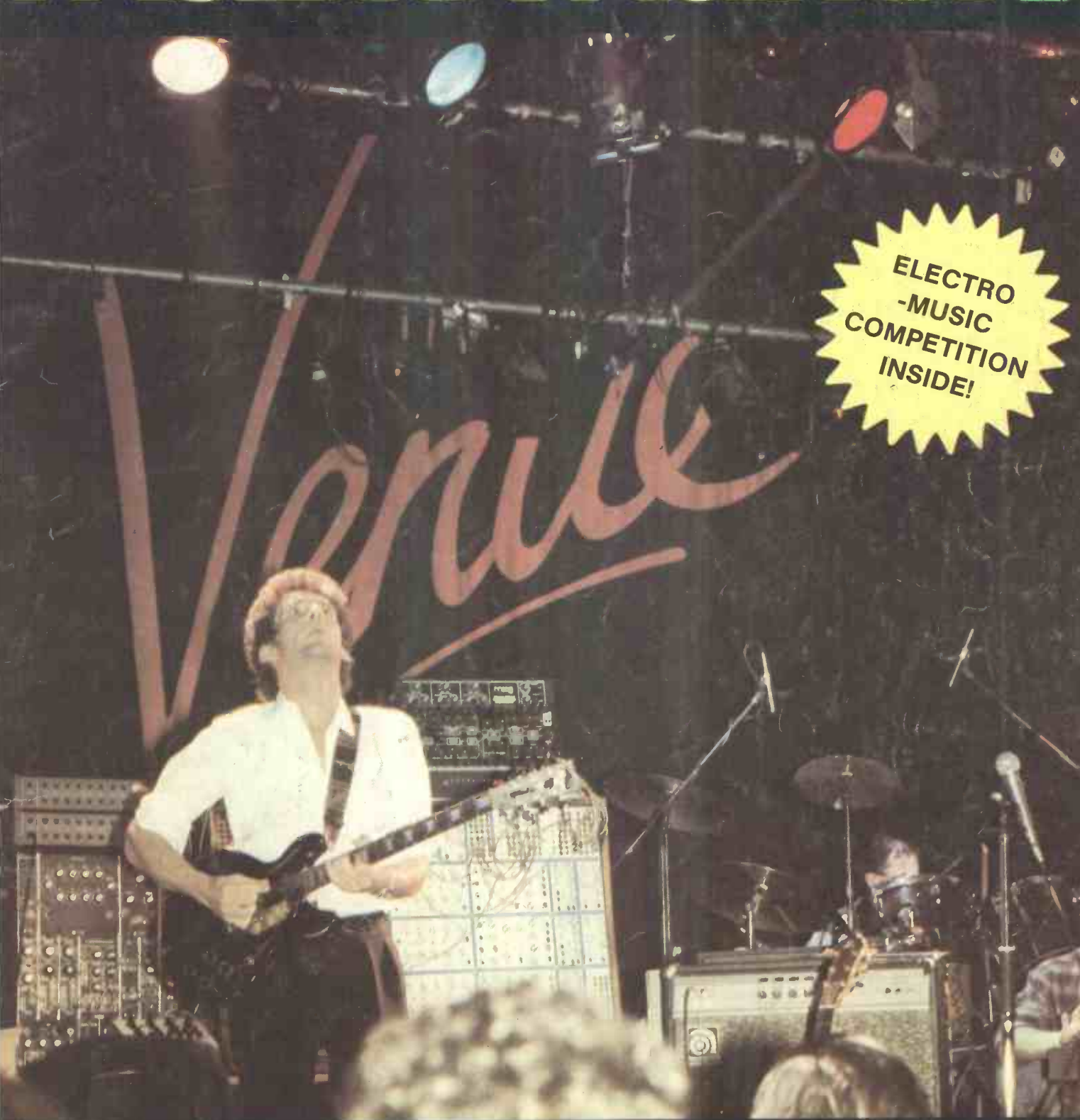
Electronics & Music Maker

SEPTEMBER 1982 75p



ELECTRO -MUSIC COMPETITION INSIDE!

★ **RICHARD PINHAS**

★ *Yamaha CS-01 Breath Control Synthesiser*

★ *Pearl Effectors*

★ **Digital Aids the Video Stars**

★ *Delta Lab Harmonicomputer*

★ *Carlsbro Stingray Electro-Acoustic Amp.*

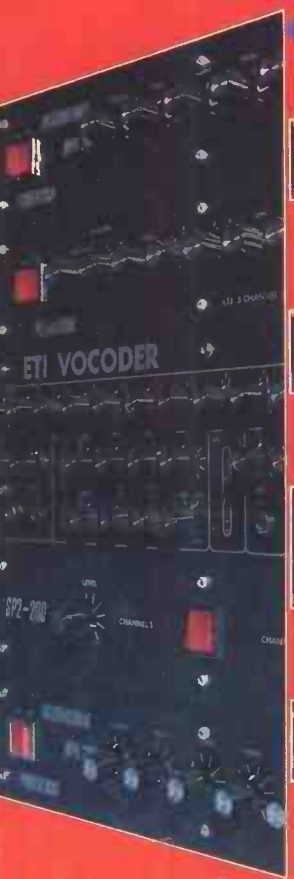
★ **Non-Concordant Tone Generation**

★ *Fender Squier Guitars*

★ *PLUS many more electro-music features!*

POWER PLUS PERFORMANCE

MAN-MADE MUSIC AT IT'S VERY FINEST — SEE OUR GREAT SYNTHESISERS INSIDE FRONT COVER



MPA 200 is a low price, high powr 100W amplifier, its smart styling, professional appearance and performance make it one of our most popular designs. With adaptable inputs the mixer accepts a variety of sources yet straighforward construction makes it ideal for the first-time builder.
Complete kit £49.90 + VAT

CHROMATHEQUE 5000 — a 5-channel lighting system powerful enough for professional discos yet controllable for home-effects. Sound to light, strobe to music level, random or sequential effects — each channel can handle up to 500W yet minimal wiring is needed with our unique single board design.
Complete kit £49.50 + VAT

ETI VOCODER — 14 channels, each with independent level control, for maximum versatility and intelligibility; Two input amplifiers — for speech/excitation — each with level control and tone control. The Vocoder is a powerful yet flexible machine that is interesting to build and thanks to our easy to follow construction manual, is within the capability of most enthusiasts.
Complete kit £175.00 + VAT

SP2 200 twice the power with two of the reliable, durable and economic amps from the MPA 200; fed by separate power supplies from a common toroidal transformer. Superb finish and quality components throughout — up to (even over!) the standard of high priced factory-built units.
Compete kit £64.90 + VAT

DJ90 Stereo Mixer — this is a really versatile new mixer that enables the constructor DJ to produce a professional performance every time. There are two stereo inputs for magnetic cartridges, a stereo auxiliary input and mike input. Other 'plus' features are auto-panning for fast or slow slider controls, multi-mixing, ducking, interrupt, input modulation. In short everything ... the whole works — AND — under £100 complete! (We have illustrated the DJ90 teamed in our own console with the Chromatheque and an SP2 200 and speakers. — Console only available as Sales Counter purchase.
Complete Kit — £97.50 + VAT

NEW

Digital Delay Line

Our latest kit! With its ability to give delay times from 1.6 mSecs to up to 1.6 secs. Many powerful effects including phasing, flanging, A.D.T., chorus, echo & vibrato are obtained. The basic kit is extended in 400 mS steps up to 1.6 secs. Simply by adding more parts to the PCB. Compare with units costing over £1,000!
Complete kit (400 mS delay) £130 + VAT.
Parts for extra 400 mS delay £9.50p.

POWERTRAN

WORLD LEADERS IN ELECTRONIC KITS

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ANDOVER. HANTS. SP10 2NM
TELEPHONE
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- **MONEY BACK GUARANTEE:** — if you are not completely satisfied with your Powertran Kit return it in original condition within 10 days for full refund.
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INSIDE FRONT COVER

CHASE

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MANCHESTER
BIRMINGHAM

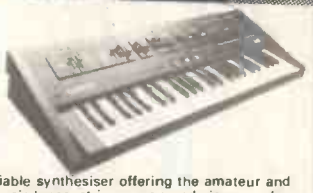
12 MONTHS INTEREST FREE CREDIT AT ALL OUR STORES APR 0%

KITTEN: CHASE PRICE £249.00 — weekly repayment £4.79

CAT: CHASE PRICE £399 — weekly repayment £7.68

OCTAVE KITTEN & CAT

ARP QUARTET
Chase Price £349.00
Weekly Repayment £6.72



The new Quartet by ARP is a compact, preset/variable synthesiser offering the amateur and semi-professional musician a wide range of polyphonic brass, string, organ and piano — plus combinations of any or all these voices — at the touch of a button. The Quartet is the first state-of-the-art instrument in its price range featuring LED function indicators, electronically latched switches, low noise specifications, colour-coded controls, and both high and low level outputs.

CRUMAR DP/50
RRP £1300 CHASE PRICE £849
Weekly Repayment £16.33

12 incredible Piano Voices, the ability to create your own and a keyboard response you can tailor to your touch

THE VOICES: Sit down at the Crumar DP-50 and you'll discover the world's most popular pianos are at your fingertips. Six presets function in two modes, the first six being more traditional acoustic and electric piano sounds, the second six offering more brilliantly defined sounds not normally associated with acoustically orlented instruments.
FREE SECTION: The seventh preset enables you to control our very special Free Filter Section. This section lets you create your own piano sounds, plus many expressive synthesiser voices individually coloured by the energy you direct into the keyboard.
THE FEEL: There are several electronic pianos claiming to be dynamic, but they still dictate what your playing style and touch should be. Not so with the DP-50. In the back of the piano is a Keyboard Response Control. You can use this to tailor the DP-50 to your style and touch. If your technique is very forceful, you can adjust the DP-50 to let you whisper, when you want. If you play with a delicate touch, the DP-50 can still give you powerful emphasis when you need it. Simply put, you don't conform to the DP-50, the DP-50 conforms to you.

CRUMAR STRATUS POLY SYNTH
RRP £900 CHASE PRICE £549
Weekly Repayment £10.56

SYNFUL SOUND: The Crumar Stratus is the first polyphonic synthesiser that satisfies the needs of both the creative synthesist and the multi-keyboard player. It offers a powerful array of sound, from the explosive to the expressive, and yet the majority of control comes from the keys you play, not the dials you turn. The heart of this outstanding versatility is found in the six actively engaged Filters and Envelopes that span the keyboard. These generate true polyphonic capability, letting you depress as many keys simultaneously as you want. Most polyphonic synthesisers are limited by their 4 or 5 voice capability. Go beyond that and notes drop out. The Stratus also features unique trigger modes (both Multiple and Mono) which allow you to turn on the Oscillator Glide, reset the LFO delay the alternate between the sawtooth and square

waves all directly from the keyboard. You can retrigger a particular effect whenever a new note is played, even though other keys are depressed. There are other noteworthy qualities to the Stratus, like two independent oscillators, continuously variable and invertible envelopes and polyphonic resonances. But, we suggest you experience this "synful" sound for yourself at Chase. At a price under £550, it's a devilishly exciting way to burn up a stage.

CRUMAR PERFORMER Strings & Brass
RRP £500 CHASE PRICE £399
Weekly Repayment £7.68

MORE STRINGS — MORE BRASS — MORE GIGS!

Violins, violas and cellos. Trumpets, trombones and French Horns. Synthesiser effects. You can have them all at your fingertips with the Crumar Performer. This incredible range of sounds that you can mix and overlap in any proportion you choose, make the Performer the most gig-producing keyboard on the market. Whether you do cover tunes or originals, the ability to add a true-to-life string and brass section tremendously expands your musical versatility. The Performer is priced just right for the working musician. Get your hands on one today. Crumar's completely new

Performer is a professional quality strings and bass synthesiser at a not so professional price. You could pay much more and still not get all the features the Performer offers: Two distinct 8- and 16-foot string voices, an on-board graphic equaliser, variable crescendo, full brass filter and envelope controls, delay modulation, a 4-octave range keyboard and trouble-free LED switching.

OBERHEIM THE SYSTEM

CHASE ARE THE SOLE U.K. AGENTS AUTHORISED BY OBERHEIM TO SELL AND SERVICE THE PRODUCTS IN THE U.K.

THE OBERHEIM SYNTHESISER PERFORMANCE SYSTEM consists of either the Oberheim OB-XA or the OB-SX Polyphonic Synthesiser, plus the DSX Digital Polyphonic Sequencer and the DMX Programmable Digital Drum Machine. You can record notes, patches and drum beats, then play them on stage or in the studio in a dazzling performance that would take a dozen musicians or a dozen tracks to pull off conventionally. THE OBERHEIM SYNTHESISER PERFORMANCE SYSTEM makes getting your ideas down faster and easier than ever before.
Program the multi-track DSX directly from the Synthesiser keyboard — record different sections and then merge them together to make the song as long as you want. The DSX can store up to 6000 notes plus patch changes, splits, tempos and transpositions in any of 10 different sequences, each with 10 tracks. In addition to driving all of the voices in the Synthesiser, the DSX also has eight external CV and Gate outputs, which can be used with other synthesisers for up to sixteen voice polyphony. The DSX also syncs up with the DMX for sound you wouldn't believe could come out of a box. Program your drum beats, combine the individual parts into a complete song, then let the whole SYSTEM loose with the touch of a single button! THE SYSTEM has cassette interface and battery back-up too, so you don't lose your recordings when you lose power. The Oberheim Performance System products that work together to expand your creativity as never before.
THE OB-Xa POLYPHONIC SYNTHESISER: 4, 6 or 8 Voice Synthesiser 120 Patch Programs 5 Octave Programmable Split/Double Keyboard Stereo/Mono Outputs.
THE OB-SX POLYPHONIC SYNTHESISER: 4, 5 or 6 Voice Synthesiser 56 Patch Programs 4 Octave Keyboard.
THE DSX DIGITAL POLYPHONIC SEQUENCER: 6000 Note Capacity 16 Voice Polyphony 10 Sequences, each with 10 tracks 10 Merges Loop and Transpose.
THE DMX PROGRAMMABLE DIGITAL DRUM MACHINE: Real Sounds Recorded Digitally. 2000 Event Capacity 24 Drums 100 Sequences 50 Songs.

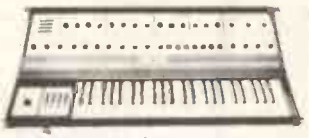
CRUMAR ROADRUNNER PIANO
RRP £300 CHASE PRICE £229
Weekly Repayment £3.88

The ROADRUNNER/2 has been designed for a colourful new look and positive electronic and mechanical reliability. The features include a new variable "chorus" effect, and accessible pitch control and rainbow tab controls for bass and 3 different piano sounds. Still included is the two octave bass extension that can be fed through a separate amplifier to give a "stereo" effect. For the ultimate in portable pianos, play CRUMAR'S new ROAD-

RUNNER/2 — the first and foremost of its kind.

CRUMAR TRILOGY POLYPHONIC SYNTH
RRP £1300 CHASE PRICE £749
Weekly Repayment £14.41

TRILOGY: Crumar's Trilogy combines polyphonic synthesiser, orchestra, strings, and cathedral organ in one instrument, then lets you combine them in any proportion for limitless creative potential.
Usually we do not think one single instrument should do everything or be everything to the professional musician, but with the TRILOGY natural events "led" us to betraying this ideal. Accordingly we have created the most complete polyphonic synthesiser the musician would wish to have. Big, fat, aggressive, today's sounds combined with some unique features such as alternating waveform keyboard trigger and invertible envelopes in a



polyphonic format. Added to these a comprehensive, easy to use, bank of presets which may also be internally altered to your own taste, a super String Section and you have all the ingredients to make the TRILOGY live up to our highest expectations.

ARP SOLINA
Chase Price £299.00
Weekly Repayment £6.33

4-octave fully polyphonic keyboard with violas, violins, trumpets and brass, all mixable, to produce unlimited range of sounds including organ, electric piano, etc. Separate bass section. Attack and crescendo facility. Interfaceable with other synthesisers to produce polyphonic synthesiser sounds. Reduced from over £800 to £299! Carrying case also available for only £20 extra. This is the best bargain we have ever had on offer!

CHASE

LONDON SYNTHESIZER CENTRE

LONDON:	22 Chalton Street, off Euston Road, London NW1. Telephone: 01-387 7626/7449.
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BIRMINGHAM:	10 Priory Queensway, Birmingham B4 6BS. Telephone: 021-236 8146.

Opening hours Tues. to Sat. (inc.) 10.00 a.m. to 5.30 p.m.
Please note our stores are closed on Sundays and Mondays.

Electronics & Music Maker

E&MM's New Team

After a hectic few weeks, covering our first two issues under new ownership and one exhibition, some of the staff were given a few minutes break to celebrate the occasion! In the photo from left to right are Dennis Hill (Director), Alan Hardman, Mike Beecher, Toni Markwick, Terry Day (Director) and Kenneth McAlpine.

Looking ahead, we've been preparing reviews of exciting new instruments that appeared at the London Show and have lined up some more interviews with electro-musicians you've requested in the readers questionnaire earlier this year.

Finally, a few words about projects. Continuing our tradition of supplying kits for most projects, an E&MM PCB and Kit Distribution Service has been set up from our offices for this purpose. You'll find the relevant details with each project. From next month we'll be expanding the number of pages to 80 and we have a very special monthly kit offer for musicians as well as one of our longest researched projects yet.

Don't miss your copy!

Mike Beecher

Volume 2 Number 7
September 1982

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CONTENTS

Lodge Go Digital

Lodge Studios in Suffolk are to be the second studio in the U.K. to have multitrack Digital recording, using the 3M Digital mastering system.

The installation will consist of one 32 track record/playback machine and one 4 track machine with an electronic editing console. By using digital technology, the 3M system is able to achieve a 90db plus signal to noise ratio — virtually noise free recordings.

Speaking on behalf of Lodge Studios, Lester Mortimer, manager of rock band The Enid said: "We're making incredible demands on conventional analogue equipment and the only way forward now is to use digital — virtually all the hi-fi manufacturers are introducing digital disc players in the next year, so every studio will have to go digital pretty soon.

There are now more than sixty 3M digital mastering systems in use in the U.S. and Europe and record producers are continuing to endorse the system with more than 150 albums and singles mastered using the 3M system.

The first 3M Digital Mastering system to be installed in the U.K. was at Roundhouse Studios in 1980.

Gateway Recording

Gateway Studio have put together a series of courses in multi-track recording techniques for the home-recordist or musician recording at any level. The courses have been organised in conjunction with Bandive Ltd, the Fostex corporation and Atlantex Ltd.

The courses have been structured to run over four days or evenings and include instruction in sound theory, the creative and corrective uses of equalisation, the use of reverberation and other effects and will concentrate on using professional studio techniques in the home studio.

A great deal of theory and jargon will be explained and emphasis will be placed on the practical demonstration of 4, 8 and 16 track techniques and the effects used with them.

The courses will cost £60 plus VAT and the cost will include written course material for the participants to take away.

The courses will start from Friday, 10th September, and will be held in Battersea, South London. Accommodation can be provided.

For more information contact Dave Ward, Gateway Studio on 01-223 8901.

Schulze Cancels Concerts

The long-awaited concerts by Klaus Schulze scheduled for Brighton 17th September, Dunstable 18th September, and London 19th September, have been cancelled. These concerts were originally intended to form part of Schulze's imminent European tour.

The only information E&MM have been able to obtain at the time of going to press is that Schulze has accepted a film score offer and he has cancelled all four arrangements to concentrate on this.

Schröder's Cosmic Gig

Robert Schröder will be playing the opening concert at the ARS Electronica at Linz, Austria, on the 26th September. A new album entitled 'Galaxy Cygnus A' will be released to coincide with the event.

The theme of the album and the concert is space, and the whole concert will be beamed directly out into space by a radio telescope.

Sound Synthesists Pressure Group

Last month E&MM News reported that a Union of Sound Synthesists had been set up by E.S.S.P. (Electronic Synthesiser Sound Projects) and was operating in opposition to the recent MU proposal to restrict the use of synthesisers.

This month we are able to report that the Union have set up an active pressure group to monitor the activities of any persons who aim to restrict the use of computers and synthesisers in sound and vision recording and live performance. As well as preparing to co-ordinate what the U.S.S. terms "any necessary action", the organisation have launched a campaign to help promote the education of computer-synthesiser sound engineering and to examine areas in need of development.

Schools,. radio stations, musical instrument retailers and record shops are the subject of reports being compiled by U.S.S. to analyse educational facilities, play lists, and retail sales and service.

For further information send an S.A.E. to U.S.S., PO Box 37b, East Molesey, Surrey KT8 9JB.

Advancing Digital Delay

Advanced Music Systems are advancing in a big way. Twelve of their new RMX 16 digital reverberation units are part of an order placed by the BBC for Pebble Mill Studios in Birmingham. These units will replace mechanical plates already installed in the radio and television studios. Seven RMX 16 systems have been ordered by NRK (Norwegian Broadcasting) and a single system has been ordered by Icelandic Broadcasting.

As if that weren't enough the new A/V Sync audio delay compensator, for use with digital synchronisers, has proved very popular in the U.K. Thames Television have ordered 12 units, London Weekend T.V. have ordered 6, Channel 4 T.V. have ordered 2, Yorkshire T.V. 3, and Molinaire 1.

Strings

Many top bands such as Dire Straits, AC/DC, Thin Lizzy etc. now use and endorse the increasingly popular Dean Markley range of guitar strings. The company are offering a free package of brochure, sticker, badge and other goodies to anyone dropping a line to them.

Any readers wanting this package should write to: Dean Markley (UK). Ltd., Dept. E.M., 77, Withermoor Road, Bournemouth, Dorset, BH9 2NU.

Video Boom

The number of households in Great Britain that have video cassette recorders had quadrupled in the last two years. In 1980 only 2% of all households had video machines compared to the present figure of 9%. There has also been a significant increase in the number of 'non-owners' who are very/fairly likely to get a video machine during the next 12 months. Expressed interest in acquiring a machine has risen from 4% in 1980 to 12% in 1982.

