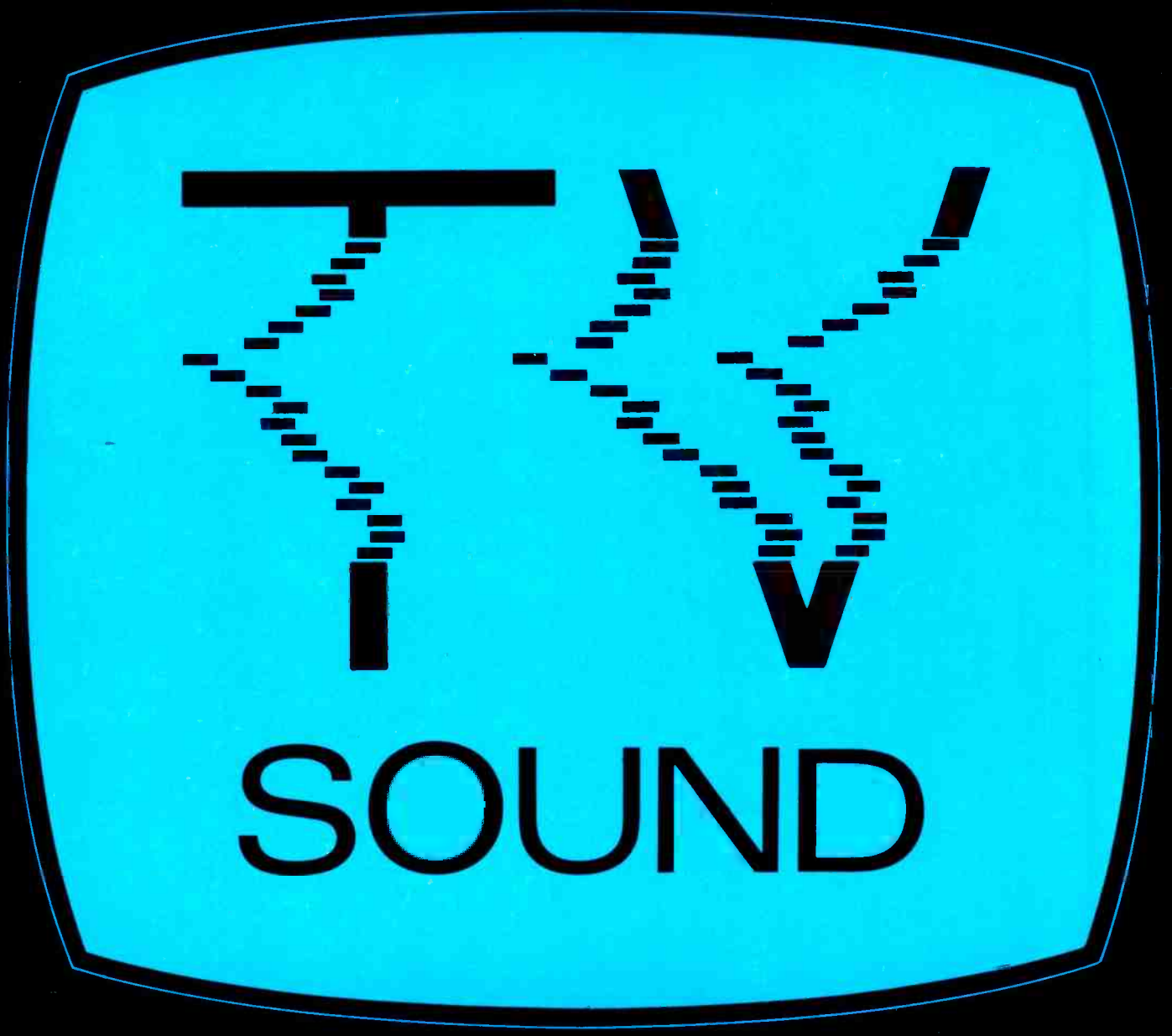
February 1976 35p

studio sound

AND BROADCAST ENGINEERING




Estudios Gema
Barcelona
El sonido del nombre
es el nombre del sonido.
cadac
The leaders in music recording consoles
and techniques.
Cadac (London) Ltd.
141 Lower Luton Road Harpenden Herts. AL5 5EL
Harpenden (STD 05827) 64351 Telex 826923

EDITOR MICHAEL THORNE
ASSISTANT EDITOR
FRANK OGDEN
EDITORIAL PRODUCTION
DRUSILLA DALRYMPLE
EXECUTIVE ADVERTISEMENT MANAGER
DOUGLAS G. SHUARD
ADVERTISEMENT MANAGER
TONY NEWMAN
MAGAZINE SALES MANAGER
DON BAILEY

THE LINK HOUSE GROUP
Editorial and Advertising Offices:
LINK HOUSE,
DINGWALL AVENUE,
CROYDON CR9 2TA
Telephone: 01-686 2599
Telex: 947709, EXCHMART CROYDN
Telegrams: Aviculture Croydon

STUDIO SOUND is published on the 14th of the preceding month unless that date falls on a Sunday, when it appears on the Saturday.

DISTRIBUTION
STUDIO SOUND, published monthly, enables engineers and studio management to keep abreast of new technical and commercial developments in electronic communication. It is available without charge to qualified readers; these are directors, managers, executives and key personnel actively engaged in the sound recording, broadcasting and cinematograph industries in any part of the world. Non-qualifying readers can buy STUDIO SOUND at an annual subscription of £5.80 (UK) or £6 (Overseas). Express (air mail) as follows (extra charge over paid or free subscription: Argentina (B), Angola (B), Australia (C), Austria (X), Barbados (B), Belgium (X), Bermuda (B), Botswana (B), Brazil (B), Bulgaria (X), Canada (B), Chile (B), Colombia (B), Cyprus (X), Denmark (X), Finland (X), France (X), Ghana (B), Greece (X), Holland (X), Hong Kong (B), Hungary (X), Iceland (X), India (B), Indonesia (B), Iran (A), Israel (A), Italy (X), Jamaica (B), Japan (C), Kenya (B), Lebanon (A), Malawi (B) Malaysia (B), Mexico (B), Monaco (X), New Zealand (C), Nigeria (B), Norway (X), Peru (B), Philippines (C), Poland (X), Portugal (X), Rhodesia (B), Rumania (X), Singapore (B), South Africa (B), Spain (X), Sri Lanka (B), Sweden (X), Switzerland (X), Tanzania (B), Thailand (B), Trinidad (B), USA (B), Virgin Islands (B), West Germany (X), Yugoslavia (X), Zambia (B).

Zones
X *Europe goes air mail regardless 2nd class air mail*
A *£18.78 (12 issues)*
B *£18.84 (12 issues)*
C *£22.56 (12 issues)*

BINDERS
Loose-leaf binders for annual volumes of STUDIO SOUND are available from Modern Bookbinders, Chadwick Street, Blackburn, Lancashire. Price is £1.50 (UK and overseas). Please quote the volume number or date when ordering.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Total average net circulation of 8535 per issue during 1974. UK 5663, overseas 2872.

studio sound

AND BROADCAST ENGINEERING

Sound with vision has been second rate for so long that no-one has really been able or confident to justify the shortcomings. The historical background, particularly in conventional film areas, is clear enough; not least of these is that film technology and production led audio for the crucial parts of the medium's development. As a result of parallel developments in film and video, we now have a situation where the market is the controlling factor in the sound that the tv or cinema screen watcher expects and receives. But this is in its turn similar to earlier times, when records were available in large quantities and with remarkable quality—as some of the transfers from old disc masters are showing—but when the actual realisation of the sound possibilities was, if it existed, at all, restricted to a small band of devotees.

So why bother? Because there is a small penetration which, however small, ought to result in an improvement in general consumer listening standards even if only by word of mouth and the various other social pressures. It was in just this way that people graduated from single record players to a point where selling and buying audio equipment has more to do with those processes in the motor industry than with the hi-fi freaks' activities of years gone by. A parallel market development in the tv sound field might seem unlikely at present, but remains an attractive possibility.

And thus to the features this month, one covering just that compromise and the other, at the opposite end of the scale, the equipment and techniques used in ZDF outside broadcasts. For the usual combination of unlikely and unfortunate reasons, other complementary features could not be included, but will appear in the very near future as space permits. In this way we hope to provide some coverage of a medium which, due to these limitations, has become the poor relation of the music recording and sound broadcasting worlds. There's no long term reason why it should be, even if there remains an uncomfortable feeling that the impetus will not be available for a while yet. Consumer education in this case means opening ears, not yelling slogans.

contents

FEATURES

SURVEY: LIMITERS AND COMPRESSORS 24

ZDF AND OUTSIDE BROADCASTING
Peter Jens, Peter Preker 34

CONSUMER COMPROMISE
John Dwyer 46

COLUMNS

BOOKS 10
NEWS 12
WORK 50

REVIEWS

HAECO *PL2* COMPRESSOR/LIMITER
Hugh Ford 18

EVENTIDE OMNIPRESSOR *2830*
Hugh Ford 20

dbx *160* SERIES COMPRESSOR/LIMITER
Hugh Ford 40

FEBRUARY 1976 VOLUME 18 NUMBER 2

Roger Squire's the specialists in deejay equipment for radio studios

PROFESSIONAL EQUIPMENT AT COMPETITIVE PRICES FOR BOTH BROADCASTING STUDIOS—AND RADIO RECORDING STUDIOS

ALL PRICES ARE NETT PROFESSIONAL

JINGLE MACHINES

SQUIRE S3000 Mk. II
R/Playback compat. **£145**

SPOTMASTER
Model 1000 **£339**

BROADCAST TURNTABLES

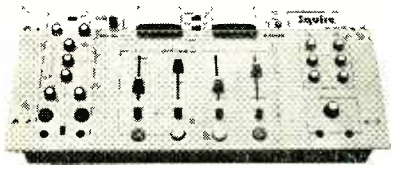
Russco Sparta
£175 **£295**

INSTANT START

Alice Broadcast Mixer

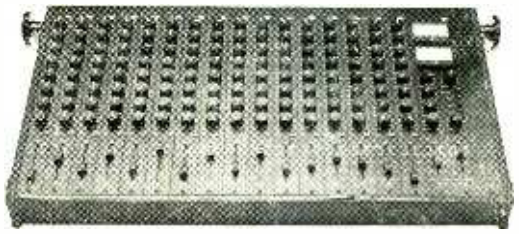
At last we can bring you a professional Broadcast mixer that features an ergonomically laid out DJ control panel.
Also featuring limiter on voice, On Air and Talkback facilities, P.F.L., and Peak Programme Meters.

This mixer can be operated MONO or STEREO and will take up to 8 inputs. All channels have remote switching. This mixer meets and exceeds IBA specifications.
Available ex-stock. NETT PROFESSIONAL PRICE **£465**



FEATURING
Remote starts
Voice auto fade
Full studio spec.

Squire S4000 6ch M/S Mixer **£218**



ALLEN & HEATH

16/2	...	**£580**
14/2	...	**£527**
12/2	...	**£474**
10/2	...	**£421**

ALSO

Stanton B/Cast Carts	... ...	**£13·25**
AKG Studio Mics, from	... ...	**£49·00**
Anglepoise Mic Stands	... ...	**£14·75**
Budget-priced mixers, from	... ...	**£59·00**
Uher Interview Recorders	... ...	**£284·00**
HH variable echo units	... ...	**£134·00**

UK CUSTOMERS VAT EXTRA

DELIVERY ANYWHERE IN UK *plus* EXPORT SERVICE

Most items available ex-stock. Prices subject to change without notice.

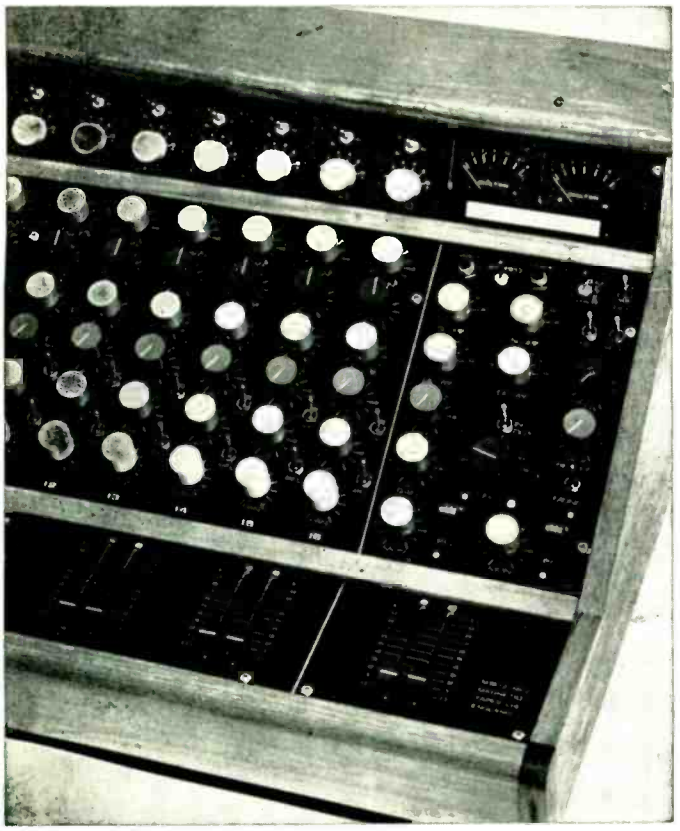
Showrooms open Tuesday—Saturday Closed Mondays

OPENING TIMES 10.00 a.m. - 5.00 p.m. LATE NIGHT WEDNESDAYS UNTIL 8.00 p.m.

Talk to our Manager Terry Way.
He knows about Radio Studios.

SOME ITEMS ALSO AVAILABLE FROM OUR MANCHESTER BRANCH.

Roger Squire's
STUDIO EQUIPMENT DIVISION
55 CHARLBERT STREET, LONDON NW8 6JN
Telephone 01-722 8111



WHY CHILTON MIXERS?

We are manufacturers in the true sense of the word; producing Teak Cabinets, Sheet Metal Work, Tooling, Front Panel and Printed Circuit Artwork etc., our products are accurate with an attention to detail that is second nature to us.

The popular M10/2 (10 in 2 out) portable mixer shown is supplied as a basic unit with 10 Line inputs inc PPM, Oscillator, LF/HF Equalisers, 1 Aux and PFL. You choose the number of Microphone or Gram inputs, the channels to have Presence, Switchable HF/LF Filters or Ducking. In addition a 2nd Aux channel, Talk-Back, and/or Compressors can be fitted.

Ring or write for full information, if however our standard range is unsuitable it may be possible to modify one to suit your requirements.

M10/2 Mk4 BASIC	..	**£365·00+VAT**
16 input version	.. ..	**£530·00+VAT**
12 in 4 out Mk2	.. ..	**£580·00+VAT**

MAGNETIC TAPES Ltd., Chilton Works, Garden Rd., Richmond, Surrey, TW9 4NS

Telephone 01-876 7957

WILMSLOW AUDIO

THE Firm for speakers!

Tannoy - Gauss - Radford - Kef - Goodmans - Celestion - Fane - Decca - Peerless - Baker, etc.

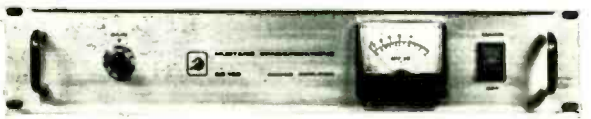
From stock:

RADFORD ZD22 Zero distortion stereo preamp
RADFORD HD250 High Definition Stereo amplifier
RADFORD Low distortion oscillator
RADFORD Distortion measuring set
Expected soon: RADFORD ZD100 and ZD200, 150 watt and 250 watt per channel, zero-distortion power amplifiers!

(Speakers) **Wilmslow Audio, Swan Works, Bank Square, Wilmslow, Cheshire**
(P.A. etc.) **Wilmslow Audio, 10 Swan Street, Wilmslow, Cheshire**
(Hi-fi etc.) **Swift of Wilmslow, 5 Swan Street, Wilmslow, Cheshire**

Tel. Wilmslow 29599 (speakers), 26213 (Hi-fi, PA etc.)

POWER AMPLIFICATION BY MUSTANG



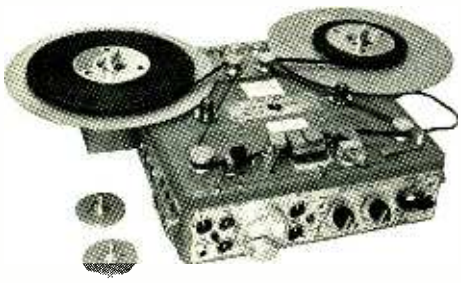
Our SS.100 and SS.50 are economical amplifiers with outputs of up to 150 and 80 Watts RMS into 8-15 ohms, typical THD figures being 0.1%, slewing rate > 10v/μs, noise > 90dB down, zero level input, and full electronic protection.
Considering these points with their proven reliability and robust construction, plug in output transistors and driver board, optional balanced input and 100V line output, and virtually ex stock despatches we reckon we take some beating!
Contact us now for the full technical specifications.

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

MUSTANG COMMUNICATIONS

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

PROFESSIONAL AUDIO PRODUCTS

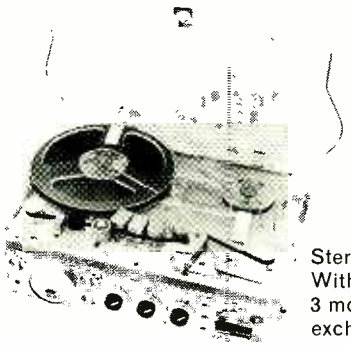


NAGRA 10½" SPOOL ADAPTOR

QGB * Nagra 10½" NAB Spool Adaptor. Suits any Series 3 or 4 Nagra Recorder. Battery or Ma ns powered.

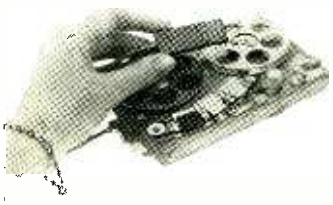
NAGRA IS MODEL

IS* Latest Kudelski Model. 3 motors. Fast spooling. Push button controls. Size 11" x 8" x 3". Weight exc batteries 8½lb. 2 speeds. Pilotton version available with built-in crystal.



NAGRA 4.2 SERIES

Stereo and Mono versions. With or without Pilot. Old Nagra 3 models bought in part exchange.



NAGRA SN
MINIATURE RECORDER

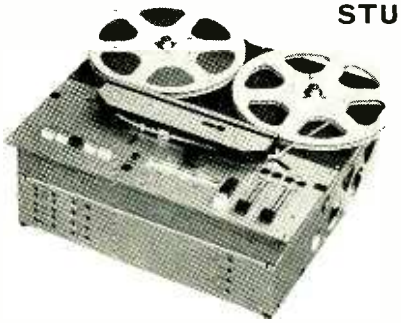
SN* Nagra Pocket Recorder. Size 6" x 4" x 1". Weight 18oz. 3 versions now available. Accessories now include: Add on Xtal pilot generator, playback synchroniser and mains PU.

*All above items ex stock.

Ask for details of our Leasing/ Purchase Plan for all Nagra models.

SONDOR LIBRA

Brand new 16mm sprocketed Magnetic Film Recorder/ Reproducer for transfer or dubbing. 2 channels (mike or line inputs) plus Cue Channel (for mike or time code signals). Syncs with mains, pilot, any projector and any other Sondor. Built-in Xtal.
Rock and roll up to 10 times speed. Stops at any preset position.
Detachable control panel for local or remote control.
Straight line lacing. Video version now available. 19" rack or table top mounting.



TELEFUNKEN
STUDIO TAPE RECORDERS

Model M.12—"The wow and flutter as measured to the DIN weighted quasi-peak method was the lowest that I have ever encountered."—*Studio Sound* magazine, May 1975.

Ask for details also of M.15 model, multi-channel machines and the range of Telefunken Automatic Tape Duplicating and Cassette loading equipment.

SENNHEISER
MICROPHONES

Phantom powered RF Condenser Microphones now available.

Free 96-page Review and Catalogue on request.

Hayden Laboratories Ltd
Churchfield Road
Chalfont St. Peter, Bucks.
SL9 9EW
Tel. Gerrards Cross 88447

HAYDEN

Name .....

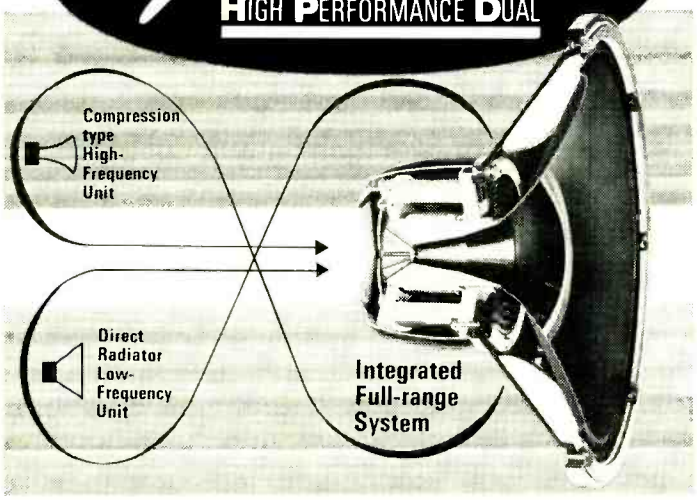
Address .....

.....

.....

THE *New* TANNOY *Monitor*

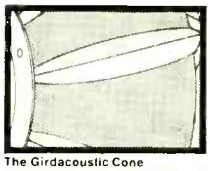
HIGH PERFORMANCE DUAL



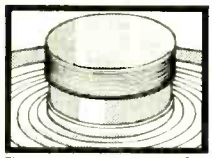
The Monitor H.P.D. represents a further outstanding improvement of a loudspeaker system which has become regarded as a quality standard over the last 25 years by Recording Studios throughout the world. There is a very good chance that your favourite records and tapes were monitored on Tannoy Dual Concentric loudspeakers, and to select these superbly engineered, individually hand-assembled speakers for *your* music system assures you of the same professional performance.

	260 mm 10″	310 mm 12″	410 mm 15″
Power Handling Capacity*	50W	60W	85W
Frequency Response	27-20,000 HZ	25-20,000 HZ	23-20,000 HZ
Intermodulation Products	less than 2%	less than 2%	less than 2%
Impedance via Crossover network	8 ohms (5 ohms min.)	8 ohms (5 ohms min.)	8 ohms (5 ohms min.)

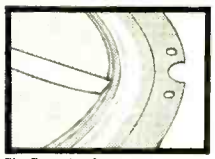
*INTEGRATED PROGRAMME MATERIAL



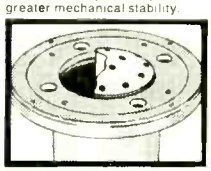
The Girdacoustic Cone improves frequency and transient response, gives much increased power handling capacity and greater mechanical stability.



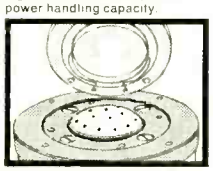
The High Temperature Voice Coil assures absolute climatic stability and great mechanical strength together with much improved power handling capacity.



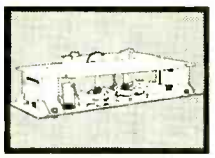
The Tanoplas Surround gives low bass resonance with excellent mechanical stability and freedom from edge reflections.



Patented Magnetic Shunt combined with specially treated and selected steel gives maximum magnetic flux in the unique Tannoy twin gap system, improves sensitivity and damping.



Unique High Frequency Unit with separate diaphragm and voice coil coupled to the horn by a 19 element phase-matching system.



High Power Crossover Unit with solid dielectric condensers throughout, combined with treble and roll-off controls.

Designed to sound better—naturally...

TANNOY

NORWOOD RD. WEST NORWOOD SE27 9AB
Tel: 01-670 1131 Telex: 949755

AUDIO MODULES

BUILD YOUR OWN

Mixers, Consoles, or add on to old equipt.

easy to use

10 different MODELS

Mic (Low-Z, Hi-Z), Mag. Phono, NAB Tape,
Active Equalizer, Line Amp, Power Amp.

From $16.50 to $43.50 Pro-NET (domestic)
check your nearest distributor for local prices.

Send for NEW Catalog over 280 items for Audio

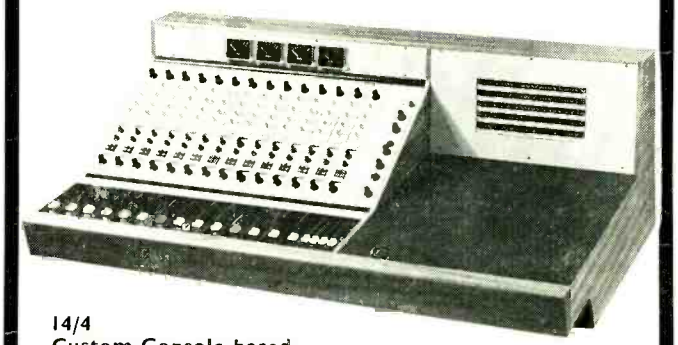
SESCOM foreign distributors:

Australia:	*Klarion Enterprises Pty. Ltd., So. Melboure*
Canada:	*Chas. L. Thompson, Ltd., No. Vancouver BC*
	John R. Tilton Ltd., Scarbough Ont.
England:	*Future Film Developments, London*
Greece:	*Laboacustica Hellas: Athens*
Holland:	*Iemke Roots Import, Amsterdam*
Italy:	*Laboacustia Srl, Roma*
Norway:	*Roger Arnhoff Studio a.s., Oslo*

SESCOM, INC.

"QUALITY ENGINEERED SOUND PROUDUCTS"
P.O. Box 590, Gardena, CA 90247 USA
(213) 770 3510, TWX 910 346 7023

A Mini Mixer with a true
PROFESSIONAL STUDIO SPECIFICATION



14/4
Custom Console based on Mini Mixer modules.

STANDARD MIXER (October issue for illustration)
10 Input Channels, 4 Output Groups.
Auxiliary Sends and Echo Returns.
XLR Connectors to balanced Mic Inputs and Line Returns.
Normalled Insert Jacks.
Low Noise and High Output levels.
Portable.
Extension units, PPM's, Limiters etc. also available.

South African Agents:
E. J. S. AUDIOVISUAL SERVICES
242 D. F. Malan Drive,
Blackheath, Johannesburg
Tel. 678-6613

RAINDIRK LTD., **Downham Market, Norfolk.**
Tel. 2165 and 3617

ITA—Britain's Leading Distributor

REVOX

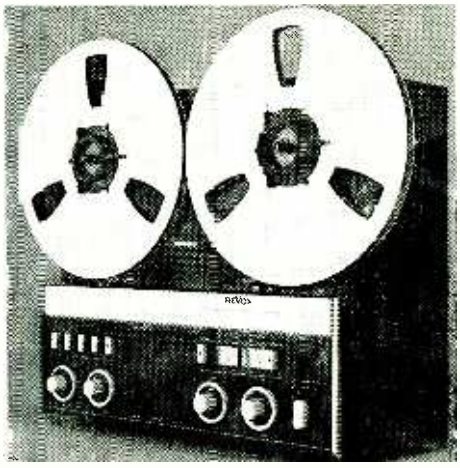
REVOX A-700 SERIES

The new big Revox - ideal for all studio requirements. Highly sophisticated design features include servo tape tension, full deck logic, crystal controlled servo electronics, 3 speeds, tape footage counter.

Immediate delivery.

+ HS77 £338 + A700 £630 +

REVOX A-77 SERIES Mk4



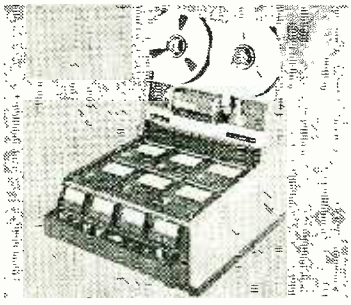
The famous A77 has been consistently improved over the past 8 years and is now available in the latest Mk. 4 version.

The wide choice of specifications includes versions for duplicating and logging applications. Backed by UK's fastest service.

Hire service.
Check our prices.
Immediate delivery.

OTARI

OTARI DP-4050 CASSETTE COPIER



Ideal for one copy or ten thousand. Eight times copy speed, foolproof operation for non-skilled personnel, modular construction, servo-controlled direct capstan drive.

Immediate delivery.

ALL TAPE RECORDERS SOLD BY ITA
FOR INDUSTRIAL USE SUBJECT TO 8% VAT

Industrial Tape Applications

ITA

5 Pratt Street, London NW1 0AE.
Tel: 01-485 6162 Telex: 21879

books

IC OP-AMP COOKBOOK
Walter G Jung
591pp, $12.95. Ref no 20969 published by Howard W Sams & Co Inc, and the Bobbs-Merrill Co Inc, Indianapolis.

'The linear ic has achieved acceptance as a standard design tool—a highly sophisticated parcel of gain available at passive component prices. Today, the ic op-amp has clearly revolutionised the field of linear circuit design, encompassing applications far beyond the original scope of analogue computer circuits.'

In this book, author Walter G. Jung has set out, and completely achieved, to explain and enlarge upon this statement from the *foreword* in a manner which makes this one of the most important practical design handbooks to be found on any engineer's bookshelf. He has managed to achieve the virtually impossible task of catering for all levels of understanding in electronics; heavy theory is provided, but always backed up with enough practical applications of the topic under discussion to instill a basic grasp in the most empirical of experimenters. But it's still all there for a man with a programmable calculator. On virtually every one of the 590 pages, there are real life circuit examples using off-the-shelf devices and preferred value r/c combinations together with sufficient basic formulas, completely reduced, to enable adaption to specific applications.

The author's style seems occasionally fireside, pipe and slippers but this doesn't detract from the authority of the arguments. Not only has Jung got an impressive track record in linear circuit design, but he was helped in preparation of the book by the actual ic circuit designers from six major manufacturers. So much for the credentials; far more important is the content of the book.

Chapter one is divided into three sections; the first of these—the ideal op-amp—sets out to show what the perfect device should do, while the second section—the non-ideal op-amp—points out clearly and precisely why real life devices don't. The third section—ic op-amp specifications—amounts to a comprehensive glossary of parameters encountered in manufacturers' specifications of these devices.

Chapter two describes the evolution of the various categories of op-amps providing at the same time a great deal of information about the popularly available types such as the *101, 709, 741* etc. It gives the pros and cons for each type in terms of gain/bandwidth product, slew, offset etc. Under each device type heading, there is a very useful applications subheading for real life deployment of the ic. The chapter concludes with an op-amp optimisation chart to enable device selection through one particular leading parameter.

Chapter three deals with general operating procedures and caveats device by device. Of these in particular, the author provides a good account of what to do to prevent building an unscheduled prototype high frequency oscillator. He also gives a lesson on input offsets.

The subsequent chapters are written under the heading *Op-Amp Applications* which is exactly what they are.

Chapter four offers an in depth study of current and voltage regulators incorporating op-amps for error correction purposes. The author describes, with help from many circuit diagrams, how to design precision voltage or current sources and the way to control them by the use of remote sensing lines.

Chapter five—signal processing circuits. This is a very wide applications area with almost perfect solutions provided the characteristics of the differential amplifier. In this case, the op-amp provides a building block to 'operate' on an input signal, thus creating a new form of output signal altered in some way from the input. These are the terms of reference for the topics detailed in this chapter. Anyone who has ever been interested in instrumental synthesisers would find this section of much use: precision diodes, precision clippers, dc restorers, full and half wave precision rectifiers, peak detectors (want to build a ppm?), sample hold circuits, limiters of various types, diode bridges, offset voltage followers, sign changers, logarithmic circuits, all types of comparators, instrumentation amplifiers and analogue multipliers. In some ways, the last topic is the most interesting in the chapter. It is not always appreciated by audio circuit design engineers just how useful and versatile the analogue multiplier is. The author discusses designs for both two and four quadrant multipliers quoting examples of both types of circuit. The multiplier can be used to create voltage controlled amps, limiters and compressors, raising to a power and DBX style noise reduction. This type of circuit is a natural for demodulation and ring modulation. When talking about four quadrant operation, Jung uses the much used Motorola *MC1595* as the illustration.

Chapter six—audio circuits. This is the bit you need if you want to build your own desk. But the author doesn't rush in. He first describes exactly what device parameters are important in audio applications. In particular, he sorts out problems relating to slew rate limiting and the various effects of incorrect compensation. Other topics: the general op-amp configuration translated into audio applications and practical audio circuits using op-amps. This section abounds with circuit diagrams for mic amplifiers (do you know how to work out the value of the input components to obtain the best overall noise performance?) phono amps, optimised tape replay amps, line amps, active filters (design equations provided), eq circuits, power amps, and of great interest, a complete mini section for the design of high performance transformerless balanced transmission lines, replacing the very expensive mic transformers in general use at present. There is also a circuit of a precision vu meter amp which doesn't introduce distortion when bridging a line.

Chapter seven concerns itself with signal generation circuits: integrators and differentiators from basic theory to finished design. Also sinusoidal oscillators, quadrature oscillators, multivibrators, function generators and saw tooth generators. Once again, Walter Jung gives enough information for a man armed with a pocket calculator to produce an anti-howlround frequency shifter or the tone generation department of an advanced synthesiser with about the same amount of effort.

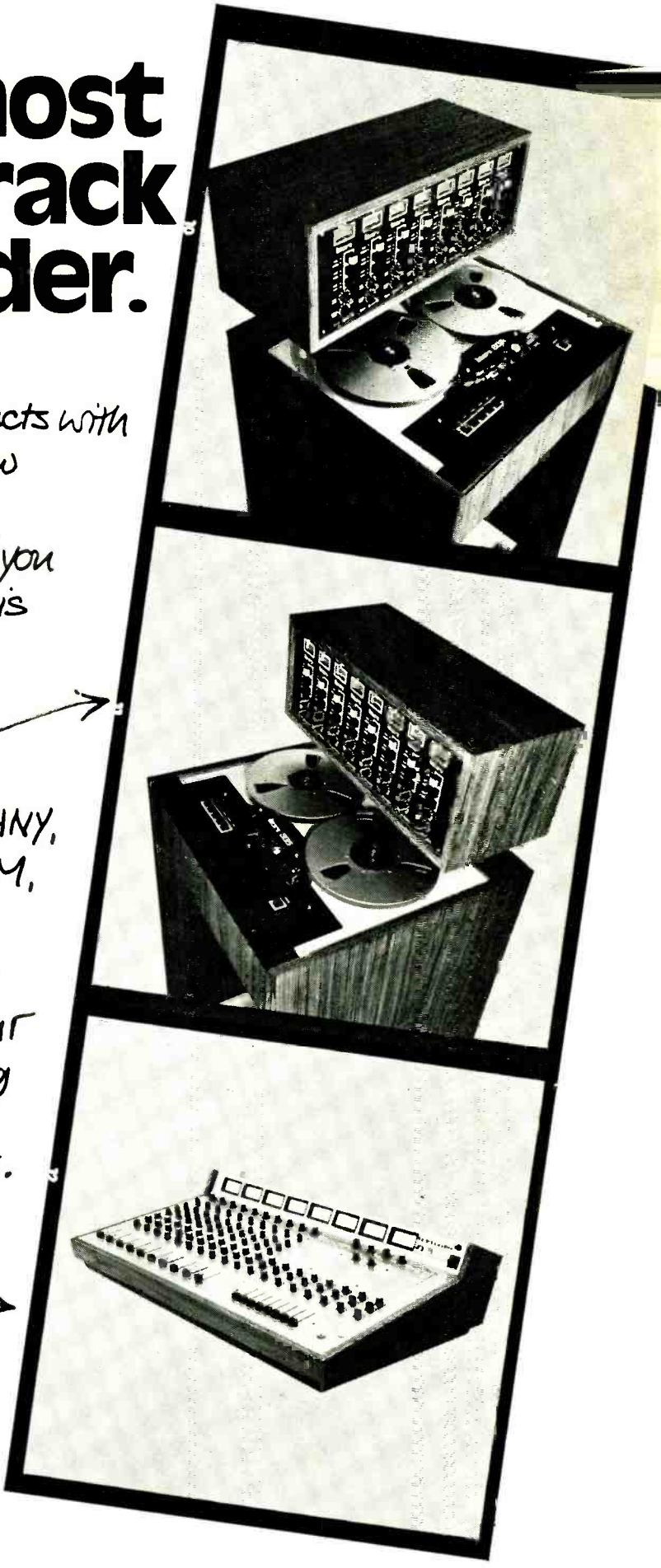
Chapter eight covers what the author describes as 'unique op-amp devices'. This deals with specialist devices such as op-amps with multiple inputs with remote selection of the appropriate input pair by a two bit binary number, micropower programmable op-amps, operational transconductance amplifiers, and current differencing amplifiers. The last category are not true differential amplifiers in the accepted sense. They are actually single ended with a current mirror built into the amp input. They can't therefore be operated in the common voltage mode because of this input configuration. However they can perform many of the tasks handled by a true differential device. The section on input multiplexed amps would be of considerable interest to studio designers. Solid state multiplexing (for this is what the section is about) could provide some elegant solutions to the problems of switching racks of Dolbies, desks, routing and tape machines etc. On operational transconductance amplifiers, Walter Jung proposes some very simple designs for voltage controlled amplifiers using the current sourcing or sinking properties of these amplifiers with their characteristic very high output impedance. The designs make use of the ability to set up the internal idling current but with a single resistor.

In the appendix at the rear of the *Cookbook*, there are manufacturers' specification sheets for the general purpose op-amps. The appendix also includes a linear ic cross reference guide.

The author has also written two other books *Unique Op Amp Applications* and *Audio IC Op Amp Applications*. They cost $4.95 from the same publisher. These volumes amount to virtually straight cribs from the relevant sections of the *Cookbook*. It seems probable that, for example, an audio engineer might buy the smaller book dealing wholly with his field rather than shell out quite a bit more for the *Cookbook*. It would be a pity because the whole volume is relevant from start to finish.

Frank Ogden

itam 805.
The world's most advanced 8 track 1/2 inch recorder.



few manufacturers back their products with "On Site" demos — who wants to show everyone a lousy product!
The 805 is in a class of its own. If you can't produce studio masters on this baby — stick to dressmaking.

Transportable version £1790 + VAT

Right now the 805 is operational in the U.S.A., GERMANY, FRANCE, SWEDEN, FINLAND, BELGIUM, GREECE, AUSTRALIA and the U.K.

We're big in mixers too, very big. We don't just sell on price, quality is our key word. While everyone is hacking the bugs from theirs, we keep on driving. We got it right first time.
THAT'S ITAM TECHNOLOGY.

10-8 £1260 + VAT

itam

5, Pratt St., London N.W.1, Tel: 01 485 6162, Telex: 21879.

news

Sound clean up

There are two new instruments on the market which alleviate sound problem areas. The first, from UREI, is an anti-howlround box.

The 560 contains four active notch filters, each adjustable in notch depth from 0 to 20 dB, and adjustable in frequency from 60 Hz to 6000 Hz. Microphone preamplification is built in, permitting it to be used at either microphone or line level. *XLR*-3 connectors allow simple connection between microphone and amplifier, and jack sockets are provided for line level input and output.

In using the 560, system gain is slowly increased until the first feedback occurs and is sustained. One notch filter is then switched in and tuned until the feedback ceases. The gain is increased again, and the next resonance attenuated by the second filter. This procedure is repeated with filter 3 and 4.

The manufacturer claims a typical result is 'an increase of 12 dB or more in actual system gain before feedback, and improved intelligibility'.

