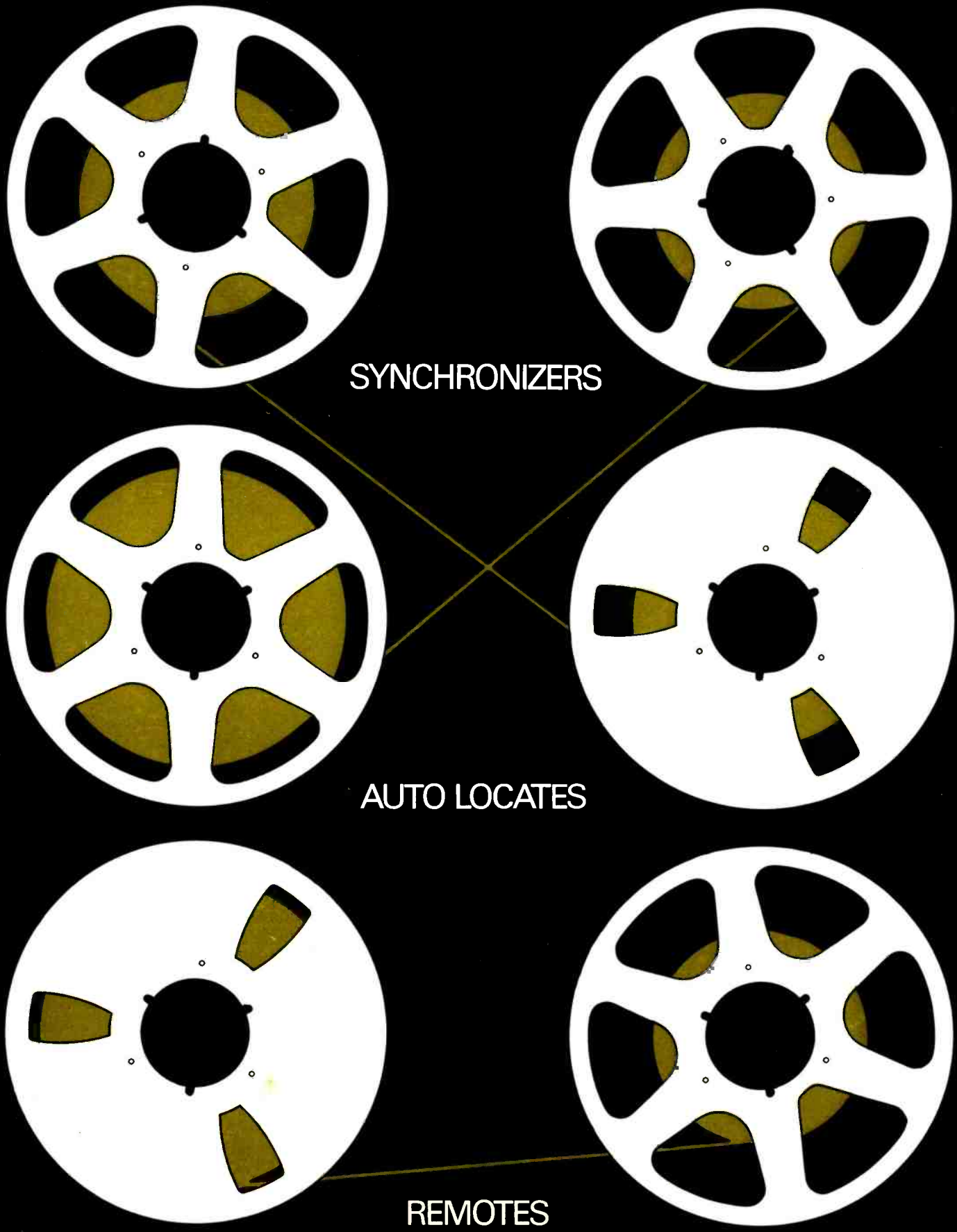
January 1976 35p

studio sound

AND BROADCAST ENGINEERING




Estudios Gema
Barcelona
El souido del nombre
es el nombre del souido.
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 826323

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

This month, for the first time, we have collected a survey of tape transport control equipment. Although such auxiliary equipment has been around for some time in various forms, it is really only recently that it has proliferated to the extent that it is a subject in its own right.

However novel the idea of synchronising level or switching to tape (and therefore music) motion may seem, in context it is simply the extension of a mechanical function already necessary and present. The idea of stabilising tape motion with respect to a reference frequency, that of the mains supply, was developed long ago to maintain constant motion; and that was the only objective.

However, now we have the option of reaching much farther. We have already become accustomed to simple extensions such as synchronisation (which is effectively just another use of a common frequency reference but incorporating feedback into the system) and even to coding the time sequence itself so that we can perform autolocate and autocue functions.

To another side, we are also able to synchronise level changes with tape motion; the familiar word is automation, however abused that might have been in the past. Thus, we have developed over the past very few years to a stage where all functions can be made repeatable. The mix then becomes a series of adjustments to a set progression already memorised.

Thus, the rearrangement-of-a-well-known-phrase-or-saying-in-three-minutes-flat becomes a much more leisurely process; with the tape control available, we have reached a point where the mix can be set up to any desired point by the simple insertion into the system of the appropriate program key.

Basic technique looks like changing yet again, to accommodate. It becomes easier to set up, and level decisions can be almost eliminated from the recording stage. Eventually, though, some balance between decision postponement and real-time working has to be reached, if cost effectiveness appears anywhere on the horizon. That, however, is up to the individual engineer. For him, though, the more options, the better.

contents

FEATURES

COLUMNS

REVIEWS

JANUARY 1976 VOLUME 18 NUMBER 1

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.

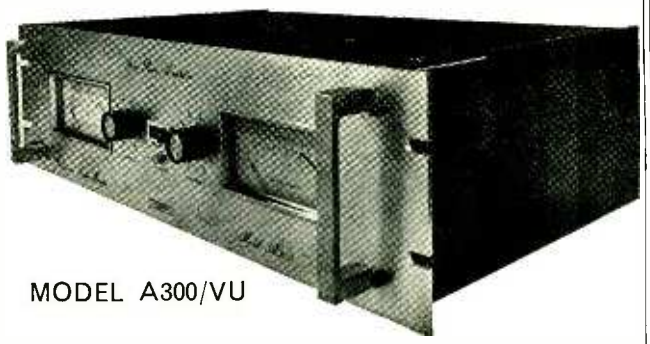
M10/2 Mk4 BASIC	..	**£365·00+VAT**
16 input version	.. ..	**£530·00+VAT**
12 in 4 out Mk2	.. ..	**£580·00+VAT**

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

Telephone 01-876 7957

—TURNER—

STEREO POWER AMPLIFIERS



MODEL A300/VU

A range of professional stereo power amplifiers designed and manufactured to a very high standard.

The A Series (Professional Studio Monitor) amplifiers feature dual power supplies to maintain full RMS power on both channels.

The B Series (Professional) amplifiers feature single power supplies suitable for most music applications.

		STANDARD	*WITH VU's*
MODEL A500	250+250 watts RMS, 4 ohms	**£380·00**	**£440·00**
MODEL A300	150+150 watts RMS, 4 ohms	**£262·50**	**£322·50**
MODEL B300	150 watts RMS per channel	**£210·00**	**£250·00**
MODEL B200	100 watts RMS per channel	**£170·00**	**£210·00**

The above prices are list and exclusive of VAT.

TURNER ELECTRONIC INDUSTRIES LTD
175 Uxbridge Road, London W7 3TH
Tel. 01-567 8472

TAKE YOUR PICK

BIAS ELECTRONICS
and
LEEVERS-RICH
EQUIPMENT

Following the merger between the two companies we are pleased to announce that, with the increased production capacity now available we can offer the Leevers-Rich and Bias range of professional recorders on much shorter delivery.
For all your requirements in the broadcast, studio and educational fields enquire about our range of 6.25mm recorders, cartridge machines and bulk erasers.

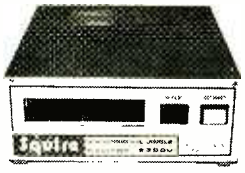
LEEVERS-RICH EQUIPMENT LIMITED
incorporating **BIAS ELECTRONICS**
319 TRINITY ROAD, WANDSWORTH,
LONDON SW18 3SL **01-874 9054**

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**

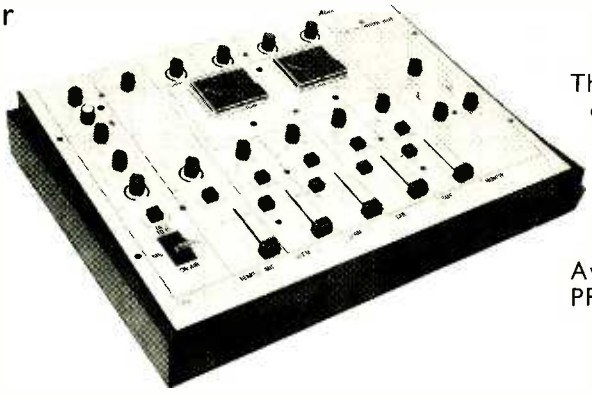
BROADCAST TURNTABLES

Russco Sparta
£175 **£295**

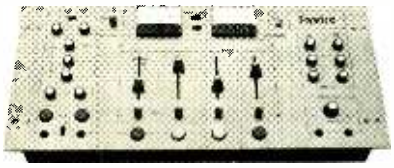
INSTANT START

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.

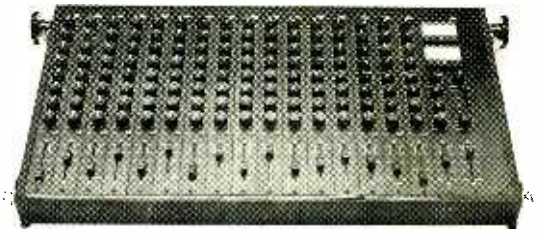


This mixer can be operated MONO or STEREO and will take up to 8 inputs. All channels have remote switching. This mixer meets and exceeds IBA specifications.
Available ex-stock. NETT PROFESSIONAL PRICE **£465**



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

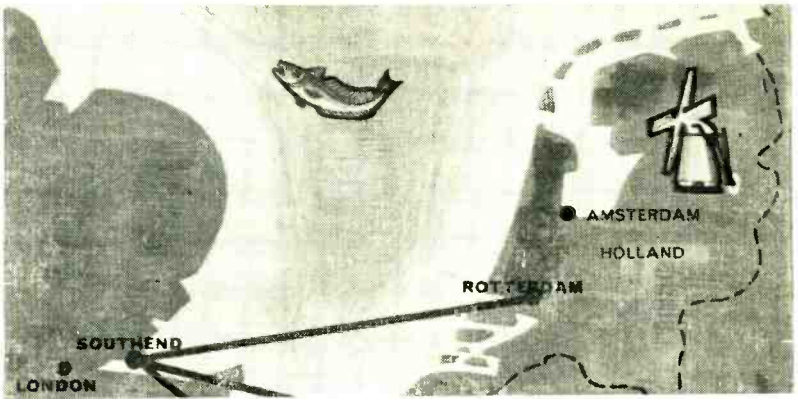
PARTRIDGE ELECTRONICS

Announce the Appointment of

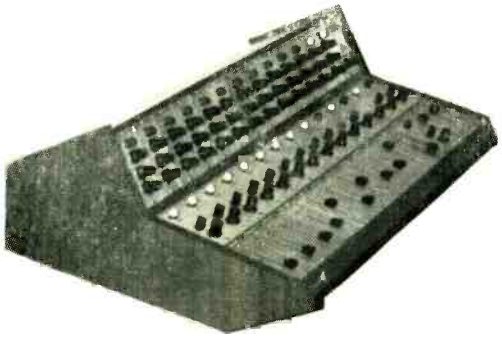
SOUND TECHNIQUES

as our official Agents for

HOLLAND



Distributors and stockists of our full range of Audio Mixer Systems and Sub-Assemblies.



Specialist technical enquiries to:—

PARTRIDGE ELECTRONICS
21-25 Hart Road,
Benfleet,
Essex, England.
Telephone: 03745-3256

Enquiries for Holland to:—

SOUND TECHNIQUES
P.O. Box 206,
Alkmaar,
Holland.
Telephone: 072-12944

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

POWER AMPLIFICATION BY MUSTANG

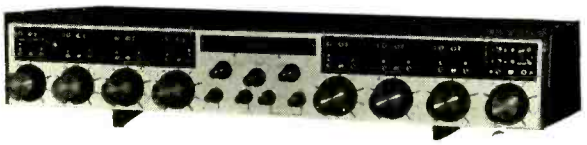
Our SS.100 and SS.50 are economical amplifiers with outputs of up to 150 and 80 Watts RMS into 8-15 ohms, typical THD figures being 0.1%, slewing rate > 10v/μs, noise > 90dB down, zero level input, and full electronic protection.
Considering these points with their proven reliability and robust construction, 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

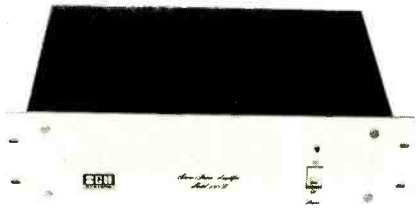
RAMKO RESEARCH

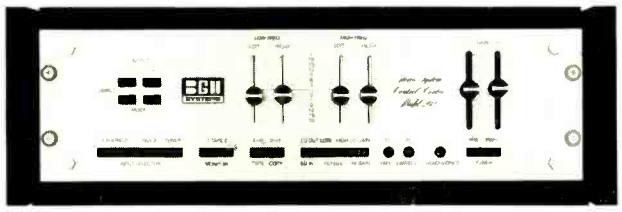


Broadcast stereo and monaural audio input control consoles featuring silent C/MOS Solid State touch pad switching with LED status indication, noiseless DC controlled attenuators, LED type VU meters, mon-mix outputs on stereo consoles, full cuing, muting, and monitoring.

Ramko also manufactures a full complement of turntable equalized preamplifiers, audio line and distribution amplifiers, monitoring amplifiers, and automatic tape cartridge and cassette loaders.

BGW SYSTEMS





Professional stereo and monaural audio power amplifiers with power outputs ranging from 85 watts RMS to over one kilowatt. Extremely fast response IC operational amplifier front end. Single-diffused high dissipation power transistors with high degree of redundancy for extremely rugged and dependable output stage. Circuit breaker and fast acting electronic crowbar for protection against overloads and potentially destructive surges or output transistor failure. Automatic power line current inrush limiter prevents line circuit breaker tipping when amplifier is turned on. Modular construction for ease of maintenance. Wide frequency/power bandwidth with minimum distortion. The use of highest grade components such as all hermetically sealed can transistors, carbon film resistors, teflon insulated harness wiring, expoxy glass circuit boards, and huge fan cooled heat sinks all assure maximum dependability. The perfect audio power amplifiers for all applications from rock groups to your own parlor.

In addition, BGW has commenced production of a stereo control preamplifier with all the outstanding features and performance that characterize all BGW Products.

Telesco International Corporation manages international sales for both Ramko Research and BGW Systems, distributorship for some countries is still open. Current Distributors in Europe include:

SPAIN
Commercial Lavilla
Rocafort, 249
Barcelona -15-Spain

ENGLAND
Webland International
Post Office Box 326
London, England W2

GERMANY
Imperial Electronics Import
GMBH
Otto-Hahn-Strs. 12
D6079 Sprendlingen,
West Germany

BELGIUM
Delta Equipment
Rue de Calevoet, 112
1180 Bruxelles, Belgium

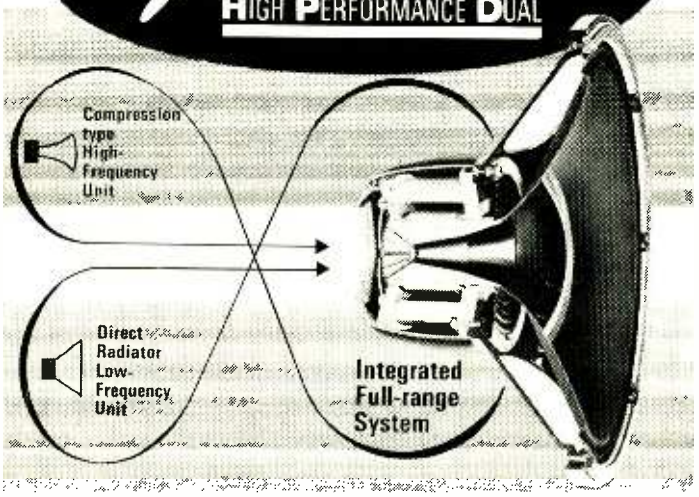
THE TELESCO INTERNATIONAL CORPORATION

One Dupont Street South, Plainview, New York 11803, U.S.A.

CABLES: TELESCOMM — TELEPHONE: 516 - 433 - 6210

THE *New* TANNOY *Monitor*

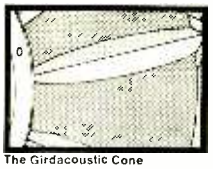
HIGH PERFORMANCE DUAL



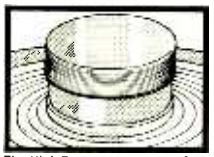
The Monitor H.P.D. represents a further outstanding improvement of a loudspeaker system which has become regarded as a quality standard over the last 25 years by Recording Studios throughout the world. There is a very good chance that your favourite records and tapes were monitored on Tannoy Dual Concentric 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.)

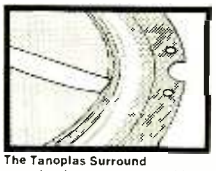
*INTEGRATED PROGRAMME MATERIAL



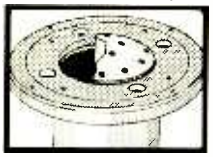
The Girdacoustic Cone improves frequency and transient response, gives much increased power handling capacity and greater mechanical stability



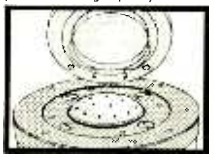
The High Temperature Voice Coil assures absolute climatic stability and great mechanical strength together with much improved power handling capacity



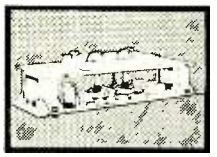
The Tanoplas Surround gives low bass resonance with excellent mechanical stability and freedom from edge reflections.



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

TRAD

SALES and SERVICE

Telephone: Cardington 404

Specialists in Service and Repair of T.R.D. recorders.

All parts, motors, etc available. Collection and delivery:— London and Home Counties.

FOR SALE

16 Track **Studer** A80
16 ,, **Ampex** MM1000 + 8T H/Block Varispeed
8 ,, **3M** M28
8 ,, **Scully**
8 ,, **Scully** Replay only
8 ,, **Ampex** AG440
8 ,, **Scully** new Richardson amps
4 ,, **Scully** Replay only
8 ,, **Leevers-Rich** new Richardson amps
8 **Dolby** 301 units with all remotes, racks, etc.
stero **Ampex** 350 perfect
1 **Leevers-Rich** E200 as new
1 Pair **Lockwood** Cabs with reds
1 Ditto, with golds
1 Pair **Spendor** BCIII
1 **Neumann** U67
1 **Neumann** U47 valve type
2 **Electrovoice** rifle mics
Various **AKG** Types C28, C60, 202, etc.
Alice 10-4-8T monitoring desk
Neve 28-24 quad mon, etc.
Neve 16+4 aux—16 desk
Triad "B" 16-8-16 desk

LOTS OF OTHER EQUIPMENT

WANTED

8 Track **Ampex** MM1100—*URGENT*

DOG HOUSE
COPLE, BEDFORDSHIRE

Telephone: Cardington 404

NOW AMCRON INTRODUCE THE D150A!

* DC coupled throughout
* Drives into 1 ohm
* Rack mounting

* Stereo-Mono switch
* 200 watts per channel
* Ex-stock delivery

As a logical follow-up to the world-beating DC300A, AMCRON have introduced the D150A power amplifier to replace the old D150. This superb new amplifier will operate into load, down to 1 ohm, is DC-coupled throughout, provides up to 200 watts rms from one channel, and has newly designed heatsinks to handle the extra power. Other features include level controls on the front panel as well as a mains power switch, and mains warning lamp. On the rear of the D150A is a switch which allows the user to select either a Mono or Stereo operating mode. As a monitoring, or PA amplifier, the D150A is really a delight, and is said to be a 'Baby' DC300A! Certainly where the higher power of the DC300A is not required, the D150A is the obvious choice.

Our London stockists for all AMCRON equipment are REW (Audio Visual) Ltd., 146 Charing Cross Road, London WC2. Tel. 01-240 3883, and also at 10-12 High St., Colliers Wood, London SW19. Tel. 01-540 9684, and K. J. Leisure Sound, 48 Wigmore Street, London W1. Telephone 01-486 8263.

Or Direct to sole agents:

MACINNES LABORATORIES LTD.
MACINNES HOUSE, CARLTON PARK INDUSTRIAL ESTATE,
SAXMUNDHAM, SUFFOLK IP17 2NL
TEL: (0728) 2262 2615

RADFORD

AUDIO MEASURING INSTRUMENTS

LDO3. LOW DISTORTION OSCILLATOR
A continuously variable frequency laboratory oscillator with a range 10Hz-100kHz, having virtually zero distortion over the audio frequency band with a fast settling time.

Specification:

Frequency range:	10Hz-100kHz (4 bands)
Output voltage:	10 volts r.m.s. max.
Output source resistance:	150 ohms unbalanced (optional 150 ohms unbalanced plus 150/600 ohms balanced/floating)
Output attenuation:	0-100dB (eight, 10dB steps plus 0-20dB variable)
Output attenuation accuracy:	1%
Sine wave distortion:	Less than 0.002% 10Hz-10kHz (typically below noise of measuring instrument)
Square wave rise and fall time:	40/60 n.secs
Monitor output meter:	Scaled 0-3, 0-10 and dBV
Mains input:	110V/130V, 220V/240V
Size:	17" (43cm) x 7" (18cm) high x 8¾" (22cm) deep **£275.00**

LDO3B. LOW DISTORTION OSCILLATOR
As **LDO3** but additionally fitted with output amplifier and transformer providing a 600 ohm floating balanced output. Unbalance: —80dB 1kHz, —60dB 10kHz. **£375.00**

DMS3. DISTORTION MEASURING SET *(illustrated above)*
A sensitive instrument with high input impedance for the measurement of total harmonic distortion. Designed for speedy and accurate use. Capable of measuring distortion products down to 0.001%. Direct reading from calibrated meter scale.

Specification:

Frequency range:	5Hz-50kHz (4 bands)
Distortion range (f.s.d.):	0.01%-100% (9 ranges)
Input voltage measurement range:	50mv-60V (3 ranges)
Input resistance:	47K ohms on all ranges
High pass filter:	12dB/octave below 500Hz
Power requirement:	2 x PP9, included
Size:	17" (43cm) x 7" (18cm) high x 8¾" (22cm) deep **£225.00**

HSV1. HIGH SENSITIVITY VOLTMETER
Average reading: 10μV to 300V f.s.d. **£125.00**

HSV2. HIGH SENSITIVITY VOLTMETER
True r.m.s. reading: 10μV to 300V f.s.d. **£175.00**

ANM1. AUDIO NOISE METER AND HIGH SENSITIVITY VOLTMETER
Average reading: 10μV to 300V f.s.d. Includes Wide band, Audio band, IEC curve 'A' and CCIR weighting networks. **£150.00**

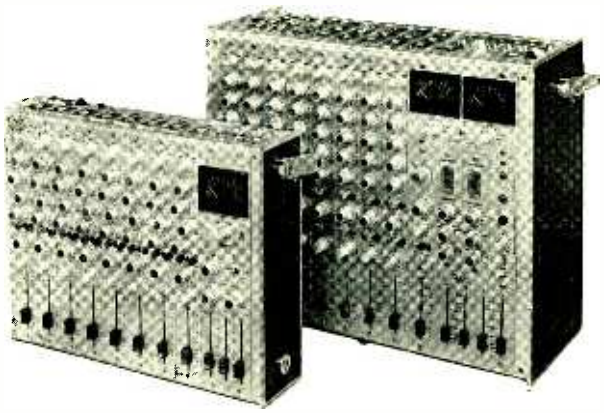
ANM2. AUDIO NOISE METER AND HIGH SENSITIVITY VOLTMETER
As **ANM1** but true r.m.s. reading **£200.00**
Size of all Voltmeters 11¼" x 7¼" x 7½"

Send for leaflets for further details:

Radford Laboratory Instruments Ltd
ASHTON VALE ROAD, BRISTOL BS3 2HZ, AVON
Tel. 0272 662301

AUDIO DEVELOPMENTS

PORTABLE MIXERS



AD 031 and AD 007

The Portable Mixers with the professional qualities and the professional performance.

Both have 8 inputs that drive into 4 or 2 groups.

All inputs and outputs balanced using XLR connectors throughout.

Peak Programme Meter to BS4297/1968 specification. (V.U. meter optional.)

Auxiliary for use on either echo or foldback.

Stereo linkable compressors on the AD 007.

Extender Units that can incorporate 10 extra input modules

Size: 540 x 480 x 225 mm AD 007
420 x 335 x 127 mm AD 031

Weight: 22.7 Kg AD 007, 10 Kg AD 031

Modular construction to promote serviceability.

Both mixers can be hired and National Sound Reproducers of Northolt Road, South Harrow, Middlesex, are agents for hire in the London area.

The following agents have been appointed:

AUSTRIA
Mr. Drott,
M. R. Drott K.G., Johannesgasse 18.
A-1015 Wien.
Tel. 0222/524545.

CANADA
Mr. Derek Roughton.
Double Diamond Electronics Ltd.,
200 Consumers Road, Suite 105.
Willowdale, Ontario.
Tel. 494 1453.

FRANCE
M. Gerard Buisset, R.E.D.
Rue de Telegraphe, 705020 Paris,
Tel. 636.73.10.

NETHERLANDS
Mr. D. Zijlmans,
Sound Techniques, Postbus 206,
Alkmaar.
Tel. 072-12944.

ITALY
Dr. Paulo Curti Gialdino.
Laboacustica, Via Muggia 33
00195 Rome.
Tel. 381.965-355.506.

NORWAY
Mr. Biorn Benum,
Siv. Ing. Benum & Co.. Boks 2493,
Solli, Oslo 2.
Tel. (02) 56.57.53.

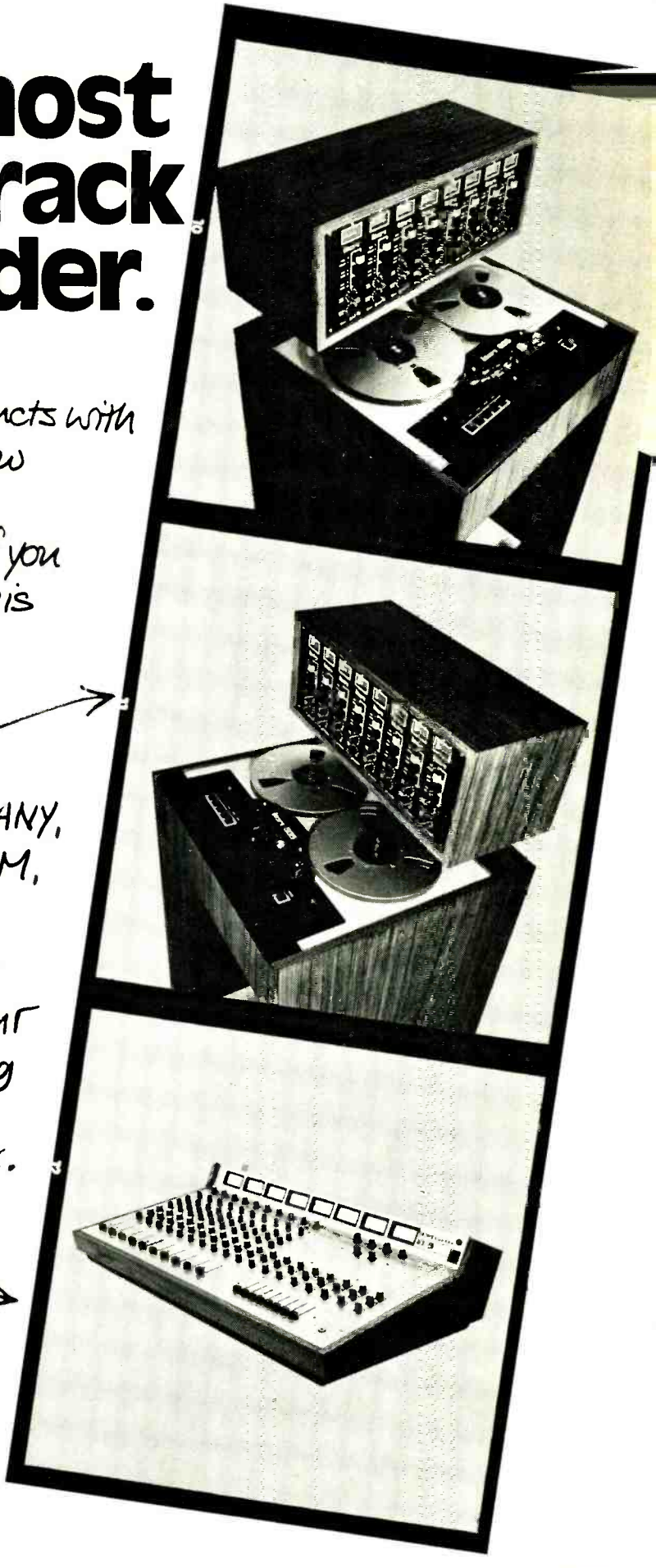
SWEDEN
Mr. Jan Setterburg.
Tal & Ton, Brevkortsgatan 11,
431 36 Molndal, Sweden.
Tel. 031.130205.

Enquiries are invited from energetic Companies with well-established contacts to market our product in countries not yet represented.

Audio Developments

Hall Lane
Walsall Wood
Walsall
WS9 9AU
Brownhills 5351/3

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.

letters

Dear Sir, I was particularly interested in the review by Hugh Ford of the Cooper Time Cube. During the late 1940s while working in the Research Laboratory of the British Thomson Houston Company we developed and patented a delay unit of exactly the same type as the Cooper Cube. Several were manufactured and installed in Odeon theatres and the Blackpool Tower complex, the delay being inserted in the amplifier system feeding loudspeakers mounted well forward of the stage microphones.

The technique was almost exactly the same as that now used in the Cooper Cube, time delays up to about 105 milliseconds being obtained for a 100ft length of rubber hose. Pre-emphasis was used to compensate for the frequency dependent losses in the delay line. To obtain several values of time delay the hose was cut at the appropriate point and a standard type of brass coupler inserted.

These delay systems worked very well, having all the advantage and limitations noted by Hugh Ford, but the device was obviously produced 25 years too soon.

Yours faithfully, James Moir, James Moir & Associates, Acoustical Consultants, 16 Wayside, Chipperfield, Hertfordshire WD4 9JJ.

Dear Sir, Thank you for sending me a copy of Hugh Ford's review of the BGW 750A. *I have studied the review and think it might be useful to elaborate on a few of the points raised by Mr Ford in his review.* (See p46—**ed**)

The design philosophy behind the whole range of BGW amplifiers is to provide users with units capable of withstanding the most severe conditions of use (and abuse) without sacrificing the fidelity of reproduction, be it music in a recording studio or sinewaves in an industrial application. The BGW amplifiers are designed to drive continuously any load of greater than 2 ohms impedance and to drive highly reactive loads without distortion or limiting. The output stages used are capable of withstanding the full loads likely to be imposed on them and thus the need for current and voltage limiting circuitry has been eliminated. However, some form of protection still has to be incorporated to guard against severe overdriving of the amplifier, short circuit load conditions and the unlikely event of amplifier malfunction. The BGW amplifiers are protected by an electronic crowbar circuit which discharges the dc power supply and triggers a high speed magnetically operated circuit breaker.

Experience has shown that this is only likely to be triggered by a short circuit output or very large transient signal inputs. Bursts of hf from re-winding tapes seem to give no trouble—but they are likely to damage the tweeters in most loudspeakers. In normal use the amplifier runs quite cool, the thermal trips are therefore unlikely to operate and as stated in the review operate independently on each channel. The more expensive BGW 1000 *is fitted with over temperature indicators. Mr Ford has in fact described the air flow through the amplifier incorrectly. Air is drawn in through the rear of the unit into the main body of the amplifier and discharged over the heatsinks and out of the perforated end covers of the case.*

The 750A *was designed to be as rugged and reliable as possible and hence the most consistent and reliable single diffused output devices had to be selected. Any user requiring a slightly 'faster' amplifier with slightly lower levels of THD and IM distortion might like to look at the BGW* 500D *which does employ faster output devices. We do not consider that the use of a high speed op-amp is negated by using slower output devices. The choice of the high speed device offers a much wider open-loop bandwidth than that available from the devices often used in audio amplifiers. This minimises the likelihood of any forms of transient distortion occurring in the input stages of the amplifier—and if you don't believe in transient distortion then rest assured that the high speed device sounds better!*

The manual supplied with the 750A *was a provisional one and the full manual will be available shortly. The fuse inside the unit is part of the power supply start up circuitry, when the relay is energised and the load connected, a few seconds after switch on, this fuse is by-passed. So the fuse is not in circuit during normal operation. The layout of the unit which allows a single fan to cool the transformer and the two unexposed heatsinks coupled with the facility for rapid removal and replacement of the power amp modules necessitates having the input, output and power supply cables grouped and wired to a single multi pin plug. The hum measured by Hugh Ford in his tests is induced by radiated field from the power transformer. Channel one is directly above the power transformer, and therefore picks up more stray field than channel two. BGW have been trying to improve the power transformer to reduce this stray field. Although the published specification called for 110 dB, this has now been revised to 105 dB. This has no practical consequence and will not degrade the signal-to-noise ratio in a system.*

I hope the above comments will be of interest to you and your readers.