Questioned about usage 20% of those with VCRs recorded other programmes on TV and 15% recorded films from TV, whilst 44% did both equally. Only 17% mainly play pre-recorded tapes. In the area of pre-recorded full length cinema films well over half of all households with VCR's (65%) preferred to rent the films as opposed to buying them.

These figures would seem to substantiate the forecast of a boom in the video cassette recorder market and are some of the findings in a recent survey carried out by the Continuous Surveys Division of NOP Market Research Ltd.

EVENTS

We shall be pleased to publish news of forthcoming electronic and electro-music exhibitions, club meetings and special electronic music concerts.

April-September JVC's 5th ANNUAL TOKYO INTERNATIONAL VIDEO FESTIVAL. This competition has been divided into two categories — one is a completely open category and the other is called 'Video Letter Exchange' for compositions using video as a means of 2-way communication. The prize is a 15-day trip to Japan to receive a large cash prize, trophy and citation. There are over 30 prizes to be won. Closing date is 10th September. For further information contact JVC (U.K.) Ltd., Eldonwall Trading Estate, Staples Corner, 6-8 Priestley Way, London NW2 7AF. Tel: 01-4502621.

September SOUND BROADCAST EQUIPMENT SHOW, Albany Hotel, Birmingham. An exhibition catering specifically to users of professional sound broadcast equipment in radio and television. Admission by invitation only. Over 60 exhibitions. Details from Audio and Design (Recording) Ltd., 16, North Street, Reading, RG1 1BR.

October 15-19 8th INTERNATIONAL VIDEO-COMMUNICATIONS MARKET. New Palais Des Festival, Cannes, France. Thousands of participants from 54 countries will be at Vidcom this year catering for producers, distributors, publishers, manufacturers and all users of video communications equipment. Details from Vidcom, 179, Avenue Victor-Hugo, 75116 Paris. Tel: (1) 505 14 03.

November 25-27 THE NORTHERN COMPUTER FAIR. Belle Vue, Manchester. Following the success of their London show at Earls Court in April the sponsors have decided to hold a similar exhibition in Manchester. It will follow the same format as the London show with 'Club Avenue' for the specialist user groups, a Sinclair Village and sections devoted to the business applications of personal computers. Details on 01-643 8040.

November 30th is the closing date for entries for THE WORLD SONG FESTIVAL which takes place at the Royal Albert Hall next February. The winner will receive $10,000 and a recording contract. Entry forms from The Melkonian Foundation, 67-68, New Bond Street, London W1. Tel: 01-408 1612.

CORRIGENDA

Dec '81

Synclock, Page 86, Fig. 2: If the 4017 is mistriggered by IC1, giving rise to erratic sequencing, add 100nF in parallel with R11.

April '82

MF1 Sync Unit, page 48: RV1,3 - two off required. Calibrated knobs — two off only required. Maplin Verobox code should read LQ08J. Multi-Reverb, page 54, Fig. 1, Junction of R2 and R3 should be joined to the junction of C2 +ve terminal and TR1 base.

Aug '82

8201 Line Mixer, Page 56, Parts List: Due to new stocks from a different supplier, West Hyde Developments Ltd. can now supply the blank aluminium panel at a price of £3.85 inc. p&p and VAT.

Last month's superb cover picture has received much praise. It was an air brush design by well known artist Stephan Suchomski.

FUTURE MUSIC

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Fender soundhouse

Rhodes 73, 54 Strats, Teles, All In Stock!

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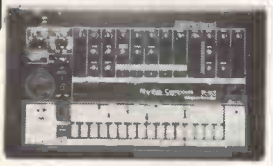
Audio Visual Studios
OFFERS
Trade your S/H Gear for Studio Time!
Free Time Against cash purchases!

Roland

Largest Stocks! Lowest Prices!
Call for quote!

TR 606 Drumaticks

TB 303 Bass Line



TR 808

Guitar Synths 808, 303, 202, 505

JP 8

CR 8000

Bolt 100
Spirit 50, 50 B 30, 30 B

HP 70
HP 60
EP 11
EP 6060

Juno 6

Boss Complete range of these terrific effects,pedals in stock.,Low, Low prices!!

YAMAHA

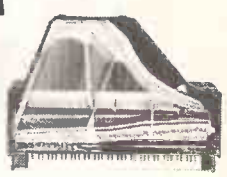
MUSICAL INSTRUMENTS

New GS 2

New CE 20

New CS 70M

New CP 11



BASSES

BB 2000
1200 S
1000 S
4000 S

GUITARS

SF 1200
SF 600
SF 400

YAMAHA KEY BOARDS

CP 80	£2999
CP 70	£2895
CS 40M	£1195
SK 30	£1395
SK 20	£899
CS 5	£235

Full range of Yamaha in stock!

New Producer Range

MA 10 Headphone Amp

CS 01

MM 10 Portable Mixer

SEQUENTIAL CIRCUITS INC

Future music now has these fabulous American synths from stock!

Prophet 5 £2995

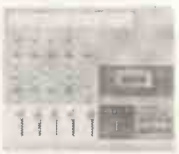
Prophet 10 £4595

Pro 1 £495

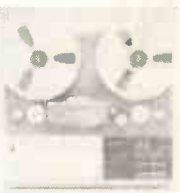
Poly Sequencer £795

FOSTEX

At last! The affordable personal multitrack
A8-8 tracks on ¼" + Dolby C
A4-4 tracks on ¼" + Dolby C
A2-2 track stereo + Dolby C



250 Multitracker, the most versatile 4 track cassette available.
350 Mixer, incredibly compact but sophisticated mixer, with or without meterbridge.
3050 Delay
3040 Dolby 'C'



2050 Line Mix

3030 Graphic

DRUMSTORE SPECIALS

JUST IN!
VAST STOCKS OF PAISTE
2002, 602 RUDE 101, 404, 505
SOUND CREATION CALL FOR LOW PRICES!

Turbo
Direct from France! We now have these terrific new kits both Standard and Extra deep versions. New chain operated pedals Fantastic!

5 Drum Kit	£650
Cymbal Stands	£28
Boom Stands	£38
Stool	£28
Rototom Stand	£22
B.D. Pedal	£43
Hi-Hat	£43

Ludwig
Now available again in the U.K. These famous American drums are second to none for sound and style. Now without stands.

Maxwin
Percussion on a budget! Maxwin offers professional features at beginners prices! All concert toms and snare drums in stock.

Pearl
These best selling kits are now better value than ever! Now available in new wood finishes and in Powertom.

Innovation	£650
Powertom	£435
Rock Kit	£625
Sound Venture	£715
Export	£399
Full Dimension	£715

Premier
Premier strike back! With the incredible value ROYALE! 5 Drums and stands. CROWN coming soon. Premier Quality At Low Price. ROYALE £350.

SALE! SALE! SALE! SALE! SALE! SALE! SALE! SALE!

NEW GUITARS AND BASSES

Yamaha SG 1000S & case	£340
Yamaha SC 800 & case	£240
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RICHARD PINHAS

Richard Pinhas is one of Europe's most creative electronic musicians. We examine the man and his music — including an exclusive interview and an analysis of his latest album 'L'Ethique'.

The Man and his Music

It is often said of prophets that they are never accepted in their own country. Richard Pinhas, that quiet, intense Frenchman, who has produced some of the most interesting electronic music of recent years, is a prime example of that truism.

He has been voted number one electronic musician in Japan and he has a dedicated group of followers world-wide (with such notables as Robert Fripp, Brian Eno, Kraftwerk and Vangelis numbered amongst his friends and admirers) yet the importance of his position in modern music has yet to be realised by his own countrymen. Happily, he is now starting to gain recognition in England.

The basic force behind Pinhas' music is the philosophy from which it stems — and Pinhas is well-grounded in philosophy. He taught at the Sorbonne after receiving his PhD at an early age and he has developed an attitude towards music that goes far beyond the sounds one actually hears to an almost mystical conceptualisation of the meaning behind the sounds.

For Pinhas, music and time are inextricably linked, and in a thesis written for his PhD he elaborates on this relationship.

Man, maintains Pinhas, has no real volitional control over his existence. His mode of being is taken as given and is dictated by the Law of Eternal Recurrence (which has been written about at length by Ouspensky and other mystically minded philosophers). Basically this Law concentrates on the cyclic nature of existence and is extremely fatalistic in emphasis. What man *can* do, though, is express his own individual existence through an art form such as music, using his will to focus his perceptions into a creative point. Music, when approached in this manner, transcends limitations of time and expresses the eternal through a time based medium.

Some may find this a difficult concept to grasp and, admittedly, I am trying to convey a 21 page doctoral thesis in a few lines which doesn't help matters. But to understand Pinhas' music it is essential to understand the ideas behind it.

This is not to say that Pinhas' compositions are abstract intellectualisations. they are essentially emotional pieces and a sincere attempt at artistic, non-verbal (and therefore non-intellectual) expression. A serious headphone session with Pinhas' latest album 'L'Ethique', which, incidentally, is titled after a work by Spinoza, should make some of the above a bit clearer.

Pinhas has arrived at his present understanding of music after years spent working with many eminent musicians. During the late sixties he formed a blues band which included Klaus Blasquiz (who later turned up as a regular member of the shifting Magma line-up) and followed it up with a jazz-rock group. At the same time he was studying at the Sorbonne where his PhD paper (examining aspects of time) sufficiently impressed the authorities that they offered him a teaching job there. This he accepted and took up the post for one year before quitting in order to concentrate his activities in music.

Between 1971 and 1973 he stopped making music but after he finished at the Sorbonne he recorded the backing tracks of the first Heldon album. The album was made very cheaply with one AKS, a guitar and two Revoxes and Pinhas is the first to admit that the sound was bad and the compositions unachieved. But this album opened up a new direction that Pinhas was able to explore subsequently.

Three more Heldon albums followed — all home recordings — and these early albums all display traces of Pinhas' affection for the music of Robert Fripp and Brian Eno. With Heldon's later albums the more overt aspects of Fripp and Eno's influence diminished as the technology they were working with changed. Now working with Francois Auger (drums and percussion) and Didier Batard (bass) Pinhas was using sixteen and twenty-four track equipment instead of his small home set up and his music became less personal taking on a hard metal-electronic direction.

Pinhas at The Venue.

Two solo albums followed, 'Rhizoshere' and 'Iceland', the latter being Pinhas' first release on the British Pulse label, they were followed by 'East-West' and his latest album 'L'Ethique' sees a return to the externalised violence of his earlier work with Heldon. In spite of three computer based compositions the overall feel of the album is that of a band production. The Pinhas band consists of Bernard Paganotti (bass) and Clement Bailly (drums). In addition there are occasional contributions from such Parisian stalwarts as Goude, Gauthier and Grunblatt.

There is no new album planned until 1984 but the title is already fixed as 'Sein und Zeit: The Rise and Fall of Joe Chip". 'Sein und Zeit' is German for 'Being and Time' so Pinhas' interests are certainly consistent. Joe Chip is a Sci-Fi character — Sci-Fi being another of Pinhas' passions.

Pinhas recently performed 'L'Ethique' in its entirety in London at The Venue. The day after the concert Pinhas talked to E&MM and this is what the man had to say.

The Interview

Do you regard the guitar as your main instrument?

Richard: Yes. I compose on the guitar and I always think that I play guitar, I don't play synthesiser. But I don't know how you can play synthesiser, it is not an instrument, it is a machine that creates sounds but it is not an instrument for somebody who can play. I mean you can make the chords or scales on the synthesiser but that doesn't mean anything, it's just a medium to create on because you can get fantastic sounds, fantastic velocity, and you can explore a lot of fields. For example, in my system you have sixteen tracks, you have floppy discs, you have a lot of things, and you have a lot of sounds but it is not an instrument.

You are really implying that if you approach a synthesiser you would start making sounds rather than playing sounds.

Yes, of course.

Surely a keyboard player can get over that. If I want to compose on a synthesiser I can ignore that quality.

It is better to compose on a Steinway grand concert.

Yes, I agree with you on that. I have a piano in the lounge that I still prefer to sit down at and not be distracted by the interfacing of synthesisers and whatever.

You can use a synthesiser for playing or composition because you know you can transpose, you can play with the sounds, but you can do this in your mind when you have been playing synthesisers for ten years. I think that I can represent in my head all the sounds that an analogical synthesiser, even one with 20 different voices, can do. After years with synthesisers I have started to think like a sound engineer to an extent and have learnt quite a lot about the technical side.

So you consider that a knowledge of the electronic aspects of your instrument is as important as the music.

Yes. I know how to produce any sound using synthesisers and recently my guitar amplifier broke for the first time in 6 years and I repaired it myself, but I am not an electrician. I know all the components of sounds and I am working theoretically with the nature of sound.

Let me go back to this interesting point — you are implying that you are using the guitar as a harmonic, melodic and rhythmic instrument, in a traditional sense if you like, but in that initial stage of composing you are not really interested in creating the sound because you already have in your mind a concrete image of what that sound will eventually be, on guitar of synthesiser or whatever, For example, you might eventually put the guitar through a flanger or a harmoniser but what you are implying is that you are still basically, in the first instance, only concerned with the melody and the music itself. Then I listen to your music and I have to say that sometimes I have this feeling, not so much on the new album, that it is very easy for you and I who are using new technology instruments to create new sounds and then to say "this is an effect I like, this is my music for this piece" and one then begins to lose a sense of classical form or whatever.

On the first tracks of 'L'Ethique', I wanted to get away from the technology. All the album has been done with big technology, big synthesisers. I am in a position to have everything I need if I want it, and the first track is the best one for me. It has been done with one Minimoog and one guitar and it sounds bigger than all the things we spent a lot of time on. We made all the rhythms with the Minimoog by hand — not with a sequencer — and we wanted to try to go to the more simple things. I think we have succeeded on this track to get with one thousand pounds worth of instruments (and I have more than £40,000 of computers and everything, including Prophet 10, E-mu system and PPG digital waveform terminal) to produce the best track we can do with the smallest technology — and it sounds like the biggest technology you can imagine.

And all the technology has grown up. I mean that in '74 it was possible to release a record that had been done on a Revox because the standard of the records was very low. It has increased a lot every year, now everybody is record-

Pinhas makes a few adjustments during the set.

RICHARD PINHAS

ing using digital systems, and the standard of sounds in two years should be higher and higher and higher.

You haven't actually done any digital recording yet?

Not yet. That's the next LP.

What have been your main influences?

The main influences are Richard Wagner and Robert Fripp — definitively. I like very much what Robert Fripp is doing and I think there is a straight connection between who I see as the three most important people in the history of modern music: Wagner, Bartok and Robert Fripp. But Fripp is the most important composer. It is important that people realise that what he has done has more importance than any other recent compositions. I can just tell you one thing, that he is developing something like an organic rhythm that suggests the pulsation of the earth. You know in physical studies you have something you call the electronic noise, the noise of the Cosmos? Well, he is doing this in music and that is one of the most important things you can do. Wagner developed all the ground mythology and Fripp is developing electronic noise reality. And the second thing is that his music is composed of a block of time, he is not doing music *in* the time, he is doing music that is immediately a *block* of time. That is why he is so important.

So he does obviously give you inspiration.

A little bit more than inspiration. You know, to understand any music you must devote yourself to listening to it. When I discovered Wagner I listened to each opera thirty times, one after the other, it takes weeks and weeks. When I discovered Stockhausen ten years ago, it was the first record I discovered 'Hymnen' and he takes some real instruments, big orchestral playing, and he makes electronic noise on it. I took the record and spent three days and nights just trying to understand what he is saying. And the more you listen, the more you realise that music and life are completely connected. When you are composing you are actually re-composing something that has been working for a long time in your head. And even when you improvise, it is the improvisation of all your life. I have been working for four years at the Freudian school in Paris and it is true that your unconscious work is more important than your conscious, and your unconscious is working 24 hours a day.

The years 71-73 are reported that you did no music, presumably because you were studying.

Yes, that is right because I was finishing the Ph.D. during 72-73.

That can't really be true, because once a musician always a musician.

Well, I was making music but it was not the main centre of my life at that time.

And you started out, as most of us do, with an album using little equipment: an AKS, guitar, and two Revoxes. How have you built up to your present instrumentation?

I sold my small independent record label to a guy and he gave me a Moog modular system in exchange. Then I got some ARP stuff but I sold all that. I kept the AKS and then I got an Oberheim DS2 sequencer and I made a custom analogue sequencer. Then I got the E-mu system that I used recently at The Venue, in London. Everything at the gig was controlled by the E-mu system.

You were using an impressive array of equipment at the gig. Perhaps you could describe the set-up you were using.

Well, first of all there was the E-mu modular system and on top of that I had a French 4-voice RSF synthesiser and the E-mu computer interface. Next to that was my small E-mu — basic VCO-Filter-VCA. I also had two custom-built Moog modular systems including fixed filter banks for percussion.

You have a marvellous percussion cymbal sound which, of course, you can only get by very precise filtering.

Yes. All percussion comes from the modular Moog systems and is triggered by the computer. To the right of all this was my Polymoog and next to that was a digital delay/harmoniser. I use two Teac 8-2 mixers for on-stage mixing.

What guitars do you use?

On stage and for recording I use a 1965 Gibson Stereo and I also play a 1957 Les Paul, but I only use that in the studio. On the last album, 'L'Ethique', I played through a Roland guitar synthesiser on Robert Fripp's orders! I also have a Travis Bean which I used at The Venue with the Roland equipment.

How do you regard the role of the two synth players? In actual fact you don't really need them, do you?

No, I don't need them but I like the presence of other musicians. They are great. They're not computers but very, very good musicians. They're all on the album and we're very close. Patrick Gauthier played in Magma for three years and Jean Phillipe Goude played with Bernard Paganotti and Patrick Gauthier for a long time.

Are the synth players using sequencers or playing rearranged patterns?

They don't use sequencers although they do play sequences. But they make moods in the sequences that no computer can do. They change things where they want to and they certainly add their own presence. All the tracks, apart from the solos are completely constructed, but within that construction they are able to add their own personalities. And Bernard Paganotti's such a complete musician that I couldn't see a live performance of my music working so well without someone of his standard on bass.

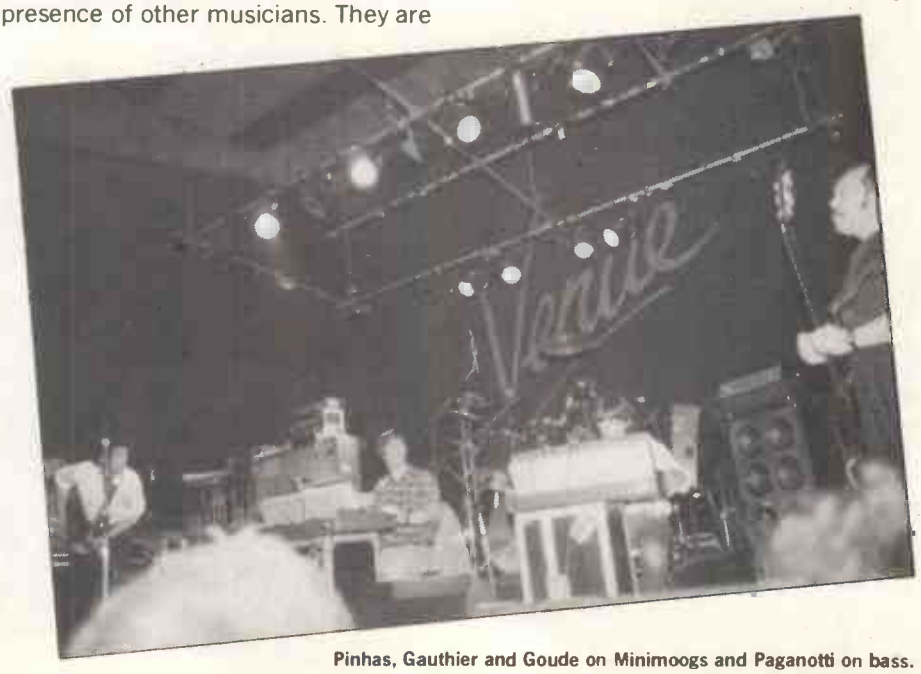
You have done solo and band work, which do you think you would like to concentrate on in the future?

I'd like to continue with a mixture of both. I intend spending a year and a half until my next album. I don't want to release an album before 1984 and I've some surprises in store for that. I don't want to say too much about it yet though.

I'm recording a string quartet playing a piece that I wrote and I may use that for the next album. I'm going to analyse all the string sounds with a real-time analyser and encode them for the PPG digital synthesiser and correct the timbre. I'll take the real timbre of the strings and make one piece with the real timbre and another with the real timbre analysed by a synthesiser — a Fairlight or something like this — but with the PPG.

You don't have a Fairlight though.

No, I've got the PPG. It's better with the PPG because the technology of the PPG is really brand new. The Fairlight is four years old. It's good but the PPG is using higher technology. With the string quartet I'll be using this technology to analyse the sound step by step, taking in all the parameters of length, intensity, duration and timbre. This way I



Pinhas, Gauthier and Goude on Minimoogs and Paganotti on bass.

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RICHARD PINHAS

will have the original quartet and a synthesised one that has been taken from the original image.
I am really interested in the whole digital thing. I have a lot to learn because digital synthesisers are still at the beginning stage. Whereas with analogical synthesiser, people like Klaus Schulze, Tangerine Dream or people like me don't have anything left to learn. We are at the end of the analogue era.

But you obviously appreciate the analogue/digital mix of the PPG.
Even the analogue E-mu. I like it but I don't think it can help me find really new sounds. To give you an idea — at the beginning of the 'seventies it would take half an hour to find a really new sound.
Now it would take two months because all the sounds have been done by people like Tangerine Dream, Kraftwerk, Schulze, Brian Eno or Heldon. In the composing process choosing the sounds can take a very long time while choosing the notes can take a comparatively short time. But this isn't a good way to work. You have to do the composition first and try to find the sounds as a part of the composition.
You have to first get your idea, and when you've got your idea it's an idea of composition. I insist on this word 'composition' because the composition is not only notes or chords — it is also sounds, texture and density.

So in terms of the new technology you are keeping up with all the latest developments.
Yes. When I knew the digital synthesisers were coming I learnt as much as I could about them in advance. They didn't exist yet but I started learning the basics just to be prepared.

Bernard Paganotti.