The second device deals with un-recordable/uncutable transients and is manufactured by EMT. The 260 De-Esser is a fast reacting filter. Its frequency response is normally flat until a high level 'S' transient occurs, whereupon the unit turns into a Baxandall type filter with a −3 dB point at approximately 3 kHz. Attenuation is up to 12 dB at 15 kHz, depending on the control settings and input level. The change from the flat state to the filtered state takes only 50 μs, whereas the recovery time can be manually adjusted over a wide range. United Recording Electronic Industries, 11922 Valerio Street, North Hollywood, Ca 91605 USA. Phone: (213) 764 1500: Franz Vertriebgesellschaft mbH, 763 Lahr 1, Postfach 1520, West Germany. Phone: 07825-512: FWO Bauch, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Phone: 01-953 0091.

Urei 560 feedback suppressor

Hearing damage—new Leeds

A valuable one day teach-in on the vexed question of Entertainment Noise as a Hazard to Hearing (organised in London by the Institute of Acoustics) came too late for reference in our recent articles on the subject.

Two main points of interest arose, one surprising, one not so surprising. As previously explained in STUDIO SOUND, Leeds has steadfastly refused to discuss the matter of its much criticised limit of a 96 dBA peak for live and disco music in public places. It now emerges that as long ago as January 1 1975 Leeds tried to extricate itself from the untenable position adopted in 1973 by quietly replacing the 96 dBA peak limit with a compromise that will almost certainly prove equally untenable. The fact that Leeds has never previously admitted the existence of this compromise, despite direct requests for information and opportunities to reply in print to published criticism of the previous limit, suggests that the Council is well aware of its policy shortcomings.

The January 1 edict is directed to potential applicants for music licences and refers, not now to peak level limits, but to the more acceptable equivalent continuous sound level or Leq. However the wording is very vague, specifying only that the Leq 'shall not exceed a *reasonable* level'. After an initial absence of any guide as to what does and does not constitute a reasonable Leq in Leeds, an interim guide was made available to potential licensees, which simply referred to the Leq levels regarded as acceptable in industry.

But even now, nearly a year after the edict, a working party is still debating on an acceptable guide to make permanent. As Leeds has already admitted to itself in an internal document, music promoters just do not understand what an Leq of 90 dBA means in practice. So, to be on the safe side of the Leeds bureaucrats, they simply promote no music that is a possible risk. In fact, even if the promoters did understand the Leq, the situation would remain unchanged. The London readings taken when the GLC threatened its own industrial limit on music (and referred to in STUDIO SOUND) showed quite conclusively that such a limit effectively kills modern pop music stone dead.

Bearing in mind the high cost and difficulty of obtaining tickets for concerts by popular artists an Leq much higher than that applicable to the industrial working week (100 dBA has been suggested by Sandy Brown Associates) should adequately protect all but the most affluent and dedicated pop fan.

However, as the London conference clearly also showed (to no one's surprise) disagreement on such points is total. But fortunately it is only Leeds that has so far blundered into positive legislation despite this, although, of course, London is on the brink.

Adrian Hope

Bias/Leevers in sync

Leevers-Rich have acquired the goodwill, stock and work in progress of Bias Electronics. Bias directors Tony Costello and Peter Lindsley join the Leevers board, Costello as general manager and Lindsley as technical manager. Managing director of the joint companies is Bob Blezard.

In a statement the new company, provisionally called Leevers-Rich Equipment Ltd Incorporating Bias Electronics, said that the move was 'a logical step in the expansion plans of both companies and will result in a stronger, more dynamic company with a wider product range, well able to cater for the demands of the recording and broadcasting industries.'

General manager Tony Costello said that the product ranges of the two companies were complementary. They had started talks some time ago with a view to co-operate on various activities, such as overseas marketing, but the discussions led to firm consideration of a merger in about May 1975. The two companies had always been, he said, 'a mutual admiration society.' Both he and his partner Peter Lindsley had worked for Leevers before they decided to leave three years ago to form their own company. **John Dwyer**

Knob distributors

You can now buy Sifam collet knobs at the following newly appointed distributors.

UK: Townsend Coates Ltd, Lunsford Road, Leicester.

Canada: H. M. Brown & Sons, 3111 Woodchester Drive, Mississauga, Ontario L5L 1J2.

USA: Selco Products, 15420 Cornet Avenue, Santa Fe Springs, Ca 90670.

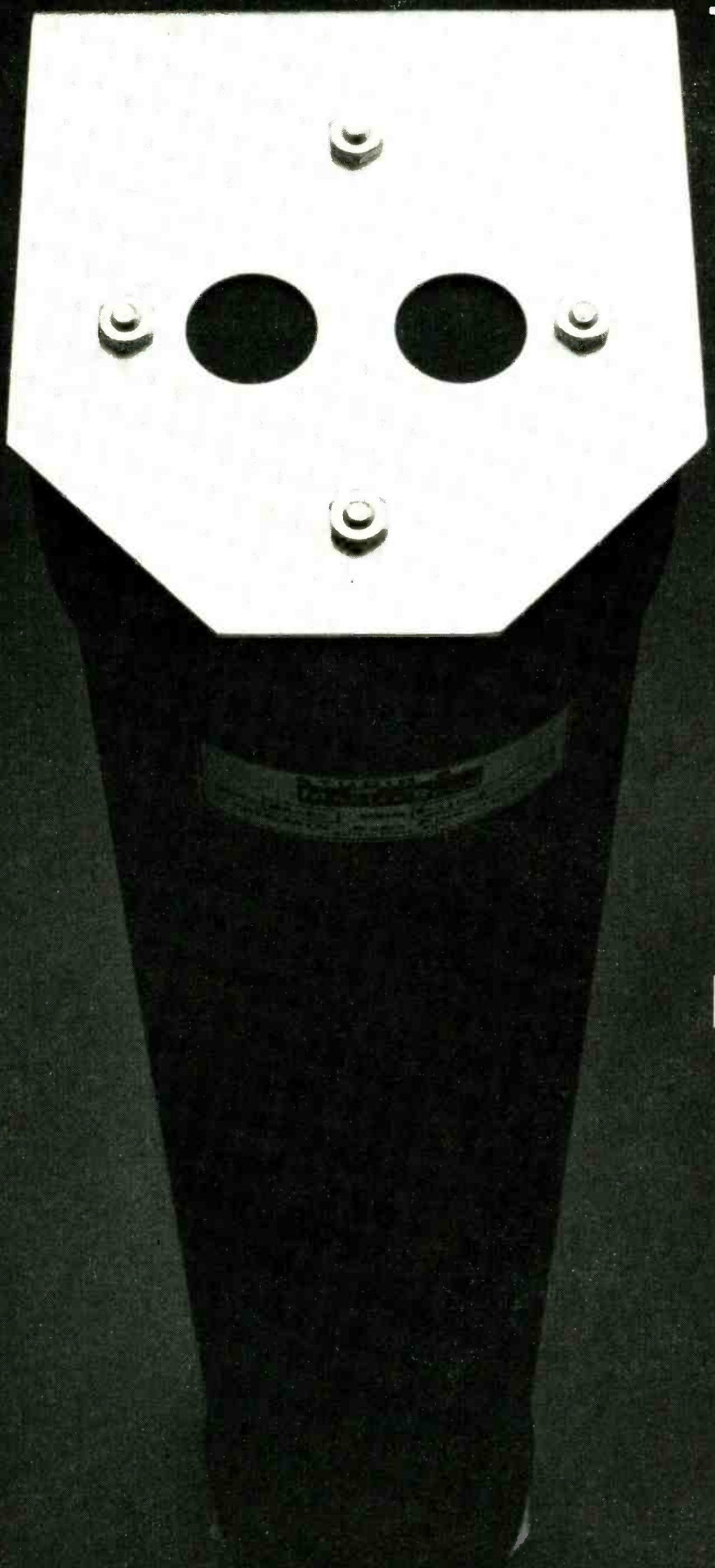
Sifam Ltd, Woodland Road, Torquay TQ2 7AY, UK. Phone: 0803-63822.

Ob system for Bahrain

The Ministry of Information of the Arabian Gulf State of Bahrain has placed an order with Pye TVT of Cambridge, UK for a sound outside broadcast vehicle valued at £50.000.

The sound outside broadcast vehicle, based on a Bedford van chassis, is one of Pye TVT's standard range. The *LDM* 1360 is fully air conditioned, and equipped with portable tape recorders that can be used inside or outside the vehicle for interview sequences. The programme material can be recorded for broadcasting at a later date, or can be relayed live, via a broadcast quality radio link, to the studio for transmission. A Pye SM 8 eight channel audio mixer is the centre of the usual ob mobile facilities.

14 ▶



We'd like you to listen to this column

The four and one half inch diameter column is the heart of this new Master-Room Studio B series of variable decay time units. It may be mounted up to twenty-five feet away from the electronic control unit pictured below and contains the same unique mechanisms which have made the fixed-decay time Master-Room series among the most popular professional reverberation devices available today.

The Master-Room Studio B series has been designed to meet the needs of operators in the Broadcast, Film Dubbing, Public Address and Sound Recording fields for a realistically priced, transportable variable decay time single channel reverberation unit.

Two Studio B units are available.

Model MRB-2 has a decay time adjustable between one and three seconds and accurately synthesizes the reverberant field of an acoustically well-balanced room. Model MRB-3 has decay adjustable between two and four seconds to synthesize the reverberant field of an auditorium.

All Master-Room units sound uniquely like their natural room equivalents through the use of internal structures which delay the sound before the first echo return is heard and then furnish a decaying sound field of uniform intensity that is proportioned to the decay time. Free from the objectionable flutter echo, rumble and 'spring sound' of other reverberation units, Master-Rooms are also exceptionally uniform from unit to unit.

The front panel of the Studio B control unit has an internal mix control allowing the unit to be inserted directly into a program line without the need for separate console echo send and return lines. Front panel metering of output level, control of decay time and peak equalisation of the reverberant signal are also provided. An optional remote control unit can be used for operation of the reverb and decay controls up to 25 feet distant from the electronics assembly.

Signal connections to the Studio B units are by standard XLR connectors and input and output lines are floating and balanced.

For further information or a demonstration of the Studio B series from Master-Room, contact, the sole U.K. agent.

Scenic Sounds Equipment
27/37 Bryanston Street
London W1H 7AB
Phone 01-935 0141

In France	3M France Mincom Division
Germany	Audiolive Cologne
Italy	Telav Milan and Rome
Netherlands	Pieter Bollen Geluidstechniek Hilversum
Scandinavia	Ing Firma Jan Setterberg Gothenberg Sweden

NEWS

The vehicle will be installed by Pye TVT in Cambridge and delivered in April 1976. Pye TVT Ltd, Coldhams Lane, Cambridge CB1 3JU. Phone: 0223-45115.

Dolby in California

A new head office and laboratory has been opened by Dolby Laboratories Inc. in San Francisco, California. The office combines some of the activities now carried out in London with those of the former Dolby New York office. The San Francisco office is at 731 Sansome Street (415-391 8892). The new office has the functions of research and development, new market development, licensing, and US sales of Dolby professional noise reduction equipment manufactured in London. The company's policy of specialization in noise reduction technology remains unchanged.

Hayden Labs—new address

Hayden Laboratories, UK agents for Sennheiser and Telefunken Professional, have moved from Amersham as from December 15. The new address is: Hayden Laboratories Ltd, Hayden House, Churchfield Road, Chalfont St Peter, SL9 9EW. Phone: Gerrards Cross 88447. Telex: 849469.

Oop—slight misunderstanding

Contrary to the impression that the Work article *Manor Studios* (Jan '76 p42) may have given, Alan White, drummer with *Yes*, is still a very integral part of that band. Further, the relevant paragraph ambiguously implied that Alan actually owned the studio. Not true. Although Alan White was, at the time of the interview, doing an album with friends of which none were from *Yes*, this was an individual project into funky rock and far removed from the corporate presentation.

Virgin Records supremo, Richard Branson, remains firmly in the pilot seat at Manor Studios.

Phase linear crossover

This electronic crossover network would appear to be something of a Holy Grail to those who pursue the very latest fashion in loudspeakers—the phase linear array. One of the claims that the manufacturers, Interface Electronics Inc, make is that the model *XO312* 'keeps all outputs in phase at all frequencies'. Very nice. Especially when the filter roll off is 12 dB/octave Butterworth response.

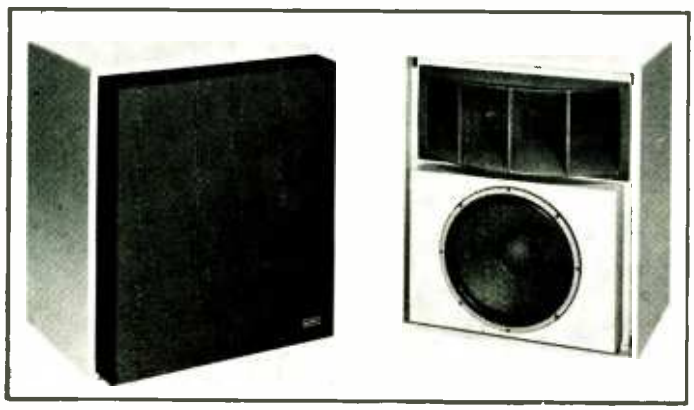
The unit provides two continuously variable crossover points with the filters so arranged that the intersection point always occurs at the −3 dB point for each arm. The tunable ranges are 100 to 1k Hz for the first cross, and 1k to 14k Hz for the upper point. Interface states that the sum signal is within ±1 dB over the range 20 to 20k Hz. Other parameters include:

Input: balanced 600 ohm with front panel attenuator.
Output: bass, mid and treble through transformers and individual attenuators.
Output level: +20 dBm max.
Distortion: less than 0.1%.

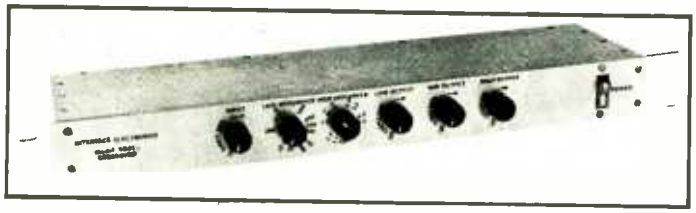
Interface Electronics Inc, 3810 Westheimer, Houston, Texas 77027, USA.

Above: *A Pye TVT sound outside broadcast vehicle recently supplied to Egypt. A similar vehicle has been ordered by Bahrein in a £50 000 deal.*

Below: *One of a new range from Altec, the 9846 8A handles upwards of 100W enabling spls of over 110 dB around the desk area in the average control room.*



Stevenson XO312 electronic crossover



Teac agent corrected

ITA were accredited with being a UK agent for Teac equipment (p38 Jan. '76). Acoustic Research International are in fact sole UK agents and ITA are one of the many dealers. We're sorry for the inconvenience to Acoustic Research.

Rf current measurement

Delta Electronics Inc has brought out a system of aerial current measurement which, they claim, is more accurate than the usual thermo-couple meters normally employed for this purpose. There are two models, *TCA* and *TCA-XM*, which meet the FCC requirement of 2% accuracy. Calibration at broadcast frequencies 'assures that there are no errors due to frequency effects when using these instruments.'

Aerial current samples are taken from the current carrying conductor by a toroidal current transformer requiring no interruption of the rf circuit. An integral lightning protection switch on the indicator eliminates the requirement for a meter switch in the rf circuit. Current samples are transported to a 50 ohm terminating resistor by a two metre coax cable. The voltage developed across termination load is rectified by a temperature compensated precision rectifier, the product of which is displayed on a mirror scale taut band meter. The meter/rectifier is housed in a shielded enclosure for the *TCA* models. The *TCA-XM* has the meter mounted independently. Delta Electronics Inc, 5534 Port Royal Road, Springfield, Va 22151, USA. Phone: (703) 321 9845.

Improved synchroniser

The EECO range of audio and video tape indexing and synchronising hardware, marketed by Ampex, has been extended to include a 'chase' feature in the dual cue controller. This allows the user to select either one of two tape transports to chase the other in a 'follow the leader' mode during fast forward and rewind operations. The new control facility is in addition to the original capability of cueing two transports

16 ▶

4104 Broadcast quality commentator's noise cancelling microphone

This broadcast quality microphone is ideal for commentating and ensures freedom from non-linearity and low frequency surges. Th. microphone is fitted with a mouth guard and breath shield, which ensures that the speaker's mouth is the correct distance from the instrument, while the breath shield supresses noise from lips and nostrils obviating any blasting.

It is ideal for commentating purposes where there is a high level of background noise. Careful design of the case and magnetic system gives a frequency response and freedom from non-linearity distortio. vastly superior to those of previous close talking microphones.

Light in weight and robustly constructed with a specially light and flexible cable of small diameter, this microphone is not unduly affected by wind and can be used in airstreams of velocities up to about 20 mph without a wind shield.

The design of the 4104 incorporates elements covered by Patent 737096 owned by the British Broadcasting Corporation.

This microphone is distributed by Hampstead High Fidelity and is available ex stock.

TECHNICAL SPECIFICATION.

MEAN SENSITIVITY. Open circuit voltage per 10 dyne/cm^2 (10 micro-bar) 0.085 mV Open circuit voltage level per 10 micro-bar ref.1 mW –82db. Power delivered into 30 ohms for 10 micro-bar, ref. 1mW–72db. American ASA rating, ref. 1mW –168db.

ELECTRICAL IMPEDANCE. Norminal impedance 30 ohms (A 300 ohms version of the 4104 microphone is available to special order)

EQUIVALENT ELECTRO–MAGNETIC HUM PICK–UP less than 0.0002 dynes/cm^2 equivalent input for 1 milligauss at 50c/s

DISTORTION Less than 1% total harmonics at + 120 db above 0.0002 dyne/cm^2 (20 micro-Newtons per sq. metre)

WEIGHT 10oz. (283g) approx.

DIMENSIONS Length overall 8ins. (20.3cm) Head unit – Height 1¾ins. (4.4cm) Width 2¼ins. (5.7cm) Depth 3ins. (7.6CM).

HHF **Hampstead High Fidelity,** 63 Hampstead High Street, London NW3 6SS
Telephone 01-435 0999 and 435 6377

automatically to any selected point —individually or simultaneously. Other improvements include a code parity error detector to improve the overall system operation.

The 'chase' feature was incorporated by adding a prom to the basic Intel *4004* microprocessor circuitry to expand the software required by the new facility. The system price remains unchanged at $12 000. Ampex Corporation, Audio-Video Systems Division, 401 The Broadway, Redwood City, Ca 94063, USA. Phone: (213) 240 5000.

Ampex (Great Britain) Ltd, Acre Road, Reading, Berks. Phone: 0734-85200. Telex: 848345.

Above: *A new, triamplified monitor loudspeaker system from Spectra Sonics. This system is designed for external crossover networks and for separate power amplifiers for each of the low, mid-range and high frequency transducers. The price of the model 3000 is $846.*

UREI room eq machine

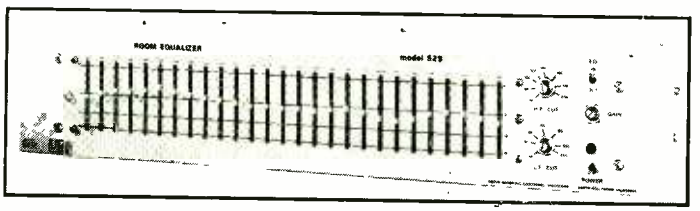
The model *529* is an active filter set specifically designed for room 'equalisation' or tuning. Unlike its companion UREI product, the *527-A* ⅓-octave Graphic Equaliser (review: November 74, p64), which permits both boost and attenuation, the *529* provides 0 to 15 dB of attenuation at each of its 27 frequencies, but does not boost. In addition, the *329* features tunable hi-pass and lo-pass band stop filters with attenuation rates of 18 dB/octave.

The 27 vertical, stepless controls vary the depth of active filters which are centred on standard ISO ⅓-octave frequencies from 40 Hz to 16 kHz. Hi-pass and lo-pass filters are screwdriver adjustable from the front panel. The hi-pass filter is continuously tunable from 30 Hz to 240 Hz; the lo-pass filter tunes from 3.5 kHz to 20 kHz (−3 dB points).

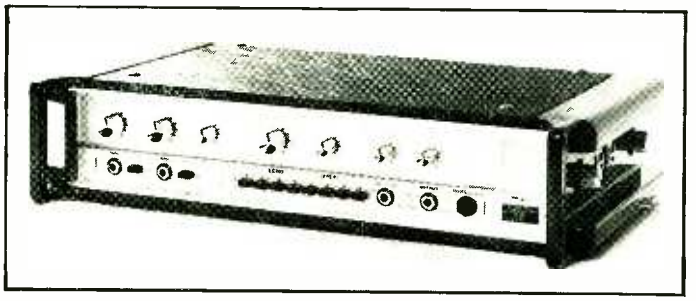
The band-reject filters are active, minimum phase networks, whose skirts combine for 'minimum ripple and phase shift' when used in combination. As in the *527-A*, the gain structure may be altered by a rear chassis switch to accommodate programme input levels from—20 dBm to +20 dBm. An adjustable front panel gain control provides up to 20 dB gain to make up attenuation of the equalisation filters and to establish the maximum gain before feedback of the equalised system. A bypass switch allows the unit to be switched out of the system, restoring unity gain. Optional accessory, model *529SC* Security Cover, may be installed over the front panel to protect all operating controls against inadvertent disturbance or tampering in fixed installations. The cover is in smoke grey transparent plastic so the settings can still be seen. The equaliser is completely self-contained with built-in power supply, and operates from either 110/120V or 220/240V ac.

United Recording Electronic Industries, 11922 Valerio Street, North Hollywood, Ca 91605, USA. Phone: (213) 764 1500.

FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts. Phone: 01-953 0091.



Above: *Urei 529 room equaliser*



Above: *H/H multi-echo*

Multi-head H/H echo

The latest version of the bin loop echo uses 4 separate playback heads spaced at regular intervals from the record head. They can be switched in by front panel pushbuttons in any combination. According to the manufacturers, this gives a potential of 240 individual echo variations. The other H/H bin loop echo uses a single playback head on a sliding rack thus offering a single repeat after a continuously variable delay. Both models offer the usual facilities such as echo level, clean feed level and repeat (feedback). Price is £157.36.

For stage monitoring use, the company has introduced a self powered foldback system for use with existing pa networks. Called the *Monitor Combo*, that's exactly what it looks like. A 100W amplifier drives a single 30 cm dual concentric chassis unit via a control pre-amp with a high level signal input. This enables direct bridging across the speaker terminals of the house pa. The eq on the foldback compo features a shelving control to reduce howlround without chopping the high frequencies right off, as is the case with a straight low pass filter. The system costs £145.22.

There is also a self powered extension speaker available at £74.50. H/H Electronic, Industrial Site, Cambridge Road, Milton, Cambridge CB4 4HZ. Phone: 0223-65945/6/7.

Lip sync direct from tape

It's simple, elegant and it really does work and it's called the Elfin Digital Interlock System. This must be the verdict on the latest development in tape to film soundtrack synchronisation. The advantages are better explained looking at the hardware that the system *doesn't* require. Such as magnetic film stripping, or perhaps a synchronous motor/servo loop or even sprocketed magnetic tape. The system does require a slightly modified projector, amplifier/control unit and a two or more track tape source.

The heart of the design is a stepping motor used to drive the projector mechanism via a toothed belt. This type of motor induces a fixed angular increment of its armature for every pulse applied to the driving coils. It follows that the rotational speed will be directly proportional to the frequency of the applied driving pulses; rather like a synchronous motor without the starting hassles. In other applications, stepping motors are used wherever rotational synchronism must be maintained from standstill to full speed.

In the new system, lip sync is obtained by recording the motor drive tone on a spare tape track at the same time as the soundtrack is dubbed. If both tape and film are then wound back to an optical and/or audible starting cue, then both film and tape will be in synchronisation from the moment that the tape recorder is put in the play mode. Practicalities of the system include facilities to inch the film backwards or forwards in respect to the tape to obtain perfect sync.

The system works well enough to operate from low quality tape sources such as stereo cassettes etc. However, cross talk problems from the 5 kHz carrier to the audio track can arise. Further details from Elf Audio Visual Ltd, 836 Yeovil Road Trading Estate, Slough, Bucks. Phone: Slough 36123.

Five monitors. One sound. Five JBL studio monitors.
You could record with any one, play back on any other, and take your pick among the rest for mixing or mastering.
The only differences are acoustic output, size and cost.
No matter what size your studio is, you can cross reference with any other studio using JBL's.
But reading isn't knowing for sure. Come listen to one. Or two. Or five.

C.E. Hammond & Co Ltd Lamb House Church Street London W4 2PB Tel 01-995 4551

JBL

reviews

Haeco PL2 Limiter/Compressor

Hugh Ford

Manufacturer: Holzer Audio Engineering Corporation, 14110 Aetna St, Van Nuys, California 91401, USA.

MANUFACTURERS' SPECIFICATION
Controls: front: compression threshold; release time; gain reduction meter. Rear: meter zero calibrate; gain reduction bias.
Power equipment: —35 to —50V dc.
Frequency response: 15 Hz to 30 kHz ±0.5 dB.
Distortion: at limiting threshold—less than 0.5% nominal, less than 0.15%.
Maximum output: +24 dB (using 50V power supply).
Input impedance: 2.0k ohms.
Output impedance: 6 ohms to be driven into 100 ohms or greater.
Gain structure: unity to +30 dB, adjustable internally.
Attack time: 500 μs.
Release time: 300 ms to 5s.
Signal-to-noise ratio: —85 dBm at any gain setting from unity to +30 dB.
Dimensions (whd): 38.1 x 162 x 140 mm.
Weight: 400g.
Price: $100.

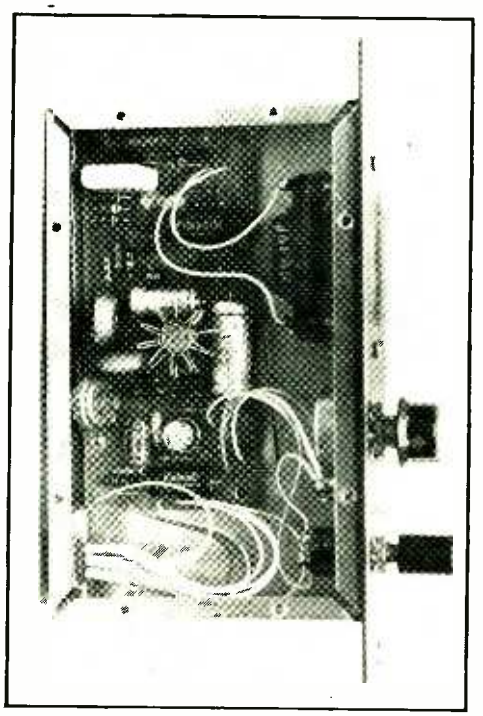
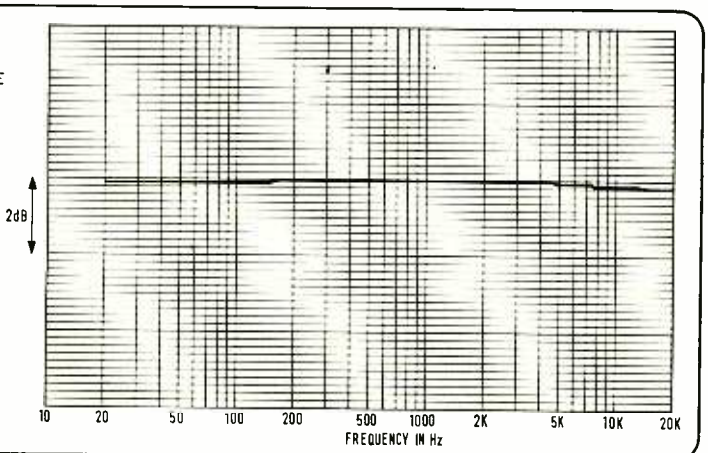


FIG. 1
HAECO
FREQUENCY RESPONSE



RECTIFIER: RMS
ZERO LEVEL: 0dBm
LOWER LIM. FREQ: 10Hz
POT: 10dB
WRITING SPEED: 200mm/s
PAPER SPEED: 3mm/s

IN appearance the Haeco limiter/compressor is a very neat and small unit with the minimum of paraphernalia, the front panel being occupied by only two controls. These take the form of a release time control and a threshold control which effects the level at which the onset of compression or limiting starts. In addition there is a 'Japanese style' vu meter which indicates the amount of compression currently in use.

At the rear of the unit the signal input and output, as well as the single rail power supply, are connected to the unit by means of a single seven-pin connector. Perhaps this is not the most convenient arrangement, for wiring small multi-pin connectors with coaxial or similar cables is not the envy of many engineers. Furthermore, this is far from being compatible with the general practice for signal connections.

The remaining rear panel facilities comprise two screwdriver accessible potentiometers, one of which is used to set the compression meter zero level, and the other to set the onset level for compression. While the mechanical construction of the unit is decidedly solid, and the unit is very compact, the mounting of the single fibreglass pcb is rather rudimentary. In fact the board is secured to the chassis by means of two screws and is flush mounted with the printed side to the chassis with an interleaving layer of insulating material, the latter taking the form of a thin adhesive tape. The layout of the board is clean and tidy, but no components are identified and the board did not correspond to the circuit provided in the instruction manual; this indicated the use of a *614N* integrated circuit in the input stages which, in practice, took the form of a discrete component amplifier.

In spite of these comments the *modus operandi* of the compressor is rather simple and interesting. The amplifier section of the unit consists of a straightforward operational amplifier, the gain of which is controlled by a feedback resistor from output to input and a second resistor from input to ground, as is conventional. However, the resistor from input to ground takes the form of a light dependent resistor which is controlled by the input signal—thus offering the possibility of changing the gain of the operational amplifier in accordance with the amplitude of the input signal. The value of the fixed resistor from the output of the operational amplifier to its input is adjusted in accordance with the desired gain of the unit under non-limiting conditions.

The output of the 'controlled' operational amplifier is fed to a further amplifier block which is followed by a rectifier stage. This applies a direct current to the light emitting section of the light dependent resistor and also to the gain reduction meter. The former is part of the gain controlled operational amplifier section.

Perhaps this form of gain control is too

simple to be true, and to a large extent its performance depends upon the characteristics of the light dependent resistor device. This is a 'Clairex *CLM 4012A*' about which I do not have any information, but I suspect that it incorporates a conventional filament lamp associated with a light dependent resistor. If this is the case, the compressor would not have the specified 500 μs attack time, as indeed was the case with the measured performance. This does not however indicate that the performance is inadequate in practice. In fact, too fast an attack time is often associated with clicks and other undesirable effects in the output under practical operational conditions.

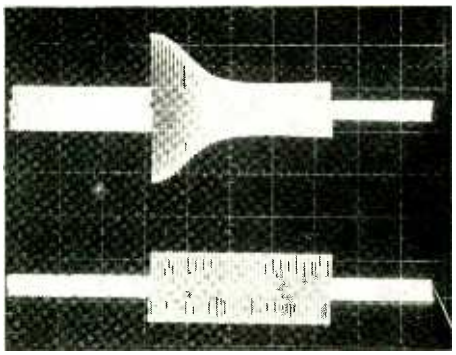


FIG. 2 *Haeco 10 ms/div, 10 dB limiting*

Input and output

Both the input and the output are unbalanced and are capacitively isolated from the internal dc potentials within the unit. The overall gain is internally adjusted by altering a fixed resistor and although it was stated that the gain of the review sample had been set to 7 dB, I was not able to obtain this amount of gain. In fact it was found that the overall maximum gain varied over wide limits depending upon the temperature of the internal components and the supply voltage.

The worst gain variations were found with a 50V supply when the cold gain was +5 dB, and when hot was −5.5 dB. This is a somewhat disastrous condition, and furthermore, the input impedance also varied with supply voltage and temperature. However, this variation was relatively small and the input impedance remained in the region of 1800 ohms. This is decidedly on the low side for many applications. On the output end the impedance is very low and the output is quite happy to drive any normal load, the available output level being up to +21 dBm into 600 ohms with a 50V supply rail, or 2 dB more level into an open circuit.

Frequency response and noise

The overall frequency response when loaded into 600 ohms is shown in **Fig 1** from which it is to be seen that the response is absolutely flat from 20 Hz to 20 kHz. Further investigations showed that the response remained flat at other input levels and also when compression was in action. Indeed, the overall response extended well below 20 Hz as was to be expected from the circuit of the device.

Noise was measured at the output when loaded into 600 ohms, the results being −92.5 dBm over the band 20 Hz to 20 kHz or −108 dBm(A) using the standard 'A' weighting network and a true rms meter. These performance figures are more than adequate, particularly when one takes into account the drive capability of up to +21 dBm.

Distortion

Investigation into the second and third harmonic distortion at 0 dBm output gave astoundingly good results, the distortion over the band 20 Hz to 20 kHz was consistently below 0.03% with second harmonic predominating.

Even under conditions of 10 dB compression the distortion was generally around the same limits, but as the active element is simply an operational amplifier with a variable feedback resistor chain this is to be expected with the proviso that the gain control element is sufficiently smoothed from the audio signal.

Attack and release times

The attack and release times were investigated by using bursts of increased level of a continuous sinewave. The continuous low level was set at the point of limiting; the burst then drove the unit into 10 dB of limiting. **Fig 2** shows in the lower trace the input waveform and in the upper trace the output from the compressor/limiter. It is to be seen that it takes approximately 20 ms for full level change to be accomplished and this time was found to be effectively independent of frequency. It follows that the actual attack time observed was nothing like the specified 500 μs, and it would be interesting to know how the manufacturer arrives at this figure. It should also be noted that the length of the attack time means that the unit cannot be used as a peak limiter in broadcasting or similar applications where a very fast attack time is vital. Investigations into the release time using a similar tone burst arrangement, showed that full recovery from compression could be varied from about 300 ms to 1.4s, the latter figure falling short of the manufacturers' specificaton but representing a useful release time.

General

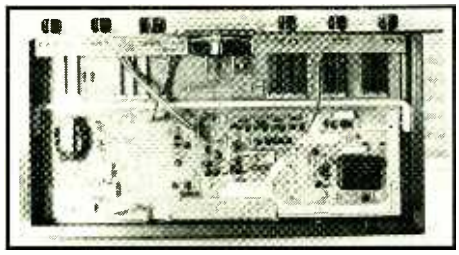
Subjective testing of the unit give entirely satisfactory results and went to confirm the very low distortion introduced by the unit and the satisfactory noise performance. The instruction book supplied with the unit was clear and provided sufficient servicing information. However, the inclusion of the correct circuit diagram would have helped.

Summary

Although the method of mounting the printed board is rather basic, and no component identifications are provided in either the unit or the instruction book, this is generally a well made unit. In semi-professional applications this is a cheap and satisfactory limiter, but in strictly professional use, the temperature sensitivity of the overall gain could cause severe embarrassment.

Eventide Omnipressor 2830

Hugh Ford



MANUFACTURERS' SPECIFICATION

Input level: 0 to +8 dBm nominal level. Threshold control provided to centre gain control operation over range —25 to +15 dBm. Maximum level should not exceed +20 dBm or clipping will occur.

Input impedance: 10K electronically balanced. 600 ohm transformer available optionally.

Output level: 0 to +8 dBm nominal level. Maximum level before clipping is +18 dBm. Calibrated +10 and +20 may be inserted to compensate for extremes of gain reduction.

Output impedance: 600 ohms nominal, single ended. 600 ohm transformer available.

Frequency response: +0, —0.5 dB 20 Hz to 16 kHz; +0, —1 dB 15 Hz-20 kHz.

Gain: agc disabled: unity, +10 dB, +30 dB depending upon output cal.

Compression: continuously variable from 1:1 through ∞ through —10:1.

Expansion: continuously variable from 1:1 through 10:1.

Gain linearity: infinite compression setting gives constant output level ±1 dB for 60 dB change in input level.

Function control: continuously variable function knob is used to set appropriate compression/expansion ratio. Control operates parabolically to give spread near centre. Common settings are calibrated.

Limit controls: the Atten Limit and Gain Limit controls serve to restrict the gain control range to any value between 0 and 30 dB in each direction.

Distortion: agc disabled: 0.05% between 20 Hz and 20 kHz. Typically 0.02% at 1 kHz. —20 dB agc, +20 dB output gain: Less than 1% above 100 Hz, 0.5% at 1 kHz.

Signal/noise: at unity gain, output noise level is below —90 dBm.

Metering: front panel meter provided which measures either absolute input level, absolute output level, or gain on linear/log scale over 60 dB.

Time constant: definition: numbers refer to the time required for the Omnipressor to change gain by 10 dB in response to an input step change of 10 dB in infinite compression mode. ATTACK TIME: continuously variable from 100 μs through 100 ms. RELEASE TIME: continuously variable from 1 ms through 1s.

Power required: 115V ac, 50-60 Hz ±12% or 230V ac, 50-60 Hz ±12%; nominal 10W.

Dimensions (whd): 48.26 x 8.89 x 22.86 cm.

Appearance: black aluminium panel and chassis, white lettering. Red and green light emitting diode indicator lamps show power, in/out and gain/atten. status.

Price: $682, £355 re present exchange rate.

Manufacturer: Eventide Clock Works, Inc, 265 West 54th Street, New York City, NY 10019, USA.

UK: Feldon Audio Ltd, 126 Great Portland Street, London W1.

WHAT is the *Omnipressor*? Well, it's a sort of all singing and dancing compressor/expander/inverter with extraordinary versatility. In the compressor mode it is virtually a conventional compressor with adjustable threshold and adjustable compression ratio which is continuously variable from 1:1 to infinity to -10:1. In the expander mode it can expand signals over any expansion ratio within the limits 1:1 to 10:1. In addition to these facilities, both the maximum compression and the maximum expansion can be continuously adjusted over the range zero to 30 dB, and furthermore both the attack time and the release time of the electronics are variable over a very large range.

Clearly the *Omnipressor* is a very useful 'gimmick box' in addition to performing relatively normal compressor functions. In the former application it may be said that scientific measurements on the unit are not particularly appropriate, but because it also fulfils some of the commoner studio requirements it is interesting to see how it performs in the more conventional applications.

The construction of the unit comprises a standard rack mounting front panel upon which all the controls and an alloy box section chassis are mounted. The complete unit is black anodised with clear white legends which identify all the controls and connections. Virtually all the electronic components are mounted on a single printed board within the chassis; the front panel variable controls are connected to the printed board by push connectors. Board layout is generally tidy, and the various calibration controls properly identified. Individual component identification is rather poor such that servicing would be hampered. Another not uncommon feature, which I dislike is that the incoming mains power is routed on printed board conductors to the mains transformer and the power on/off switch. The electrical safety of this practice is very much open to question, particularly with European mains voltages.

The signal input and output are arranged on a barrier strip on the rear panel; the standard configuration offers an electronically balanced input and a single ended output with the option of a balancing transformer. The same barrier strip gives access to the internal voltage controlled amplifier's control input which takes the form of a balanced connection—it is therefore possible to use the *Omnipressor* as a straightforward vca and also to gang units for stereo and quad use. However, the latter applications require some care because the control voltage must be derived from a combination of the input signals if image shifting is to be avoided.

Turning to the front panel facilities, all the variable controls have a very wide range associated with rather sparse calibration points. While the actual calibration does not really matter in probable applications, it would be useful to be able to reset the controls to previously noted points with better accuracy. The first control defines the threshold about which the gain law changes within the range +15 dBm to -25 dBm input level. The character of the gain law is set by a second control which is calibrated from 10:1 expansion through 1:1 to infinite compression, and then on to -10:1 compression—a tremendous range of laws! The amount of gain change is monitored by a meter over the maximum range ±30 dB, the gain or attenuation limits are set by two further potentiometers which have the range 0 dB to 30 dB. In addition to this function, the meter may be switched by means of three interlocking pushbutton switches to read the input level or the output level. However, the meter ballistics are very slow such that this is only really an useful function on continuous signals. Of more practical use are two led indicators which show if either the compression or expansion functions are in use.