Yours faithfully, Philip M. Swift, Technical Director, Webland Electronics Ltd, 117-121 Wandsworth Bridge Road, London SW6 2NA.

Dear Sir, We have in front of us the October 1975 issue of STUDIO SOUND *which contains Mr Hugh Ford's and Mr Angus McKenzie's review on the Revox* A700 *tape recorder.*

In our opinion both reviewers have come to some wrong conclusions whenever they criticise a particular aspect or performance detail of the recorder. In fact we had already occasion to communicate with Mr McKenzie some six months ago, because we had seen a similar review under his name elsewhere. At that time we discussed with him the recorder's input, which he considers as being too high in impedance and too noisy. It is not difficult to prove that both statements need some correction. While it is true that the impedance is 6k ohms at 1 kHz, it drops to 1.8k ohms at the extreme ends of the audio spectrum. If a higher turns ratio for the input transformer were used, these end impedances would become correspondingly lower, with consequent loading of the microphone, thereby affecting frequency response in a negative way. The recorder's input impedance is designed to work satisfactorily when connecting the 600 ohm Revox 3500 *microphone, yet even a 200 ohm source reveals an equivalent input noise level which is only 3.3 dB above that theoretically attainable.*

A further miscomprehension would seem to lie in the statement that there is a timelag before the tape stops when running out after fast wind or rewind. Contrary to this, there is no driving force on the full tape reel as soon as the photoelectric end-of-tape switch becomes activated; thus the full reel keeps running by its own inertia. The empty reel, however, speeds up in the opposite direction which causes the illusion that both spooling motors remain energised as long as the motion sensing roller keeps rotating.

Finally, both reviewers seem to have been tricked by the system employed for listening to the fast winding tape. While Mr Ford is under the impression that this is not possible at all, Mr McKenzie comes to the opposite conclusion in that he expresses fear of excessive head-wear due to this feature. In actual fact the tape gets lifted off the heads during fast wind by only a small amount, while a muting signal is being sent out to the playback amplifiers. However, the tape is still close enough to the playback head so that some flux will be picked up by it and, when pressing either of the fast wind buttons fully down, the muting signal gets cancelled and the 'monkey chatter' of the fast running tape will become audible.

Yours faithfully, J. W. Dorner
Revox ELA AG, CH 8105 Regensdorf, Switzerland.

The machine which Hugh Ford and I reviewed was tested over a year ago and the review was submitted shortly afterwards. My comments on the performance of the mic input stages relate specifically to the review sample, for indeed I have found that within the last nine months Revox have considerably improved the noise in this circuitry, perhaps, although they would not admit it, because of criticisms that were already voiced direct by Mr Ford and I. In any case, a transformer that varies in impedance as drastically as Revox admits surely cannot be good enough and while I would tentatively agree that for 600 ohm microphones the performance was adequate on the review

16 ▶

The Studer B62's

Versatility with Proven Reliability

The Studer B62 has a well earned reputation for reliable operation and as a compact space-saving professional tape machine has become the accepted standard by numerous studios and broadcast companies.

Manufactured to the exacting standards of Swiss precision engineering in the Studer tradition, with fully transistorised modular construction, electronically controlled tape tension, servo controlled capstan, remote controllability in mono, stereo, two track or pilot-tone.

Available as a chassis, in carrying case, or trolley mounted the B62 is equally suited to studio or O.B. situations. You can now appreciate why we say reliability with proven versatility — either way it all adds up to the Studer B62.

F.W.O. Bauch Limited

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

LETTERS

sample, for 200 ohm models it certainly was not. Most potential users of the *700* would be purchasing 200 ohm microphones, since the most popular moving coils are of this impedance.

Revox's comments about the tape stopping are really quite amusing, for we now see that again they appear to have heeded criticism by changing the deck plate design to avoid tape catching underneath the spools for the very reason that Mr Ford and I outlined.

The replay head during spooling cueing still does not in my opinion produce a loud enough 'monkey chatter'. Furthermore I have found recently that the replay head azimuth appears to change because of the mumetal shield mechanism jolting the head assembly. This has only appeared in the last three months or so on two separate model *700*s that we have been using. There are of course always intermittent problems and usage annoyances that appear after a review has been written, since naturally when reviewing a machine it is not possible to spend hundreds of hours checking reliability. Nevertheless I feel strongly that Mr Ford's review and my field trial were both very fair, representing the true picture as seen at the time that the review sample was tested. I feel it unfortunate that once again Revox should attempt to pick holes in a review that is in general extremely complimentary. Reviewers must remain independent and as such are clearly liable to personal prejudices, among which is my personal abhorrence of poor tape stop mechanisms which flap in the breeze before stopping.

Angus McKenzie

Not only do I endorse the contents of the reply made by Angus McKenzie, but I would add that I quite frankly find Revox's letter rather too aggressive. We both reviewed a machine as supplied by Revox and did not refer to the known misdemeanours of some of the earlier type *700* machines.

The measured microphone input noise was found to be uncomfortably high for use with 200 ohm microphones, and will remain so if a 6000 ohm input impedance is retained. Furthermore, I consider the input impedance variation over a range of almost 4:1 in the audio frequency band most undesirable.

The alleged 'further misconception' that there is a timelag before the tape stops after it has run out in the fast mode! Unless I am completely insane this is no misconception—the fact could be observed by anyone who has a little intelligence. The reason why the tape flies all over the place is a different matter, but it should not happen.

On Revox's final point about listening in the fast wind mode, I admit that I may have been wrong about this. It is a valid point and I am glad that it has been raised, but perhaps Revox could clarify their instruction manual so that other users do not miss this facility.

Hugh Ford

Dear Sir, At the outset, may I applaud Angus McKenzie and Tony Faulkner for leaping into some very sticky ground by reviewing such complex pieces of equipment as multitrack consoles. By definition, it is impossible to review every aspect of the mixers in the given space and, sure enough, although some aspects are examined in most careful detail, other parameters are skimmed over, even forgotten. For example: noise performance is examined in detail together with input and output impedances—quite rightly, but impedances are only quoted at a single frequency and no mention is made of common-mode rejection, both parameters being most important. With regard to distortion, it is not completely clear from the test whether it is measured at a single frequency or over the audio bandwidth—this should be made clear as we would have extreme difficulty in meeting the figures quoted 20 to 20 kHz at +18 dBm even on our most sophisticated products!

One could go on listing parameters but this would only serve to prove the basic truism that a comprehensive review is an impossibility. Useful reviews we now have and, with a little less nit picking and a little more appreciation of what functions are important to the user, we could have a meaningful means of comparison and a truly informative document.

Yours faithfully, Ted Fletcher, Alice (Stancoil Ltd), 38 Alexandra Road, Windsor, Berkshire.

Remix Automation comes of age with a NEW PROGRAMMER by AUTOMATED PROCESSES... World leader in console automation.

Created in answer to industry need and available *now*, this extremely reliable programmer, the Model 1024, has been designed to accommodate every known console requirement. With over 1000 control channels, it provides functional capability for future growth as well . . . and at a reasonable price!

Unlike previous programmers, the Model 1024 uses a digital data cartridge to store programming information. During playback, data is recalled from the cartridge in sync with the program tape or other timing source . . . without accumulation of delay at each pass since timing data is included in the data on the cartridge. New data is recorded at each updating pass and previous data is formatted as part of the new data. But because previous data is retained in the cartridge, it is always possible to return to the former mix . . . and up to ten final mixes may be stored for later recall.

The system is normally referenced to an internally generated MagLink timing code recorded on one track of the multi-track tape, but the timing reference may be the output of any time code generator, or from a tape timer (thereby requiring *no* tracks of the multi-track tape). Since no data is recorded on the multi-track tape during remix, crosstalk problems are eliminated. The timing code track can also serve to control the audio tape machine and to synchronize additional tape machines by means of a MagLink or Minimag Synchronizer.

Program tapes made with the Model 1024 are totally compatible from studio to studio whether the automation system used is simple or complex. What's more, this new programmer is compatible with existing consoles and can easily be retro-fitted into current installations.

If you would like to find out why audio professionals continue to prefer Automated Processes consoles and components, write or call today.

AUTOMATED PROCESSES, INC.
789 PARK AVENUE, HUNTINGTON, NEW YORK 11743 • 516-427-6024

New York— AES 52nd Convention

MICHAEL THORNE

The 52nd Convention of the Audio Engineering Society was held between October 31 and November 3, 1975.

NOTHING was particularly promising about the New York AES exhibition. Fears had been expressed by a number of exhibitors at the Los Angeles Hilton in May about the demise of the show due to exhibitors pulling away, and in particular an acceleration of the recording trend away from New York. Add to this the cloud hanging over the city itself: Ford's refusal of Federal aid to avert the threatened default, and the subsequent political rumblings. By the time this report appears, you will know whether the critical December 1st came and went with or without upset.

This indulgent introduction was possible largely because the show was a considerable success, both from exhibitor and visitor standpoints, with total attendance over 3,500 and a record number of exhibitors. In particular the weekend organisation attracted a lot of engineers who might not have found time during the week, an implication for the LA equivalent. And while the number of train spotters was inevitably higher on Sunday, certainly there was a high proportion of committed and genuinely interested visitors.

As in London in June and LA in May (see September *Studio Sound*) there was less a feeling of new product explosion as a consolidation of positions and a cautious and far from extravagant expansion. With the US recovery gingerly underway, it was clear that more financing for studio operations was coming, a sentiment confirmed by the large tape machine manufacturers. Another limiting factor is obviously the huge range of facilities already available—to change something drastically now demands such a radical rethink of the subtleties and implications as to make it a larger undertaking than a comparable development seven years ago when 16 track was something outrageous that would never catch on.

A particular area where fast development has led to compatibility problems is that of automation. In addition to the ubiquitous Allison Research programmer, of which an improved high-density system is impending, is now a separate and incompatible programmer offered by Automated Processes for use with their *Automix* console, and in addition the MCI system will incorporate their own, presently at design stage. So the situation of divergent tape and information codes, worried about in the October issue, has worsened to a point where it becomes a question of 'take it or leave it'. Neve's long-rumoured computer-aided mixdown system was finally officially declared; for an effective description and discussion of the underlying design philosophies, see Derek Tilsley's article in October 1975.

In the console arena, the interest in API again centred on *Automix 2*, simply a version of the LA exhibit with a few minor rethinks such as 'swapping round a few leds or so'. And MCI, although they were working to a deadline of January 1st with their automation facility, with availability some three of four months later, showed their 24/24 format of their new range incorporating automation interface; on show was a desk bound for Criteria in Miami, with two others nearing delivery to Atlantic in New York.

MCI's automation is basically conventional and straightforward, limited to level functions only. Apart from that, the channel strip now incorporates a full 24 position routing switch, giving the effective 24 group capacity in addition to the familiar straight-through mode. The input strip is shown alongside, and is largely self-explanatory.

Although the large Harrison system was rush-completed for the show, an indication of their 32/32 console was provided, for delivery complete by the end of November. The possibilities on the relatively complex modules are considerable, but a basic innovation is in use of voltage controlled group output. This has the subsequent advantage of simplifying sub-grouping such that any section may be moved and interlinked with one output fader. The channel faders are not vc operated, although provision is made for interface with the Allison programmer. Update is cumulative; the fader is held at a mark to coincide with the previous level, any further movement causing boost or cut. A metering innovation is a combination of vu and ppm. High intensity leds arranged in blocks conform to a vu characteristic, but any ppm-resolved overload causes the high red leds to double in intensity.

The only other 32/32 exhibited was another stylish affair, from Spectra-Sonics. The modules are similar to the stock 10/24 standard model, with an increased routing flexibility. Full 32 output switching is offered, together with an array of 32 meters, in addition to the usual echo/stereo/quad sub-bussing. Above the straight through channel record mode, there are eight mixed busses which have channels switched with a push-button array; in addition there are cue sends, four echo sends and four main quad busses.

Down a level in size, 2005 AD improved the fascia of the *2022* with clearly marked knobs—a simple but useful improvement permitting Polaroid photography to supersede notebook as desk setting memory. A recent opera recording to 16 track was undertaken at the Wolftrap, using five of these mixers: 16 outputs came from four times left, right, cue and echo busses, with the fifth used for monitor returns and mix. A large multitrack desk is at design stage.

Richmond had also an improved design, intended to extend studio-type facilities such as separately line/mic inputs and a breakpoint with reinsert so that echo may be mixed directly in at the head of the channel. Quad joystick modules are also offered; production of everything should now be underway. And Soundcraft's *Series 2* 12/4 console was shown for the first time, the price increase being modest and consolidating its competitive position, with considerably improved electronics and a redesigned sloping fascia with 105 mm Waters faders.

And although Interface maintained basic design patterns, a number of new modules are offered for mainframe insertion. In particular a strip third-octave graphic and associated eight-group limiter are on a desk for Alice Cooper sound reinforcement, with integral electronic crossover without phase shift. Also: four-way quad joystick modules, with a 16 input rack mounting system on order.

Another middle-sized new console was shown by Audio Processing Systems, the *Model 2000*. Of particular interest was the switching flexibility in the 24/4 design, with four flexible subgroups which may be used as cue/echo channels or as additional master groups. Layout was likewise exceptionally clean and simple. Prices are 16/4 $4500, 24/4 $6200.

On the tape transport front, things were relatively quiet. Greatest activity was from Otari, introducing two new recorders and a high speed duplicating system. The *MX-7308* is an eight channel recorder

using 25 mm tape, with optional remote control. Layout is simple and conventional, with easy access to heads. Price is $7600. The *MX-5050-8* uses 12.5 mm tape for eight tracks, and has a similar functional cleanliness. Transport is carried in one section, electronics in the other; both bolt together for transit. Rack mounting version also available. Finally, reflecting an increasing concern for tape duplication demonstration, the *DP-1010*. The speed ratio is 16:1, with program usable in conventional reel-to-reel or 580m loop bin formats; options are between 6.25 mm and 12.5 mm tape, with the slaves also available for cassette tape recording.

Eeco, on the Ampex stand, introduced another extension to the range of tape control, equipment for use with that company's vidco/audio transports. This synchroniser incorporates a 'chase mode' such that either of two machines may be set to follow the other, with tolerances within one information frame. Operation is now fully locked, with the slave following everything from fast wind to hard cue. Stephens extended the scope of their 40 track 50 mm machine with the auto-locator promised at the LA show.

The Teac/Tascam product line also continues to expand. Complementing the 16 track 25 mm transport introduced in LA is a new 8 track on 12.5 mm fixed speed and format machine. This now incorporates DBX noise reduction, the first time it has been incorporated in a regular tape machine, with the aim at the 'semi-pro' and similar regions. To this end an operating booklet may be produced covering multitrack techniques . . . strange to think that state-of-the-art records were being produced with this format five years ago.

Elsewhere, Agfa introduced their *PEM 468* mastertape, in the same high output/low noise area as has stirred recent interest. Figures quoted for 320 nW/m at 38 cm/s include third harmonic distortion at 0.2% (intermod not specified) and signal-to-print of 58 dB.

As well as the Teac link, DBX also appeared with a two-channel module compatible with the Nagra recorders, the *192* at $600. Another extension offered from DBX is the *162*, a stereo version of the *160* compressor/limiter. Of considerable interest was the *169* variable frequency compressor limiter. In addition to fierce versions of the usual facilities is a band select, giving hi/lo/band pass input variable over the whole spectrum via a dual slider. Aimed as a problem solver 'for work on tracks where you're already in trouble', possible use could include adjusting drum kit balance by selective compression. The converse is frequency-selective downward expansion which can reduce hiss on an under-recorded track with far less effect on the sound quality than conventional equalisation or full-band expansion—such techniques may be used for any form of noise and unwanted signal improvement. Opposite end of the compressor scale, but still fulfilling an accepted need for example in vocal compression, was the $100 Haeco *PL.2* unit with variable level and release time control for a light coupled system claiming 500μs attack time.

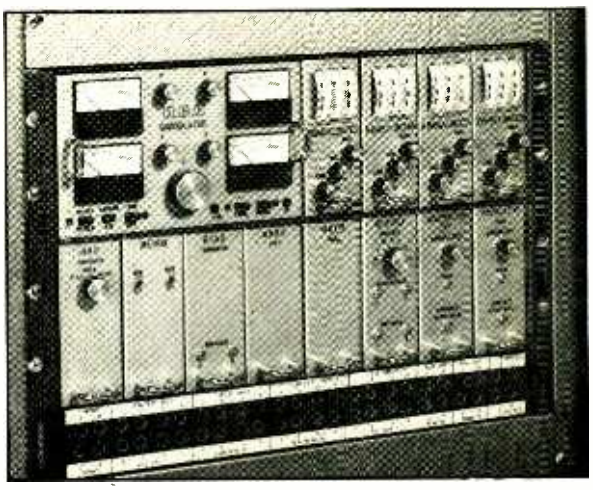
There continues an accelerating, more flexible trend towards parametric and other wide band equalisers, with many on show in both desk-modular and rack-mounting fittings. UREI especially introduced six new products in their usual rack frame assembly: *555* ($324) and *556* ($416) variable bandpass filters with 18 dB/octave variable cut off at top and bottom in one and ganged two channel versions. The *532* ($316) is a simple nine-band graphic equaliser, ±10 dB at octaves above 50 Hz. Results on the *200* ($2250) plotter system which may again be rack mounted with its associated control module.

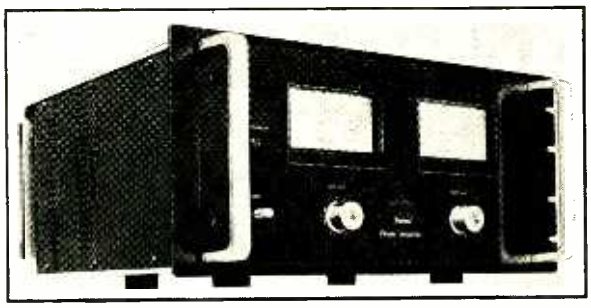
Sontec reappear with a different name and continuous three-band filter unit utilising op-amp circuitry; with switched shelving control from the bottom point of the shape control, their other channel module works out at $390. For the previous two channel version cost is $1460, or $1540 with variable frequency filters. A major application is anticipated in disc mastering.

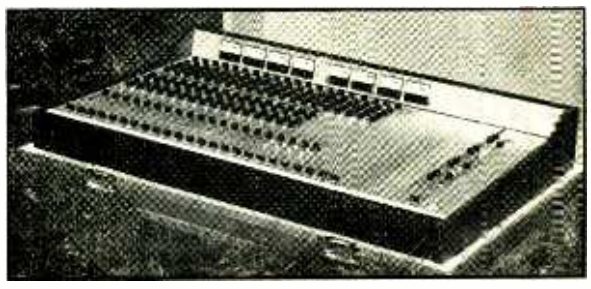
And as well as their new consoles, Audio Processing Systems showed a four band parametric equaliser available in modular form.

The complementary function, that of real time frequency analysis, was usefully expanded. Amber were showing serial numbers *99* to *101* of their established led analyser. Audio Designs introduced an extension of their familiar tv monitor Vue-Scan channel metering: the *660* analyser showed third octave splits between 40 and 20k Hz, offered in various versions at prices around $2900. A closer-to-graphic display (as compared with the histogram format

Left: *A section of the MCI JH-528 audio mixing desk.*
Right, top to bottom: *AKG BX10 reverberation unit. RCA Quadulator. The lathe from Scully. Sansui BA-5000 power amplifier. APSI model 2000.*







of the previous two) was exhibited by White Instruments: third octave display on a red led matrix in 2 dB steps over a 20 dB range. Mic as well as conventional line levels are accepted. Two CMOS memories can replay information such as response coefficients or a previous reading; switching is possible between memories and real time settings. So now there is an increasing choice in this field; perhaps now is the time to standardise the time constants so that such devices could feasibly be used in place of conventional wide band meters. Thus, disc cutting, tape duplicating and other production response problems can be anticipated and overcome at the mixing stage.

'Just another one of our toys' was Eventide's prototype frequency shifter. The small keyboard provides for harmonic correspondence of signal frequency shifting—thus a composite track can be fed through and harmonised by a mix/reinsert circuit, and the musically related shift can move as fast as fingers. The Instant Flanger, seen on the East Coast for the first time since its May LA introduction has managed insidiously to subvert old languages, and other new products were variously described as flangers as well as phasers, the new term superseding to mean variable signal path shifting. The omnipressor in a new version incorporates a dynamic reversal mode, gate, expansion, limiting and infinite compression in a powerful unit. The claimed dynamic possibilities also include 'inverse' compression.

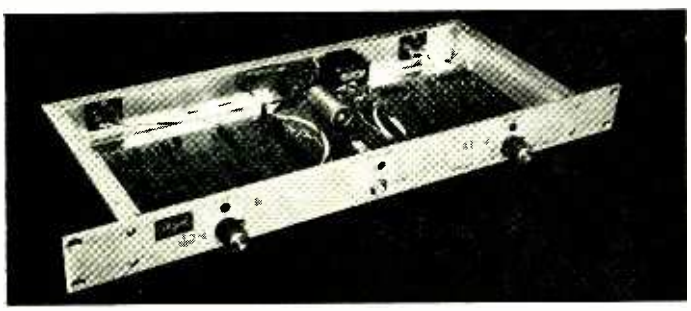
Also in the phase/flanger line, in conjunction with a range of keyboard synthesisers, was Aries, associated with Trine Corporation. A thoughtful 'stereo phase-flanger' at $369 offered a linear vc delay section in conjunction with 10 cycles of phase shift, giving the usual eq/resonance and stereo image shifts in conjunction with appropriate settings of the integral oscillator. Also announced as close to production was a 'complementary multimode parametric equaliser' with the usual options but with vc control insertion; a noise reduction system basically an envelope sensing expander; and a 'sound system measurement package' based on a pink noise generator.

A similar effect was promised by the Marshall Time Modulator, with sole distributor Sheffield Professional Products. Basic unit offers a delay of 15 or 30 ms with full response up to 15 kHz; an optional 75 ms delay involves compromise in hf performance. Between 1.5 and 20 ms is available as state vc control. A shift of between 0.2 and 3 ms is offered under vc control, from external source or integral oscillator, with following mix/reinsert capability —corresponding to up to 12 octaves maximum shift which aurally agreed with the 'relatively absurd' tag. Production should now be underway, with $1250 the price.

Lexicon's Delta *T 102* vco module appears at the same price as their normal output module, or $350, with integral clock oscillator controlling the unit delay—with another conventional fixed delay module, stereo and mono flanging effects can be achieved in the usual way. Also from Lexicon, the *Mark 2* version of their *Varispeech* compressor, available with package power supply and speaker for learning applications. Rack mounting with *XLR* connectors also offered.

Returning to the more staid arena of levelling and control amplification, UREI introduced *LA-4* and *LA-5* amplifiers. The former is a compressor/limiter, with attack and release times depending on input signal and switchable compression ratios 2/4/8/12/20:1, with a −30 to +20 dBm threshhold variation. The *LA-5* audio leveller restrains to a maximum output—a similar unit but fulfilling a specific function. February 20, 1976 sees introduction at $346 and $286 respectively.

Bozak time delay unit model TD-1



A cheap, simple delay unit comes from Bozak, orientated for simple stereo-times-two ambience needs. Delay is fixed at 20 ms, using a bucket brigade system (the subject of a certain amount of patent discussion at present). Level control and overload indicate are provided, the package costing just $500 for rack mounting set. Possible applications, at this price, are suggested in home quadraphonic derivation, from stereo program. Availability is from January. The only introduction in conventional reverberation devices was AKG's *BX10*, a portable unit similar to the *BX20* but with simplified localised delay, level and equalisation controls and more convenient shape and size. The inbuilt limiter functions at +18 dB over set sensitivity, and price is $1795. Also Bozak showed for the first time in the East their 150W rack mounting power amps; about the only other detachable new power amps were the Sony V-fet at $1000 (no-one seemed to know whether a rack mount was offered). Also from Sony was an upgrade of their range of microphones, but extending over the *C47P* condenser claiming a startling maximum spl input of 124 dB spl. Further unusual aspects are the 100V power rail and the $1050 price tag. Other new models include *C37P* at $450, the *ECM-56P* electret at $240 and the *ECM-50P* phantom powered tie clip mic.

Probably the biggest show news was in the relatively esoteric field of disc cutting. The Lathe from Scully, confirming that gentleman's re-entry into the cutting business, was described more thoroughly in our July issue and shown for the first time here. A complete system, it is compatible with Westrex and Ortofon heads. Operation is deliberately simple and the logic control of table motion and tape machine is sequential and incorporates operator fail-safe features, the philosophy being 'set the level and go'. Other design features include 150x Nikon microscope with vertical illuminator, 16⅔ rpm table speed option for *CD-4*, multiply decoupled mounting and easy playback/calibration system.

In another stage to the Automated Processed introduction of an automated lathe control system, also incorporated in the composite lathe and peripherals offered by Haeco. Three functions in both program and preview mode are controlled: level, limiter threshhold and equalisation. There are two types of program change. The first, held in electronic store, is up to 12 values of the above settings, with consequential switching activated from conventional banding. This 'state' mode can be read off onto tape and thus stored at the head of an album for reprogramming of the lathe at a subsequent recut—hopefully, this will eliminate the rather drastic sound changes which often happen over a period of album availability. The real time changes require a tape signal channel for data storage, in the familiar way. The principle difference between API and Haeco is the latter's use of a ddl on the program before feed to the cutter head—immediate worries about distortion are claimed to be alleviated by a suitably high density storage unit.

The quadraphonic front was stable, the main introduction being RCA's *Quadulator* (see December 75, p24) CD-4 cutter drive system utilising the recently introduced phase-lock design and needing some 26 cm of standard rack space only. Designed for use with Ortofon *DSS-731/GO-741* and Neumann *SX-74/SAL-74* systems, asking price is $9500 including installation. From Sansui the *QSE-5B* split type encoders: *20DS* with centre back at 140° shift to improve mono broadcast compatibility or the *20 ES* with 170° for normal recording studios. CBS reiterated the Paramatrix decoder performance introduced in London, with a range of records increased enormously. The UD-4 system was not demonstrated. To another side Gerantium Laboratories Associates showed a widely flexible four-channel broadcast console: four-position joysticks for tape mix, direct stepped control round 360°, four mix inputs, two committed turntables, one auxiliary, SQ/QS encode system with additional CD-4 demodulator. Disco possibilities are in mind, but the $5000 price tag is discouraging there.

Most colourful among the useful bits and pieces were Keith Monks' variously coloured mic stands, shown for the first time. Sescom's considerable module range had extensions including ten console line modules, interchangeable for various functions, a range of professional connectors and also cheap sliders. California Switch and Signal, whose main service is in custom patch and switching bays, introduced a two-level jack strip in four socket units for repair ease; standard rack frame fittings.

It's all in the family

The new Scully 284B-8:
1-inch 8 channel master recorder with DC Servo and 14" reels.

The new Scully 284B:
¼" or ½" recorder with 1-4 channels and 14" reels.

The new multi-purpose Scully 280B:
up to 11.5" reels with AC motors or DC Servo capstan drive.

Scully's new 280B family of innovative audio tape recorders has a list of improvements and features that won't quit.
As a result, Scully can handle any recording assignment you have. Just take a look.

- **Optional DC capstan servo**
- **Speeds to 30 in/sec.**
- **Transports up to 14" reels**
- **New direction sensing control logic**
- **Functionally illuminated controls**
- **1/4" full-track to 1-inch 8-track recorders**
- **Innovative low-noise electronics**
- **Common components for interchangeability**
- **14" reels for 30 in/sec. mix-downs**
- **Variable Speed accessory with L.E.D. exact speed read-out**

Scully makes it easy for you, including sales and service which is available from over 200 distributors throughout the world. For all the facts, write, Telex or phone.

Scully | Metrotech
Division of Dictaphone
475 Ellis Street
Mountain View, California 94043
(415) 968-8389 TLX 34-5524

news

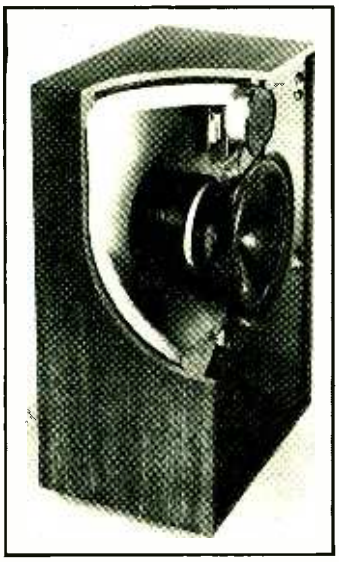
New KEF loudspeaker

'Model *103* is a new bookshelf type loudspeaker of the highest quality with a generous power handling ability. It incorporates novel features giving it clear advantages over other bookshelf systems.'

That's what KEF says and this is the specification to back it up:

Dimensions: 500 x 330 x 225 mm.
Internal volume: 25.4 litres.
Weight (net): 19.05 kg.
Nominal impedance: 8 ohms.
Power ratings: (a) Maximum rated power—100W programme. (b) Continuous sinewave rating—25V (80W) 100-2500 Hz. Reducing to: 10V (12W) above 3000 Hz.
Frequency response: (a) Nominal frequency range—30-20 000 Hz. (b) Specific frequency response—±2 dB 50-20 000 Hz.
System resonance: 58 Hz.
Dividing frequency: 3000 Hz (electrical cut-off slope 18 dB/octave).
Harmonic distortion: 1% thd 100-20 000 Hz relative to 96 dB spl at 400 Hz 3% thd at 50 Hz.
Sensitivity: 15W into nominal 8 ohms produces 96 dB at one metre and 400 Hz in anechoic conditions.
Amplifier requirements: 25-100W into 8 ohms.
Room size: up to 280 cubic metres.
Finishes: walnut, teak.
Grille: black microcellular foam.

The price for the *103* is £72.50 and $245 from: KEF Electronics Ltd, Tovil, Maidstone ME15 6QP. Phone: 0622-57288.
US: Intratec, 399 Jefferson Davis Highway, Arlington, Virginia 22202, USA.



Cut away view of KEF 103 'reference loudspeaker'

A story with a moral for broadcasters

In August, 1963, reporter William Stuckey was looking for material for his Latin Listening Post programme on the New Orleans local radio station, WDSU. What he particularly wanted was a pro-Castro enthusiast to talk about Cuba, and, by a happy coincidence, he heard of someone who had just spent a night in the local gaol for handing out 'Fair play for Cuba' leaflets. A half-hour interview was recorded on August 17, but only five minutes was ever transmitted, because the programme producer vetoed the rest as insufficiently interesting. But Stuckey kept the whole tape and in November the same year must have been a very happy man that he had done so. For that August interview was with Lee Harvey Oswald, who on November 22 allegedly shot President Kennedy and was thereafter himself shot by Jack Ruby.

The Warren Commission, looking into Kennedy's assassination, commandeered the tape, and it was not heard of again. Or rather, it was not heard again until Vic Wheatman, Public Affairs Director of Station WBUR in Boston, somehow acquired not only the tape but the right to re-broadcast it. Had Oswald not found infamy through subsequent events, the tape today would be almost as boring as a British Local Radio phone-in; but because of what happened afterwards it now makes fascinating listening. For instance, it is hard to imagine someone as obviously obsessed with his Cuban cause and anxious for publicity as Oswald, not immediately boasting of his guilt when arrested for the assassination. Also, all those rumours about CIA involvement with Dallas fall into confusion when you hear Oswald's mentioning as an apparently honest aside that the CIA is 'now defunct' and then defending his comment when pounced on by the interviewer.

WBUR also have in their possession a second WDSU tape of Oswald talking, but so far have not had permission to use it. The second tape should be even more interesting than the first, because WBUR reckon it was wrongly transcribed in at least one place by the Warren Commission. Of course none of this proves anything, but it is what good current affairs and news radio is all about. The story also carries an obvious moral for radio reporters—if it's humanly possible, keep a copy of every interview you've ever taped, because what sounds boring now may one day be hot news.

Adrian Hope

Radio Orwell: ilr no 16

The latest independent local radio station to go on the air covers the Ipswich area bringing the total potential audience for vhf commercial radio to more than 22 million. Radio Orwell Ltd operates this franchise under the chairmanship of Cmdr John Jacob.

Both the mf and the vhf transmitters operate from the same site on Foxhall Heath immediately to the east of Ipswich (grid reference TM 212 445). In the mf band, the station transmits on 1169 kHz from two 1 kW Marconi transmitters, adjusted for low power operation, feeding into 54m mast. The vhf installation, frequency 97.1 MHz, transmits an erp of 1 kW through a four stack omnidirectional aerial with circular polarisation. The radiator height is 81m above sea level.

The fifteenth ilr, Radio Victory, opened a few weeks before Orwell, providing coverage of the Portsmouth area.

Update—Studer Stateside

According to FWO Bauch, the UK distributors for Studer, the US addresses given at the foot of the A67 newsnote (October, p26) are now out of date, although they still appear as such on the press handouts. They should read: Willi Studer America Inc, 1819 Broadway, Nashville, Tenn 37203, USA. The Canadian agents are: Studer Revox Canada Ltd, 14 Banigan Drive, Toronto, 17 M4H 1E9.

APRS Course

The second course given by the APRS on recording techniques was successfully held at the University of Surrey, Guildford, between September 8 and 12. Subjects covered included most aspects of signal processing, with an inevitable bias towards the technical side. In particular, a session on automation was conducted with Clive Green from Cadac, whose consoles can incorporate the Allison Research vca system, and Geoff Watts of Neve, whose direct, servo-driven system is the philosophical opposite.