Do you think that musicians today should have an awareness of these new developments.
If they like this aspect, yes. If they don't, I think the answer must be no. The important thing is that the musician understands how to compose his own music and knows how best to express this music — whether electronically or not.
Many electronic groups today don't do anything new or important. They just duplicate and you can't even call this music. The important thing is to do music — electronic or not. The electronic process comes in symbiosis with the music. You have to be a musician before you can be an electronic musician.

How would you describe your own music?
It's elementary Cosmic expression. The same is true for Wagner, and Robert Fripp, and at a lower level, for me.
The focal point of Wagner's music is God, for Robert Fripp it is organic pulsation, and for me . . . I think this is still something I have to discover. I hope I still have a long way to go. I hope this is only the beginning.

The Album

SIDE ONE

Track One: L'Ethique (Part 1)

The album opens with this minimalistic track comprising solely of a repeated six bar theme which is itself split into three identical two bar segments based on the major tonic, minor second and diminished third triads respectively. Underneath this chordal progression a bass riff repeats a one-bar phrase alternating ominously between two roots an octave apart.

Synthesised chord layering and sequencing produce a powerful yet ethereal effect that is brought down to earth by the insistent regularity of the programmed percussion, and on top of this Richard Pinhas' heavily treated guitar meanders with a plaintive aimlessness.

Track Two: Dedicated to K.C.

After an introduction consisting of one root bass note per chord and synthesised arpeggios this track suddenly errupts into a chaotic section that resurrects ghosts of seventies 'progressive' rock — King Crimson in particular comes to mind and I should think it's a safe bet that they are the K.C. of the title.

The time signature changes from simple 4/4 to alternating 4/4, 3/4 with the bass guitar supplying a seven beat riff under a gradually rising guitar line that makes a good imitation of a horde of angry hornets.

Another abrupt change and a third theme (back in 4/4) is introduced. This is all on one chord and features Pinhas' guitar, with the emphasis still on ascension, over a hectic rhythm section. This

section explodes back into the eighties with a bright sustained chord on synthesiser and a different feel is introduced. The emphasis is still on repetition but the mood is comparatively more relaxed and a short breathing space is provided before the final theme.

This 'motif finale' is a violently simple descending pattern that departs from the usual 1,2,4 or 8 bar format. Spread over five bars this section reinforces the 'off-beat' and unusual time structure of the track and counterpoints the ascending guitar lines featured earlier on.

Track Three: Melodic Simple Transition

The title of this track says it all, although it cheats a little. It seems at first to be the most melodic track so far but then one realises that there is, in fact, no melody at all! The melodious flavour is provided by a sequenced synthesiser pattern that flows easily from one key to another. The 'melody' lies in the transposition which is beautifully accomplished.

The sequence itself is four bars long and consists of quaver notes that dance and cascade like a musical waterfall. The four bar phrase is really the same bar repeated four times with the bass and lead synth lines counterpointing each other through lush chordal layers.

There are only four chord changes repeated in a twelve bar format: 4 bars G, four bars D, four bars A and four bars C and it becomes difficult to pick out which is representing the tonic. This results in a light, floating quality — the resolution is always expected but it never quite comes.

Track Four: Belfast

A politically titled track — Pinhas has been dubbed the 'wild man of rock' because of his political interests and activities — that opens with an isolated 'space invaders' noise over a sparse, syncopated bass drum.

As the bass guitar comes in the 'space invaders' sound quickly establishes itself as an integral part of the powerful rhythm section. This is one of the tracks on the album where Pinhas' use of an extremely accomplished 'live' rhythm section, as opposed to bass synth lines and programmed percussion, makes itself most strongly felt.

A strangely sinister, high register nursery-rhyme-type synth line is re-

peated on every third and fourth beat of the track (it is used solo as an introduction) and the overall effect is one of danger and foreboding mixed with a tinge of the manic. Madness is just around the corner here.

The whole piece is based on the tonic with no other chords or key changes and the synth and guitar lines weave throughout the texture of the piece unable to find a resting place. As the instrumentation fades out we are left with the nursery-rhyme motif punctuated by staccato rim-shots.

SIDE TWO

Track Five: L'Ethique (Part 2)

A shorter version of L'Ethique (part 1) lasting 4.05 minutes instead of 6.21 minutes. Part One was introduced by solo percussion before bass, synth and guitar made an appearance, but on this side the piece gradually fades in with full instrumentation present from the beginning. Other than that, this is an identical revisitation to the album's opening theme.

Track Six: The Western Wail (Part 1)

This track opens on the tonic chord, A minor, with an arpeggio sequence and a root bass note indicating the key. The haunting two note motif enters almost immediately — a 'door-chime' E - C which, taken out of its usual major key context, has a plaintive and yearning quality.

The track consists entirely of repeated two bar statements. The first bar contains the two note motif played as dotted crotchet and a two-and-a-half beat minim plus quaver. The second bar contains the backing track only which plays exactly the same bass riff and sequence as in the first bar. Without the motif, however, this bar acts as an effective answer to the previous bar's question.

These two bars are repeated for some time and at exactly the right moment the whole arrangement is transposed into E minor. Unsure of itself the composition hops between A minor and E minor staying in each for four bars until, in desperation, it dissolves into a guitar solo played over staccato sequencing and a tribal drum beat.

The main motif then comes back, interrupting the guitar and re-establishing itself as the owner of the piece. But it is again displaced by a new theme (which reappears in The Western Wail, Part Two) before finally coming back and closing the piece.

Track Seven: L'Ethique (Part 3)

Not, as the title would suggest, a continuation of parts one and two but a completely different piece. This track is again based on chordal repetition in a four bar format — one bar each of Am, G, F and G again and uses Pinhas' trade mark of powerful rhythm section, sequencing and chordal layering.

The most striking aspect of this track is the use of time. It is in 4/4 but try tapping out a steady four to the bar and you'd be totally lost. This is because the four bar sequence gradually slows in tempo towards the middle and speeds up again towards the end. This time sequence is repeated throughout the track and the hectic syncopation in the rhythm section and the placing of chords — they never quite come in on *any* beat — creates a music that is totally removed from the anchor of accepted musical time.

Track Eight: The Western Wail (Part 2)

This track consists entirely of a four bar melody repeated each time in a different key. Underneath this melody, and counterpointing it in a lower register, is a theme taken from The Western Wail, Part 1.

This is a completely synthesised track that features George Grunblatt on Minimoog. The plaintive quality that is evident in so much of Pinhas' work is very much to the fore here and the minor keys, the haunting melody, the counterpoint and the repetition are unmistakably his work.

Track Nine: L'Ethique (Part 4)

Another completely synthesised track with no bass lines or percussion. It opens with an arpeggio sequence that cannot be pinned down to any time signature — it just floats on its own. The sequence continues throughout this short track, embellished on the way by counter sequences and chording, until the whole thing fades out. A fragile piece that closes a stimulating, often violent, and always interesting album.

Alan Hardman **E&MM**

ELECTRO-MUSIC ENGINEER

Non-Concordant Tone Generation

Robert Penfold

Most non-electronic musical instruments of western origin produce notes by resonating a string, tube, or skin. This gives a spectrum of output frequencies that are largely harmonically related, and most western music is based on complex harmonies.

Of course, there are musical instruments which give a spectrum of output frequencies which are non-concordant (a bell being perhaps the most obvious example), and in some musical cultures instruments of this type predominate. These produce a very complex spectrum of output frequencies, many of which are not harmonically related to the fundamental output frequency.

A complex sound of this type cannot be generated electronically using a single tone generator plus envelope shaping. It is necessary to use two tone generators plus a double balanced modulator (or ring modulator as it is more commonly called in electronic music applications) to produce the non-harmonically related output signals. A ring modulator has two inputs and a single output, and signals applied at either input do not appear at the output. What do appear at the output are the sum and difference frequencies. To take a simple example, if 200Hz and 800Hz sinewaves are applied to the inputs of a ring modulator, there are just two output frequencies; the 600Hz difference frequency (800Hz - 200Hz = 600Hz), and the 1000Hz sum frequency (800Hz + 200Hz = 1000Hz or 1kHz). In practice one or both of the inputs would be a tone having a large number of harmonics such as sawtooth or square wave, or some other fairly complex signal, so that the output signal would contain a vast number of frequencies — not just two frequencies which could be produced direct from the tone generators without using a ring modulator. Each harmonic of one input reacts with every harmonic at the second input of the modulator to produce sum and difference frequencies.

A ring modulator can be based on a voltage controlled attenuator using the arrangement shown in the block diagram of Figure 1. Some of the input signal is fed to a mixer via a gain control, and the rest of the input signal is fed to the mixer by way of a voltage controlled amplifier and an inverter. The balance control is adjusted so that the two inputs to the mixer are at precisely the same level, but due to the inclusion of the inverter stage they are out-of-phase. They thus cancel each other out exactly, and a signal applied to the input does not appear at the output. With a good quality voltage controlled amplifier the breakthrough from the control input to the output should be very small as well.

If a signal is applied to the control input, the signal balance at the mixer is lost except when the control signal passes through the quiescent control voltage, and this gives the required intermodulation of the two input signals and the sum and difference signals at the output.

Practical Circuits

There are a number of double balanced modulator integrated circuits available, and although these are mostly intended for use in communications equipment with high input frequencies, they can be used at audio frequencies with suitably modified component values. This mainly entails an increase in the value of input and output coupling capacitors so that efficient coupling is provided even at the lowest audio frequencies. One of the least expensive double balanced modulator devices is the MC1496 (or equivalent), and a simple ring modulator circuit which employs this device is shown in Figure 2.

This circuit has a simple tone generator built around IC1 which feeds one input of the ring modulator, and this has a frequency range of approximately 50Hz with VR1 at maximum value to 5kHz with it at minimum value. However, reducing the values of C3 and C4 (which should have the same value) gives an inversely proportional increase in the output frequency range, and increasing the values of these components similarly gives a reduction in the output frequency range. For example, changing C3 and C4 from 10nF to 100nF gives an output frequency range of about 5Hz to 500Hz.

The output waveform of the oscillator is a sinewave, but since diode waveshaping is used, a small amount of distortion is evident on the output signal.

Obviously it is not essential to use the built-in oscillator circuit, and any desired signal can be coupled to pin 10 of IC2, but the input signal level should only be about 50mV RMS if overloading is to be avoided.

The other input signal is applied to JK1, and needs to have an amplitude of a few hundred millivolts RMS with the maximum level prior to clipping being approximately 1 volt RMS. The voltage gain of IC2 is set by R13 and using the specified value and input signal to pin 10 the output signal level is comparable to that supplied to JK1. The MC1496 has differential outputs at pins 6 and 12, but in this application it is only necessary to use one of these outputs.

Balance control is set by RV2, and this is carefully adjusted to minimise breakthrough of the oscillator signal with no input applied to JK1. The fundamental oscillator frequency can be completely eliminated, but harmonics generated by IC2 will be left. Nevertheless, a high degree of suppression is achieved with the total noise output of the circuit being typically less than a millivolt, and this is more than adequate for any normal application of the circuit. The circuit requires dual 9 volt supplies, current consumption being only about 3 milliamps from each rail.

An alternative ring modulator circuit is shown in Figure 3, and this requires only a single 15 volt supply rail, but the circuit will work quite well from a supply potential of around 9 volts. The current consumption of the circuit is about 17 milliamps using a 15 volt supply, or about 12 milliamps using a 9 volt supply.

The oscillator section of the circuit is essentially the same as the one used in the earlier circuit, but R1, R2 and C3 are needed to effectively give a central 0V supply rail for the oscillator circuitry.

The ring modulator is based on the SG3402 integrated circuit, and this is designed to handle input signal levels of only about 50 millivolts peak to peak. R7 and R8 are therefore used to attenuate the oscillator signal to the appropriate level, and R9 plus R10 attenuate the signal at the other input of the ring modulator so that an input level of up to about 500 millivolts RMS can be handled without overloading. The overload margin can be further increased if necessary by making R9 higher in value. Tr1 is used as a low gain common emitter amplifier at the output of the circuit, and this simply restores the signal level to one comparable to the input level.

Balance control is provided by RV2, and this can be adjusted to give a very high degree of suppression so that there is no significant breakthrough of the oscillator signal at the output.

Mixer

Ring modulators can be used in a number of ways, and the circuits of Figures 2 and 3 can be used to process signals from practically any electronic

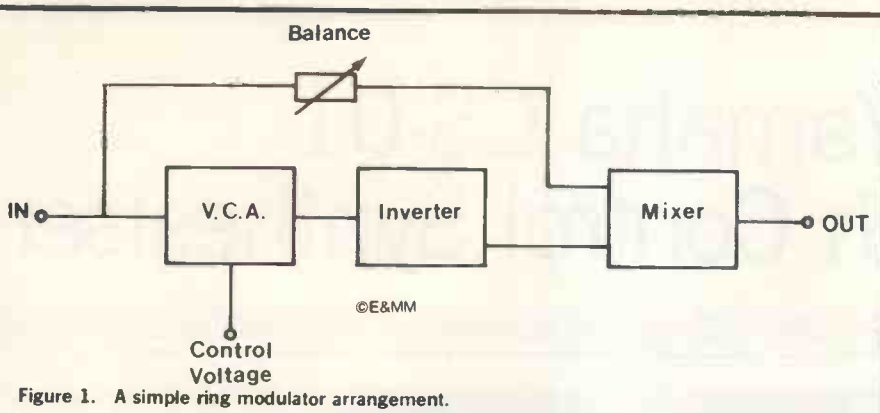


Figure 1. A simple ring modulator arrangement.

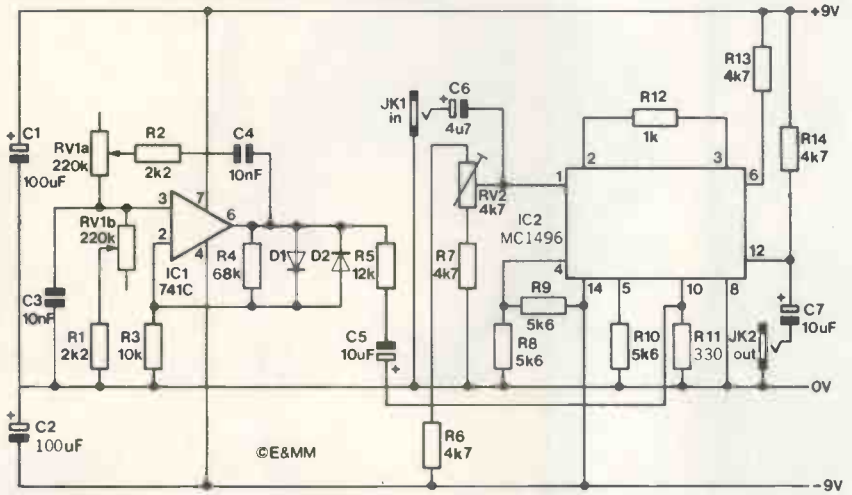


Figure 2. Sinewave generator and MC1496 based ring modulator.

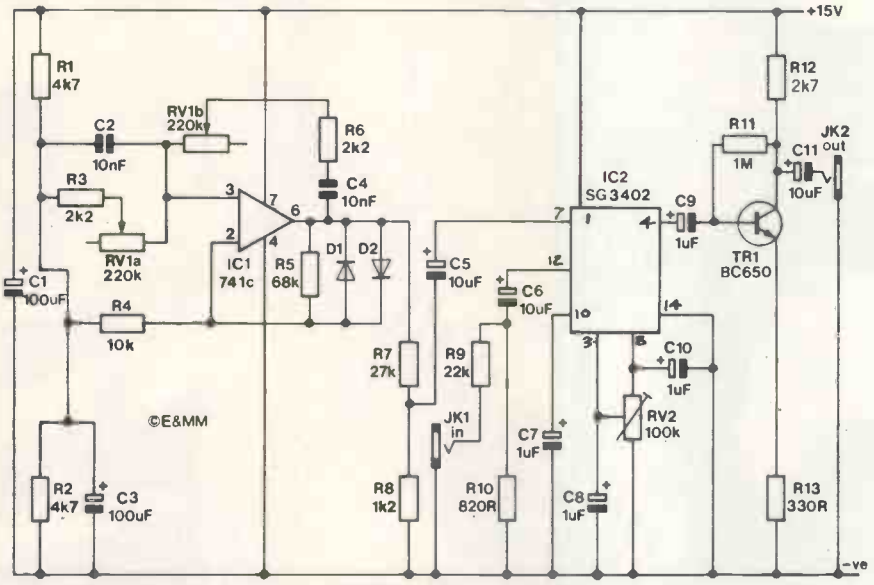


Figure 3. Sinewave generator and SG3402 based ring modulator.

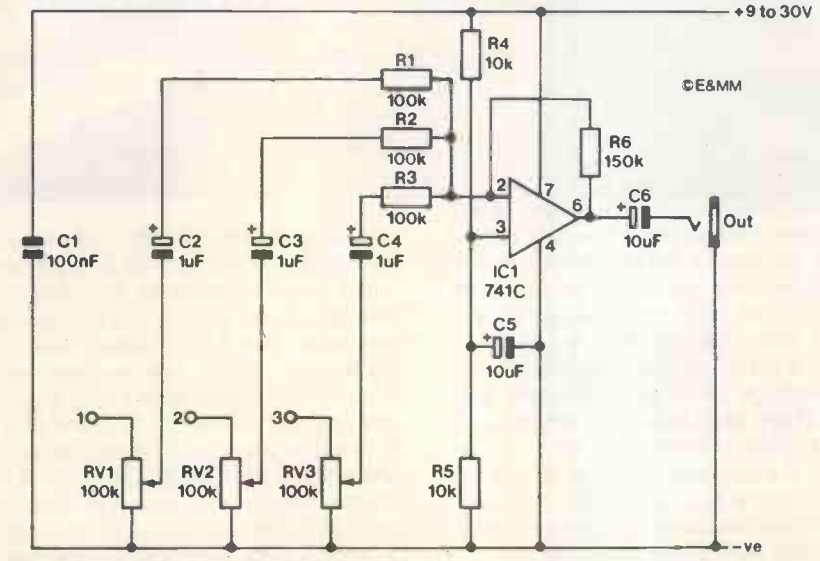


Figure 4. Suggested three channel mixer.

instrument, or even a voice signal. However, the effect obtained is a very extreme one, bearing in mind that input signal only appears at the output at an insignificant level, and that the new frequencies will not (except by chance) be harmonically related to the input frequencies. Therefore, when using a ring modulator and tone generator to process the output of an instrument, it is normally necessary to mix a certain amount of processed signal with the unprocessed one. Figure 4 shows the circuit diagram of a simple and quite conventional mixer circuit which can be used to do this. There are three inputs available so that it is in fact possible to mix both input signals and the output signal in any desired proportions.

Ring modulation can be used in the production of bell-like sounds, and this is achieved using two reasonably pure tones as the input signals to the ring modulator. The two tones are adjusted to slightly different frequencies to give a beat note of a few Hertz (the difference frequency), plus the main bell tone which will of course be at double the pitch of the input tones (the sum frequency). Harmonics of the input tones will react with one another to give a richer more realistic sound, but in order to obtain a really good effect it is necessary to have proper envelope shaping. Bell type tones can also be produced using two oscillators some musical interval apart, but they should be slightly off-tune in order to give a realistic metallic 'clanging' sound.

By using a tone generator and a white noise source as the input signals to a ring modulator, it is possible to obtain a sort of filtered noise, with a high frequency tone tending to give a high pitched noise output. This can be used in the generation of cymbal type sounds, and gives better results than using direct white noise.

Another interesting use of a ring modulator is as a frequency doubler, and in this application it is merely necessary to feed the same signal to both inputs of the modulator, provided the input is sinusoidal. The difference signal is obviously zero, and the sum signal gives the required frequency doubling. By mixing the input signal and the output signal (or by simply unbalancing the ring modulator slightly), a tone having a strong second harmonic can be produced. Note that processing a complex signal using this frequency doubling technique also results in strong intermodulation, and not just the frequency doubling. **E&MM**

SPECIAL FEATURE

The Yamaha CS-01 Breath Control Synthesiser

Running through it as a synth then, what have we got? There's the tuning pitch control, with octave selection of 4', 8', 16', 32' and, quite surprisingly, the white noise. Waveforms are sinewave, sawtooth, squarewave, pulse and pulse width modulation with a separate pulse width speed (which is nothing to do with the LFO).

That's quite a good idea.

Yes, it makes it entirely independent; and there's glissando, which is a discrete semitone slide from one note to the next.

So there's no depth to the PWM?

That's right. You hear it or you don't.

And no traditional portamento?

No. Moving on to the VCF section you've got the usual Frequency Cut Off, Resonance (with high and low positions — it's not a fader). I think this is something to do with the internal circuitry.

Then, of course, there's an EG depth for the filter. The amplifier also has its own EG depth and at the right of the controls is the EG with ADSR slide faders. There's LFO speed, marked from slow to fast. Incidentally, all these controls are on vertical faders which slide smoothly or over notched switch positions.

Okay, LFO speed and the modulation section is up here on the left. Modulation is done on a wheel — a moulette — but a nice fat one.

It's not centered in any way?

No, it's off or on increasingly and you can use it on VCF or VCO as normal. But modulation is very shallow, extremely shallow. This again, I believe, is due to the nature of the instrument. The pitch bend is sprung.

It's quite a strong spring — do you find any problem with it?

None at all. By the position both wheels are in, you can see from the way I'm holding the synth that they lie in a very natural position for the left hand. With hardly any movement — you just *think* pitch bend and there it is!

The little section beneath the wheels is for the breath controller — we'll come to that shortly.

So if I just set up an open envelope, an organ one, put the filter about halfway, you can hear the oscillator in its various pitches and waveforms. By the way, the triangle can easily be filtered to sound like a sinewave and the sawtooth has a really bright, brassy feel to it.

There seem to be some click noises breaking through when you make a note?

All the switches will make a noise if you move them when you're depressing a note. As long as you switch in between a phrase, they won't. It's actually not switch noise, but the change in the circuit when the amplifier is open.

Dave Bristow demonstrating the Yamaha CS-01.

You'll also find that the instrument can produce very tight envelopes and these sharp percussive sounds are part of the sophisticated circuitry — although the beginner may not be used to them. I think the waveforms are very good to use because of their richness, especially with pulse modulation.