The attack time is continuously adjustable over a nominal range 100 μs to 100 ms with the release time being adjustable from a nominal 1 ms to 1s. Because the level detectors may be upset by very low frequency signals, such as floor vibration, a high pass filter may be included in the control signal chain by means of a pushbutton switch. The inclusion of this facility in no way effects the overall frequency response, and purely protects the level sensing circuits against very low frequency effects. A final facility

which can be desirable in some circumstances is the set of three output calibration push-buttons which serve the purpose of inserting 10 dB or 20 dB gain in the output section of the instrument—this facility can be useful when heavy compression is in use at low threshold levels.

Inputs and outputs

The input arrangements of the unit include an electronically balanced input, which may be optionally fitted with an input transformer to offer a 600 ohm input. Where a transformer is not fitted, as with the review sample, care must be taken to avoid applying excessively high voltages (such as power line leakage) to the inputs which are not protected in this respect. The measured input impedance was found to be 19 900 ohms against the specified 10 000 ohms which clearly applies to the use of a single ended input; however, either input impedance is quite satisfactory for normal applications. It was found that the input was capable of handling +21.6 dBm which is generally adequate. It is presumed that the manufacturers' suggestion of 0 ±8 dBm refers to signals measured with a vu meter.

At the output, the impedance was found to be 604 ohms at 1592 Hz without the optional transformer fitted. For those who, like myself, do not like such a high output impedance, it is a very simple matter to modify the unit for a lower output impedance. The drive capability of the output was found to be +15.4 dBm into 600 ohms, or 6 dB higher into an open circuit in which circumstances the overall gain without compression or expansion in use was +5.8 dB. Having regard to the potential difficulties which are inherent in the use of expanders, it is felt that considerably more headroom is desirable in the output department.

The metering system

The meter scaling is in the desirable linear decibel form over the range ±30 dB with 10 dB increments, the same scale being used for monitoring the input signal, the output signal or the degree of compression or expansion. Within practical limits the meter calibration was found to be accurate in all modes, provided that the output line was loaded into 600 ohms. However, the meter dynamics are far too slow for the meter to be of any practical use for measuring signal levels.

Frequency response and noise

As is to be seen from **Fig 1,** which shows the overall frequency response with unity gain and in the 10 dB compress and expand modes, the response varies to a certain extent according to which is in use. While it is felt that the variations in low frequency response are of little consequence, the drop in high frequency response in the compression mode may be cause for concern.

Noise was measured at the output into an open circuit, with the instrument set for the unity gain mode; thus, the noise referred to the input may be found by adding 6 dB to the following figures:

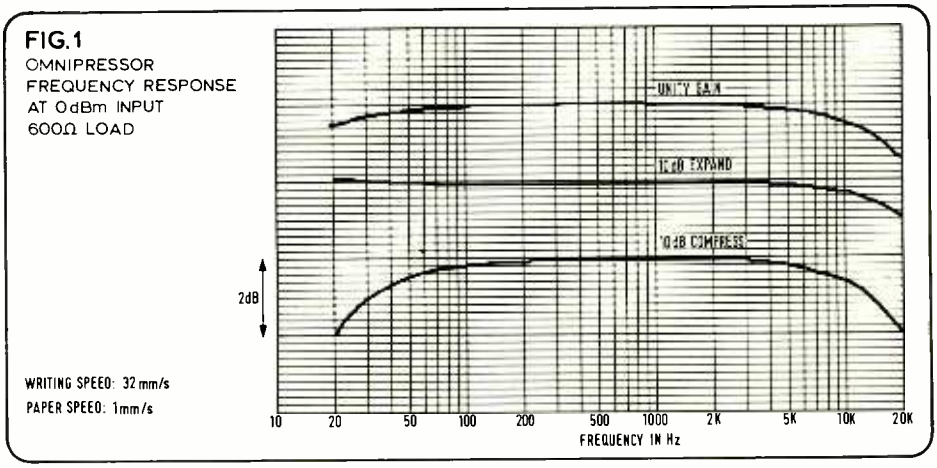
Band limited 20 Hz to	**Output Noise**
20 kHz rms	—86.0 dBm
'A' weighted rms	—92.5 dBm(A)
CCIR weighted rms	—85.5 dBm
CCIR weighted DIN quasi-peak	—81.0 dBm

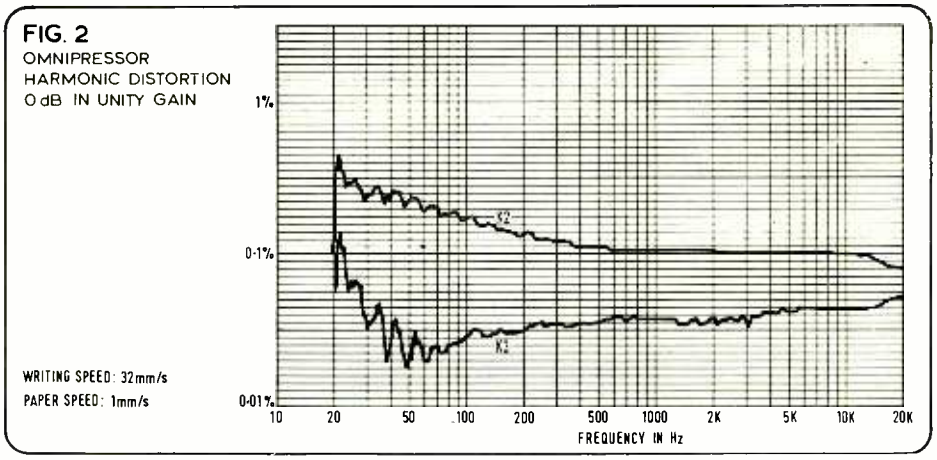
It is felt that these results offer a more than adequate dynamic range for the likely uses of the *Omnipressor*, and it should be remarked that power supply hum was at extremely low levels.

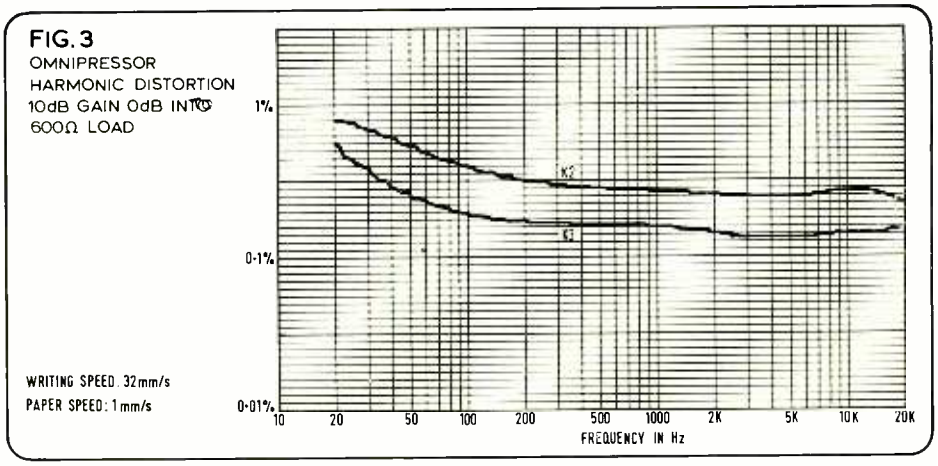
Distortion

The second and third harmonic distortion introduced by the unit when functioning as a unity gain device is shown in **Fig 2** from which it is to be seen that the second harmonic is substantially above the third harmonic. The cause of this is likely to be the alignment of the voltage controlled amplifier, or possibly the presence of the input signal on the control voltage. When the attenuation mode is in action an alarming increase in low frequency distortion was noted with the third harmonic at 20 Hz

22 ▶







almost reaching 0.5% and the second harmonic at over 1%—it is considered that this amount of distortion is poor in any circumstances. Likewise, as is shown in **Fig 3**, the second and third harmonics are at fairly high levels when the *Omnipressor* is acting at 10 dB gain. However, the low frequency distortion is better than when the 10 dB attenuation mode is activated.

I would conclude that the distortion performance is inadequate if the unit were to be used as a straightforward compressor. But when use is made of the *Omnipressor* to produce unusual effects such as dynamic range inversion, it is probable that the distortion characteristics will not be of direct concern—what matters in these circumstances is the resulting sound.

The controls

As has already been said, the calibration of the various controls is fairly arbitrary in most instances. For instance, checking the five calibration points on the threshold control showed that its overall range was +20 dB to −25.5 dB as compared with its nominal range of +15 dB to −25 dB, with a maximum calibration point error of 2.5 dB at the −15dB setting.

A similar pattern was noted with the gain limit and the attenuation limit controls, but does this really matter? I think that from the creative point of view, it does not matter (the device is not a measuring instrument), but it would have been nice to have more repeatable calibration points. One would then be in the position to abandon a session, and at some time in the future to return to the same conditions with better accuracy.

Exactly the same comment applies to the attack time and the release time controls. They were found to do what they claim to do with approximately the correct overall calibration. They can be set to make 'clean' sounds or 'dirty' sounds.

The dynamic performance

Reference to **Fig 4** which plots compression/expansion against the input level with various gain control characteristics show a few of the interesting gain characteristics which can be obtained with a constant threshold setting. It is notable that the threshold point remains constant, as it should do, but that the gain control laws are not particularly linear. This provides unique possibilities.

Finally **Fig 5** shows the effect of altering the threshold control setting with other controls constant. As is to be expected, the threshold point shifts in the predicted manner, but it is notable that, at the lower thresholds, the maximum compression becomes limited to less than the potential maximum of 30 dB available at higher threshold levels.

Summary

The *Omnipressor* is not intended as a simple compressor, and while it can perform this function, there are alternative instruments which make a far better job in this application.

As a device for generating unusual effects, it is unique—and it is for this purpose that it is really intended. It is therefore perhaps unfair to be critical of some of the measured parameters. The parameters which do matter in this application, such as dynamic range, are satisfactory; it would however have been better to find more headroom in the output and to find a peak reading level meter which shows what is really happening at the output end of the box.

FIG. 4 OMNIPRESSOR CONTROL CHARACTERISTICS - VARYING COMPRESSION RATIO AT CONSTANT THRESHOLD

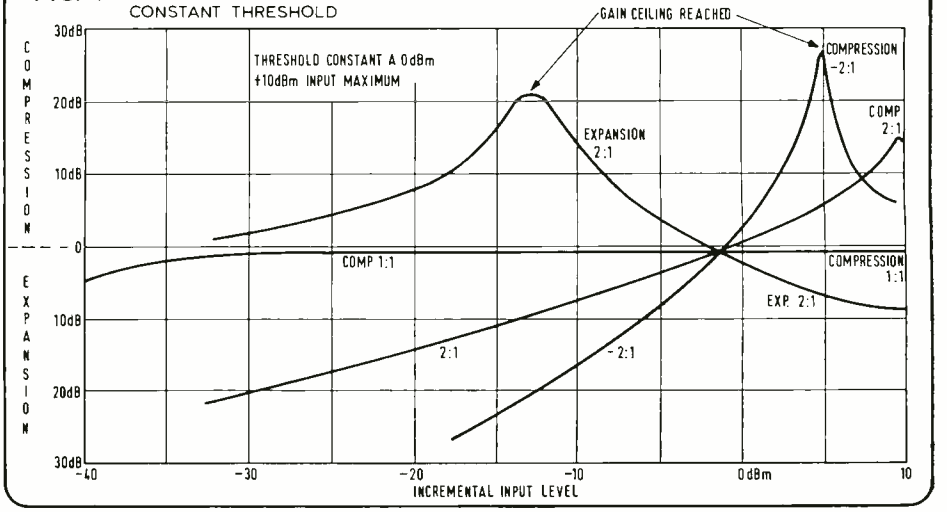
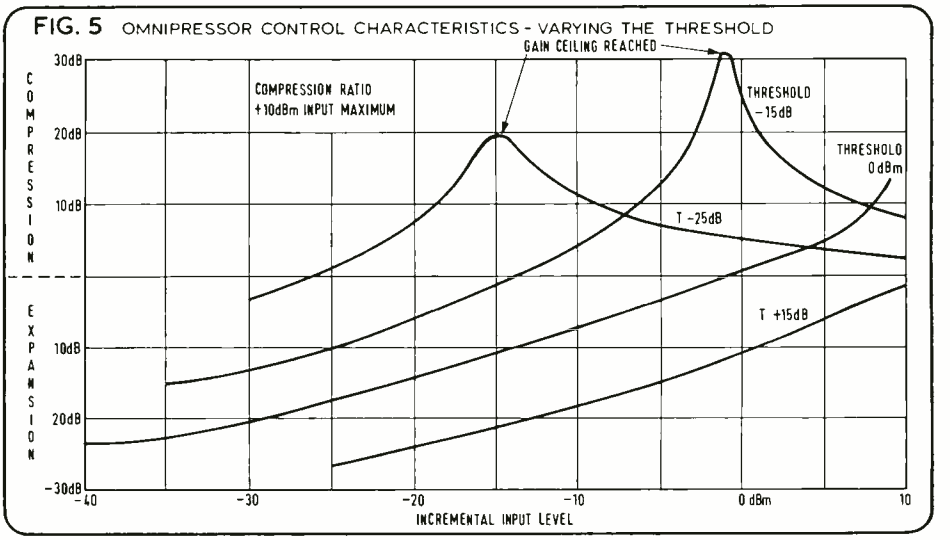
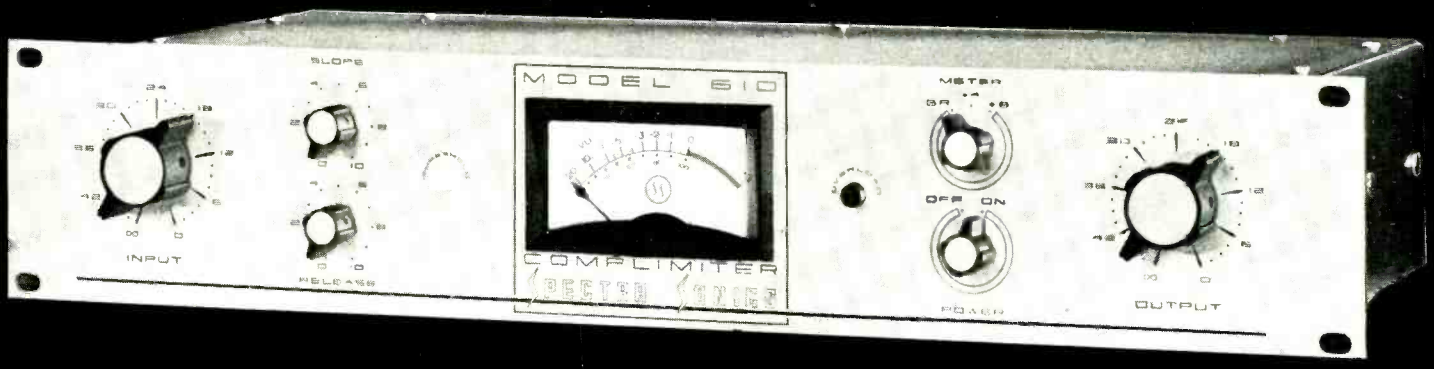


FIG. 5 OMNIPRESSOR CONTROL CHARACTERISTICS - VARYING THE THRESHOLD



NUMBER 1!



"COMPLIMITER"™

PERFORMANCE: The SPECTRA SONICS Model 610 "COMPLIMITER"™ can accomplish, irdependently or simultaneously, limiting and compression functions with performance that is unequalled by most *linear amplifiers*. The minimal noise inherent in this system assures a low threshold of -40dBM and permits an input sensitivity substantially greater than other systems. Through the use of the most advanced circuitry, the Model 610 "COMPLIMITER"™ has the fastest attack time (100 nanoseconds to 2 microseconds). The "COMPLIMITER"™ allows undistorted recording and transmission at levels that are measurably higher than those commonly in use. In tape recording, for example, this "limiting only" mode eliminates approximately 6dB usually set aside for tape overload protection.

RELIABILITY: The extensive use of the "COMPLIMITER"™ in the audio industry confirms the highest order of confidence in reliable, consistent operation.

Today's competition can only be met through the most advanced designs — "Beyonc The State Of The Art." For more information on audio products of superior performance contact SPECTRA SONICS at:

770 Wall Avenue
Ogden, Utah 84404
(801) 392-7531

6430 Sunset Elvd., Suite 1117
Hollywood, Calif. 90028
(213) 461-4321

SPECTRA SONICS

LEADER IN ADVANCED TECHNOLOGY

Survey: limiters and compressors

Forthcoming Surveys

We would be grateful for copy on the following :
April: Microphones (Feb. 3)
May: Cartridges and cartridge machines (Mar. 3)

ACOUSMAT

Acousmat/Apollo Electronics, 22 Rue St-Ambroise, 75011 Paris, France.
Phone: 357-16-97.

HM30
Intended for inclusion as a discrete electronic component in mixers, line amplifiers and other audio transmission and processing equipment, the *HM30* is a 24 pin dual in line hybrid circuit that offers a compressor/limiter function when used with a few external components.
Specification
For supply voltage: between 12 and 24V.
Input and output impedance: 5k ohms.
Voltage gain: unity.
Max input level as limiter: +18 dBm.
Max compression for 1% distortion: 34 dB.
Distortion for 12 dB compression: 0.25%.
Compression slope as limiter: 20:1.
Attack time for 12 dB compression: 50 µs.
Recommended min release time: 50 ms.
Recommended max release time: 60s.
Tracking accuracy for linked units: ±1 dB.
Current consumption: 15 mA.
Size: 33 x 20 x 15 mm.
Socket connector: 24 pins DIL standard.
Price: £19, $40.

CL36
Compressor/limiter
Specification
Frequency response: 20 to 20k Hz.
Input impedance: 600 ohms unbalanced.
Max input level: +19 dBm.
Output source impedance: 50 ohms.
Max output level: +19 dBm.
Gain, below threshold: 0 dB ±1 dB.
Unweighted output noise level: —80 dBm.
Max compression: 36 dB.
Total harmonic distortion: 1.5% for 36 dB comp, 0.5% for 30 dB comp.
Threshold level control in steps of 3 dB: —18 to +6 dBm.
Compression ratio control: 1:1 to limiter function.
Attack time: automatic.
Release time control for 12 dB comp: 0.2 to 6s.
Operating voltage: 24V dc/35 mA.
Weight: 0.63 kg.
Connector: 16 way gold plated.
Price: £93, $190.

MCX7
Compressor/expander
Specification
Compander overall voltage gain: unity.
Compander input impedance: 50k ohms unblcd.
Compander output impedance: 600 ohms unblcd.
Compander max input and output level: +18 dBm.
Compander frequency response: 20 Hz to 20 kHz ±0.5 dB.
Compander unweighted output noise level: —70 dBm.
Expansion range: 0 to 20 dB.
Expansion slope: 1:2.
Expansion threshold: —30 to —50 dBm.
Expander release time: 50, 100, 250 ms.
Expander attack time: 50 µs.
Expander distortion: better than 0.1%.
Compression ratio: 1:1 to limiter.
Compression slope as limiter: 20:1 or more.
Max compression for 1% distortion: 34 dB.
Distortion for 12 dB compression: 0.25%.
Compression threshold: —12 to +8 dBm.
Compressor release time: 0.1 to 2s.
Compressor attack time for 12 dB compression: 50 µs.
Operating voltage: 12 to 24V dc/60/80 mA.
Price: £165, $338.

EX60
Expander
Frequency response: 40 Hz to 20 kHz ±3 dB.
Input impedance: 10k ohms unbalanced.
Max input level: +19 dBm.
Output source impedance: 50Ω unbalanced.
Terminating impedance: 600Ω or higher.
Max output level: +19 dBm.
Gain above threshold: 0 dB (±1 dB) unity.
Signal to noise ratio: greater than 90 dB.
Expansion range control: 0 to 60 dB ±2 dB.
Treshold level control: 0 to —22 dBm.
Attack time: 20 µs.
Release time control: 0.1 to 4.5s.
Expansion ratio from 0 to 30 dB: 2:1 gradually increasing at 60 dB to 4:1.
Total harmonic distortion: 0.5% or less.
Operating voltage: 24V at 60 mA.
Weight: 0.66 kg.
Connector: 16 way gold plated.
Price: £93, $190.

ALLISON

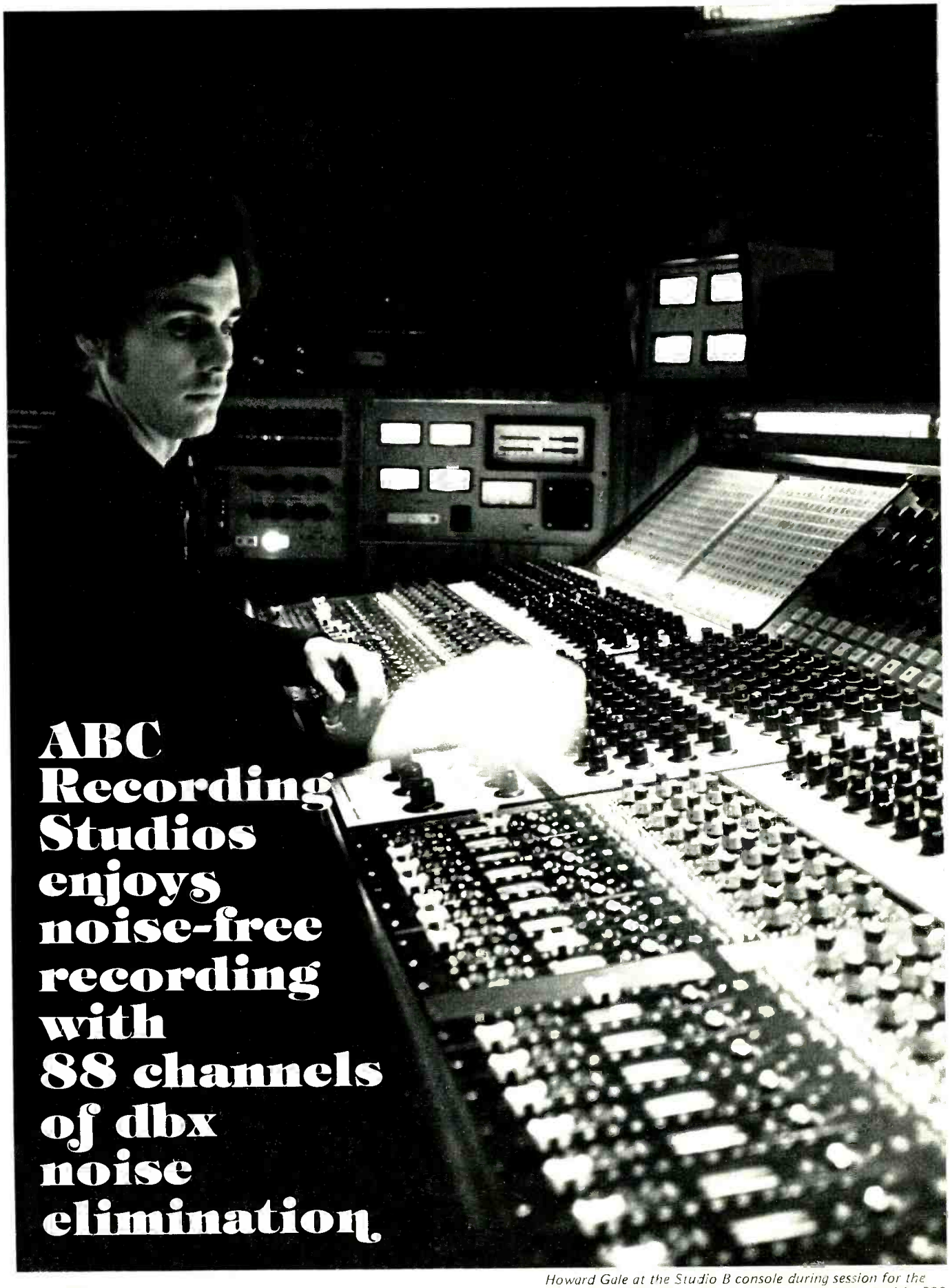
Allison Research Inc, 7120 Sunset Boulevard, Hollywood, Ca 90046, USA.
Phone (213) 874 6615.
Export: Gotham Audio Corporation, 741 Washington Street, New York, NY 10014, USA.
Phone: (212) 741 7411.
UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ.
Phone: 01-953 0091.

GAIN BRAIN 700
Specification
Gain reduction range: 30 dB.
Noise level (20 Hz to 20 kHz): at least 83 dB below threshold of peak limiting.
Distortion: total harmonic distortion is less than .3% from 40 Hz to 15 kHz.
Attack time: peak section, less than 1.5 dB overshoot 1 µs after application of 50 kHz tone burst exceeding the threshold of limiting by 15 dB; rms section, 7 ms to 40ms for 90% of ultimate gain reduction. Dependent on waveform complexity, amount of limiting and position of FUNCTION control.
Release time: peak section (for transients of less than 50 µs duration) less than 1 µs. For other peak signals, variable by RELEASE control 50 ms to 5s; rms section, variable 250 ms to 5s.
Limiting ratio: peak section, approx 50 to 1; rms section, approx 40 to 1.
Limiting thresholds: with FUNCTION control in PEAK position all thresholds are at —20 dBm with INPUT LEVEL control fully clockwise (variable to +30 dBm).
Separation between thresholds: rotating FUNCTION control from PEAK to RMS position raises peak thresholds 6 dB, while lowering rms threshold 6 dB. This allows a separation of thresholds which is continuously variable from 0 dB to 12 dB.
Frequency response: ±1 dB 25 Hz to 80 kHz.
Output level: up to +18 dBm into 150 ohms or higher (+24 dBm may be obtained by using a 150 ohm to 600 ohm output transformer).
Coupling: connection provided for tandem limiting functions.
Power requirements: regulated 24V dc to 28V dc negative ground at 70 mA.
Metering specifications
Gain reduction meter: 7 sequential increment light emitting diode array indicates gain reduction from 2 dB to 24 dB.
Accuracy: ±1 dB (2 dB to 12 dB gain reduction), ±2 dB (18 dB to 24 dB gain reduction).
Speed: virtually instantaneous. Permits accurate reading of short term fast release limiting.
Peak limiting indicator: led indicates when peak limiting is taking place.
Rms limiting indicator: led indicates when rms limiting is taking place.
Price: £181.

AUDIO DESIGN RECORDING

Audio Design (Recording) Ltd, St Michaels, Shinfield Road, Shinfield Green, Reading, Berks RG2 9BE.
Phone: (0734)-84487.
USA: Ken Schaffer Group, 21 West 58th Street, NYC 10019.
Phone (212) 371 2335.
Agents in: Brazil, Belgium, Canada, Denmark, France, West Germany, Holland, Greece, Italy, Japan, Portugal, South Africa, Sweden, Switzerland, New Zealand, Norway.
F600 LIMITER
Suitable for use in the final signal chain in broadcast applications.
Specification
Input: 10k ohms unbalanced/floating.
Output: unbalanced, clip level +18 dBm. Floating/balanced 75 ohm, clip level +22 dBm.
Gain: 34 dB.
Limit thresholds: min input level for limiting —20 dBm. Max output limit threshold +15 dBm.
Control range: in excess of 30 dB.
Slope: 30:1.
Attack: 10 µs to 25 ms (six switched positions).
Release: 25 ms to 3.2s (eight positions) plus AUTO.
Meter: gain reduction scaled 0 to 20 dB.
Noise: —84 dB ref threshold.
Distortion: 30 to 20k Hz ±0.5 dB.
Other: available with de-emphasis in the control circuits to order.

26 ▶



ABC Recording Studios enjoys noise-free recording with 88 channels of dbx noise elimination.

Howard Gale at the Studio B console during session for the Three Dog Night album Comin' Down Your Way, ABCD-388.

dbx Incorporated • 296 Newton Street • Waltham, MA 02154

SURVEY: LIMITERS AND COMPRESSORS

F700 COMPRESSOR/LIMITER/EXPANDER

Provides limiter-compressor facilities with expander/gate option. Peak level overload limiter provides internal protection on soft slopes. Threshold switched with slope to maintain constant output level for 10 dB compression.

Specification

Input } standard line option, transformer isolated.
Output }

Gain: 30 dB before attenuation. Unity in bypass.
Thresholds: at maximum input sensitivity —31 dBm on 2:1 slope, or —22 dBm on 20:1 slope.
Slopes: compressor—1:1, 2:1, 3:1, 5:1, 10:1, 20:1. Overload limiter—20:1. Expander—2:1, 20:1 gate.
Release: nine switched positions 25 ms to 3.2s plus AUTO. Overload limiter—25 ms. Expander—25 ms to 1.6s.
Attack: compressor/limiter—250 µs, 2.5 ms, 25 ms. Overload limiter—25 µs. Expander—20 µs, 2.5 ms, 40 ms.
Distortion: <0.2% thd at 1 kHz for 10 dB compression.
Noise: >—85 dB for 10 dB compression ref limit threshold.
Frequency response: ±0.5 dB 30 Hz-20 kHz.
Meter: 0-20 dB gain reduction.

F760 SERIES COMPEX—LIMITER

Peak level limiter-compressor-expander/gate system. The peak level limiter may be set with the output attenuator to levels up to +14 dBm; the compressor-limiter threshold can be varied in 2 dB steps 0-20 dB below the peak level limiter. Expander/gate operates below the compressor. Any combination switchable. Separate leds indicate operation of the expansion and limiting function. A panel meter shows overall compression and gain reduction.

The characteristics of the electronics are similar to those incorporated in the F700 model.

F759X-R VOCAL STRESSER

The *Vocal Stresser* is a combination unit comprising one *F760* Compex-Limiter channel and the *E900* parametric sweep equaliser. A routing switch enables the equaliser to be switched before or after the compressor or into the side chain of the compressor section. Thus the compressor side chain response can be modified for de-essing and the reduction of modulation effects. In the 'out' position the equaliser is available on a separate input/output connector for use on another channel.

E500 SERIES BAND SELECTIVE PROCESSORS

In these units the audio bandwidth is split to derive a specific band for processing (limiting or expansion); the selected section is then added back at the output. Low frequency low level signal; low level hf can be selectively attenuated with expansion; high level low frequency selectively limited without modulating programme mid-band, hf and ambience etc. Selective limiting in the sibilant region for de-essing.

E560

A band-splitting device using the parametric notch principle. It incorporates an *F600* limiter and provides for external send to another device (eg expander). Limiter can be switched to operate over the full bandwidth or selectively on the notch content alone. In the eq position, the unit will act as a normal parametric equaliser.

E300 VOICE EXPANDER/GATE

Specification

Inputs: 10k ohm electronically balanced.
Output: clip level +30 dBm balanced.
Gain: unity gain above threshold.
Range: calibrated control variable 0-40 dB attenuation.
Slope: 'Exp'—from 1.5:1 at 10 dB attenuation range to 3:1 at 40 dB attenuation range. 'Gate'—20:1.
Thresholds: —50 to +10 dB.
Release: Auto plus variable 25 ms-3s.
Attack: Auto plus switched 20 µs, 2.5 ms, 40 ms.
Noise: >—95 dBm on normal threshold range.
Distortion: <0.1% thd.
Response: 30 Hz-20 kHz ±0.5dB.

BURWEN

Burwen Laboratories, 209 Middlesex Turnpike, Burlington, Mass 01803, USA.
Phone: (617) 273 1488.
Overseas: (professional products) The Ampex Corporation.

DNF1100 bandwidth 10 to 30k Hz.

The DNF1100 dynamic noise filter reduces noise by attenuating high frequencies when there is little or no musical information present.

Specification

Input and output: standard 600 ohm balanced line using a nominal 0 dBm operating level.
Frequency response: minimum bandwidth —3 dB at 500 Hz, sloping to —10 dB at 1 kHz and —20 dB at 2.5 kHz. Maximum bandwidth —3 dB at 30 kHz.
Harmonic distortion: at +10 dBm 20 to 10k Hz 0.2% max.
Noise: 20 to 20k Hz —80 dB.
Attenuator: ±15 dB in 3 dB steps.
Connectors: Switchcraft or Cannon.
Power: 115/230V.
Size: 24 x 8 x 45 cm.
Price: $1695 for two channel system.

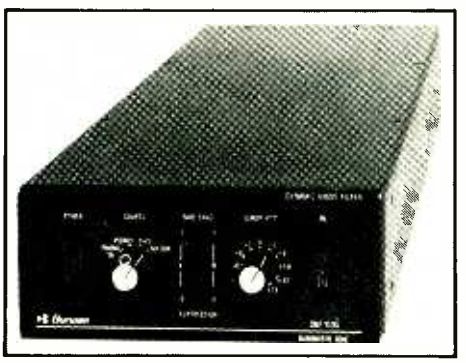
DNF1500A

Generally as *DNF1100* but with bandstop at 8 kHz. Intended for use with video soundtracks and class A telephone lines. Price. $845.

DNF1500D

Generally as *DNF1100* but with bandwidth restricted to 250 and 4k Hz. Intended for use with class D telephone lines. A front panel tone control enables tilt of the response curve for best subjective results. Price: $810.

Burwen DNF 1100. Bandwidth 30 kHz. Dynamic noise filter.



DBX

DBX Inc, 296 Newton Street, Waltham, Mass 02154, USA.
Phone: (617) 899 8090.
UK and Europe: Scenic Sounds Equipment, 27/31 Bryanston Street, London W1H 7AB.
Phone: 01-935 0141.

160 SERIES COMPRESSOR/LIMITER

See review: p34.

162 STEREO COMPRESSOR/LIMITER

Individually, each channel has the same performance specification as the *160*. However, both channels are coupled mechanically through the front panel controls and electrically through a common vca line. Separate metering is provided for each channel. Provision has been made for coupling more than one *162* unit when operating in a multi mode.

DUKANE

Dukane Corporation, Communications System Division, 2900 Dukane Drive, St Charles, Illinois 60174, USA.
Phone: (312) 584 2300.

2A80B

The unit offers facilities for volume compression and noise gating.

Specification

Inputs (2) } 600 ohms standard line. Also 10k ohms
Output } bridging.

Max output: +28 dBm, +14 dBm nominal.
Distortion: at up to 40 dB compression 0.5% thd.
Frequency response: 20 to 20k Hz ±1 dB.
Gain: input 1—51.5 dB at 600 ohms, 14 dB bridging 10k ohms at threshold of compression. Input 2—21 dB into 10k ohms unbalanced.
Noise: —70 dB or —80 dB with noise gate on.
Compression ratio: 10:1 and 5:1 switchable.
Compression attack time: 30 µs.
Compression release time: 1.5s.
Noise gate: 1 µs attack time and 200 ms release.
Input pad: —20 dB switchable.
Power requirements: 105/125V ac.
Size: 8.9 x 48.3 x 22.9 cm.
Weight: 4.6 kg.

2A165

Compressor amplifier module

Specification

Frequency response: ±1 dB, 50 to 20 000 Hz.
Input impedance: 10k ohms.
Input source impedance: 10k ohms or less.
Output source impedance: 70 ohms.
Output load impedance: 600 ohms or greater.
Rated output: +14 dBm. 4V (600 ohms).
Distortion (5dB into compression): less than 5% thd.
Noise: 5 dB into compression, 20 kHz bandwidth, 4V output reference, 80 dB below output.
Input voltage (at threshold of compression): .4V ±2 dB.
Gain (below threshold): 20 dB ±2 dB.
Compression ratio: 20:1.
Compression attack time: 500 ms.
Compression release time: 3 to 5s.
Controls: input level control.
Power required: ±22.5V, 20 mA.
Size: 6.4 x 12.7 x 2.6 cm.
Weight: 57g.

EMI

EMI Sound and Vision Equipment Ltd, EMI Television Division, 252 Blyth Road, Hayes, Middlesex UB3 1HW.
Phone: 01-573 3888.
Telex: 25145.

8025 COMPRESSOR

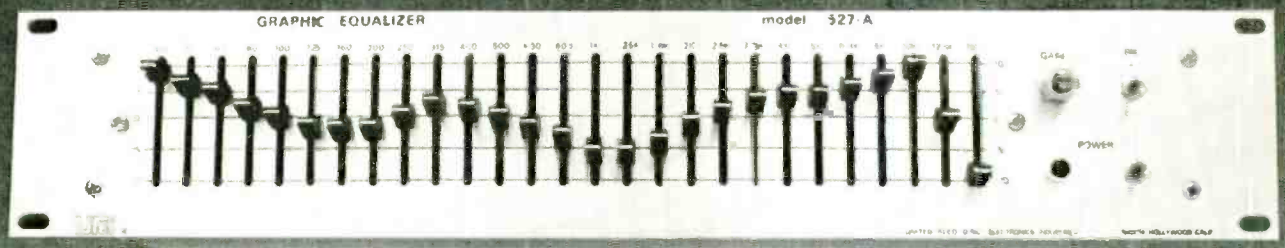
Specification

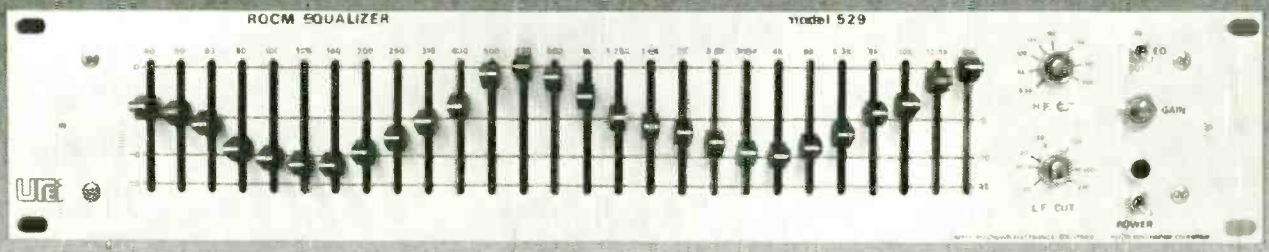
Power supply: ±24V.
Input impedance: 10k ohms in parallel with 50H.
Voltage gain below knee: adjustable from 0 to 20 dB by means of the compression range control.
Compression: range variable from 0 to 20 dB: ratio is selectable to 1:1, 2:1, 3:1, and 5:1 by a switch.
Output level: independent of compression ratio and range—adjustable from 0 dBm to +24 dBm.
Sensitivity: peak input level, to give full compression is adjustable from —16 dB to —24 dB relative to 775 mV.
Attack time: 1 ms.
Recovery time: selectable to 125 ms, 250 ms, 500 ms, 1s, 2s, or 3s by means of a front panel switch.
Frequency response: within a 1 dB envelope from 60 to 8k Hz and within a 2 dB envelope from 40 to 15k Hz.
Distortion: 1% at 40 Hz with a recovery time of 500 ms or more.
Signal to noise ratio: 60 dB over the band 40 to 15k Hz.
Temperature range: 0 to +50°C.
Price: £334.