As before, a workshop/demonstration was held in a London studio, this time at the new Roundhouse Studios (see *Work* last month). Three evening hours with a session band gave Adrian Kerridge time to run through basic multitrack balancing, and the palatial control room gave adequate space for the assembled throng.

All concerned with the organisation, and particularly coordinator John Borwick, were demonstrably keen to establish some feedback from the students, whose range of experience and knowledge was wide, although all were from the music industry. Consensus appeared to indicate that while many subjects did not go deep enough, which is inevitable on any concentrated course, the presentation of a clear overview, with subjects given in a broad context, was of considerable use. Thus, an understanding of the broad uses and functioning of equipment could be achieved, in contrast with the standard piecemeal opportunities of a working environment.

A similar course is expected to be held next year. As before, numbers will be restricted to around 20—details will be announced in due course.

Patenting an idea

A studio sound reader has asked how to go about protecting a new mixer circuit that he had devised. It emerged that he was not really so interested in obtaining a patent monopoly on the circuit as ensuring that no one else, working independently, could come up with the same idea and patent it, thereby securing a blocking monopoly. Remember that the technological state of the recording and electronics art now moves so fast that many inventions are made virtually simultaneously by strangers working quite independently at opposite ends of the earth.

It turned out that the reader had in fact shown his circuit to various colleagues and had made these disclosures in open manner rather than in confidence. He had also let visitors to his studio into the secret. This would all probably add up to 'prior use' of the invention, under British Patent Law, and thus would

equally probably enable him to invalidate any patent on the idea subsequently lodged by a third party. But the legal area of prior use is expensively confused So what should readers ideally do if they come up with what seems like a valuable new idea in studio technology but feel disinclined to spend the considerable amount of money it now costs to patent that invention and thereby secure a monopoly on the idea? It must, after all, be a fairly common occurrence for a studio engineer to cook up a clever new idea to solve a long standing problem, and it would be unfortunate for him if he later found that someone else's patent prevented him from legitimately working the idea without a legal battle.

The answer is to take positive steps to *publish* details of any worthwhile new idea that is considered not worth patenting. An article in STUDIO SOUND describing details of the development will, of course, block the possibility of anyone (including the writer) ever applying for a patent for the idea. It will probably also carry the added bonus of earning the inventor some hard cash, rather than putting him out of pocket. But not all new ideas make interesting articles, and there is the added problem that it takes several, if not many, months for an article of this nature finally to appear in print. In the meantime, someone else, who has come up with the same idea independently, could have applied for a patent. The safer answer is to pay someone to publish brief details of the idea and so block all chances of a future patent. The publication *Research Disclosure*, of Homewell, Havant, Hants, UK, exists simply and solely for this purpose. *RD* will publish whatever details of whatever invention you wish, provided you pay the basic fee (several pounds per inch of print). Publication is very rapid, the lag between submission and publication being only a few weeks, and *RD* guarantee their publication to be on the shelves of strategically placed libraries throughout all the major countries in the world.

Deliberate protective disclosure of this type should not be regarded as a replacement for patenting, because it achieves a different end. It does, however, achieve that end relatively cheaply, and must become more popular as the UK Government in particular continues on its suicidal course of continually increasing the cost of official patent fees. **Adrian Hope**

Ambisonics

At the recent London presentation of the National Research Development Council Annual Report, it was forcibly suggested that if Ambisonics is to go down in history as anything other than an esoteric concept it must be demonstrated without further delay to studio engineers and recording executives, preferably at a central London venue, and with someone on hand who can answer laymen's questions in laymen's language.

The NRDC owns the patent rights on Ambisonics, and during the last eighteen months or so has handed over £30,000 to the partnership of Professor Felgett, Michael Gerzon and IMF, for the production of working equipment and demonstration tapes with which to sell the system. But, according to the NRDC, a final package, with which everyone is satisfied, has not yet been forthcoming.

Largely for this reason, demonstrations of the system have been few and far between. After the original rather unconvincing Sonex launch, there was a lecture-demonstration at the Olympia Audio Fair, and there have been several private demonstrations to commercial bodies, including the BBC and Decca. But as yet no final decisions have been taken by these or any other parties. Reports suggest that the five-part discussions which have been taking place (Felgett, Gerzon, IMF, NRDC and the potential customer) have sometimes suffered from the almost inevitable clash of personalities involved.

So far, the NRDC has made no efforts to interest the independent radio stations individually, and has confined its approaches to the IBA on a very general level. Not surprisingly, the IBA has so far shown no real interest. The BBC has shown interest but that is all. Astonishingly the NRDC has not yet tried to sell the system abroad, and at a recent press conference at their factory in Germany, the BASF engineers admitted that they had never even heard of Ambisonics. BASF, in common with other commercial interests in Germany, is apparently moving towards the adoption of SQ, and unless the Ambisonics system is pushed hard, *now*, throughout at least Europe, the system and the NRDC money so far invested in it might as well be written off. Realistically, once any system has been widely adopted in Europe, it is unlikely to be dropped in favour of another system, such as Ambisonics, even if the latter system is 'better'.

Regrettably — but understandably—the NRDC appears totally out of touch with the strategy needed to sell a system like Ambisonics to the recording and broadcasting world. Likewise, there is still no published account of how Ambisonics works, and what it has to offer, which is written in the nuts-and-bolts words of one syllable that will mean something to the essentially non-technical men who make the policy decisions in the world of broadcasting and recording; the two published articles in August STUDIO SOUND were clear, but too long for this purpose.

It has been suggested that even if Ambisonics fails commercially there may be patent royalties accruing, thanks to the earlier priority date which the NRDC patent is reputed to have over the Duane Cooper patent covering UD-4. Contrary to what has been previously contended, NRDC is not unambiguously ahead of Cooper. The legal situation is complex, but, in a nutshell, Ambisonics is ahead of Cooper with one date, and behind him with another. Until recently, only the NRDC patent had been published (BP 1 369 813), but very soon the Cooper patent will be published, under the number 1 411 994. As soon as the Cooper patent is published, all will be revealed, to the—doubtless by now—numerous legally interested parties. **Adrian Hope**

Outside broadcast communications

The recently announced 700 series covers a range of audio communications products which can be built up into a comprehensive communication and talkback system. The manufacturers, Link Electronics Ltd, can even supply a private 10 line solid-state telephone exchange which additionally can interface with PO lines.

The equipment was initially developed by Link for use in outside broadcast units and tv studios that were under construction by the company. It was then refined into a range of standard equipment for general distribution. Individual operator panels carry a mic, loudspeaker and selector switches together with associated volume controls. Carrying no 'active' circuitry, the stations are connected to the main rack by a single multiway cable.

The company have installed several systems; current projects include control centre communications for BFN and RTE. Link Electronics Ltd, North Way, Andover, Hants, UK. Phone: 0264-61345.

Montreux Symposium dates fixed

The committee of the Montreux International Television Symposium has confirmed the following dates for the 1977 convention: Friday June 3 to Thursday June 9. This is slightly later than in 1975 to avoid a clash with the Whitsun bank holiday.

Plans for the next symposium are under preparation; further details will be announced in the Spring of '76. R. Jaussi, Case-Box 122, 1820 Montreux, Switzerland. Phone: (021) 61 45 02. Telex: 25 555.

Wrong number

Regent Acoustics, Sheffield Direct Cut Disc suppliers, were accredited with the wrong phone number (Dec 75, p40). The correct number is 01-437 1997.

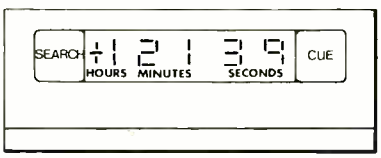
Link Electronics new audio communications equipment.

Survey: tape transport remote controllers

Unlike the machines with which they operate, position locators, synchronisers and remotes cannot be used alone. Since virtually all are manufactured for specific transports, the facilities on offer could be influential in the choice of machine.

AMPEX

Ampex Corporation, Audio-Video Systems Division, 401 Broadway, Redwood City, Ca 94063, USA.
UK: Ampex Great Britain Ltd, 72 Berkley Avenue, Reading RG1 6HZ. Phone: 0734-55341.



Ampex search—to cue remote indicator.

SEARCH TO CUE AND TAPE TIMING ACCESSORY. For *MM1100* series.
The Search-to-Cue and Tape Timing accessory is an 'efficient and reliable' low-cost tool for mixdown and over-dubbing operations on *MM-1100* series recorders. It permits the operator to set a cue at any position on the tape, then return to that exact point automatically and at shuffle speed (Fast Forward or Rewind) as many times as required, by simply pressing the SEARCH button.

The display/controller includes an 'easy-to-read' digital tape timer, SEARCH and CUE controls, and a display reset button for setting the zero point. Zero can be set at the beginning of the first selection, or at any other point on the tape. Since the timer is tape-driven and is independent of the Search-to-Cue logic, the timer readout remains unaffected no matter how many times the cue may be reset. Conversely, if the timer readout is reset with the display reset button, the operator can still return to the previously set cue. A new cue is set (and the old one cleared) by manually going to the desired point on the tape and then pressing the CUE button.

Five numerals and a + or — display appear on the tape timer readout. The + or — indicates that the current readout is ahead of or behind, respectively, the display zero. In Search mode, the tape speed is controlled in a proportional trajectory, slowing down as it approaches the cue so that there is no overshoot. Timing is accurate to ±0.5s at 38 cm/s.

As a further convenience, the operator may actuate the SEARCH control on the Search-to-Cue accessory and then the PLAY control on the tape transport. The machine will shuttle the tape to the cue and immediately go into the Play mode. If the operator wishes to cancel the Search mode at any time, he can do so by actuating the STOP control on the transport.

The Search-to-Cue comes in kit form and can be 'easily installed by a qualified technician'. Electronics are installed inside the *MM-1100* console, while the display/controller and tape roller are mounted on the tape transport. Also available is an optional remote display/controller with a complete set of controls.

Features
Tape-driven operation, reads up to 1 hour, 59 min, 59s.
Searches in either direction to a preset point.
Remotable display/controller. ±0.5s accuracy at 38 cm/s.

SEARCH TO ZERO ACCESSORY. For *MM1100* series.
This permits the operator to set a Reset, or 'Zero' point anywhere on the tape, then return to that exact point at shuttle speed (Fast Forward or Rewind) as many times as required by pressing the CUE button. The reset point can then be cleared and another 'Zero' point set up for successive returns.

An 'easy-to-read' counter shows where the tape is in relation to the zero point, while a + or — display indicates that the current reading is ahead or behind, respectively, of the zero point.

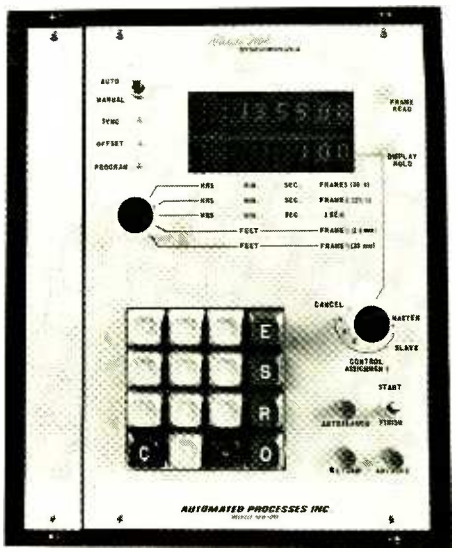
When searching to the reset point, the tape speed is controlled in a proportional trajectory, slowing down as it approaches zero so that there is no overshoot. Timing is accurate to ±0.5s at 38 cm/s.

As a further convenience, the operator may actuate the CUE control on the Search-to-Zero accessory and then the PLAY control on the tape transport. The machine will shuttle the tape tc the reset point and immediately go into the Play mode. If the operator wishes to override the CUE control at any time, he can do so by actuating any transport control. The Search-to-Zero comes in kit form and can be 'easily installed by a qualified technician'. Electronics are installed inside the *MM-1100* console, while the display/controller and tape roller are mounted on the tape transport. Also available is an optional remote display/controller with Reset and Cue controls.

API

Automated Processes Inc, 80 Marcus Drive, Melville, NY 11746, USA. Phone: (516) 694 9212.
UK: 3M Mincom Products, Witley Works, Witley Gardens, Southall, Middlesex. Phone: 01-574 5929/6045.

MINIMAG 2
'Minimag 2 is a second generation design that incorporates every essential function for auto-



API Maglink programming panel.

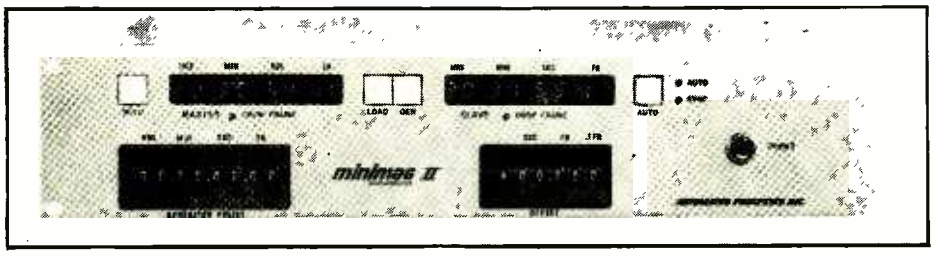
matically synchronising and interlocking any two audio or video multi-track tape machines . . . It is recommended for audio sweetening, for simulcasting tv and stereo fm, for remote overdub recording, and for combining an audio mix with a visual medium.'

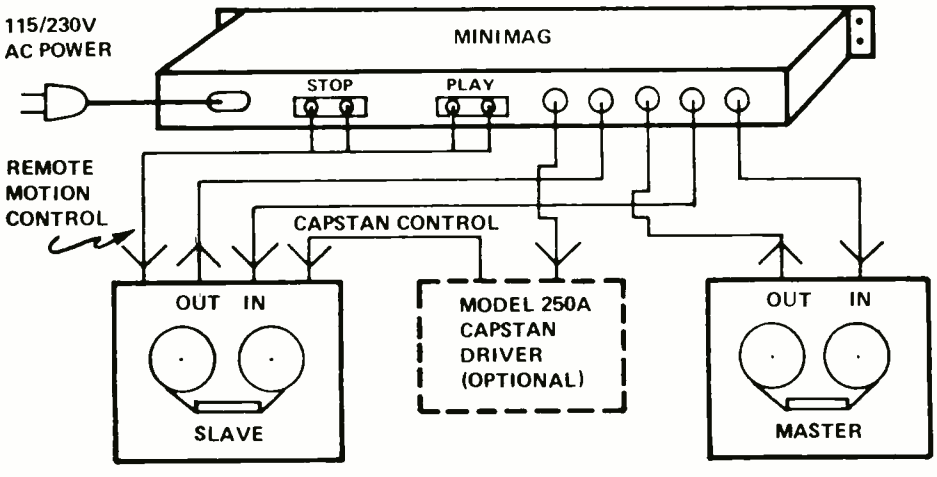
The SMPTE standard time and control code generated by the device is recorded on both the master and the slave units. This can be done before, or at the same time as, the programme material is recorded. The synchroniser will then automatically compare the code played back from the slave tape with the code on the master tape, and issue a capstan control signal to lock both tapes in perfect sync. Tape machines designed for dc servo operation are controlled directly; synchronous motor machines are controlled through an optional capstan drive amplifier.

Tapes need not be in alignment before starting since the machine has a 24-hour capture range. A thumbwheel switchbank on the front panel permits offsetting or shifting between tapes to achieve lip sync or delay effects. This offset may be as much as ±49.9s in 0.1 frame increments. All functions, such as fast forward, rewind, stop and play are slaved, causing the slave machine to move precisely as commanded by the mastertape. Switches provide for 30, 29.97 or 25 frame rates. Power requirements are specified to user option.

The internal code generator can be preset to any time of day and position readout for both slave and master are provided. Mounting is in standard 48 cm rack.

MAGLINK
MagLink is a 'completely new approach to fast, efficient tape synchronising, position logging and editing. Through the use of a unique timing code system, videotape, multi-track audio, and magnetic film machines may now be locked in synchronism, offset or stopped and started at preset positions with an accuracy not formerly attainable.' A master and any number and type of slave machines may be controlled by *MagLink* and will remain synchronised even In REWIND and FAST FORWARD modes.





CONNECTION DIAGRAM WITH OPTIONAL STOP/START (PLAY) PLUG-IN RELAYS

Top: *API Minimag 2.* **Above:** *API Minimag-application example.*

Synchronisation

Synchronisation can occur between a master tape machine and up to six slave machines per *Model 200* assembly.

When the AUTO/MANUAL switch is set to AUTO, all slaves will automatically assume the same stationary positions as the master, regardless of where they were, and will remain stationary until the master tape machine is set in motion.

When this happens, all slaves stay locked to the master, whether it is in the PLAY or RECORD mode, or in the FAST FORWARD or REWIND mode.

In the latter two modes, synchronisation will be maintained regardless of the speed of the machines, and in the case of most machines available today, regardless of whether or not the tape is lifted away from the heads. No modifications to the tape machine are required. However, connections to the remote motion controls are necessary. This is a simple process and data is provided. These connections are required for the master and the slaves. Additionally, connections are made to the drive motor of each slave.

Offset

The term OFFSET denotes the constant difference in position maintained between two machines in motion. For example, one slave may always be 5s behind the master. Offset can be created in either of two ways:

The CONTROL ASSIGNMENT switch is used to select the appropriate machine. Then, using the keyboard, any desired offset (up to 31 hours) may be entered and the OFFSET key depressed. As soon as the OFFSET key has been depressed, the slave will assume the offset. The actual offset is indicated by the lower half of the POSITION READOUT in units determined by the READOUT CONVERSION SELECTOR.

If a negative offset is required, ie, if a machine is to fall behind the others, the number entered on the keyboard is preceded by the minus sign (—).

Pushing the ADVANCE or RETARD button will cause the selected machine to increase or decrease its speed at the rate of 2 frames (.07s) per second with respect to the others, thus causing an offset. When the button is released, this offset will be retained, even if the machines are stopped, started, and run in fast forward or rewind.

Regardless of which way offset is achieved, zero offset can be restored automatically by simply pressing the OFFSET key. Offset mode operation is verified by the OFFSET INDICATOR.

Search

The search functions can be used to find any position on any or all of the machines in the group.

When the CONTROL ASSIGNMENT switch has selected a slave, entering a 1 to 8 digit position on the keyboard followed by depressing the SEARCH button will cause the selected machine to find and assume that position. When the CONTROL ASSIGNMENT switch is in the MASTER POSITION the master as well as all slaves will find and assume the selected position. If the AUTOSEARCH button is pressed at the start of a take, the tape will return to that starting point each time the SEARCH key is pressed.

Preprogramming

This function allows the master machine to be synchronised to slaves containing portions of material located at random throughout the length of their tapes. When the master tape machine is set in motion, the slave will go to its first programmed position and wait for the master to reach its corresponding cue point. Both will then go into sync until the finish cue arrives after which both machines unlock. The slave then goes ahead to the next cue point to await arrival of the master.

The slave will always assume a waiting position which is located sufficiently ahead of the entered position to be completely in sync with the master when the latter reaches that position. All commands are entered through a 16 button keyboard; it is possible to exchange cue information about a specific cue anywhere within a preset sequence of several.

Timing code clock

The code clock can be set to zero, or at any point in time through the use of the keyboard and the RESET key. There is an internal switch in the rack equipment for use with color sync (NTSC).

A 'Jam Sync' feature allows the clock to synchronise with a pre-existing time code and continue consecutive time. This is useful when doing drop ins or add-ons. It eliminates the necessity of re-reccrding the entire time code in order to achieve a consecutive count. To synchronise the clock with a pre-recorded time code on the tape, simply press the RESET key, then put the code track in Record to cause the time code to be recorded beyond that point. In synchronisation, a consecutive count is not required, but may be a convenience for editing point computations. On the other hand, a 'time of day' clock may be preferred when 'take' identification is of prime importance.

Display

The *MagLink* control panel will display the machine positions in units that are commonly used in different applications, as indicated by the 5-position READOUT CONVERSION SELECTOR. Additional readout displays may be remoted if required.

In the first three positions of the CONVERSION SELECTOR, the first six digits display hours (0-23), minutes (0-59) and seconds (0-59). The last two digits display frames (0-29), frames (0-24), or tenths of seconds.

In the last two positions the first digits display feet (0-9999), and the last two, 16mm frames or 35 mm frames (0-39 and 0-15 respectively).

Since all position codes are derived from the same basic code format, the CONVERSION SELECTOR can be moved to any position at any time during recording or playback.

In the PRE-PROGRAM mode, the true positions of master and selected slave are displayed. True positions are also displayed in the MANUAL mode in which the machines operate as conventional independent tape drives.

General

In addition to the synchroniser controls, the only other controls required to operate the tape machines are those normally needed to run the master machine and an optional RECORD button for each slave. These RECORD buttons are provided since it is possible to RECORD as well as PLAY BACK from a tape in sync.

Through the correct interface module, the *MagLink* output can be made compatible with any type of machine. The unit will control synchronous motors as well as servo or other voltage controlled motors. Contact closures are provided for audio mute, etc, during search or slewing.

Specification

Code generator output: —6 to +4 dBm.
Code crosstalk into programme tracks: does not degrade normal program crosstalk specifications of machine.
Nature of code: unique format. Converter module available to interface with SMPTE Sync code.
Required bandwidth: 30 Hz to 4 kHz (± 6 dB).
Required signal to noise ratio: 24 dB.
Minimum data recognition speed: approx .02 normal speed.*
Maximum data recognition speed (play mode): 4 times normal speed.*
Maximum data recognition speed (slewing mode): 400 times normal speed.*
Sync resolution (accuracy): ±1/300s.
Search accuracy: determined by stopping time of machine. Typically 0.2s at 38 cm/s.
Size: controls: 20.3 x 25.4 cm panel in sloping front cabinet. 10.2 cm high (max.). Electronics: 26.7 x 48.3 cm rack mount card frame, 28 cm deep. Power supply: 13.4 x 48.3 cm rack mount, 40.7 cm deep.
Power required: 115/230 Volts 50-60 Hz.
Maximum number of slaves: six per assembly.

26 ▶

Maximum pre-program capacity: 1,200 cues.
**Although not all tape machine drives will produce these extremes, hand slewing within the specified limits is permissible.*

MINIMAG

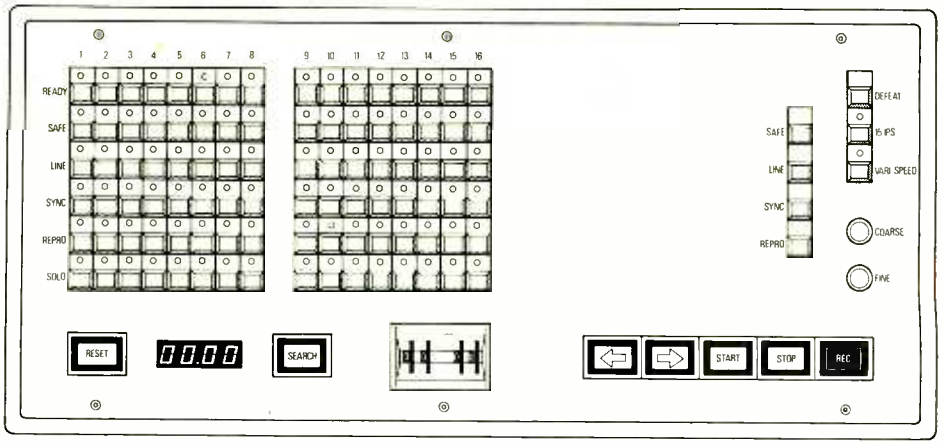
In operation, the time code generated by the *Mini-Mag* unit is recorded on both the 'master' and the 'slave' tape, either before, or simultaneously with the recording of program material. Thereafter, it compares the code played back from the slave tape with the code on the master tape and generates a capstan control signal which locks the tapes in perfect synchronism. Tape machines designed for dc servo operation are controlled directly, while synchronous motor machines require the accessory capstan drive amplifier, *Model 250A*. The tapes need not be perfectly aligned before starting because of the ±50s capture range provided. A front panel control makes it possible to offset or shift one tape with respect to the other to achieve lip sync or delay effects.

Optional plug-in relays are available to slave the Stop and Play functions as well as capstan control. With these relays installed, the slave machine will start and stop automatically as commanded by the master machine.

Switches provide for operation at either 115 or 230V and at either 50 or 60 Hz. Interconnection is accomplished by means of *XLR* type connectors and installation may be accomplished in less than 15 minutes.

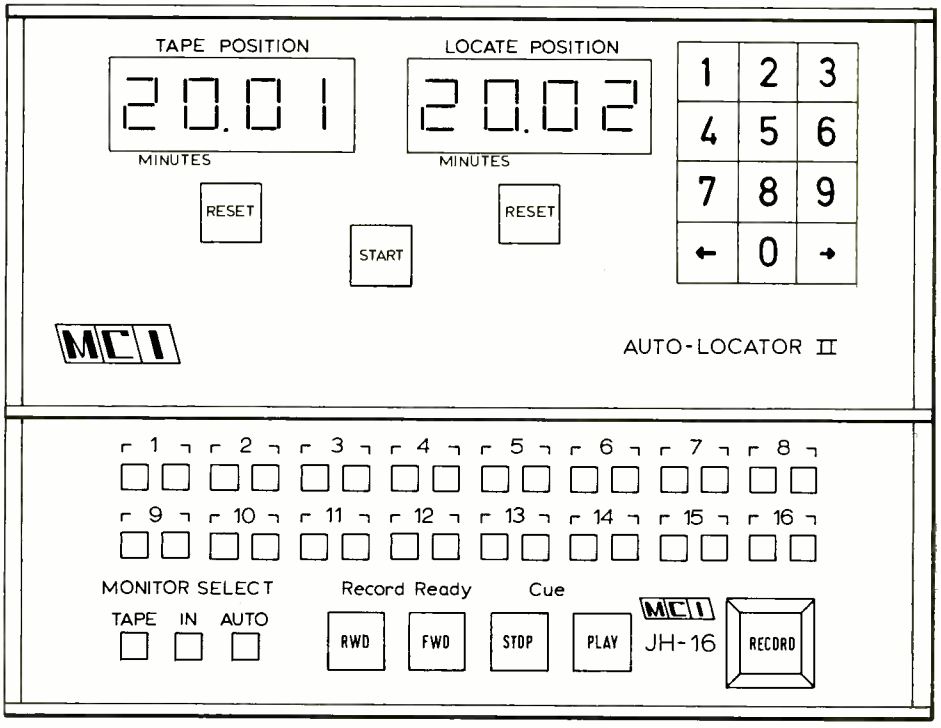
Specification

Time code: sine wave digital code.
Code generator output: —6 dBm nominal (code generator with front panel reset switch is included in basic unit).
Code crosstalk into program tracks: does not degrade normal crosstalk specifications of tape machine.
Time code bandwidth: 2.5 kHz to 3.5 kHz. Requires tape channel response of ±6 dB, 2 kHz to 4 kHz.
Sync resolution: 1/300s.
Sync locking time: Typically under 2s from dead stop.
Capture range: ±50s.
Offset range: ±33s.
Power: 115/230V ac, 50/60 Hz, 2W.
Dimensions: 4.5 x 48.3 cm rack panel, 25.4 cm deep.
Weight: 4 kg.
Connectors: *XLR* type.
Relays: optional solid state plug-in type with screw terminals for connection to remote 'stop' and 'play' inputs of tape machine.



Above: *Lyrec remote panel for TR53 series recorders*

Below: *MCI JH-16 Auto-Locator II.*



LYREC

Lyrec A/S, Hollandsvej 12, DK 2800, Lyngby, Denmark. Phone: 02-87 63 22.
UK: Industrial Tape Applications, 5 Pratt Street, London NW1 0AE. Phone: 01-485 6162.

REMOTE CONTROL BOX for use with 50 mm series *TR53* machines.
This unit functions at three levels. It controls the usual LINE/SYNC/REPLAY/SOLO status of the individual recorder tracks. It remotes the tape transport control functions. It offers an auto-cueing function to either a reset point or a preselected cue position; a digital readout indicates the tape/time/position. Coarse and fine speed controls give a vari-speed option.

MCI

MCI, 4007 NE 6th Avenue, Ft Lauderdale, Florida 33308, USA. Phone: (305) 566 2853. Telex: 51-4362.
UK: MCI (Professional Studio Equipment) Ltd, 21 Claremont Square, London N1 91X. Phone: 01-278 2288.

AUTO-LOCATOR

This comprises two displays TAPE POSITION and LOCATE POSITION each calibrated in minutes and seconds. The time position can be entered into either through the keyboard. SHIFT buttons (arrowed on the bottom line of the keyboard) nominate which display is to be updated.

The TAPE POSITION display gives a real time readout of the current tape position in minutes and hundredths. It is normal to enter 00.00 at the start of the tape to provide a baseline. The LOCATE POSITION display indicates the required tape position entered through the keyboard. Minutes and hundredths. Each display has its own RESET button with a START button mounted in between. The latter initiates the location process.

The buttons on the lower half of the unit relate to the record status of each channel. The left hand individual track buttons are RECORD READY, which selects tracks to be brought into record when the RECORD button is pressed. The right hand CUE button gives cue status to that track. The master status buttons (TAPE, IN, AUTO) select play, input and automatic overdub.
Price: $1500, £825.

JH-34 SYNCHRONISER

This machine offers a reliable way of interlocking two or more multi-channel tape recorders, using a simple, easy to generate and transfer time code.

Under certain circumstances, it may be necessary to use more than 16 channels of audio during complex recording sessions. The *Zero Position Error* sync system provides the producer and engineer more than 16 channels when it is necessary, not compromising the sound when it is not necessary to use more than 16 channels.

A sync signal is recorded onto one channel of each recorder for interlock purposes. This can be done anytime before the last track is used; ie a producer does not have to make the decision to go

28 ▶

Orban Parasound's Two Channel Parametric Equaliser

It's the most cost-effective professional equaliser available today.

Two totally independent channels each with four overlapping 4.3 octave range bands.

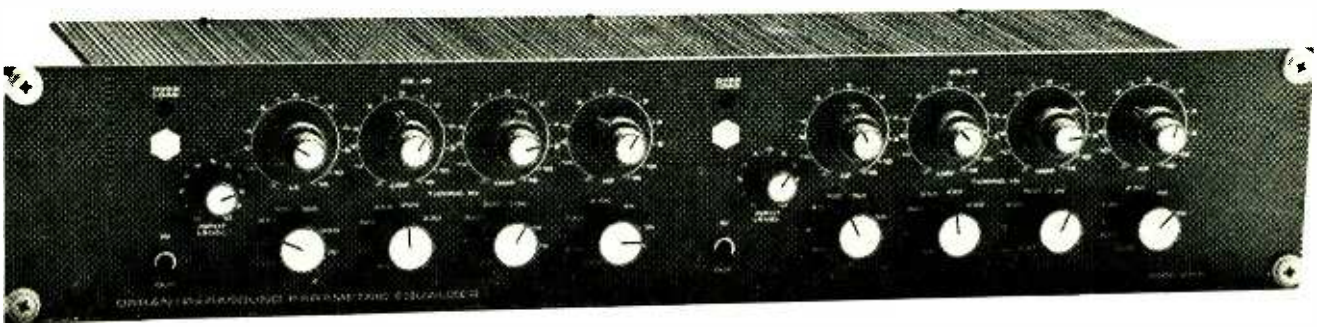
Continuously variable tuning, equalisation level *and* bandwidth controls on each band.

Up to 16 db boost, minus infinity cut available on each band.

'Constant Q' rather than reciprocal equalisation curves. Extremes of equalisation are musically useful instead of being peaky and ringy.

Click-free in/out switching.

L.E.D. overload indication.



For full information or a demonstration of the 621 B equaliser, the 516 EC dynamic sibilance controller or any other Orban product contact:

Scenic Sounds Equipment,
27-31 Bryanston Street,
London W1H 7AB.
Phone No. 01-935 0141.

Orban/Parasound
San Francisco, California 94109

SURVEY: TAPE CONTROLLERS

32 track until his 15th channel is used, and he may need more than 16 channels on only a couple of songs in an album project. Once 15 channels are filled, they can be mixed down to an open track of the second machine and used for cue in all forthcoming overdubs, making it necessary to use two 16 track machines only in the final mixdown. Due to the accuracy of *Auto-Locator II*, the lockup time is 5s or less, making two-machine operation simple.

An MCI *JH-16* can also be interlocked to video tape or a film equipment.

Specification

Lock-up Time: 60 cm/s tape difference at 38 cm/s, 7 seconds for lock-up.
Accuracy: 30μs or 10° phase shift at 1 kHz.
Input Impedance: 10 kΩ bridging.
Input Level: —10 to +18 dBm.
Output Impedance: 50 Ω,will drive 600Ω or greater.
Output Level: +4 dBm.

3M

Mincom Division, 300 South Lewis Road, Camarillo, Ca. 93010, USA. Phone: (805) 482 1911.
UK: 3M Mincom Products, Sales and Service, Witley Works, Witley Gardens, Southall, Middlesex Phone: 01-574 5929/6045.

SELECTAKE for use with 3M professional series.

General

The *Selectake*, when interfaced with one of the 3M series professional recorders, automatically locates preselected tape position on a recorder and indicates this position. When this position is located, the *Selectake* commands the recorder to stop. The unit comprises a dc power supply and a pc board which contains the logic and control circuitry.

