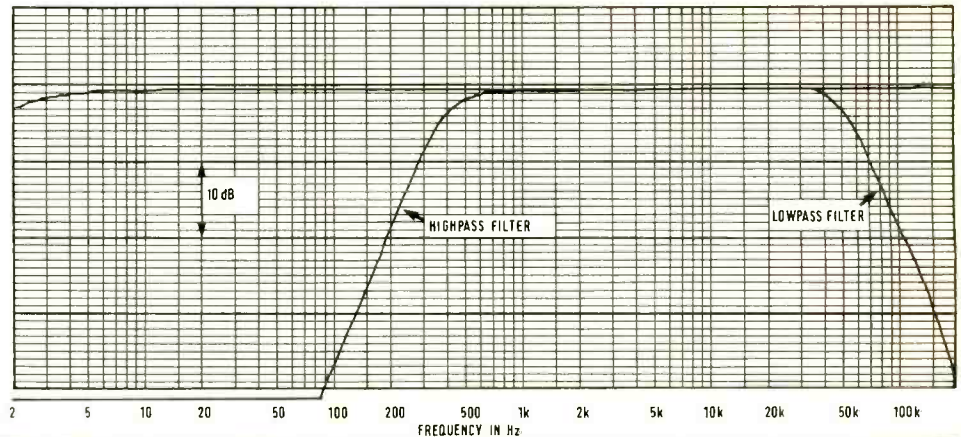
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FIG. 1  
AMBER 3500 FREQUENCY  
RESPONSE TO MONITOR OUTPUT



**Oscillator section**

The accuracy of the three switched attenuators was checked at 1kHz and found to have a worst-case error of only 0.07dB with the pot control offering a 12dB range.

The actual output level is of course monitored by the measuring section and more will be said about the accuracy of this section which suffered from drift. However the frequency response of the oscillator section was excellent, being within 0.1dB from 10Hz to 100kHz at all attenuator settings. Changing frequency initiated a small amplitude bounce of short duration which would not be troublesome.

Checking the oscillator's harmonic distortion produced some quite remarkable results as shown in **Table 1** which was obtained by using a passive notch filter in front of a Hewlett Packard type 3580A spectrum analyser.

When measuring the total harmonic distortion plus noise the measuring bandwidth will of course have a large effect upon the results and restricting the bandwidth will permit measurement to levels well below the tabulated results.

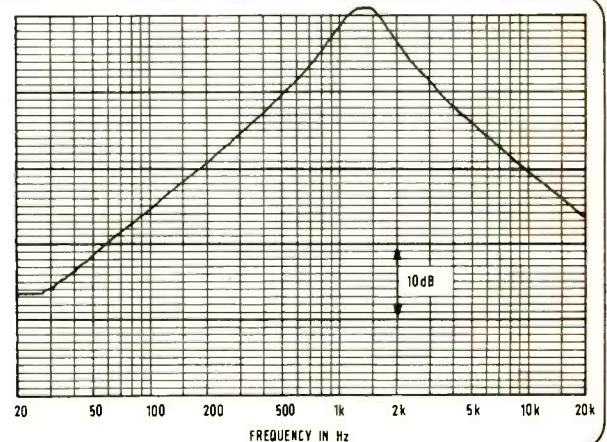
The accuracy of the oscillator frequency was checked at seven positions of the frequency setting potentiometer including the two extreme settings which are outside the calibrations with the results shown in **Table 2**. From this it can be seen that the frequency setting is not particularly accurate, but, I understand that a new version of the instrument will appear with an inbuilt frequency counter to measure both oscillator frequency and the frequency of incoming signals.

Whilst using the instrument it was noted that it created quite considerable radio frequency interference and it was found that rf was present in the oscillator output even when the oscillator was switched off. Measurements showed that up to 1mV at 4.8MHz was present in the oscillator output with the rf extending to well above 100MHz where 100µV was found in the oscillator output.

It is understood from the manufacturer that this radiation emanates from the switching type power supply within the instrument. The presence of such high levels of rf does however mean that the instrument cannot be used for some measurements upon radio receivers; it is however unlikely to create problems with audio frequency equipment.