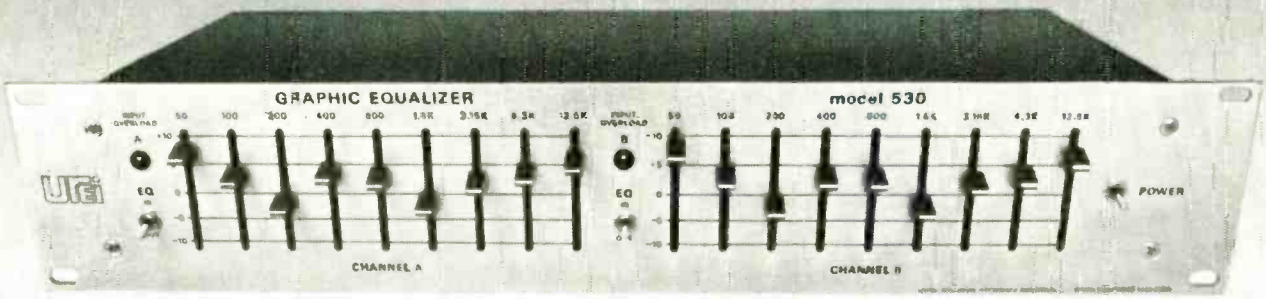
28 ▶

UREI

Graphic in Audio







The most comprehensive range of graphic equalisers for recording and sound reinforcement applications. Moderately priced, with UREI quality, of course.

Model 527 features
10dB boost and attenuation from 40Hz to 16kHz in 27 × ⅓rd octave steps.

Model 529 offers from
40Hz to 16kHz in 27 steps with up to 15dB of attenuation; with additional high-pass and low-pass filters.

Model 530
a two- channel octave equaliser allowing independent selection in 9 steps from 50Hz to 12.5kHz for stereo application, 10dB boost and attenuation.

Model 532 – the mono version of the 530.

F.W.O. Bauch Limited

49 Theobald Street, Boreham Wood,
Hertfordshire, WD6 4RZ
Tel: 01 953 0091 Telex: 27502

SURVEY: LIMITERS AND COMPRESSORS

EMT

Franz Vertriebsgesellschaft mbH, D-763 Lahr 1, Postfach 1520, West Germany.
Phone: 07825-512. Telex: 75 43 19.
USA: Gotham Audio Corporation, 741 Washington Street, New York, NY 10014.
Phone: (212) 741 7411.
UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts.
Phone: 01-953 0091.

EMT156 (stereo) and **EMT156TV** (mono)
This compressor limiter uses a high speed chopping principle. This technique potentially removes the 2nd harmonic distortion inherent in most other types of variable resistance or conductance gain elements.
Specification
No of channels: 2 (control linked).
Input: variable from +4 to +24 dBm (max).
Input impedance: balanced line <5k ohm.
Output: +4 to +15 dBm at 50 ohms.
Total distortion: at 1 kHz, 0 dB gain, 0 dB internal level ≦.6%. In the working range of the compressor (automatic release time) ≦.6%. In the limiter range (automatic release time) ≦ 1%.
Frequency response: referred to 1 kHz, 30 Hz to 10 kHz ±1 dB, at 15 kHz —1.5 dB.
Signal to noise ratio (unweighted): R source = 200Ω, R term = 600Ω at 0 dB gain 70 dB rms, at 18 dB gain 68 dB rms.
Signal to noise ratio (weighted): R source = 200Ω, R term = 600Ω at 0 dB gain 70 dB rms, 65 dB peak. At 18 dB gain 68 dB rms, 63 dB peak.
Crosstalk: between channels 1-2 and 2-1 at 1 kHz and nominal level >35 dB. With input level of +20 dB absolute (limiter operation) >35 dB.
Maximum gain control range of compressor and limiter: 40 dB.
Limiter
Threshold: —2 dB to +7.5 dB*.
Max input level, independent of nominal level setting +24 dBm (12.3V).
Attack time: max 100 µs.
Release time, with 10 dB jump in level and manual selection .25 to 2.5s. Automatic program controlled.
Compressor
Compressor gain, adjustable 0 to 18 dB.
Compression ratio: 1.5:1 to 4:1.
Rotation point, adjustable —6 dB to —1.5 dB*.
Attack time: internally adjustable 1 to 4 ms, set at factory for 2 ms.
Release time: for 10 dB gain variation, manually adjustable .5 to 3.5s, automatic program controlled.
Expander
Expansion ratio: 1:1.5/1:2.5.
Rotation point, adjustable: —35 dB to —55 dB*.
Attack time: coupled with compressor release time —program controlled.
Release time: for 10 dB gain variation, manually adjustable 1.5 to 7.5s. Automatic about 4.5s.
Power requirements: 100 to 250V ac, 40W.
Weight: 13.3 kg.
Price: £1997
**referred to an internal reference level of 0 dB.*

EMT25611
This is a compressor and simple expander using a four quadrant multiplier as the gain control element.
Input: —20 to +6 dBm, floating standard line 600 ohms.
Output: range and terminations as input. Max output level +19.5 dBm at 1% total harmonic distortion.
Gain: 0 to 18 dB.
Compression ratio: 2 to 20:1. Bypass position on ratio control.
Attack time: 2.5 ms.
Release time: .25 to 10s. Also automatic position.
Expander: automatic attack and release time with a decilinear expansion ratio of 2.5:1. Rotation point internally adjustable from —55 to —35 dB. Switched in by front panel toggle.
Other: front panel switch cuts bass to control rectifier to inhibit low frequency modulation effects. Small meter gives indication of operational gain.
Frequency response: 40 to 15k Hz ±0.5 dB.
Distortion: less than 0.5% thd at unity gain, 1 kHz.
Signal to noise: 67 dB, unspecified bandwidth.
Power requirements: 24V dc.
Size: 4 x 19 x 11 cm.
Weight: 800g.
Price: £467.

EMT257
This is a peak limiter with a facility for complementary pre-emphasis of the signal applied to the control network.
Specification
Input } —20 to +6 dB. Floating 600 ohm standard
Output } line.
Max output: +19.5 dBm at 1% total harmonic distortion.
Frequency response: 40 to 15k Hz into 600 ohms.
Distortion: less than 0.5% thd for internal zero level and AUTO operation at 1 kHz.
Signal to noise (unweighted): greater than 75 dB at 0 dB output level.
Attack time: adjustable between 50 to 500 µs.
Release time: adjustable between 0.25 to 10s/10 dB.
Threshold: —2 to +10 dB relative to internal zero.
Range: 20 dB max.
Power requirements: 24V dc.
Size: 4 x 19 x 11 cm.
Price: £419.

EVENTIDE

Eventide Clockworks Inc, 265 West 64th Street, New York City, 10019, USA.
Phone: (212) 581 9138.
UK: Feldon Audio Ltd, 125 Great Portland Street, London W1N 5PH.
Phone: 01-580 4314.
Canada: Chromacord Corp, 2343 43rd Street, Lachine, Quebec H8T 2K1.
Australia: W C Wenderspoon Pty Ltd, 3 Ford Street, Greenacre, NSW, Australia.
France: 3M France, 135 Boulevard Serurier, 75940 Paris, Cedex 19.
Italy: Audio Products International, Viale Rimembranze di Lambrate 13, 20134 Milano.
South Africa: Telemusik, Lynnwoodridge Shopping Centre, Freesiastraat, Lynnwoodridge, Pretoria.

CI1035a and **CI1035b**
These are complementary compression expansion cards intended for use with digital delay line to extend the operating dynamic range. Operating at standard line level, the units employ a decilinear compression ratio of 2:1 in the transmission medium. They are constructed for mounting in the Eventide *C200* ddl mainframe. Price: $143 each card.

2830 OMNIPRESSOR
See review p20.

HARRIS

Harris Corporation, Broadcast Products Division, 123 Hampshire Street, Quincy, Illinois 62301, USA.

SOLID STATESMAN FM LIMITER
For use in the signal path to fm broadcast transmitters.
Specification
Gain: 50 dB, ±2 dB max at 1 kHz. (May be reduced by built-in input and/or output attenuators.)
Frequency response: ±1.0 dB, 30 Hz to 16 kHz, below threshold of instantaneous limiter.
Harmonic distortion: 1% max 30 Hz to 16 kHz, below limiting, or at 10 dB of limiting in any recovery mode.
Noise: 70 dB below the threshold of limiting. (Bandwidth 30 Hz to 16 kHz.)
Attack time: 40 µs, maximum.
Recovery time: selectable; **fast:** dynamically gated for 200 ms, **medium:** 2s, **slow:** 10s.
Amount of limiting: 30 dB.
Limiting slope: Better than 30:1.
Input level: —17 dBm to +23 dBm for 10 dB of limiting.
Output level: adjustable to +23 dBm maximum with limiting, +30 dBm amplifier maximum.
Input and output impedance: 600 ohms, balanced or unbalanced.
Size: 8.9 x 34.6 x 48.3 cm.
Power: 115/230V, 5W.

AM PEAK LIMITER
Specification
Gain: 44 dB, ±2 dB maximum at 1 kHz. (May be reduced by built-in input and/or output attenuators.)
Frequency response: ±1.0 dB maximum, 30 to 16 000 Hz (with or without limiting).
Harmonic distortion: less than 1.0% from 50 to 16 000 Hz, from 0 to 10 dB of limiting; less than 3.0% at 30 Hz.
Noise: 70 dB below threshold of limiting, 30 to 16 000 Hz.
Clipping level: positive: adjustable from 110% to 140% in approximately 4% steps. Negative: factory set at 100%.
Attack time: 30 µs, adjustable to 1 ms.
Recovery or release time: dual/adjustable: fast, 3s; medium, 5s; slow, 7s.
Amount of limiting: 30 dB with a 30:1 compression ratio.
Input level: adjustable —24 to +16 dBm for threshold of limiting.
Output level: adjustable to +20 dBm maximum with compression, +26 dBm without compression.
Input and output impedance: 600 ohms, balanced or unbalanced.
Size: 8.9 x 30.5 x 48.3 cm
Power requirements: 115/230V.

INOVONICS

Inovonics Inc, 1630 Dell Avenue, Campbell, Ca 95008, USA.
Phone: (408) 374 8300.
UK: Allotrope Ltd, 90 Wardour Street, London W1V 3LE.
Phone: 01-437 1892.

201
The unit is a compressor/limiter for general purpose use in broadcasting, mastering and studio applications. It features 'increasing ratio' compression which can be a continuously variable function of input level.
Specification
Frequency response: ±0.5 dB 20-20k Hz.
Signal to noise ratio: >75 dB, 20-20k Hz referred to +4 dBm line level.

Distortion:	50-200 Hz	200-20k Hz
Peak limiter		
S (slow) release:	<0.5%	<0.25%
F(fast) release:	<1.0%	<0.25%
Average level limiter:	<0.5%	<0.25%

Limiters OFF: >0.15%, 20-20 Hz at +23 dBm.
Limiter timing:
Peak limiter
ATTACK: continuously variable between 1 µs/dB-limiting (F) and 1 ms/dB-limiting (S).
RELEASE: continuously variable between 5 ms/dB-limiting (F) and 50 ms/dB-limiting (S).
Average level limiter
AVG response: 10 ms/dB-limiting (attack and release).
'VU' response: 30 ms/dB-limiting (attack and release).
Stereo coupling: two or more units may be interconnected for ganged gain reduction.
Input } standard 0 dBm line level.
Output }

30 ▶

SURVEY: LIMITERS AND COMPRESSORS

Power requirement: 105 to 230V ac, 10W.
Size: 4.5 x 48.3 x 16.5 cm.
Price: $480.

210 LIMITER
Two limiting functions—one acts in the normal peak ceiling mode, the other features a plug-in de-emphasis network in the control circuits for limiting equalised signals.
Specification
Frequency response: ±0.5 dB 20-20k Hz.
Signal to noise ratio: >75 dB, 20-20k Hz referred to +4 dBm line level.

Distortion:	50-200 Hz	200-20k Hz
Peak limiter		
S (normal) release:	<0.5%	<0.3%
F (fast) release:	<0.8%	<0.4%
Freq selective limiter:	—	<0.5%

Limiters OFF: <0.15%, 20-20k Hz at +23 dBm.
Limiter timing:
Peak limiter
ATTACK: continuously variable between a 'normal' setting of 1 µs/dB-limiting (F) and a 'delayed' figure of 1 ms/dB-limiting (S).
RELEASE: continuously variable between a 'normal' setting of 30 ms/dB-limiting (S) and 6 ms/dB-limiting (F).
Frequency selective limiter
ATTACK: <1 µs/dB-limiting (fixed).
RELEASE: 50 ms (max) for any degree of reduction.
Stereo coupling: two or more units may be interconnected.
Input } standard 0 dBm line level.
Output }
Power requirement: 105 to 230V ac, 10W.
Size: 4.5 x 48.3 x 16.5 cm.
Price: $490.

220 AUDIO LEVEL OPTIMISER
Overall signal processor for use in the signal path of broadcast transmitters.
Specification
Frequency response: ±0.5 dB, 20-20k Hz.
Noise level: better than 70 dB below output program level.

Distortion:	50-200 Hz	200-20k Hz
Peak limiter		
SLOW release:	<0.5%	<0.3%
FAST release:	<0.8%	<0.4%
Freq selective limiter:	—	<0.5%

Below limiting threshold: <0.15%, 20-20k Hz at +23 dBm.
Output clipping level: >+24 dBm.
Limiter timing:
Peak limiter
ATTACK: <1 µs/dB-limiting.
RELEASE: continuously variable between 30 ms/dB-limiting (SLOW) and 6 ms/dB-limiting (FAST).
Averaging function
ATTACK and RELEASE approx 50 ms/dB limiting.
Frequency selective limiter
ATTACK: <1 µs/dB-limiting.
RELEASE: 50 ms (max) for any degree of reduction.
Gating circuit:
Operation: circuit serves to hold gain at level of prior compression when input signal falls below gating threshold. If input signal remains below threshold in excess of 10s, at the user's option the circuit will (1) continue to HOLD GAIN at the level of prior compression; (2) slowly increase gain reduction to a maximum of 20 dB (DELAY & FADE); or (3) slowly restore gain to the uncompressed value (DELAY & RELEASE).
Threshold level: continuously variable; adjusts to open gate on input signals of —40 dBm at maximum sensitivity.
Threshold weighting —3 dB points at 300 Hz and 3k Hz to restrict gating operation to legitimate program material.
Peak limiting symmetry: a series of straps on the circuit board permits setting the value of positive peaks to 100% (symmetrical), 105%, 110%, 115%, 120% or 125% of the negative peak value.
Frequency selective limiting characteristic: optional plug-in insert complements.
Stereo coupling: two or more units may be interconnected.
Input } 0 dBm standard line level.
Output }
Price: $680.

NEVE

Rupert Neve & Co Ltd, Cambridge House, Melbourn, Royston, Herts SG8 6AU, UK.
Phone: 0763-60776. Telex: 81381. Cables: Neve Cambridge.
USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, Connecticut 06801.
Phone: (203) 744-6230. Telex: 969638.
Suite 616, 1800 N Highland Ave, Hollywood, California 90028.
Phone: (213) 465-4822.
Elsewhere: other agents in major countries worldwide.

2254E
Limiter/compressor has separate side-chains for limiting and compression functions which may be switched separately or together, as required.
Input } 0 dBm nominal, standard line, max output
Output } +26 dBm.
Gain: unity.
Noise: —73 dBm, 20 to 20k Hz, zero gain make up.
Frequency response: flat within 1 dB from 20 to 20k Hz.
Distortion: measured at +9 dBm and with 800 ms recovery time: residual linear mode 0.05%, compression mode, 6:1 ratio 0.2%, limiting mode at 20 dB input 0.4%.
Power requirement: 24V dc at 50 mA.
Limiter
Ratio: greater than 100:1.
Level: +8 dBm within 0.5 dB on pre-set, adjustable from +4 dBm to +12 dBm in steps of 0.5 dBm.
Attack time: 5 ms (slow) or 100 µs (fast).
Recovery time: 100 ms, 200 ms, 800 ms, and AUTO 50 ms/5s.
Compressor
Ratio: 1.5:1, 2:1, 3:1, 4:1, 6:1.
Threshold: 0 dBm, within 0.5 dB on pre-set, adjustable from —20 dBm to +10 dBm in 2 dB steps.
Attack time: 5 ms.
Recovery time: 400 ms, 800 ms, 1500 ms and AUTO 50 ms/5s.
Gain: 0 dB below compression threshold, adjustable 'GAIN MAKE UP' available from 0 dBm to +20 dB.
Meter: switched to indicate either gain control up to 16 dB (black scale) or signal level, —12 dBm to +12 dBm (red scale). Action approximates to that of a ppm.

2257 BACKGROUND NOISE SUPPRESSOR
Threshold control: 0 dBm to —40 dBm in r dB steps. Lamp indicates when threshold is exceeded.
Attenuation depth: selects degree of attenuation of unwanted signal; 3 to 33 dB in 3 dB steps.
Recovery: recovery time of 100 ms, 300 ms and 1s.
Gain: unity.
Frequency response: 20 to 20k Hz, ±0.5 dB.
Noise: with attenuation depth set to —3 dB, less than —85 dBm, measured wideband 20 to 20k Hz.
Distortion: +20 dBm into 600 ohms. Less than 0.02% at 1k Hz, less than 0.075% at 100 Hz and 10k Hz.
Maximum output: +26 dBm into 600 ohms.
Input: 10 000 ohms, bridging, balanced and floating.
Output: 80 ohms source impedance, balanced and floating.
Power requirements: 24V dc (negative earth) at 60 mA.
Dimensions: 222 x 46 x 273 mm.

2264
Limiter/compressor similar to *2254E* but housed in a 45 mm width module making it interchangeable with all Neve 45 mm eq modules.

NTP

NTP Elecktronik A/S, 44 Theklavej, DK-2400, Copenhagen NV, Denmark.
Phone: (01) 10 12 22.
Telex: 16378.
Export: direct.

179-120
Compressor limiter
Specification
Frequency range (0.5 dB points): 20 Hz to 20 kHz.
Min load impedance: 100 ohms.
Gain: 0 to 15 dB.
Compression ratio: adjustable 1:1, 2:1, 3:1, 5:1, 20:1.
Attack time: adjustable 100 µs/20 dB to 200 ms/20 dB (11 steps).
Recovery time: adjustable 60 ms/20 dB to 4s/20 dB and one AUTO position (11 steps).
'Auto' dual time constants: 200 ms to 15s.
Recovery delay: switchable 0 or 50 ms.
Distortion: less than 0.5% up to 20 dB gain reduction.
Signal to noise ratio at compression threshold: 80 dB 'A'-curve typical, compression 15 dB ratio 2:1, less than —86 dB 'A'-curve.
Limiter function
Attack time: 1.5 ms combined with a full-wave logarithmic circuit which limits peaks shorter than 1.5 ms to a max level 3 dB above steady state.
Recovery time: follows the recovery time set for the compressor.
Meter output: 0 to 1 mA for 0 to 20 dB compression, linear dB scale.
Supply voltage: 24V dc ± 10% at 100 mA.
Price: Kr 4600, £368.

179-230
This limiting amplifier uses a combination limiting technique comprising a conventional long attack time, high slope compressor and a series coupled symmetrical logarithmic clipping amplifier. This type of circuit is said to be free of limiting noise when subjected to heavy transients.
Specification
Frequency response: ±0.5 dB 20 Hz to 20 kHz.
Input impedance 20 Hz to 20 kHz: 22k ohms ±15% balanced floating.
Input overload level: +21 dB.
Output impedance 20 Hz to 20 kHz: 20 ohms floating.
Minimum load: 200 ohms.
Preamplifier gain: adjustable 0 to 24 dB in 3 dB steps.
Limiting threshold: re to output, +6 dB ±0.5 dB.
Limiting range: more than 30 dB.
Distortion 20 Hz to 20 kHz: 0 to 20 dB limiting 0.3%, 20 to 30 dB limiting 0.5%.
Attack time: 1.5 ms combined with fullwave logarithmic clipping circuit.
Recovery time (1) adjustable: 0.1—0.2—0.4—1—2—4 sec.
Recovery time (2) adjustable: 1—2—4—10—20 sec.
Control voltage output: 5 dB/V.
Meter output: 0 to 1 mA for 0 to 20 dB limiting. Linear dB scale.
Signal to noise ratio: at lim threshold 84 dB A-curve.
Supply voltage: 24V dc ±10% at 75 mA.
Price: Kr 3250, £260.

179-240
Generally as limiter *179-230*. Has a provision for pre-emphasis (50 µs) of signal applied to the control networks. Two units can also be coupled for stereo. Price: Kr 2950, £236.

179-250
Limiting amplifier for console mounting.
Specification
Frequency range: within 0.5 dB 20 Hz to 20 kHz.
Input impedance at 1 kHz: 2 kΩ ±15% balanced floating.
Output impedance: 20Ω ±15% balanced floating.

32 ▶

SURVEY: LIMITERS AND COMPRESSORS

Minimum load impedance: 200Ω.
Limiting threshold: (input) +15, +6, 0, —6, —12, —18 dBu ±0, 5 dB.
Output in limiting range: +15 dBu ±0.5 dB. Limiting range depending on setting of input.
Limiting threshold: 6, 15, 21, 27, 30, 30 dB (max 30 dB).
Input overload level: +21 dB.
Distortion: 20 Hz to 20 kHz, 0 to 20 dB lim, 0.5%; 20 to 30 dB lim, 1%.
Signal to noise ratio: at limiting threshold 84 dB A-curve.
Supply voltage: 24V dc at 75 mA.
Price: Kr 3300, £264.

179-260
Limiting amplifier. Generally the same spec as the *179-250*, but supplied in the printed circuit board form for incorporation in other equipment. Price: Kr 2725, £218.

179-300
This limiter amplifier card uses the same principle (slow attack and log clipper) described as for *179-230*. The unit has a meter output to indicate the degree of limiting. Two cards can be coupled together for stereo operation.
Specification
Frequency response: 20 to 20k Hz.
Input: high level, +6 dBm at 22k ohms; low level, —28 dBm at 460 ohms.
Output: 100 ohms load minimum.
Gain (high level): unity.
Threshold: +6 dBm.
Limiting range: more than 30 dB.
Distortion: 20 dB limiting 40 Hz to 20 kHz, less than 0.2%.
Signal to noise ratio at limiting threshold: 82 dB A-curve.
Control voltage output: 1V per 5 dB.
Indicator output (led indicator): 14 mA.
Attack time: 1.5 ms combined with a full-wave logarithmic clipping circuit.
Recovery time: dual time constants 200 ms up to 15s.
Weight: 70g.
Price: Kr 950, £76.

ORBAN/PARASOUND
Orban/Parasound, 680 Beach Street, San Francisco, Ca 94109, USA.
Phone: (415) 776 2808.
UK: Helios Electronics Ltd, Browells Lane, Feltham, Middlesex TW1 3ER.
Phone: 01-977 7841.
Italy: Audio Products International, Viale Rimembranze di Lambrate 13, 20134 Milano.
Phone: 381965/355506.

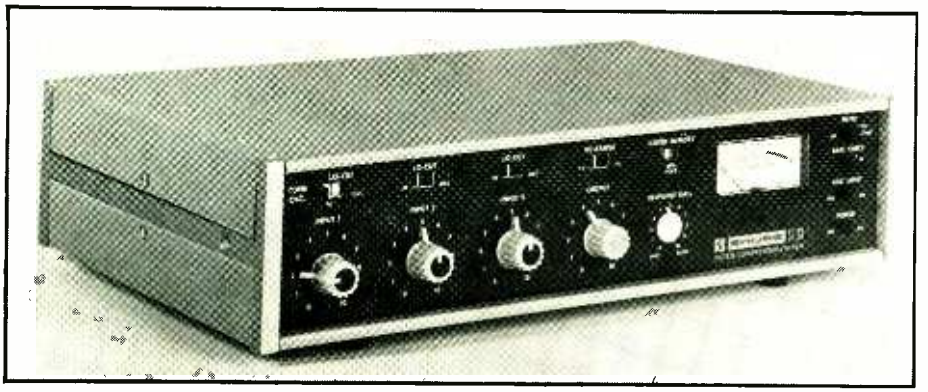
516EC
The *516EC* Dynamic Sibilance Controller features a hipass filter of 24 dB/octave to prevent frequencies unassociated with sibilance from operating the compressor. This acts over the whole band minimising tonal loss.
Specification
Input } nominal 0 dBm operating level, 600 ohms
Output } standard line.
Max output: +20 dBm 20 to 20k Hz.
Noise: —85 dBm 30 to 18k Hz.
Distortion: typically 0.03% thd at 1 kHz 0.2% thd at 20 kHz, 18 dBm out.
Attack time: 1 ms.
Release time: 15 ms.
Power requirements: 115/230V ac, 7W.

QUAIL ELECTRONICS
Zero 88 Lighting Ltd, 115 Hatfield Road, St Albans, Herts AL1 4JS.
Phone: 0727-63727.

CM4
By tracking gain, threshold and compression ratio all on one control, the *CM4* enables continuous adjustment of compression from 1:1 at unity gain to 7:1 with 30 dB gain swing and the result is a progressive increase in compression depth with 'no apparent change' in output level. Release time is continuously variable from 25 ms to 4s and a switched 'auto' facility is provided.

The unit is equipped with an independent limiter side chain to handle peaks which may occur at low levels of compression and this can be switched to operate at 5 dB or 10 dB above normal working level.
Specification
Compressor
Compression ratio: 1:1 to 7:1.
Max gain: 10 dB.
Max attenuation: 20 dB.
Attack time: 500 µs.
Release time: 25 ms to 4s, plus 'auto' feature.
Limiter
Limiting ratio: 20:1.
Attack time: 50 µs.
Release time: 25 ms.
Threshold: +10 dB or +5 dB (swtiched).
Overall
Metering (switched): compression ratio, peak operating level and peak output level.
Frequency response: 30 Hz to 20 kHz ±1 dB.
Distortion: less than 0.3% worst case at 1 kHz, 10 dB compression.
Noise: better than 70 dB below operating level, worst case.
Insertion gain: 0 dB nominal.
Operating level: adjustable, —20 dBm to 0 dBm.
Input headroom: 20 dB.
Power requirements: +24V ±1V.
Panel dimensions: 60 x 222 mm.
Other: can be supplied with either balanced or unbalanced input/output.

Shure SE30 gated compressor/mixer



RAC
Rugby Automation Consultants, 19 Freemantle Road, Rugby, Warwickshire CV22 7HZ.
Phone: 0788-810877.
Benelux: Sound Techniques, Postbus 206, Alkmaar, Netherlands.

LIM 1, LIM 2
When used with output amplifier *MA 2, LIM 1* acts as a simple compressor limiter while *LIM 2* can be used as a remote volume control or ducking amplifier.
Specification
Threshold: —10 to +13 dB adjustable by preset pot.
Compression ratio: 4:1 at —10 dB threshold; increasing to 25:1 at +13 dB threshold.
Output impedance: 25 ohms.
Price: *LIM 1* or *LIM 2* (with *MA 2* amplifier and appropriate connectors) £11.32, $23.

SHURE
Shure Bros Inc, 222 Hartrey Ave, Evanston, Illinois 60204, USA.
Phone: (312) 679 5830.
UK: Shure Electronics Ltd, Eccleston Road, Maidstone ME15 6AU.
Phone: 0622-59881.

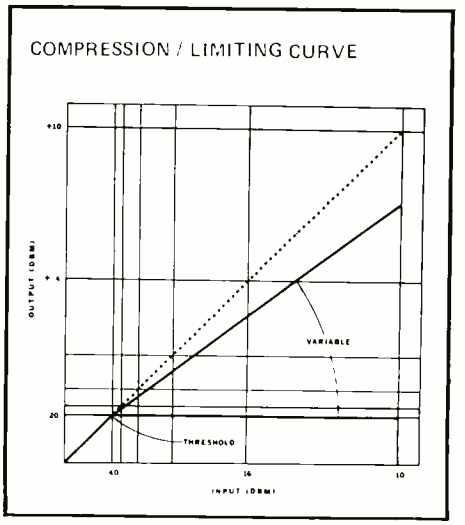
M62V AUDIO LEVEL CONTROLLER
A simple compressor powered from a 9V battery offering a compression range of up to 40 dB.
Specification
Frequency response: 40 to 20k Hz ±2 dB.
Input: hi and lo Z compatible with input levels ranging from lo Z mic to 10V (22 dB .7V).
Output: up to 2.2 dB .7V into 10k ohms.
Size: 6.4 x 29.9 x 13.4 cm.
Price: £39.20.

M625-2E VOICE GATE
Functions as a two level expander with the input compatible with raw mic levels. Below rotation point, unit holds throughput gain at —16 dB. Price: £84.80. Further modules slave powered from the above unit cost £61.60.

SE30-2E GATED COMPRESSOR/MIXER
The compressor function has a similar specification to the *M65V*. In addition, the unit incorporates a three into one mixer with an output vu meter. Mains powered, it provides an output at 600 ohms standard line level. Price: £203.

SPECTRA SONICS
Spectra Sonics, 770 Wall Avenue, Ogden, Utah 84404, USA.
Phone: (801) 392 7531.

Spectra Sonics 601 module characteristics.



601 COMPRESSOR/LIMITER MODULE

Specification
Gain: below threshold, 20 dB. Threshold to 30 dB comp, 20 dB to —10 dB, respectively.
Compression limiting ratio: continuously variable or fixed from approximately 1:1 to greater than 100 1.
Attack time: automatically variable.
Limiter: 100 ns to 2.0 μs.
Compressor: 100 ns to 1.2 ms.
Release time: for 90% recovery.
Limiter: less than 90 ns.
Compressor: continuously variable from 50 ms to >10s.
Frequency response: within 1 dB from 20 Hz to 50 kHz, (—1 dB at 10 Hz and 100 kHz).
Max undistorted output: +12 dBm.
Total harmonic distortion: not over 0.1%—typically less than 0.05% (up to 30 dB comp, 20 Hz to 20 kHz).
Signal to noise ratio: better than 80 dB below compressor/limiter output (—40 dBm input signal, 20 Hz to 20 kHz).
Source impedance: 50 ohms to infinity.
Input impedance: 600 ohms (10k ohms available on request).
Output impedance: less than 6 ohms.
Output loading: 600 ohms to infinity.
Power requirement: 24V dc at approx 40 mA.
Size: 6.35 x 12.7 x 1.9 cm
Weight: 85g.

610 COMPRESSOR/LIMITER

Specification
Input impedance: 600 ohms.
Output impedance: approximately 120 ohms (1 kHz), floating.
Output loading: 600 ohms to infinity, balanced or unbalanced.
Maximum gain: 56 dB.
Input level: typically —50 dBm to +10 dBm.
Threshold attack level: —40 dBm.
Output level: typically +4 dBm or +8 dBm.
Signal to noise ratio: not less than 80 dB below +4 dBm output with —40 dBm input (threshold), 20 Hz to 20 kHz, unweighted.
Frequency response: ±.1 dB, 20 Hz to 40 kHz, at +16 dB (high Z load), ±.5 dB, 20 Hz to 20 kHz, at +16 dBm (600 ohm load).
Harmonic distortion: less than 0.1%, 30 Hz to 20 kHz, at +16 dBm up to 30 dB compression, with release time such that attack and release does not occur on successive peaks of the lowest frequency utilized. (Typically less than 0.05%.)
Compression/limiting ratio: continuously variable from approx 1.1:1 to 100:1.
Attack time: automatically variable.
Limiter: 100 ns to 2.0 μs.
Compressor: 100 ns to 1.2 ms.
Release time: for 90% recovery.
Limiter: less than 90 ns.
Compressor: continuously variable from 50 ms to more than 10s.
Power requirement: 105-124V ac, 60 Hz, 6W.
Size: 8.9 (h) x 48.3 (w) x 21.6 (d) cm for standard rack mounting.
Weight: 4.3 kg.
Stereophonic interconnection: two units are coupled easily. Requires Model *610 SI* accessory for interconnection.

TEKNIK

Klark-Teknik Ltd, MOS Industrial Site, Summerfield, Kidderminster DY11 7RE, Worcs.
Phone: 0562-64027.

DN70

The company plans to manufacture a multi-function device with separate compression, limiting and expansion facilities. The exact number of control functions has yet to be decided. However, positive claims for the new model include a level of 0.1% total harmonic distortion at all levels of compression; an attack time of 5 μs and a noise figure 85 dB below line level measured over a 20 to 20k Hz bandwidth.

THOMSON-CSF

Thomson-CSF Laboratories Inc, 37 Brownhouse Road, Stamford, Conn 05902, USA.
Phone: (203) 327 7700.

AUDIMAX 4440A mono/4450A stereo

This unit monitors the incoming signal and compares it with the memory content collected from the programme over the preceding period of time. From this information, the unit decides the long term throughput gain.

After cessation of programme, the gain is held steady for a ten second period held over from the last 'correct' level setting. After this, the gain returns to the normal baseline.

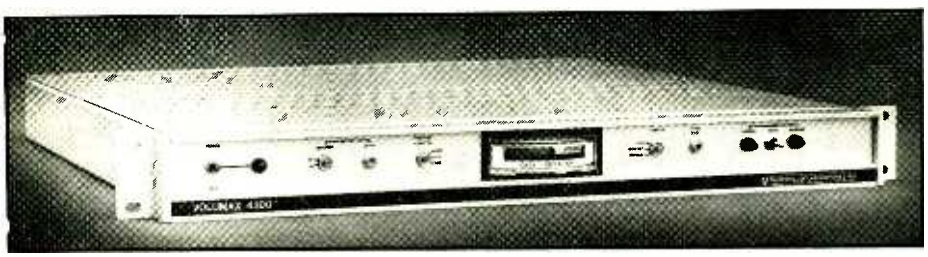
Specification
Control characteristic: ±10 dB of gain control.
Frequency response: ±½ dB from 50 to 15 000 Hz.
Harmonic distortion: less than 0.5% from 50 Hz to 15 000 Hz at +16 dBm output.
Signal to noise ratio: greater than 70 dB, with normal gain.
Gated gain stabilization: threshold adjustable from —20 dB to normal input.
Maximum gain: 40 dB*.
Input and output impedances: 600 ohms or 150 ohms, balanced or unbalanced.
Minimum input level: — 25 dBm.
Normal output level: 14* vu program, 18* dBm sine wave.
Maximum output: —26 dBm*.
Size: 48.2 x 4 x 28.5 cm.
**These figures do not include the 6 dB output pad.*

FM VOLUMAX 4101/4111

This is a peak level controller using multiband limiting intended for use in fm broadcasting. Low frequencies are initially controlled by a 'moderately fast' agc circuit. Active filters separate the signal into two bands with a 5 kHz crossover. Then after pre-emphasis, two dynamic band limiting circuits with appropriate time constants control the middle and upper-frequency peak amplitudes. After recombination, an instantaneous safety peak limiter provides added overmodulation protection. The final de-emphasis network restores flat response at low levels.

Specification
Frequency response: flat ±1 dB below the limiting threshold. Variable as a function of level above limiting threshold reaching the 75 μs de-emphasis characteristic ±1 dB at maximum level.
Noise: at least 70 dB below maximum output level.
Harmonic distortion: less than 1% with normal gain-reduction levels, 50-15 000 Hz. See Figure 2 for typical performance.
Attack time: between 1 μs and 3 ms depending on program waveform and rise time.
Recovery time: 200 ms (low frequencies), 10 ms (mid frequencies), 2 ms (high frequencies). (All field changeable.)
Power requirements: 12W 120/240V ac, 50/60 Hz.
Size: standard 48 cm rack width, 4 cm high, 47 cm deep.

Thomson CSF Volumax 4300.



VOLUMAX 4300

Automatic peak level controller prevents overmodulation in am broadcasting. It also provides symmetrical or asymmetrical limiting.

Specification:
Input and output impedance: 600 ohms, balanced or unbalanced.
Input level: —24 to +8 dBm.
Maximum output: +22 dBm.
Positive peak limiting: 100%, 115% or 125% of negative peaks.
Maximum gain: 50 dB.
Signal to noise ratio: 70 dB with respect to maximum output level.
Frequency response: ±0.5 dB, 50-15 000 Hz.
Harmonic distortion: less than 1%, 50-15 000 Hz.
Attack time: less than 1 μs or 2 ms, depending on program waveform.
Recovery time: 200 ms.
Power requirements: 105-130V ac, 50-60 Hz, 20W (230V, 50-60 Hz optional).

TWEED

Tweed Audio, Rosewood Industrial Estate, Kelso, Roxburghshire, Scotland.
Phone: 057 32-2983.

CL601

This compressor limiter has an attack time of about 5 ms and a release time variable over a 30:1 ratio; the release time can also be set for automatic operation dependent on programme time within the limiting area.

Specification
Fixed gain: 0 to 10 dB.
Max output: 24 dBm.
Noise: less than 0.03% residual, 0.1% operating.
Compression ratio: between 1.5 and 20:1.
Threshold: —20 to +10 dB.
Release time: 100 ms to 3s.
Mounting: two *CL601s* and a side mounting power supply fit into a standard 48 cm rack.
Price: £185, $370.

UREI

United Recording Electronics Industries, 11922 Valerio Street, North Hollywood, Cal 91605, USA.
Phone: (213) 764 1500.
UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD 64RZ.
Phone 01-953 0091.
Rest of world: Gotham Audio Corporation, 741 Washington Street, New York, NY 10014, USA.
Phone (212) 741 7411.

1176LN

Limiting amplifier using an fet as the gain control element.

Specification
Input impedance: 600 ohms, bridge-T control (floating).
Output load impedance: 600 ohms, floating.
Frequency response: ±1 dB 20 Hz to 20 kHz.
Gain: 45 dB ±1 dB.

58 ▶

ZDF and outside broadcasting

PETER JENS* **PETER PREKER***

A survey of the audio equipment of a four-camera outside broadcast van, the associated sound reinforcement system, radio microphone arrangements and their deployment within ZDF.

***Zweites Deutsches Fernsehen,** Mainz, West Germany.

ZDF (Zweites Deutsches Fernsehen), meaning 'German TV Channel 2', is an institution subject to public law. This means it is not a government body but an autonomous one, independent of the state. Its aim is to serve the community, its programmes are not governed by profit motives.

The sub-divisions of this institution are:

1. The Television Board.
2. The Administrative Board.
3. The Intendant (Director General).

The Television Board is ZDF's real supervisory organ. Its tasks consist in setting up and controlling the general programme policies, in advising the Director General and programmes, and in approving the budget. The Television Board reflects a modern pluralistic society and consists of 66 members. The Administrative Board controls the financial activities of ZDF and approves the budget drawn up by the Director General, which is afterwards submitted to the Television Board. The same goes for the annual balance. The Director General represents ZDF in and out of court, being responsible for programmes and their contents. He is accountable to the Television Board and the Administrative Board for his programming and financial decisions. He is elected by the Television Board for five years and can be re-elected. The Director General is assisted by the Administrative Director, the Programme Director, the Chief Editor and the Technical Director.

The technical department consists of three main divisions: operations, planning and maintenance. One of the subdivisions of operations is Outside Broadcasting. This division has to carry out the technical requirements for all television outside broadcasting events and tv productions not being produced in studios. The subdivision owns more than 50 technical vehicles including lighting vehicles, vtr vehicles and news-gathering vehicles, to meet programme demands. More than 200 employees of outside broadcasting undertake drama productions in theatres and opera houses; they produce in concert halls, churches and educational institutions; they make outside broadcasts of light entertainment and election events, of sports such as football and boxing; and, last not least, they support productions in film studios not equipped with tv facilities. Eurovision broadcasts are relayed by a Eurovision ob van that was shown at the Montreux TV Fair (Exhibition 1973). One of these vehicles (**fig. 1**, ob van 3) is a four-camera van, the sound equipment and use of which is summarised. The sound desk has 24 input channels switchable beteeen four groups and four output groups. In the back part of the vehicle are six five-core cable reels with 150m of cable each. The cables end in modulation distribution boxes fitted with Switchcraft and Tuchel connectors in parallel. Inside the vehicle, cable reels end in jacks mounted in a distribution panel with 504 jacks altogether. For these external connections jacks are used which switch through the signal circuit if no plug is inserted. The signal path is broken if one plug is inserted into the jack, and the signal can be used via a patchboard for other purposes. This kind of jack is used in many parts of the sound desk, ie. in couples always, to feed cross-route signal, or to patch in particular limiters or equalisers.