Operation of the unit is performed in conjunction with the operation of an interfacing audio recorder. Once the controls of the *Selectake* are set up, the interfacing unit's controls must be operated to initiate the rewind and forward modes. It should be set up with 'take one' as a zero starting position for a tape segment. The 'take positions' indicated on the readout tubes should be noted and recorded.

Operating controls

SET ZERO—resets the readout tubes to 0000.
LAMP TEST—tests indicator tubes, reading 8888.
COUNT ENABLE—allows operator to maintain a registered count during such modes as editing when one reel may have tape added or subtracted, while the other may contain the information to be located, ie downbeat.
SEARCH STOP ENABLE—inhibits the automatic search operation.
PRESELECTOR—sets the location of a predetermined tape position on the recorder.

Operating procedure

Press the SET ZERO switch at the beginning of 'take one' to reset the readout to zero. Proceed with the recording take in the normal manner and record the readout at each subsequent position. To return to that position, the following action is required. Set the required position count on the preselector thumbwheel, and if the selected position number is greater than that on the readout, go into the forward wind mode. The recorder will then stop within ±2 counts of the chosen value. If the position number is less than that shown on the readout, the rewind mode must be selected. The search mode may be terminated at any time by depressing the stop button.

REVOX

Willi Studer, CH-8105 Regensdorf, Zurich, Switzerland.

30 ▶

Our Incredible Opening Offer

Buy this

TEAC A3340S
4 channel recorder with simul-sync, 15 and 7½ips, 10½in. spools, 3 motors.

TEAC MODEL 2
6 input, 4 out mixer. Very versatile, designed for 3340S, 4 channel panning, filters, echo send.

OUR PRICE
£950.75

Buy this

REVOX A77 H1102 MARK 4
High speed stereo tape deck, 2 track, 15 and 7½ ips 10½in. spools.

LAMB PML 420
4 input, 2 out mixer, 3 way EQ, echo send, pan, limiters, V.U. meters.

OUR PRICE
£635

Get all this FREE!

4 AKG D190E/Hi Studio Cardioid Microphones with Cannon XLR connectors and leads. One TEAC RC 120 remote control.
Worth £186.50

Professional REW Audio

Get all this FREE!

4 AKG D190E Studio Cardioid Microphones with Cannon XLR connectors and leads.
Worth £149.50

Prices include VAT

REW Professional Audio, 146 Charing Cross Road, London WC2. Tel: 01-240 3064 (4 lines).

STOP PRESS! HH MULTI-ECHO & ECHO UNITS NOW IN STOCK

SURVEY: TAPE CONTROLLERS

UK: C E Hammond & Co Ltd, Lamb House, Church Street, Chiswick, London W4 2PB. Phone: 01-995 4551.
US: Willi Studer America Inc, 1819 Broadway, Nashville Tenn 37203, USA.

REMOTE CONTROLS for use with *A700* series.
No 34205 Vari-speed
This device provides continuous variation of speed from 6.5 to 57 cm/s. A built in led indicates lock of the capstan motor to any of the standard speeds or an external reference frequency. £37.

No 34201 Remote function control
In addition to providing remote function of the usual transport controls, it offers remote function of the following:
AUTOMATIC. Machine reads clear tape at end of spool, rewinds to clear leader at the start of tape and automatically restarts in the play mode. This repetition continues ad infinitum.
PAUSE. Pauses transport in any mode, and also gives the ability to change mode while in pause.
REPEAT. When this button is depressed, the recorder goes into rewind. However, when the button is released, the machine drops into the play mode.

The remote also gives control over the recording and erasure of sync pulses when used with a modified version of the *A700* for automated slide shows. £53.55.

Revox also manufactures a small remote for use with the *A77* series. The device simply remotes the usual transport functions. Handheld with 5m cable £13.40. Desk mount with non slip case and 10m cable £17.55.

SONAPLAN

Sonaplan Ltd, 36 The Four Tubs, Bushey Heath, Herts WD2 3SJ. Phone: 01-950 1667.

SERIES 79 TAPE TIMER
This is a simple tape timer for use on 3M professional tape machines of any vintage. It offers minute and second indication using a four digit led readout.

XT 14 AUTO-LOCATOR
This claims to be the 'most sophisticated auto locator unit available from any manufacturer'. It has been designed solely for use with 3M 79 series recorders. The quoted accuracy is within ±0.5s over 760m of tape.
Extract from advance specification:

Operates in minutes and seconds with ±0.5s accuracy over 30 minutes. Automatic compensation for HI/LOW speed change.

Two completely separate counters, one as a master *M79* tape timer unaffected by any auto-location program, the other being the *XT 14* counter and the basis of all auto-location commands.

Full transport remote control with led illumination on each button. Optional led flashing is available on an internal switch.

All transport and location commands are mutually exclusive, eg the operator is able to countermand any function selected merely by depressing the new function button required, without the necessity to go through stop. This also applies to RECORD. If PLAY is selected whilst in RECORD, the electronics will drop out of RECORD enabling continuous drop ins and outs to be made easily. Normal PLAY + RECORD interlock is required to initiate RECORD.

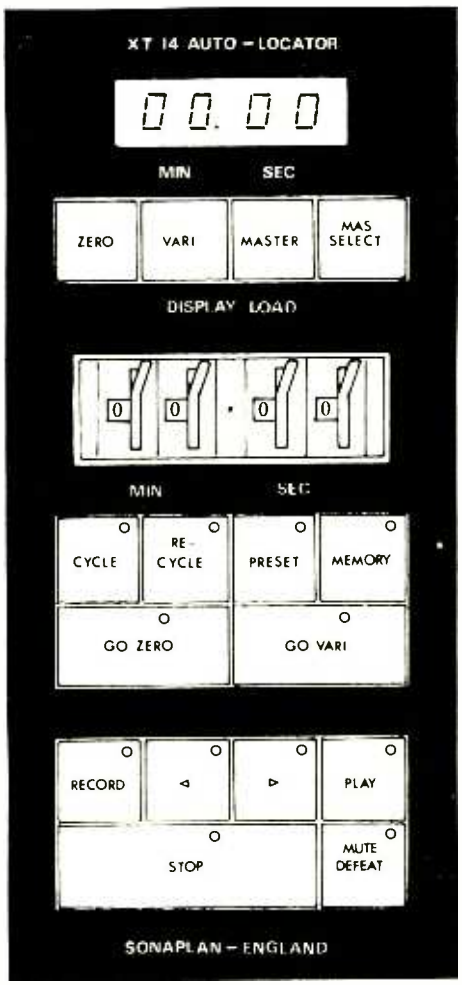
Simple plug inversion to change the *XT 14* from 19-38 cm/s operation to 38-76 cm/s.

Both counters have automatic freeze on tape run-out and automatic counter zero when machine is switched on.

Power supplies are derived from machine eliminating bulky power supplies and voltage compatibility problems.

CONTROL FUNCTIONS

Below left: *Sonaplan XT14 control panel.* **Immediately below:** *Sonaplan XT14 layout.*



Go zero: The machine will spool in the correct direction to the point on the tape where the *XT14* counter was last zero loaded and stop
Go vari: This function works in conjunction with either the PRESET leverwheels or the MEMORY facility. If the PRESET button is illuminated GO VARI will send the tape to the time set on the leverwheels and then stop. If the MEMORY button is illuminated GO VARI will send the tape to the time point where the MEMORY button was last depressed and then stop.
Preset: Depression of this button will de-select the MEMORY function and ensure that any subsequent GO VARI commands refer to the leverwheel settings only.
Memory: Depression of this button will de-select the PRESET function and will store the minutes and seconds reading on the counter at the initial moment the button was depressed. This information remains stored until PRESET is selected. It is possible to read the MEMORY by depressing VARI LOAD, however this process will cancel the store and PRESET will automatically be re-selected. The MEMORY function is designed as an electronic marker for rapid re-location of potential drop in points.
Cycle: The machine will spool in the correct direction to zero, enter PLAY up to the PRESET leverwheel settings, rewind to zero and stop. If CYCLE + RECORD are selected the machine will spool to zero enter RECORD up to PRESET, rewind to zero, enter PLAY up to PRESET, rewind to zero and stop. The CYCLE function is designed to ease re-mix sessions, while the CYCLE + RECORD function will ease overdubbing.
Re-cycle: This function is very similar to CYCLE except that the program is repeated until another function is selected. If RE-CYCLE + RECORD are selected a continuous RECORD/REWIND/RECORD program occurs between zero and PRESET.
Zero load: This loads the *XT 14* counter and display with zero, acting as a base for all automatic location functions. If the reset button is depressed on the optional *M79* machine display, both *XT 14* and Master *M79* counters are set to zero. This should normally only be set when a new tape is placed on the machine.
Vari load: This loads the leverwheel settings into the counter providing PRESET is illuminated. If MEMORY is illuminated, the MEMORY readout will be loaded into the counter, thereby cancelling the store and automatically re-selecting PRESET. Therefore by double depression of the VARI-LOAD button, PRESET will always be loaded at the expense of the MEMORY.
Master load: This loads the master *M79* counter readout into the *XT 14* counter enabling a check to be made on the tape used or simply to refer to original location points with reference to master zero.
Master select: If this button is depressed with ZERO LOAD both *XT 14* and Master *M79* counters are zeroed. It will be necessary to use this facility if the optional master *M79* display is not required. If this button is depressed with VARI LOAD both counters are loaded with either PRESET or MEMORY whichever is selected. This enables instant auto-location functions on tapes that are stored tail out, providing the original end of tape freeze count has been noted and is able to be re-loaded into both counters.

INSTALLATION
The 'brain' of the auto-locator is mounted under the *M79* electronics and simply plugs into the main logic board. The *XT 14* controller is supplied as a free standing unit with an 8m cable. It can be mounted in a console. The pickup sensors, which plug into the 'brain' are mounted underneath the large idler at the front of the 3M transport which in turn is fitted with a reflector plate.

An optional additional display coupled to the master counter is available to be mounted on top of the VU penthouse, again plugging into the 'brain'.

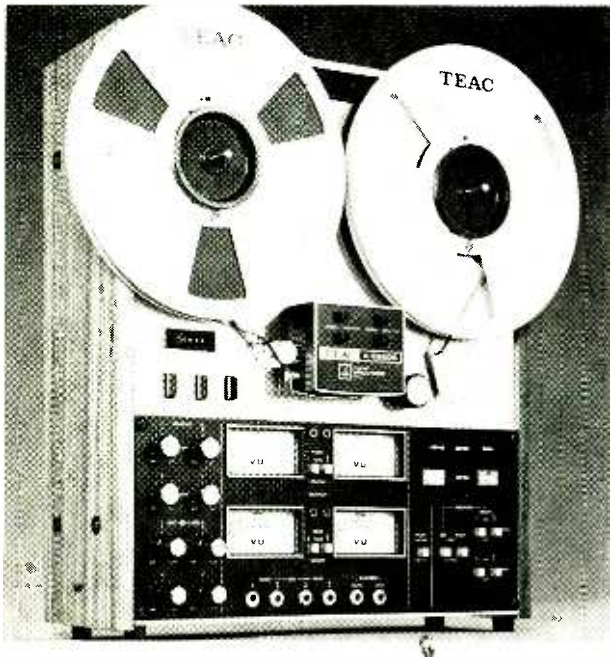
32 ▶

Meet the creator. The TEAC A-3340S.

Think of a professional recording studio engineered into a 50 lb package — at a fraction of its cost — and you'll have an idea of the capability of the TEAC A-3340S 4-channel tape deck.

Consider its versatile features. Like Simul-Sync. It allows you to record several instruments and voices at once or at different times *individually*. And each track of the Simul-Sync record head can be electronically switched to permit monitoring of the previous tracks as each new track is being recorded. Since the A-3340S is a 4-channel deck, you can lay down four individual tracks at the exact recording levels you desire. This material may be mixed and subtly blended together at a later date until the desired end result is achieved.

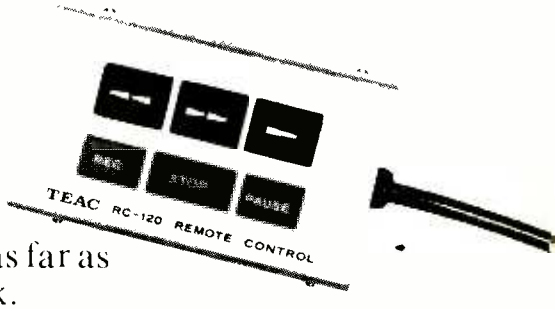
TEAC is innovator of the 3-head/3-motor tape transport system. A 4/8 pole, dual speed synchronous motor powering an extra heavy, balanced flywheel drives the capstan. This motor assures a stable and constant tape run, impervious to line voltage fluctuations or other external factors.



TEAC's own Permaflux heads, specifically designed for 4-channel operation, are notable for their excellent frequency response and low distortion.

Simple and positive touch-button controls enable you to move through directional functions (play, fast forward, stop, record, pause and rewind) with a mere touch of the finger. All of the six control buttons are positioned for easy operation.

With the RC-120 remote control unit (optional extra) you don't have to hang over the A-3340S. All the basic transport functions will be at your finger tips as far as 16 feet away from the deck.



Separate Bias and EQ switches maintain a compatible adjustment between the tape deck's electronics and the different types of tape.

The "Punch-in" record feature permits you to go directly from play mode to record mode (running splice). This facilitates creative recording and editing, and is a valuable, unique feature of the A-3340S.

Signals from 8 sources (4 line and 4 mic inputs) may be recorded simultaneously. Independent mic and line preamps, each with its own level control, provide maximum flexibility for creative recording, and permit input from a combination of line/source and mic signals.

The A-3340S with its 10½" reel capacity is an inexhaustible partner in the creative process — one that opens up a realm of original sound limited only by your imagination.

TELEDYNE ACOUSTIC RESEARCH High Street,* Houghton Regis, Dunstable, Bedfordshire LU5 5QJ Telephone: Dunstable (0582) 603151

SURVEY: TAPE CONTROLLERS

STUDER

Studer Franz AG, Professional Audio Equipment, CH-5430 Wettingen, Switzerland.
UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts. Phone: 01-953 0091.
US: Willi, Studer America Inc, 1819 Broadway, Nashville, Tenn 37203, USA.

AUTO-LOCATOR FOR STUDER A80 SERIES

General

The *A80* pre-selection unit enables fast and precise location of a programmed tape position. By simply depressing a push button, the system automatically finds a freely chosen tape timer zero point or predetermined setting. With normally adjusted braking times the locating process takes place without any overshoot.

The locating system works with high accuracy due to the use of the pulse signal of the tape timer electronics: within 1s on 19/38 cm/s machines and within 0.5s on 38/76 cm/s machines. The *A80* tape locating system enables speedier working when recording or mixing down by taking the load off the recording engineer.

In addition an automatic mode can be activated to repeat a desired length of tape as many times as required.

Front panel controls

Tape transport push button set—in standard order.

ZERO button for automatic seeking of tape timer position 00.00.

VAR button for automatic seeking of predetermined position.

Thumbwheel switches for selection of tape position to be found, and for setting the counter.

Electronic minutes-seconds counter with SET and RESET buttons.

MASTER RESET button.

Switch for selecting tape width (6.25, 12.5, 25 and 50 mm).

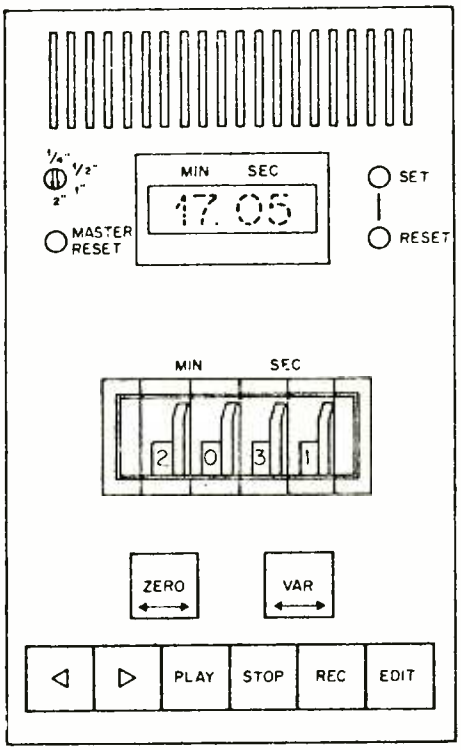
Functions

Depressing either of the buttons ZERO or VAR sets the unit in the automatic locating mode. ZERO locates tape position 00.00 on the tape timer, and VAR finds the position set on the thumbwheel.

When the auto-locator is not in operation, the transport control buttons operate in the normal manner. However, their mode is altered when seeking is in progress. FORWARD/REWIND override as long as they are physically depressed. After release, the automatic function takes over. Pressing PLAY during the location procedure makes the recorder drop into the play mode when the programmed position has been reached. To drop into play directly, the STOP and PLAY buttons must be depressed together.

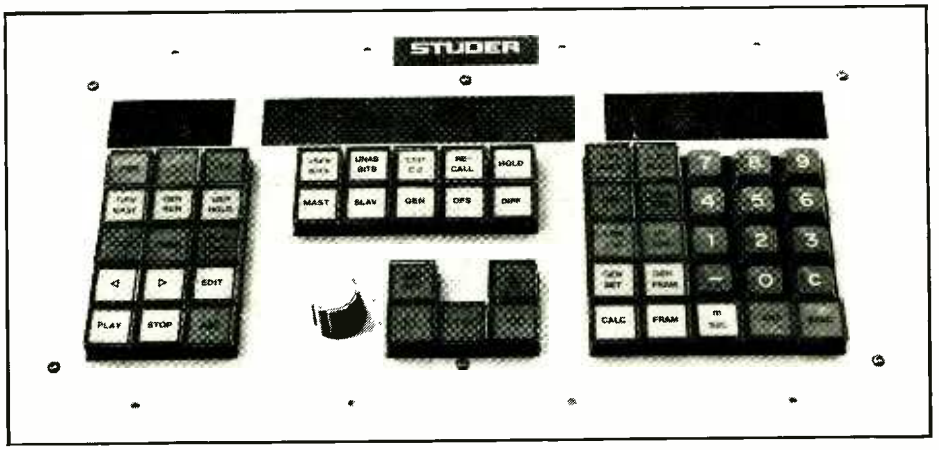
The MASTER RESET button sets both the counter and the counter in the machine to zero. The RESET function sets only the preselection counter to zero. This means that the tape machine counter can be used for the actual time of a production, whereas preselection counter can, for example, be reset to zero for each programme section.

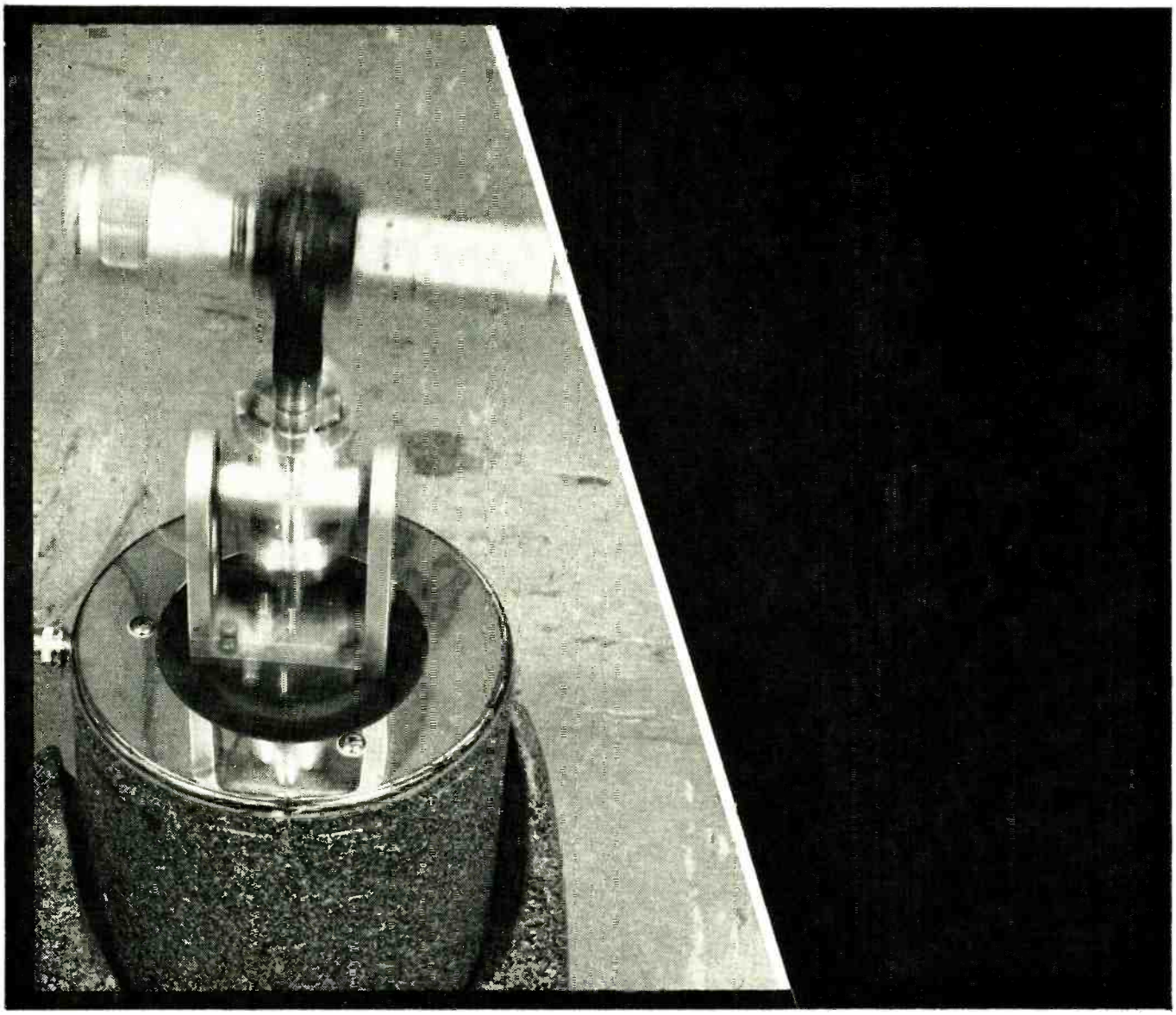
The SET button sets the preselection counter to the value set on the thumbwheel. 38▶



Left: *Studer locator control panel.*

Below: *Studer Tape Lock System 2000. This equipment locks two multitrack tape machines in synchronisation in a master/slave routine. It uses one track from each machine in the normal manner. The synchroniser logic is housed within the A80 console; the control panel depicted in the photograph is mounted on the mixing console. The SMPTE code gives a parking accuracy of ±1 frame. The manufacturers quote a maximum locking error of 100 µS.*





Shake, rattle & roll.

Welcome to our chamber of horrors. Inside the Shure Quality Control laboratory, some of the most brutal product tests ever devised are administered to Shure microphones. The illustration above shows a "shaking" machine at work on a Shure microphone and noise-isolation mount. It's only one in a battery of torturous tests that shake, rattle, roll, drop, heat, chill, dampen, bend, twist, and generally commit mechanical, electrical and acoustical mayhem on off-the-production-line samples of all Shure microphones. It's a treatment that could cause lesser microphones to become inoperative in minutes. This kind of continuing quality control makes ordinary "spot checks" pale by comparison. The point is that if Shure microphones can survive our chamber of horrors, they can survive the roughest in-the-field treatment you can give them! For your catalog, write:

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

SHURE®

Campus radio: the broadcasting wasteland

KEITH BLOOMFIELD

A sizeable percentage of America's future broadcasters will probably be veterans of college and university campus radio stations. Campus radio has been producing broadcasters for at least forty years; long enough to graduate from its ranks students who were destined to be the program executives of the three major tv and radio networks, pioneers in public broadcasting, and the announcers, owners, and engineers of the nation's more than 8000 licensed broadcasting stations.

CAMPUS radio can be broadly classified under three general headings:

1. Commercial/non-commercial
2. Am/fm
3. Wireless/wired wireless

With the exception of fm wired wireless, you can choose any class of station from each of the three headings and arrive at a permutation that matches some genre of campus facility.

Commercial stations produce revenue by selling time to advertisers. Non-commercial stations survive through the good graces of grant giving foundations and listener contributions.

Am and fm are the two standard broadcast bands. The am band is located from 535 to 1600 kHz and the fm band is located between 88 and 108 MHz.

Wireless broadcasting is the old Marconi method of transmission from transmitting antenna to receiving antenna. Wired wireless broadcasting is a hybrid system utilizing an electrical conductor to bring an rf signal to a receiver. Wired wireless or carrier current broadcasting (ccb) is the least expensive and most often used method of setting up a broadcasting facility that services only an immediate campus area.

A ccb station does not require licences for its personnel or its equipment, although the transmitter must be Federal Communications Commission (FCC) type approved. The FCC provides for ccb under Section 15 of its Rules and Regulations. These stringent rules are difficult to monitor and, subsequently, flagrantly violated.

Ccb transmitters range in output from two to 50 watts, depending on the size of the designated reception area. The transmitter is impedance matched and coupled to the three phase ac power network in a building to be covered (dormitory, classroom, etc). The building's wiring conducts the rf energy throughout the building. Any radio receiver connected to the network or in close proximity to it can receive the signal. Hence, wired—referring to the building's wiring and wireless—since direct connection to the network is not needed.

Section 15 limits the reception area to a distance of 300 ft of a signal conductor. I know of one instance where due to a 'skip' a signal was received over 200 miles away. Not bad for six watts. The atmospheric freak momentarily multiplied the station's potential audience by a million fold. Unfortunately, its effects were too short lived for the staff to adjust their advertising rates accordingly.

Thus, a campus radio station can be classified by its source of funding, broadcast band and method of transmission. These classifications also serve as qualifiers during the sticky job of preparing an administrative proposal.

For legal and economic purposes, a station's licence, if indeed the station need be licensed, is filed under the corporate name of the institution. With the college experience usually lasting four years, the board of directors of a station change frequently—often by the week. Banks are justifiably reticent about granting loans in the face of such instability. But stations tend to come about through the efforts of a core of active, vigorous and thoroughly bored students who eventually suffer academically, physically and morally for their involvement and don't take no for an answer.

The administrative proposal reads like a House bill to increase taxes. It is, after all, a salespitch and its job is to justify, for the administration's benefit, the salient reasons it has for backing or investing in the venture. Educational benefits, public image and community service are the most frequently used ploys. If a college education can be thought of as a purchasable commodity, then a campus radio station is but another selling point. It demeans the facility and the institution, but it's an often used and highly successful approach.

For argument sake, let's say that the powers that be have granted

permission to a student group to build a station. What now? If the station needs to be licensed, they must obtain a Construction Permit (cp) from the FCC. The cp requires information on expected capital expenditures, financing, programming, and a myriad of troublesome details.

Stations in their embryonic stages opt for carrier current or educational fm operation. Both are relatively inexpensive to build and maintain. A ccb station can easily be expanded to an fm educational operation and an fm educational facility can be upgraded in power.

The segment of the fm band allocated for educational operation is restricted to the lower end of the spectrum. The minimum operating power for an fm educational station is ten watts, measured from the final output stage of the transmitter. The resident electronics wizard, a prerequisite for all budding stations, has grandiose aspirations of hyping up the antenna system and broadcasting worldwide. But the FCC is hip to his tricks and is very cautious about approving prototype antenna designs. A multiple bay antenna can easily quadruple the erp of a ten watt station. And if the station covers a campus housing thousands of students in its dormitories, ten watts begins to behave more like one thousand in terms of its reach.

What constitutes educational programming? Good question—wish I had an answer. Educational programming is a vague governmental umbrella classification. Some stations interpret it more liberally than others. A station that takes it literally may program classroom lessons or thumb its nose at the five hours per week programming minimum and begin each day by playing foreign language teaching tapes. A great new market for Berlitz.

Educational programming is usually interpreted as fare that is other than entertainment. This definition has tremendous latitude and many stations are quite innovative, particularly in the realm of community services and involvement. Some stations are political entities. Though they avoid taking sides on issues, their consciousness raising efforts betray their positions.

To provide these services often requires some very respectable hardware. College stations pride themselves on the equipment they have and on how well they manage with what they lack. University funding is tight and by any other standard, these stations appear to function on subsistence budgets.

Equipmentwise, they are fundamentally the same: studio microphone, two or three turntables, cartridge and reel to reel tape machines and a mixing console. Of course there are stations that are more elaborate, boasting announcer booths, facilities for outside broadcasts, sophisticated consoles, etc.

Equalization on broadcast mixing consoles is unheard of. The average college broadcaster would only abuse such a board. While a number of stations broadcast in fm stereo, the thought of quad broadcasting is but a dream—for the moment.

At some schools, good equipment is a luxury that cannot be afforded due to constant pilferage. Shure and Stanton cartridges have a peculiar way of finding themselves a part of a student's stereo system, along with Koss and AKG headphones. Electrovoice and AKG microphones are often adopted by local rock bands that visit the station when they are in need of equipment just prior to a gig. And as for records—forget it.

Record companies spend fortunes promoting new releases and since college campuses house a substantial portion of the record buying public, they are a logical place to spend the promotional dollar.

Each year, the Intercollegiate Broadcasting System (IBS) holds a convention. Its purpose is to give college broadcasters an opportunity to meet and discuss topics of importance to them both privately and in seminar sessions. Convention crowds compare notes on programming, equipment, engineering, record libraries—personal and station, and on what they've ripped off from the convention suites. The attendees are there for the freebies—Uriah Heep candles, T-shirts emblazoned with company logos, open bars, day-glo posters, a brief chat with a new artist, and a copy of his album. There's nothing more audience or ego building for a college broadcaster, than to be able to say to his listeners, 'Ronnie Rock and I were talking about his new album the other day and I thought you'd like to hear a few cuts from it'.

Certainly the search for freebies undermines the spirit of the convention, but for whose benefit is the convention held; the broadcasters or the record company reps? And if the record companies were excluded, what effect would it have on the student attendance? I would like to say none, but in all honesty I can not. Without the hope of returning home with kitbags full of goodies, the conventioneers' numbers are bound to dwindle.

As a breed, college broadcasters lack overt professionalism. Commercial college stations strive to imitate the 'Big Town Big Sound' of the legitimate stations and fm educationals, by and large, have become self-indulgent: ponderous djs and pseudo-hip programming. College radio should be the bastion of experimentation. But alas, it is not. The demands of commercial radio and the competition for the relatively few jobs in the industry have robbed the young broadcasters of the time and the freedom they need for growth. It's unfortunate that commercial progressive radio has forgotten its roots. The progressives' memories are skirting over the mid and late sixties when fm was that other band reserved for classical music and muzak; when the most progressive music heard on the airways were isolated cuts from *Sergeant Pepper*; when jazz was relegated to stations with predominantly black audiences and folk meant the Kingston Trio and Peter, Paul and Mary.

College radio was given its head when the students who operated the stations discovered that they were alone. The awakening of college radio was in great part a political discovery. The climate of the country had changed and campus life styles were vastly different from 'civilian' modes. The glory days of college radio took place during the early days of May, 1970. After the Government chose to send troops into Cambodia, students at Kent State University in Ohio demonstrated on campus in protest of the move. Violence erupted and the National Guard's actions resulted in the death of four people. The nation's college campuses reacted with student strikes and sit-ins that virtually paralyzed the higher education system for seven long spring days.

These were days that the students involved will look back on with some reverence. The days when they were united in the job of informing their audiences of the real story. When regional and national information networks sprang up overnight. These were also the days during which the news media looked at the campuses in shock and feared for the future. And these were the days when the commercial stations, the suffering fms, looked toward the universities and realized that *there* was an untapped audience. So they borrowed the college radio format and began to lure away its music, its style, and its personnel.

The outstanding stations that participated in the national strike effort were not fledgling facilities. Stations don't blossom unattended. They require direction, love and patience. It's a long process this station building. The obstacles and the pain involved in 'raising' a broadcasting child are numerous.

The first college station that I worked at is a prime example of the embryonic development that a station undergoes. WCRS was begun by a small core of students, with the help of student government funds, back in 1967. It started as a ccb station with two transmitters, strategically placed in two of the college's five dormitories. One transmitter was located in an off campus student building, serviced the building and the adjoining road—for a distance of nearly five miles. Since the signal, strictly speaking, was being carried by the powerline that bordered the road (ie an rf conductor), this extended coverage was not in violation of FCC regulations. But our first opposition was not from the government; it came from a rival on-campus station—WOMB.

WOMB broadcast from the room of a fellow student. His five watt transmitter, pumping into a two hundred foot long wire antenna draped across the face of a hill behind the campus, effectively jammed our signal— which he didn't think we'd mind sharing. WOMB's operations were curtailed, after a late night raid staged by the WCRS staff armed with wire cutters.

Our greatest enemy in those days was our equipment. The first studio was outfitted with a pair of antiquated sixteen inch transcription turntables (a gift), a massive RCA ribbon microphone, and a home brewed four channel console. When we firmed up our financial situation, we purchased a Sparta five channel mixer, Tapecaster broadcast cartridge recorder/player, and finally two

36 ▶

luxurious (at the time) Rek-O-Kut turntables equipped with Shure *M91* cartridges. We subsequently borrowed Electrovoice *635* and *666* microphones, an Ampex *600* series tape deck and, with the best wishes of the physics department, a variable power supply for our console and our turntable preamps.

The economic crunch has affected college radio too. Financial need has necessitated the need for innovation, in equipment procurement and utilization. Chief engineers have learned to. cannibalize stock equipment for parts and to construct inexpensive limiters, compressors, and mysterious black boxes from the remains of old radios and tv sets.