I'll now move on to performing with the instrument, which I like to play standing up. The CS-01 is most easily used battery-powered on stage, although an AC to 9/12V DC adapter is available. An LED flashes when the battery is getting low — then you've about three hours left as long as you're not using the internal speaker. Once a line out jack to your amp is inserted, the 2W speaker is cut out. There's an 8 ohm mono headphone output at the lower end with the DC and line out socket (-16dB, 10k) and at the upper end a socket for the breath controller.

RECORDED ON E&MM CASSETTE

E&MM keyboard consultant Dave Bristow demonstrates and talks in depth about this new concept instrument for keyboard players.

I must admit I'm so taken with the breath device on this, I've never used the CS-01 without it! One of the reasons that I enjoy using the breath control is that it saves mucking about with all these controls. It does away with seven controls and you're left, in fact, with switches. All you need to alter when you've got the breath controller in is the octave switch, the waveform switch and resonance switch — that's all. Everything else (you'll maybe set the PWM speed occasionally) such as glissando and LFO speed usually remain the same. You certainly don't need to change the EG envelope and depth or the frequency cut off. You're really just using those few switches, which makes the breath control amazingly useful — it really is.

How do you get on with the small keys?

Fine, you soon get used to it. The first little surprise I had using the small keys was when I had my right hand on the CS-01 keys and my left on another keyboard. Automatically I found myself playing 'genuine' octaves — but that came out as 10ths on this one!

The fact that it is monophonic must help.

Yes, it's very easy and very nicely sprung — and certainly not a 'toy' keyboard. It's slightly better than the CS keyboards, it doesn't clack around and the springs are tighter.

Some of the settings turn it into a great bass synth as well as a lead instrument. We agree that the CS-01 is not the first to utilise breath control. There's the Variophon . . .

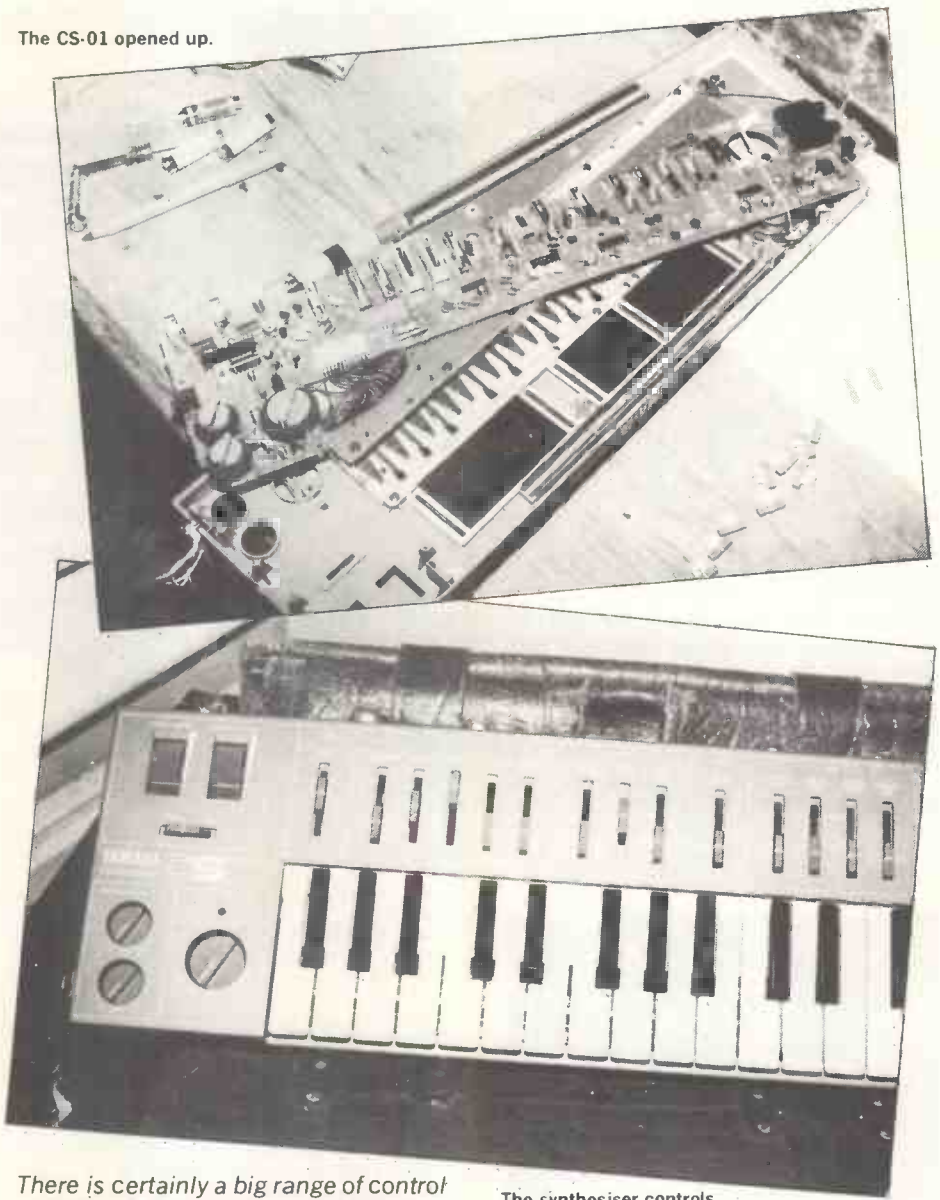
That's right, and the Lyricon, and the Steiner which was designed around a trumpet format with a breath sensitive device going through a filter and a valve trumpet pitch action. There's also a separate device where you put a tube in your mouth which could be linked to any keyboard — as long as the synth generated a good sawtooth wave. This was fed into the filter that was controlled by your breath.

The Breath Control Unit here links to the synth via a stereo jack lead. In the unit is quite a bit of circuitry and a GS-2 velocity contact (see photo).

Let's try it out. First, I'll take out the EG depth controls, and the ADSR controls, and the frequency cut off. All those functions are controlled from the mouthpiece. In the breath control sections I'll open up the VCA completely and adjust the degree of effect that my blowing has on the VCF.

As I play, the last note is remembered while I trigger a sound from the breath controller by blowing.

The CS-01 opened up.



The synthesiser controls.

There is certainly a big range of control available, but why does the mouthpiece always 'buzz' slightly while you blow it?

The buzzing noise is my breath escaping — the air has to go somewhere as does the water, which can end up running down your chest and if you're not careful it runs into the keys of the synth!

What happened to your breath controller lead?

It began to break where the rubber stop is — but remember I've carted this particular one in my briefcase unpackaged all over Europe! I haven't really looked after it very well either.

Another important thing is the way the volume can go so quiet while you're blowing gently.

You'd be hard pushed to get the same dynamic range from a keyboard sensitivity control.

Some unusual effects can also be generated — if I hum, for example, I can get an extraordinary 'ring-modulated' type of sound. Flutter tongueing gives a deep rumbling effect. Guitar sounds, too, are effective — I use 8 foot pitch with PWM, some resonance and overdrive the line out signal into the mixer.

[At this point I became convinced we'd have to put this incredible sound on an E&MM Demo Cassette, because many Rock fans might wonder what they're listening to.]

To get the fast triggering, my trombone playing comes in useful — I go 'tucatucatuca . . .' with my tongue against the roof of my mouth.

Do you buzz pitches into the mouthpiece?

The Yamaha CS-01 Breath Control Synthesiser

Not really — I do buzz, but then the pitch bend takes over.

It must be really satisfying playing to the audience because you can physically bend with the notes like a guitarist would do.

Another point. Playing softly can sound clean, whilst blowing harder brings in the 'overdrive'!

Do you have to blow quite hard?

To get to the top of the voltage control you do — there's a little adjusting screw for setting the breath control just off. I've told people it is a very natural thing to blow as you play, it isn't a problem. The only thing which you might not be able to do at first, especially if you've not blown any kind of wind instrument before, is the fast tongueing.

Also, even if you don't want to strut around with it around your neck, you can put the instrument on top of another keyboard (but make sure you don't pull it off — it's so light) and simply create one note effects without touching the keys — the audience just doesn't know where all the sounds are coming from! What I love is the screaming effects which you can get — just like the guitar players. And I like the fact that it does not pretend to be a guitar, like the Liberator.

Using the Breath Control Unit.

Close-up of the circuitry and velocity sensor.

It's visually attractive, although people are sometimes put off by having something in their mouth.

Not for me, because I've played trombone, sax and flute. I'd feel different about it if it was just a little turning on and off device.

What's the reaction when you play it on gigs?

I tried it at the Music Trade Fair at the NEC. It was a jazz gig and I had the instrument slung round my neck while I played the GS-2. In that situation I found I could still get a lot of expression using just the right hand on the keyboard and no modulation wheels.

My ideal set-up for me would be this and the GS-1!

Surprisingly, the synth's single oscillator is never apparent simply because of the controller.

And it's likely to bring about quite a change in the keyboard player's role on stage — no longer is he relegated to the back line. Instead he's likely to end up sweating away out front for the first time as he blows his heart out on solos!

E&MM

Recommended retail prices: CS-01 £189.00
BC1 Breath Control Unit £19.00
PA-1 AC Adapter £12.00
Yamaha instruments are distributed in the U.K. by Kemble-Yamaha, Mount Avenue, Bletchley, Milton Keynes MK1 1JE, Bucks. Tel: 0908 71771.

CS-01 Specifications

32 keys F2-C5 (high note priority)
VCO 4'/8'/16'/32'/Noise
Waveforms: Triangle/Sawtooth/Square/Pulse
PWM speed 0.2Hz-10Hz
VCF Cut off Freq, Resonance High/Low, EG Depth
VCA EG Depth
EG Attack (2 secs), Decay (4 secs), Sustain, Release (6 secs) max. times.
LFO speed 0.2Hz-30Hz
Effects: Glissando, Pitch Bend ± 1 semitone, Modulation wheel (VCO/VCF)
Breath Control (VCF/VCA)
Volume out
Dimensions: 48.9 x 3.6 x 16cm (W x H x D)
Weight: 1.5kg
Optional extras: PA-1 AC Adaptor, SC-01 Soft Case, BC1 Breath Control Unit.

She thinks it's a game. You know it's a music lesson.

Any teacher will tell you that when it comes to music lessons, children can be a real handful. Yet it's true that people who never bothered to learn an instrument often wished they had – by then it's too late!

But now Yamaha's own little handfuls, the HS-200 and HS-500, are finding their way into little (and not so little) hands.

These 25-note portable keyboards have a selection of five different instrumental sounds (organ, clarinet, violin, piano and harpsichord) with sustain.

Not only that; on the HS-500 you can test your ability on five musical games, incorporating the use of single notes, chords and melodies. With beginner, intermediate and advanced levels, the more you play the HS-500, the more you win (and the more you learn).

Both keyboards can be mains or battery-operated and can be connected to a home stereo system.

The Yamaha Handysounds weigh in at 1lb or less, and are so compact that they'll fit in your coat pocket. With price-tags of £39.95 for the HS-200 and £59.95 for the HS-500, they won't burn a hole in it either.

A handful of Fun.

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Please rush me a free colour brochure on Yamaha's amazing Handysound keyboards and the Name and address of my nearest stockist.

Name: _____

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A HISTORY OF ELECTRONIC MUSIC

Part 7

Brian Eno was born in Woodbridge, Suffolk, on 15th May 1948. His influence on contemporary rock music has been enormous and often underestimated.

He attended Ipswich Art School for two years and Winchester Art School for three years. During his time at Ipswich he became interested in tape recorders and their potential as musical devices. Also during this period he began studying phonetics and cybernetics.

In 1967 together with a group of shifting membership called Merchant Taylor's Simultaneous Cabinet he performed works by Christian Wolff, Tom Philips and George Brecht. He also helped form the first rock group he was to be involved in with 'Maxwell Demon'.

Moving to London in 1969 he began working with friends (mostly ex-art students) who had an interest in the future of contemporary culture. Eventually joining the Scratch Orchestra formed in 1968 by Cornelius Cardew (b. 1936) he began a career which was to elevate the position of the 'non musician' in rock. John Cage had already suggested "that everyone might be a musician, everyone a composer". Brian Eno was to make this notion more general, and socially significant.

In January 1971 he joined Roxy Music, whose contribution to electronic music has already been mentioned (E&MM June 1982). He recorded two albums with Roxy before leaving in July 1973. That year heralded the release of 'No Pussyfooting',[1] a collaboration with Robert Fripp who had been left high and dry by the then recent disintegration of King Crimson III.

The album featured Eno's hypnotic synthesiser tones and Fripp's heavily treated guitar. Eno had introduced Fripp to a system of recording which used two Revoxes to form a signal loop and layer sounds. This process had been used by Terry Riley and certain other avant-garde performers. It was to be further exploited by Fripp and accordingly labelled 'Frippertronics'.

'No Pussyfooting' and 'Discreet Music'[2] are masterly examples of rock avant-gardism. Whilst not really 'rock' in any but the loosest terms they were produced by a rock sensibility and aimed at a rock audience. Eno had undoubtedly been influenced by much of his early dabblings with the avant-garde, particularly the quiescent, dappled, textural shiftings that arose from American composer La Monte Young's music. Eno produced an environmental or ambient 'Musak', much of it quiet, gentle and rather unusual in the world of 'rock music'.

Robert Fripp's continuing involvement with Frippertronics fall into two categories, applied and pure.

Applied Frippertronics is used as an alternative to traditional arrangements or orchestration and was first used on record for Daryl Hall's 'Sacred Songs' album released in 1977. Pure Frippertronics is where

King Crimson.

Frippertronics are used alone, and this again falls into two categories: ambient, much like Brian Eno's work often as ignorable as listenable, and imperative Frippertronics, where the music demands attention to validate its procession.

Robert Fripps conception of Frippertronics is interesting as it is a fairly isolated attempt to provide human contact in the performance place. Fripp left King Crimson for a number of reasons, one being the largely decreasing possibility of any real contact between audience and performers. Frippertronics counters this by limiting the audience to between 10 and 250, also enabling a feedback to develop between Fripp and his listeners.

By 1975 Brian Eno had started his own label, 'Obscure Records', introducing the rock world to the music of (amongst others), Christopher Hobbs, Gavin Bryars, Michael Nyman and members of the Scratch Orchestra. Eno also produced albums for Portsmouth Sinfonia and Simon Jeffes Penguin Cafe Orchestra.

Apart from his ambient music series of albums, Eno recorded several, more conventional rock albums. The first being entitled 'Here come the Warm Jets'.[3] The album featured various members of Roxy Music and King Crimson, including Phil Manzanera, Andy Mackay and Robert Fripp.

It reveals a fascination with the relationship between lead and backing, as well as an unusual use of melody. The electronically treated guitars of Fripp and Manzanera are devastating and they are countered by Eno's mesmerising vocal style, producing a totally original vehicle for Eno's surreal unsentimental irony.

'Here come the Warm Jets' was followed by 1975 by 'Another Green World'.[4] By then Eno had become aware of setting each piece within its own particular landscape and allowing the mood of that landscape to determine the activity that could occur within. Taking advantage of the fact that he

Brian Eno.

could create his own psycho-acoustic space by the use of echo, delay etc., he became interested in exaggerating and inventing rather than replicating space and in particular the various techniques of time distortion. These techniques culminated in his latest record Ambient 4/'On Land' (see review).

Eno's methods of putting songs together were also novel, as long as you began with a swinging, driving rhythm, you could put all manner of weird sounding, electronic topping afterwards, e.g. 'The Paw Paw Negro Blow Torch' on 'Here come the Warm Jets'. The pieces on 'Another Green World' had been based on tentative, playful rhythms, and 'Before and After Science'[5] which was to follow played with soundscapes rather than dance tunes. It paved the way for his collaboration with David Bowie on 'Low' and introduced Roedelius and Moebius A.K.A. 'Cluster' with whom he was later to record several albums.

Eno's work with Bowie comprised the 'Berlin Trilogy' of albums. 'Low' [6]the first of these collaborations featured 'Warsawa' with its wash of synthesised chords and strange

Derek Pierce

Brian Eno's influence on contemporary electronic rock music plus his collaboration with Robert Fripp and Frippertronics.

Robert Fripp giving the first European Frippertronics performance at Notting Hill Gate, London, on April 25th 1979.

vocal chants, and 'Weeping Wall' with its Terry Riley/Steve Reich marimba patterns and synthesised melody. Proving once again Bowie's ability to absorb influences from outside 'rock' music and popularise them. The feel of much of side two of this album was undoubtedly 'electronic and experimental' in nature. The 'Heroes' [7] album which followed was the more successful of the two, showing as it did Bowie's new found formal accuracy, and emotional directness. The trilogy's climatic LP 'Lodger' assimilated all of the Eno influenced strategies into a supple, fluid style.

Following his work with Bowie, Eno released 'Music for Films'.[8] It was comparable with instrumental pieces of his 'Another Green World' album and the instrumental collaborations of 'Low' and 'Heroes'. It stands between his songs and his experimental work (such as 'Discreet Music') and suggests each of them. It is interesting for its use of the facilities and freedoms offered by the contemporary recording studio, without lapsing into the quirky gimmickry that normally characterises this pursuit. It sought to make a happier liaison between electronic and natural instruments than is often achieved and in this it succeeded admirably, being amongst his finest work to date.

Eno's contribution to electronic music was the inevitable result of an awareness of the structuralist principles of composers like Young, Reich and Glass. It should be remembered how Brian Eno became something of a guru to the new breed of synthesiser bands. The Human League, for example, were inspired by his use of electronics and glamorous appearance in the early days of Roxy Music. His production work has had a marked effect on the popularity of the bands involved and for Eno's name to be associated with a band or performer ensured larger sales and widespread interest. He has produced or co-produced records for John Cale, Ultravox, Robert Wyatt, Nico and Phil Manzanera. (See Discography).

Eno has recently moved away from the use of synthesiser and has developed an interest in the use of found sound, tribal rhythms and African music. An album released in October 1980, 'My Life in the Bush of Ghosts', featured the use of 'found' voices from either radio or records woven into the music. Although not a new concept, it was considered unique in rock music and as such found much critical acclaim.

Parallels can be drawn between Eno's work and that of the German band Tangerine Dream. Their leader, Edgar Froese, drew his inspiration from the works of Hungarian composer Gyorgy Ligetti and the electronic music of Karlheinz Stockhausen and Yannis Xenakis. Although often less interesting, the results are surprisingly similar to Eno's ambient music, being impressionistic and full of subtle electronic colour. Next month we will look at the German electronic music of Tangerine Dream, Cluster and Giogio Moroder amongst others.

AMBIENT 4, ON LAND

The term landscape or more appropriately 'soundscape' is often used in music to indicate a setting or back-drop for something else to happen in front of. In 'On Land' however, everything that happens is part of the landscape. There is no longer a distinction between foreground and background.

The album is said to have been inspired by, amongst other things, Fellini's 'Amarcord' (I remember), a presumably unfaithful reconstruction of childhood memories. The record is in some ways an aural counterpart to it.

The pieces on the record take the listener to various places visited, if only in imagination by Eno. Lantern Marsh, for instance was only a few miles from where Eno grew up in East Anglia. His experience of it is derived from imagining where and what it might be like although he almost certainly visited it as a child.

The sonic elements in these pieces arose by listening to the world in a 'musical' way. The resulting record is somewhat like opening a window on the world listening with a powerful 'stethoscope' and at the same time having a record on very quietly in the room.

The synthesiser is used very sparingly on this album as Eno has found it "of rather limited usefulness". The instrumentation is often accoustic in nature, and sometimes he also uses non-instruments; for example, sticks, stones and pieces of chain. He has altered the sounds of rooks, frogs and insects within the mix.

Eno is quoted as saying that anything which was recorded on the tape must appear on the final mix (allowing himself the freedom to mutate or reduce it but not to destroy it) and that any piece of music that he worked on, if finally rejected, should be fed into another piece. Somewhat like a compost heap, turning waste into nourishment.

The result is I feel nourishing and worthwhile. Having said that it would not nourish a 'heavy rock' fan for very long and is of limited appeal. Those of you familiar with Eno's other ambient works will undoubtedly find this particular recording very pleasureable.

For those of you who wish to sample the delights of Eno's ambient music I suggest you start with 'On Land/Ambient 4'. EGED 20.

Selected Discography

SOLO ALBUMS

[3]Here Come The Warm Jets. Polydor 2302 063
Taking Tiger Mountain (by Strategy). Polydor 2302 068
[4]Another Green World. Polydor 2302 069
[5]Before And After Science. Polydor 2302 071
[2]Discreet Music. Obscure OBS 3
[8]Music For Films. Polydor 2310 623

COLLABORATIONS

[1]No Pussyfooting (with Robert Fripp)
Evening Star (with Robert Fripp)
Roxy Music (with Roxy Music)
For Your Pleasure (with Roxy Music)
June 1 1974 (with Kevin Ayers, John Cale and Nico)
801 Live (with Phil Manzanera and others)
[6]Low (with David Bowie)
[7]Heroes (with David Bowie)

PRODUCTIONS AND CO-PRODUCTIONS

The Obscure series of albums
Fear (John Cale)
Lucky Lief and the Longships (Robert Calvert)
Ultravox! (Ultravox!)
Portsmouth Sinfonia (Portsmouth Sinfonia)
Hallelujah! (Portsmouth Sinfonia)
More Songs About Buildings And Food (Talking Heads)
Are We Not Men (Devo)
Ambient Musics 1-4.

Stingray Electro-Acoustic

The new Stingray Electro Acoustic combo from Carlsbro presented a problem at first. It is a lead combo or a bass combo? Certainly the amp looked like it had been designed with lead work in mind, and the accompanying press blurb described the unit as suitable for acoustic and electro-acoustic guitars. Couple this with the name and the answer seems obvious. But the cabinet, with its 15" speaker and overtones of previous Carlsbro bass cabinets seemed to tell another story.

The answer is that the Stingray is neither a straight lead nor a straight bass combo — it is a hybrid creature that combines elements of both. Carlsbro have gone in for successful cross-breeding here and have combined their standard lead top with their Pro-Bass Combo speaker cabinet, resulting in an extremely versatile unit that operates well over a wide frequency range.