Due to this kind of signal switching, the level (+6 dBm) is obviously made identical at all break-points; the output impedance is low (<40 ohms) and balanced.

Jacks are arranged so as to make the sound desk operational without having initially to plug any connection. This particular technique of jack switching is standard throughout ZDF in all stationary and mobile sound installations and facilitates special switchings. In the diagram signal path is the microphone amplifier following the first row of coupled jacks, adjusting levels to +6 dBm. The input of the mic amplifier is provided with the 48V supply to feed phantom condensor mikes via two appropriate resistors. The amplifier has stepless gain from 0 to 76 dB and a steep-edged, low-cut equalisier with change-over frequencies of 40/80/140 Hz. The mic amplifier has two independent outputs. One output is switched with the help of a break-jack to a connecting panel in the rear of the vehicle and is used to produce a special sound mix feed for the pa system. The other output drives, via coupled jacks, a high/low-presence equaliser (15 kHz ± 15dB, 60 Hz ±15dB; 07/1/1.4/2/3/4 kHz +8 dB). In addition to these equalisers, fitted in each input channel are two steep-edged (18 dB/octave) high- and low-cut equalisers. As is seen from the diagram there is a by-pass switch for the equaliser. The by-pass switch now following makes it possible to patch in, via a rotating selector switch, one of six *U373a* limiters. A total of six limiters is built in. For special purposes, there are Fairchild limiters or URE1 *1176 LN* available.

Next in the signal path is the active channel fader *W690*; this channel fader has a built-in amplifier giving it a normal

amplification of 15 dB. In front of the fader we find a monitoring point (pfl). Behind it there is a jack to be used, for instance, for n-1 conference purposes via the built-in n-1 conference unit for five participants. Besides that, at this point the signal for two fold-back paths and two echo-send paths is fed out.

One of the fold-back paths and both the echo-sends may be fed before and after-fader. The fold-back and echo-send paths may be switched in groups, if necessary. Besides that it is possible to patch in appropriate equalisers or time-delay units. Echo equipment is the AKG *BX 20*, with remote control from the console, and for time-delay a Lyrec *TDU* is used.

Channel fader output may be switched between four groups. Usually, for instance, the orchestra takes one group, the soloists another, a small combo the next, and all parts of the production being played in (vtr, tape, telecine) the last. This grouping enables the pa system to bring the respective signals exactly to the points in the auditorium or on stage where they are wanted. The four group amplifiers which follow the four bussbars amplify the signal to +6 dBm, to accommodate further processing. At this point the modulation can again be switched to the two fold-back and echo-send paths, break-points for other routings being provided, for example through the Fairchild or UREI limiter compressors.

Following are the four group faders, and after those four push-buttons per fader to form the final output groups. Between two rows of coupled breaking jacks are two transmitter switches with the following positions:

1. output group 1 **2.** output group 2 **3.** rehearsal
4. off **5.** line-up tone, ie. identification via an external tape loop recorder (Loopmatic).

The other two transmitter switches have the following positions:

1. output group 3 **2.** output group 4 **3.** rehearsal
4. off **5.** line-up tone, ie. indentification via an external tape loop recorder (Loopmatic).

The transmitting amplifier follows upon the coupled breaking jacks mentioned earlier. It has a 15 dBm output for the PTT (the Post Office) in which may be patched equalisers to match and equalise the PTT sound circuit. This amplifier also has an additional +6 dBm output to feed vtr and tape recorders. To match incoming PTT sound circuits, three special equalisers with amplifiers are in-built.

All important points of the sound console can be monitored by two monitoring paths, using two Telefunken *086* speakers; level control is by ppm *U370B*, with light spot meters. In order to give the commentators uniform working conditions which measure up to all necessary technical requirements, connections for two commentator units were built in. These worked very well during the Olympic Games in Mexico and Munich, during the Football World Championship, and many other sports events. The unit offers, for two commentators, telephone communication with the home studio, the possibility of monitoring various programmes (to receive feedback circuits from their home studio) and, of course, the transmission of reports and commentaries. The important monitoring points of the sound console for the vision control and the camera control can be selected from there.

For recording and playback, one Telefunken *M5* two-track tape recorder and one Telefunken *M5* mono/pilot tape recorder are incorporated. This unit comprises a small mixing desk and necessary monitoring facilities to do mixing and tape editing independent of the large sound console. All production staff are connected over the talk-back system; in addition are ten incoming and outgoing talk-back paths.

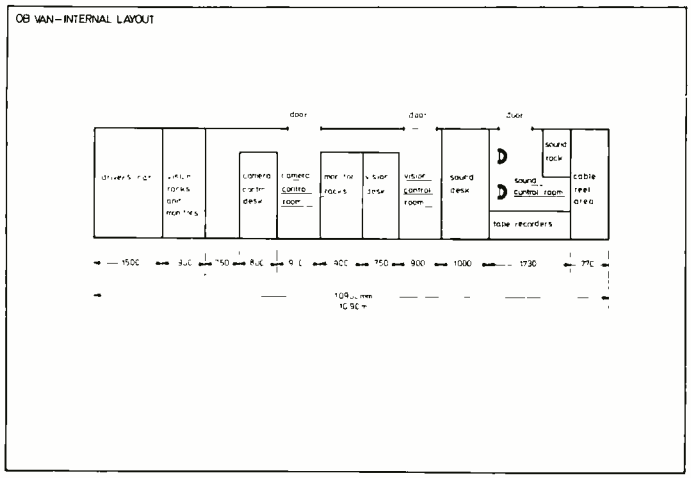
For wireless communication, one transceiver with 6W output in the 160 MHz range and one transceiver with 6W output in the 164 MHz range are used. A radio telephone is built in to offer permanent communication with the home studio and this is useful if the standing communication circuit to the home studio breaks down.

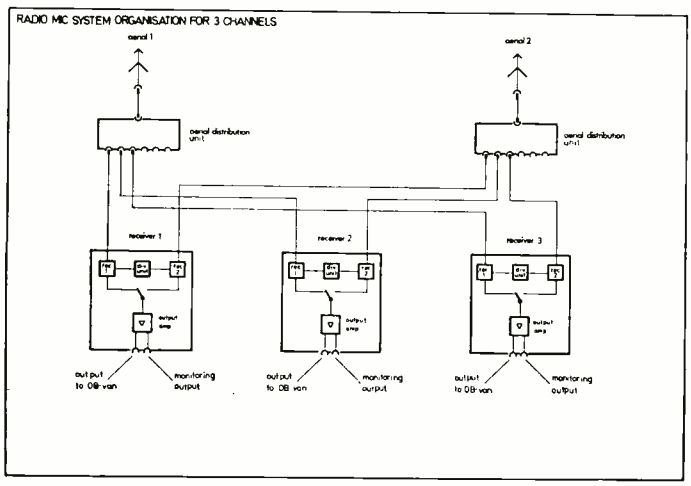
36 ▶

Previous page: *view onto ob vehicle sound console, with vision control monitors.* **This page top:** *Audience of light entertainment production, with ZDF sound reinforcement system.* **Centre:** *Outside broadcast van: on left the 504 jackfield, on right the tape machines. Foreground: part view of sound console with the talkback mic.* **Bottom:** *General view of ob van types in use at ZDF.*

ZDF AND OUTSIDE BROADCASTING

Master of ceremonies and his radio mic transmitter (SK 1007).





The basic sound equipment of the vehicle includes largely Neumann condenser mics, with 20 *KM 84*, with other condensers from Sennheiser and dynamics from Sennheiser and Shure. Mic complement is finished with two *M160* Beyer ribbons. Additional special equipment, for instance limiters or special equalisers not constantly in use, can bewithdrawn for the occasion from a stock kept by the ob division.

Since ZDF produces a great deal of its programme (24%) from public halls, theatres and tv studios with an auditorium, the pa system is necessarily quite large. Quite often, for both optical and acoustic reasons, the music is played live by the orchestra and, following immediately, the next title will be played in by tape during a broadcast. For the audience in the hall, this difference should not be noticeable, and the viewer at home should be similarly unaware. Therefore, this kind of outside broadcasting requires the public address system to be of the highest technical quality. The pa systems normally built in in halls or theatres do not meet the requirements of the tv sound technique due to their typically limited technical apparatus.

The great danger of acoustic feedback, missing equalisers and delay units, and the demand for good audibility all over the auditorium forced ZDF, after some disappointment with built-in or hired pa systems, to develop and buy a special pa system for their own use. ZDF now owns two large and one small pa systems. Public addressing of a more simple character is accomplished with the standard technical equipment of the ob van.

The basic equipment of a large pa system consists of:

One sound desk with 14 input channels and four output groups.
Two power amplifier racks with four Telewatt power amplifiers *A120* 120W rms and one Telewatt *E120* power amplifier (120W rms) each.
One mains rack.
One Altec graphic equaliser (Acousta Voicette).
Four loudspeakers Lansing *PA 12075/ZDF*.
12 sound columns 40W.
Five sound columns 30W.
Five sound columns 20W.
15 ball loudspeakers (Grundig 10W).
10 table speakers Isophon Isonetta.
—and all material necessary for cabling, hanging, and standing the loudspeakers (cable, chains, and stands).

For the transport of this equipment we have a Mercedes *L608D* with the necessary interior and fixing points for safety. The equipment is mounted, wired and operated by one engineer and two assistants, one of whom also drives the vehicle.

The console has 14 balanced microphone inputs, gain switchable from 64 dB to 0 dB in 4 dB steps. Each channel has a high/low equaliser, whose outputs may be routed into four groups. If necessary, the fold-back path can be used as a fifth. The four group faders end on a 4 x 4 cross bar panel. This is the point where, if necessary, the Altec graphic equalizer or the Lyrec time delay unit is patched. At the output of the cross bar panel are four limiters to prevent any overloading the power amplifiers. A selector switch in front of the output amplifier makes it possible to switch line-up tones or the microphone of the built-in talk-back equipment to the output. Pre-fade listening is, of course, built in. All important points (including the power amplifier outputs) can be monitored. The level control is effected by a ppm *U 370A* with light spot meter. A built-in talk-back system with three outputs and three inputs connects the audio engineer in the ob van with the audio engineer of the pa system. In contrast with the sound equipment in the ob van, this sound desk is balanced only in its inputs and outputs (input impedance about 1 kΩ, output impedance 40Ω, output level +6 dBm). The sound desk offers no special jack routing, since it is designed especially for PA purposes (use). Both the power amplifier racks with the total output power of 1.2 kW rms, allow large auditoriums high-quality sound at a high level.

The mixing desk outputs are distributed by a cross bar panel to the power amplifier inputs. Each power amplifier has a gain control for respective levelling, with outputs also ending on a cross bar panel. This cross bar panel allows distributing of the outputs to 15 speaker circuits. Appearance of artists (particularly singers) from among the audience makes it necessary to cut off the speakers

38 ▶

in this area from the outputs to prevent acoustic feedback. This option is provided for five speaker circuits per rack. The output level of the power amplifiers is 100V, to feed the speaker lines. Thus, power losses on long circuits between speakers and power amplifier racks are kept low. By variation of the speaker matching impedance, an easy control of their power consumption is possible.

Since mains earthing conditions in the various halls are often not clear at all, to prevent accidents caused by defective equipment and to comply with German VDE-regulations, each system has its own mains rack with a built-in isolation transformer and the necessary circuit breakers and sockets.

As a rule, sound desk, power amplifier rack and mains rack are mounted within the auditorium to let the audio engineer achieve a wide-ranging mixing and sound control. The pa sound console is fed via five-core cables from the ob van. To feed the pa sound desk with microphone modulation, the second output of the ob van mike amplifiers is used. Besides that there is the possibility to feed the pa system with, for instance, the orchestra group, the soloist or tape group, or any other signal. The kind of handling capability of the pa system described above makes ZDF sure that the audience gets in all places the highest performance possible as far as sound is concerned (loudness, audibility and stability.)

Tv-specific production methods as, for instance, few visible microphones, movability of performers, long shots where a microphone boom would mar the artistic impression, as well as the usual general production mix-up caused by tv cameras, lamps, cables, speakers and other microphones, prompted ZDF to use radio microphones at a very early stage, ie. in the early sixties. At first, only the 'master of ceremonies' was furnished with a radio mike, as available equipment then failed to offer satisfactory operational reliability and technical quality. A 90-minute live broadcast without breakdowns or undesired noise due to low field strength was then very rare. When the programme people discovered how uncomplicated and easy handling of radio mikes can be, they clamoured for more and still more of them.

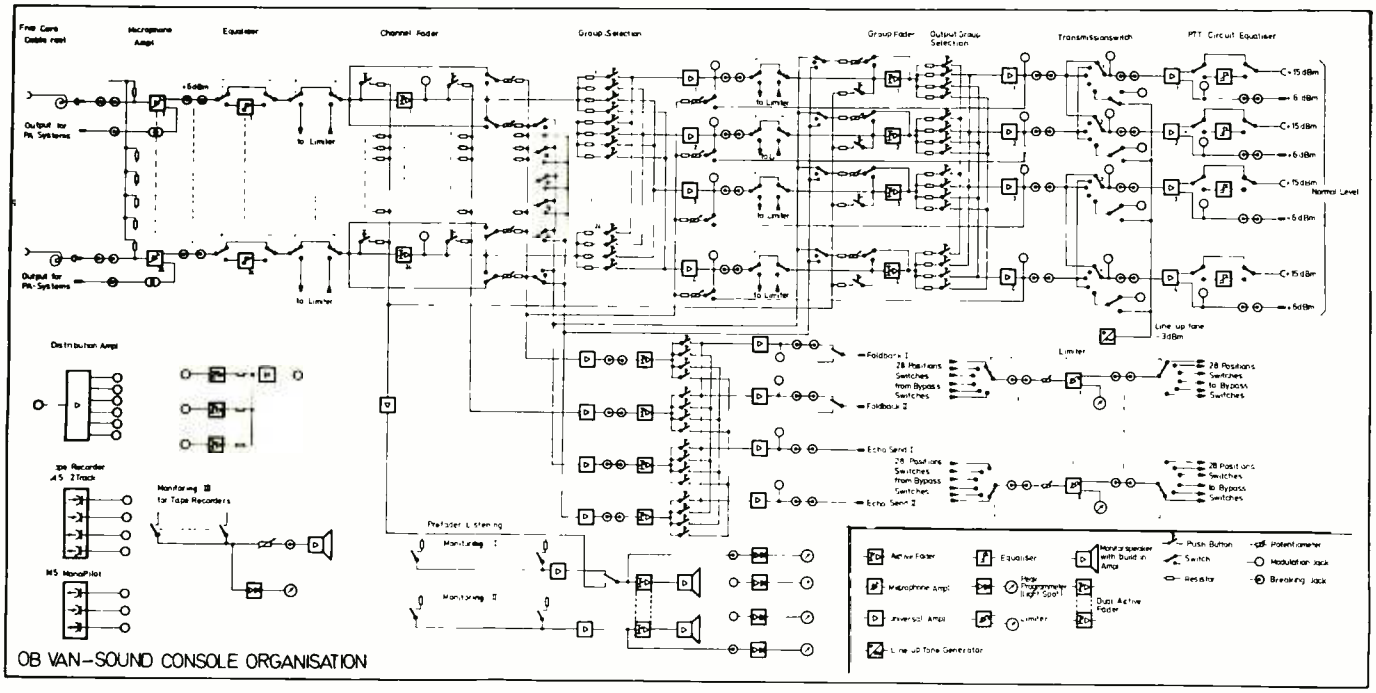
To increase quality, experiments with diversity equipment for four receivers were made. This diversity unit switched the receiver with the highest received voltage to the output. This procedure improved the technical quality and operational reliability considerably but was rather fussy and involved from the necessity of having to mount four receivers, four aerials and one diversity unit per radio mike. And as the market did not offer the desired equipment, ZDF decided, together with a company experienced in this field, to develop and have built a special receiver to meet all requirements.

This receiver has two complete receiving sets tuned together by 12 push-buttons to the 12 frequencies between 30 and 40 MHz allowed for such purposes by the German postal authorities. It also has a built-in diversity unit which switches the receiving set with the highest field strength to the output. The switching is effected inaudibly and without clicking or crackling. To make handling easier, logarithmic field strength meters (S-meters) and tuning meters, as well as an optical indicator showing which of the receivers is switched to the output, are built in. The receiver has an output impedance of 40Ω and an output level of +6 dBm at the frequency deviation of ± 40 kHz; it also has an isolated monitoring output with the same conditions. It has become the heart of a system consisting of aerials and aerial distribution and monitoring equipment. Since the introduction of this system it has become possible, if the frequencies have been selected appropriately, to operate six radio mikes simultaneously. The operations reliability and immunity to interference have become so good as to equal wired microphones.

For receiving aerials, ZDF uses self-developed ground-plane aerials. Independent of the number of radio mikes required, only two aerials are put up in the hall, theatre or studio. The base impedance of these aerials is 60Ω. The aerials will be connected to the aerial distribution unit by a 60Ω coaxial cable. The outputs of these aerial distribution units feed one receiver per radio mike. When receiving conditions are not satisfactory, aerial amplifiers can be used. With a monitoring unit and head phones the quality of the received signal can be controlled.

As transmitters we use Sennheiser *SK 1007* with *MK 12* as Lavalier microphone, or Neumann *KM 75* as hand mikes; in that case the microphone is supplied by the transmitter battery. As handheld transmitter we use the Sennheiser *SK 1008* with various microphones (*MD 1008* omnidirectional, *MD 4008* cardioid and a self-developed mike based on the capsule of the Neumann *KM 75* cardioid). The microphone based on the Neumann *KM 85* capsule was developed to operate this transmitter, too, with a high quality condenser microphone.

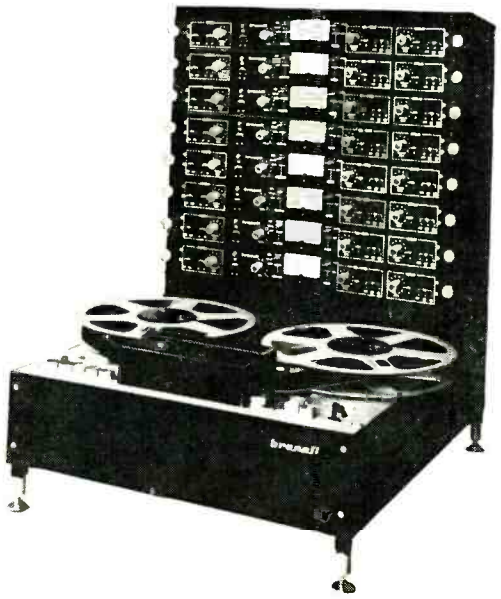
Due to the German PTT regulations, operation of this kind of transmitters is only allowed indoors. For transmitting over great distances, ZDF has some transmitters with 1W power output in the 77 MHz range. This power can be increased by an additional power amplifier to 10W output. For wireless communication, Teleport *VI* and Teleport *VII* transceivers with 1W power output corresponding to the 6W transceivers built-in in the ob van find use. This apparatus offers communication on ten different channels.



OB VAN–SOUND CONSOLE ORGANISATION

NEW FROM BRENELL 4, 8, 16, 24 or 32 track professional studio recorders

Equalisation, N.A.B. & D.I.N. one or two speeds all adjustable from front panel, signal to noise 60 Db overall, crosstalk 60 Db at 1kHz, VU meters, all functions Remotable.



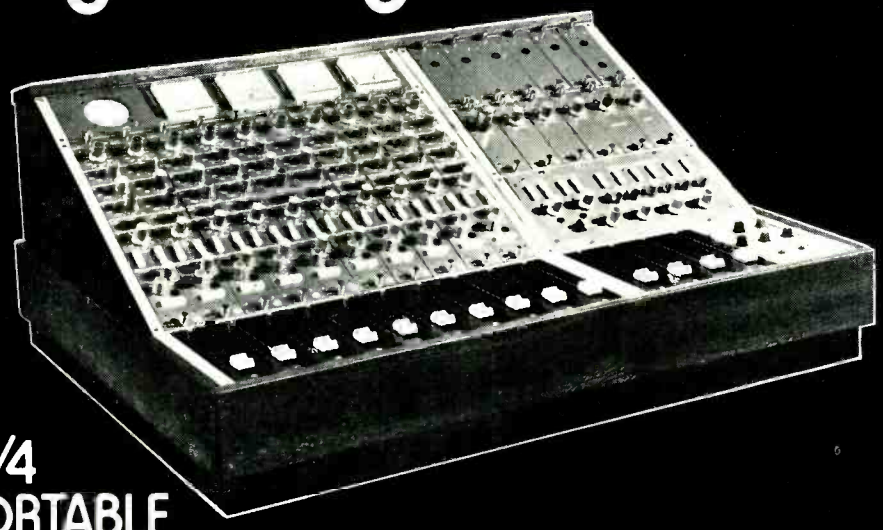
TAPE TRANSPORTS

We manufacture machines handling from $\frac{1}{8}$" to 2" tape width. Speeds from 3mm to 120 ips with heavy duty solenoid operation with remote control facilities. Cassette and slot stereo duplicating equipment available.

BRENELL ENGINEERING CO. LTD.

231/5 LIVERPOOL ROAD, LONDON N1 1LY TELEPHONE 01-607 8271 (all lines)

Tight budget?



10/4 PORTABLE

TWEED have some sound advice ~ring Kelso 2983 for a quotation.

Specialists in Audio Control equipment for the Broadcast and Sound Recording Industries

TWEED AUDIO

ELECTRONICS

ROSEWOOD INDUSTRIAL ESTATE, KELSO, ROXBURGHSHIRE SCOTLAND TELEPHONE 2983 STD 05732

reviews

dbx 160 series compressor/limiter

Hugh Ford

MANUFACTURERS' SPECIFICATION
Compression ratio: variable from 1:1 to infinite ratio.
Input impedance: *160* 50k ohms balanced, 25k ohms unbalanced, *161* 25k ohms unbalanced.
Input level: *160* +21 dBm max, *161* +17 dBm max.
Signal to noise ratio: —80 dBm equivalent input or output noise.
Output impedance: *160* 25 ohms, *161* 100 ohms.
Output level: *160* +24 dBm into 600 ohms, +26 dBm into 10k ohms. *161* +16 dBm into 600 ohms, +18 dBm into 10k ohms.
Frequency response: +1 dB 30 to 20 000 Hz.
Distortion: .075% 2nd harmonic at 20:1 compression and +4 dBm output. 0.5% 3rd harmonic typical at infinite compression ratio.
Attack time: dependent on programme dynamics. With 1 kHz tone burst 10 dB over threshold requires 15 ms for 63% change, with 20 dB over requires 5 ms for 63% change, with 30 dB over requires 2.5 ms for 63% change. Maximum rate of change of gain, 100 dB/s.
Meter set zero: —10 dBm to +10 dBm.
Controls: threshold, compression, output, gain, meter function switch, meter zero adjust*
Connections: *160* Jones barrier terminal strip. *161* RCA type phono jacks.
Case: solid walnut sides, balance aluminium.
Dimensions: 95 mm (H) x 235 mm (W) x 267 mm (D).
Weight: 2.4 kg.
Power requirements: 117V ac +10% 50-60 Hz or 240V version for UK.
Power consumption: 8W.
Price: $300, £188.
Manufacturers: dbx Incorporated, 296 Newton Street, Waltham, Mass 02154, USA.
Europe: Scenic Sounds Equipment, 27-31 Bryanston Street, London W1.

THE DBX *160* series of compressor/limiters currently comprises two models with similar functions. The *161* is a 'domesticised' version of the professional model *160* reviewed here. The only actual difference between the models is the input and output terminations, therefore everything else in this review applies to both models.

The units both use rms detection of level, on the principle that the human ear's response is related to the power of sound and not to its peak or average. While some people may dispute this, there is certainly one great asset, in that the rms power is not affected by phase shift which can give large variations in the peaks.

A further important factor in the dbx compressor limiter is that the level sensing is performed by measuring the signal input before the gain control function, as opposed to the common practice of sensing level at the output from the gain control element and feeding the resulting signal back to the gain control element. The latter practice is fraught with stability problems because a feedback loop is used which must remain stable at least within the audio frequency band under transient conditions, while the former 'feed forward' method does not suffer from loop instability which may cause clicks and other aberrations in the output. A final rather unusual facility in the dbx is the level metering. This provides for the indication of levels over a 60 dB range on a linear scale, with the switched option of indicating the input level, the output level or the degree of gain change currently in use.

The construction of the unit is based on extruded alloy front and rear panels, into which the top and bottom covers slot from the sides, the hardwood side members retaining the covers. Not only is this form of construction simple to assemble, but it is mechanically sound and leads to extremely easy access for servicing. Within the case all the electronic components, with the exception of manual controls, are mounted on a single fibreglass printed board which is equipped with pin connectors to feed the controls and input connectors. Although the layout of the board is very clean, it would have been nice to see the components identified with component references; there is no indication whatsoever about the value of the mains fuse unless one happens to be able to find a copy of the circuit diagram.

Turning now to the external facilities, these are all clearly identified and laid out in a functional fashion. The front panel incorporates an illuminated meter which is scaled from –40 dB to +20 dB, which may be switched to read input, output or gain change by means of three interlocked pushbutton switches. In addition there is the pushbutton power on/off switch and three 270° potentiometer controls. One of these controls the output gain relative to the input and bears a calibration in 5 dB steps from –20 dB to +20 dB. A further control selects the desired compression ratio and the third control selects the input threshold for the start of compression. This control which has a range from 10 mV to 3V input on a linear scale works in conjunction with two led indicator lamps. These lamps are used to indicate whether the input level is above or below the onset of the threshold (and hence compression) setting. The final control is a rear panel potentiometer which is accessed through a hole in the rear panel. This control is for setting the meter zero over the nominal range ±10 dBm input level; overall gain is not affected by this control which is solely a meter calibration control.

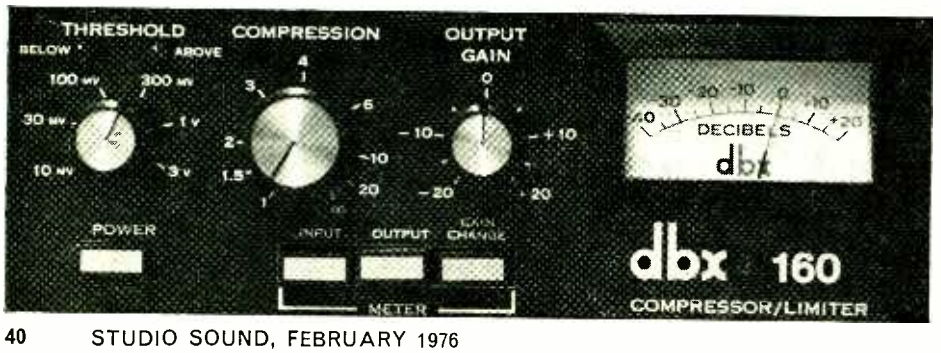
A barrier strip forms the input and output connections at the rear panel, the inputs and outputs being effectively balanced circuits using electronic techniques rather than transformers. Finally, the mains input takes the form of a fixed two core lead—personally I prefer the use of IEC standard connectors.

Input and output

The balanced input arrangement uses an operational amplifier to provide the balance, a low pass filter being incorporated to reduce any transient inputs which might damage the amplifier. Bridge measurement of the input impedance at 1592 Hz showed that the input was effectively 43 900 ohms in parallel with 0.86 nF which is more than adequately high for professional applications. It was however rather alarming to see that according to the circuit diagram, the input connector is dc coupled to the input of the balancing amplifier—a dangerous practice. Common mode rejection at the input was found to be excellent, being in excess of 60 dB at 50 Hz and at 1 kHz. The signal handling capability of +24.8 dBm before the onset of clipping is more than adequate.

While the output may normally be treated as a balanced circuit, the arrangement is rather more subtle, in that the hot output provides the output signal and the other output connection is used to insert any unwanted out of balance signal into the output amplifier's feedback loop. bx call this system a 'Ground Loop Compensating Stage' which is an apt description because

42 ▶



IF THE NAKAMICHI CAN CAPTURE HIM, THINK WHAT IT'LL DO FOR THE PINK FLOYD.

Most portable cassette decks are quite happy recording something ordinary.

But give them something truly challenging, and you soon realize their shortcomings. Fine, if you're content to be unambitious. But at Nakamichi we think you should be able to record any sound you want. Which is the reason why we produced the Nakamichi 550.

From a mouse squeak to the fantastic sounds of the Pink Floyd, you can record it all on a Nakamichi 550.

Its peak level meters have a range of 45dB. Its signal-to-noise ratio is more than 60dB. Its microphone inputs have a dynamic range of 125dB.

Wider ranges than any other portable cassette deck in the world.

And that's not all. The 550 is also the only portable cassette deck with 3 microphone inputs. And a tape end alarm with pre-set timer.

The only one too, with a button that shows how much of your cassette you've used.

And Nakamichi's exclusive record/playback head. And it's the only one with a battery life that can give you up to 15 hours continuous playing.

When you try the Nakamichi 550, you'll know why it costs £236+ VAT.

Suddenly, other portable cassette decks look like toys.

NAKAMICHI

THE WORLD'S MOST VERSATILE PORTABLE CASSETTE DECK

Natural Sound Systems Limited,
Strathcona Road, North Wembley, Middx. HA9 8QL. 01-904 0141.

the output compensates for any unwanted signal pickup in the output connections—a cunning idea. The measured output impedance was suitably low at 26.3 ohms with an associated drive capability of +24 dBm (into 600 ohms) or 2 dB higher in level into an open circuit. Like the input arrangement, I take exception to the output line being dc coupled, in spite of the small dc offset which was measured as –4 mV.

The metering system

The level metering which has a range of +20 dB to –40 dB relative to a pre-set level relies upon the characteristics of the rms detector for its linearity, and the meter does not read input and output levels *per se*, but derives its indication from the dc output of the rms detector for the input metering; or the dc output of the processed gain control signal for the output level. The difference between these levels is naturally the degree of gain change in use. In practice the meter was accurate within the readability of the scale, giving a realistic reading within about 1 dB. The meter does not claim to meet any of the standards for programme meters, but is in fact a relatively fast meter when compared with the standard vu meter, having a rise time of 55 ms and a true rms rectifier law as opposed to the average law of the vu meter and the quasi-peak law of the ppm.

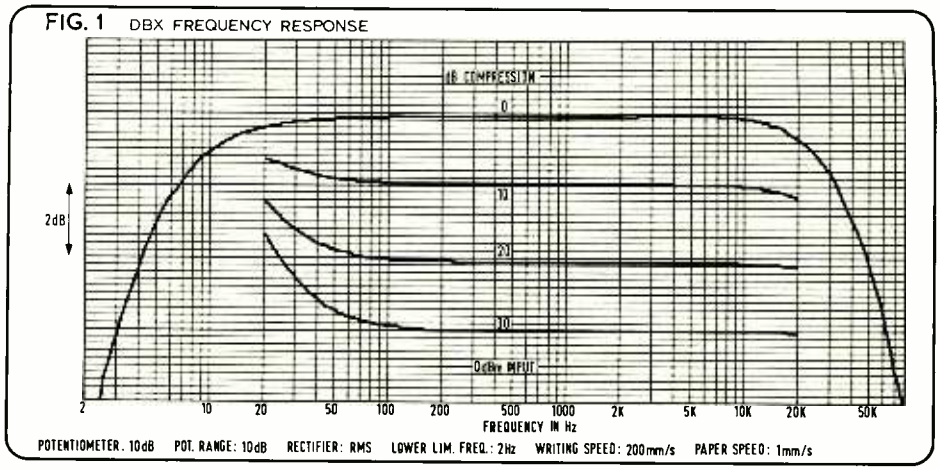
Frequency response and noise

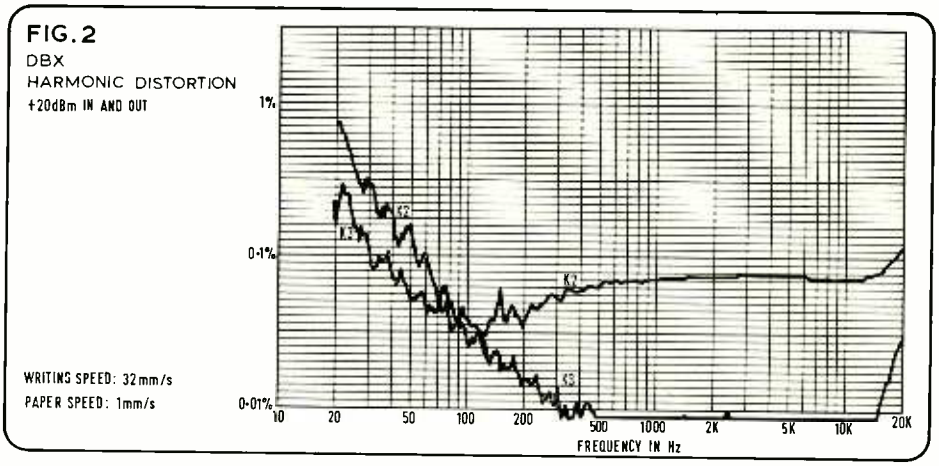
As, thankfully, the compressor/limiter does not incorporate any pre or de-emphasis, the sinewave frequency response should be relatively independent of the degree of compression or limiting. As is to be seen from **Fig 1** the overall response is within +0 –0.5 dB from 20 Hz to 20 kHz when no compression takes place, and the response remains within these good limits above 100 Hz with up to 30 dB compression. Below 100 Hz there is a relatively minor boost which increases with increasing compression, while it is not felt that this boost has any practical significance, dbx may modify the unit in this respect.

On the problems of noise, for reasons which will be explained the noise referred to the input was measured a number of times, the result in terms of equivalent input noise in dBm is as above:

	Unweighted rms 20 Hz to 20 kHz	'A' weighted rms	CCIR weighted rms	DIN peak
Maximum output gain	–93.8 dBm	–96 dBm	–87.3 dBm	–82.8 dBm
Zero gain	–85 dBm	–89 dBm	–80 dBm	–75.5 dBm
Minimum output gain	–60 dBm	–70 dBm	–57 dBm	–49 dBm

Now, if all was in good order, the noise referred to the input would have been the same under all gain settings, as the gain control is far from the input stages. It is very clear from the above that this is not the case, and having regard to the fact that the range of the output gain control was found to be +23.8 dB to –23 dB it is noticeable that the difference in apparent input noise changes by not far from 23 dB between minimum and zero gain. It is to be concluded that the measured noise under these gain conditions is almost entirely output stage noise—but this is not a problem if high output levels are used. As the gain is further increased the gap closes, but it is thought that the genuine input stage noise is not really seen until something near maximum gain is approached.





The other matter which deserves comment is that the side panels of the instrument are not screened, so that some care must be taken in locating the compressor/limiter away from other pieces of mains operated equipment which might induce hum fields through the side of the cabinet.

In spite of these adverse comments about the noise performance, it is only fair to say that if the full signal capability is used the dbx in fact does offer a very good dynamic range, but there could be noise problems in some applications.

Distortion

The distortion introduced by the dbx type 160 when used as a straight amplifier at –20 dBm in and out without compression or limiting is shown in **Fig 2** which illustrates the second and third harmonic content of the output. While the performance is very good, some allowance must be made at low frequencies for the inherent distortion in the measurement method used, so that at low frequencies the figure is pessimistic. The measurement of higher harmonics showed that they were at even lower levels, and intermodulation distortion measured by the SMPTE method using 50 Hz and 7 kHz tones in the amplitude ratio 4:1 gave figures around 0.1% at 0 dBm equivalent peak sinewave, and at lower levels down to –30 dBm equivalent peak sinewave.

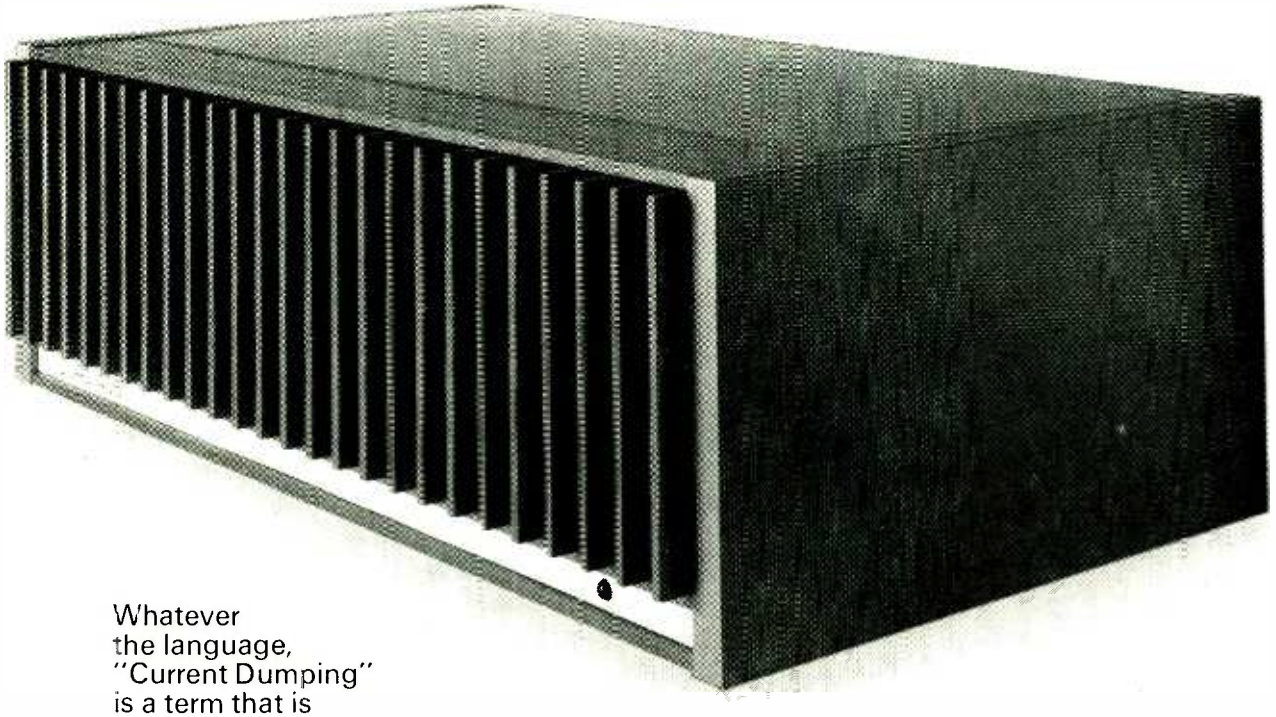
The measurement of harmonic distortion with the compressor in action showed consistent results with compression ratios below 10:1, and although, as is shown in **Fig 3,** there is a considerable increase in harmonic distortion, the results of the measurement are really quite respectable. As is to be expected, the SMPTE intermodulation distortion also rose with the compressor in action. Here again the compression ratio had little effect upon the measured 1.2% with a compression ratio of 4:1 and 10 dB of compression.

The compressor controls

The function of the compressor is effected by two front panel controls, one which controls the threshold of the onset of compression and the other which sets the

44 ▶

Current Dumping
Strom Ablade
Asservissement des étages générateurs de courant
Stroomtoelevering



Whatever the language, "Current Dumping" is a term that is rapidly becoming familiar to audio engineers and hi-fi enthusiasts.