Some ccb stations have found that they can expand their reception areas by being picked up by cable tv operators, who also rebroadcast local fm stations, and added to the rebroadcast list. The first college station, that I know of, to be permitted to be rebroadcast was Juniata College's WJC in Huntington, Pennsylvania. The cable operation requested the FCC's written authorization and the FCC granted their request, but stipulated that they follow the same rules of broadcast conduct by which licensed stations must abide by. The FCC is, on the whole, very obliging to the legitimate requests made by campus radio stations. The Commission recognizes campus radio's energy and forward direction; and above all, that *they* are the commercial broadcasters of five or ten years hence.

College programming seems to be dominated by two schools of broadcaster. Daytime is often ruled by a small group of would be Top Forty djs. They developed tight board techniques, a clever and commercial patter and operated within the confines of a strict program format. The drive time djs utilised program wheels. These cleverly constructed discs were sliced into program categories that closely followed our program logs. They were randomly selected to set the musical pace for each given hour of the drive time slot. The discs dictated the type and order of the music to be played, when to insert psa's, news or weather briefs, and pre-recorded breakers, all of this being unlogged material. Using a program wheel, a half hour segment might proceed like this:

Station/dj id segueed into rock (current hit)
Easy listening (current hit)
Oldie breaker with dj talk over into rock oldie
psa
Folk
Weather brief with dj talk over into rock (current hit)
and so on

Each cut was tightly back-timed for continuity sake and the signal was highly compressed for the effect of an overall loud signal. Of course, the compression killed any dynamics the music might have had.

At night, the station's programming changed drastically; as did the needs of the audience. The night time mood of the studio was altered with the aid of dimmers that controlled our recessed ceiling lights—mellow surroundings for mellow music. Little known jazz artists, comedy records and tracks from rare 'British Import' albums were the mainstay of these nightowl broadcasters. Their style of programming was relaxed and laid back, often with the aid of organic preparations. This 'free form' radio style might sound simple to achieve, but it requires a broadcaster with complete manual, vocal and mental dexterity.

Free form radio is an audio potpourri. The free form broadcaster is part musician, critic and raconteur. And he unifies each of these facets into audience involving programs. Imitators punctuate their shows with dead air, stammerings and boring monologues, but the free form communicator has complete control of his audience and leads them by their ears.

There is a great disparity between the dj and the free form broadcaster. Our djs studied at their styles. They wanted to be commercial broadcasters and to make it, they adopted a style of delivery that was marketable. They developed their production and copywriting abilities to make them look attractive in the market place. But the real talents were the free formers and they had no desire to become pros; they were having too much fun. No matter what other significance you attach to college radio, you can not negate the fact that it's fun. And it's the fun aspect that probably attracts a bulk of the broadcasters. It's a tragedy that some of these pure hearts forget about the fun and become little Napoleons with empires stretching clear across campus or to the limits of the station's A contour.

Let's look at the other end of the spectrum—the multikilowatt station. On the college level, these facilities are usually affiliated with a large university complex. These universities operate their stations in conjunction with their communications departments. Serious pressure is placed on the young broadcasters if the school is located in a large radio market and the station is forced to compete for an audience.

In a competitive situation, the station has two options; play the game and compete or become the maverick—the non-commercial alternative which is, in essence, a form of competition. The alternative radio concept is simple: offer your audience something completely different. In theory at least, this approach is compatible with the FCC's regulations regarding the operation of an educational fm broadcast facility. But it doesn't always work in reality.

Alternative radio is often a bare skeleton of progressive rock and jazz, pre-empted by minority programming. While programming for the minority factions of a community is in keeping with the highest traditions of FCC policy, does it really serve the needs of an established college listenership and, more important, will the audience heed the words of unpaid and often unprofessional broadcast talent?

A licence to operate a broadcasting station is tantamount to a government admission; an admission that the licensee is a responsible party who has accepted a certain responsibility to the public. Neither the people nor the government own the airways, but it is the responsibility—there's that word again—of the FCC to regulate the limited spectrum space of the US. If, in their estimation, minority programming is in the best interests of a community, then such programming should be actively supported on the community level and not left solely up to the efforts of students who know little of the public that they are striving to reach.

America has its laws as to who may be granted a broadcast licence. It also has individuals and groups who for various reasons, be they economic, political, etc cannot obtain an FCC licence or prefer to operate outside the law in protest or in challenge. These are our pirates. It's too bad that we don't hear much about them until after they are caught by the FCC.

Two of our younger and more pugnacious pirates operated twin am and fm stations from the basement studios of one of their parent's suburban New York homes. The stations operated on frequencies just above the 160 kHz am band limit and below fm's 88 MHz boundary. Their patchwork studios and military surplus transmitters blanketed the New York Metropolitan area with WXMN-FM's signal and the suburbs with WSEX-AM's signal.

Their open microphone 'anything goes' attitude produced some of the most refreshing radio I've ever heard. They were frequently visited by FCC agents who relieved them of their expensive and difficult-to-replace output tubes and threatened them with legal action if they refused to sign off permanently. They must have stockpiled the tubes, because they never left the air for very long. Their predilection for drug-oriented music, a favourite gripe of the FCC, and the unbridled use of obscenity, resulted in the youths receiving suspended sentences and fines amounting up to fifteen years in prison and $15 000. Their only regret was that their solicitations for operating funds did not net them enough to put their pirate tv station on the air.

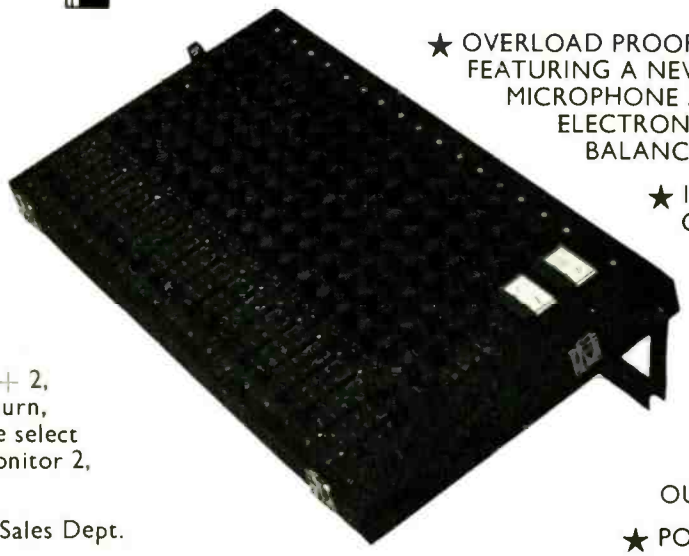
Granted, the youths were operating illegally, but these two stations were a dynamic and a vital force in the immediate community. Did the FCC take that into consideration? During its last summer of operation, the studios were the focal point of community activity. The program matter may have been questionable, but the high-school-aged students who ran the station were not out for a lark. They were deeply committed to providing the community with a service that they honestly believed they needed. How can you complain about that?

Youngsters are not the only ones who play at pirates. On September 19th, 1973, the Rev Dr Carl McIntire of the

38 ▶

pop-mixer

16 CHANNEL STEREO PA MIXER



★ OVERLOAD PROOF INPUTS FEATURING A NEW TYPE OF MICROPHONE AMPLIFIER WITH ELECTRONIC BALANCING

★ INDIVIDUAL CHANNEL MONITORING AND METERING

★ TWO SEPARATE CUE OR STAGE MONITOR CIRCUITS

★ HIGH LEVEL SIGNAL ON ALL OUTPUTS

★ POWERFUL HEADPHONE AMP

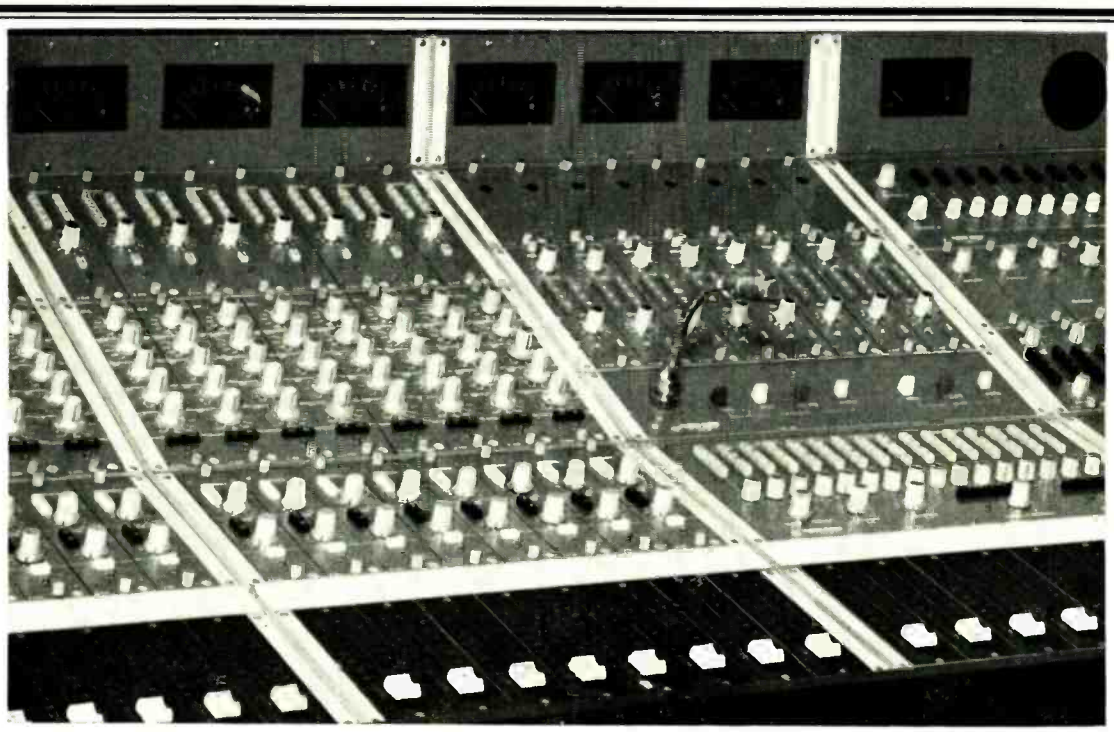
INPUT CHANNEL:
Gain control, treble middle bass, monitor 1 and 2, echo, pan, solo, slider fader.

OUTPUT CHANNEL:
Stage monitors, masters 1 + 2, echo master send, echo return, headphone gain, headphone select to talk back, monitor 1, monitor 2, solo, stereo, VU meters.

For further details contact Sales Dept.

ALLEN & HEATH LTD

PEMBROKE HOUSE, CAMPSBOURNE ROAD, HORNSEY, LONDON N.8. Tel. No. 340-3291



All our equipment has been designed for performance with reliability, maximum flexibility and real economy in mind. Various systems are available from Stereo to 24 track recording, with comprehensive metering and monitoring.

TWEED AUDIO
ELECTRONICS

ROSEWOOD INDUSTRIAL ESTATE, KELSO, ROXBURGHSHIRE
SCOTLAND. TELEPHONE 2983 STD 057 23

CAMPUS RADIO

Bible Presbyterian church began broadcasting from his 140 ft converted World War II minesweeper anchored in international waters off the coast of Cape May, New Jersey. Radio Free America's 10 kW transmitter broadcast to the Eastern seaboard, and then some, on 1160 kHz. The ship's broadcasts were shortlived due to interference complaints filed by WHLW in nearby Lakewood, New Jersey and by KSL in Salt Lake City, Utah. The FCC and the Department of Justice cited Section 301 of the Communications Act of 1934, which prohibits broadcasts by unlicensed stations either on land or 'upon any vessel or aircraft of the United States', and the International Telecommunications Conference of 1959's regulations prohibiting the use of broadcast stations aboard ships outside national territorial waters as justification for the injunction they sought. McIntire stated that his technicians were working to solve the interference problems and that he was 'prepared to defy the courts if they attempt to enjoin him from preaching the Gospel on that boat.' The good ship Columbus and Radio Free America were the first known ocean going pirates to beam to the continental United States. Radio Free America was the fulfilment of McIntire's dream of an expanded pulpit. A vanity, perhaps, but in his eyes a justifiable endeavor.

Let's look again at the campus station. Unlike the pirates, they have to try to operate within the law. Their claim to fame should be what they do for their listeners. Format effectiveness and listener acceptance cannot be equated with the comprehensiveness of a station's physical plant. But in larger university supported stations, the 'look at what we have' attitude, rather than the 'hear what we can do' posture is the rule and not the exception. Large budgets and the need to impress have given rise to some of the most amazing and useless facilities imaginable. These 'broadcasting suites' are usually comprised of a reception area/office, a record and tape library, newsroom, production studio, and one or more broadcast studios with adjoining announcer booths.

Acoustical treatment of walls and ceilings is accomplished in a number of ways, but the use of cork panelling and cloth covered spun fibreglass battens used in conjunction with perforated ceiling tiles predominate. Carpeting and adjustable lighting usually complete the environmental design.

Studio equipment is often highlighted by the obligatory oversized Gates console. Ancillary equipment might include two or three turntables, broadcast cartridge recorder/player, an Ampex series *440* tape deck or two, and a variety of microphone feeds. Koss and Sennheiser cans have gained great popularity as have Electro Voice, AKG and Sony microphones. JBL, Dynaco, and, periodically, bookshelf size AR speakers powered by McIntosh and Crown amps, provide in-studio monitoring umph.

One station that is housed in the same building as an eight track studio and two color tv studios has its staff hoping to use the eight track to provide two channel mixdowns of live music from the recording or tv studios for simulcasting or video taping.

Their technical staff has been successful at doing outside broadcasts using a twelve channel Altec mixer hitched up to a 100 mW fm transmitter. The multiplexed signal was beamed via a parabolic antenna to the studio and reprocessed for broadcast.

Because of student schedules and the need to give as many people as possible a chance to participate, station staffs at the larger schools tend to be ridiculously large. Quantity is no excuse for quality, but there is no question as to the diversity of delivery styles available to the audience. An on-air staff of 40 or 50 is not unheard of, and those figures and personnel are in constant flux.

College radio is not the playpen of budding Marconis, the verbose, or the empire builders of the future. It is a vital and a dynamic arena for self discovery. It is in flux. And it will always be in flux, but this state of change is what makes it so inviting.

Suggested Reading

'Sex and Broadcasting' by Lorenzo W. Milam.

Don't let the name of the book fool you. This publication is one of the most authoritative books around on starting college and community stations. Besides being informative, it's fun to read. The book is available from KTAO, Los Gatos, California 95030.

'Practical Guide to College Radio' by Joe Burnham.

This is a 'how to' handbook written for the more technically inclined. While much of the information overlaps that con ained in *S & B*, they complement each other quite nicely. WFPC at Florida Presbyterian College in St Petersburg are the publishers.

IBS's *Master Handbook* is the ultimate source for all college radio information. IBS (Intercollegiate Broadcasting System) is headquartered in Vails Gate, New York.

SURVEY: TAPECONTROLLERS

SIMPLE TRANSPORT REMOTE CONTROL UNITS

Since these require little discussion, only a simple list of manufacturers and suppliers has been compiled.

ABE
ABE Apparatebau und Elektronik, Becker GmbH & Co, Kommanditgesellschaft, D-7750 Konstanz, Otto-Raggenbassstrasse 5, Switzerland. Phone-075-31-21536.

AKAI
Akai Trading Co Ltd, Tokyo, Japan.
UK Agents: Rank Audio Products, PO Box 70, Great West Road, Brentford, Middlesex TW8 9HR. Phone: 01-568 9222.

AMCRON
Amcron International, 1718 West Mishakawa Road, Elkhart, Indiana 46514, USA. Phone: 219-294 5571.
UK Agents: Macinnes Laboratories Ltd, Macinnes House, Carlton Park Industrial Estate, Saxmundham, Suffolk IP17 2NL. Phone: 0728-2262 2615.

BRENELL
Brenell Engineering Co Ltd, 231/235 Liverpool Road, London N1 1LY. Phone: 01-607 8271.

FERROGRAPH
Ferrograph Professional Recorder Company Ltd, Auriema House, 443 Bath Road, Cippenham, Slough, Bucks SL1 6BB. Phone: 062 86-62511.

ITAM
Industrial Tape Applications, 5 Pratt Street, London NW1 0AE. Phone: 01-485 6162/7833.

LEEVERS-RICH BIAS ELECTRONICS
Leevers-Rich Equipment Ltd, 319 Trinity Road, London SW18 3SL. Phone: 01-874 9054.

NAGRA
Kudelski SA, CA 1033 Cheseaux, Lausanne, Switzerland.
UK agents: Hayden Laboratories Ltd, Hayden House, 17 Chesham Road, Amersham, Bucks HP6 5AG. Phone: 02403 5511.

OTARI
Otari Corporation, 981 Industrial Road, San Carlos, California 94070, USA. Phone: 415-593 1648.
UK Agents: Industrial Tape Applications, 5 Pratt Street, London NW1 0AE. Phone: 01-485 6162.

SCULLY/METROTECH
Scully/Metrotech, 475 Ellis Street, Mountain View, California 94040, USA. Phone: 415 968 8389.
UK Agents: Scully/Metrotech, Alperton House, Bridgewater Road, Wembley, Middlesex. Phone: 01-903 1477.

STELLAVOX
Stellavox, Georges Quellet, Engineer EPZ, 2068 Hauterive/Ne, Switzerland.
UK Agents: AV Distributors (London) Ltd, 26 Park Road, Baker Street, London NW1 4SH. Phone: 01-935 8161.

TANDBERG
Tandbergs Radiofabrikk A/S, Kjelsas, Norway.
UK Agents: Farnell-Tandberg Ltd, Farnell House, 81 Kirkstall Road, Leeds LS3 1HR. Phone 0532-35111.

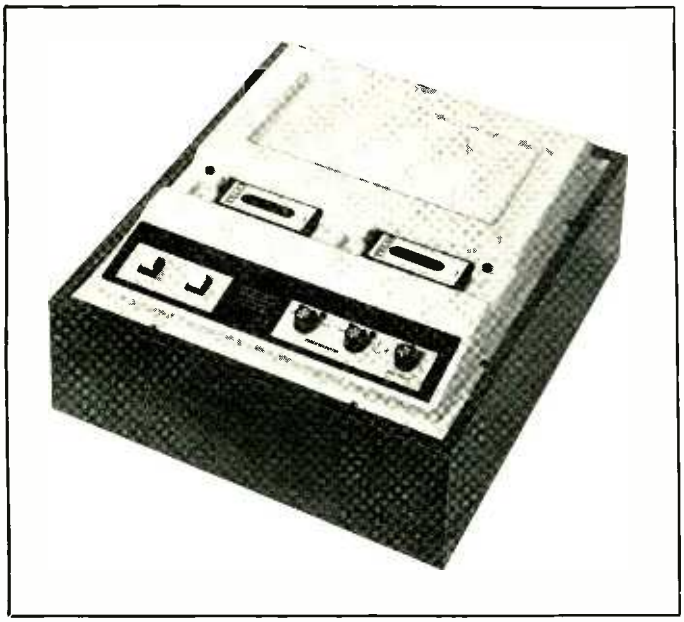
TEAC
Teac Corporation, 3-7-3 Maka Cho, Musashino, Tokyo, Japan. Phone: 03-343 5151.
UK Agents: Acoustic Research, High Street, Houghton Regis, Bedfordshire. Phone 0582 603151. ITA, 5 Pratt Street, London NW1 0AE. Phone: 01-485 6162.

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

TELEFUNKEN
AEG-Telefunken, 775 Konstanz, Buchlestrasse 1-5, West Germany.
UK Agents: Hayden Laboratories, Hayden House, 17 Chesham Road, Amersham, Bucks. Phone: 02403-5511.

UHER
Uher Werke Munchen, 8 Munchen 71, Postfach 71 10 20, West Germany.
UK Agents: Uher (UK) Ltd, PO Box 30, Braintree Essex CM7 7RG. Phone: 0376-23192.

Telex high speed cassette copiers...

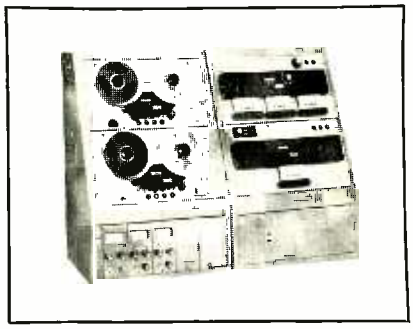


functional versatility, operational simplicity.

The Telex two channel Copier I has earned a reputation for fast, easy, dependable use. The new Copier IV now adds the versatility of track selectable, four channel operation.

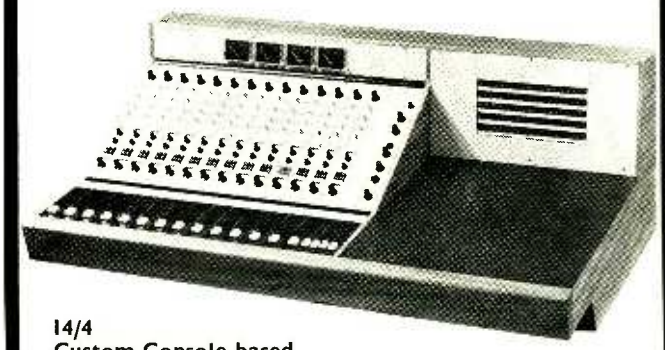
As easy to use as paper copiers, the Telex cassette copiers feature automatic control. Just select the tracks for copying and push the copy button. When copying is completed all cassettes are automatically rewound and indicator lights signal the stoppage of tape movement. Inserting or removing the master cassette automatically turns the unit on and off. A rewind button provides manual rewinding of all cassettes and the Copier IV has bias select for either ferric oxide or chromium dioxide tapes.

Their compact design and wood grain styling suit the Copiers to desk top use, while optional add-ons can provide up to five copies simultaneously. For higher production capacity, there's the Telex series 300 tape duplicator with modular flexibility to expand as your requirements change. For complete information on both products write:



AVCOM SYSTEMS LTD
STANLAKE MEWS LONDON W12 7HS
01-749 2201. Telex: 897749 Avcom

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

Audio Education Co.

★

Seasons Greetings

and

A Prosperous New Year

to

All Our Friends

In The Industry

★

01-723 6635

work

Revelation

Over recent years, curious observers have watched with bemused fascination at the way that BBC Records have moved out from under the shadow of Auntie and into the big, bad world of commerce. It all started when Roy Tempest came into the warm of BBC Enterprises from out of the cold, commercial world of Philips records. Since then we have witnessed the advent of businesslike BBC Records distribution, press launches, gimmicks, cassette issues, the Beeb label, trademark, and, as a result, ever-increasing sales to swell the BBC's coffers and perhaps keep our TV licence fees down a few bob.

But BBC Records have always been fighting with at least one hand behind their back, because they are forbidden to advertise. This is why it came as such a surprise when Beeb records actually advertised their single *Rock Around The Rock* on Capital Radio a few months ago. How did they get away with it? One theory was that the commercial was so badly produced that nobody could hear the voice-over and thus no-one knew it was the Beeb. Another theory was that those who did hear it couldn't believe their ears and thought they must have been dreaming. But now all is revealed. The Capital commercial, although advertising a Beeb record, was in fact produced and paid for by the man who wrote the song and produced the record—Brian Wade. The BBC Charter, while forbidding any advertising by the BBC itself, quite understandably doesn't say anything about other people philanthropically paying for adverts that mention the BBC. Brian Wade made the single at the Marquee Studio (nothing to do with the BBC, but it could be bought in for issue on the Beeb label because it was scheduled to be used on a BBC strip show broadcast) and was frustrated at the lack of publicity which it would get. So he made the commercial himself using a friend as the voice-over, and booked and paid for time on Capital and several of the other commercial radio stations. Incidentally, the newest BBC label release is a Morecambe and Wise lp, which won't need any advertising at all.

Adrian Hope

LA Renaissance

If you've ever had the experience of working or living in Los Angeles you will notice straight away that the city lacks something. At first you find it quite difficult to put your finger on it; perhaps it's the perpetuance of neon and McDonalds' hamburgers. But then you begin to notice that Los Angeles really doesn't go out for anything very cultural.

For that reason ABC Records, with their newly reactivated label *Command*, have chosen Los Angeles to record their first of a series of releases, Marco da Gagliano's 17th century opera *La Dafne* featuring Robert White of the New York City Opera in the title role of Apollo, tenor Hayden Blanchard, viola da gamba soloist Mary Springfels and the ensemble of Musica Pacifica under the direction of Paul Vorwerk.

The person in charge of this project as well as the reactivation of Command is Director of Classical A&R Kathryn King, whose extensive knowledge and love for both renaissance music and sound put this project right up her professional street.

After the initial decision was made to record the work, the question arose as to where it should be recorded. As Los Angeles does not have an abundance of vacant concert halls, or concert halls at all for that matter, the choice was narrowed down to either a church, where the work was performed for the first time in LA in 1971, or a conventional studio.

'Paul Vorwerk and I went over the pros and cons of the studio versus the church. It was Paul's feeling that recording in the church was an important point. In his words, "a player or singer feels like a king in a church; you feel wonderful and you play better," and singers do perform better when they are in that acoustic environment. We wanted to do a remote using Wally Heider's setup but the cost was just too prohibitive and we would had to do it in the middle of the night because of the outside traffic and it would have meant paying all the musicians premium time and the budget just wouldn't have allowed it.'

The other problem was the lack of large rooms and modern equipment. Since large productions have all but disappeared in Los Angeles, the few studios that do usually cater to independent film productions or commercials and are by no means adequately set up to do what she needed doing. Finally, Western Recorders on Sunset Boulevard proved to be the ideal choice. It had both a large room and excellent equipment. 'We were lucky when we found Western, for they had everything we needed; and, better still, it was set up for quad. We wanted to do the album using the Sansui quad encoder system which the Sansui people gave to us for use during the session.'

A bit of background on Western Recorders. Primarily a multi-purpose studio with capabilities for doing everything from scoring sessions to television commercials, they primarily do rock recording. One of their earlier claims to fame, and by no means their only, was almost every album put out by the Partridge Family. I am sure that sends a thrill up and down your spine, but you also have to realize that in Los Angeles reside many, many rock and roll engineers who profess great latent classical tendencies, and Jerry Barnes, chief engineer for Western was thrilled and more than excited to work on this project.

The interesting thing about this session was the mixture of rock technology with classical purity. As one would not suspect, the opera was recorded in pieces, much the same as any Rock or Pop piece is cut. The orchestra would come in one day and lay down some basic tracks, while the principal singers would do their arias at some other time during the week.

At first, the question arose that with such an articulate piece such as a 17th century opera was 'wouldn't such a technique lose much of the spontaneity of the opera itself?' As Ms. King points out: 'We didn't suffer from that because the opera was rehearsed in sections and the opera itself is in very short segments. So the performers were used to rehearsing something from Scene 1 and something from Scene 4 and it didn't disorient them too much. I was worried about it at first and we tried to put things in sequence within a day's worth of recording, I was concerned, yet luckily, this particular opera, more than any other I know, lends itself beautifully to recording because the longest complete section in the work is only 4:15 long.'

The fact that the opera *is* in segments made it very easy to record and edit, something you couldn't or wouldn't want to do with *La Traviata*.

The entire opera was recorded in three sessions with one overtime session and two pickup sessions with overdubs.

The next point of concern was miking. Considering the types of instruments used such as harpsichord and viola da gamba, a lot of care had to be taken with placement of mikes to capture fully the purity of their sound.

As is always the case with rock recording, the first inclination is to throw a couple of *U87s* as close to keyboard instruments as possible. The majority of American engineers have a tight miking disease, forgetting that a mere few inches can make all the difference in the world. Luckily, with Jerry Barnes in charge, his sensitivity towards the music itself coupled with his experience in all fields of recording lent itself greatly to the overall lushness of the recording, taking special consideration that the end result would be in quad. For this reason he left the mike pots open, even when there wasn't the full ensemble present to maintain the same room atmosphere and presence.

After the relative ease with the recording came the nose-to-the-grindstone of mixing down. This project, as you remember, is to be mixed in quad utilizing the new Sansui quad encoder system. Just released to the public, *La Daphne* would be the first such in which this system was used. Aided with the help of Jack Muroi and a team of six technicians from Sansui, they proceeded to install and maintain the new system.

During the course of the mix they were informed by editor James Moore that at the time this piece was composed in 1608 the performance practices were not the same as they are today and in effect it was common for musicians to sit around in the general vicinity of the audience. A mute historical sideline, maybe, but in reality the quad mix that was achieved here may genuinely be the way the opera was originally heard in 1608. One of the many ironies of technology I suppose.

Although the actual recording took place in less than a half-dozen sessions, the final mixdown took well over a month. Place the instruments in proper perspective with each other, maintaining an overall balance and trying desperately not to be swept away with the potential gimmickry that is so tempting in quad the end result is, without a doubt, pristine.

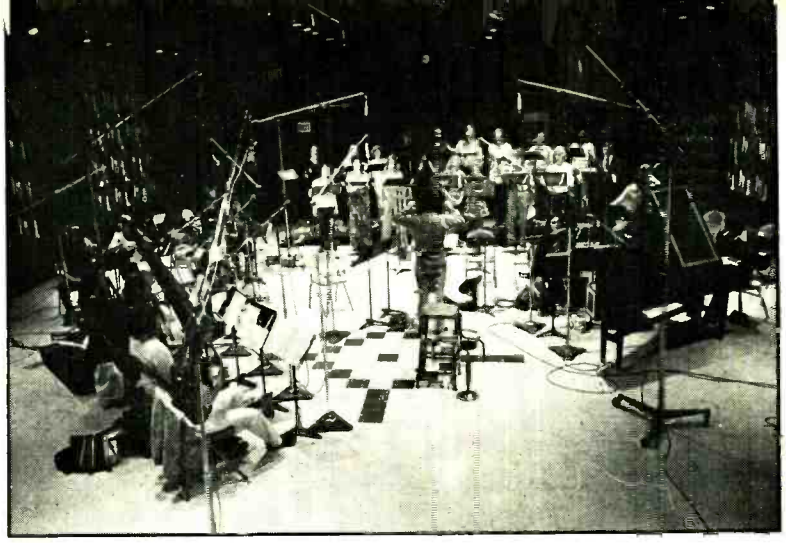
With the mix finally finished, the only doubts that are raised are in regards to the echo. 'Western's room is, still strictly speaking, a dead room for all practical purposes even though it's quite large, so we added echo. And the only fault to the recording at all is the fact that we didn't use enough echo. But next time . . .'

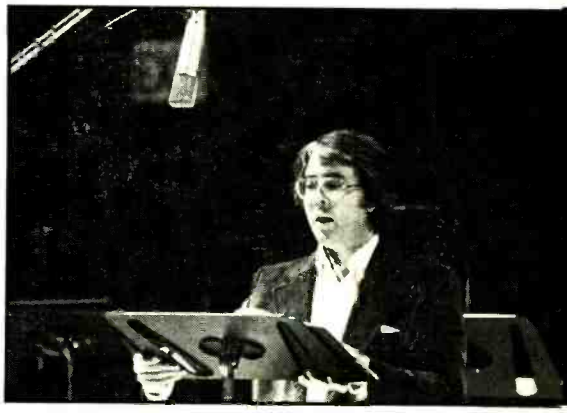
So with the final mix complete and to nearly everyone's satisfaction, the next step was to get a master disc cut. For obvious reasons the care that was shown in the recording and the mix should also reflect in the disc which it's mastered on. After a few unsuccessful attempts the tape was finally taken to Kent Duncan, owner of Kendun Recorders, whose studio is building a reputation of sheer incredible throughout the US. In Ms. King's mind, Kent Duncan is one of the few mastering engineers in Los Angeles who really understand a quad disc and, like Jerry Barnes, also understands and loves classical music. Incidentally Kendun's clients like Western's are primarily rock oriented, and thus another discovery of a closet classical engineer.

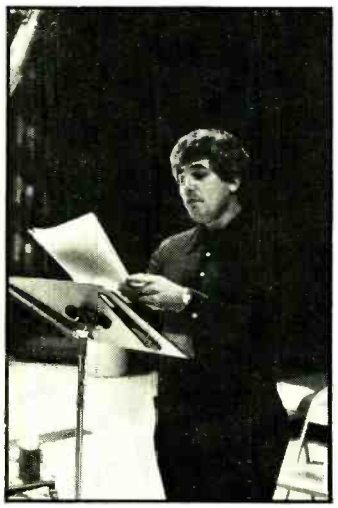
After an initial cutting, which later showed traces of pre-groove echo even with an automatic 6 dB expand on the mastering console, which is considerable, the disc was recut with added manual expand over and above the already automatic expand. As Ms. King put: 'It looked like they strapped ice-skates on miniature mice and asked them to skate across the disc.' The result was flawless.

The pre-groove echo posed quite a problem, and does in classical recording, particularly when an extremely quiet passage is interrupted by an abrupt loud passage. Any pre-groove echo can ruin the desired effect and the excitement of the performance is dampened by the 'sneak preview'.

The project is now complete and ready for release, which will be sometime in December in America and January in the UK through EMI. The opera climaxes four years worth of work for Kathy King who now has the definitive and only commercially available recording in existence. And a lot of happy engineers who never thought they would ever have the chance to break away from the Boom-shaka-laka-laka's of commercial rock music and work on something that they have always wondered about. **Gordon Skene**







Top to bottom, l to r: *Mic set up pictured was left standing, with pots open for all sessions, including those without full ensemble present.*

Mary Springfels on bass viola da gamba.

Recorder section at La Dafne sessions.

Robert White, tenor, as Apollo.

Engineer Jerry Barnes and producer Kathryn King at Studio One's console.

Tenor, Hayden Blanchard.