The final measurements upon the oscillator section related to the SMPTE type IM waveform which was found to add a 59.7Hz tone to the normal oscillator output some 11.5dB down as

FIG 2  
AMBER 3500  
NARROW BAND FILTER SHAPE



opposed to the nominal -12dB for the conventional 4:1 amplitude ratio.

**Amplitude Measurement and Filters**

Checking the accuracy of the metering showed that there was significant drift with a +20dBV (10V) indication corresponding to 9.13V at switch on and drifting to 9.78V over about half an hour's operation after which the metering stabilised. Whilst the latter figure is within the specified accuracy of ±0.2dB it is felt that the amount of drift is rather excessive.

Measurement of the attenuator accuracies (including the distortion range attenuator) showed this to be very good with errors less than 0.05dB at 1kHz. The dB linear meter scaling was considered to be an excellent feature and checking the accuracy of the scaling relative to the zero dB indication provided **Table 3** which shows a good

88 ▶

TABLE 1

Frequency in Hz	2nd harmonic	3rd harmonic	Total + noise
20	-101.5dB 0.00084%	-106dB 0.0005%	-92dB 0.0025%
100	-105.5dB 0.00053%	-113dB 0.00022%	-97dB 0.0014%
1k	-110.5dB 0.0003%	-121dB 0.00009%	-97dB 0.0014%
10k	-104dB 0.00063%	-114dB 0.0002%	> -93dB <0.0022%
20k	-111.5dB 0.00027%		> -93dB <0.0022%
100k			-74dB 0.02%

TABLE 2

Range: Setting	× 10	× 100	× 1k	× 10k
1	13.3Hz	130Hz	1316Hz	13.16kHz
4	41.2Hz	401Hz	4063Hz	40.68kHz
6	61.2Hz	595Hz	6033Hz	60.45kHz
8	82.3Hz	800Hz	8069Hz	81.31kHz
10	101.4Hz	988Hz	10002Hz	100.42kHz
Clockwise	101.5Hz	988Hz	10002Hz	100.42kHz
Anti-clockwise	8.8Hz	86Hz	873Hz	8.73kHz

TABLE 3

Meter indication	Actual change	Error
+2dB	+1.95dB	0.05dB
0	0	0
-2dB	-2.03dB	0.03dB
-4dB	-3.85dB	0.15dB
-6dB	-5.72dB	0.28dB
-8dB	-7.71dB	0.29dB
-10dB	-9.77dB	0.23dB



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performance in comparison with the common logarithmic decibel calibrations.

The frequency response of the meter was found to be flat within the readability of the scale from 25Hz to 200kHz with the 1f - 3dB point being at 2.7Hz where the meter speed limits readability.

Fig 1 shows the frequency response from the meter input to the monitor output with and without the high and lowpass filters which were very close to their nominal frequencies with 12dB/octave skirts.

In the wide band mode the instrument can measure down to -70dBV (300µV) with the selective mode using the distortion attenuator to extend the range down to -120dBV (1µV). In the narrow band mode noise was below -120dBV at frequencies below 10kHz with a 1kΩ source resistance rising to -113dBV at 100kHz.

Reference to Fig 2 shows the filter shape when tuned to 1kHz, the shape remaining the same at other frequencies giving a constant percentage bandwidth characteristic with a fairly flat top to the curve easing tuning.

**Distortion measurement**

Measuring the notch characteristics in the harmonic distortion mode showed that the second harmonic was about 0.5dB down with negligible errors for higher harmonics. The nature of the notch filter being shown in Fig 3 which does not show the excellent notch depth which was found to be 104dB at both 1kHz and 10kHz which would imply a measurement capability down to 0.00063%.

The complete instrument's residual distortion varied with frequency and frequency range, being best at the high end of the frequency ranges with the best performance being as shown in Table 4.

The above figures were obtained with the lowpass filter in circuit except for the 100kHz figure with the 10kHz performance dropping to -96dB (0.0016%) with the filter out of circuit.

In the case of measurement of SMPTE-type IM

distortion the residual depended upon the higher frequency, being -86dB (0.005%) using 2kHz and falling to -93dB (0.0022%) at the normal 7kHz measuring frequency and above.