To the engineer it means an end to such problems as crossover, crossover distortion, quiescent current adjustment, thermal tracking and transistor matching.

To the hi-fi enthusiast it means an absolutely predictable and impeccable performance which cannot change with time.

Current dumping is another QUAD development.

Details from your nearest QUAD retailer or write directly to Dept. SS Acoustical Manufacturing Co. Ltd., Huntingdon, Cambs., PE18 7DB.

QUAD

for the closest approach to the original sound

QUAD *is a Registered Trade Mark*

dbx 160 SERIES

compression ratio. (The compression ratio is defined as the change in input level divided by the resulting change in output level; ie with a 2:1 ratio a 6 dB change in input level will result in a 3 dB change in output level). **Fig 4** illustrates the relation between the input and output under various conditions, the horizontal axis depicts the input level and the vertical axis depicts the amount of compression introduced. Using a nominal 4:1 compression ratio the figure shows the effect of adjusting the threshold control at 10 mV, 30 mV, 300 mV and 3V settings, in addition the effect of adjusting the compression ratio control at a fixed 30 mV threshold setting is shown. Both the linearity of the compression characteristics and the well defined entry into the area of compression at the threshold are particularly impressive from this figure.

While the calibration of the threshold control extends from 10 mV to 3V with reasonable accuracy of calibration, it was found that an even larger range was available at the extremes of the control, the absolute limits being 6 mV and 6V. This feature also applied to the output gain control which has a nominal calibrated range from

58 ▶

FIG. 3
DBX
HARMONIC DISTORTION
AT 10:1
COMPRESSION RATIO

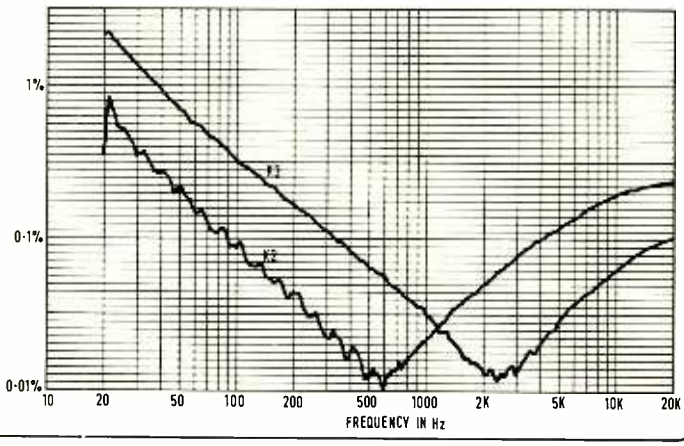
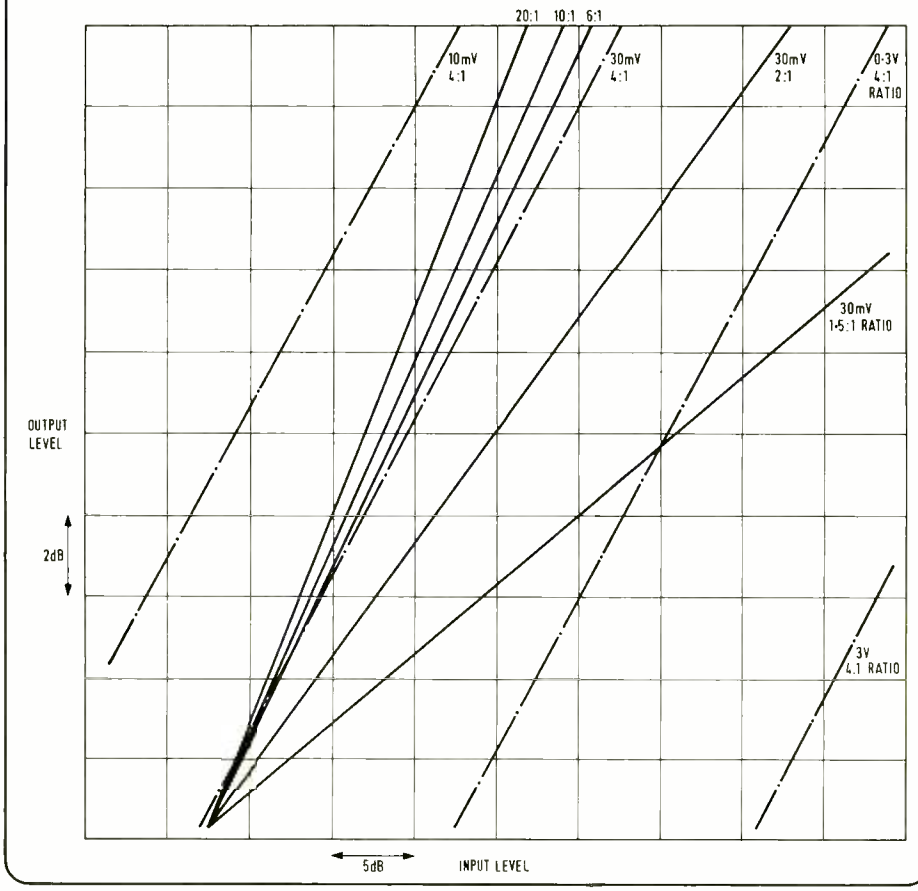


FIG. 4 DBX COMPRESSION CHARACTERISTICS



Alice BROADCASTING

SIX CHANNEL STEREO TRANSMISSION MIXER
(ALICE'S BABY)

STM6

INPUTS
MICROPHONES
LINES/TAPE/CARTS
PICK-UPS
OFF AIR

OUTPUTS
LINES
P.A.
HEADPHONES
RECORDING

The definitive OB/DJ/Production Mixer. Can you afford to use anything else?

£465
excluding
VAT
Dimensions
20" x 15" x 4½"

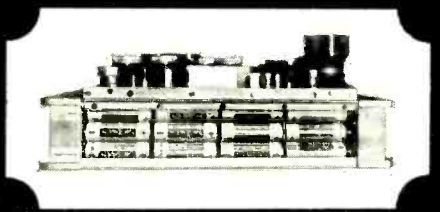
Contact **Chris Walden** on **Windsor 51056/7**

Alice **(Stancoil Ltd) Alexandra Rd, Windsor, Berkshire, England**

also available from Roger Squires London or Manchester

future proof

With its all-modular construction and plug-in pre-equalised head blocks your Stellavox recorder need never be obsolete.
Any current or future tape standard or format can be accommodated by simple exchange of units, without taking the recorder out of service.
Available in stereo, mono, with or without pilot track, or quadraphonic.
Illustrated: SM7 Stellamaster, music mastering recorder.



STELLAVOX

A.V. Distributors (London) Ltd.
26 Park Road, Baker Street,
London NW1 4SH.
Tel.: 01-935 8161.
Telex: 259406 Photosound Ldn
Please send me further Stellavox details.

Name .....

Address .....

.....

.....

.....

Consumer compromise

JOHN DWYER

Domestic television sound has always been the poor relation of the UK picture. The short-term commercial reasons are clear, although they may not be a reflection of the eventual market.

UNLIKE the buyer of disc or radio equipment, the purchaser of a UK tv set cannot pay more for decent sound if he wants to. After years of takeovers and mergers the British television receiver industry has been reduced to around half a dozen big names, along with two or three smaller companies. Quantities produced are so large, and production lines so long, that engineers in other electronic desciplines may find small quantities of needed components available only when the television industry is in recession. Vast numbers of sets are produced cheaply, but the sets are all aimed at the most profitable market. The result has been the levelling down in the quality of sets. If what you want can't be made in thousands, it can't be made.

The result is that the sound is tacked on as an afterthought. Speakers are tiny, unenclosed and driven from inadequately powered amplifiers. Often, the audio amplifier is no more than a complementary pair; on the best colour sets there may be four transistors. Mike Butler of Philips commented that over the last few years the situation had worsened rather than improved 'because of the low voltage available for the sound. The tendency has been to take the audio supply from the line output transformer and this limits the power available.' The reason he gave (as did others contacted) was the price.

Mr Butler was one of those who took part in a Royal Television Society panel discussion in mid-November 1971 called 'TV Sound, the Poor Relation.'[1] The others were Des Browning, head of sound at the BBC, Alan Evans, head of sound at LWT, Angus McKenzie, John Gilbert, and Tony Kaye of Rediffusion Rentals. Alan Evans had taken measurements on a well-aligned tv set and discovered that 'it was even worse than I expected.' John Gilbert subsequently published some figures and response curves in *Wireless World*.[2] He discovered that in most cases the distortion increased as the volume control went up, and in the case of two of the models was nearly 13 per cent at full volume.

Alan Evans said recently that at two watts output some sets had bass distortion of up to 40 per cent. On his own set at home he had discovered that BBC sound seemed better than his own LWT sound, a distressing discovery. The reason was that he always turned the sound up a little for LWT programmes, and he found that the frequency response varied with the volume control. 'You got less treble as the volume control went up.'

No one I spoke to seemed to imagine that the sound of tv had improved since the RTS panel discussion. 'No, we've not done a lot about it since then,' said Mike Butler. He said there had been a tendency to fit extra sockets for taking the sound into a decent amplifier; but Philips hadn't done that yet, though they might 'within the next year or two.' The tendency he speaks of is only evident in imported sets. A spokesman for the British Radio Equipment Manufacturers' Association said 'There is no demand at the moment. The quality of the sound is what the average television viewer requires. We've got to produce in volume.'

The lack of complaints about the sound of television is one of the main pillars of the manufacturers' argument for leaving things as they are. Mr Walter Todds, senior music producer at BBC TV, said 'For a long time now we've been saying to manufacturers "Why don't you improve this?" They say "we don't get any complaints about it." But of course they don't get any complaints; it's the BBC that gets the complaints.' Did he still get complaints?: 'Well less so. There was a time when there was a general undercurrent of, sort of "Why is the sound so bad?" but that seems to have died down.'

Mr B. P. Emmett of the BBC's audience research department said that complaints to the BBC about tv sound were 'a steady trickle' but it certainly wasn't one of the major complaints 'or anything like it', he said. 'A lot of them can't even be bothered to switch to vhf from mw and get the improvement that makes, even if the set they're using has vhf on it.' Des Browning said he had had very little reaction; 'I've had no letters'. People weren't interested in sound. 'If you look at the sets in a tv shop they're flickering away there—most of them are appallingly adjusted anyway—and they've all got the sound turned down. Nobody bothers to turn the sound up to see what is sounds like before they take it away.'

There's no doubt that the public is greatly at fault. Some years ago Murphy started an advertising campaign in which they included in the ads for a new set that a larger speaker had been fitted. Demand for the set was good, but market research proved subsequently that the only reason it had sold well was that it was the only set on the market available in a range of colours. The sound didn't come into it.

Mr Emmett of BBC Audience Research tried in vain to discover some evidence of dissatisfaction with the quality of the sound of particular programmes. 'I did not expect to find much,' he said, 'but in fact there was none at all. Indeed, such comment as there was *commended* the sound. It may well be, of course, that viewers would not mention dissatisfaction with the sound to the BBC, feeling that the fault lay elsewhere—with the set manufacturers—but I must admit to being surprised that the point has not come up at all.'

The lack of any audience reaction to poor sound is all the more puzzling in view of the growth in sales of hi-fi equipment over the last few years. BREMA are quite happy to tell you, seeming to contradict their view that people aren't interested in good sound quality, that stereo radio went into 2M homes in the year to the end of 1974. That alone is 10 per cent of the total, so they estimate that market penetration of good quality audio is between 20 and 25 per cent of homes. If mass market audio systems were were included, the penetration might be 50 per cent or higher.

Yet the public doesn't seem to notice the discrepancy between what they hear from their audio gear and the tv. 'There is no point in depending on a public outcry,' said Mr Emmett, 'People are not really interested.' Bob Bourhill of Motion Electronics, who has designed a high quality tv sound tuner and marketed it with some success, said 'People are quite happy to be mesmerised by the picture with the sound as an accompaniment to make the thing intelligible.' As far as sales of his tuner went he admitted he had to

'fight for every one.' Des Browning uttered a similar point of view: 'The public get what they ask for.' Sales of the Telefi, which was often quoted by representatives of the industry as though its existence relieved them of their responsibility, were described by Celestion as 'an anti-climax.'

But when I asked Walter Todds if the thought people wanted better sound he replied 'That's rather like asking people "Do you want Morecambe and Wise?" before Morecambe and Wise had appeared on the scene. How do they know what they want until they get it?'

'Music producers are aware of the poverty of the tv receiver because you're competing with hi-fi equipment, and anything which compared very badly with that is going to be to their detriment . . . there must be an element of dissatisfaction with tv sound when you know that hi-fi developments are in the forefront of people's minds. It is partly a status symbol but it's not all that. There must be some interest in sound. People must feel the discrepancy between what they can get out of hi-fi and the ordinary tv receiver.'

One of the most hopeful signs of some concern with tv sound has been shown by simulcast, the simultaneous transmission of television programmes with stereo sound on one of the available radio channels; Mr Emmett said they had been generally welcomed. An Audience Research report of the performance of Stockhausen's *Ylem* on *Full House* said: 'A few listeners said they thought it was an excellent idea to link stereo radio with tv in a simultaneous broadcast; it was a pity, some added, that the work chosen for this promising experiment was one which would attract only a small audience (was conceived for instruments surrounding the listener) and for the appreciation of which the composer himself recommended shutting the eyes . . . '

I asked Walter Todds if there was any evidence that simulcasts increased audiences. He couldn't say that it had any effect. 'The music being played is more important in increasing audiences; that's the most important feature.'

There is some (albeit little) evidence of demand for stereo sound with tv. In may 1973, for example, Mr Milo Keynes of Oxford wrote a letter to *The Times* to point out that in a recent Radio Three programme John Culshaw, then director of music programmes for BBC television, had said a lot about music on tv but nothing about the poor sound quality available from most sets. Keynes said it was worse than from reasonably good radio receivers of 20 years ago. 'There is no stereo sound easily available on tv: for one glorious programme broadcast during the 50 years celebrations we were treated to synchronous BBC TV with stereo sound from BBC 3. As an experiment this broadcast sounded far better with non-stereo radio equipment than when listening only from a colour tv set.

'Mr Culshaw did not consider the technical aspects of tv music making. Surely it would be easily possible for "stereo sound" from tv sets and the opportunity to rent or buy stereo-sound tv sets by paying more? And very possibly the demand might be greater than the size of the tv music-viewing public suggests.' Then he went on to make the usual criticisms of general sound quality, pointing out that the cost of the loudspeaker must be small compared with the cost of the set.

Culshaw wrote back to say that he couldn't deal with the subject in a 17 minute radio talk and that he and his colleagues had been trying to persuade the manufacturers to improve the situation. 'I have myself been told repeatedly by manufacturers and retailers that the public is not interested in better sound quality, which seems a very odd statement indeed at a time when the market for high fidelity equipment is booming.'

'From our end we cannot at present record and transmit in stereo purely for television. . . ' He advised Mr Keynes to go out and buy 'an inexpensive device . . . which receives the television sound signals independent of vision and feeds it through whatever high fidelity system one has.' This would probably be the Motion Electronics tuner, which costs at least £50 at present. A further letter pointed out that a socket fitted to the television would be preferable to these devices. This short series of letters does indicate that there is not complete lack of interest in stereo tv. [3], [4], [5].

Mixing pictures with stereo sound presents great difficulties. Jon Hocking, technical director of Zoom Television, told of some experiments he had conducted. 'Stereo is a whole new ball game. The problem is to relate the picture to the sound. We've had one stab at it—just messing around to see what we could do.' The main difficulty, he discovered, was to match the stereo sound to the cuts in the picture, and fading the sound correctly. He thought simulcast was 'a gimmick'. 'The camera shots are all wrong. The sound is on the left and you see the thing making the sound on the right of the picture. I've not been impressed. The difficulties are immense, and there'll have to be some work done to get it together commercially.'

The opinion that there is something unnatural about simulcasts is widespread. Walter Todds said there would be more of them in in future. 'There are certain snags to stereo . . . the snag is the location problem.' The view had been put forward that there should only be one shot of the orchestra, as one might see it from the best seats in the house, and the viewer could look where he wanted. With small screens, of course, this is ridiculous.

Of the broadcasts so far the criticisms have tended to be of camerawork. In a recent *Callas-Di Stefano* broadcast the singer had been pan potted into the centre of the sound stage while moving freely about the television stage. People who have a highly developed visual acuity are disturbed by this, but it seems those used to using their aural sense are not worried by it.

Another difficulty is that so much trouble is taken over the visual content of the programme that the sound men are limited in what they can achieve. Microphones cannot be put in the best position, cameras are moving about the whole time and air conditioning is blasting away to keep the place cool[6]. Trying to get a reasonable stereo picture under these conditions multiplies the difficulty.

As for making stereo television sound permanent, 'It puts limitations on what the producers and directors can do,' said Des Browning, 'and they wouldn't accept it.' Nevertheless, he regarded it as inevitable. He thought straight music programmes as in a concert would be no problem, as they haven't been up to now; but even in a concert there was little point in seeing anything provided you could hear well. To music 'vision is superfluous', he said.

Alan Evans agreed. 'In television we're not geared to doing stereo', he said. There was the difficulty of synching the stereo sound with videotape, though various systems were available. At London Weekend they recorded stereo in sum and difference, putting the sum track on the sound track and the difference on the cue track, Dolby encoded. That way the mono track was available for bradcast and a good quality stereo track was also there if needed. Another difficulty was what the tv and radio independent companies, if they collaborated on a project, would do during the commercial breaks. 'It would happen occasionally,' he said, but added that he would rather not watch it because of the discrepancy between sound and vision. 'Perhaps when there's a larger screen . . . '

Permanent stereo tv sound may not be that far away. NHK in Japan had announced in 1970 its intension to begin experimental multiplex stereo sound transmissions to accompany both black and white and colour transmissions.[7] Sets had been demonstrated in May 1969 and models were available from Matsushita, Toshiba and Hitachi.

There is no shortage of programmes which might justify such treatment here, and they would certainly justify good mono sound. For example, between October 1974 and September 1975 the BBC transmitted 55 hours of programmes with British artists, 47 hours with foreign artists and 17 hours with artists of mixed foreign and British nationality, a total of about 120 hours, including music-related programmes as well as concerts. 'In comparison with other tv services in the world we compare very favourably,' said Walter Todds. 'There can't be many countries who do better than we do for music, with the possible exception of the Japanese, who are besotted with Western music at the moment.'

The big question is what allowances are made for the poor reception quality of the sound. A spokesman for BBC engineering said 'In theory it doesn't affect them, but in practice it's bound to affect the engineers. They have to get the best sound they can, and so they balance on high quality loudspeakers. In practical terms they bear in mind that the receivers are limited.'

Did Des Browning feel the situation put limitations on him? 'No. That's the simple answer. There are no limitations, because

48 ▶

CONSUMER COMPROMISE

we're unaware of the modifications to the signal taking place at the other end.' The imperfections in every set were different, even in five supposedly identical sets, so you couldn't allow for them. 'Limiting and compression are an operational requirement only,' he said. 'We assume that they're listening on the best equipment and that if they're not that's their own look out.' There were things like Telefi available if people wanted to buy them.

Alan Evans said the same. 'I'm against trying to compensate. If everyone had the same set with the same characteristics then we would be tempted to do something about it. Also, a lot of people have Telefis and things to improve the sound and as those people have made the effort one shouldn't penalise them.'

Des Browning thought there were good reasons for monitoring at a fairly high level, although he was aware that it could make a bad sound a little more exciting. 'You can't balance at normal listening levels because all you do is overmod, generally speaking.' Where dynamic range was concerned, people complained even about having to adjust the level between programmes. 'All you can ever hope to do is to try and see that the viewer doesn't have to adjust the volume control within a given programme.' They did use small desk speakers for occasional reference.

Alan Evans stressed the importance of equal loudness curves. If you monitored at a higher level you tended to hear everything with greater clarity. 'We do check the balances at a lower level but it becomes unnecessary, after a while, to know what it sounds like at a lower level.' He cited the example of balancing a singer against an orchestra. Unless the monitoring level were high enough the bass and treble would disappear, though the singer would be largely unaffected. For that reason, when the balance is made the orchestra is emphasised so that it would be about right at the other end, at normal listening level. 'I prefer the engineers not to use the small speakers. I prefer them to keep it as flat and clean as possible.' He insisted that the equipment was maintained to better standards than those required by the IBA.

I asked Walter Todds how these problems affected the music producer: 'There are limitations of course, but, you can't take them into account. You try to achieve the best you can. It may be that some sound supervisors—I can't really speak for them—may realise that tv sets begin to roll off rather early and perhaps favour the bass end, but generally you try to get as good as sound as you possibly can. If you did start making allowances for this or that there's no knowing where you might stop.'

There was no effect on the range of music that was broadcast and poor sound quality had never been advanced to him as a reason for restricting the amount of music on television in favour of something which was less of a minority taste. 'I can only think of perhaps one exception, where we won't do it because of the sound, and that is the organ.' He admitted this was also because the audience for organ music was a small, albeit enthusiastic, minority, but 'we are reluctant to do programmes on and about the organ and one of the reasons is that the organ sound is not perhaps marvellously captured on a cheap speaker.'

Not all television pictures are broadcast, of course. Zoom Television are a good example of a company that provides audio visual material for various uses, such as advertising, training and promotion. Zoom's Jon Hocking said they had to provide what the customer asked for, and usually that wasn't a great deal as far as the sound went. Videocassette machines, he said, often had poor specifications, a low tape speed, poor transport, narrow band frequency response, high distortion and noise levels and some even had age, to make things worse. 'It's then coupled with a standard television,' he said, and then it's the old old problem. I don't know of one single person who has tried to improve it. The sad fact is that it's an economic thing. There are no complaints about it, it's the poor relation; people accept it and don't even know the difference. They're not trained to hear the faults in the sound unless it's something basic, like hum or something. They accept it as it is.'

At one point he had tried putting in better sound for the Lintas agency, who are in the same building, to hear some work Zoom had been doing for Lintas. It sounded fine when it was played in the office, but when they got it home 'they bucked against it.' They replaced it with ordinary equipment and the Lintas men then couldn't hear the sound effects they had wanted put in, so a compromise was reached with a B & O television and an external speaker. Hocking admits that when they were building they had a certain amount of money and the sound equipment took the back end of the budget, though he added 'now we're replacing it.'

The assumption we are all making, of course, is that the sound is good when it reaches us. Technically that may be true, in that what gets to the microphone isn't transmitted with little degradation[8]. But as we've seen, there are important reservations about what reaches the microphones. These result from the mistaken assumption that it is the picture that carries most of the information, and resources are allocated accordingly. The consequences of this and a fuller explanation of the reasons for it are explained in an excellent book by Glyn Alkin.[9]

Perhaps the reason for the present impasse is that so much excellent music is transmitted on radio that the music freaks use that as their main source of entertainment. But perhaps it isn't: the visual sense, poorly developed in most people though it is, is the most impressionable, the most easily and cheaply titillated. Giving people something superficially attractive to look at, whether in a tv programme or at a sales conference, is an easy way of gaining effect. When the content is small people will pay attention to a picture without spotting that you have nothing to say.

Knowing this doesn't help, but perhaps something else will. Until a few years ago the television manufacturers had everything their own way. The reason the 405 line standard, followed by dual standard sets. No foreign manufacturers wanted to make special sets for a market as small as Britain. Now that's all changed. Our sets are uhf only, and the members of BREMA have been bleating about Japanese imports for the last five years or so. Foreign sets do have mains transformers and they do have external sockets for feeding to other equipment, as my Hitachi portable testifies. 'If we were to make a set with extra good sound we'd lose money on it,' pleads Mike Butler, 'and you have to decide "Is it worth doing for the prestige? Is it worth losing money on it?" In Germany they're mad keen on good sound and they use higher wattages and they even talk about DIN 45 500. There is a greater tendency to remote control, but it just shows you the difference between the various countries.'

There is no evidence, however, that all these improvements in foreign sets make them less competitive. Why else would Lord Thorneycroft, champion of free enterprise and competition, head a delegation from the Radio Industries Council to Japan last year to beg the Japanese to stop exports to the UK?

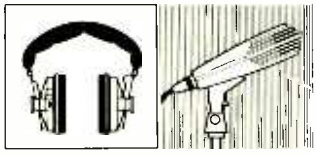
Whether people are buying foreign sets because they are cheaper or because they have these extra facilities matters not, for it defeats the manufacturers' arguments either way. When it was in their interests to make us buy stereo fm tuners they pursuaded us to do so. When they wanted us to dispose of the black and white set and get a colour tv they persuaded us that colour was essential to enjoying the programmes, and the broadcasters, particularly the BBC, co-operated. There had been no particularly strong demand for stereo or colour tv, but this presented no difficulty. Fm stereo encouraged people to buy new tuners (after a long campaign by the BBC) and colour tv provided a bonus for the makers, the beneficiaries of more licence money, and the purveyors of more spectacular advertising. From sales of 504 000 in 1970, colour sets have risen to nearly 3 000 000 in 1973, falling to 2 208 000 the following year. They could do the same with better tv sound if they really felt like it but they don't seem to think there's any profit in it. It's just possible that the Japanese might be able to tell a different story.

1 *Of a Poor Relation.* News Item, Hi Fi News January 1972 p 51
2 John Gilbert: *The Poor Relation—TV Sound.* Wireless World, January 1972
3 *The Sound of Television.* Letter to *The Times* from Milo Keynes, May 5, 1973.
4 Letter to *The Times* from Mr John Culshaw of BBC TV, May 8, 1973.
5 Letter to *The Times* from Mr Leonard Stone, May 15, 1973.
6 Adrian Hope, *The Picture's Poor Relation.* Hi Fi for Pleasure, Vol 2 No 9 September 1974.
7 *TV in Stereo.* News Item, Hi Fi News March 1970 p 353.
8 Alan Reekie: *Better Sound from Television.* Hi Fi News, April 1972 p 661.
9 Glyn Alkin: *Sound with Vision, Sound Techniques for Vision and Film.* Pub by arrangement with the BBC. Butterworth, £6.

Professionally canned from ear to ear

The DT 100 is only one of an extensive range of headphones manufactured by Beyer Dynamic, in use in studios throughout the world . . . . . setting a new sound standard.

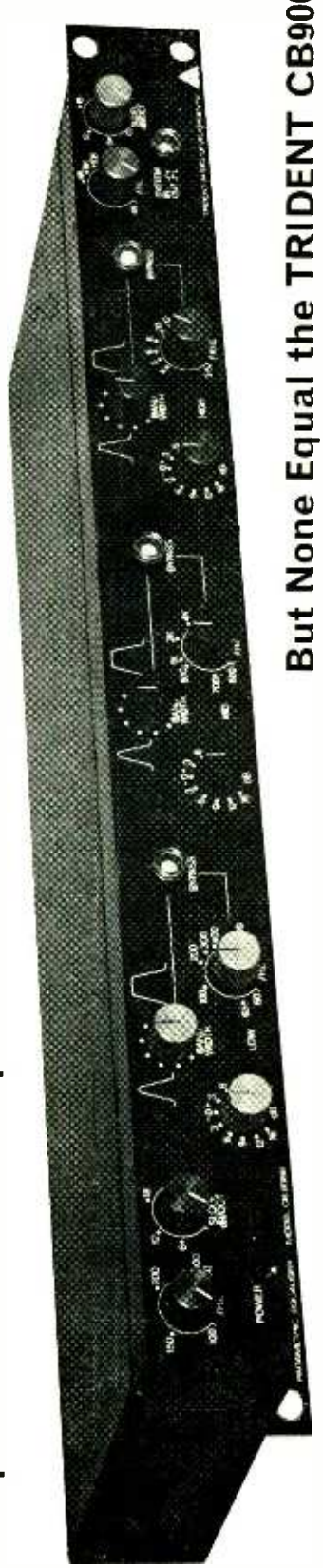
* Frequency Response: 30-20,000 Hz
* Output Level at 100 HZ and 1 mW: 110 db over 2. 10^{-4} µ bar
* Rated Input: appr. 600m V per cartridge
* Peak Power Load: 1W or 20V per cartridge
* Impedance: 2 x 400 Ω (2 x 8, 2 x 100, 2 x 800, 2 x 2,000 Ω upon request)



BEYER DYNAMIC

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

Some Equalisers Are More Equal Than Others . . . .



But None Equal the TRIDENT CB9066

FEATURES:

★ Low, Mid and High range, continuously variable control of Frequency, Amplitude and Q.
★ Separate High-Pass and Low-Pass Filters with continuously variable control of Cut-off frequency and slope.
★ Silent IN/OUT switching of ranges and system.
★ Automatic compensation for sharp and broad Q settings adjusts for apparent loss of loudness in sharp Q modes.
★ Compact 19in x 1¾in x 8in rack mountable.
★ Built-in Power Supply.

THE TRIDENT MODEL CB9066 PARAMETRIC EQUALISER/FILTER is a comprehensive equaliser offering the user a degree of flexibility in tone correction hitherto unavailable. The unit features continuously variable control of Frequency, Boost/Cut Amplitude and Q. Each of the three parametric sections can be separately bypassed by a pushbutton switch and the total system, including the filter sections, can be bypassed by a fourth pushbutton. The five sections of the Equaliser can be used simultaneously. Silent switch operation enables the facility to be used during critical applications such as Disc Mastering, Re-Mixing, etc.

Trident Audio Developments Ltd.,
4/10 North Road, London N7 9HN
Telephone: 01-609 0087 Telex: 264773

work

Radio Hallam

Keith Skues, Roger Moffat, Johnny Moran and Bill Crozier are all alive and well and broadcasting in Sheffield. When Skues was appointed ilr Radio Hallam programme director in March 1974, his first move was to recruit these famous ex-BBC names. 'So in effect, we're a national station based outside London, but only heard locally,' says Derrick Connolly, Hallam's chief engineer. Indeed, Hallam is a *very* local radio station. Broadcasting on one medium wave frequency and two vhf frequencies from separate transmitters, it has to operate on quite astonishingly low powers.

Hallam transmits from Rotherham, on 95.9 MHz with an erp of 50W; on 95.2 MHz from Tapton Hill, with an erp of 100W, and on medium wave from Skew Hill on 194m, with a transmitter power of 300W. What is more, the Tapton Hill transmitter is not even circularly polarised (as is normal for ILR stations to improve reception). All this is, of course, in accordance with the IBA and BBC grand plan for local coverage of the UK, without co-channel interference. But radio and TV reception in the Sheffield area is notoriously difficult at the best of times, and Hallam has continually to advise would-be listeners in stereo to invest in the highest gain aerial possible. Like all ilr stations, Hallam is obviously nervous about offending Big Brother IBA by voicing criticisms but, equally obviously, the station is less than happy about renting transmitter powers 400 times less than its closest national rival.

Despite these handicaps, there is no doubt that Hallam's get-up-and-go attitude to broadcasting is paying dividends. The latest survey claims a weekly listenership of 48 per cent of the population in the service area, the highest of any local radio station in England. Much of the credit for this must go to Skues' choice of broadcasters. In the case of Roger Moffat, it is no secret that it was a brave choice. Moffat was sacked from the BBC for being 'totally irresponsible'. This, being translated by borrowing one of Moffat's own phrases from his days as NDO compere, means he celebrated too much before reading the Shipping Forecast one night on BBC Radio 2. On the day Moffat arrived at Sheffield, he made the local headlines by telling a reporter that 'Sheffield is a bloody awful place'. His daily three-hour programme, is often similarly frank.

Hallam occupies two floors of a modern building in central Sheffield. But, unlike BBC Radio Sheffield, it has not been council-baptised by the erection of official road signs. Indeed, I encountered a general undercurrent of feeling in the city that 'the Establishment' still tends to regard Hallam as a cheeky interloper on the airwaves.

Because the staff of Hallam is relatively small (around 50 in all) the engineers carry Air Call bleep receivers while they are off duty. If there is panic in the studio an engineer can be called in with a bleep from anywhere within a radius of 25 miles.

A custom-built mobile is used for major obs, but the station owns a battery-powered Post Office radio-telephone via which a reporter can send back phoned reports from locations where there is no phone. Post Office regulations preclude the direct broadcast of such phoned-in reports, and insist that they be taped at the studio before transmission. The obvious question which someone must soon ask is whether transmission via the standard seven-second tape delay found in all ilr stations would or would not constitute legal prior taping.

Along with the interest in Dolby, quadraphonics and dummy head transmission now commonly found among most, if not all, ilr engineers (but doused by the IBA) Hallam wants to experiment with the possibility of programme choice between vhf and medium wave. Consider, for instance, Saturday afternoon, where sports results are coming through thick and fast and there is a musical programme being transmitted. Isn't it reasonable that, on vhf, the music should go out uninterrupted, the results being broadcast as interruptions only on the medium wave? It seems a logical step to take, especially in view of the similar handling by the BBC of shipping forecasts. Several ilr stations are waiting with interest for the Home-Office to deliver its verdict to Hallam on the idea.

Another bright idea from Hallam is the policy of starting all news broadcasts three or five minutes *before* the hour, rather than *on* the hour. The logic is again sound, and intended to cut down on the loss of listeners who don't want to listen to the news. Anyone who hears the news come up on Hallam will soon become accustomed to the fact that there is no point in moving over to the radio, and re-tuning to another station, because by the time they have done so any other stations will be just starting their on-the-hour news bulletins.

Hallam has very little time for those awful, boring phone-in programmes featuring listeners saying nothing worthwhile at length that other stations use to fill up their air time cheaply. Bill Crozier has a clever way of playing good music without using up valuable needle time. Because he knows the music business inside out, he also knows what musicians are playing on some of the better non-copyright library recordings that are available and uses some of this music in his programme. The only problem is that when the public phone in wanting to know where they can buy what they have just heard on the air, they are disappointed to hear that it is not available in the shops.

One result of the generally poor state of reception in hilly Sheffield is that there is a long-established local cable system for piping radio and TV. Moreover the occupants of some twenty thousand council houses that are linked to the British Relay cable are expressly forbidden to erect a roof aerial. In Sheffield, the fourth tv channel on the piped system carries the locally originating community service, Sheffield Cablevision. Owing to budget problems, this station can offer original programmes for only a few hours a day and for the remainder of the day and night runs a continuous shop window of local advert slides. And cleverly, this silent shop window service is accompanied by the sound of Radio Hallam.

This way Cable subscribers can hear Hallam even though there is in theory no room for it on the limited number of line pairs available on the British Relay cables. The only reservations from all those concerned seem to be that one day a picture advert may conflict with a sound advert, to the detriment of

52 ▶

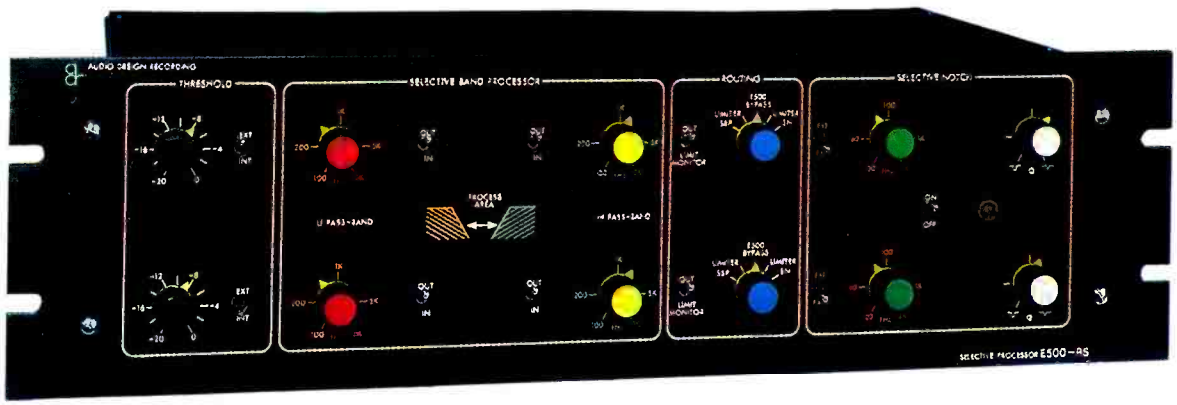
Left: *Roger Moffat on his daily morning show.*
Below: *Marc Bolan joins Keith Skues and Ray Stuart on an outside broadcast.*

audio design recording

E500 Selective Limiting/Expansion

DYNAMIC EQUALISATION

Conventional so-called 'frequency selective' limiters have frequency conscious side-chains that trigger limiting at lower threshold levels for a particular frequency area; however, when operating, the whole audio bandwidth is attenuated. The ADR E500 series of Band Selection units, bandsplits the audio signal, routing a selected area alone, through a limiter (for high-level attenuation) or expander (for low-level attenuation); the processed area is then added back to the main signal. Under unity gain conditions the output is flat and identical to the input; as input level changes and gain reduction occurs there is momentary attenuation in the selected region.
This is the only way that heavily modulated LF signal can be limited (as opposed to compressed) without any modulation on the ambient programme content. Using an expander, hum or rumble can be attenuated at low level and the threshold arranged to produce a flat response when wanted LF is present to mask it. Static pre- or de-emphasis can be arranged, becoming flat progressively as signal levels rise. The units offer an optimum de-essing facility.
In addition to their selective functions units can be used to provide static EQ with flexible high- and low-pass sweep filters and a fully parametric bandpass filter. Invaluable for studios specialising in the preparation of masters for transfer to cassette, disc or film.



E500-RS Bandselection Processor

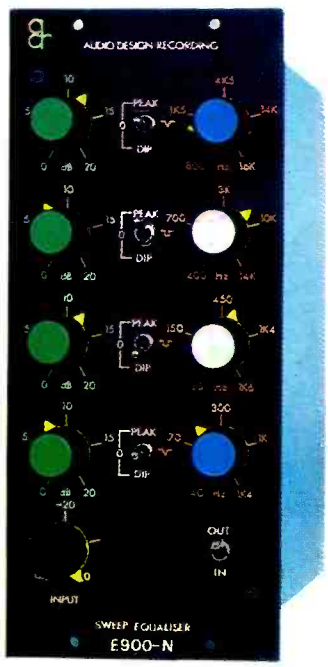
E900 Sweep Equaliser

This equaliser offers parametric sweep facilities on four sectional bandpass controls. It has been specifically designed to provide simple yet flexible operation for the recording engineer. Its unusual range of control makes it ideal for use in pop applications on individual instruments. Sections can be switched from 'peak' to 'dip' without clicks; sections can be pre-selected and switched in momentarily from the flat position of the selector switch. Each pair of controls covers the audio bandwidth, one pair at a 'Q' of 1.5; the other pair at a 'Q' of 3.

The advantages of sweep equalisation are self-evident; the engineer being able to exactly select an area (instrument fundamental or overtones/voice, etc.) that requires accentuation or attenuation, without having to accept a compromise between fixed frequency positions.