Manor Studios

Studios go in and out of fashion, and the reasons why *everyone* is using this or that studio lately are often obscure. In the case of the Manor perhaps it's easier to explain, for if it had had two microphones, a passive mixer and a

42 ▶

mono cassette machine when it opened five years ago someone, at least, would have used it just to stay a few days.

All the same, despite the obvious attractions of the place and its surroundings, you wondered when you went into the old control room just why the place was as famed as it was. The control room was built on a balcony above the floor of what had been the barn and, if I remember correctly, musicians had to ascend a set of steep, dimly lit stairs to the balcony whenever they wanted to hear a playback. The desk, a 20/16 Audio Developments job, looked small and faintly ridiculous, complementing two Wharfedales high above it; they normally monitored on two Tannoys.

Consciously or not, in some ways the folksiness neared parody. Patch cords hung from nails driven crazily into oak beams and a huge cartwheel hung perilously by ropes above the studio floor. On one occasion it nearly fell on NME rocker Roy Hollingworth.

People flocked there. It was like going home. No locks on the doors, huge dogs padding about the place, tiny dehydrated rabbits to shove lettuce at, a fire in the grate, a snooker table . . .

So with one thing and another, the biggest worry on learning they'd been Westlaked was that they might have made other changes, like installing rubber plants, aluminium lampshades and hot drinks machines. Or built a waiting room filled with six year old copies of 'Horse and Hound' and chairs that shed PVC. Perhaps they'd tarmacked the drive to paint white lines over it saying 'Reserved for Dave Hawkins', imported women wearing tweed skirts and aftershave, and sold the dogs to a man who towed holiday barges along the Oxford Cut.

Impossible. Not so much as a brass 'Reception' sign, and the gravel's as crunchy as ever. But the studio is something else again. The Manor was about the 86th studio, give or take a few, that Westlake Audio had designed. The only other British studio they'd done was Threshold.

I asked Manor engineer Mick Glossop why, when the decision to redesign the studio was taken last January, they had chosen Westlake. 'We knew Dave Hawkins, who's their agent over here, and I had worked with a Westlake studio in Canada. We talked to Tom Hidley and when he'd finished talking that was it.

'They're the only people to give a guarantee . . . They guarantee the frequency response of the studio so that if you go in there with a pink noise generator and measure the response at different frequencies they will all come out at the same level.' If you used other acoustic consultants, Mick said, they would do the job all right, 'but they'll tell you at the end that it may sound like this, it may sound like that.'

There are relatively few screens in the studio. The drum booth is open at the front—not even a glass screen. It's built under the balcony, which is now a recording gallery for string over dubs and so on, and has a trap above it to catch the sound. Like the roof of the studio, which is hidden from view by black fabric, the inside of the trap is hung with sound absorbent blankets. The effect of the trap, and the other bass traps built into the walls, says Mike Glossop, is to produce good separation without the need for screens. Westlake guarantee 24 dB of isolation at 40 Hz and say the piano can be recorded with over 20 dB rejection of unwanted sound to the piano mikes with the lid open. They also guarantee 30 dB of isolation at a particular frequency between a band and a vocalist separated by only ten feet.

The balcony, formerly the control room.

The absorbent panels are a Westlake special. The principle is that if a panel moves when sound hits it the energy used in moving the panel will absorb the sound energy and none of it will be reflected back. It depends to a large extent on the resonant frequency of the panels, of course, but Westlake have used the principle with great success. In the Manor studio these are used in the ceiling of the area beneath the gallery and in the bass absorbers in the walls of the studio. The blankets used in the roof and in the drum trap, which are made of an acoustic material covered in fibreglass absorber, also move when sound strikes them. Westlake calls these 'active' traps or ceilings, and say of the roof, for example, that 'from 40 Hz up this produces an infinite third dimension such as would be present in an amphitheatre'. Hence the separation. It's always been assumed, of course, that the lower the ceiling the better the separation.

Another thing about the drum area—you can't really call it a booth—is that the walls are wood-panelled, giving a more live sound than used to be considered adequate. This reflects a general tendency in other studios; the drum sound that could be likened to that of a damp kipper landing in a flour barrel is on its way out. But if that's what you want there are carpets for the floor and curtains for the walls.

The studio has been open in its present form since August 1, before which the Manor was closed for seven weeks while the building was gutted. Even the plaster was stripped off the walls, and the result is more than just decorative. 'The stone reflects the high frequencies,' said Mick Glossop, 'but also scatters them. It reflects the sound evenly.' Building took only three and half weeks, he said, but there were hold-ups with materials.

The control room is now on the ground floor at the opposite end from the gallery. A feature of the studio area is that the new windows let in plenty of light. But this can have its drawbacks, as I learned when I asked why the windows had been covered over: 'Well, when you've been up all night working, when it starts getting light as the dawn comes up it can be very disconcerting.' Usually, though, there was enough light in there not to need any artificial lighting at all. When it is needed it's plentiful and can be controlled by dimmers in the studio.

The studio was set up for album sessions by ex-Yes drummer and session man Alan White, engineered by freelance Bob Potter. Alan had set his kit up, not in the booth, but in the opposite corner in the angle of a stone wall and one of the control room side-windows. It seemed odd seeing a kit out in the open like that. Mick explained that Alan had wanted a really live sound, even more live than he could get in the drum trap, and this corner gave it to him.

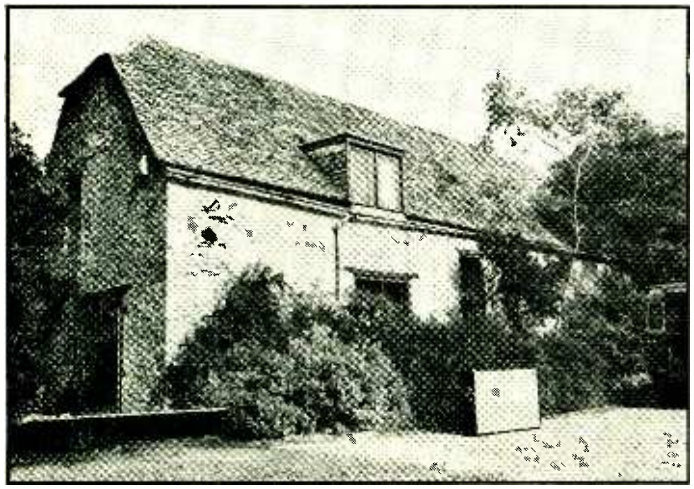
Instead of the usual control room window there are two sets of 2m double glass doors, and on each side of these doors there is a window overlooking the studio. The visibility is good, said Mick, but there is another reason for using the glass doors, which is that Westlake insist the control room should be symmetrical. A door at the side of the control room would break up the wall surface. Each side of the studio control room is matched, so that as you go back from the two side windows, set in wooden panelling, you see stone wall, then cork, then beneath the rear monitors two alcoves for tape machines, and then curtaining on the rear wall. The control room side of the door to the outside is covered with cork.

The shape of the room is that of an irregular octagon. The symmetry is for the benefit of good stereo monitoring and is essential for quad, say Westlake. The only problem with the glass doors is that when you're tired you can easily walk into an open door that isn't, and the doors have had to be taped for that reason. The control room ceiling consists of alternate panels of black fabric, covering absorber panels, and wooden panels, set at sawtooth angles to one another.

The sound-proofing passed a severe test while I was inside. The

44 ▶

The studio is built apart from the house in what was the barn.



YOUR SPECIALISTS IN

LANGUAGE RECORDING

AUDIO CASSETTE—
REEL TO REEL DUPLICATION
ALL PUBLIC ADDRESS EQUIPMENT HIRED
CONFERENCES AND EXHIBITIONS COVERED

TEL: 01-499 1231

Griffiths Hansen (RECORDINGS) Ltd (Est 1953)

12 BALDERTON ST. LONDON W1Y ITF

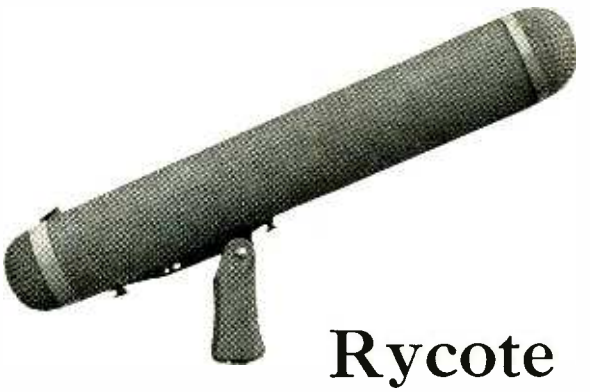
ZEL-LA

RECORDING STUDIOS

wish their many customers, colleagues and friends a very happy Christmas and a prosperous 1976

ZELLA RECORDS (BIRMINGHAM) **LTD.**

"Walker Hall," Ampton Road, Edgbaston, Birmingham B15 2UJ
021 - 455 - 0645



Rycote

Have **a New Address**
and a new windscreen—

new smooth grey plastic mesh and a new screening material still as durable.

Rycote windshields were selected for the recent Everest expedition.

RYCOTE
Edgehill Farm, Edge, Stroud, Glos. GL6 6PA
Telephone: Painswick 813615

Soundcraft-Series II

SOUNDCRAFT ELECTRONICS LIMITED

5-8 Gt Sutton Street London EC1V 0BX Tel: 01-251-3631/2/3 Telegrams: Soundcraft LDN EC.
Systems & Technology in Music Inc., 2025 Factory Street Kalamazoo Michigan 49001 USA Tel: (616) 382 6300

photographer said later that a low flying plane had been making such a noise as to shake his car—and his car can't take much shaking. I hadn't heard it.

The Helios desk cost £50,000 and almost meets the symmetry requirement, an additional section on the right hand wing housing the two jack bays. Most of the ancillary equipment is mounted in the desk rather than in the equipment rack, which holds only the 34 Dolby and four dBx channels and a Pandora Time Line patchable digital delay unit. So the four Kepexes, two dBx companders, two UA compressors, two Teletronix *LA3a* limiters, four A & D *F760* companders, Eventide Phaser, Little Dipper notch filter and Wot Not product generator are all mounted in the desk, as well as two Neve compressors.

Mick and Steve Cox designed a lot of the desk layout themselves, with the benefit of advice from Dick Swettenham, who suggested, for example, that they separate the meter and input pot of each of the two UREI compressors from their units and put them on a separate panel on the left, between the monitor and main mixers.

The desk has 32 inputs, 24 output groups and four quad outputs. The Allison Research programmable mixing system uses API faders, which are operated by voltage controlled amplifiers and can be grouped electronically to selected master faders.

'The desk is fully quad,' Mick Glossop explained, 'even down to the track monitor mixer. As well as quad panning it has quad echo returns as well. Every channel has parametric equalisation . . . there are four bands, each with variable Q and a shelving network.' The bands overlap: from 45 to 800 Hz, 500 Hz to 5 kHz; 800 Hz to 8 kHz; and 2.5 to 18 kHz. Mick said that you could both boost and cut the same frequency by up to 14 dB, and there was also bass and top cut. If even this equalisation proved inadequate there were two 22 slot UREI graphic equalisers. I asked in what circumstances you would need the graphics as opposed to the channel eq. 'When you're equalising mixes. If you get a bit of boom you can cut it out; you put two of those across the stereo and that sorts it out.'

The foldback is comprehensive. There are two stereo foldback systems, each of which has panning as well as level controls.

Other equipment in the control room includes two Neal cassette recorders. Echo is provided by two EMT plates and two Master Room units, and there are the normal tape delay facilities. All the machines are Ampex, with *VS19* Varispeed, which provides speed control in steps corresponding to musical intervals, say Ampex. Mick Glossop said it really worked that way: 'You can get plus or minus one tone at quarter-tone intervals. There's also a variable coarse or fine control on a knob, and a display shows you which frequency you're at.' There is a 24 track *MM1100*, two four and a two track *AG440Cs* and a four track *AG300*.

Each of the four identical monitors has a Westlake horn driven by a JBL tweeter. The mid-range drivers are also JBL but the bass units are by Gauss, and Westlake built them into the wall-fitted cabinets. I asked Bob Potter, who had also worked in Westlake studios in America, whether the Westlake sound really was identical from one studio to another. 'It's not really the same, though it's similar.' He enthused about the Manor speakers: 'The monitors here are bloody great. There's loads of volume, with no distortion. It doesn't wear your head out either, like many other high level speakers.' He thought the Manor was probably the most advanced studio in the country.

I asked Mick Glossop if, in spite of the technical magnificence of the new Manor studio, perhaps the Manor might have lost some of its atmosphere. He was aware of the problem. 'We've tried to keep the same atmosphere, and it is fairly relaxed here.' He thought the previous set-up had been untidy.

A lot of the free and easiness at the Manor had to go. They used to keep open house and the local kids came and went whenever they felt like it. But so much damage has resulted that they've had to restrict visits to invitation. The gardener, for example, had collected examples of every species of poppy in the world. Studio manager Barbara Jeffries says that of hundreds there are now only about five species left: 'It took years to get together. We could never replace something like that.' They now had to lock the tennis courts and restrict access to the swimming pool.

Still, that's hardly a disincentive to visiting bands, and the place has been busier than ever, Barbara said, since the place reopened. She couldn't say how long the average stay was. 'It varies from a day to three weeks. For an album it's at least two weeks.' The charges are £490 a day plus tape at £32 for two inch and £7.50 for quarter. Virgin artists did get a discount, she said, largely because they used to book so much time. 'Now they don't book so much, because we haven't got the time to give them.'

The mix of bands that record at the Manor hasn't changed much. Kevin Coyne makes periodic appearances, and Boxer had been in. Anthony Moore, formerly of Slapp Happy, had been doing singles, however, and a Birmingham band called City Boy had recorded for Phonogram. 'They're very commercial,' said Barbara, 'but they're very enthusiastic, dedicated.' Mick thought them fresh, 'but musically they're not so green'. They were coming back again: 'It's really nice when they re-book,' said Barbara of groups in general. Other bookings included Tangerine Dream, Matthias and John McBarry. 'We don't do a lot of commercial stuff, although Vic Smith comes here a lot and his work is very commercial.'

She hadn't noticed any effects of the recession on the studio. In a country studio people tended to book a long time in advance and they knew where they were. 'But cancellations tend to affect us more than if we were in London.'

Her next step, she said, would be to get more musical instruments people could hire. One company she mentioned would let you have a tambourine, but they'd charge you £50 to deliver it. 'So if you forget one thing it can cost you £50 to get one. We need a variety of amps, a Fender Rhodes, a clavinet ... We could rent them out at just enough to cover the price, so we're not making anything, but they wouldn't have to hire them.' She also wanted some improvements made to the house and grounds 'and a pianola, for us unmusical people round the place'.

There are about a dozen staff at the Manor altogether. Some live in the house, some live locally and some in a nearby cottage. Most have been there over two years. 'People like to come back and recognise the faces,' said Barbara. 'That's important.'

It's more than important, because no matter what they do to the studio, the appeal of the Manor is an equal mixture of the house and its permanent inhabitants. They haven't changed, and as long as that is so, the atmosphere won't change either.

John Dwyer

Manor's Mick Glossop at the Helios console.

Vangelis At Home

Vangelis' private studio might be just another star's secret 16 track deluxe-rama, except for one or two things. The first makes itself abundantly clear as you walk in: it's hard to imagine a larger collection of big drums outside Doc Hunt's. Including shells awaiting appropriate skins there are, lying around in a random arrangement, seven bass drums, and 15 timpani, of which three are pitch-variable. And then there are gongs, latin-american percussion, vibes, and a small battery driven fan which was liberated from the street outside and which can make noises . . . everything that a superstar percussionist might require. Except that he's best known as a keyboard player. It wasn't possible to pin down exactly the number and types that were around, all electric except for a concert Bösender for passing through, but it seemed a reasonable estimate: 'Yes, I've probably got that. It's more like a keyboard shop in here, they come from America, Japan. The only one you won't find is the Mellotron, because I find the action horrible and besides I can get a better string sound from

my *B3* if I want to.'

More disorienting is the situation, a few blocks above Marble Arch. But Vangelis has not been one to get it together in the country: between leaving Greece, done so regretfully but as a reaction to 'the musical colonisation by the Italians, or Americans, or whatever', and arrival in London, his time was spent in Paris where his most prominent activity was with Aphrodite's Child; this band took up residence in the French charts at least more or less permanently, although this did not prevent him from taking a less than enthusiastic view of the Paris music scene. His film and television work, however, proved attractive and lasting, and while he has left much behind he hopes to maintain 'once I can get this studio finished.' As usual, spare tape machine parts take two days from LA, the chairs six weeks from Ealing.

The main job in hand was the album, start of a new contract with RCA and an optimistic late October issue. During the recording, some new ground was broken: the sound of the English Chamber Choir hitting his characteristically barbaric rhythmic arrangements and then all those timps should provide food for a few neighbours' thoughts—the photo shows the equivalent event at a date in the Paris Olympia. It was hoped that a big concert performance would accompany the album issue 'with, er, a hundred drums... well, maybe 30'. But at the time of writing, nothing was finalised.

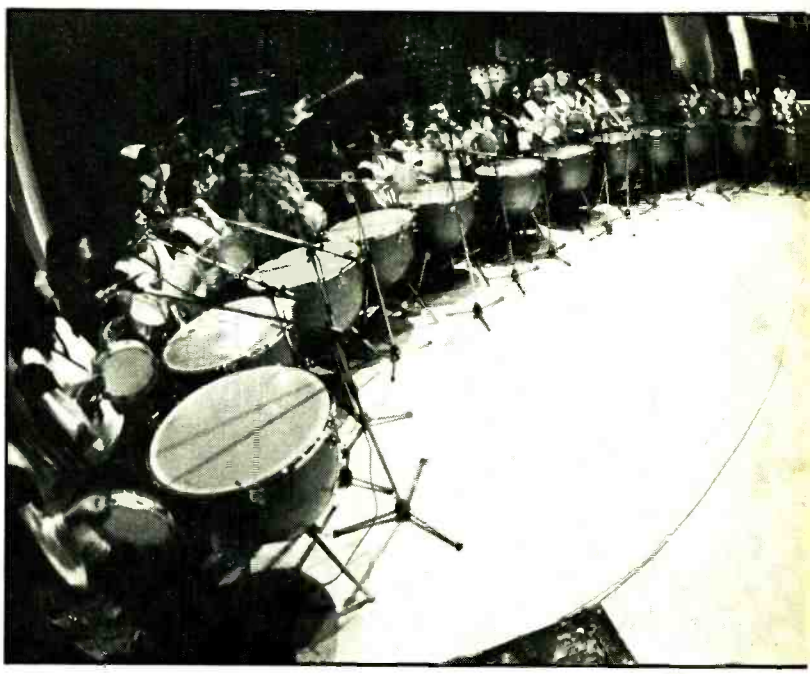
The large control room has four Lockwoods rail-mounted slightly back of centre. They do strain a bit, and the thought 'once we get things organised' is to purchase perhaps some more powerful JBLs. Sitting in the corner is a feeling of déjà vu hovering around the API console which used to grace Command Studio One—apparently a bit of maintenance and reworking by Roger Paton and everyone was very content, although one channel slider still bears the legend 'phucked'. The huge wooden cabinet containing the three tape machines also has a familiar ring to it, as does engineer Alan Lucas who looks a bit more contented and as casually free with words as any dour Scotsman. Vangelis had been one of the prospective buyers for Command, making qualifiedly enthusiastic noises about the place, but discussions lapsed when the landlords said they didn't want the premises to be used for a recording studio any more.

For a performer, setting up your own studio is a considerable commitment. 'The more well-known you become, the less free. There's only a certain amount of energy there, and when both sides, record companies and artists, hit the ceiling, that's trouble.' And owning a studio means you have to produce, but 'it's not to be a commercial studio. I'd prefer to run a restaurant—more money and fewer troubles.' The studio should be commercially viable on 'two or three expensive albums'. Even so, the UK studios are expensive after a point, although three years ago Vangelis recalls paying £85 per hour in one Paris studio three years ago. 'But prices have dropped now, because there isn't the work around.'

While the movement is in the direction of artist-owned studios, he does not see this as a threat to the independents. 'There will always be enough good clients of the public studios, for there are new bands arriving to begin going through the process all the time.' But, more pessimistically, and maintaining the image *gastronomique*, 'there will be bigger numbers of producers and bigger numbers of artists. Bigger and worse, until... Wimpy. Thousands of miles of James Brown, Tamla, soft music; whatever sells there'll be thousands of producers doing the same thing.'

Although Vangelis may be eclectic, you could hardly claim to have heard his music before. While the basics are keyboard-oriented, he has worked choir and extensive percussion into some stark, aggressive Carl-Orff-meets-rock-and-roll arrangements, heard in rough-mix. In fashion: 'There 's something in a choral sound that you can't get electronically—but I don't make a definite difference between the two; sometimes I use one or the other, but don't say automatically; sometimes techniques change, but really there's nothing new.' And out of style: 'I'd rather be percussionist as much as keyboard player. Here, though, you can get the sounds as well electronically—I sometimes use these rhythm machines, so flexible, so you can use tango, cha-cha-cha, rumba; anything as a basic shape.' As a result, 70% of the time is spent wallowing in the carpet of the control room overdubbing electrics to the mute appreciation of various alabaster statues and a bust of Beethoven.

Michael Thorne



Top: *We'd like to ask you some questions about your studio.*

Middle: *Vangelis' percussionist.*

Bottom: *Vangelis' concert at the Paris Olympia.*

reviews

BGW 750A POWER AMPLIFIER

HUGH FORD

MANUFACTURER'S SPECIFICATION

Power output and distortion: 200W minimum sinewave continuous average power output per channel with both channels driving 8 ohm loads over a power band from 5 Hz to 15 kHz. The maximum total harmonic distortion at any power level from 250 mW to 200W shall be no more than 0.2%. (In accordance with the FTC Trade Regulation Rule on amplifier power output specifications effective November 4, 1974.)
300W minimum sinewave continuous average power output per channel with both channels driving 4 ohm loads over a power band from 5 Hz to 10 kHz. The maximum total harmonic distortion at any power level from 250 mW to 300W shall be no more than 0.25%.
600W minimum sinewave continuous average power output monaural driving an 8 ohm load over a power band from 5 Hz to 10 kHz. The maximum total harmonic distortion at any power level from 250 mW to 600W shall be no more than 0.25%.
Small signal frequency response: +0, —3 dB, 1 Hz to 65 kHz; +0, —0.25 dB, 20 Hz to 20 kHz.
Noise and hum level: Better than 110 dB below rated output into 8 ohm.
Input sensitivity: 2.0V for 40V out (full power at 8 ohms). Voltage gain 26 dB (20 times).
Input impedance: 47 000 ohms.
Damping factor: Greater than 1000 at low frequencies into 8 ohms.
Output impedance: Designed for any load impedance equal to or greater than 2 ohms.
Power requirements: Available factory wired for any of the following voltage-current combinations: 120V at 15A; 220V at 7.5A; or 240V at 7.5A.
Note: Field conversion is possible but usually requires replacement of circuit breaker.
Semiconductor complement: 2 Op Amp ics (equivalent 44 transistors each), 37 transistors, 1 unijunction transistor, 1 thyristor, 5 zener diodes, and 19 diodes.
Dimensions: 178 mm by 483 mm standard rack front panel by 305 mm deep.
Weight: 22.2 kg net, 24.9 kg shipping.
Price: £675 plus VAT, $979
Manufacturer: BGW Systems, PO Box 3742, Beverley Hills, California 90212, USA.
UK Agent: Webland Electronics Ltd, 119/121 Wandsworth Bridge Road, London SW6.

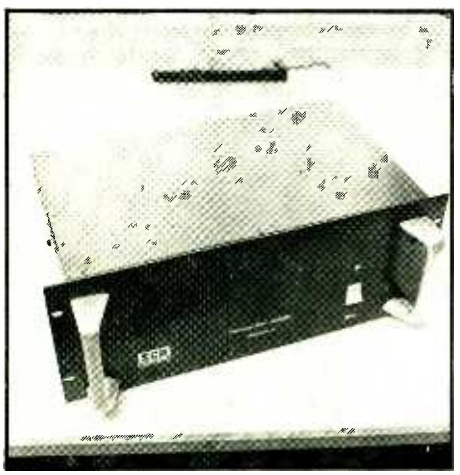
THE BGW model *750A* is one of a range of power amplifiers manufactured by BGW Systems, and has been specifically designed with the new Federal Trade Commission rules for the power rating of amplifiers in mind. Briefly, the FTC rules make it mandatory for a manufacturer to specify power output and distortion as measured under controlled conditions. These conditions include a pre-conditioning period of one hour running at one-third rated power, under which conditions many amplifier designs have minimum efficiency and maximum thermal dissipation, followed by maximum rated power testing for five minutes. The distortion must then be specified as the maximum distortion at any output between 250 mW and the full rated power.

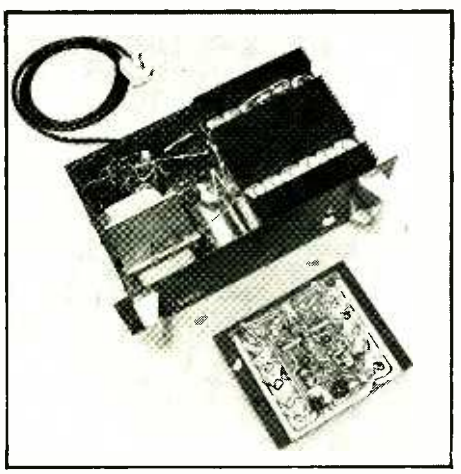
Rather oddly, the Federal Trade Commission Rules only apply to amplifiers 'Utilised in Home Entertainment Products', and in this context the rules have been hotly disputed by some manufacturers. Without entering that particular argument, I am of the opinion that the rules are most appropriate to professional applications where amplifiers are used in practice for reproducing pop music for extended periods; I am however not convinced that the choice of a 1 kHz tone for the pre-conditioning period is the optimum choice.

Anyhow, returning to the BGW type *750A* amplifier: this is a twin channel amplifier rated at 200W per channel into eight ohms with the inbuilt facility for bridge connecting the two channels. It will then deliver 600W into eight ohms. The amplifier, which is designed for mounting into a standard 483 mm rack, has a single front panel control which is the mains on/off switch in the form of a magnetic circuit breaker, part of the protection system, with a mains power indicator mounted adjacent on the front panel. The rear panel has two pairs of terminal/sockets on standard 19 mm spacing for the output connectors and 9.35 mm standard jack sockets for the inputs. The mains input is by a fixed lead about 2m in length, there being no mains fuse as the unit is nominally protected by the magnetic circuit breaker. Resulting from this design feature, no mains voltage selector is fitted, as it may be necessary to fit an alternative circuit breaker when the mains tappings are altered. (*See Letters, p14*—**Ed.**)

The only control on the back panel is a pushbutton switch for making the bridge connection for monaural use, and this and all other aspects of the amplifier are clearly labelled. The centre of the back panel contains a well protected two-speed fan which is normally very quiet in operation and remains normally in the slow mode. However if the amplifier is driven really hard it switches into the fast mode as a result of the rise in temperature of the heat sinks, and the noise level could then be obtrusive. Further thermal protection is provided by thermostats in the dc supplies to each channel, and should one of these operate the appropriate channel packs up without any indication that the thermostat has opened—rather a disconcerting arrangement, as one imagines that something has blown up.

The mechanical construction is such that each complete amplifier channel is mounted on a heatsink to which is mounted a single printed circuit board equipped with a ten way socket for all input/output connections. Cooling air is drawn through the perforated top cover of the amplifier over the heatsinks, then into the main body of the amplifier and discharged through the rear of the amplifier; as no air filter is fitted it is felt that the accumulation of dust within the amplifier may present a problem.





48 ▶

BGW 750A AMPLIFIER

Power supplies and the protection circuit printed board are mounted within the body of the amplifier, which is accessible by removing the heatsinks after breaking the manufacturers lead seal (which invalidates the three year warranty). Within the amplifier, the general standard of construction is to a respectable standard, but individual components are not labelled and there is an unidentified fuse within the guts which I was unable to find in the circuit diagrams. These are provided in a rather sparse instruction manual (which may be provisional?) accompanied by a test report on individual amplifiers. I understand that the UK agents are completing the test report on all amplifiers before despatch, and also that they are willing to modify input and output connections etc to alternative types to order.

Turning to the electronics, the unbalanced input feeds an integrated circuit input stage which according to BGW is of a type 'like those used in analog computers' and is 'considered too costly by other manufacturers' and to complete the puzzle the ics are 'equivalent to 44 transistors each'. Any guesses? Yes, it's the good old *LM318H* high speed operational amplifier which costs something under £1, and I hope that BGW select them for noise performance. The input amplifier is followed by a complementary driver arrangement which drives two paralleled sets of *2N3773* output transistors which are mounted on the large heatsinks.

FIG. 1 *Distortion 20 kHz, 1W, 8Ω.*

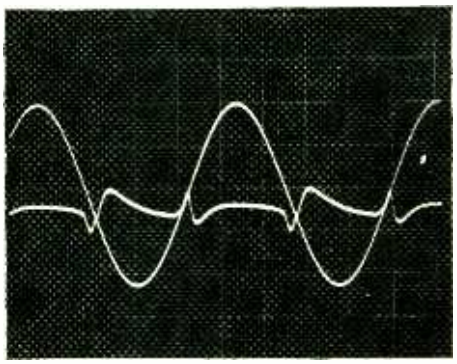
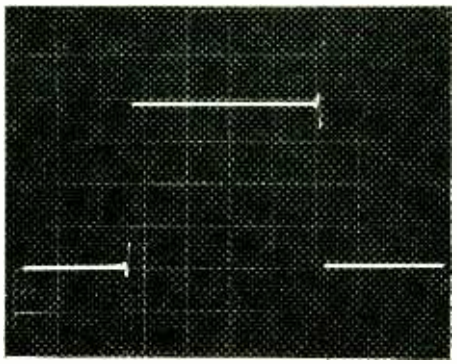
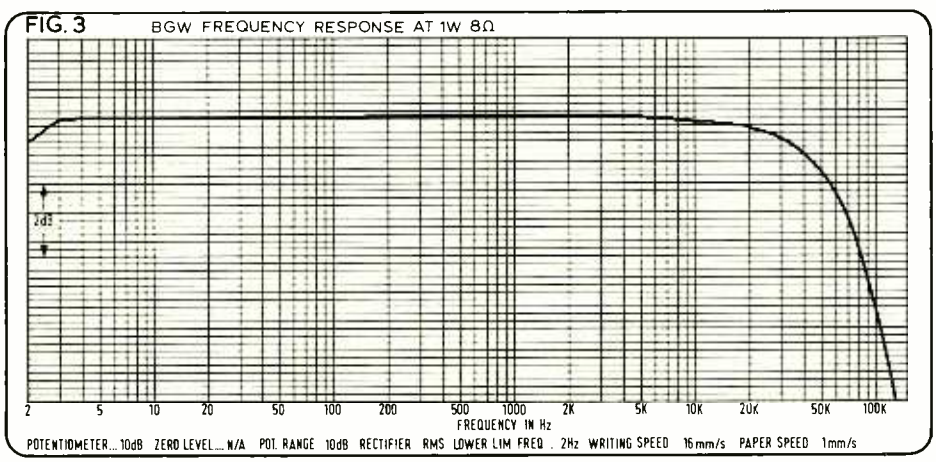


FIG. 2 *1 kHz, 8Ω, // 2μF, 100W peak.*



Condition	Power	Frequency 10 Hz	100 Hz	1 kHz	10 kHz	20 kHz
Both channels driven into 8 ohms	200W	·026%	·024%	·026%	·058%	·070%
	20W	·027%	·025%	·027%	·066%	·100%
	2W	·027%	·025%	·026%	·080%	·200%
	200 mW	·027%	·025%	·022%	·082%	·200%
Both channels driven into 4 ohms	300W	·045%	·052%	·056%	·100%	Trips
	30W	·061%	·061%	·055%	·120%	·155%
	3W	·053%	·051%	·054%	·130%	·205%
	300 mW	·056%	·055%	·050%	·145%	·280%



No protection circuitry is built into the amplifiers as such, as BGW do not believe in limiting within the amplifier because of the problems which this type of circuit can give with reactive loads. As an alternative, the BGW *750A* uses a sensing amplifier which samples the output from each channel and fires a thyristor across the dc supplies if things go awry. This crowbar system will then open the magnetic circuit breaker in the mains supply as a result of the dc supplies being shorted by the thyristor. In addition to this protection system, there are the previously mentioned thermostats in the dc supplies to each channel.

Power Output and Distortion

As is my normal practice when measuring the performance of power amplifiers, considerable care was taken to use controlled conditions. The incoming mains supply was stabilised at 240V ±0.5% and the output voltage was measured with a digital voltmeter accurate to within ±0.25% using precision load resistors capable of dissipating several kW. (I am often asked where accurate load resistors can be obtained—I use 300W aluminium-housed resistors which are available from the CGS Resistance Company Ltd, of Marsh Lane, Gosport Street, Lymington, Hants, in the range 0.1 to 22k ohms with tolerances as close as ±0.25%.)

Under these conditions, the amplifier was driven with a 1 kHz sinewave to the onset of waveform clipping, when the power output was found to be as follows:

	Channel 1	Channel 2	Mono Bridge Connected
8 ohm load	249W	251W	892W
4 ohm load	418W	421W	Trips*
2 ohm load	Trips*	Trips*	Trips*

*The burst power at clipping when bridge connected is over 900W into 4 ohms, or when used in the two channel mode over 900W into 2 ohms.

It is to be noted that the clipping points give a very wide margin over the rated power output, as do the following figures for total harmonic distortion which, while they are far from the best which I have seen, do represent a good practical performance (see left).