As explained earlier the instrument does not generate a twin tone signal for measuring to the CCIF twin tone method, but, using the Bruel and Kjaer type 1902 generator the residual distortion was found to be -60dB (0.01%) at 1kHz falling to -78dB (0.013%) at higher frequencies. It must however be remembered that only the difference frequency (f1 - f2) is measured.

**Summary**

So far as distortion measurement is concerned this is a most versatile instrument with an outstanding performance so far as harmonic distortion is concerned. In fact the distortion performance is marginally better than any other instrument of which I am aware and the Amber device is extremely quick and simple to use.

IM distortion performance is also very good to the SMPTE method, but CCIF measurements are limited to the difference frequency and not other IM products which are often more significant.

So far as level measurements are concerned the narrow band feature can be very valuable and the sensitivity range is unusually wide. I do however have complaint about the absolute accuracy of level measurements in view of the switch-on drift.

The other cause for complaint is the radio frequency interference caused by the instrument. As already noted, this can certainly cause problems when making measurements upon radio frequency equipment but is unlikely to be troublesome on audio frequency equipment.

Overall the Amber 3500 is a most versatile instrument at a most reasonable cost having regard to the measurement potential. Furthermore it is well made and readily portable.

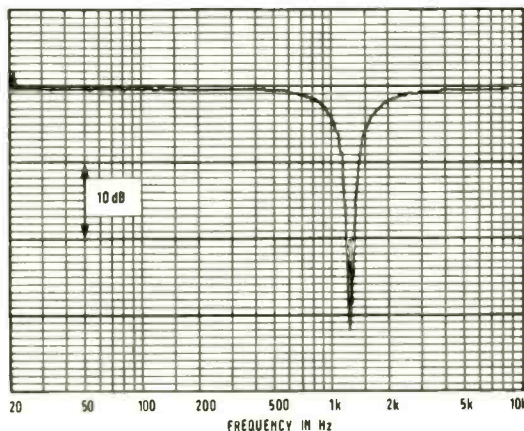
Whilst at the time of the review the owner's manual did not include circuits (for good reason!) a new and improved manual is on the way, complete with circuits.

Hugh Ford

TABLE 4

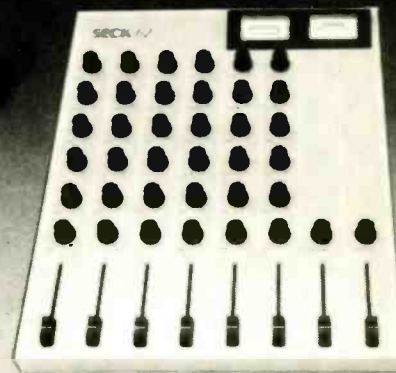
Frequency in Hz	10	100	1k	10k	100k
Residual (dB)	-95dB	-99dB	> -100dB	-99dB	-88dB
Residual (%)	0.0018%	0.0011%	> 0.001%	0.0011%	0.004%

FIG 3  
AMBER 3500  
HARMONIC DISTORTION  
NOTCH CHARACTERISTICS



**Editor's note:** Due to technical problems, the microphone reviews planned for this issue have been held over. These reviews will appear as soon as space is available.