The unit is in classic Carlsbro black with moulded black plastic corner pieces. The older style metal corner pieces always inspire more confidence, but these plastic ones are quite rugged and an added plus is that scratches don't show up as much as they do on chrome plated corners. Four castors are fitted and I am pleased to say that the back two are fitted with brakes. There is nothing worse than seeing your Combo rolling slowly towards the edge of the stage at a gig!

Castors really are necessary on this unit — it is extremely heavy. And this brings me to the handle; there is only one, fitted centre top, and this is made of ridged black plastic. It hardly looks capable of lifting the weight of the unit many times before breaking, but Carlsbro assure me that the handle has been thoroughly tested with weights five times that of the Electro-Acoustic. Psychologically, though, a stronger looking handle would inspire much more confidence.

Recessed side handles are essential on this combo. It needs two people to carry it without the severe risk of a double hernia and their absence is a mystery. When I pointed this out to Carlsbro, they said that this would be rectified in the near future — so recessed handles may well be appearing shortly on this model.

As I have already mentioned, the cabinet is a direct steal from the Carlsbro Pro-Bass combo, but with the addition of two high-frequency bullet radiator horns situated top left and right. The speaker remains the same — a 150 watt 15", 4 ohm RCF. This is a Rolls-Royce, or at least a Bentley, amongst speakers and its presence here, alongside the horns, provides for stunning frequency range and effects — but more of this later.

The speaker grill is another source of complaint, however. It looks fairly rugged, but with a bit of poking it soon becomes clear that this is the flimsiest of covers and its function can only be described as more cosmetic than practical.

Now to the amplifier. The back panel contains the mains switch, fuse (2AT), two output sockets, preamp out socket and two slave sockets. Maximum power output on this amp is 150 watts when the combined impedance of all speakers used is 4 ohms. The RCF is 4 ohms so it follows that if any additional speakers are linked up, power output will drop.

The preamp and power output sections of the amplifiers may be isolated by inserting a jack lead into the preamplifier socket on the rear panel. This prevents the signal from reaching the power amplifier and provides a low level output which is fully controlled by the tone and effects circuits. This signal may be fed into any suitable signal processing unit such as a mixer unit. The output from the mixer unit can then be fed back into the power amplifier by means of a jack lead inserted into either of the two slave sockets which are also situated on the rear panel.

The circuitry is in two sections: the preamp and control circuits are mounted on to the front panel by the pots while the transformer, smoothing capacitors and power amplifier are mounted to the back panel. The input preamp, tone filters and reverb amplifiers are built around quad, low-noise operational amplifiers.

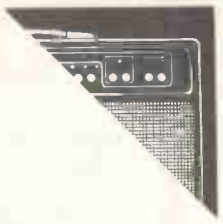
The hefty transformer, smoothing capacitors and bridge rectifier supply the rails to the power-amp board which is mounted over the power transistors. All interconnections are well made with wiring tied together in a loom.

The only complaint concerns the mains switch which is a flick switch with a plastic toggle. Either a metal toggle or rocker switch would be more suitable and prevent the chance of the toggle leaving the switch during manhandling!

Overall the quality of construction is high throughout with the components, resist-coated PCBs and few interconnections inspiring confidence and ensuring reliable, quiet operation.

The front panel is very impressive and has two channels, each having two high impedance inputs of high and low sensitivity.

Of the two channels, the first is the most interesting. The controls for this channel are 'Gain', 'Low', 'Parametric Frequency', 'Parametric Gain', 'Hi', 'Suzz Sustain'. A 'Bright' switch is also provided and gives you extra brilliance



and attack to the sound. The 'Gain' control enables you to match your instrument to the amplifier input. Also, by turning the 'Gain' up and the 'Vol' control down, overload distortion can be obtained giving a dirty, overdriven sound. Being brought up on Marshall valve amps, I am still not convinced by solid circuitry 'overdrive' but this effect really is quite good. 'Lo' and 'Hi' controls work in the conventional manner. In addition to these controls, channel 1 features a Parametric Equaliser. Any frequency between 75Hz and 1kHz can be selected by the control marked 'Freq'. This can then be cut or boosted by the control marked 'Gain'. In effect, the parametric section operates like a powerful graphic equaliser. 'Suzz is obtained by adjusting the 'Sustain' control for the length of sustain, and the 'Gain control for the volume of the suzz. The 'Sustain' control also functions as an on/off switch for the suzz effect.

All in all, this channel offers comprehensive and versatile facilities. For example, set 'Gain' on low, 'Parametric Frequency' in centre position, and 'Parametric Gain' on full, both 'Suzz' controls on full, 'Lo' on medium and 'Hi' on full and a very long, smooth sustain sound is obtained. A bit more knob twiddling and you can get a bright, hard, clear sound, a growling bass with bright treble or a stringy treble that will transform a Les Paul into a fair imitation of a Strat. Some more knob twiddling can even transform a Strat into a fair imitation of a bass!

Channel 2 is a simple extra with 'Gain', 'Lo' and 'Hi' controls as in channel 1, but without the Bright switch and the Parametric or Suzz features. This simplicity of the second channel doesn't really matter because with the extra facilities on the first channel it is unlikely that anyone would use it anyway except for amplifying a second instrument or vocals in a small rehearsal situation.

Other controls on the front panel are Volume and Reverberation. Reverberation is available for both channels and is selected by pressing either of the two push buttons situated beside the 'Rev' control. Adjustment of the 'Rev' control varies depth and the unit itself is of the usual spring line type. The suzz and reverberation effects can be switched on and off using the double foot switch which is provided with the amplifier and its ¼" jack plug plugs into the 'F/S' socket on the front panel.

As I have already indicated, the sounds available from the Stingray Electro-Acoustic are quite remarkable and its combination of bass cabinet, horns and lead top add to this dexterity. For the home studio musician who plays a number of instruments this combo is an excellent all-rounder. It's great for guitar work, excellent for keyboards because of its wide frequency range and it also doubles as a bass guitar unit offering an impressive range of bass effects.

Standard bass sounds are easily available and the lead top allows the exploration of a number of high register bass effects. It is easy to change, for example, from classic jazz/bass sounds to a solid bass with a hard 'click' on the higher notes. And if you like Rickenbacker bass effects, they can also be imitated using this unit.

But perhaps the musician who will be most impressed by the Stingray Electro-Acoustic is the amplified acoustic guitar player — after all the combo is named after him. Finger picking styles become a treat to hear: the thumb picked bass notes are warmly relayed and higher register finger picked notes are punched out through the horns with sparkling clarity. This is probably the best combo for the electro-acoustic guitar player presently available in the U.K. market.

The price of the Stingray Electro-Acoustic is £458.10, which is quite reasonable when you consider that the Stingray Pro Bass retails at £490.18 and the Stingray Lead combo retails at £388. (All these prices include VAT.)

At a price midway between the two, Carlsbro have produced a unit that, arguably, combines the best of both.

Alan Hardman **E&MM**

The Stingray Electro-Acoustic is distributed in the UK by Carlsbro Sales Ltd., Cross Drive, Lowmoor Road Industrial Estate, Kirkby-in-Ashfield, Nottinghamshire. Tel: Mansfield 753902.

Specifications:

Amplifier:

Channel 1

Controls
- Gain, Bright switch, Lo, Parametric Frequency and Gain, Hi, Suzz Gain and Sustain, Rev, Vol.

Input Sensitivity
- 5mV-16mV with tone controls in centre position.

Input Overload
- 1.6V on both Hi and Lo inputs.

Bright Switch
- +10 dB boost at 5kHz

Parametric Frequency
- Variable from 75Hz to 1kHz

Parametric Gain
- +20 dB variation at selected frequency.

Hi 35dB variation at 6.5kHz

Lo 25dB variation at 50Hz

Channel 2

Controls
- Gain, Lo, Hi (same specification as Channel 1).

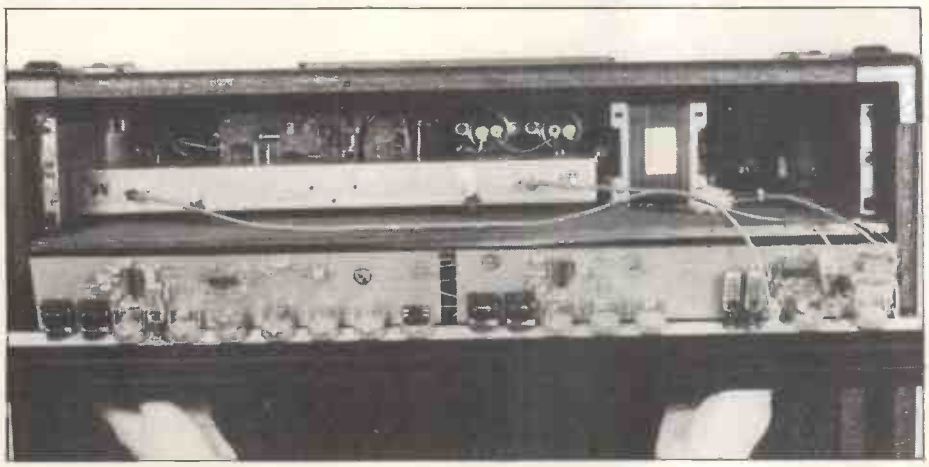
Input sensitivity and input overload are the same for both channels.

Rev
- Varies depth of reverberation. Reverberation selected for each channel by push button selector. Reverberation unit is of the spring line type.

Footswitch
- Rev and Suzz can be switched on or off by footswitch.

Speaker
- 150 watt, 15", 4 ohm RCF.

Horns
- Two high frequency bullet radiator horn units.



Internal shot of the lead top.

STUDIO SOUND TECHNIQUES

Equalisation is used extensively in modern sound recording to accentuate or attenuate various frequencies in order to embellish the sound in some way. Often it is necessary to compare instruments to be mixed to ensure that they blend well, with no unpleasant overtones. Depending on the effect one wants it is possible either to make things sound quite separate or roughly similar. I'll be giving actual figures for you to try on different instruments later on in the series.

Since all sounds are composed of fundamental and harmonic or other frequencies, it is the ratio between these that we are most concerned with. Equalisation (EQ) gives us a degree of control over what is considered to be desirable or otherwise. Because our aural system makes an evaluation on a relative basis, it is important to be able to compare the equalised sound with the straight (unequalised) sound so that a judgment may be on the merits of the proposed EQ. Bear in mind that, when adding an amount of boost at a certain frequency, the overall level will go up. Apart from possibly causing unwanted peaks there is the chance that because it sounds louder it is thought to sound better. To make a like for like comparison adjust the level of the equalised signal to be the same as the straight sound so that a proper evaluation may be made. In practice most equalisers have in/out switches which should be noiseless in operation. This latter point is sometimes overlooked so do check when buying. Often, only a short section of one track requires EQ, or a change of EQ, so noiseless switches and controls are a must.

There are many types of EQ systems available. One popular type (particularly on hi-fi these days) is the ***graphic,*** so called because it has a strong correlation between frequency response and the control settings. Although these are good for gaining an appreciation of frequency response curves they are clumsy if rapid, drastic changes are called for. This is often required when one track has several different instruments or effects alternating between verse, chorus and bridge with maybe only a beat or two in between each section.

Probably the most common EQ system consists of frequency selector switches,

boost/cut controls and an in/out switch. In addition there may be high and low fixed frequency boost and cut from treble and bass controls and high and low pass filters. As the name 'filter' suggests it is often desirable to get rid of parts of the sound which are felt to be cluttering the overall picture. The problem with any fixed frequency system is that invariably a compromise is reached where you trade off the part you want for the part to be rejected.

The most versatile system from a sound engineering point of view then is commonly called ***Parametric*** EQ. The main feature of this system is the ability to tune in precisely to the frequency bandwidth one wishes to adjust. The best systems are provided with: a *frequency* control over less than two decades in one sweep, a *bandwidth* control which should vary the area covered either side of the selected centre frequency, a *boost/cut* control with at least ±15 dB variation, an in/out switch on each of these sections and a level adjust control to compensate for the gain or loss overall.

If your console doesn't have parametric EQ, don't despair. There are many companies offering these as both 19" rack mounting units or in a small modular format. Prices and specifications vary a lot, so shop around before committing yourself.

Console Maintenance

There is probably nothing worse for an electro-musician than a noisy control or switch. The causes and cures are many and varied. If you have purchased a second-hand mixing console the chances are it will need some sort of overhaul immediately after installation. Even electronic components are subject to degraded performance through ageing. Capacitors and transistors go leaky and/or noisy and these have to be 'weeded out' as soon as possible.

Fault Finding

First try to isolate the faulty amplifier stage by observing which combination of switches and controls allow the noise through to the output. Refer back to Figure 3 given in part two and let's assume we have a noisy channel fader buffer amplifier. It follows from the diagram that nothing ahead of the channel fader is going to affect this noise, but that the pan pot and post-echo-outputs would be noisy. The channel fader might affect the noise output depending on the design of the amplifier and the nature of the fault. In some cases closing the fader may make it worse. Finding the defective

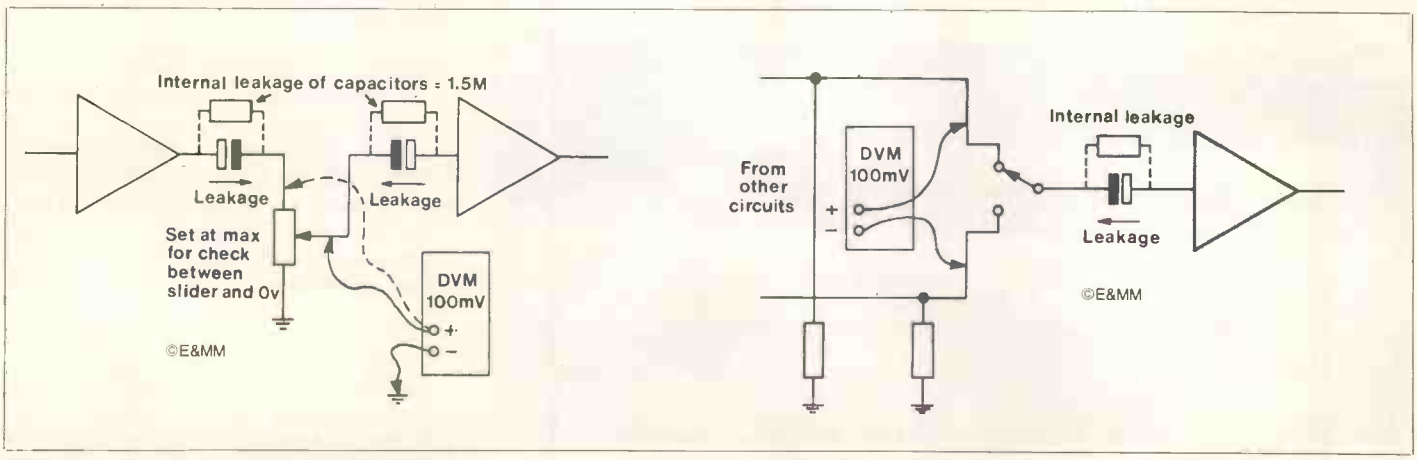


Figure 5a. Checking for leakage currents causing pot noise.

Figure 5b. Checking for leakage currents causing switch noise.

Part 3
by P. A. Becque

component is largely a question of familiarity with the design and experience. However, a 0.22uF capacitor earthed at one end can be useful. By probing around the circuit with the unearthed end it is possible to decouple the noise which may help you find the defective component. The capacitor will introduce a transient current as it charges so care is necessary when using this technique.

Potentiometers and Switches

The most common cause of noise in potentiometers (pots) and rotary switches is dirt and dust. This is often easily remedied by spraying with contact cleaner. Be sure to use a spray that evaporates completely without leaving an oily residue, otherwise this will act as a dust trap. If the control is still noisy after spraying it may have simply worn out, in which case, as with a sealed pot, replace it. Be sure to replace it with a pot of the same resistance value and characteristic (log, lin etc). If the new replacement still makes noises when operated further investigation is necessary.

A common cause of noise generated by pots, is an errant DC component across the pot often coming from a leaky capacitor. This can be checked by measuring between the terminals of the pot with a DVM or other sensitive meter, as shown in Figure 5a. One tenth of a volt (100mV) could cause trouble in a sensitive part of a circuit. Ideally there should be no DC across any controls or switches. Figure 5b shows a situation guaranteed to cause 'clicks' or 'pops' when the switch is operated. In both cases the cure is to replace the leaky capacitors, preferably with tantalum types of a suitable voltage and capacitance.

Another source of DC on the output of operational amplifiers is drift in the offset null circuit. This only applies to op-amps fed from dual supply lines (±). Because the output normally sits at 0V, no DC blocking capacitors are required. So if any drift, or inadvertant twiddling of the offset null preset has taken place a troublesome DC level will be present. If it's possible to adjust this out on the offset null preset all well and good, otherwise replace the chip.

A less common cause of noise on pots are radio frequencies (RF); either generated by poorly compensated operational amplifiers, or being picked up in some sensitive part (eg mic amp) of the circuit. This RF component invariably gets filtered out somewhere along the line so don't necessarily expect to see it at the output of the suspect unit. The only way I know of tracing this sort of interference is with an oscilloscope or high frequency millivoltmeter. Because RF interference is associated with instability the very act of delving in to check for its presence often removes the cause. So when you open up the equipment or attach the piece of test gear it miraculously disappear, only to return at some later, inconvenient stage in the proceedings. (See E&MM March '82 for details of curing RF interference).

A good rule therefore whenever fault finding is to check that the fault is still manifesting itself at each stage of disassembly or whenever you move the test gear to a new node in the circuit. The internal impedance of a meter or oscilloscope can be sufficient to 'fix' the fault temporarily. So this information can guide you to the faulty part of the circuit provided you check for the malfunction each time. **E&MM**

If you have a specific problem with your studio equipment that you would like discussed in this series, please write to Paul Becque, c/o E&MM.

MAKING NOTES

'Rhythm' is the theme for my article this month written especially for musicians experiencing difficulty in playing and creating rhythmic accompaniments or keeping time with a rhythm unit.

'Rhythm' is a regular pulsating beat or steady throb in music, comparable to our own life-pulse beat.

Musical Timing, which was featured in one of my previous articles, dealt with note values, understanding Time Signatures and Beats of music. The next step after mastering Timing is to play to a *rhythm*, with or without the aid of an automatic rhythm unit or a live drummer.

Fortunate musicians possess a natural 'inbuilt' rhythm, almost like an internal metronome. For them, learning to play rhythmic accompaniments is an easy, almost automatic reaction to playing along with the Latin, waltz, quickstep, etc. features on a rhythm unit. Other musicians, not quite so fortunate, have to spend more time learning how to play to a rhythm, which can be achieved as I have known many very good 'rhythmic' musicians who do not physically feel the rhythms they can create.

The musical term 'Tempo' refers to the speed at which you choose to play a piece of music. How fast or slow you play often depends upon personal moods or the capability of the musician. Musical instructions on a manuscript such as — moderately — lively — slowly, are the suggested speeds at which the composer or arranger intends the music to be played. Personal interpretation of the 'Tempo' instructions can result in almost any music being played to any time.

Back to our theme this month: to start to create rhythmic Bass pedal and left hand Chord techniques, written as notation upon the Bass Stave and also including Chord Symbols.

The thirteen note pedal board on the Spinet Electronic Organ is now also a feature on some synthesisers. Most aspiring musicians of these instruments persevere with the unfamiliar left foot movement to play the Bass pedal notes which provide the deep rich Bass accompaniment to left hand Chords and melody notes.

If the bass section of the orchestra was missing, or the bass pedal notes of the electronic organ or synthesiser are not played, a musical score will sound incomplete. The automatic features to be found on most electronic organs and keyboard instruments provide not only the Bass pedal notes and left hand Chords, but piano or harp arpeggios and rhythmic instrumental accompaniments, simply by pressing one or more tabs and playing a single note on the manual.

Playing hints

When first starting to play the Bass pedals, the basic single pedal note will be the ROOT note of each left hand chord, and also the ROOT note of the Scale from which the left hand chord was formed.

The two notes of a ROOT and FIFTH pedal movement are the ROOT note, which you have already been playing and the FIFTH note duplicated from the left hand chord, or from the same Scale as the ROOT note was taken.

For music written with a $\frac{4}{4}$ Time Signature, the ROOT and FIFTH pedal notes which will be played on the First and Third beats in each bar, will have the Time value of a MINIM. The left hand chords can initially be sustained for the Four Beats in each bar.

On the first illustration (Figure 1), the music is written in the key of G Major with an F# key signature. The G Major Chord in the first two bars is accompanied by the ROOT pedal note of G followed by the FIFTH note of D in each bar. The two notes of G and D are the ROOT and FIFTH notes of the G Major chord, or G Major Scale. When the left hand chord changes to D Seventh for the Third and Fourth bars of the illustration, the ROOT note of D followed by the FIFTH note of A in the D seventh chord or the D Major Scale are played as the pedal notes.

From the first basic movement in Figure 1, create a rhythmic Left Hand Chord accompaniment to a variation of the ROOT and FIFTH pedal technique, also known as PEDAL — CHORD — PEDAL — CHORD. In Figure 2, the music is again written in the key of G Major with a $\frac{4}{4}$ Time Signature and identical left hand chords and Bass pedal notes. The ROOT and FIFTH pedal notes, again played on the First and Third Beats in each bar, are now played to the Time Value of a CROTCHET, with a REST on beats Two and Four in the bar. While the pedal note rests, the left hand chord is played creating an alternating movement between the pedal notes and left hand chords. A Play — Release — Play — Release action for the pedal notes and a Rest — Play — Rest — Play action for the chords for each bar will help you to maintain the correct timing of the music.

To develop a Waltz Rhythm technique, known as PEDAL — CHORD — CHORD accompaniment, the pedal note and left hand chords will each have the time value of a crotchet, with the music now written in $\frac{3}{4}$ Time, in the Key of C Major (in Figure 3).

The pedal note, played on the first crotchet beat in the bar, is immediately released. The left hand chord rests on the first beat and is then played on the second beat and repeated on the third beat in each bar.

The ROOT and FIFTH pedal notes will be alternating *between bars* in this movement.

In Figure 3 the ROOT pedal note of C in the first bar is followed by the FIFTH pedal note of G in the second bar while the C Major left hand chords are played. The ROOT pedal note of G followed by the FIFTH note of D, from the G Seventh Chord, are played in bars three and four of the illustration.