At 10 kHz and 20 kHz the above figures represent the worst channel, there being a difference of up to 6 dB in distortion between channels; however, it was pleasing to note that the above figures were extremely close to those quoted in the test report supplied with the amplifier. Intermodulation distortion as measured to the SMPTE method using 50 Hz and 7 kHz tones in the amplitude ratio 4:1 also gave satisfactory results as is to be seen from the following table.

As is common in amplifiers using a multitude of paralleled output transistors, the predominant distortion products are crossover products as is shown in **fig. 1,** which shows the residual distortion of a 20 kHz sinewave at 1W into 8 ohms. The other factor which

Equivalent Peak Sinewave Output	Intermodulation Distortion 8 Ohm Load	4 Ohm Load
300W	—	0·195%
200W	0·098%	—
20W	0·10%	0·205%
2W	0·10%	0·20%
200 mW	0·10%	0·20%
20 mW	0·08%	0·13%

came to light during distortion measurements was that the current drawn from the incoming mains increased rapidly as the audio input frequency was increased, to the extent that the amplifier would trip when driving an open circuit at very high frequencies. It may be thought that frequencies outside the audio range are not of interest, but when rewinding tapes very high frequencies can occur and the amplifier trips when driving 6W into four ohms within four seconds when hot. The same factor is not irrelevant at audio frequencies as the power consumption changes drastically with load and can far exceed the manufacturer's nominal requirement of 7.5A at 240V:

Frequency	Input VA at 240V, both channels driven 300W/4ohms	200W/8ohms
100 Hz	1·6 kW	1·1 kW
1 kHz	1·6 kW	1·1 kW
10 kHz	1·9 kW	1·2 kW
20 kHz	over 2·4 kW	1·7 kW increasing to
50 kHz	over 2·4 kW	over 2·4 kW (over 2·4 kW

The application of square waves did not provoke any signs of instability, but as is to be seen from **fig. 2,** the ringing into capacitive loads is rather excessive. The rise time into eight ohms was found to be 5 μs, with an associated maximum slew rate of 12 V/μs. It is suspected that the relatively slow slew rate and also the high current drain at high frequencies are associated with the choice of *2N3773* output transistors, which are not fast transistors but have the advantage of being rugged. Naturally, the advantages of using a 15 MHz operational amplifier as an input stage are rather decreased by using output transistors with an ft of 0.8 MHz.

Frequency Response and Noise

With the exception of an input coupling capacitor, the amplifier is direct coupled; thus the frequency response as shown in **fig. 3** shows little fall-off in the bass response and an overall response of +0 -0.25 dB from under 3 Hz to 20 kHz at 1W output into eight ohms. The frequency response when bridge connected is very similar, with the -3 dB point at high frequencies shifting from 70 kHz to 60 kHz.

The measurement of amplifier noise presented some problems due to hum pickup in the internal wiring, and it is felt that this situation could be improved by routing the signal inputs away from power supply cables. The adjacent figures illustrate the large difference in hum levels for one particular set of measurements as well as illustrating the large hum content in the wide band noise which is just on specification:

FIG. 4
BGW
OUTPUT IMPEDANCE

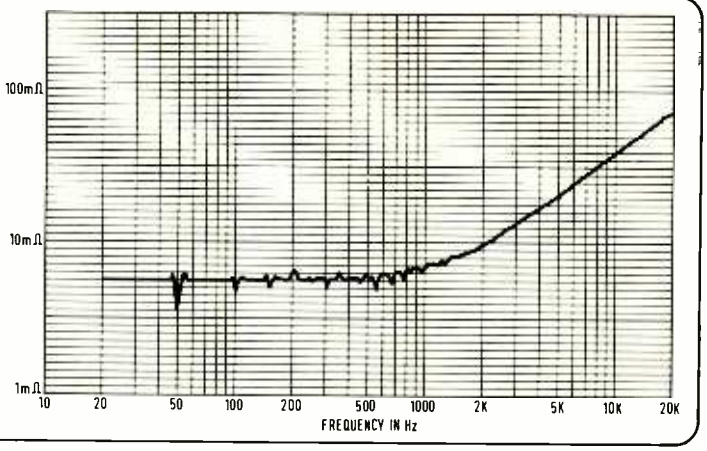


FIG. 5 BGW PHASE SHIFT

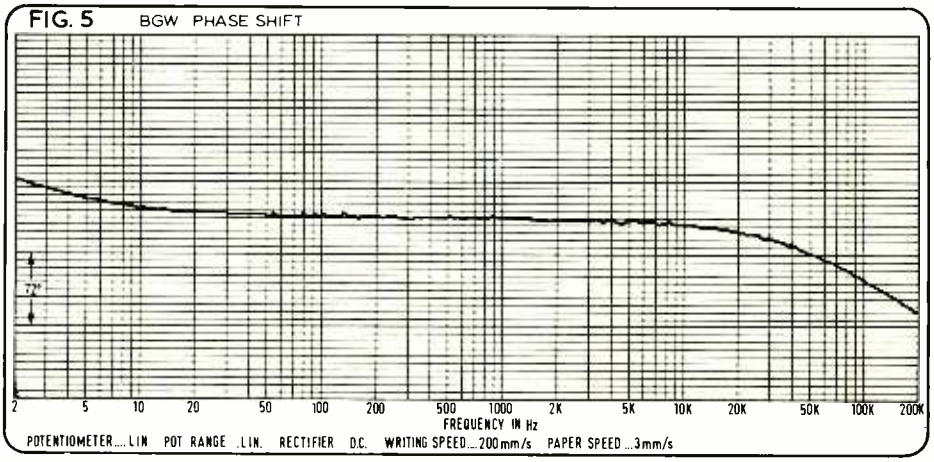
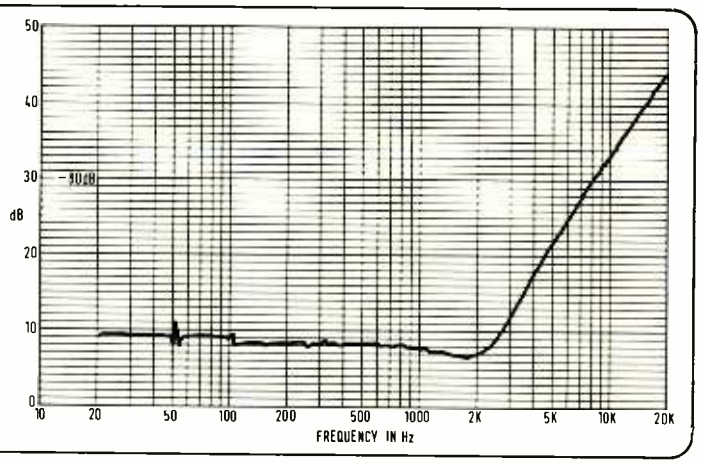


FIG. 6
BGW
CROSSTALK
REF 200W INTO 8Ω



Inputs and Outputs

The input sensitivity at the jack sockets for 200W output into eight ohms at 1 kHz was found to be 2.02V for either channel with an associated input impedance of 44 900 ohms in parallel with 459 pF in channel two or 440 pF in channel one.

While the resistive element of the input impedance is suitable for virtually all purposes, it is felt that the shunt

Condition	200W into 8 ohms to rms noise Channel 1	Channel 2
Wide band 20 Hz to 20 kHz	—105·2 dB	—111·7 dB
Wide bd 200 Hz to 20 kHz	—111·2 dB	—113·7 dB
Wide bd 400 Hz to 20 kHz	—113·7 dB	—115·7 dB
'A' Weighted	—113·7 dB	—116·2 dB
50 Hz hum	—111·7 dB	—110·7 dB
100 Hz hum	—101·2 dB	—106·7 dB
150 Hz hum	—125·7 dB	—120·2 dB

50 ▶

BGW 750A AMPLIFIER

capacitance is rather excessive when one considers that the reactance of 459 pF at 15 kHz is as low as 23 000 ohms. This is a further reason for re-routing the input cables, and perhaps using an alternative type of cable.

The output impedance of the amplifier as is shown in **fig. 4** is six milliohms at low frequencies, thus providing a more than adequate damping factor at low frequencies where it matters.

Other Matters

The phase shift at 1W output into eight ohms is shown in **fig. 5**, which demonstrates that it is negligible in the audio spectrum, and gives no suggestion that instability might be provoked at high frequencies where the gain is rapidly falling.

Crosstalk between the two channels at 200W output into eight ohms was unusually good at low frequencies as is shown in **fig. 6**, which is indicative of good power supply design.

Investigations into the overload recovery characteristics did not reveal any tendency to shift the dc operating point after overloads into heavy clipping.

Investigations into the protection circuits showed that it took 400 ms for the power supply to collapse if one output of the amplifier was shorted when working at full power into 8 ohms, and it is felt that this speed is adequate to protect loudspeakers. I did not, however, dare short the output with the amplifier hot and delivering 200W at 20 kHz. One thing which I do have against the protection system is that it is necessary to manually reset the circuit breaker after an overload, which may just be caused by switching 'splats'.

Summary

The BGW *750A* certainly delivers the power it claims, and is capable of considerably more on a short term basis; while the harmonic distortion and the intermodulation distortion are not to the highest standards, this may well be a purely academic matter as distortion levels are generally low.

Likewise the noise performance is generally satisfactory, but mains induced hum levels within the input wiring may be troublesome and I would suggest that BGW modify this wiring to overcome this problem and also the rather high shunt capacity of the inputs.

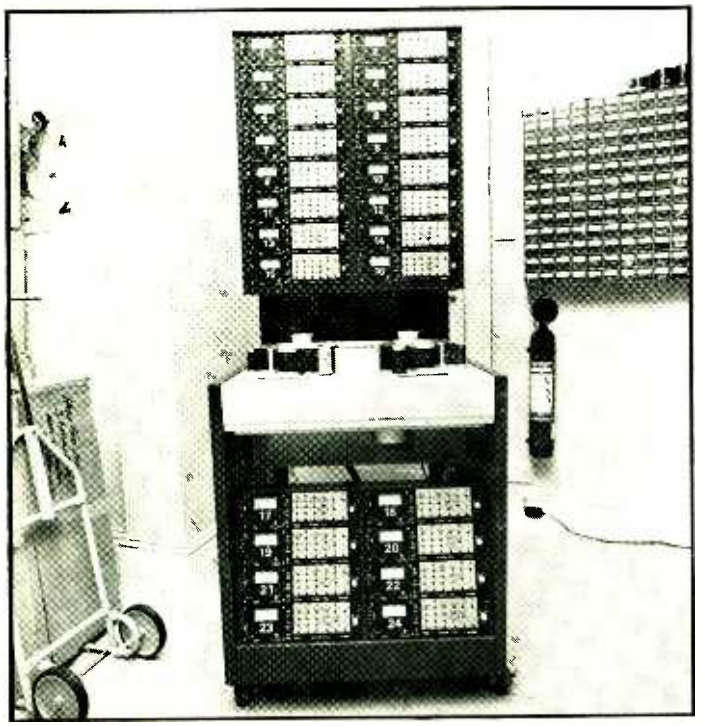
So far as could be determined from non-destructive testing, the protection circuits were satisfactory. However, from a practical point of view, it is a nuisance to have to reset manually the trip which can be actuated in operation by short 'splats' or by ultrasonic inputs which can occur when rewinding tapes.

STUDER A80 TAPE RECORDER

HUGH FORD

MANUFACTURERS' SPECIFICATION

Tape speeds: 76 cm/s and 38 cm/s ±0.2% (adjustable).
Reel type: up to 266.7 mm NAB hub.
Tape slip: 0.1% or less.
Wow and flutter: 0.04% or less at either speed as DIN 45507.
Starting time: 0.5s or less, to reach 0.1% flutter.
Tape timer: 0.2% timing and repeated timing accuracy, indicating hours, minutes and seconds, real time indication; tape timer stops instantly at end of tape.
Rewind time: approximately 100s for 730m reel.
Line inputs: balanced and floating, input impedance 8k ohms. Minimum input level: —14 dBm to produce recommended operating level. Maximum input level: +22 dBm to produce recommended operating level. Operating level 200 nW/m.



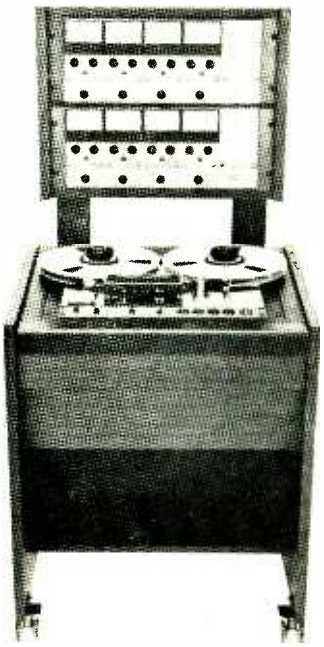
Line outputs: balanced and floating. Output impedance 30 ohms. Maximum undistorted output: +24 dBm.
Sync outputs: same specifications as line outputs.
Equalisation (switchable): 76 cm/s 17.5 µs. 38 cm/s NAB 50 µs/3180 µs or CCIR 35 µs.
Frequency response (overall): 76 cm/s ±1 dB 60 Hz-18 kHz; ±2 dB 50 Hz-20 kHz. 38 cm/s ±1 dB 60 Hz-15 kHz; ±2 dB 30 Hz-18 kHz.
Sync frequency response: 76 cm/s ±2 dB 60 Hz-12 kHz; 38 cm/s ±2 dB 40 Hz-12 kHz.
Signal to noise ratio referred to 6 dB above operating level (unweighted according to NAB standard). Record-Reproduce 57 dB; Record-sync 54 dB.
Distortion at 1 kHz: NAB equalisation at operating level 1% maximum. Record and reproduce amplifiers at 15 dB above operating level 0.2% maximum.
Crosstalk rejection: 40 dB min 60 Hz-15 kHz; between record channel and any adjacent sync channel at 38 cm/s 18 dB min. at 1 kHz, 4 dB min. at 10 kHz.
Erase efficiency: 75 dB min at 1 kHz.
Bias frequency: 240 kHz.
Erase frequency: 80 kHz.
Power requirements (tape transport and amplifiers): 100V-120V or 200V-240V ±10% 50 Hz or 60 Hz 800 VA.
Price: UK £15 800.
Manufacturer: Studer International AG, CH-5430 Wettigen, Switzerland.
U.K. Agent: FWO Bauch Ltd. 49 Theobald Street, Boreham Wood, Herts.
US Agent: Willi Studer America Inc, 1819 Broadway, Nashville, Tenn 37203 USA.
Phone: (615) 329 9576

EARLIER THIS YEAR (STUDIO SOUND, March 1975) I had the pleasure of reviewing three well known 24 track machines, and for the sake of comparison I have used identical techniques for reviewing the Studer *A80/VU*. The first thing that strikes you about the 24 track Studer is its large size, but in fact the apparent bulk is brought about by the 16 amplifiers which are mounted above the tape transport and the machine requires no more floor space than competitive products—however it is rather heavier than some.

The remaining eight amplifiers in the 24 track model are located underneath the tape transport and are set at an angle for good visibility and easy access to the controls, although the cable connectors which are at the lower rear of the amplifier modules can hardly be called accessible in the two lower amplifiers. However, the amplifiers are extremely easy to remove for servicing,

52 ▶

THE SENSATIONAL TASCAM



½" 8-Track
Studio Recorder

Now available for the first time in the UK and Europe. In stock for immediate delivery.

● PROFESSIONAL PRICE ON APPLICATION ● EXPORT TO EUROPE OUR SPECIALITY

FOUR CHANNEL PRICE BREAKTHROUGH!

New Dokorder 8140 Multi-Sync Recorder

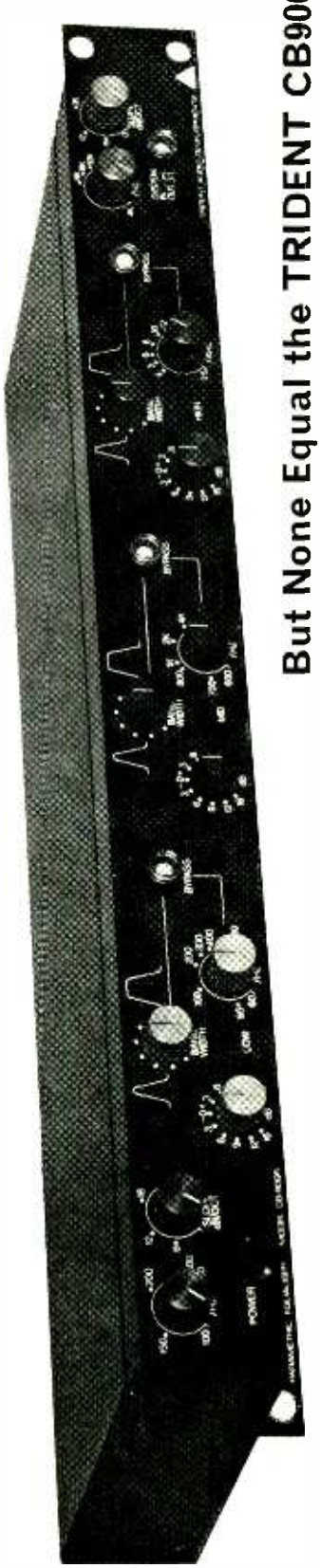
Similar facilities to Teac 3340. Three motors, 3 heads solenoid operation, electronic echo. Speeds 7½ and 3¾ i.p.s. 7in spools, Mic and line mixing.

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

Some Equalisers Are More Equal Than Others . . . .



But None Equal the TRIDENT CB9066

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.

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.

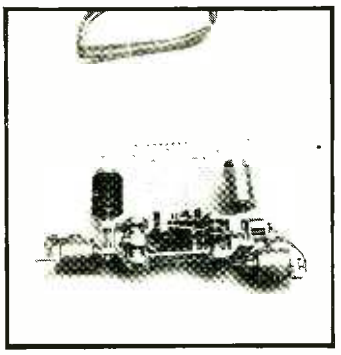
Trident Audio Developments Ltd.,
4/10 North Road, London N7 9HN
Telephone: 01-609 0087 Telex: 264773

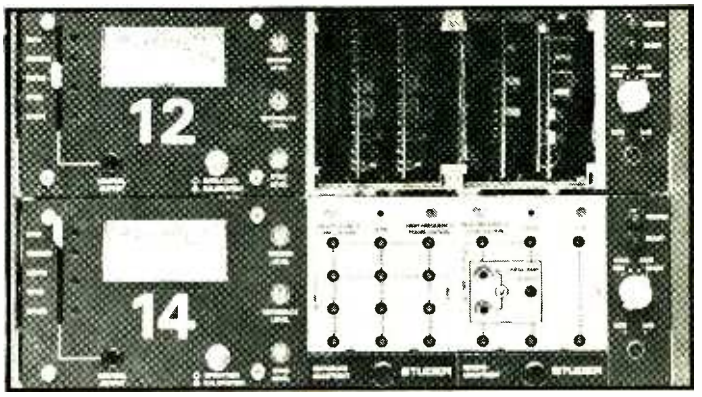
as are all other parts of the machine, a first class instruction manual being provided complete with exploded diagrams and parts lists for both electrical and mechanical parts. Other than the amplifier modules and a few printed boards in the tape transport, the only remaining electronics are three ac power supplies (one per eight channels) which supply low voltage ac to the amplifiers which contain their individual rectifiers and stabilisers.

The tape transport is designed on the very best of engineering principles, the basis being a webbed precision casting which is machined with reference faces to which the major mechanical components are fitted. Steel studs are inserted into the casting to reinforce the more commonly used reference faces such as the head block mounting. Considerable thought has clearly been given to the problem of maintenance, and not only are most parts accessible *in situ*, but also it is possible to remove any of the major assemblies such as the motors or the pinch roller assembly with the aid of only two tools, and in the space of only a few minutes. No shims are used in the assembly so replacement of parts is a very straightforward exercise, and also many of the securing screws which might otherwise 'be lost in the works' are captive. It is hardly necessary to say that the standard of workmanship and methods of construction are to the best traditions of Swiss precision engineering.

As is to be expected of such a piece of precision engineering the tape handling in all modes of operation is beyond reproach. The control over tape tension is absolutely positive without the slightest tendency to sling loops, snatch or perform any other of the well known acrobatics. This excellent tape control is achieved by complete interlocking of the tape motion signals such that the mode cannot change before the tape has stopped, in conjunction with an advanced spool servo control system. The latter consists of unusual tension sensors which take the form of a rotary damped potentiometer which is driven by two tape roller guides which are mounted diametrically opposite each other on the potentiometer spindle. The tension potentiometers feed the servo control amplifiers (one for each spool) which are also fed with direction and acceleration information and subsequently drive ac spooling motors via a bridge rectifier type switch.

The overall tape path from the pay-off spool passes over the pay-off tension sensor which has an incoming edge guide and an outgoing roller, whence it passes to a damping roller with edge guides and a magnetic brake. From there there is a photoelectric tape presence sensor and a pair of staggered 12 track erase heads followed by a movable rear-of-tape edge guide and the record head. After this there are a large diameter flutter roller, the replay head, capstan and movable pinch wheel and the tape counter guide, which is a further edge guide, followed by the take-up





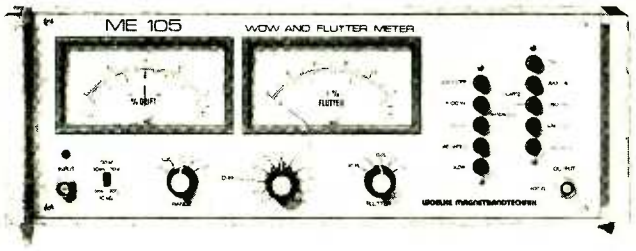
tension sensor which is similar to the pay-off tension sensor. Wisely, there are not any fixed guides in the tape path, and the five edge guides are placed at the ideal strategic points to control good spooling and provide good guidance over the heads.

The close fitting record and replay head shields are moved into position by the pinch roller solenoid, which also operates the movable guide before the record head, this providing a clear tape path for tape threading between the tension sensors which themselves present the only complication. This, however, is soon learnt and found to become quite natural.

The capstan motor, like the spooling motors, is a servo controlled ac motor controlled by a bridge rectifier arrangement driven by a discriminator which is itself fed by the servo amplifier system. The latter takes its frequency reference from a photoelectric pickup attached to the capstan motor shaft. The tape speed is in effect controlled by the discriminator, with the option of external speed

54 ▶

WOW and FLUTTER METERS



Illustrated is the ME105, the very latest type of Wow and Flutter Meters manufactured by Woelke Magnetbandtechnik, Munich, Germany, and distributed exclusively by us in the U.K. Anyone concerned with the most accurate measurement of drift (down to plus/minus 0.1%) and wow and flutter (down to plus/minus 0.03%) will be interested in the ME 105. Fuller, final details on application.

LENNARD DEVELOPMENTS LTD.
206 CHASE SIDE, ENFIELD EN2 0QX
MIDDLESEX Tel. 01-363 8238

HI-FI EQUIPMENT

RESLO Cabaret Radio Mike as new **£200.** AKG D190C Mike **£18.** AKG D707C Mike **£16.** Shure Unisphere B 5885A **£15.** Eagle LL2 Private Telephone, four stations, two as new **£80.** Alice BD8 Limiter, two Alice CNS Unit **£250.** Reslo Ribbon Mike **£6.** Philips EL3549 **£15,** Quantity P.A. Speakers **£2** each. Two damaged Hi-Fi Speakers **£5** pair. All plus V.A.T. **01.586 0064.**

NEW—AKG K160 phones **£19.** REVOX illuminated Remote Control **£15.** REVOX Remote Control 30ft. lead **£15.** D10L Mike **£7.50.** D190E Mike **£25.50.** Ferrograph Defluxers **£4.20** each. Audio Techniques Mixer MM42A **£77.** Quad 303 Power Amp **£65.** REVOX A78 Power Amps Mk.3 **£185.** Koss ESP6 Phones **£30.** REVOX A77 Dust Covers **£6,** REVOX W/Proof Cover **£6.** REVOX vulcanised Carry Case **£12.** Spendor BC1 Speakers with stands **£180** pair. All plus VAT.
01-586 0064

MagLink and Minimag- 3M's answer to your sync problems

A sophisticated synchronizer to sync a number of tape machines

The MagLink Synchronizer, developed by Automated Processes, Inc., is an indispensable tool in multi-track audio production, video mixing, editing and 'sweetening', film sound track production and foreign language overdubbing.

A unique timing code system allows a master and any number of slaves to be controlled by MagLink and will remain synchronized even in rewind and fast forward modes.

A low cost synchronizer to sync two machines

The Automated Processes Minimag is the ideal synchronizer whether your multi-track machine is video or audio, sprocketed or unsprocketed. It can be used to connect two 16 track machines to function as a single 30 track machine.

For further information on the MagLink and Minimag Synchronizers, contact F. O'Neill, 3M United Kingdom Limited, 3M House, Wigmore Street, London W1A 1ET.

3M

3M is a trademark 3M 2312

control by means of an external potentiometer which may be remote from the tape unit.

The tape counter, calibrated in minutes and seconds, is driven from a photoelectric pickup on the tape counter guide. The guide surface is unlike the common synthetic rubber covered guide as it takes the form of a finned roller which appears to have a remarkable adhesion to the tape. The counter itself is of the dot matrix type display, which gives high brightness and very good legibility.

The major tape control functions are performed from the conventional two fast controls, record and play controls taking the form of large illuminated pushbuttons which are electronically interlocked such that the machine automatically enters the tape stopped condition before any change of mode—it was found to be completely impossible to fool this sytem or upset the excellent tape control by using any combination of control functions. Other than the tape timer reset button, there are only two other controls on the tape transport; these are an illuminated 'edit' button and a variable spooling speed potentiometer. The 'edit' button serves two purposes, firstly it puts the tape in contact with the heads in either of the fast modes and secondly it activates the variable spooling speed potentiometer. The latter in standard form has to be depressed and then rotated to the desired tape speed and direction, but various modifications are possible if alternative modes of operation are desired. When in the edit mode the tape may be rocked and rolled by hand with great ease, and for locating the edit point the headshield assembly is detached by lifting it from its mounting on the tape transport, thus giving complete free access to the heads.

Turning now to the 24 amplifier modules, these are secured into the cabinet by two captive screws which have knurled heads for easy removal without tools. The cabling to the amplifiers has also been carefully thought-out so that it is impossible to make incorrect connections, the three head connections being different types of PREH connectors with a fourth type being used for the remote control leads and an Amphenol connector being used for power supplies. The three audio connectors (line in, line out and sync) are standard Cannon *XLR-3* type providing floating lines. As is common throughout the machine, all connectors, fuses and other functions are clearly identified and all printed boards are keyed so that they cannot be inserted in incorrect positions.

Each amplifier module contains nine printed boards which comprise two replay amplifiers (play and sync), the record amplifier. the erase head driver which is fed from a central oscillator in the tape transport electronics, power supplies, line drivers, fet switches etc. In addition to these main boards, the record and replay amplifiers each have a small 'piggyback' board which contains the basic equalisation components, such that equalisation standards can be changed by inserting an alternative board. In addition to this facility, the full sets of variable set-up controls including level, bias and equalisation are mounted in two plug-in modules at the front of the amplifier; one for replay and the other for record. These modules may be aligned for different head configurations, different tape types etc, thus making it, for example, a quick and simple task to change to alternative heads.

Over and above these facilities, each amplifier module houses a vu meter which can be switched to read bias, record level, reproduce level, sync level or erase by means of a large slide type switch which also applies the appropriate level to a monitor output in the form of a standard 6.25 mm jack socket. Alongside the switch are preset potentiometers for aligning the meter indication for each meter function and under the vu meter is an extremely clear channel identification number. The metering also operates in conjunction with an operation/calibration pushbutton which serves the purpose of switching the meter to the input or output of the line amplifiers so that correct internal levels can be set. The final amplifier controls are a screwdriver operated CCIR/NAB equalisation switch, which affects both record and replay, and the mode switch which has four

FIG. 1 STUDER A80 RECORD/PLAY FREQUENCY RESPONSE

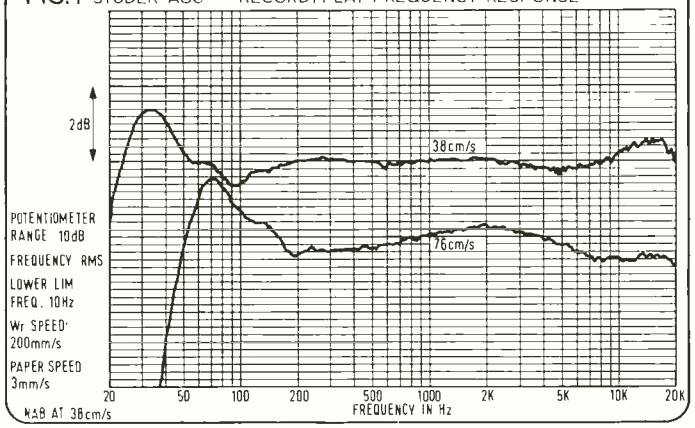


FIG. 2 STUDER A80 RECORD/SYNC FREQUENCY RESPONSE

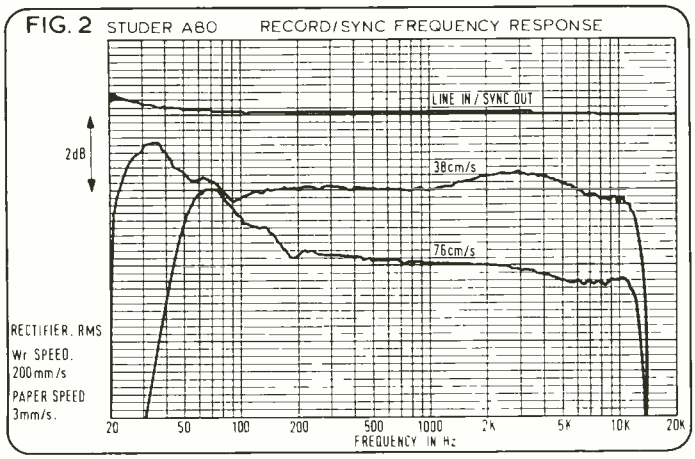


FIG. 3 STUDER A80 ELECTRONICS ONLY DISTORTION PERFORMANCE

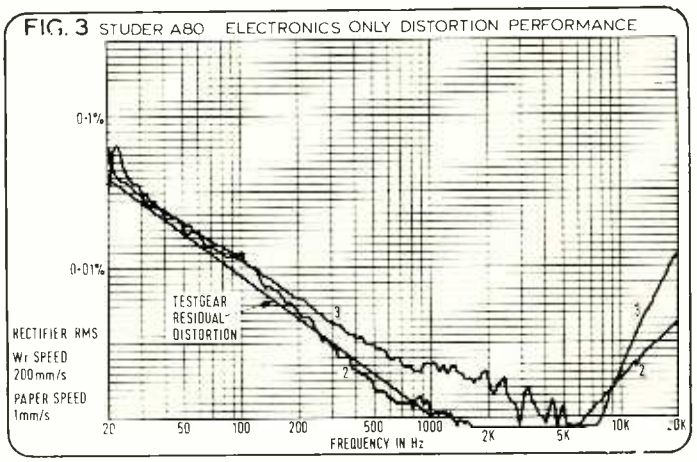
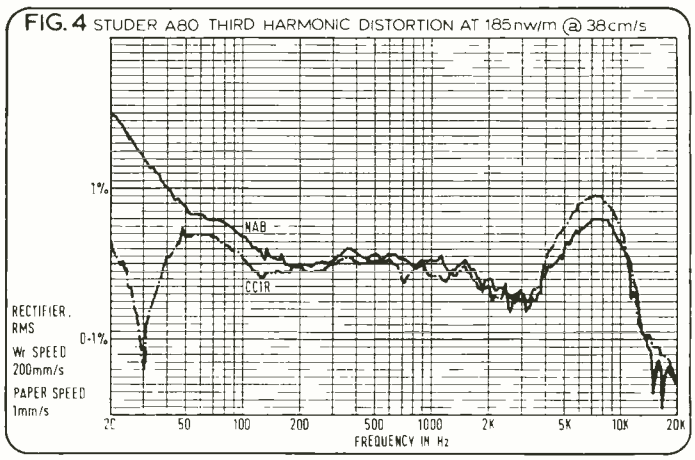


FIG. 4 STUDER A80 THIRD HARMONIC DISTORTION AT 185nw/m @ 38cm/s



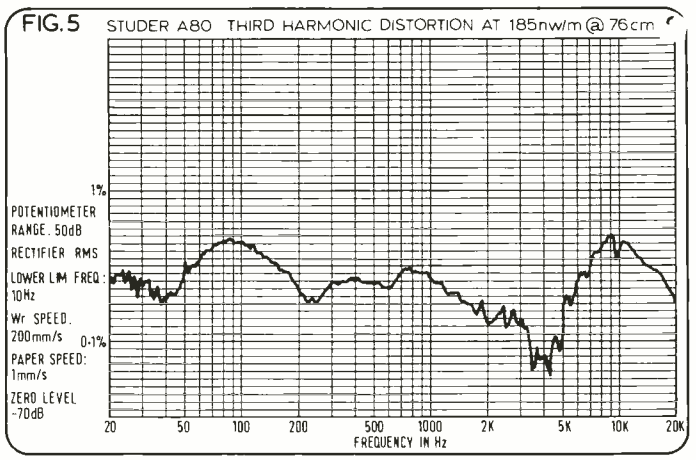
positions. In the 'ready' position, the channel may be put into record from the tape transport function switch; in 'safe', record cannot be entered as is the case in the 'sync' position: the final position provides for remote control. The 'ready' setting activates one of two lights on the amplifier, 'ready' being indicated by a green light and 'record' by a red light. The replay line output is connected to the replay head in all modes except the sync mode. The sync output is switched from the record head to line input by fet switches when the record mode is entered.