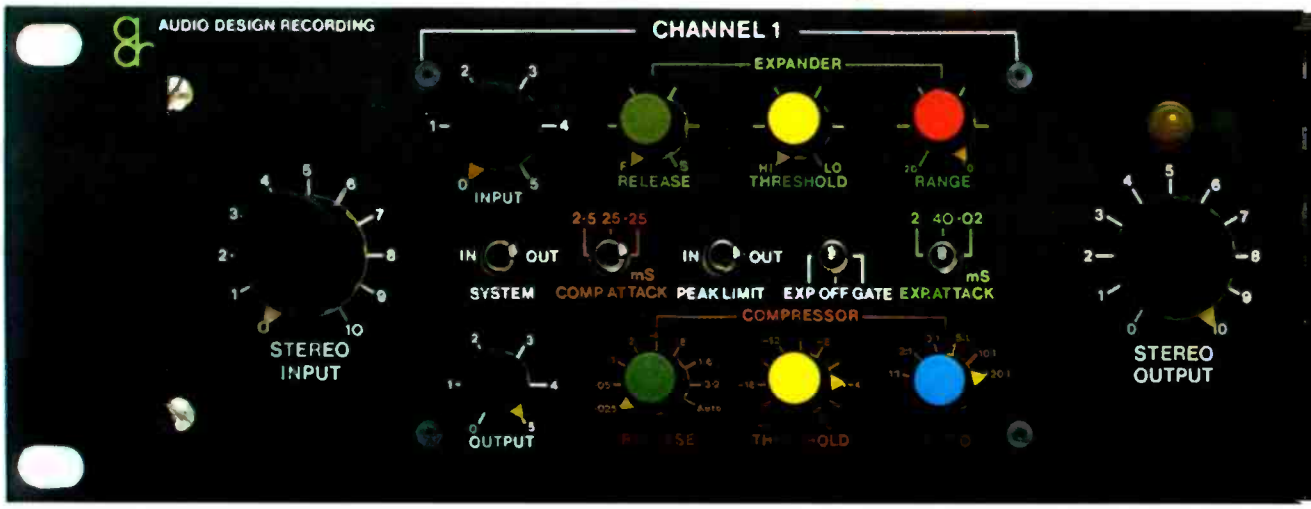
Control Range 40dB (±20dB)
1st Section 40Hz — 1k4Hz (Q-3)
2nd Section 80Hz — 1k6Hz (Q-1.5)
3rd Section 400Hz — 14kHz (Q-1.5)
4th Section 800Hz — 16kHz (Q-3)

Rack and modular formats available



E900-N Module

audio design recording

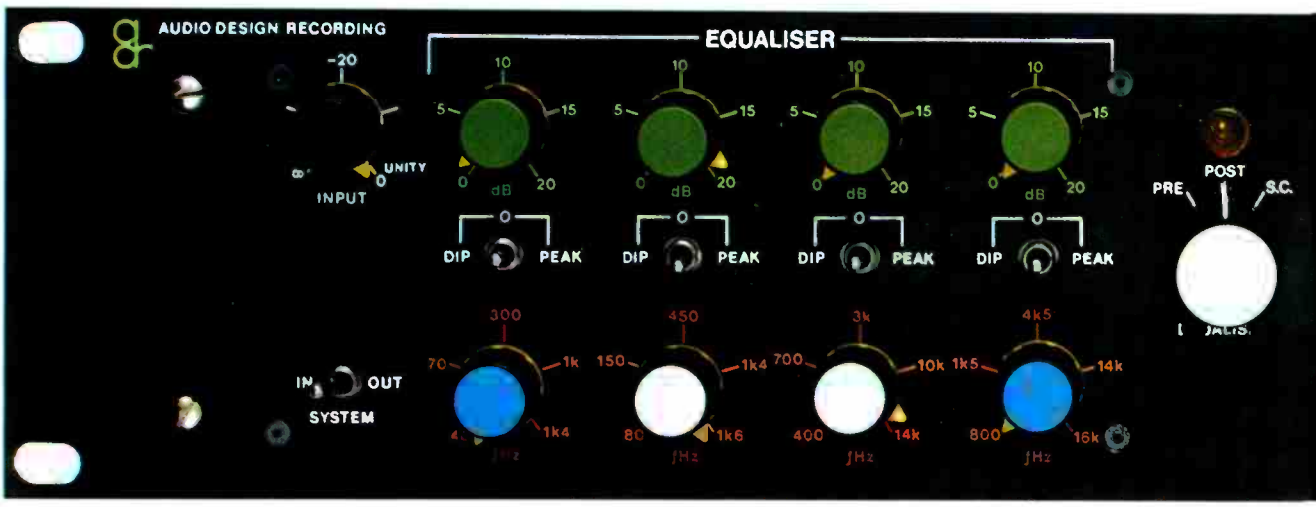


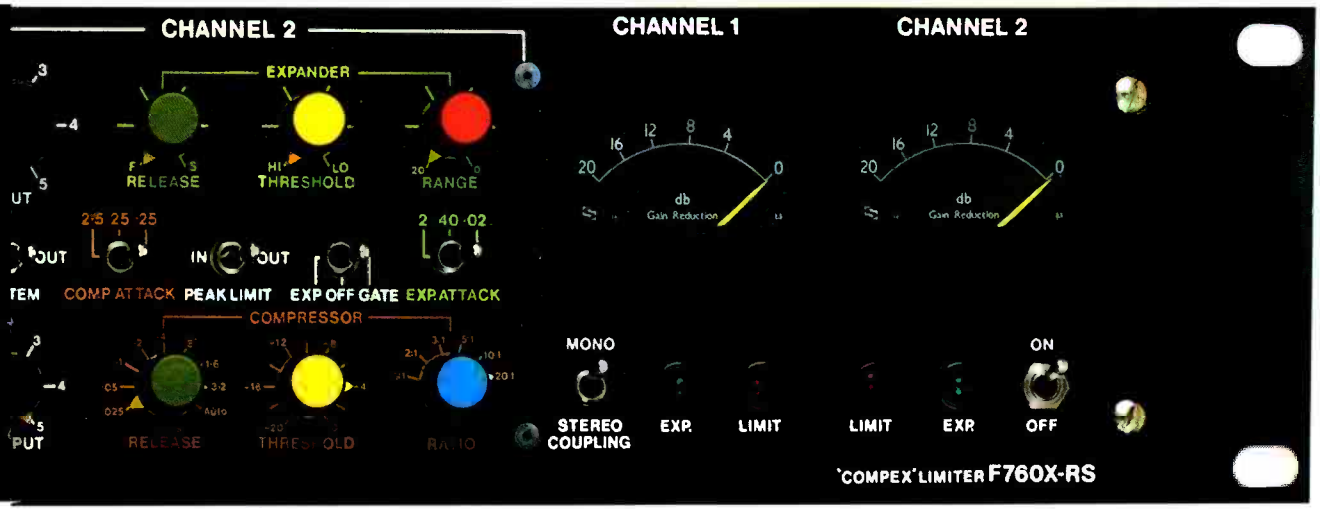
★ SEPERATE PEAK LEVEL LIMITING (optional frequency conscious side-chain)
★ MULTIRATIO VARIABLE THRESHOLD COMPRESSOR
★ EXPANDER WITH GATE OPTION
★ AUTO RELEASE CHARACTERISTIC

....meet the P

A Unique Audio Package

F769X-R VOCAL-STRESSER





F760X-RS COMPEX-LIMITER

An Exceptional Combination Unit

...OFESSIONALS

★ ALL THE PLUSES OF THE COMPEX-LIMITER
★ PARAMETRIC SWEEP EQUALISER (40 dB range)
★ EQUALISER ROUTING – 'PRE', 'POST' OR 'S.C'
(Side chain of compressor for deessing etc.)
providing

★ TOTAL VOICE & INSTRUMENT CONTROL

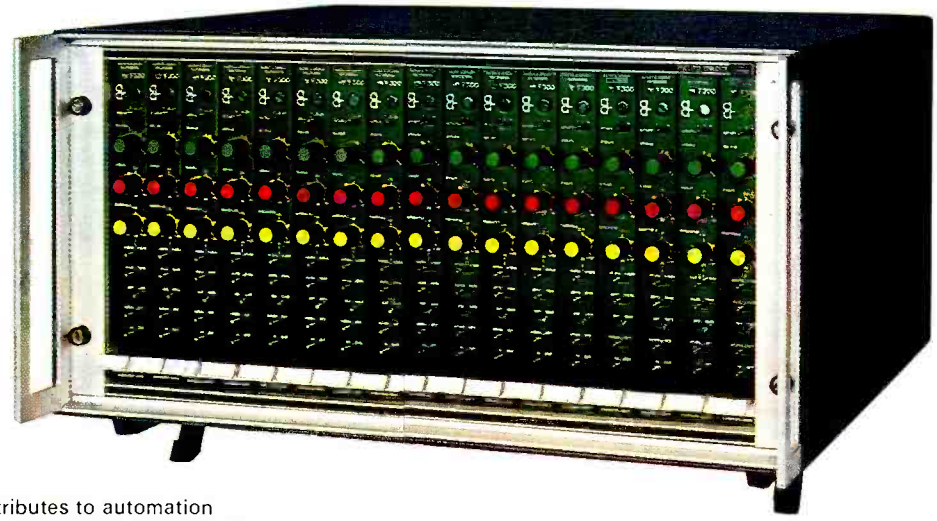
audio design recording

presents . . . . SCAMP

REGD TRADEMARK

The Standardised Compatible Audio Modular Package (SCAMP) system is a concept realised by Audio Design Recording whose aim is to provide a means of making available all of the facilities demanded by discerning studios, yet remain inexpensive and versatile, without sacrifice to quality.
Continuing the design philosophy incorporated in the F300 Expander-Gate system (*illustrated below*) a standard rack with mother board connections and power supply will provide for optional hard wiring to the studio jack field. Various audio modules of a compatible format will then simply plug-in at any point to become instantly available for productive work. The system is entirely 'open-ended' in design and so constructed that new ideas and advances in technology will be swiftly translated into working modules, for incorporation into the main system. SCAMP users will be constantly updated on, and automatically offered an opportunity to evaluate, all new modules.
The SCAMP system will provide for easy extension of studio facilities (e.g. extra mic channels, equalisers, limiters, compressors, etc., and effects units) and will also facilitate the rapid reconfiguration of auxillary equipment for between session setup.
Full details of the exciting new system will be supplied on request.

F300 Expander-Gate



F316-Rack System

The F300 Expander-Gate contributes to automation because it has been especially designed for multi-track work with careful attention being given to ensure simplicity of operation. By use of auto-dynamic characteristics, the signal is swiftly yet smoothly controlled, shutting down the channel as it ceases to contribute useful signal to the mix, yet opening with a clean instantaneous response as necessary.

The F300 Expander-Gate contributes to noise reduction since as a single ended processor of superb quality, it not only attenuates tape noise under most conditions in pop-recording, but can also make a dramatic improvement by reducing studio microphone cross-pickup and equipment cross-talk, whilst increasing control over studio ambience.

- ★ AUTO-DYNAMIC CHARACTERISTICS
- ★ EXPANDER-GATE SLOPE OPTIONS
- ★ VERSATILE FACILITIES
- ★ SUPERB PERFORMANCE
- ★ COMPACT (16 units to one rack system)

St. Michaels, Shinfield Road, Reading, Berks, U.K
Tel. Reading (0734) 84487

"I PAY **LESS** THAN 38p
FOR A DUPLICATED C60 CASSETTE"

Recordings are equal in quality to major record labels

Stay as you are—you must be using **duplitape**

Recordings are poor and inconsistent because cassettes are low quality and produced by "in cassette" method of copying. Also programme lengths are fixed not flexible

"I PAY **MORE** THAN 38p
FOR A DUPLICATED C60 CASSETTE"

Quality is poor

Avoid bankruptcy—bring your product quality into line with consumers' requirements and reduce prime costs

Quality is good

You are too benevolent

Your regular duplicating company probably sub-contracts to **duplitape**. Pocket the difference—go direct

USE **duplitape** FOR THE SAME "READY FOR RETAIL" QUALITY AS EMI, DECCA, CBS, ETC., WHO'S CASSETTES ARE ALSO RECORDED BY THE "LOOP BIN" METHOD. ANY PROGRAMME LENGTH FROM C1/2 TO C131 WITH ABSOLUTE CONSISTENCY.

DUPLICATING COSTS

1000 up 38p free mastering
500 up 40p
250 up 43p
100 up 46p

including library case
Based on C60 length

duplitape
5 PRATT STREET
CAMDEN TOWN
LONDON, NW1 0AE
Tel. 01-485 7833

both. But, rather as no monkey equipped with a typewriter has yet written even a couple of words of Shakespeare by accident, so the problem has not yet proved to be a real one. **Adrian Hope**

A Day at the Races

Whoops I nearly lost my head for a minute.
Heave.
Whoops I nearly lost my head for a minute.

'Well I'm blowed. Four tracks on there and I get the same. Perfectly simple, really, it's just a 40 mm diameter hill and dale record with a stylus pressing on it from a diaphragm inside the doll's head. When you pull on the head, you wind it up. It's a toy firm we are doing some work for, as a result of the record I told you about on the phone.'

County Recording Service, or Martin Watch Laboratories, or Marnic Engineering, is basically John Martin and wife Jeanette situated in a backwater in Bracknell; even there, the entrance to the random group of untidy workshops seems rather low key. And while County Recording Service activities were the reason for the visit, the relation to the others soon becomes clear. 'This cutting business isn't so amazing; after all, it's really only engraving. And the tolerances aren't that special. You see, I was trained as a watchmaker and press tool maker which is an unfair advantage. You want a clock making?'

The mono machine is an early Presto *7C*, from New York, with a Grampian head. Designed for BBC requirements 'like a battleship', it uses a Neumann two speed synchronous motor in place of the original rim drive, which didn't help original rumble performance.

The lathes threaten to be almost as archaic as the timepieces lying about the place. The stereo is an early Neumann, again spindle driven from another two speed floor mounted motor by the same company. 'That lash up is for 45 rpm—you may laugh, but it works. The pulley's made of wood . . . that's another story'. But on it around the cutter head is an inscrutable black metal box 'to keep out dust, dirt and prying eyes'. Oh, er, 'scuse me. The subject of a number of patent applications, not to mention eight years' work, by John and electronics engineer Eric Elliott, it is hoped that it will form the basis of a British cutter system marketed at around £5000 to £7000, aimed 'not at the CBS, Decca or EMI boys but at the smaller studios that haven't the money to fling around. Don't get me wrong, I'm not going into competition with Ortofon or any of those people—I couldn't. But it's cheap, works up to 17k. And there are the drive amps.' A pair of *50E* quads lie on the shelf above. 'We think we've found a way to cut the mass even further and extend the top response.'

As for the stylus, that isn't news. Some late-Picasso bits of angle iron, a universal joint, a flat turntable and a variable speed drive makes a lapping machine. Manufacturing and re-lapping cutting styli is another activity. 'Oh, we make them for Neumann, Ortofon, Grampian and Connoisseur cutter heads. I think ours are quieter.' But it's not a big production line technology, even though he is now probably the only British producer left. 'I've tried to train people to lap and polish cutting styli, but they never manage . . . maybe someone as young as you, eventually, but it takes time. In the old days when we had six or so people working here, there was a girl doing the initial lapping work, but I always had to do the burnishing facet and finish it off.' Like the lathes, the manufacturing side isn't smoothly automated, nor is there any desire to make it so. 'The pure scientists in these big establishments really can't cope with everything. It's to do with something in your *hands* . . . you have to *do* it.'

In the old days there was also a pressing plant: 'one machine operated on a shift system.' By this time Paddy had arrived with an interesting clockwork motor that ran for seven minutes without a rewind. Conversation is suspended. He used to be one of the press operators. Estimates on production arrived as about one minute plus per 45, so that on runs of up to 1000 they were competitive. And the press was electrically heated, to the tune of 12 kW. 'Only people I think used it rather than steam were Philips . . . and they were near a hydroelectric plant . . . '

Those heady days of mass employment are over though. 'Talk about the rat race—I was part of it. I see these boys in the record industry and I wonder. One day I'd been up at six to turn on the heaters for the seven o'clock start on pressing and I felt like death. Told the wife I hated it. She did too, both of us working flat out. So we stopped.' Certainly, there is a laid back air to the recording industry in Bracknell.

Conversation is dragged back to multistart records. The interest is in discs due for launch in late October, with eight tracks. A conventional twelve inch disc is cut with eight parallel and separate grooves, each lasting two and a half minutes, to make a total of 20. The idea has been marketed in the US, from a cut in New York, but the pressings show a distinct grooving repetition. John's are like any other record, apart from a visible rumble pattern, which is not troublesome on replay. This is caused by the linkage used for cutting: via a system of special gearing, the cutter head advance is coupled with the turntable rotating (nothing is new). Thus, the head follows a particular path on the disc no matter when it is lowered. The trick is then reduced to lowering and lifting the head at the right places.

Thus, the first track is cut, and moves fearsomely fast across the lacquer, taking just the two and a half minute playing time to cross. The gearing is advanced 45° and the process repeated until the area is fully cut, in mono. 'It's not worth going to stereo; the audience won't bother about the difference. And if necessary you could cut a total of 45 minutes on the side, with up to 20 different starts using this method. But it'll be used on cheap players. It helps that it's just speech and effects; if it was a pop organ . . . forget it.

'I don't know how George Peckham did that Monty Python record, but he would have had to bypass all the Varipitch stuff on his Neumann. Don't really want to challenge him, because he's a cracking engineer, but I bet he could never manage eight tracks.'

Apart from the mention of the obvious lead screw/turntable synchronisation, John remains cagey about the technique concerned lest its simplicity becomes adopted elsewhere, reflecting the client's request. He is generous in praise of the recording studio, Sound Developments, with the session producer Graham DeWilde and engineer Adrian Sear. Each of the eight alternative race versions begins identically, so that in the game bets can be placed (with 'paper money', instructions sternly imply) after which the variations are grafted on. Apparently, the subjectively low echo from the track pa system was reduced after taking expert advice, to bring it below that of the recorded American equivalent and confirming ideas about the relative power of English and American pa installations.

Certainly the feel is right, if engineers placing bets in the control room at the start of each take is a reasonable indication. The only unforeseen problem was in centring for the press. Since the groove cannot be approximated to a circle any more, it had to be hand-guessed; an offer to cut reference marks inside and outside the playing area proved impractical because the microscope at the other end could only travel near the centre of the side. Problems of stamper cracking due to eight run-in grooves were foreseen, and the cutter head lowered within the actual pressing area instead of travelling in from the dead area. For the cutting engineer, a total of 37 hours' work successful. For the statistician, a question. How many times may you expect to play the test pressing before you pass a side?

Michael Thorne

Molinare

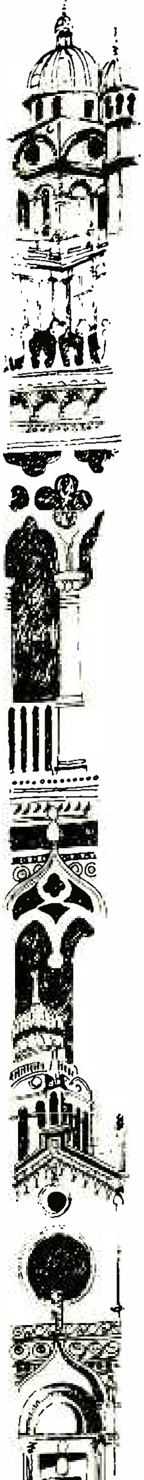
'We keep putting another studio up—about every six months we build another one—but they get booked up.' Stefan Sargent seemed almost to be complaining how pitiless their clients at Molinare were not to let them stay still. But if he was complaining he was doing it wearing a grin. In January 1974 there was only one studio at their new place at Broadwick Street, Soho, where they had moved from a basement in Stratford Place. Now there are four operating, another is being built, and there is probably room for a couple more in the warrens beneath and behind number 45. When they moved their turnover was £2000 a month. Now the amount coming in is eight times that, apart from the Moli shop.

Molinare specialise in voice recordings. A few years ago Sargent, a freelance film maker, wanted to put a single voice commentary on one of the industrial films he had made. He couldn't find a studio that would do it. You had to pay for all the music gear to do one voice. As he put it, 'Everyone was hung up on multitrack.'

So he and fellow Australian Robert Parker started Molinare. Now Sargent's back where he started. He wanted to use one of the studios for a voiceover recently and there wasn't any room. He had to go to another studio.

One reason for the increase in business, which coincided with the birth and growth of commercial radio, must be their imaginative use of NAB cartridge machines. A good example is the album compilation ads they do for various record companies. For K-Tel, Arcade, CBS, Polydor, EMI and so on, they put tracks from the album on separate cartridges and the cues would follow one another automatically as each cart was punched. A lot of the business they do in this line

54 ▶



RISTORANTE VENEZIA

21 Gt. Chapel Street, W1 Telephone 01-437 6506

Antipasti

ANTIPASTO AL CARELLO S.Q.
HONEYDEW MELON (when available) .55
OGEN MELON (when available) 80
MELONE CON PROSCUITTO DI PARMA 1·30
AVOCADO VINAIGRETTE 45
AVOCADO FRUTTA DI MARE 90
PATE MAISON 60

POTTED SHRIMPS 65
COCKTAIL DI GAMBERETTI (PRAWN) 70
INSALATA DI MARE 70
SALMONE AFFUMICATO 1·50
WHITEBAIT 75
GAMBERETTI AL NERONE 75

Zuppe

MINESTRONE DI VERDURA 40
PASTA E FAGGIOLI 50
ZUPPA DI PESCE 80

STRACCIATELLA ALLA ROMANA 45
ZUPPA DI CIPOLLE (ONION) 45

Pasta (MAIN DISH PASTA – £1·00)

LASAGNE VERDI AL FORNO 70
CANELLONI 70
RAVIOLI RAGU O POMODORO 70

TAGLIATELLE ALL'ALFREDO 70
SPAGHETTI ALLA CASALINGA 70
SPAGHETTI ALLA CARBONARA 70
SPAGHETTI ALLE VONGOLE 75

Pesce

TROTA ALLE MANDORLE 1·40
RIVER TROUT IN ALMONDS
TROTA ALLA GRENOBLESE 1·40
RIVER TROUT DRESSED WITH LEMON AND PRAWNS
SOGLIOLA ALLA GRIGLIA 2·05
GRILLED DOVER SOLE
SOGLIOLA ALLA MUGNAIA 2·10
DOVER SOLE MEUNIERE
SOGLIOLA ALLA BUONA DONNA 2·15
DOVER SOLE BONNE FEMME
SOGLIOLA ALLA DIEPPOISE 2·20
DOVER SOLE DRESSED WITH PRAWNS AND SEAFOOD.

SCAMPI FRITTI 1·75
FRIED SCAMPI
SCAMPI PROVENCAL 1·85
SCAMPI IN TOMATOES AND GARLIC WITH RICE
SCAMPI ALLA CERTOSINA 1·85
SCAMPI IN BUTTER, CREAM AND TOMATOES
SCAMPI ALLA VINCENZO 1·95
SCAMPI IN CREAM SAUCE GRATINÉE WITH RICE
SCAMPI AL FUNGHETTO 1·95
SCAMPI IN MUSHROOMS, WINE AND GARLIC

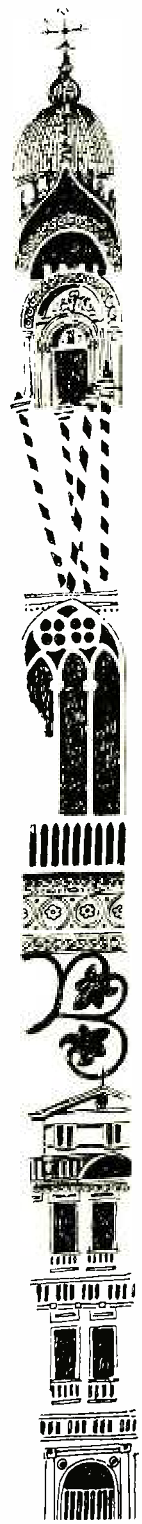
Entrees

SUPREMA DI POLLO ALLA SOPRESA 1·45
DEEP FRIED ROLLED CHICKEN BREAST, GARLIC BUTTER FILLING
SCALOPPA DI POLLO ALLA VALDOSTANA 1·45
ESCALOP OF CHICKEN TOPPED WITH HAM AND CHEESE
SCALOPPA DI POLLO ALLA PRINCIPESSA 1·45
ESCALOP OF CHICKEN SAUTÉ WITH ASPARAGUS TIPS
PICCATINE AL LIMONE 1·45
SMALL ESCALOPES OF VEAL IN LEMON SAUCE
SALTIMBOCCA ALLA ROMANA 1·50
VEAL ESCALOPPINE, HAM AND SAGE TOPPING
SCALOPPA CORDON BLEU 1·50
BREADCRUMBED VEAL ESCALOP SANDWICH, HAM AND CHEESE FILLING
INVOLTINI ALLA VENEZIANA 1·50
ROLLED VEAL ESCALOPE, SAVOURY FILLING SAUTÉ IN WINE AND ONIONS
SCALOPPA ALLA FINANZIERA 1·50
VEAL ESCALOP IN A SAUCE OF CREAM, WINE, MUSHROOMS AND CHICKEN LIVERS

SCALOPPA ALLA MILANESE 1·50
BREADCRUMBED ESCALOP OF VEAL.
FEGATO ALLA VENEZIANA 1·55
CALVES LIVER IN WINE AND ONIONS
CONTROFILETTO ALLA GRIGLIA 1·65
GRILLED SCOTCH SIRLOIN STEAK.
CONTROFILETTO ALLA PIZZAIOLA 1·80
SIRLOIN STEAK IN TOMATOES, GARLIC AND OREGANO.
STEAK DIANE 1·90
FLAMBÉ
STEAK TARTARE 1·95
RAW, CHOPPED, SEASONED AND SPICED.
TORNEDOS CORDON ROUGE 2·05
TORNEDOS STEAK SPLIT, PATÉ FILLED, TOPPED WITH BACON, RED WINE SAUCE
CHATEAUBRIAND 4·25
SAUCE BEARNESE (2 PERSONS)

Legumi

FRESH VEGETABLES OF THE DAY (see daily list) 35
INSALATA MISTA O VERDE 35
PATATE A PIACERE 20



But if you require a less digestible fare of: Broadcast Pattern Audio Jackfields ● Audio Patch Cords ● Microphone Cable ● Installation Cable ● Multiway Cable ● Post Office & Render Jacks ● Cable Markers ● Lever Keys ● Linear Faders ● Cannon Connectors ● Preh Connectors ● Tuchel Connectors ● Switchcraft Connectors ● Military Tri-Lock Bayonet Connectors ● Audio Attenuators ● Wahl Soldering and Tools ● Crimp Terminals ● Cable Drums ● AB Engineering Wire Strippers and De-solder Guns:—

FUTURE FILM DEVELOPMENTS

90 Wardour Street, London WIV 3LE

Tel: 01-437 1892 Telex: 21624

comes from abroad. 'One comes from Germany to do compilation mixes. He says he can't get the timing elsewhere.'

Using cartridge machines this way you can do several different versions in a short time. You can play around with the order in which the tracks are played until you strike the right balance. It is also easy to alter the length of the ad, and to do it in different languages. When I went to Molinare they were doing an Arcade compilation in French, German and Dutch.

'We're attuned to the demands of the advertising industry, and often those demands are totally unreasonable.' They were quite likely to phone you up and say they wanted something done yesterday. The studio would never have been successful, he said, if they had not been in Soho where people could reach them in a hurry.

Another attraction must be the Molinare effects library. Sargent winced when I asked him how many effects they could offer on cartridge altogether, but he was able to say, for example, that they had ten different blizzard effects. I counted 25 or 30 traffic effects, some of them a bit esoteric, or distinctive like 'New York Traffic'. Someone once wanted the sound of a piano being hit over some poor unfortunate's head—no problem. Neither was the request for a church organ being played badly, as with arthritic hands.

They turn out something like 80 cartridges a day and on a Friday it can be as many as 100. That doesn't count any cartridges that are duplicated in local radio stations via land-lines.

The land-lines are an advantage to Molinare, and have been used to advantage by record promoters. The studios are linked to each of the 16 commercial radio stations. In one case a group was due to appear at Radio Hallam in a promotion spot but they couldn't get to the station. They went into Molinare and were interviewed as if they were at Hallam.

Sargent says about half Molinare's income is from duplicating. He's always looking round for better and cheaper ways of doing it. He pointed to a Wollensack cassette duplicator: 'Have you seen this? You must have seen one of those'. He showed how it took in one master cassette, ran through it at fast wind when a single button was pressed, and produced two duplicates.

Molinare have an eight track facility, but Stefan Sargent isn't all that keen, unlike his partner, to go into music. He describes Robert Parker as a music freak. The amount of money that would be needed would be high, he thought, and 'the competition's pretty fierce isn't it?' Yes, you could say that.

All the studios are built to the same design, with the same equipment in, so that bookings can go into any available studio with no disadvantages. All the channels in the mixing consoles were built by Molinare in their workshop. The striking thing about the channels is that they are stereo channels with ganged pots and faders for all the functions. Sargent was surprised to find how difficult they were to obtain when the desks were being built, so he went to Richardson's, who built them specially. Subsequently, one of the engineers came to work for Molinare full time. 'It halves the number of everything. On most desks they have to fade things down in twos. We may have to use channels separately but it's never happened yet.'

There's a large workshop in the basement where they make everything from universal swivel brackets for the Spendor monitor speakers they use throughout the studios to their own echo plates. Apparently a contingent of Molinare staff went round a warehouse hitting large sheets of aluminium until they found what they thought might be suitable. They fitted a transmitter transducer and two pickups and they say they're quite happy with the results. The plates, two of them, are kept in the workshop and patched in where they are needed. Other equipment down here includes a small injection moulding machine and an engraver.

Upstairs on Broadwick Street they run the Moli-Shop, where they hire out av equipment. The equipment available includes ten carousel projectors, six 8 mm portable projectors and a couple of Electrosonic *ES3601* double projector units. This has two projectors on it and a cassette player. The cassette player provides commentary and, on the second track, programmes the slides in the Carousel projectors to snap change, fast or slow dissolve.

A third company, Electrophon Music Ltd, lives on the same premises as Molinare. The arrangement is mutually profitable since Electrophon is an electronic music studio run by an ex-BBC Radiophonic Workshop engineer Brian Hodgson and pianist, organist and composer, John Lewis. They say they offer a complete composition service, a recording service for electronic composers and a special effects service. Equipment includes an eight track 25 mm tape machine, three stereo 6.25 mm machines and a 10/10 mixing desk, along with walls full of sequencers and a wide assortment of standard and custom vc equipment. Rates are £20 an hour. Molinare's rates vary between £12 and £18 an hour.

Sargent supplies the entrepreneurial talent, it would seem, and Parker is more keen on the desk jockeying. Occasionally Robert Parker puts his back out from leaning over the consoles and has to go to a clinic to be straightened out. This happened when I went down there, and Sargent was faced with a voiceover session for the National Economic Development Office on working conditions in the hotel and catering trades.

Andrew Faulds, MP, actor, veteran of *Journey into Space* and the voice for this session, was sitting in the studio wiping the hair out of his eyes at five past ten. Sargent, nervous like a cat, turns to his producers and says 'I warn you, I'm not an engineer'. The two NEDO men would like to have made a polite noise but, since they were paying, it didn't seem appropriate.

Whatever they do at Westminster, Faulds had to be on his way to do it by 10.50. They went through it once, repeating various sections, and he had gone by 10.45. By the time the re-straightened Parker appeared at five to eleven Stefan Sargent had nearly put all the music on. 'I thought you weren't an engineer?' 'I'm not, I hate it,' he said cordially. These days he doesn't have to do it. There are eleven others to do it while he supervises the building of the next studio. **John Dwyer**

Left: *Paul Delaney mixes a compilation track in Studio A.* **Centre:** *Studio B control room.* **Right:** *Brian Hodgson of Electrophon—Molinare.*

Phonogram Spa Milano

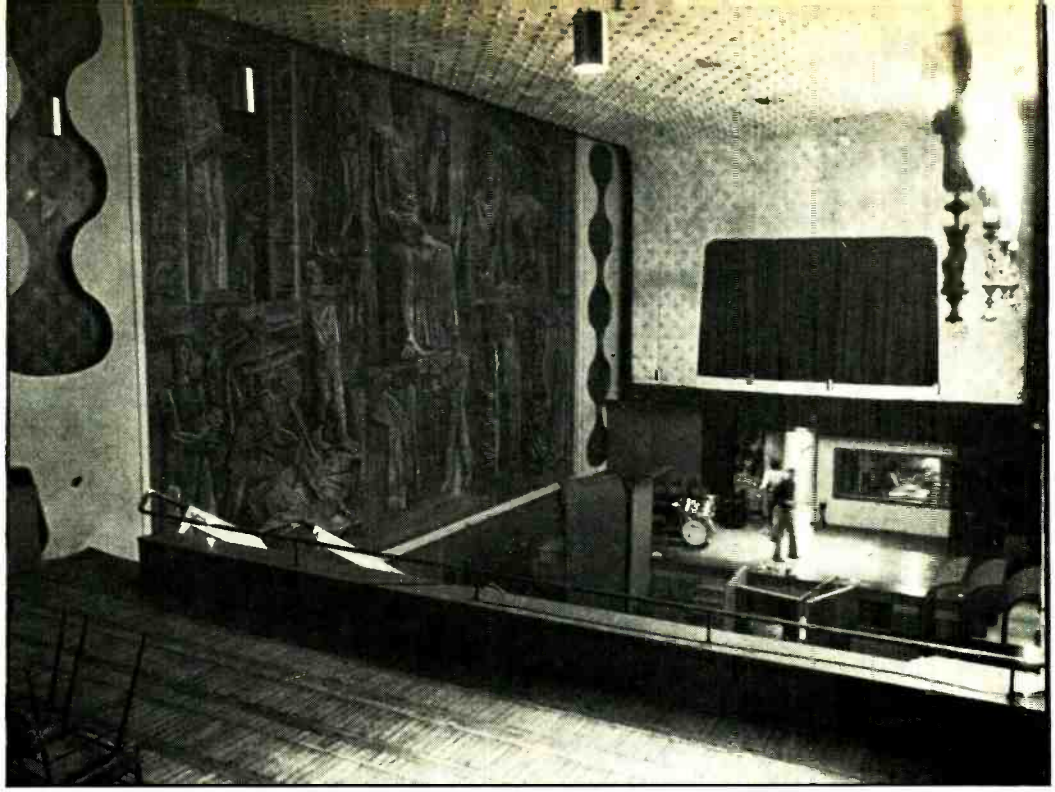
It's not really so different recording in Italy. The air conditioning works harder, people smile and wave their hands a bit more but the producer pulls the same face known the whole world over when he can't get the undivided attention of the engineer. So, what is different? Obvious things like the working language; financial things like a 20% rate reduction over comparable facilities in London, and much better things like being guaranteed a suntan by sitting on the *al fresco* patio roof between overdubs.

The Milan Phonogram studio, one of an international chain built and operated by the record company, specialises in middle-of-the-road to hard rock; other Phonograms deal solely with the classics. Athos Brinkmann, studio manager,

says his 16 track studio once tried to do a classical recording but, in the event, 'it was something that we like to forget about.' However, the success with other types of music is well documented. At one point this year, the studio accounted for no less than eight records out of the Italian top twenty at the same time. A considerable achievement in spite of the freakish circumstances surrounding the record releases that week.

The set-up is not run-of-mill. There are several unusual features both in the control room and the studio, a converted theatre on the fourth floor of a newspaper building in downtown Milan. One of the most obvious is the use of the auditorium as the recording area. Not impossibly large for the present application, the building must have been built for small scale productions. The layout is classic—from the back, there is the stalls area stretching to the foot of the raised stage. Above the rear stalls, a balcony stretches the width of the room with access to the wood block on concrete floor by side staircase. Mic lines run both from the floor and balcony terminating on a large Tuchel patch panel in the control room. This has been constructed behind the stage in the area normally associated with dressing rooms and backdrops. Generally, clients use either the floor or the balcony rather than both. This is because of the two shift arrangement for working at the studio. An example might be that a band records on the early shift (0900 to 1800) with the gear set up on the floor. Somebody else might take the late shift (1800 to 0200) using the balcony. This means that two clients can use the studio without having to set up and take down each time. Athos says that the system works quite well, although the possibilities for another studio are being looked into.

When Phonogram set up shop in the theatre 12 years ago, they did, and have done, very little to modify the acoustics, relying on many large screens for isolation and damping. Even the decor is very much original—it must surely be the only studio in the world to possess a £350 000 Sironi mosaic running from floor to ceiling along a complete side wall. Perhaps it is this accounts for 'the very good sound that we get with the arci, er how you say um . . . ah strings.' It appears that the only problem with the acoustics is light fingered superstars ripping off (literally) mosaic tiles for souvenirs. In common with its ancestry, the studio has some very effective mood lighting from both ceiling and floor level. Good for vocal overdubs. The famous lady vocalist looks towards the control room window seen but unseeing through a blaze of orange spots in the darkened auditorium. With the foldback wound up in the cans, a complete home from home.



. . . a very good sound with the arci . . .

The centre of any recording facility has to be the control room; the Milan set-up, although typical of the Phonogram format, is atypical in respect of other recording studios. It would be impossible for other organisations to equip with similar hardware as much of it, including the desk, is manufactured by a group facility at Baarn, Holland. The result is the incorporation of several interesting features into the overall control room design; the most important is in the desk. It has all the usual facilities expected of a 24/16 console including advanced four stage eq at channel level. In addition, a pin board matrix—effectively a patch panel—enables the insertion of up to six separate eq blocks and four compressor limiters anywhere within the organisation of the desk. To do this, the engineer simply has to insert a pin at the appropriate x/y intersection. The system works for individual mic channels and output groups. The extra eq blocks follow the same format as the fully parametric channel modules.

Metering is by column vu on the output groups; Athos Brinkmann and engineers Pino Ciancioso and Davide Marione had something of a downer on ppm monitoring to the red line at 540 nW/m, although the language barrier prevented a discussion of exactly why. However, the console is equipped with a couple of column ppms for a safety check, switchable to any output group. As far as could be understood, the vus are set up on a steady tone corresponding to a record flux of 185 nW/m, the European level. Further, there are four conventional moving coil vus for use in conjunction with the quad panning capability of the desk although the operators implied that this facility amounted to an elephant of a distinctly pale grey hue at that moment. But the possibility is there; the JBL *4315* front speakers are augmented by a pair of ceiling-mounted JBL custom cabinets radiating towards the rear of the main console.

Other exclusive to Phonogram features: a bright orange bin standing groin height topped with a smoked perspex canopy. This turned out to be a Binson style drum echo, two channel, to provide adt. Lifting the lid revealed some very classy lathe work mounted on classier bearings with a magnetic film (perhaps 50 mm tape inside out) mounted on the periphery of the drum of diameter circa 40 cm. Movable heads on a precision radius provide magnetic and visual, but not physical contact with the drum. The man said that the system was capable of working to an upper cut off of 17 kHz with a maximum delay of 400 mS down to a minimum of 10 mS—almost into flanging territory.

Frank Ogden

Phonogram Milano—you couldn't buy this desk at any price.

Anatomy of a

* Sansui's BA 5000 gives 300W x 2 continuous power into 8, 4 or 2 Ω, both channels driven 20-20,000Hz.

Humping the hefty BA 5000 from Sansui's Definition Series on the marble slab is no easy task for the weak spined. And prising the lid off this 300 watt per channel monster reveals a structure that is born for power - and lots of it.

Not to be put off by this feeling of strength, a first glance at the innards offers a swift solution to the absence of any distortion, noise and colouration that typifies the character of the BA 5000 - a whopping toroidal coil winding power supply dominating the centre of the case.

Close scrutiny of the electronics uncovers a few more Japanese gems. The differential amplifier at the input stage uses a dual-transistor formed on one wafer. So that's how they get the pancake-flat stability regardless of the input level settings.

Sansui specialises in producing high performance toroidal coil power supplies.