A 'Latin' Rhythmic accompaniment to music written with a $\frac{4}{4}$ Time Signature is shown in Figure 4. A counting of 1 & 2 & 3 & 4 &, eight Quaver Beats in each bar, will help you to play this rhythm.

The key of the music is F Major. The pedal note of F played on the first beat, rests on the second crotchet beat in the bar, and is then separated on the third and fourth beats to fulfil the time value of four crotchet beats in the bar. Each pedal note is the ROOT note of the left hand chord it is being played with. Make a note of the timing pattern of the chords: Oom - pah - h - pah, oom-pah, oom - pah, for each Bar. While 'Oom' is representing the pedal notes, the 'pah' accounts for the Chords. The 'pah - h - h' above represents the first and only crotchet chord in the bar.

The accompaniment technique for playing to a 'Shuffle' or 'Western' rhythm is shown in Figure 5.

The counting for each Bar will be identical to the 'Latin' Rhythm. The pedal note, sounding on beats one and three will rest on beats two and four while the left hand chords are played. Again there is a variation in the chord note values. On the second beat in each bar the two quaver note chords are played quickly, one after the other. Try to achieve an 'Oom - pah pah, Oom - pah effect, of Pedal/Chord Chord, Pedal/Chord — in each Bar.

ROOT Bass pedal notes only accompany the left hand chords which can be sustained for the duration of a bar as illustrated in Figure 6 or repeated on the same beats as the pedal notes.

The first pedal note in each bar played to the time value of three quavers (or dotted crotchets) is followed by a quaver and crotchet pedal note before resting for the last crotchet beat in the bar.

Experiment with the various Bass pedal rhythms, *without* the rhythm unit

Part 8
Brenda Hayward

initially, until familiar with their different patterns. Don't panic if the rhythm unit appears to run away from you, adjust the speed and try again.

As an alternative to the rhythmic Bass pedal techniques, a movement known as a 'Pedal Progression' can sound very effective. To 'embellish' or add to basic Bass stave notation, extra pedal notes can be slotted in between a single pedal note in two consecutive bars of the music so that the silence and spaces between the pedal notes will be 'filled in'. This must be another form of 'joining the dots'.

I must establish that any added notes used to 'fill in' are completely dependent upon the Key (or Scale) in which the music is written.

The first creation of a pedal 'fill in' will use the two final bars from a simple arrangement in the key of C Major. This contains the G seventh chord with a G pedal note in the first of the two bars, followed by the C major chord played with a C pedal note in the last bar. The 'fill in' notes are going to move *down* the pedal board from the G note to the C pedal note: G to F to E to D to C, while the timing of the music is maintained.

Playing in the key of C Major which represents the Scale of C Major, the G pedal note (fifth note of the C Major Scale) is followed by the fourth note (F), third note (E), and second note (D) of C Major before finally moving to the ROOT note of C in the last bar — a simple Pedal progression.

Now play the pedal progression for the last two bars for music written in the key of F Major. The last two chords, one for each bar, will be C seventh played with C pedal note, followed by the F Major Chord played with the F Pedal note. By playing the C Pedal note written in the music an octave higher on the pedal board, the left foot can again move in a downward progression from C to Bb to A to G to F between the two pedal notes of the music, in a steady movement from the fifth note of C to the ROOT note of F (from the F Major Scale).

This first simple pedal progression can now be used for any key of music, remembering that the 'fill in' notes are from the Key, or Scale of the music. music is written.

For the musician learning to play by Chord Symbols, instructions for playing an alternative pedal note to the ROOT note normally played with each left hand chord would be written as the chord name followed by the pedal note name after the oblique line, i.e. E /G, representing the E Major Chord played with the G pedal note. **E&MM**

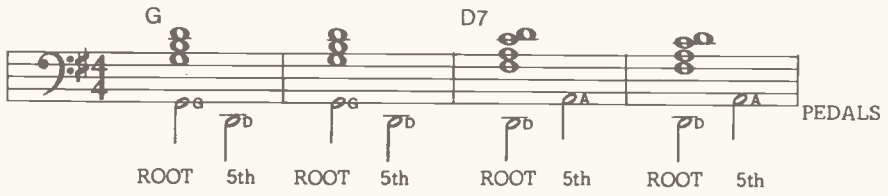


Figure 1.

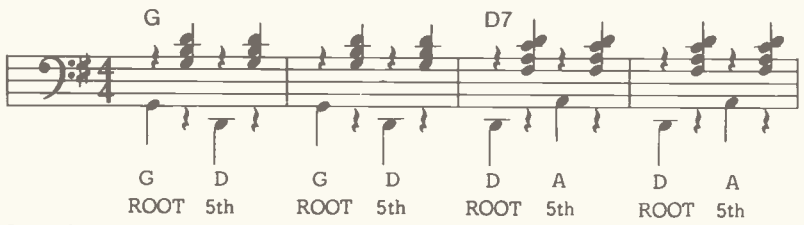


Figure 2.

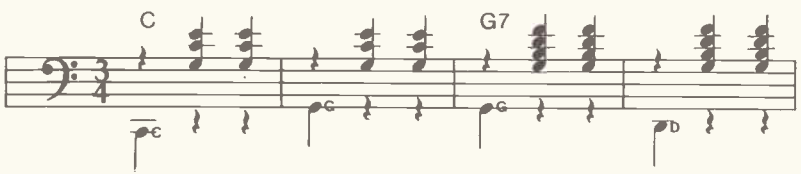


Figure 3.

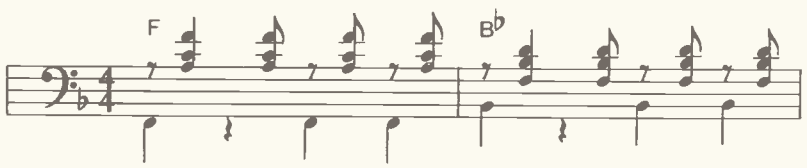


Figure 4.

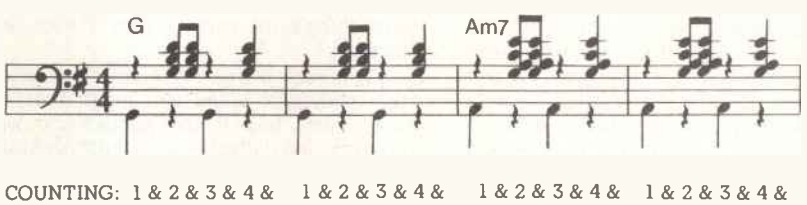


Figure 5.

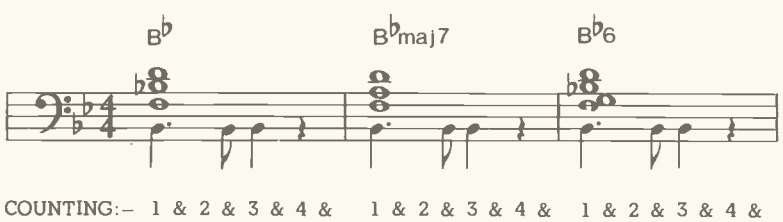


Figure 6.

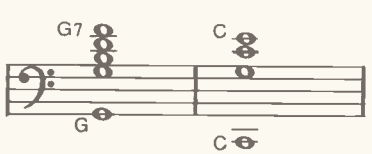


Figure 7(a).
The two final bars in written form.

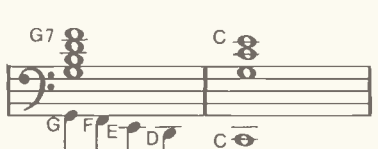


Figure 7(b). Same with 'fill in' notes.

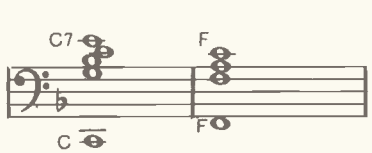


Figure 8(a). As written in the music.

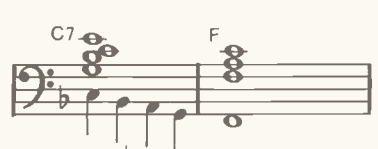


Figure 8(b). With 'fill in' notes added.

Fender Precision Bass

The Fender Squier Series

Welcome, welcome, welcome to the new range of Fender guitars. You may have heard about the recent launch of Fender's American Vintage range. OK, so you've been in a deep slumber along with at least 51% of the population. If that is the case, then now must be the right time to wake up because Fender have an even newer range of vintage guitars called the Squier Series (pronounced Squire) and this time they are made in Japan, in what must be an unprecedented move for Fender. Prices for the range vary from a measly £198 for a replica of a 52 Telecaster to a not so high £230 for a replica of a 1962 Stratocaster. This has to be good news for the guitar business which is not exactly having its greatest year on record.

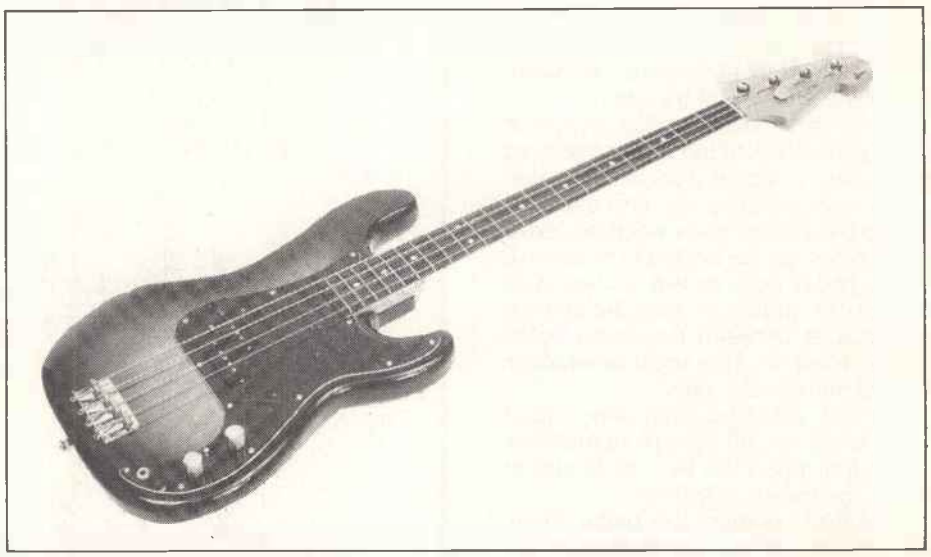
And now down to business. The model that I'm going to review for you here is the last of the six models in the Squier series that it's been my pleasure to play this weekend. On the chopping block today is this beautiful creature that I have in my lap. It's a copy of a replica if you like, of the 1962 Fender Precision Bass, mooted by certain parties, myself included, to be just about the best year for this model.

For a Fender, the writing on the headstock is a little odd and is about to become even odder. Let me explain. The wording reads 'Fender Precision Bass, Made in Japan, Squier Series'. Now the latter appears where you used to find the words Original Contour Body, but according to Fender distributors CBS, the wording on all Squier Series models in the future will read something along the lines of 'Squier Series, Made in Japan, for Fender.' This may or may not have the effect of putting off a small percentage of the population who would like to read the word Fender in its usual distinctive, large script, but is intended to simplify telling the difference between the all-American Fender and this new Japanese job. Anyway, I'm sure Fender have sound reasons for doing this. One side effect of all this is that all of these pieces, which constitute the first batch outside of Japan, are destined for the status of 'Collectors Items'. Cost of the new Squier Series Fender 62 Vintage Precision Bass is £222, whilst the maple neck version weighs in at an even more modest £213.

Good Looks

Visually, it's a veritable stunner with a return to those beautiful tortoiseshell scratchplates, and the most gorgeous 3-tone sunburst finish. Now I've never been a fan of 3-tone sunburst finishes, preferring the more ethnic 2-tone variety, but this time somebody up there has got it right. Quite recently one manufacturer produced a finish that was described as suckburst, this is definitely not one of those.

The body, according to my information is made from 2 pieces of alder, and as Precisions go it's a reasonably heavy one. Probably the worst thing about the bass is that it's neck heavy which is a matter for concern. The 57 maple neck Precision in this series balances perfectly, so I'm sure something could be done about this one. The body contour is perhaps a little sharp, but it does feel very comfortable and enables one to get very involved with one's instrument, which is surely what it's all about.



The Fender Squier Precision Bass.

Strings on this bass are not Fender and nobody seems to know quite what they are. One thing's for sure — they're very, very heavy.

The neck is one piece hard maple with the standard rosewood fingerboard, it's really quite nice. 1962 Fender necks were amongst the flattest and thinnest necks and this one keeps its promise until you move below the fifth fret. It's still a goody though.

The frets number 20, they are well polished Fender style thin frets and the fretting is a treat. I wish more were like this. The neck has a slight camber and the action is a bit stiff which I put down to these dreaded heavy strings. There are white dot inlays up the side of the neck and again on the fretboard itself. They've been styled in a matt plastic so that they look, to all intents and purposes, like the old clay dot markers that Fender used between 1959-1964.

Necks on the whole of the Squier Series have been stained to look just like the old ones (give that man a geisha voucher immediately) and Fender have gone back to the old style of truss rod adjustment here, so now it's available at the bottom end of the neck. It's not a Micro-Tilt action and the actual neck fit is splendid. Machine heads are the large Kluson type in the clover leaf style and they seem to hold in tune very well.

The nut is white plastic, the single string guide is circular, and suddenly I'm reminded that these guys are on top of it. Between the years 1959 and 1962, all Fender rosewood fretboards were finished off at the nut by a convex curve that extends into the headstock, and that's just what they've done here on this 1962 replica — Hooray! Another acknowledgement that Fender have remembered their history, is the extra third strap button at the rear of the headstock.

Electronics on the 62 Vintage Precision are passive, with just the one tone and one volume control with the familiar, knurled steel barrel knobs. The split pickup is black and it's not an American Fender pickup, it's Japanese.

Bridge set up consists of a solid looking anchor plate but hey, where's the bridge cover gone? Come to think of it where's the hand rest gone? What a liberty! And they've had the cheek to drill two holes in the scratchplate where the handrest used to be. Funnily enough a thumb rest and screws are provided as an extra in the case, but no holes have been drilled for it.

There are 4 bridge saddles with individual 2-way adjustment for string action and harmonics i.e. the two grubscrews to raise or lower each string, and a spring loaded bolt to adjust string length.

Right now it's switch on time and for this test I'm going to be using an Ohm GB60 Graphic Bass Combo, courtesy of the chaps down at the London Rock Shop (who are open on Sundays).

Playing Points

The pickups on this bass prove to be the warmest in the range, and are very mellow indeed. If anything a slight edge is missing with the tone control turned all the way up for maximum treble response, but I'm convinced that this has more to do with the strings than the pickups themselves. Chording on this instrument is a sheer joy and the neck feels like it was built with a job in mind — it's very workmanlike. Soundwise the 62 Vintage Precision has lots of power in the pickups without ever having to sacrifice clarity for sheer power, that's good in my books.

Basically, this is a very fine instrument, though I have to admit that I prefer the 57 maple neck Precision in this series. Again I think it has more to do with the strings that come fitted to this 62 model than the bass itself. Both of these basses are going to

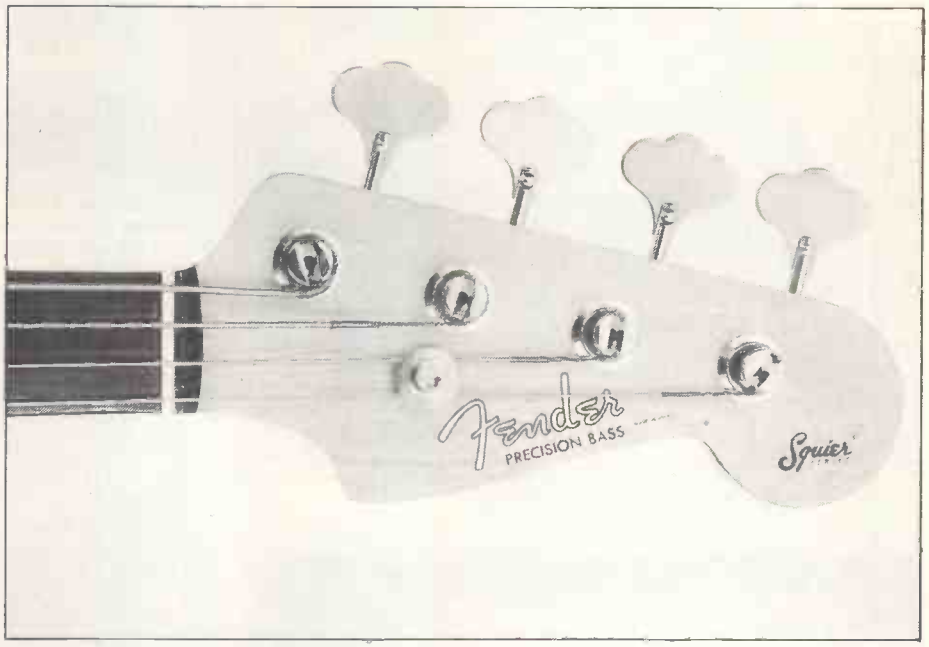
appeal to the full time megastar, superstars, professionals, musos, semi-pros, closet bass players and beginners, which should help to jolly along the sale of these Fender instruments no end.

The whole range of Squier Series guitars and basses are a boon, or should it be a boom, to the music industry, and I for one am very impressed by Fender's efforts in producing these instruments.

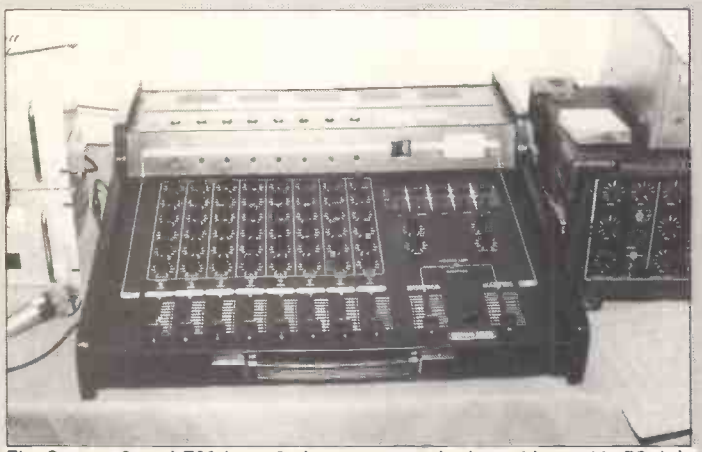
A minor point here, none of the Squier range come in cases and when I asked the Fender distributors chairman and managing director, Ivor Arbiter, about this, he replied, "Initially there will be no case". Without presuming too much, there is obviously a slim chance that there will be a free case with every one of these guitars and basses in the not too distant future. Why not? Even the Fender Bullet series which is aimed down market, has a hardshell case included in what is a much cheaper instrument than the Squier Series. We shall see.

Ed Park **E&MM**

The Fender Squier Series guitars are distributed in the U.K. by CBS, Fender House, Jeffreys Road, Enfield, Middlesex. Tel: 01-805 8555.



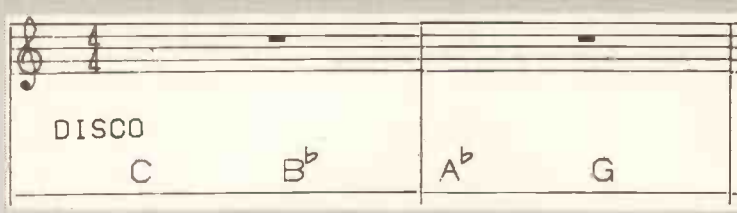
LONDON MUSIC TRADE SHOW



The Custom Sound 701 is an 8 channel powered mixer with graphic EQ. It is available in two power outputs — 150W and 300W.

Memory Rhythm Machine from British Music Strings. This four-voice programmable unit should retail at around £50.

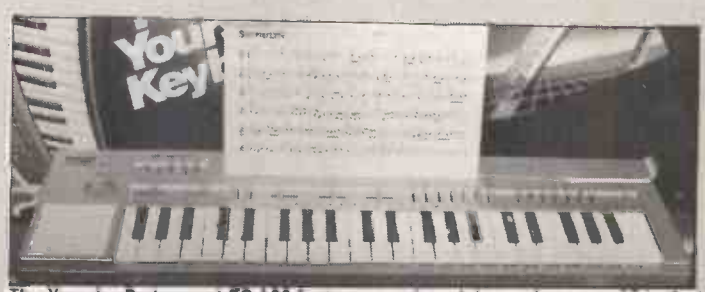
Alby Paynter of Rossetti Ltd. holds the new Gibson Firebird Mark II. This is basically the old Firebird with the added attraction of active circuitry.



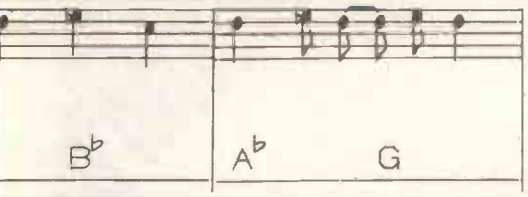
The Casiotone MT-70 is an innovative instrument with two memory storage methods — a bar code reader that picks up scores from a special musical score card, and a manual memory for storage from the keyboard with 10 auto rhythms and 20 presets.

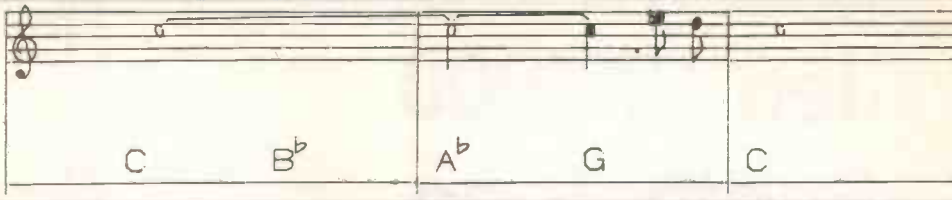
Elka Micropiano 16. This instrument has piano, honky tonk and clavichord effects plus a three track sequencer capable of memorising 128 notes per track.

The Solton Disco 64 has as the name implies. 64 preset rhythms utilising 12 voices/effects. 6 keyboard presets and a programmable pedalboard.