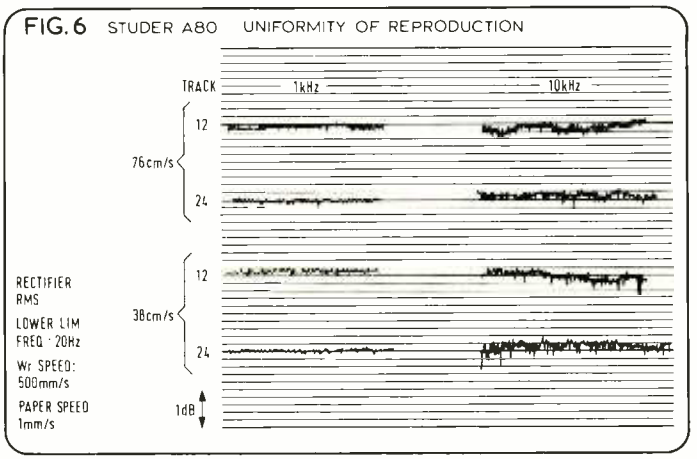
Replay Performance

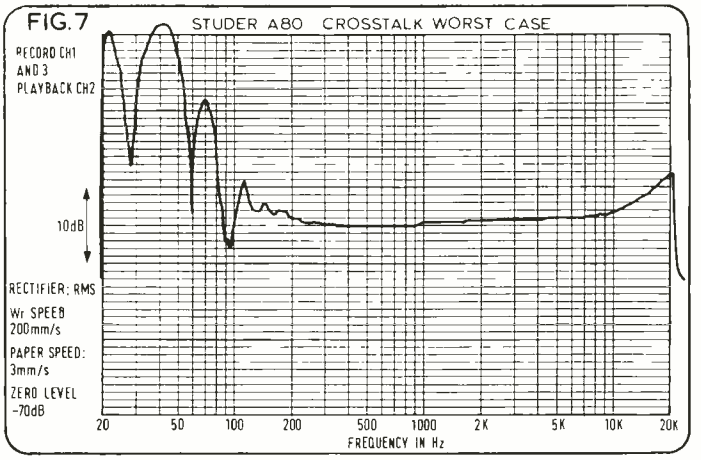
Attention was first directed to the replay frequency response, which is adjusted by a high and low frequency preset on each amplifier. These only need to be adjusted for one equalisation characteristic, but for both tape speeds. Using a wire loop in lieu of a calibration tape it was found to be a simple matter to adjust replay equalisation to within very close limits, but with plenty of leeway for alternative heads to the extent of +8/–4 dB at 15 kHz and +3/–5 dB at 50 Hz. All level adjustments also offer a wide range, but are easy to adjust within fine limits, and the maximum tape flux that the replay amplifiers will handle without clipping

Condition, speed	Unweighted rms 20 Hz–20 kHz	'A' weighted rms	CCIR weighted ref 1 kHz rms	DIN peak meter
***Replay** 76 cm/s	55.5 dB	61.5 dB	53.5 dB	48.5 dB
Machine 76 cm/s	58.0 dB	68.5 dB	63.5 dB	58.5 dB
***Replay** 38 cm/s	53.0 dB	57.5 dB	49.0 dB	44.5 dB
Machine 38 cm/s	57.0 dB	65.0 dB	58.0 dB	53.0 dB
***Sync Replay** 38 cm/s	51.5 dB	58.0 dB	49.0 dB	44.5 dB
Sync Machine 38 cm/s	53.0 dB	67.0 dB	58.5 dB	54.5 dB

All above using NAB equalisation at 38 cm/s.
*3M type *206* tape recorded on machine with bias only.







was found to be +23 dB above 185 nW/m at 1 kHz, which is more than adequate for modern tapes.

As with other parameters, the replay noise was measured on a randomly selected collection of channels, the following figures for operating level (185 nW/m) to noise being within a fraction of a decibel from one channel to another.

The above weighted figures show that the machine has a good margin between basic machine noise and tape noise from a low noise tape; furthermore the unweighted figures demonstrate that mains hum components are at a very low level. The 50 Hz output was measured from track 24, which is usually the worst track. and found to be 65 dB below reference level with NAB equalisation and with mains harmonics at an even lower level—a very good performance. As with all other 24 track machines, some care is necessary to site the machine away from ac mains transformers and other magnetic ironmongery, as the head shielding cannot cope with stray fields from such devices.

Record/Replay Performance

The major parameters were measured using 3M type *206* magnetic tape, for which the machine had been aligned by the UK agents, and the quoted figures are the average of a number of randomly selected tracks: very little difference between tracks was observed, however.

Reference to **fig. 1** shows the overall frequency response at both tape speeds with NAB equalisation at 38 cm/s. The performance of ±1 dB from 40 Hz to 20 kHz at 38 cm/s or 90 Hz to 20 kHz at 76 cm/s is certainly very good; furthermore, it was possible to improve the low frequency performance at the expense of some loss in the lower bass. It is to be noted that the bass performance is unusually free from head contour effects, which frequently make their presence felt well above 100 Hz in the form of a damped oscillatory pattern in the frequency response. The record/sync frequency response is shown in **fig. 2,** which shows a similarly good low frequency performance and general flatness of response, but as is to be expected the high frequency end falls off earlier at around 12 kHz; this is of course of little significance for the normal uses of the sync mode. Also shown in fig. 2 is the line in/sync out frequency response, which is to all intents and purposes as flat as a pancake.

Turning to distortion, **fig. 3** shows that the distortion of the electronics from line input to the sync output is to an extremely high standard and well below any possible tape distortion, which is shown in **fig. 4** and **fig. 5.** The former fig. 4 shows the third harmonic content of the output when recording at 0 vu corresponding to 185 nW/m with both CCIR and NAB equalisation at a tape speed of 38 cm/s: as is to be expected. the low frequency distortion with the NAB equalisation is considerably higher than with the CCIR equalisation, but the mid frequency standard of 0.3% is unusually good. A similarly high standard is shown in fig. 5, which refers to the standard 17.5 μs time constant at 76 cm/s tape speed.

Three percent third harmonic distortion was found to occur at 10.5 dB above 185 nW/m, which is a satisfactory standard for

56 ▶

the tape type in use, and adding this figure to the quoted operating level to noise ratios gives the available signal to noise ratio in conventional terms. Furthermore, as 0 vu corresponded to reference level there is a most satisfactory margin of 10 dB between the 3% point and 0 vu.

Checking intermodulation distortion to the SMPTE method using 50 Hz and 7 kHz tones in the amplitude ratio 4:1 again showed that the electronics department had very low distortion, and also that the distortion via tape was to a respectable standard:

Intermodulation Distortion

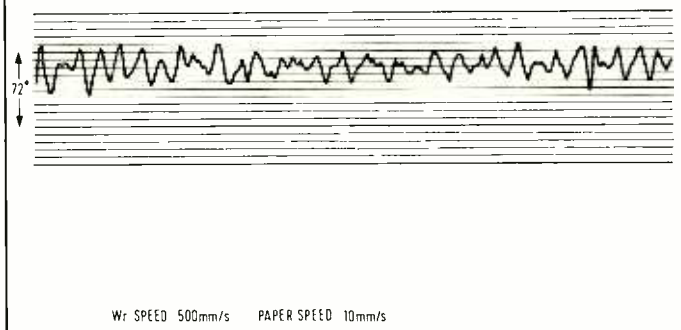
Level reference (equivalent peak sinewave)	Amplifiers	Tape 38 cm/s NAB	76 cm/s
+4 dB	0.095%	3.4%	2.2%
0 dB	0.11%	2.2%	1.2%
−10 dB	0.015%	<1.2%*	<0.7%*

*Limited by uniformity of reproduction

The apparent intermodulation distortion at −10 dB is a function of both tape and tape transport, but measured figures are unusually low, thus indicating good tape/head contact. The information is reinforced by **fig. 6,** which is a pen recording of the uniformity of output on edge and centre tracks at 1 kHz and 10 kHz and shows an exceptionally good performance for a 24 track machine.

The worst condition crosstalk between tracks is shown in **fig. 7,** which was obtained by recording on tracks one and three and then replaying track two—a condition which should not be met in practice! The result obtained certainly gives no cause for complaint. The final matter under the heading of record/replay performance is the phase shift between tracks: the machine is provided with a test report which gives this and other parameters, and I am pleased to report that not only do I agree with the measured results but also that the dynamic phase shift between tracks one and 24 as shown in **fig. 8** is the best performance that I have come across in a 24 track machine. A total excursion of the order of 30° at 10 kHz and 38 cm/s puts many 6.25 mm machines to shame!

FIG. 8 STUDER A80 DYNAMIC PHASE SHIFT BETWEEN TRACKS 1 AND 24 AT 10kHz AND 38cm/s



Wow, Flutter and Speed

Measurement of the wow and flutter to the DIN weighted method at the beginning, middle and end of a full reel of tape showed that the wow and flutter was slightly increased at the end of a reel and that the average values were 0.035% at 38 cm/s and, rather surprisingly, a worst performance of 0.04% at 76 cm/s being just on the manufacturer's specification. Analysis of the wow and flutter spectrum showed that the main offender was the capstan motor, and it is suspected that replacement of this component would yield far better performance. **Fig. 9,** which is a narrow band spectrum analysis of a 10 050 Hz tone confirms that the capstan motor is the main offender, generating sidebands at ±13 Hz, ±26 Hz and ±100 Hz at the tape speed of 38 cm/s.

Checking the tape speed showed that the relation between the two speeds was within better than 0.03% and also that the speed variation from end to end of a full reel of tape was also within 0.03%, the absolute speed being adjustable within the tape transport electronics.

Inputs and Outputs

All inputs and outputs are fully floating and transformer coupled. The output impedance was measured at 25.7 ohms at 1 kHz, which is a nice and conveniently low impedance with a capability of delivering up to +23 dBm, up to +21.5 dBm being available from a tape flux of 185 nW/m. While the nominal input impedance is 8k ohms the actual impedance was found to vary over a rather excessive range, being measured as 21 800 ohms at 1 kHz and 8500 ohms at 10 kHz—such a large variation is certainly undesirable if the recorder is fed by true 600 ohm lines or other relatively high impedance sources.

The sensitivity of the inputs was found to be variable over a large range, from −18 dBm for recording reference level at maximum sensitivity to a virtually unlimited level on the upper end.

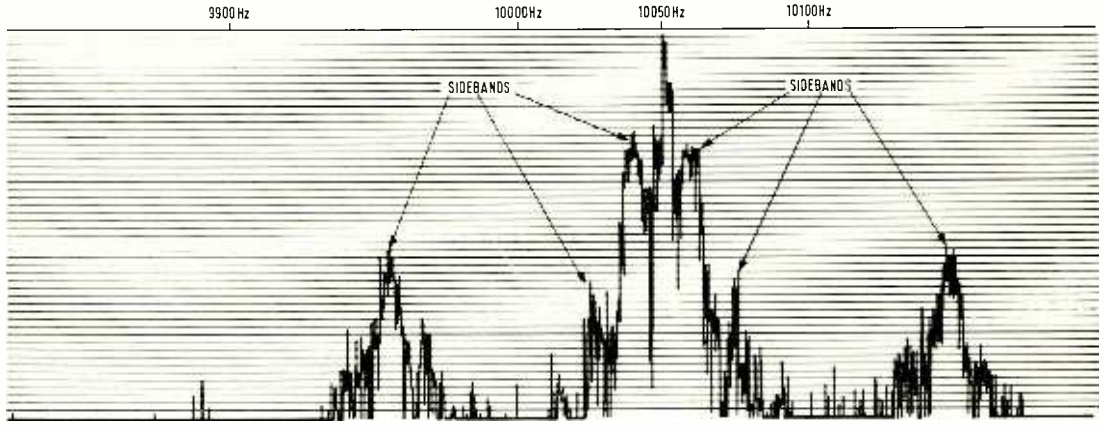
As delivered, the level meters were adjusted such that 0 vu was 10 dB below the 3% distortion point of tape, as is recommended in the original vu meter specification. Checking the ballistics of the meters showed that both the rise and fall times were to the proper specification, and was the overshoot characteristic and also the rectifier characteristic. It really is a change to find a vu meter that corresponds to the correct specification.

The Studer auto locator comprises three different boxes: a small control box for mounting on the console which is attached to the electronics unit by about 2m of cable and also a separate power supply unit which is designed to provide the power requirements of four auto locator units. The power supply connects to the electronics unit via 24 way Amphenol plugs, and a further lead

58 ▶

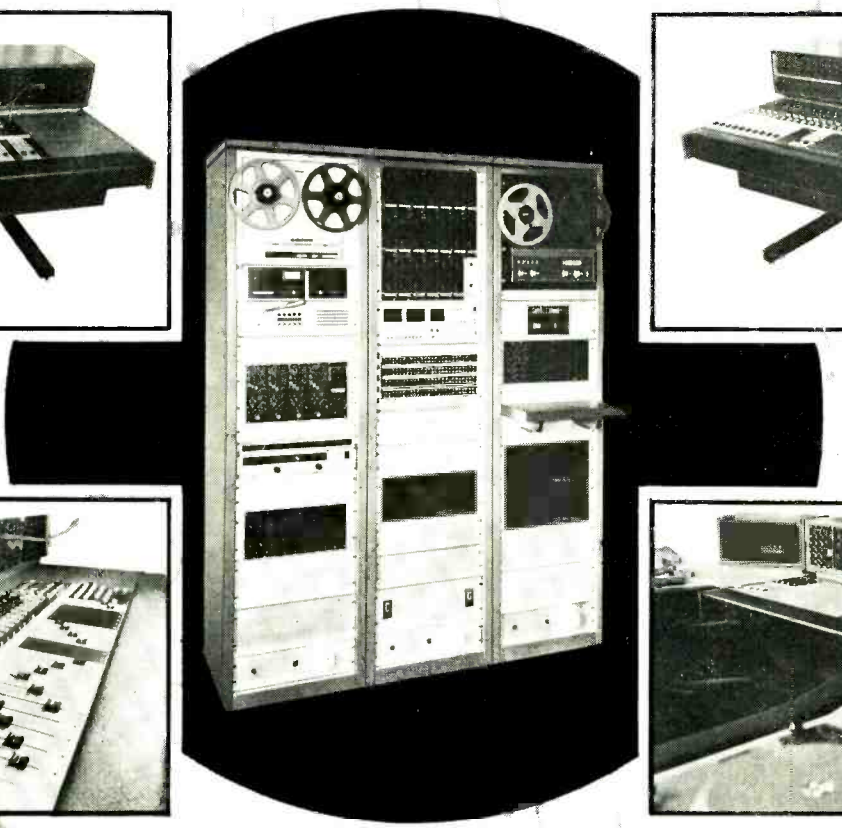
FIG. 9 STUDER A80 FLUTTER SIDEBANDS RECORDED 10050Hz TONE

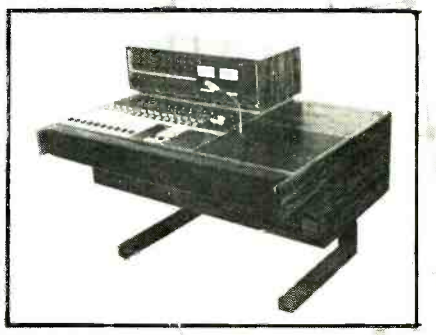
RESOLUTION: 3Hz



audix BROADCAST SYSTEMS

B102 14 to 32 input, 4 sub group, 2 main output control console.





B101 10 channel, 2 group mixing console.

14 input, 4 group, 2 mains output console fitted extra foldback and monitoring facilities.

Commercial radio central area control, monitoring and distribution rack equipment.

Radio self-operated control console – custom built to requirements.

Sound Control Consoles, 2 & 4 group ● Transportable Mixers ● Radio Continuity Consoles
D. J. Self-operated Consoles ● Gram. Consoles ● Audio Switching Matrices ● Distribution Amplifier systems
Rack mounting limiters and compressors ● Intercom. systems
Control line switching systems ● Monitor amplifiers ● Line equalising amplifiers

audix

MANUFACTURERS OF SOUND SYSTEMS AND ELECTRONICS

AUDIX LIMITED, Station Road, Wenden,
Saffron Walden, ESSEX CB11 4L9
Telephone: Saffron Walden
(STD 0799) 40888

connects the electronics unit to the tape machine via 50 way Amphenol plugs which appear to be impossible to anchor to any normal type of cable—I have many times cursed this type of plug, and it was with some relish that I noted that it has also defeated Mr Studer.

The console unit duplicates the tape motion switches on the tape transport and has an additional two illuminated tape motion controls identified as 'zero' and 'var'—in the manual mode (as selected by a three position rotary switch on the unit) the tape motion control is as per the tape transport controls with the additional facilities of the 'zero' button and 'var' button which fast wind the tape to either the zero of the tape timer in the console unit or in the case of 'var' to the tape time set on switches on the console unit. The console unit tape timer is identical in appearance to that on the tape transport but works independently in conjunction with three pushbuttons which are (1) a master reset for both tape timers (2) a local reset for the console tape timer (3) a set for setting the console tape timer to the time selected on the console unit time switches. The latter switches are four semi-rotary toggle switches for setting time in minutes and seconds up to 99 minutes 59 seconds. By using these facilities it is possible to fast wind the tape to any location irrespective of the reading of the tape transport's tape timer. Selecting the 'single' mode on the autolocate unit provides a mode whereby a given time may be played or recorded and the tape automatically rewound to the starting point. The third mode 'auto' is similar to the 'single' mode except that the required length of tape is continuously rewound and replayed until the machine is stopped—this facility is of course useful when setting levels or doing a mixdown. If record is selected in the 'auto' mode the tape is recorded for one pass, after which the machine automatically reverts to the play mode as a safety factor.

Once the functions of the autolocator have been mastered, it is a simple and very accurate unit to use, the accuracy being within a few centimetres of tape after stopping and starting throughout the length of a full reel of tape. The actual tape handling was most impressive—the tape slows down from the fast wind mode as the desired location is approached, and gently comes to a halt at the desired point without any sign of hunting or other violent action—far more precise than an operator, and much kinder to the tape!

In all respects the autolocator functioned well, but the power supply developed a very noisy transformer which is probably a one-off fault. The only other complaint which I have is that while it is sensible to have a small console unit, it does seem rather unnecessary to have a separate power unit and also separate electronics, both of which are relatively bulky.

Other Matters

All control functions were tested for putting clicks on to the tape and I was completely unable to find any fault in this direction; furthermore the machine did not ill behave itself if the mains power failed. Should the incoming mains voltage drop as low as 217V from the nominal 240V the machine drops out of record, or drops out of play at 205V; but, at these low voltages the electronics remain in good order. The start time to 76 cm/s was found to be 600 ms to 0.1% wow and flutter, or 400 ms for 0.1% wow and flutter at 38 cm/s, in either case the start being completely free from any tape snatching or lack of perfect control.

I am bound to mention that one fault did occur during the review evaluation: this was a faulty vu meter in one channel which intermittently decided to stay put at full scale deflection, but this is a familiar enough occurrence. In all other respects the machine behaved *par excellence*.

Summary

Without question this is one of the most beautifully made machines that I have come across, and I have nothing but admiration for the thought put behind its design. Not only is it constructed on the best principals of tape transport design, but also the possible maintenance problems have been given considerable thought. Access to all components, both electronic and mechanical, is really excellent and any part of the machine can be changed, literally, within the space of minutes. The overall performance of the electronics is also to a high standard and the simplicity of alignment and of changing the electronics adjustments for alternative head configurations or tape types is a great asset. Those shortcomings which do exist are generally of a minor nature, and when this review goes to press I hope to be able to report an improved wow and flutter performance—not that the machine is either out of specification or poor in this respect—I just have the feeling that it can be better.

Postscript

My findings concerning the not so good wow and flutter performance were given prompt attention by the UK agents, who brought along a new capstan motor and capstan servo electronics board. This second motor immediately improved the wow and flutter performance, but was somewhat noisier than the original motor and after some time we decided to revert to the original which had been found to be defective. The repaired original motor then gave better wow and flutter than it had originally, but not such good performance as the new (noisy) motor, the following performance being measured:

	DIN weighted wow and flutter		
	Beginning	Middle	End
76 cm/s	0.035%	0.03%	0.035%
38 cm/s	0.033%	0.025%	0.025%

Spectrum analysis of the wow and flutter waveform, and also of a recorded high frequency tone, confirmed that the original of the major wow and flutter components remained in the area of the capstan motor. There is certainly no cause for complaint about the machine's performance, but I still feel that even better can be obtained.

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 **FEBRUARY 1976** issue must reach these offices by **16th DECEMBER 1975** 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.

FOR SALE—TRADE

Roger Squire Studios
specialist recording studios for sound commercials and radio programmes: contact Tony Newman or Jayne.
55 Charlbert St, London, NW8 6JN. Tel. 01-722 8111.

★**Microphones**—AKG D202E1 £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.

★**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.

SONIFEX
6 channel monophonic mixers, 10 channel stereo mixers, NAB cartridge recorders and players. All ex-stock.
SONIFEX
15 College Street, Irthlingborough
0933 650700

★**Alice mixing desk:** 3 mic. channels, full eq, 3 mag. turntable inputs, full eq, 2 aux. inputs, 2 echo return, 2 stereo outputs, 4 quad outputs, 1 monitor through jack (earphones), 2 echo send, pan on all mics, monitor pre fade—not mics, vu meter on total output except when pre fade in use, group control left/right, qs quadraphonis decoder, £400. Built into console. Also two matching consoles for decks and records if required, £200. Y.S.M. Discotheques, 63 Bridge Way, Whitton, Twickenham, Middx. 01-894 4308 (Ansafone when office closed).

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

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%

FOR SALE—TRADE (Continued)

★**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.

TRAD
CARDINGTON 404
All Studio Equipment bought and sold.
See our advertisement on page 9.
Dog House, Cople, Hertfordshire

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/mnus 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

★**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.

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

FOR SALE—PRIVATE

★**10/4 Portable Audio Mixer,** partially built. £300 of complete components £200. 051 236 2086. 077 473 3492.

★**Bechstein grand piano.** 6ft. 6in. good condition £1500. A.R.P. pro-soloist, mint condition £450. Chester 316457/531745.

★**16/8 Allen Heath** mixer. 16 monitors, sync, etc. £1200. Audio Design comp/limiter Expandek stereo £400. Revox A77 HS. Sync, vari, £275. Chester 316457/531745.

FOR SALE—PRIVATE
(Continued)

★**Audix MXT200 Mixer,** 10 mic, 2 line inputs, 2 output groups, £350. Shelford (Cambs.) 3860.

★**Pair Lockwood Academies** in daring orange. With 15in. Tannoy HPDs, Quad 33+303 amps, matched pair AKG D202EI mics with windshields. All one year old, v.g.c., hardly used, will split. Viewed Harpenden or Brighton. Tel. 05827 3029.

★**New BTR** four track ½in. tape deck with head block, £350 o.n.o. Tel. 892 4180.

★**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.)

★**Pair JBL loudspeakers** in perfect condition. Current recommended retail price £1,237.50 inc. VAT. Prepared to sell for £700 the pair for quick sale, owner going abroad. Phone Bagshot (0276) 72897. Demonstration if required.

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.

STUDIO EQUIPMENT
SPECIALIST IN REVOX-TEAC
SERVICED, SUPPLIED, MODIFIED, MANUFACTURED TO PROFESSIONAL STANDARDS
IAN DOWNS 01-200 1229

CASSETTE TRANSCRIPTION SERVICE
Each cassette professionally copied to highest quality.
24 hour service. Half hour programme **£2.10** one to five off. Studio facilities available.
LEEDS (0532) 586637
PETAL STUDIO SERVICES
The Studio, Victoria Mill, Wellington Bridge Street, LEEDS 3

SOUND NEWS PRODUCTIONS
Britain's oldest full-time tape/disc/cassette transfer service. Direct transfers, pressings for private and for the trade. Fund-raising advisory service for Societies, Choirs, Bands. Ferrograph, Grundig, Philips, Revox equipment promptly serviced.
18 Blenheim Road, London W4
Tel. 995 1661

★**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.

STREETNOISE SYNTHESISER STUDIOS
We are the experts in Synthesiser sound. When you hire one of our synthesisers, whether it is the compact ARP 2600 or a giant Moog (discussed in the May issue of *Studio Sound*) you get a reliable, regularly serviced machine, and an operator fully experienced in Control Voltage Technology, to provide that different sound for your next session.
CALL US NOW ON **01 373 3928** FOR MORE DETAILS AND RATES

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

COUNTY RECORDING SERVICE
Stereo and mono masters and lacquer discs from your tapes.
Telephone Bracknell 54935.
London Road, Bingfield, Bracknell, Berks, Englahd

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.

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

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

TONY WALDRON
WEST OF ENGLAND SOUND LTD.
14 SWAN ST., TORQUAY
TOP SOUND ENGINEERS
Available anytime, any distance
Sensible rates
Phone 0803 28783

★**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.

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

WANTED

★**Audio Development** 8/4 mixer and/or extension channels. Chester 316457/531745.

★**Top prices paid** for your Revox A77, any model, any condition. Ring John 01-748 6815.

★**Ribbon mics, Marconi AXBT,** price and condition to Mr. K. E. Eriksson, Radjursvagen, 22, S-44003 Floda, Sweden.

GLENN MILLER
Private collector requires recordings taken from BBC broadcasts during 1944-45 of THE AMERICAN BAND OF THE A.E.F. who were stationed in the UK during this period. I am particularly interested in complete broadcasts by the full Orchestra and various sub-units under the titles of: "Swing Shift", "Swing Sextet", "Uptown Hall", "Johnny Desmond Sings", "Strings With Wings", "The American Band of the AEF", plus any 16" Transcriptions, "Air Checks" and "V" Discs, etc., in any condition. Tape copies acceptable but will pay very good price for original discs or will exchange from my collection.
Also requires AAF band from "Uncle Sam", "I Sustain the Wings" show and AFRS and OWI Transcriptions plus his civilian band broadcasts and GMMS Transcriptions. All letters answered.
A. J. HIBBERD
59 Waverley Road, The Kent, Rugby, Warks.
or phone 6473 daytime, 71066 evening

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

WIRING
ANYWHERE ANYTIME
We will do **ANYTHING**
from complete studio installations
to making mic/line leads.
Call 01-349 1207

SITUATIONS—WANTED

★**Trainee sound operator,** three appropriate "A" levels, B.B.C. experience. Bygrave, 1 New Paris Road, Guernsey.

★**Top recording engineer,** with eight years' very varied experience in major London studios, seeks freelance work as producer or engineer. Box No. 711.

SITUATIONS VACANT

THE CITY UNIVERSITY
Technician

required to work in a team developing new courses in the University. There will be two main areas of responsibility:
In the Electronic Music undergraduate studio: responsibility for developing and maintaining equipment for undergraduate work as well as forward planning towards a possible computer link and a research programme.
In the new Language Laboratory (which will develop in conjunction with a self-learning resources unit): regular servicing and immediate fault correction on language equipment and participation in forward planning.
Applicants should have experience of both design and practical work; some knowledge and interest in electronic music is essential.
Salary will be in the range £2247-£2628 or £2439-£2895 per annum. London allowance of £410 per annum is additional to both scales. Application forms obtainable from: **The Personnel Office, The City University, St. John Street, London EC1V 4PB.** Telephone No. 253 4399, Extn 334.

UNIVERSITY COLLEGE CARDIFF

Department of Physics

ELECTRONIC MUSIC STUDIO

A TECHNICIAN Grade IV is required to maintain, supervise and build equipment for the Electronic Music Studio in the Department of Physics.

The applicant should be interested in digital and audio electronics and be able to maintain analogue and digital equipment and tape recorders. The main studio is a working four channel unit using Studer A80 (1 inch) and Teac (¼-inch) four channel recorders, one Uher and six Revox machines. There is a Synthi 100 and several other synthesisers. The main mixer has eighteen channels with six groups and there is also other portable performance equipment.

The Studio runs postgraduate courses for MA and Diploma in Electronic Sound and also provides facilities for visiting composers. Among his other duties the technician will be required to help students with any construction projects if they arise.

Salary range £2,559-£2,940 (which includes a supplement of £312 pa on the basic rate).

Applications giving the names of two referees should be forwarded to the Vice-Principal (Administration) and Registrar, University College, PO Box 78, Cardiff CF1 1XL, not later than 9th February 1976, please quote ref 0427. Anyone wishing further information, or who would like to discuss the possibilities further is cordially invited to get in touch with Mr Keith Winter, Electronic Music Studio, Physics Department, University College, PO Box 78, Cardiff CF1 1XL.

INDEX TO ADVERTISERS

Published by the Proprietors, Link House Publications Limited, 10-12 South Crescent, Store Street, London W.C.1, and Printed by Arthurs Press Limited, Woodchester, Stroud, Glos. GL5 5PB.

YOUR REMARKABLE NEW ASSISTANT ALBERT

Your MCI Auto-Locator Binary Electronic Robot Tape-ape * uses sophisticated arithmetic logic to allow a velocity proportioned approach to be made to any arbitrary point, from anywhere on the tape, in either direction, in real time, and without overshoot.

Your MCI ALBERT * will always know where you're at and find it quickly according to your need. It's the most sophisticated of it's kind and highly valued by tape-ops around the world.

Efficient studios use tape-apes.

The smartest tape-ape is Albert.

Isn't that right, Al?

START BUTTON
Starts auto-location process.

RESET BUTTON
Sets tape position memory to zero.

TAPE POSITION MEMORY
Gives current tape location in minutes and hundredths.

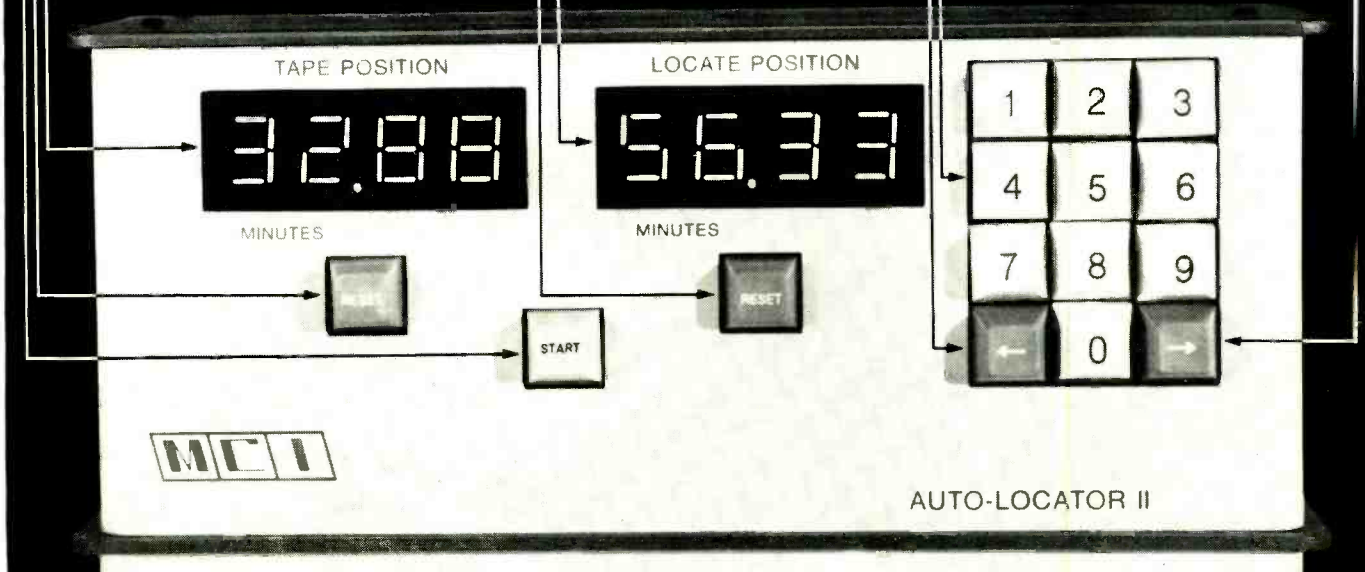
RESET BUTTON
Sets locate position memory to zero.

LOCATE POSITION MEMORY
Gives desired tape location in minutes and hundredths.

SHIFT BUTTON
Shifts locate position memory data into tape position memory.

ENTRY BUTTONS
Provide input to locate position memory.

SHIFT BUTTON
Shifts tape position memory data into locate position.



MCI

MCI (PROFESSIONAL STUDIO EQUIPMENT) LTD, 21 CLAREMONT SQUARE, LONDON N1 91X 01-278 2288

The Revox A700 fills the gap

Between the well known continuing model A77

and the fully professional studio machines

It's Revox
It's Yours –
The Specialist

Superb Performance
Lavish Engineering
A new standard in High Fidelity
Write now for full details

Revox at Lamb House
Church Street
London W4 2PB
Tel. 01-995 4551

Three Speeds (15/7½/3¾) quartz crystal controlled
Electronic tape tension, all modes.
Plug-in head assembly.
Repeat Control, Auto rewind.
Pause Control, all functions.
Memory circuits (2 LS1, 19 IC, 93 transistors, 92 diodes, 7 FW rectifiers),
4 input slider controls plus master fader with 4 balanced mic. Inputs
Bass & Treble Controls
Multiplay and Echo (even in Stereo)
Timer in minutes and seconds – and of course a truly professional specification.