Now what about the driver. Indeed, they are crafty, these Japanese. The pre-driver circuit uses a dual-transistor stage for balanced zero voltage, followed by an active-loaded driver stage for high gain class A amplification. Obviously how they get the right negative feedback to chop out any distortion.

On to the output. Humm... three Darlington connected amp stages for high current gain. With 8 beefy power transistors for each channel. Well, now we know how they get 0.1% distortion and the wide dynamic range.

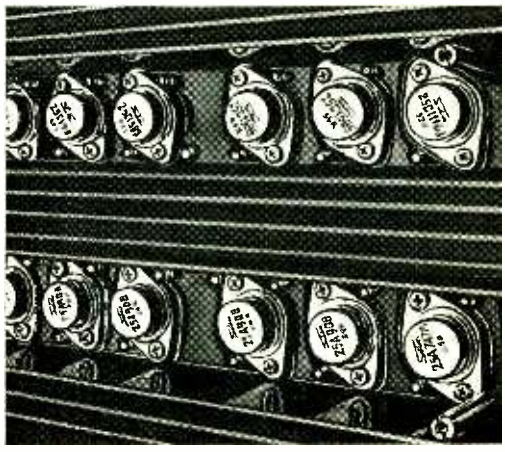
The meters. Big and very sensitive too by the look of them. Just what the doctor ordered to show pulsive inputs accurately and quickly.

Let's look at the jumbo output transformers. Obviously high efficiency jobs that let the BA 5000 deliver its 600 watts total output at 8,4 or 2 ohms. Ties in well for professional studio work I suppose.

Protection's no racket on this number. Not surprising for the packet you must pay for it.

OK, lets discard the power job and look at the preamp.

The CA 3000 they call it. Good as any name I suppose. Right, off with the lid.

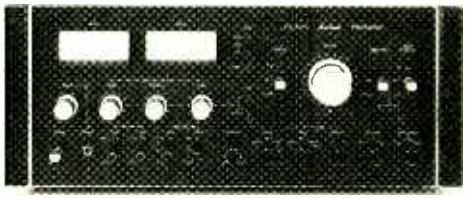


Super big heat sinks for the 8 silicon power transistors per channel.

600 watts* case.

Whew... another of those toroidal power supply jobs. Must have their own factory to supply this kind of gear at a reasonable cost.

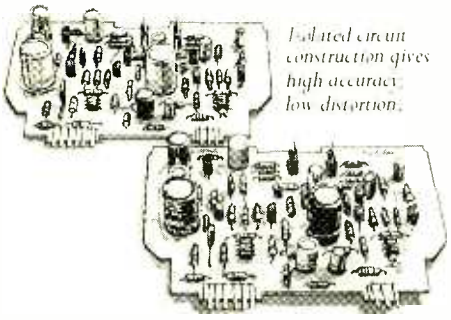
Unplug the circuit boards. Yes... each has a differential amp on the input and an emitter follower or a SEPP buffer amp at the output. Now why should that be? Must be so that each individual circuit remains unaffected by



CA3000 pre-amp, excellent RIAA characteristics with any cartridge.

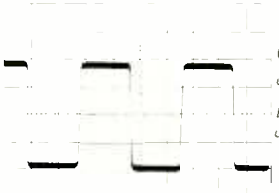
the previous one. That way they get highest accuracy and lowest distortion at each section.

The equalizer next. Smart indeed. Dual FET amp with matched low-noise FETs. Class A complementary SEPP amps at the outputs. With a CR filter stuck in there as well.



Isolated circuit construction gives high accuracy, low distortion.

All this lot must eliminate the dips and peaks in



CR-NF type equalizer eliminates dips and peaks in the RIAA equalization curve.

the RIAA equalization curve and improve phase characteristics. Here's a chart... maximum deviation from RIAA equalization curve of 0.2 dB from 30 to 15,000 Hz. Very cunning. Should handle all the types of cartridges you can lay your hands on.

The inputs. Cover about everything as far as my eyes

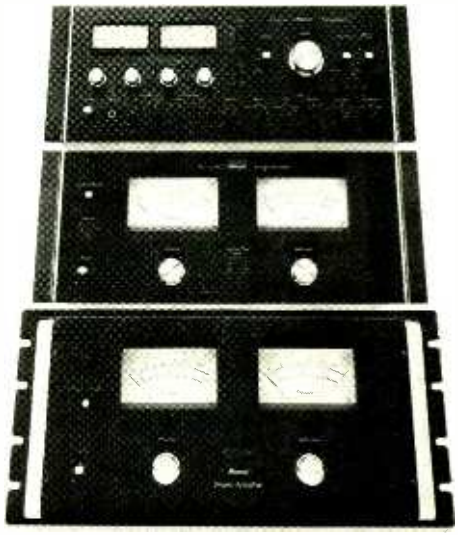
Total input flexibility for record or tape combinations.

take me. Two stereo phones. Three sets of stereo tape deck terminals. It never seems to end.

Well, I can see it's going to take a lot more time before I get to the bottom of this lot. There's another power amp to go yet, the BA3000 which has 170 watts per channel and only 0.05% distortion. How do they do it? Smarter than a barrel full of monkeys those Sansui boys.

Looks like another long night ahead. Now where did I put those cutters...

The Definition Series. See them at our London showroom (next to the GPO tower) or at selected dealers.



Sansui

Thank you for listening

Sole U.K. distributor
Vernitron Ltd., Thornhill Southampton SO95QE England

Sansui Audio Europe SA, Dracem Building,
Vestingstraat 53-55, 2000 Antwerpen, Belgium
Sansui Electronics Corporation,
55-11 Queens Boulevard, Woodside, NY 11377, USA
Sansui Electric CO. Ltd.,
14-1, 2-chome, Sugnamiku, Tokyo 168, Japan

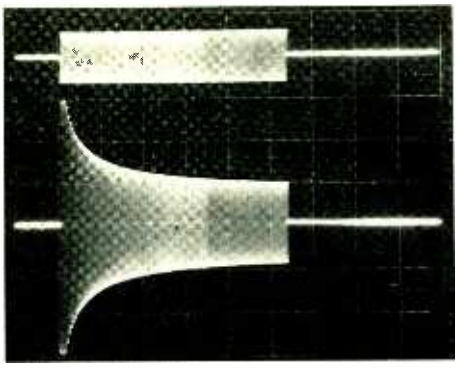
dbx 160 SERIES

– 20 dB to –20 dB, but a practical extreme range from + 24 dB to –23 dB. Here again, the calibration points were of good accuracy and within the readability of the control markings. Likewise the calibration and function of the compression ratio control can be judged from **Fig 4** which shows good accuracy, and it was found that the two led indicators which indicate the signal level in relation to the threshold operated at precisely the threshold point.

The dynamic performance

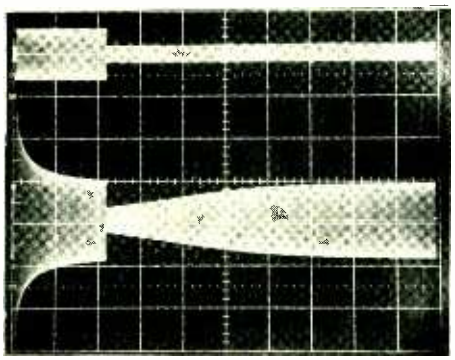
Initial investigations were directed to determining the attack and decay times using tone bursts and bursts of increased level. **Fig 5** shows the effects of driving the compressor limiter into 10 dB of compression with a tone burst at 1 kHz of just over 100 ms duration, the decay in level appearing to be exponential such that the excess level is reduced to 30% after 20 ms. This pattern of events was observed at all compression ratios and at all frequencies within the audio band. While subjectively this performance was found to be excellent, it appeared that the observations did not in any way comply with the manufacturers suggested attack times.

The release time was investigated in a similar manner as shown in **Fig 6** which like **Fig 5** shows the input to the compressor/limiter and the resulting output with the attack time and the release time visible. More detailed measurements with a high speed pen recorder operating at a pen speed of 2500 dB/s showed that the release speed achieved a maximum rate of 71 dB/s apparently independent of the amount of compression, and also at considerable variance with the manufacturers original specification of 120 dB/s. However, the subjective effect was quite acceptable. As a result of these findings, the published specification has now been modified.



Above: *Fig. 5 20 ms/div 10 dB, 1 kHz.*

Below: *Fig. 6 50 ms/div 10 dB, 1 kHz.*



Other matters

Unfortunately the current type *160* compressor/limiter is strictly a single channel device, and clearly any attempts to use the compressor/limiters in a multi-channel mode will lead to disastrous image shifting and other odd effects. However, I am informed that a coupled stereo version is on the stocks and should be available during 1976. This will be known as the *162* which will use the sum of the signals as a control voltage. (See survey p26).

As is my normal practice when reviewing equipment the unit was visually inspected for electrical safety having regard to the higher European mains voltages, and I am pleased to report that no serious deficiences were noted. On a similar theme, the susceptibility of the unit to mains voltage variations was checked and it was found that, provided that the incoming mains did not drop below 210V, no performance parameters appeared to suffer.

Summary

Because the *160* can be used either as a compressor/limiter or as a calibrated line amplifier the two aspects of its performance have been investigated. In the former role it passes with flying colours with the exception of the excessive noise in the output stages which may be embarrassing if the full output drive capability is not used. In terms of a compressor/limiter its subjective performance was good, and with the exception of the severe discrepancy between the specified attack and decay times, and those according to my measurement methods, I do not have any complaints about the performance.

The unit is relatively cheap and has clearly been given considerable thought by the manufacturer, with regard to matching other equipment and general facilities. As far as subjective performance is concerned, I have some cause for complaint about noise in the output stages. I must, however, make it clear that the attack time of the review sample makes it unsuitable as a fast limiter for protecting radio transmitters and similar devices which are readily overloaded by transients—an application that may be implied by the original specification.

SURVEY: LIMITERS AND COMPRESSORS

Distortion: less than 0.5% thd from 50 Hz to 15 kHz with limiting, at 1.1s release setting. Output capability is +24 dBm.
Signal to noise ratio: greater than 81 dB at threshold of limiting 30 Hz to 18 kHz.
Attack time: less than 20 µs for 100% recovery. Adjustable to 800 µs with front panel control.
Release time: 50 ms minimum, 1.1s maximum (for 63% recovery). Adjustable with front panel control.
Compression ratio: 20, 12, 8, 4:1 selected by front panel bush buttons.
Power requirements: 110 to 260V ac, 6W.
Other: stereo interconnection facility.
Size: 8.9 x 48.3 x 20.3 cm.
Weight: 5kg.

LA-3A LEVELING AMPLIFIER

Electro-optical gain control element. Operates either in the compression or limiting mode at a compression ratio of 50:1.

Specification
Input impedance: 600 ohms (floating).
Max input level: + 20 dBm (30 dB gain pos) 0 dBm (50 dB gain pos).
Output load impedance: 600 ohms (floating). Damping factor 8.
Max output level: +24 dBm (+27 dBm on peaks).
Gain: 50 dB or 30 dB (±1 dB). Switching at rear panel.
Frequency response: ± 1 dB 20 Hz to 20 kHz.
Signal to noise ratio: greater than 80 dB at threshold of limiting (30 Hz to 15 kHz bandwidth).
Threshold of limiting: —10 dBm at 30 dB position, —30 dBm at 50 dB position.
Distortion: less than 0.5% thd from 30 Hz to 20 kHz. Under worst case conditions (a predominant low frequency energy envelope causing 15 dB of gain reduction) the 50 Hz thd will not exceed 0.7%. Typical thd over the program spectrum bandwidth, with 20 dB of gain reduction is less than 0.3%.
Attack time: less than 250 µs to 0.5 ms depending on program material.
Release time: varies from 500 ms to 5.0s depending on the duration of the peak causing the onset of limiting.
External connections: Jones barrier terminals at rear.
Stereo interconnections: terminals at rear of chassis.
Power requirements: 110-125V ac, 50/60 Hz, 6W. Switch provided for 220-250V ac, 50/60 Hz.
Size: 8.9 x 21.6 x 23.5 cm.
Weight: 3 kg.

BL40 MODULIMITER

Essentially for broadcasting, the device incorporates both rms and peak limiting sections which can function both separately and in cascade.

Specification
Input impedance: 600 ohms bridged-T input control floating.
Output load impedance: designed to work into 600 ohm load.
Input level: —25 dBm to +25 dBm for 5 dB limiting.
Maximum output level: +27 dBm.
Gain: 70 dB with all controls at maximum.
Frequency response: +0, —0.8 dB, 30 Hz-15 kHz.
Distortion: less than 0.5% thd, 30 Hz to 15 kHz, at +24 dBm output.
Signal to noise ratio: better than 70 dB at threshold of rms limiting. Equivalent input noise less than —110 dBm.
Attack time rms section: signal dependent: 1 ms to 50 ms.
Attack time, peak section: 5 µs for 10 dB limiting.
Release time, rms section: signal dependent: 50 ms to 2s depending on duration of compression.
Release time, peak section: 100 ms.
Metering: 3 separate meters for: rms limiting, peak limiting, output level.
External connections: barrier strip on rear.
Power requirements: 110-120V ac, 50-60 Hz, 10W or 220-240V ac, 50-60 Hz, 10W.
Weight: 5 kg.

A new generation of sound recording mixers

SOUNDCRAFT ELECTRONICS LIMITED

5-8 Gt Sutton Street London EC1V 0BX Tel 01-251 3631/2/3 Telegrams Soundcraft LDN EC1
USA: 2025 Factory Street Kalamazoo Michigan 49001 Tel. (616) 382 6300

EMI AUDIO-VISUAL SERVICES LIMITED

Due to our policy of promotion within the Division, EMISON has a vacancy for a junior Operations Assistant, to undertake all types of studio work, eg speech recording, tape copying, editing, sound effects, etc, in our 8-track studio, and music recording in our 16-track studio.

Applicants must have a proven interest in, and knowledge of, music and have had at least one year's experience of work in radio or recording studios.

Apply in writing to the Director,

EMISON

23 Redan Place, London W2 4SA

WE CARE FOR OUR REVOXES— WHY NOT LET US CARE FOR YOURS?

We can do anything you can dream up for the A77 within reason, and without detriment to the normal performance of the A77. such as:

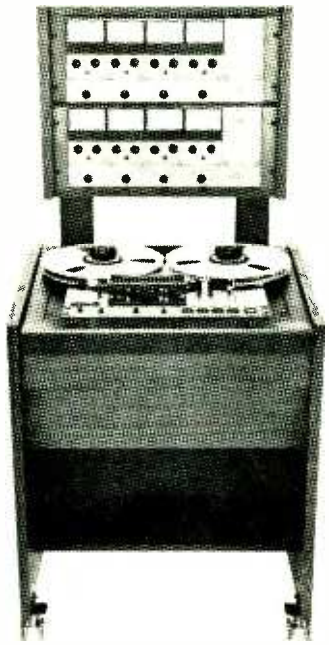
1 Any speed from 30 i.p.s. down to $\frac{15}{16}$ i.p.s. without any of the usual problems.
2 Improving specifications to the most amazing standards for the professional user.
3 Pause control.
4 Balanced line mic inputs with or without phantom speed up to 21 volts.
5 Cannon input and output.
6 RAPID SERVICE.

WE PROVIDE IMMEDIATE SERVICE TO THOSE WHO URGENTLY REQUIRE THEIR REVOXES.

Radio Recordings **Tel. No. 586 0064**

ALL MACHINES WE REPAIR OR MODIFY LEAVE US WITH A SPECIFICATION SHEET

THE SENSATIONAL TASCAM



$\frac{1}{2}$" 8-Track Studio Recorder

Now available for the first time in the UK and Europe.

● PROFESSIONAL PRICE ON APPLICATION ● EXPORT TO EUROPE OUR SPECIALITY

New Dokorder 8140 Multi-Sync Recorder

FOUR CHANNEL PRICE BREAKTHROUGH!

Similar facilities to Teac 3340. Three motors, 3 heads solenoid operation, electronic echo. Speeds $7\frac{1}{2}$ and $3\frac{3}{4}$ i.p.s. 7in spools, Mic and line mixing.

Nett Professional Price £329 + VAT
also available Model 7140. Details on request.

REW Professional Audio

146 Charing Cross Road, London WC2
For further details phone :
David Tarrant on 01-240 3064/5

Classified Advertisements

Advertisements for this section must be pre-paid. The rate is **12p** per word, minimum **£1.80.** Box Nos. **25p** extra. Semi-display rates on application. Copy and remittance for advertisements in **MARCH 1976** issue must reach these offices by **16th JANUARY 1976** addressed to: The Advertisement Manager, **Studio Sound,** Link House, Dingwall Avenue, Croydon CR9 2TA.

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

Replies to Box Nos. should be addressed to the Advertisement Manager, Studio Sound, Link House, Dingwall Avenue, Croydon CR9 2TA, and the Box No. quoted on the outside of the envelope. The district after Box No. indicates its locality.

STUDIO FACILITIES

★**Fanfare Records.** Tape - disc pressings, demo's, masters. any quantity. Studio/mobile Neumann disc cutter. S.A.E. brochure. 1 Broomfield Close, Rydes Hill, Guildford. Tel. 0483 61684.

RECORDS MADE TO ORDER

DEMO DISCS MASTERS FOR RECORD COMPANIES | VINYLITE PRESSINGS

Single discs, 1-20, Mono or Stereo, delivery 4 days from your tapes. Quantity runs 25 to 1,000 records PRESSED IN VINYLITE IN OUR OWN PLANT. Delivery 3-4 weeks. Sleeves/Labels. Finest quality NEUMANN STEREO/Mono Lathes. We cut for many Studios U.K./OVERSEAS. S.A.E. list.

DEROY RECORDS

P.O. Box 3, Hawk Street, Carnforth, Lancs.

Tel. 2273

★**J & B Recordings.** Tape to disc. 12 in. L.P. £4.00. 7in. 45 rpm £1.80. E.P. £2.00. Pressings—stereo/mono. Tape Copying, 14 Willows Avenue, Morden, Surrey. 01-648 9952.

CUSTOM CASSETTE

22 TREE ROAD, CUSTOM HOUSE, E.16

Professional high speed stereo-mono cassette duplication. Keen prices on short or long runs. Write for rate card. Reliable service.

★**For Sound Communication** use our open reel and mono/stereo cassette copying service. A prospectus describing our other services is available on request. Sound Communication (Publishers) Ltd., Field House, Wellington Road. Dewsbury, West Yorkshire WF13 1HF. Tel. 0924 469436.

Ce-Court Electronics are subcontractors to the Electronics Industry
Established in 1973 we have achieved a high reputation for quality and reliability
Facilities are available to undertake the following

PCB ASSEMBLY, CABLEFORMING, WIRE WRAPPING, CONSOLE & RACK WIRING SHEET METAL WORK
Prototype production

Please contact Mr S.F.Caldecourt
Ce-Court Electronics
Cambridge Trading Estate
Hanwell, London W7 3PA
Telephone 01-567 9672 3

WOLLENSAK 2770AV
CASSETTE FAST-COPIER
SCS *Appointed Main Dealers*
Demonstrations Personal Service Maintenance
Cassette Fast-Copying—Short or Long Runs
Full Information on Request
SOUND CASSETTE SERVICE (SSI)
PO Box 2, Gerrards Cross, Bucks SL9 8EG
Tel. 02813 84409

SOUND EFFECTS
for film, TV, stage and disc from our huge library of tapes collected since 1959
MAGNETIC EFFECTS LTD
23 REDAN PLACE LONDON W2 4SA
01-727 9801

FOR SALE—TRADE

★**For on site installation Wiring** and prewiring of patchbays, etc., call 01-891 2815.

★**For multistation** production intercoms made to measure call 01-891 2815.

★**For installation** hardware, racks, jacks, panels and connectors. call 01-891 2815.

★**Revox A77 tape machines.** Sales, service and hire. Full range of modifications available, i.e. high speed, self sync, etc. Ring Midland Sound Ltd., Rugby 71419.

★**E.M.I. Model TR51D** (½ track). 7½in. and 3¾in./sec record and replay machine for mobile professional use. Excellent condition. View/collect any time. £60 o.n.o. Tel. Shoreham-by-Sea 61108.

★**Studer A80** 16 track recorder with 8 track conversion kit. £8,250. Millard, 01-486 6466.

SALE

CONTENTS OF 16 TRACK STUDIO
Including: Tape recorders, Mixing consoles, Microphones, Reverberation devices, Dolbys, Compressor / Limiters, Delay units, Grand piano, Microphone stands, etc.

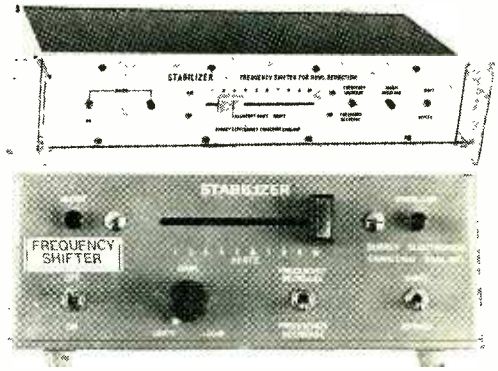
Viewing by appointment with Malcolm Jackson, **The Studios, Rickmansworth, Herts, England**
Tel. Rickmansworth 72351

★**NEAL Cassette Recorders.** Opportunity to own a famous machine at fabulous saving. Demonstration, display and review units — all models. Thoroughly rechecked to full specification by manufacturer and reboxed. Full guarantee. Example: Model 102 Mk1 at only £120 plus VAT (£150). Post enquiries only please. dB Associates, 75 Marlow Road, London SE20, or phone 08926 3150.

FOR SALE—TRADE (Continued)

★**Disc-cutting styli** for all types of mono and stereo disc-cutting heads. Heater windings fitted, relapping and specials. County Recording Service, London Road, Binfield, Bracknell, Berks. Tel. Bracknell 54935.

STABILIZER



With two years experience of frequency shifters the new Stabilizer includes all the features which have shown themselves to be desirable in a unit for howl reduction. It provides shifts between 1 and 10 Hertz either upwards or downwards and has a front panel gain control, signal overload LED and SHIFT/BYPASS switch as well as a mains switch and neon. This unit has a considerably lower noise level than any previous shifter and hum pickup within the small case is avoided by the mains transformer, and input transformer in the balanced version, being in mumetal cans. The input amplifier is protected from high voltage spikes on the signal line, whether from valve equipment or occurring through static or earth leakage voltages while a system is being plugged up. The output line driving amplifier is preceded by a 24 Hz high pass filter which not only provides further rejection of the shifting frequency but is general good practice before feeding into a power amplifier.

Available as a boxed unit with either balanced or unbalanced signal lines and as a rack mounting version offering studio quality slider 'SHIFT' control, duplicated jack and XLR connectors and a smart anodised finish with an engraved front panel.

+5Hz FIXED SHIFT CIRCUIT BOARDS for WW July 1973 article

Small enough to be built inside the cabinets of many amplifiers.

Complete kit and board £24 *Including psu and*
Board built and aligned £31 *mains transformer*

DESIGNER APPROVED

Write or ring for leaflet giving full specifications for this or any other item: STEREO DISC AMPLIFIER, 10 OUTLET DISTRIBUTION AMPLIFIER, MICROPHONE PREAMPLIFIER, PPM DRIVE CIRCUITS and Ernest Turner PPM MOVEMENTS 642, 643 and TWIN all meeting IBA requirements.

SPECTRUM SHIFTER:
Variable shifts 0.1-1000Hz for weird special effects on speech or music.

SURREY ELECTRONICS
The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG (STD 04866) 5997
CASH WITH ORDER less 5% UK post free. Add VAT at 8%

★**Uher 4000S.** Guaranteed overhauled to makers specification. £75 plus VAT. Also model 4000L. £115 plus VAT. AKG D109 mic to suit either machine. £15 plus VAT. Paul Simmon Ltd., 2 Market Street, Halifax, Yorks. Tel. 0422 52240/57442.

SOWTER TRANSFORMERS
FOR SOUND RECORDING AND REPRODUCING EQUIPMENT
We are suppliers to many well-known companies, studios and broadcasting authorities and were established in 1941. Early deliveries. Competitive prices. Large or small quantities. Let us quote.
E. A. SOWTER LTD.
Transformer Manufacturers and Designers
7 Dedham Place, Fore Street, Ipswich IP4 1JP
Telephone 0473 52794

FOR SALE—TRADE
(Continued)

★**Mixer 16 x 8,** also TEAC mixer and stereo 2 track Dolby. Pioneer reverb unit. Phone Rothley (053-724-2899).

SOWTER TYPE 3678
MULTITAP MICROPHONE TRANSFORMER
Primary windings for 600 ohm, 200 ohm and 60 ohm with Secondary loadings from 2K ohm to 10K ohm. Frequency response plus/minus ½dB 20 Hz to 25 kHz. Contained in well finished Mumetal box. 33mm diameter by 22mm high, with colour coded end leads, low distortion. DELIVERY (small quantities) EX STOCK. HIGHLY COMPETITIVE PRICE. FULL DETAILS ON REQUEST
E. A. SOWTER LTD, Dedham Place, Ipswich, IP4 1JP Telephone 0473 52794

RAC MIXERS

Custom - built mixers for groups, P.A., hospital broadcasting, recording, discos, etc, RAC plug - in audio modules for building your own mixers.

Sony, Akai, TEAC, Tandberg, Marantz, Lux, Nikko, Dual, Quad and Armstrong dealers. Shure, Calrec, AKG mikes and stands, etc. APRS Manufacturing members.

RUGBY AUTOMATION CONSULTANTS
19 Freemantle Road, Bilton, Rugby Warwickshire CV22 7HZ
Tel. 0788-810877 (Rugby)
Call, write or phone us

★**Microphones**—AKG D202EI £53.75 D190C £25.10; Calrec capacitor CM602/652 £25.80; Shure 548 £44.83 including VAT and carriage. Send for full lists. Soundbox, Haywards Heath, Sussex.

★**Nagra III** and IV and SN models available. Immediate delivery. Write or phone J. J. Francis (Wood Green) Ltd., Manwood House, Matching Green, Harlow, Essex. Tel. Matching 476.

FOR HIRE

Revox A77 (hs + standard, NAB + CCIR, Vari-pitch, Vari-speed, etc.), AKG, BX20, Quad 303, Revox A78, Spendor Speakers, mic stands, etc.

FOR SALE

Ten different colours of 14/.0076 x 2 braided mic cable, all Revox equipment, 45in. spring tensioned mic arm, ⅜in. thread for stand adaptors, designed for D202, etc.

RADIO RECORDINGS
01-586 0064

★**Audiofact No. 1!!** You can build 8 Cathedral Complimiters into your mixer for less than the cost of the one medium price competitor—and they perform. We also manufacture a range of high quality audio modules. S.a.e. details. Cathedral Sound, Fourways, Morris Lane, Halsall, Lancs L39 8SX. Tel. Halsall (0704) 840328.

★**Disc-Cutting** System, mono, Neumann heads, amplifiers, limiter, monitors, PP meter, would fit most lathes, £500. Lockwood Major roof-mounting monitor speaker, £110. ESE graphic Equaliser £20. Deroy, PO Box 3, Carnforth, Lancs.

FOR SALE—PRIVATE

★**Revox A700.** purchased June 1975, used very little. Perfect condition, £600 o.n.o. Tel. 01-863 8080.

★**Pair of JBL L200 speakers.** Twelve months old and in immaculate condition. At present in normal domestic use, but are also perfect speakers for studio monitoring. Current rec. retail price, including VAT, almost £1,400. Am prepared to sell for £700. Demonstration if required. Phone 0276 72897.

★**2 only Fi-Cord 1200A** cardioid condenser microphones (3000L) c/w power supplies, £28.50 each. Tel. Worcester 424845.

★**8 track machine,** one inch tape, valve-based electronics, manual deck. Quiet and reliable. £1,200. Ring Medway (Kent) 250762.

★**Microphone sale,** AKG C60 £65 each. AKG D25 £25 each. AKG D19 £15 each. AKG D109 £8 each. Call 01-891 2815.

★**For sale.** Revox A77 high speed £250 each. Vortexion Stereo CBL6 £85. Ferrograph 5 Mono £65. Call 01-891 2815.

★**EMI TR53** variable speed tape player £85. Vortexion mixer £18. Tape echo £25. Fisher reverb £20. Kelly 15in. speaker £12. Constant voltage transformer £12. Offers welcomed. Melton Mowbray 822586.

★**Nagra III.** FET amps, extra mic amps, mains unit, case. One private owner. Guaranteed. Offers on £550. Box 709. (East Midlands.)

TRAD

CARDINGTON 404

All Studio Equipment bought and sold.

See our advertisement on page 31.

Dog House, Cople, Hertfordshire

BRITISH PATENT No. 1,210,590

Telephone paging system and method. Owner desires commercial exploitation on reasonable terms by licence or sale. Inquiries **Fitzpatricks, 14-18 Cadogan Street, Glasgow G2 6QW** and **Warwick House, Warwick Court, London WCIR 5DJ.**

★**The Audio Amateur**—a quarterly publication for the serious audio constructor. Free prospectus. The Audio Amateur, Yellow Oak Cottage, Tillington, near Hereford HR4 8LQ.

★**Radio Commercials**--an exciting advertising media. If you have practical experience in voice over work, script writing or technical production; or if you think your studio has ideal facilities for production in this field—we'd like to hear from you. Write, with full details to Box No. 713.

WANTED

★**16 track professional recorder.** Write giving details to A.S.R. Ltd., 72 High Street, Syston, Leicestershire.

★**Mixers needing attention.** Also 10-2 mixer in good condition. REMN4 Gimblett, 3K5 Mess, H.M.S. Ark Royal, B.F.P.O. Ships, London.

★**Small** professional studio, just opening needs any equipment, mikes, stands, Revoxes, headphones, etc. Epsom 24870.

★**All Nagra** equipment urgently required for cash. J. J. Francis (W.G.) Ltd., Manwood House, Matching Green, Harlow, Essex CM17 0RS. Tel. Matching 476.

OPPORTUNITIES

★**Young man (22) requires partner,** interested in opening professional studio (Liverpool or Manchester area). Must be competent, enthusiastic and have cash and/or decent recording equipment. Telephone John 051 652 6936 (evenings). No mercenaries or businessmen please.

SERVICE ENGINEER

F. W. O. BAUCH LIMITED

A vacancy exists for a service engineer seeking varied and interesting work in the professional audio field. The successful applicant should have a sound knowledge of electronics and some mechanical aptitude. Previous experience of professional broadcasting or recording studios would be an advantage.

The post involves repairing and servicing high quality audio equipment both in our own laboratory and in the field. Salary negotiable.

Apply in writing directly to:

49 Theobald Street, Boreham Wood, Herts WD6 4RZ

SITUATIONS VACANT

★**The Manor Studios** requires a second maintenance engineer. Extensive experience with professional recording equipment essential. Ring Barbara on Kidlington (08675) 2128.

★**Busy 24 track south London studio** has vacancy for trainee Tape Op/Assistant Engineer. Applicants must have basic technical qualifications, be familiar with multi-track recording techniques and have at least two years working experience in sound recording. Box No. 710.

★**Chief engineer** experienced in studio installation and multitrack recording. Looking after an open position in progressive studio. Europe or overseas. Reply Box No. 712.

SITUATIONS—WANTED

★**Bright, hard-working young man** seeks position as tape operator (trainee sound engineer). Please contact Peter Wandless, 5 Orde Close, Pound Hill, Crawley, Sussex. Tel. Pound Hill 3244.

INDEX TO ADVERTISERS

A
Acoustical Manufacturing (Quad) .. 43
Alice (Stancoil) Ltd. 45
Allen & Heath Ltd. 4
Audix Ltd. 19
AV Distributors 45

B
Bauch, F. W. O., Ltd. 27
Beyer Dynamics 49
Brenell Engineering Co. Ltd. 39

C
Cadac (London) Ltd. 2
Ce-Court Electronics 29

D
dbx incorporated 25
Duplitape 51

E
Edric Films Ltd. 29
Emison 59

F
Feldon Audio Ltd. 31
Future Film Developments 53

H
Hammond. C. E., & Co. Ltd. (JBL) .. 41
Hampstead Hi Fi 15
Hayden Labs Ltd. 7

I
Ind. Tape Applications 9, 11

K
Klark Teknik Inc. 44

M
Macinnes Labs Ltd. 37
Magnetic Tapes Ltd. 6
Mellotronics Ltd. 37
Mustang Communications 6

N
Natural Sound Systems 41
N.T.P. Electronik A/S 29

R
Radio Recordings 59
Raindirk Ltd. 8
Revox 64
R.E.W. Audio Visual Ltd. 59
Rugby Automation Consultants 29

S
Sansui 56, 57
Scenic Sounds Equipment 13
Sescom Inc. 8
Shure Electronics 63
Soundcraft Electronics 59
Spectra Sonics 23
Surrey Electronics 22
Squire's Roger 5

T
Tannoy 8
Trad 31
Trident Audio Developments Ltd. .. 49
Tweed Audio 39

W
Wilmslow Audio 6

Z
Zero 88 Lighting Ltd. 4

CLASSIFIED ADVERTISEMENTS ORDER FORM

Please use this coupon for your private sales and wants. Rates 12p per word. Minimum £1·80. Box Nos. 25p extra. To: *Studio Sound*, Classified Advertisements Dept., Link House, Dingwall Avenue, Croydon CR9 2TA. Please publish the advertisement indicated below for ..... insertion/s under the heading .....

Name .....

Address .....

.....

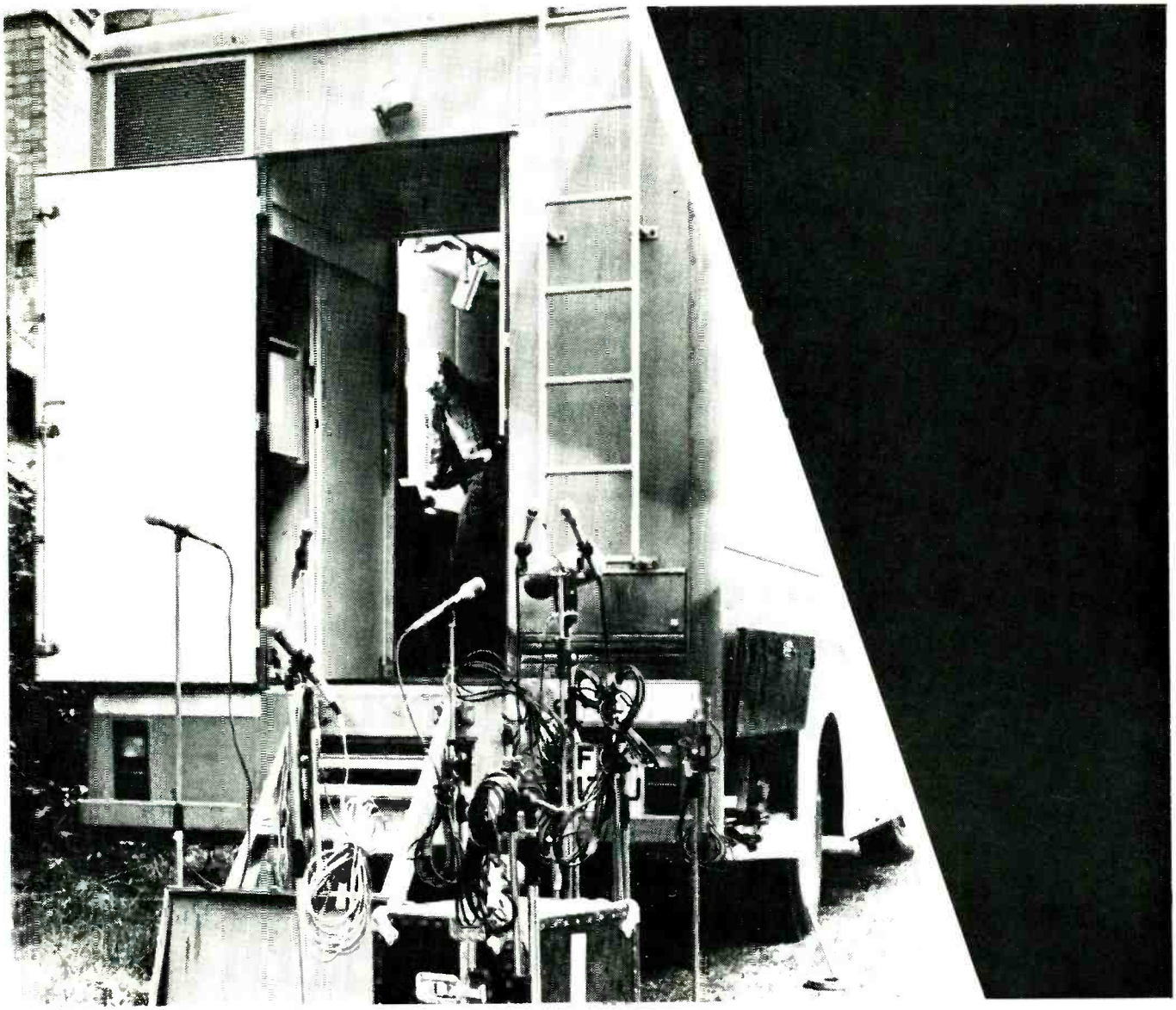
Cheque/P.O. enclosed £ .

Is a Box No. required Yes/No. If no, please include remittance to cover name and address and/or Tel. No.

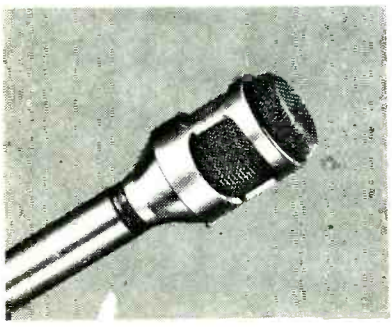
Please write in block capitals.

Link House Publications Ltd.. Registered in England No. 96948. Registered Office: 10/12 South Crescent, Store Street, London WC1E 7BG.

Published by the Proprietors, Link House Publications Limited, 10-12 South Crescent, Store Street, London, WC1, and printed by Arthurs Press Limited, Woodchester, Stroud, Glos. GL5 5PB.



Stones' Rolling Studio



A complete recording studio in a van? For Mick Jagger, it is almost a necessity. Mick and the Stones can be inspired to produce their next hit anytime, but when they're on tour or on vacation, the best recording studios aren't always around the corner. The Stones rely on their Shure-equipped mobile studio for the unmatched recording perfection they insist upon, for these moments of midnight inspiration. Whether in a recording session or on stage, the Stones' SM53, SM58, SM5C, SM33 and SM54 microphones are their assurance of consistent quality and natural sound.

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

SHURE®

First to last

When the Revox A77 MK1 first appeared in November 1967 it was acclaimed "The Magnetic recording masterpiece of our time".

To-day—more than 8 years and hundreds of thousands of A77's later the current MK IV version continues to outperform and outlast its contemporaries in every role—from home recording to digital data acquisition and 24 hours-a-day automated broadcast applications.

Now save yourself the cost of experimentation in tape recording – select the Revox A77 the recorder that will neither add to nor detract from the original.

Contact your nearest Revox Dealer for a demonstration.

The Revox A77 MKIV

buy it first it's built to last

REVOX

Revox C. E. Hammond & Co Ltd., Lamb House, Church Street, London W4 2PB.
Revox Corporation 155 Michael Drive, Syosset N.Y. 11791 U.S.A.
Revox Corporation 3637 Cahuenga Boulevard West, Hollywood, California 90068.
Revox International Regensdorf 8105 ZH, Althardstrasse 146, Switzerland.