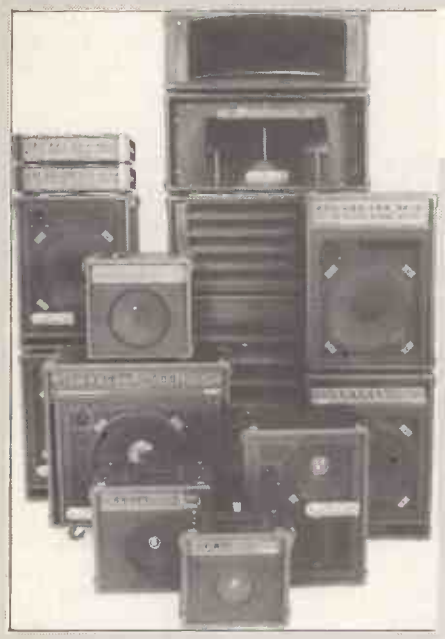
The Yamaha Portasound PC-100 features a unique playcard system. Slide the card, which contains a conventional score, into the top of the instrument and a thin magnetic strip at its base programmes the orchestration. The instrument then plays itself while you can add parts read from the score.





Pro-5 electronic piano from JSH. Features include 61-note keyboard, polished wood sides, 'bright' and mellow slider controls and a sustain pedal.

The Yamaha Portasound is another unique example of the high technology instruments that are currently exploding on the market place. This fascinating instrument is actually able to transcribe the notes and chords played using a motorised print-out. (See illustration).



Carlsbro unveiled a whole new range of amplification equipment at the show. The Electro-Acoustic Combo can be seen amongst the above and is reviewed in this month's issue.

Raven Rebel 50 general purpose amp top. Power Slave amp top and two 1x12 + Horn units with a handling capacity of 160 Watts per pair.

Technics Keyboard SX-K200. Features include 49-note keyboard, PCM digital sound source rhythm, all LED full logic control panel and stereo sound.

Looking very pleased with his new acquisition is Terry Day, publisher of E&MM and director of Glidecastle Publishing Ltd.

Two exciting new products from Bandive are the Seck 1682 16 channel mixer for under £1,000 and Fostex 6301 personal monitor speakers, with built-in power amp.

Distributors

The distributors of these products will be pleased to send you further information if you write or phone. (It helps to mention E&MM!)

Gibson Guitars Rosetti Ltd, 138-140, Old St, London EC1. Tel: 01-253 7294.

Carlsbro Amplification Carlsbro Sales Ltd, Cross Drive, Lowmoor Road Industrial Estate, Kirkby-in-Ashfield, Notts. Tel: 0623 753902.

British Music Strings Pontygwindy Industrial Estate, Caerphilly, Wales. Tel: 0222-883904.

Raven Amplification 58a, Leigh Road, Leigh, Manchester. Tel: 0942-672958.

Casio Electronics Co Ltd Unit 6, 1,000 North Circular Rd, London NW2. Tel: 01-450 9131.

Yamaha Kemble-Yamaha, Mount Ave, Bletchley, Milton Keynes, Bucks. Tel: 0908 71771.

JHS John Hornby Skewes & Co Ltd, Salem House, Garforth, Leeds. Tel: 0532 865381.

Solton Solton UK Ltd, 3-4, Kemble Parade, High St, Potters Bar, Herts. Tel: 0707-44722.

Elka Keyboards Elka-Orla (UK) Ltd, 3-5, Fourth Ave, Halstead, Essex.

Custom Sound Custom House, Arthur St, Oswestry, Shropshire. Tel: 0691-59201.

Seck, Fostex Bandive Ltd, 8, East Barnet Rd, New Barnet, Herts. Tel: 01-440 9304.

Jen SX1000 Synthetone

Having recently come across the Jen Synthetone, along with the publicity info stating "the greatest synth bargain you've ever laid hands on" it seemed pertinent to try out this instrument — especially as readers had commented on it from time to time.

The Synthetone originates from the Jen organ company in Italy and has in fact been around for over a year using chain stores and mail order companies as its main outlets. At a price of £190 (inc. VAT) it would have done well initially alongside EDP synths and the few other monophonic variable synths in the market price range, but the choice of cheap instruments has escalated rapidly since then so this review may give you one more to consider.

The SX-1000 is mains powered and is cased in veneered and black painted wood with front plastic trim (under the keyboard) and black metal main panel with white legend. It measures 17x56x36cms (HxWxD). The rear panel has holes for a wire music stand and a line out socket next to the mains cable outlet and fuse holder. No CV or trigger in/out sockets are provided.

The knobs are colour coded red for VCO, green for Noise, yellow for modulation controls, blue for ADSR and black for output volume. The synthesis sections VCO, Noise, LFO, VCF and VCA are grouped logically in the main panel and players should have little difficulty in making sounds with the instrument. To start you off, a set of six patch cards are provided with cut out holes to fit on top of the panel controls so that a dozen instrument sounds can be tried, from brass and organ to piano. These worked well considering this is a standard single oscillator instrument — benefitting from two envelope generators and pulse width modulation.

Controls

The VCO pitch can be switched to 32', 16', 8', and 4' octave ranges for the three octave C to C keyboard. A 'tune' control adjusts only very slightly up or down from A=440. Glide (really portamento) makes smooth slides between notes (continuing after release of key) from zero to four seconds over three octaves, although it is not effective aurally until '4' on the dial. The keys have a smooth action but are a little noisy against the base in operation, giving top note priority and 'keyboard follow' from the filter. Waveforms offered are sawtooth, square and pulse with variable pulse width over 5-50%, as well as modulation of the pulse shape at the LFO speed setting. Noise is switchable to white or pink and, like the VCO, has its own level control for mixing these together. The total output of the noise was noticeably less than the VCO.

The two sound sources are fed to the VCF section which is a low pass filter with (cut off) 'Frequency', 'Resonance' and ADSR controls. Maximum time for attack is 5 seconds, with Decay and Release up to 14 seconds and offers a usable range, including short clean envelopes of a few milliseconds. The filter will oscillate at extreme Resonance settings (with an increase in volume) and harmonics can be easily picked out. An 'Envelope Level' controls the amount of effect from the ADSR and allows the filter to cut off the sound completely.

From the VCF, the signal goes to the VCA with its own similar ADSR envelope generator. An LFO (0.2Hz-20Hz) adds Vibrato to the oscillator and cyclic changes to the filter tone, with individual Depth and a common Speed control.

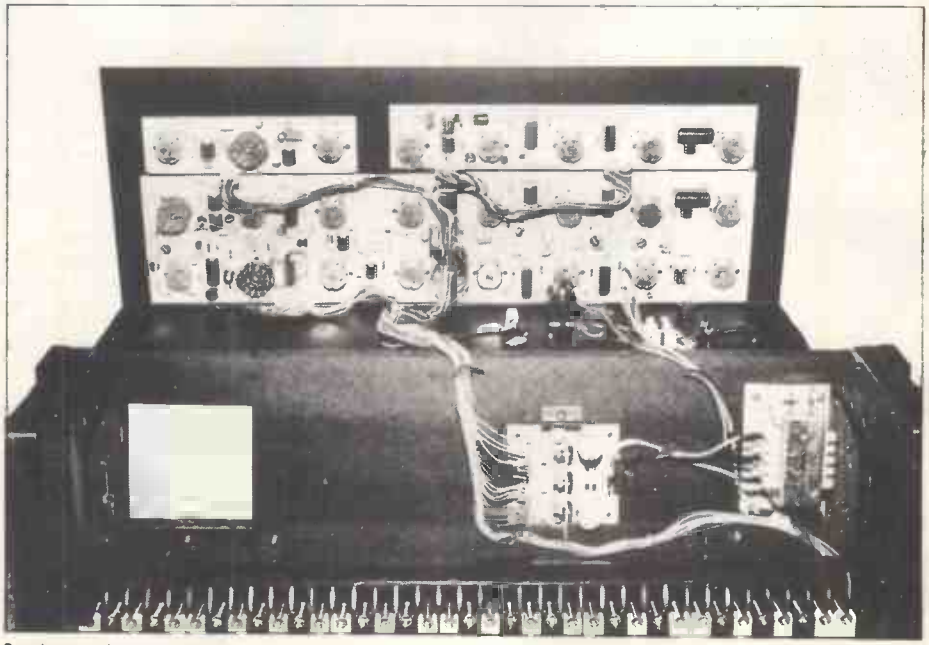
Finally, there is an Output Volume control to set levels to your hi-fi, mixer or amp.

The circuitry employs standard chips such as 741, 351, 353 and 301 opamps for signal and voltage processing, and the tone generation is based on the SGS-Ates M110. Filter control is achieved with 2 LM13600 dual transconductance amps. The EG uses discrete CMOS circuits (CD4001, CD4066) and the VCA is based on the LM3080 transconductance amp.

In conclusion, you'll not find any extras (particularly for interfacing) and there are no special functions like arpeggio or memory storage. Nevertheless, the Synthetone does offer plenty of experiment and good quality sounds for the musician looking for a variable instrument rather than a preset.

E&MM

The Jen Synthetone is distributed in the U.K. by British Music Strings Ltd, Pontygwindy Industrial Estate, Caerphilly, Mid Glamorgan, CF8 3HU. Tel: 0222 883904.



Synthetone internal circuitry.

SYNTHETONE SX 1000

THE SYNTHETONE SX-1000 is the result of an extensive research programme aimed at producing a light, compact and simple to operate synthesizer with the latest LSI technology at an amazingly low price.
It hs all the main features of the most sophisticated professional synthesizers and its controls are logically arranged and colour-coded for easy identification and playing simplicity.

THE DIGITAL technology used provide the SYNTHETONE SX-1000 with a dependable accuracy, high tune stability and reliability under the most demanding circumstances.
It also means the combination of new stanards of performance with minimum and easy servicing.

SPECIFICATIONS

37-note **KEYBOARD** C to C.
TUNE: Master tuning for setting pitch to other instruments. Adjustable ± ½ tone.
OCTAVE SELECTOR: For setting range of the keyboard at 32', 16', 8' or 4'.
WAVEFORM SELECTOR: For choosing the sound waveform among Sawtooth, Square and Pulse Width adjustable from 5% to 50%.
PWM (Pulse Width Modulation): It gives you automatic modulation on the pulse width and creates chorus, phasing and many other fabulous effects.
GLIDE: For automatic glissando between any two keys depressed. Adjustable speed.
Other **VCO** (Voltage Controlled Oscillator) include Output Level and Vibrato Intensity.
LFO (Low Frequency Oscillator) used to control VCO, VCF and PWM, creates tremolo, vibrato, trill and repeated effects. Adjustable rate.
NOISE GENERATOR with white/pink switch and level control. It enables you to obtain wind, thunder, surf and other exciting effects.
VCF (Voltage Controlled Filter) changes the timbre of the sound by adding, subtracting or enhancing harmonics. Rotary controls adjust Frequency, Resonance, LFO Intensity and Envelope Level. the ADSR (Attack, Decay, Sustain and Release) controls will enable you to obtain the exact effect you are seeking.
VCA (Voltage Controlled Amplifier) with ADSR (Attack, Sustain, Decay and Release) controls will allow you to shape the volume of the note for percussive or any other effect which you require. Additional rotary control (Output Volume) adjusts the overall volume.

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Organ Talk

Computerscope

All hobbies tend to be addictive and electronic music is no exception. The addiction leads to purchasing and constructing various pieces of equipment but even so we never have all the items we would really like.

An oscilloscope is extremely useful but there may be readers who have considered a small personal computer to have a higher priority. For those in this category who have an unexpanded ZX81, this article suggests methods of setting up complex waveform programs by mixing sine waves based on drawbar settings. The monitor will show a static display similar to the oscilloscope trace and, whilst not as exciting as 'Space Invaders', such programs are interesting and instructive.

I have always favoured the drawbar organ as this method of harmonic synthesis does not limit the player to a number of tabs with fixed tonal qualities. *The Dictionary of Hammond Organ Stops* states that drawbars can provide 23 million String Organs, 20 million Full Organs and 10 million short-resonated Reeds!

These comments are based on mathematical permutations and the individual tonal variations are often too small to be detected. However, there is no doubt that additive synthesis can provide many audibly different tonal effects from which the player can select his favourites — and he can spend a lifetime experimenting with them.

Examining waveforms of drawbar combinations on a 'scope is a fascinating exercise which we can attempt to duplicate on the 1K ZX81 — or at least obtain close approximations with pixel plotting.

Fundamental

Type the listing below into the ZX81, which will plot a simple sine curve to represent the fundamental drawbar used at its maximum setting (00 8000 000). With the exception of the double FOR-NEXT loop program for overlaying two sine waves on each other (shown later), this listing will be used in amended form for all subsequent examples:

```
10 FAST
20 FOR N = 0 TO 63
30 PLOT N, 22+20*SIN(N/32*PI)
40 NEXT N
```

This is our starting point but, before beginning to elaborate, we should take a closer look at the calculation for the Y co-ordinate:

```
22+20*SIN(N/32*PI)
```

'22' places the zero line of the sine wave at mid-screen, pixel line 22. As the sine calculations swing either side of zero, this figure will always head the Y co-ordinate calculation to ensure that it is correctly placed on the screen. Failing this, there is every chance of error report B (integer out of range) as the plot could try to exceed the vertical plot limit of 0-43.

'20' represents the relative strength of the waveform component. As additional waveforms are added to the fundamental this figure will have to be scaled down: a safe rule is to divide 20 by the total number of waveforms being summed if they are all to 'sound' at maximum strength. The result found can be scaled to accord with drawbar settings and, although drawbars are usually calibrated over the range 0-8, percentage mixtures are easier to deal with when setting up a program. This component of the Y co-ordinate needs a little thought to avoid error report B: running the program will soon prove if there is an error! Alternatively, change PLOT to PRINT in line 30 and note whether the sequence thrown up exceeds 43 or is less than 0.

'32' is the figure that controls the number of sine curves obtained - in our first program, one only. Divide 32 by the harmonic number when adding waveforms to the fundamental so that 16 will be required for the Second Harmonic, 10.667 for the Third etc.

Second Harmonic

To plot the curve of the second harmonic, therefore, line 30 is edited to read:

```
30 PLOT N, 22+20*SIN(N/16*PI)
```

Curves of both the fundamental and second harmonic can be overlaid by using two FOR-NEXT loops:

```
10 FAST
20 FOR N = 0 TO 63
30 PLOT N, 22+20*SIN(N/32*PI)
40 NEXT N
50 FOR N = 0 TO 63
60 PLOT N, 22+20*SIN(N/16*PI)
70 NEXT N
```

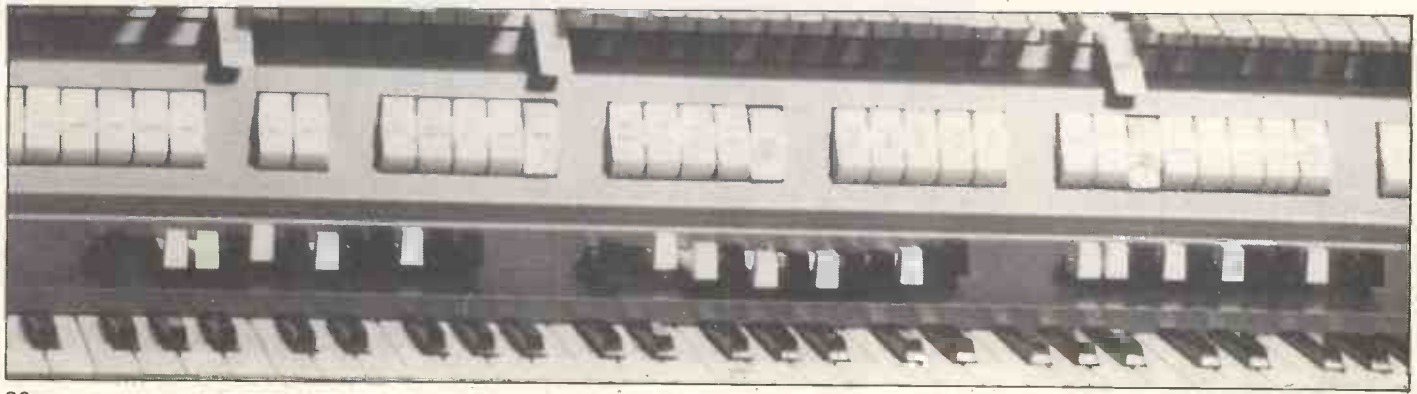
This may give some idea of what to expect when the fundamental and second harmonic are combined into a single trace, but adding a third loop is not possible with a 1K RAM and in any case the screen would become cluttered and confusing.

In order to combine these two waveforms mathematically (bearing in mind the previous comments on the Y co-ordinate), we *revert to the original program* and edit line 30 to:

```
30 PLOT N, 22+10*SIN(N/32*PI)+10*SIN(N/16*PI)
```

This will print out the curve of drawbars set at 00 8800 000. To make the second harmonic weaker relative to the fundamental, scale down the figure by which SIN(N/16*PI) is multiplied — in this case 10. So, a trace of 00 8400 000 will require:

```
30 PLOT N, 22+10*SIN(N/32*PI)+5*SIN(N/16*PI)
```



Here's a special treat for ZX81 users, with computerscope programs that show you harmonic synthesis at work for organ or synthesiser.

by Ken Lenton-Smith

And the others

Printing out the third harmonic trace on its own will call for:

```
30 PLOT N, 22+20*SIN(N/10.667* PI)
```

- or, to combine fundamental, second and third harmonics at full strength for drawbar setting 00 8880 000, this line becomes:

```
30 PLOT N, 22+7*SIN(N/32*PI)+7
   *SIN(N/16*PI)+7*SIN(N/10.667 *PI)
```

This process can be extended until, even in FAST mode, the ZX81 takes half a minute or more to complete its task. Complex waveforms all have differing overtones: sawtooth, for example, contains the full series of harmonics that get weaker as their frequencies increase. Typified by drawbars set at 00 8765 432, an approximation is given by editing line 30 finally to:

```
30 PLOT N, 22+6*SIN(N/32*PI)+5
   .25*SIN(N/16*PI)+4.5*SIN(N/10.
   667*PI)+3.75*SIN(N/8*PI)+3*SIN
   (N/6.4*PI)+2.25*SIN(N/5.3*PI)+
   1.5*SIN(N/4*PI)
```

There are plenty of ways this principle can be used (or should I say plenty of scope!) but a luxury you miss is the inability to alter Y amplifier gain by the turn of a knob. Instead, you have to play with the multiplier figure to make the vertical spread as great as possible before running into error report B.

It would be possible to assign variables at the start of the program by means of LET statements so that the multiplier (or drawbar setting) could be altered more easily and perhaps also the harmonic number as well. Part of line 30 would then appear as:

```
..... 22+A*SIN(N/X*PI) ... +B*SIN(N/Y*PI) etc.
```

- but much will depend on the memory usage in this case.

As line 30 becomes more complex, the ZX81 takes longer to plot its answer - hence, the suggestion to run in FAST mode. Without a printer attached, small differences in the waveform may not be easy to discern. An SLR camera can provide a permanent record of any display as a substitute: loaded with 100ASA film, give 1/4 second at f5.6 with brightness turned down somewhat to give the sharpest result.

Each of the suggested programs will give sensible curves, bearing in mind the limitations of pixel plotting. A graph of combined upper harmonics, however, will appear very jumbled with the course of plotting impossible to follow. In such cases, run in SLOW mode and join the plots as they appear by means of a chinagraph pencil on the monitor screen. This is easily removed afterwards with paper tissue, but at least you have a record of the plots after the equipment is switched off!

I can't think of a more sophisticated method with only 1K of memory and without extra modules but maybe you can. At any rate, the process described is an interesting one for a wet Sunday afternoon.

If musical waveforms are of particular interest, perhaps the moral of this article is to save up and purchase a 'scope! **E&MM**

Fairlight's Father Flies In!

On the 29th of July a demonstration entitled 'A Nightingale in Conduit Place' was organised by Syco Systems, U.K. importers of the Fairlight CMI.

The nightingale was in fact a reproduction of a Victorian Automaton using a clockwork drive to force air through the sound mechanism. While the nightingale was 'singing' the Fairlight was used to sample a note in its song, by converting and digitising the waveform, then displaying it on a monitor.

The Fairlight then replayed the complete song 'A Nightingale Sang In Berkeley Square' by Manning Sherwin using the sampled nightingale sound and several other 'instruments' from its sound library. The score of the song had been entered before the demonstration using the Music Composition Language, via the alpha-numeric keyboard.

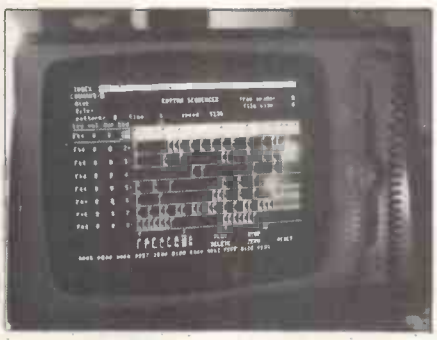
The reason for this rendition was to introduce us to Kim Ryrie, the co-inventor of the Fairlight, who at only 29 is the Chairman and Managing Director of Fairlight Instruments Pty Ltd.

In 1975 Kim Ryrie, Peter Vogel and Tony Furse formed the company to continue development of an instrument called the QASAR M8 (multimode 8), which had been started by another small Australian company, Creative Strategies. This machine was a polyphonic digital synthesiser with 8 waveform channels based around TTL circuitry with dual microprocessor control. The system attracted a lot of interest but was not really commercially viable. The team then completely redesigned and improved the system, using the experience they had gained, to produce the Fairlight CMI.

The beauty of this instrument is the way in which new updates and enhancements can be made simply by adding new software. Kim had brought with him a new software package called the 'Rhythm Sequencer' which should be available shortly to CMI users.

Loading in the new disc turns the Fairlight into the most incredible rhythm machine. Any sound which is stored in the sound library can be assigned to any one of 8 voices. Each voice can be triggered by using the light pen to place beats of selected length onto the bar or by recording in real time from the keyboard (in this mode both pitch and duration are stored). Tempo, time signature, repeats, breaks and chains can all be programmed.