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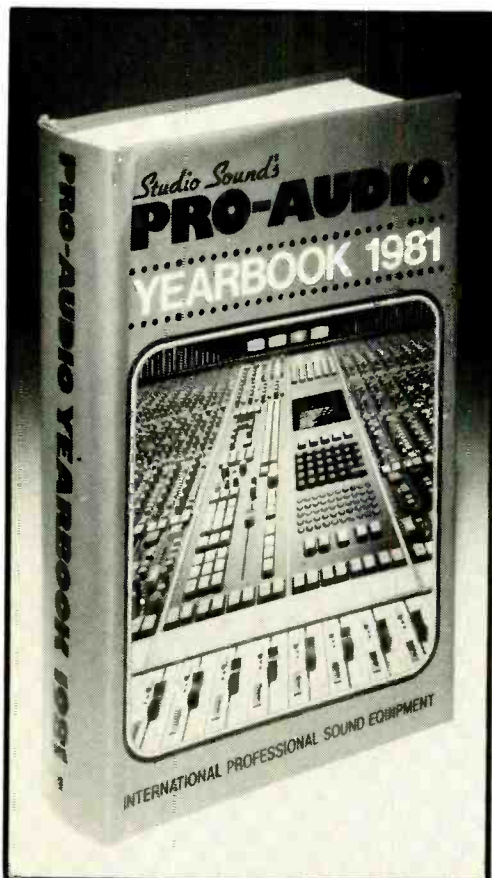
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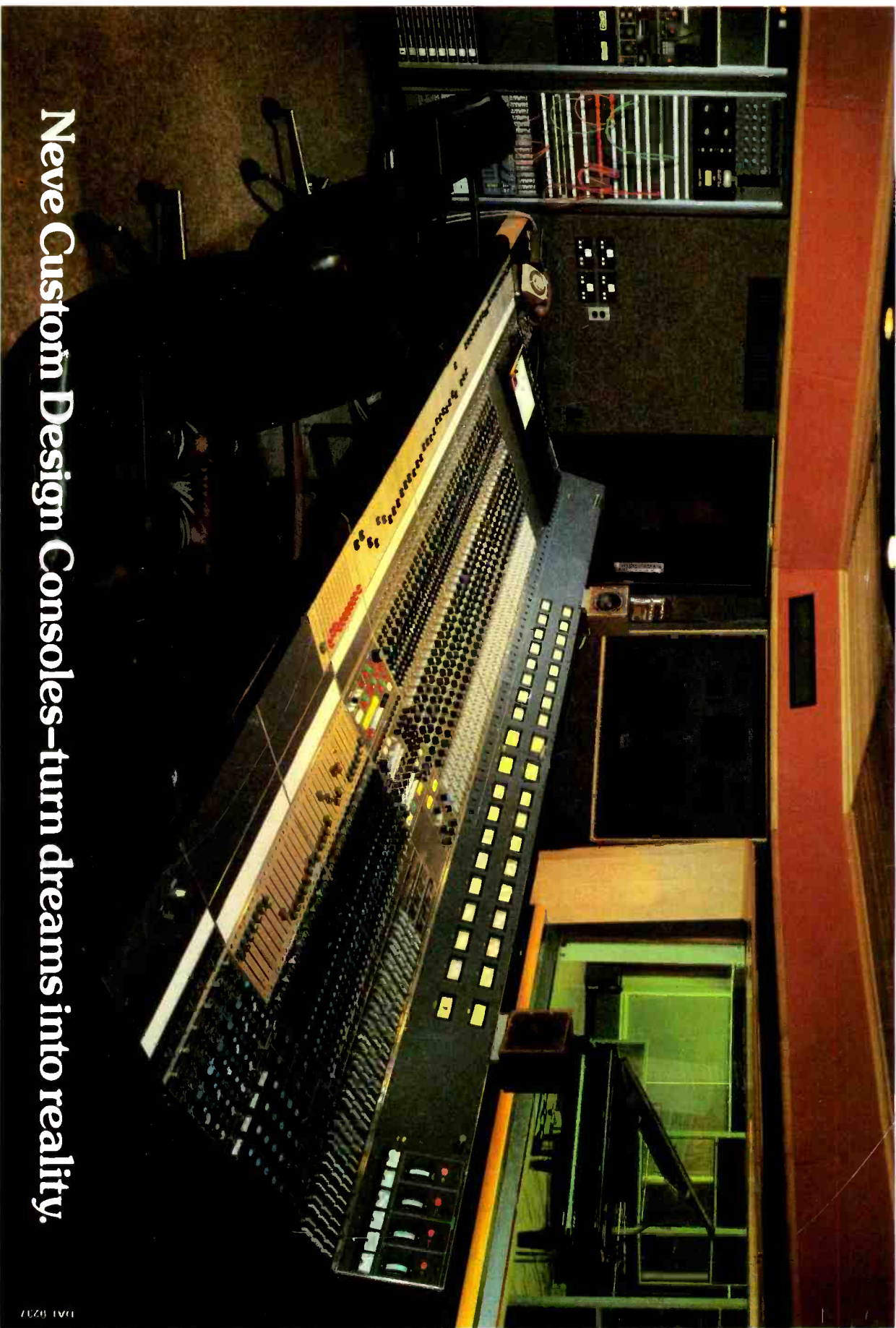
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