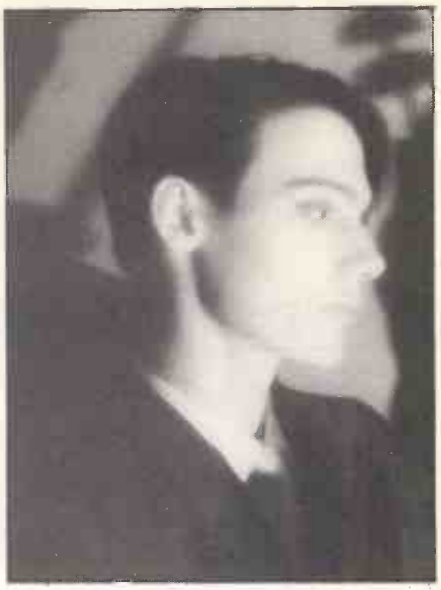
To quote Dr. Robert Moog speaking about the Fairlight at a musical industry presentation in Los Angeles "I have found the Fairlight to be by far the most intuitively efficient and satisfying tool for manipulating sound that I have ever used, and that includes modular synthesisers. The organisation of the instrument by software is your most important guarantee that this instrument will develop with the state of the art and the requirement of its users. What it does is just too useful musically, too general and too versatile to be limiting in any significant way." — Praise indeed.



Rhythm Sequencer Page in use.

Kenneth McAlpine **E&MM**

See E&MM June 1981 for an in depth review of the Fairlight Computer Musical Instrument.



Torch Song: W. Wainwright, L. S. Mayer and Grant Gilbert.

CASSETTE REVIEW

Electronics & Music Maker's CASSETTE REVIEWS aim to give an indication of what readers are up to musically, and also include a short appraisal of their work.
To this end we invite home electro-musicians to send in a cassette of their work for possible inclusion in future issues.
The recording method used is, of course, entirely up to you.
The range we seem to get is from sound-on-sound on a stereo tape machine, through bouncing in stereo between two machines, up to small 4-track multitrack recordings. But if your method comes 'above' or 'below' these in technique or application, don't hesitate to send your cassette in as well. It can be a one-off demo-type tape, an independent cassette-only release or anything in between.

You should send one cassette, mono or stereo, clearly marked with your name and address on the cassette itself, information on instruments used and recording method adopted, and a relevant black-and-white photograph. Send to: E&MM Review, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG.
Subjective 'scores' given at the end of each listing below are out of a maximum 10 for each category; tapes are generally given 4 for basic ferric types (e.g. TDK D, AD, etc), 5 for chrome types (e.g. TDK SA etc), and 6 for metal (e.g. TDK MA etc), with sometimes a point either way for variations.
If you'd like further information on any of the cassettes mentioned, such as contact addresses, please write to 'E&MM Review' at the above address.

Tony Bacon

EXCLUSIVE OPPORTUNITY FOR E&MM READERS!

Each month our Tape of the Month Winner will have the chance to discuss their music with Martin Rushent, top producer for Human League, Altered Images etc. at his Genetic Sound Studio!

This month, our *Tape of the Month Winner* is:

TORCH SONG (London W9). 8 tracks. L. S. Mayer: Roland SH2 synth + Dod flanger; Roland CSQ600 sequencer; Roland CR8000 drum machine; Olds Bb trumpet; vocals. W. Wainwright: synth system as Mayer; Fender Jazz Bass + MXR 10-band graphic; Gibson SG Standard + Bell flanger, WEM Copicat, Dod compressor; Simmons Claptrap. Grant Gilbert: Vega 1919 tenor sax; Conn 1916 alto sax; Yamaha clarinet; Chinese sax; Humdrum drum synth; Vox string machine; synth system as Mayer. Shure mics, Atlantex DI boxes. Teac A2340SX 4-track recorder; Nakamichi 6702X and 550 cassette machines; Tangent Series 4 12/4/2 mixer; Yamaha EM180 6/2 mixer-amp; Roland RE201 Space Echo; Toshiba Adres AD3 noise reduction; MXR Flanger; Rebis noise gate; Rebis headphone amp; B&W speakers.

A very accomplished and interesting three-piece unit, primarily recording-based because of equipment limitations and permutations. Dense rhythmic textures are drawn from a starting point of SH2 triggered by the 8000 via the sequencer on one channel, building up voice, bass and the rest over the other three tracks, adding more at the transfer stage. Only non-4-track take is the first version of 'Red Skies' on our tape, a lush and impressive spread accomplished at various 16-track studios. But their own 4-track version later on is better: more investigative, with some beautiful tape-sourced (we guess) chords appearing and further evidence of tape games emerging. The rest is equally good: the fractured rhythms and atmospheric interjections of 'Broken Blossom'; the harder rhythm and ringing drum of 'Tattered Dress', with Mayer's story-line vocal her best on the tape; the marvellous bass on 'Mister Blue'; the treated guitar of 'Strange Cargo' recalling Heads/Belew; and the panned dub-funk of 'Gato Del Noche'. Everything seems inspired and clever without becoming supercilious. Torch Song tell us that a short tape of two of the tracks is currently doing the rounds of the A&R departments — let's hope their ears are pricked.

Music: 7 Production: 6 Presentation: 6 Tape: 4

Best of the Rest

ANT RAWTON (Bolton, Lancs) 3 tracks: 'Minus Plus', 'Karstomp', 'Don't Follow The Depress'. Boss DR55 drum machine, voice, ADT and chorus pedals. Plus Danny at Twilight on Rickenbacker bass. Recorded at Twilight, Manchester, on to Teac A3440 4-track recorder using Ampex tape.

Very sparse voice, bass, and drum machine — the voice and bass are very forward on 'Minus Plus', the drum machine, hardly evident, clicking away in the background. Ant was in Capsule Electric until 1981, and recently bought the DR55 and went solo, singing (just about) along with his percussive electronic companion. Now, Ant's aim is to make 'danceable and audible music'. We'll not quibble about the audible bit, nor the dancing, really, which can be achieved as the drum machine emerges in the mix of 'Karstomp', with its lovely little bass part weaving around itself. 'Don't Follow The Depress' is more of the same. We're forced to ask, 'Why?'

Music: 3 Production: 4 Presentation: 5 Tape: 4

Ant Rawton

HOMELAND CASSETTES (Milton Keynes, Bucks). Three cassettes, independent releases, supplied: 'Only The Brave' (HOPE1) sampler of local groups Suspects of Improvisation, The New Scientists, The Entire Population of China, Still Romantics, and The Commercial Break; The New Scientists 'For The Good Of The Land' (HOPE4); Still Romantics (Ian G. Hopwood) (HOPE2). All recorded at Homeland, Hopwood's home studio: Sansui 1330 cassette deck, Teac 3340 4-track recorder, A&H minimixer, Roland tape echo. Instrumentation on all cassettes centres on EDP Wasp synth; Korg 800 synth; Boss DR55 drum machine; 'Woolworth' guitar; CSL guitar.

An enterprising and worthy project, proving that the music coming out of Milton Keynes is not limited to the large cardboard boxes leaving Yamaha's warehouse. Hopwood is suitably philosophical about his escapades with the local groups, and reminds us that, "Nobody involved had ever played in any band or anything before the work contained here, so the catalogue of music released on my label will effectively document the music of these outfits from virtually their first co-ordinated notes onwards". Our faves from the 'Only The Brave' sampler are the Entire Population of China — not merely for the name, but for some anarchic Abba/Motorhead/PiL-fuelled enthusiasm titled 'You Can't Dance To This' (not tested), and 'Pure Hearts'. 'Still Romantics' is described by Hopwood as his 'quiet summer solo album' with a guest vocalist who 'usually sings punk stuff so wanted to be anonymous'. The New Scientists (also included on 'Brave') are accompanied by a black-and-white-photocopied comic book, and are, er, atmospheric, synth-only, sci-fi anarchists-against-the-bomb. This month's E&MM Gold Star For Effort to Homeland and all involved, accompanied by the newly-introduced More Power To Your Record Button rosette.
Music: 6 Production: 4-6 Presentation: 7 Tapes: all 4

TAT, SWIG & OLF (Winsford, Cheshire). 3 tracks from forthcoming LP called 'The Shadow Dancer': 'False Tears', 'Better Life', 'Crack In The Mirror'. Instruments swapped by three players: Guitars, Vox Standard 25, Antoria Tele Custom, Avon Les Paul, Hondo II Precision, plus acoustics; amps: Sound City Concord 30W combo, Marshall 50W Lead combo, Nikko TRM300 (monitoring); Yamaha CS5 synth; FX: Melos tape echo; JHS phaser; Top Gear fuzz/sustain; Cry Baby wah-wah; E&MM Syntom. Sony TC366 stereo reel-to-reel; Sharp RT10 cassette machine; Seck 62 mixer; Akai and Shure mics.

'False Tears' is a little too tenuous, and yet overlong, for its own good, although some pentrating metal-edged guitar livens things up a bit — if the players and production sound unsure, the listener is bound to feel lost. The mostly-instrumental 'Better Life' is indeed better, and the chaps' decision to dump sound-on-sound in favour of transfer-and-add between the Sharp and the Sony, via the Seck, seems justified on this evidence. Balance is, of course, somewhat haphazard — the keyboard could have been a bit more prominent on 'Life', for example. 'Crack In The Mirror' is a more assured vocal and general performance, and we wish the trio well for their LP which, they say, should have appeared in May.
Music: 5 Production: 4 Presentation: 5 Tape: 4

MICHAEL LAW (Wells, Somerset). 'Meteorise'. Independent cassette release Synfinity 005. Roland SH3A, EDP Wasp and Gnat synths; Casio 201, MT30 and VL-1 keyboards; Sinclair ZX81 microcomputer with interface to drive Wasp and Gnat (recent introduction); Kay acoustic guitar with Schaller pickup; WEM Copicat; Colorsound flanger; E-H Small Stone phaser; ADC equaliser; 'Solid State' reverb. Teac 144 Portastudio; Sony ECM270F and Eagle ProM5 mics; Onkyo TAW80 cassette machine; Trio amp, Bolivar (JBL) speakers; Senneheiser cans.

Our tape fluttered here and there, causing minor discomfort on the longer, sustained lines, but generally this totally instrumental cassette pleased in a gentle, unassuming fashion. It appears to be Law's third cassette release, and readers may be aware of his activities in the 'Zero Zone' synth information service and 'Synthesiser Town' workshop down in sunny Westbury-sub-Mendip. Most of the tracks were recorded at home following Michael's purchase of his Portastudio in October 1981, although a couple ('Moonwards' and 'Afterglowing') were recorded live (DI'd to Portastudio) at the Shaftesbury Arts Centre late in 1981.
Music: 5 Production: 5 Presentation: 5 Tape: 4

FRANCIS MONKMAN (London). 'Mind-Body-Spirit'. Independent cassette release ESSP FM1. Francis Monkman, Haydn Bendall, Peter Broaders. Synclavier 2, PPG Wave II, Sequential Circuits Prophet-5 synthesisers. Recorded at Abbey Road studios, following performance at Festival for Mind-Body-Spirit, Olympia, June 1981.

A lot of expensive hardware in one place at one time, and a lot of luxuriously clean, clear, and precise synthesiser tones emerge, notably of tuned-percussion-like and organ-like character, though enviably varied in resultant texture. Perhaps one is marvelling so much at the hardware (and indeed the software) that one doesn't worry particularly about the rather pointless and meandering music, vaguely reminiscent of Steve Reich and other minimalists, but not really as engaging. Recommended to readers who want to hear these new toys in one context. The B-side is blank, incidentally, for you to use, like Island's 'controversial' 1+1 series, although you'd need to sellotape up the open tabs.
Music: 4 Production: 7 Presentation: 6 Tape: 4

L to R: Swig, Olf & Tat

E&MM

Readers Letter

Send to: Reader's Letters, Electronics & Music Maker 282 London Road, Westcliff-on-Sea, Essex SS0 7JG.

Synthesisers and the MU

Since the launch of E&MM in February 1981, we have had a lot of support from Studio Sound (and Sound International) editorial staff and Richard Elen, Editor of Studio Sound, has recently discussed the MU proposals with our own editor. Here are Richard's comments:

Having not only read Mr Cockings' letter and Maurice Jennings' reply (E&MM August, 1982), but also having seen the original wording of Lancaster's motion and covered it ourselves (Studio Sound, September, 1982), I think there are still some points to be raised.

Certainly there must be many who have fallen into the trap of believing outlandish reports in the dailies, as Mr Cockings appears to have done. But Jennings' reply is also overly dismissive. It must be quite apparent that someone of the stature of Barry Manilow has quite sufficient money to employ an orchestra on tour if he feels like it. So why didn't he this time? The only possible answer is that his use of a set of synthesists is for sensible musical reasons and very little else. In addition, he may feel that synths are fashionable at present (rightly), and that their use would help him appeal to newer, younger audiences. It is surely up to the artist to determine what instrumentation he or she uses in the creation and/or performance of any work.

And to say that these synthesists 'attempted to simulate Manilow's recorded arrangements' is somewhat facile. However good a synth is, it still has its own sound, which is distinct from that of any other instrument. Even a unit like the E-mu Systems Emulator, a latter-day 'digital Mellotron', imposes its own envelopes on the sound and permits looping and sequencing which is impossible even on the instruments 'recorded' on the Emulator to produce the final sound. Synths are instruments in their own right, and even units which use recording techniques to create sounds — for example, the Emulator, the Linn drum machines, and the Fairlight, not to mention the Mellotron — have their own sounds or are used in ways which would be difficult or impossible for a 'straight' musical instrument to accomplish. This is why so many drummers are investing in Linn machines, to offer a sound and a 'feel' (or lack of it) which is vital to much modern music. I've tried several times to get a drummer to play a pattern I have entered into a machine, and it's often impossible: it's too boring to play without the drummer adding things or getting out of time — both of which are an anathema in certain modern styles.

Synths also allow the composer a good deal more control than using session musicians, and facilitate new sounds and new arrangements which would be meaningless as well as impossible for regular instrumentalists. This is apart from economic considerations. I recently completed an album of original, classical-style synth music with a colleague using Minimoog, Source, Opus-3, Wasp/Spider, OB-Xa, Jupiter-8, VP-330 and Variophon, to name a few. About half of them were hired in and we took over two weeks to do it. Had we worked with an orchestra, it would probably have taken two days to record and been a hell of a lot cheaper. But it wouldn't have worked. Several pieces would have been unplayable, and the rest could well have sounded banal in parts. In addition, the important interplay and musical development which resulted in the composition in the studio of many of the pieces from the barest scored outline would have been impossible, because full scoring would have been necessary. No doubt some of the pieces will re-emerge in orchestral form on a future album, but these — if they even exist — will only have been possible *because* of the original album.

Whether we like it or not, music changes with time, and new instruments take the place of the old, as new styles come into prominence. Musicians are still needed to play the new machines; whether their expertise is the same as before or requires new techniques is a matter, largely, of fashion. We may regret the passing of the Big Bands when rock'n'roll came along, but who are we to say what artists should or shouldn't use to express themselves?

There already exists an agreement with the MU which covers machines like the Mellotron and says, effectively, that such instruments should not be used where conventional musicians and their instruments *may reasonably be expected to be employed*. This exempts the majority of synth applications, leaving only those where it may well be *better* to employ 'conventional' musicians than spend hours programming a synth. If you want a conventional clarinet sound, the best way to get it is to hire a conventional clarinettist — and this will always be true. But you write one note a semitone out of the clarinet's range and you need a synth. If you want a trumpet on the track, employ a trumpet-player. But if you want a synthesised brass sound, doing the same job but in a modern way, tune up the synthesiser and play it. The present arrangement covers these eventualities without discriminating against musicians whose main instrument is the synthesiser. Why change it?

The MU has already come in for criticism from rock musicians who feel that it is 'out of tune' with their modern needs. It isn't true, but you can understand the feeling. The MU is a vital part of the modern music scene, and helps to keep musicians of all kinds from exploitation. The free-for-all which would result from its virtual disappearance from modern music would be horrifying. It should not invite disaster: instead it should seek to represent *all* pro musicians, whatever they play. If the MU can't march to a modern drummer, other organisations, like the USS, will arise to take its place. It shouldn't be necessary, but if it is, synthesists should be prepared to fight for *their* livelihoods and for the music *they* wish to play.

Richard Elen
Editor, Studio Sound

Digital Aids The Video Stars

Roundhouse recording engineer, Dave Kemp, can operate the tape machines and still remain seated at the mixing desk, the best position for stereo monitoring.

Why are top recording artists like Toyah, Haircut 100 and Christopher Cross using Digital recording systems? The reason is simple — the recording quality is as near perfect as you can get as Joe Clerkin of 3M explains.

There aren't too many homes without some kind of quality hi-fi system to be proud of these days, and though it may be only the family pet who gets anything like a good centre stereo position, it's fair to say that the general public have some idea of what good quality sound should be. A visit to London's Tottenham Court Road, the hi-fi Mecca of Europe, gives a taste of the penetration of the boom in consumer electronics over the past ten years.

The recording industry for its part has played an important role in improving sound quality. It's hard to believe that nearly twenty years ago, George Martin was recording the Beatles on four track and in mono! The big milestone for the recording world was, of course, the development of multitrack recording in the late sixties, with much of the pioneering work being done by the 3M company. The M79 recorder, no longer in manufacture, is still the workhorse of many recording studios throughout the world.

Multitrack recording, the technique that allows each individual part of a musical work to be put on tape in an analogous method to the way music is set out in a full composer's score, was a real quantum leap in the music business. Firstly, it enhanced creativity: once the basic tracks were down on tape, they could be endlessly played with — mixed and remixed until the producer was satisfied with the result.

Secondly, you don't need to have all the musicians available at the same time for recording. This has proved especially useful for the classical music producers. If the soprano goes down with 'flu on the week of the studio recording, there is no need to cancel the orchestral session. You just record the orchestra without the soprano and add her later.

As musicians and producers have become more confident with the techniques so the number of tracks used has grown. The early eight track machines were superseded by 16 then 24, and finally 32 track, the maximum track density for 2 inch wide recording tape. It's still possible to go further, by syncing two or more multitrack machines together. 32 track recording is more than adequate for most commercial studio recording and has virtually become an industry standard, and was where the industry stood in the early seventies.

There was now only one more hurdle to overcome — the problem of tape noise. All the systems described up till now are analogue machines. As well as recording the audio signal, tape noise and other undesirable factors are registered as well, especially in quiet musical passages. Though highly sophisticated noise reduction systems have been developed including DBX and Dolby, they cannot eliminate the degredation in quality of the signal that occurs between the stages of signal transfer, from multitrack tape to two track master and then, finally, to disc cutting.

Digital recording was developed to overcome this problem. The result is that it is now possible to produce studio master tapes with

an incredible 90dB plus signal to noise ratio, a transparent recording which is as authentic as the real sound.

Multitrack digital recording was first achieved by 3M in late 1978 and the first 3M 32 track and four track recorders were installed in studios in the US in February 1979.

The 3M System

Whilst other systems are being developed and are commercially available the 3M system was the first to be so giving one channel of audio per track of tape. In effect the 3M system was designed so that it could fit in with studio equipment in the same way as the multitrack analogue recorder. The one track per channel configuration was developed as a result of joint co-operation between 3M and the BBC, the latter of which have had considerable experience with digital techniques in their PCM systems, used for sending broadcast material from studio centres to transmitting sites.

The recording process works by sampling the analogue waveform at a frequency of 50, 48 or 44.1 kHz. Each 1/50,000 second point in the waveform is assigned a numeric amplitude value using a 16 bit binary word. Two words are created, each representing the same sample of analogue information and a further parity word is created by comparing these first two words. All the data is spatially separated on the recording tape.

The reason for this is very simple. Every square inch of digital tape contains 890,000 separate magnetic bits of information. At a tape speed of 45 ips the number of write-ins and readouts could be as high as forty million. A small quantity of dirt or a tape blemish could cause a drop out of vital data which on playback would manifest itself as distortion or clicks.

By spatially separating the two sample words and the parity word, it is statistically unlikely that a blemish or dirt on the tape will be able to prevent reconstruction of the encoded data.

Playback of data to reconstruct the analogue signal is not dependent on the mechanical variations of the tape transport system. A time base corrector with a crystal controlled clock gates the digital words out of a playback memory providing precise even timing and completely eliminates wow and flutter. Minor variations in tape speed are servo controlled by the electronics of the readout circuitry which prevents lags of data input or pile-ups of data output.

Although recording in the digital domain enabled much higher standards to be achieved in terms of recording quality, the technique prevented conventional editing methods from being used. In conventional studio recording the multitrack master tape is mixed down to two track stereo tape — of the quarter inch format. The editing process consists of assembling takes by a cut and splice method — a tricky process and choosing suitable edit points is a matter of experience. It is easy to cut on something percussive such as a drum beat for instance but you never cut in the middle of something stringed, or on reverberation.

Editing: Initially all digital recordings had to be transferred to analogue for editing until a suitable electronic editing process could be developed. The process resembles the dub editing technique which is used to edit video tape where again cut and splice techniques are not applicable.

Electronic editing has the advantage that the tape remains untouched and unaffected by the magnetic properties of the razor blade and even the best edits using the analogue approach are subject to some degree of "drop out".

The other advantage to electronic editing is that the edit point can be auditioned and refined with variations as small as one millisecond. Two machines are necessary for the editing process linked by an editing unit. When a pair of edit points are thought to be final, the edit can be previewed. The preview edit function causes the first machine to play up the first edit point, mutes its sound whereby the sound then comes from the second machine. The tapes can be programmed to move backwards and forwards across the edit point to allow the edit to be further refined if necessary before commiting the edit.

Performance: As described the 3M digital recording system has an outstanding signal to noise ratio of 90dB plus, which means a complete lack of tape noise. The dynamic range is also very great, which enables very low levels of sound to be recorded with high level sound without resorting to the use of compressors and eliminating the distortion associated with these devices.

Improved Disc Cutting: The digital delay process employed in the 3M system has lead to improved disc cutting. Where there are particularly loud passages in music the disc cutting lathe pitch has to be set so that the disc grooves are more widely spaced than in quiet passages. It is possible to feed a direct signal to the pitch control and a delayed signal to the disc cutter so that the cutting process is automatically regulated. This leads to more efficient use of the disc surface.

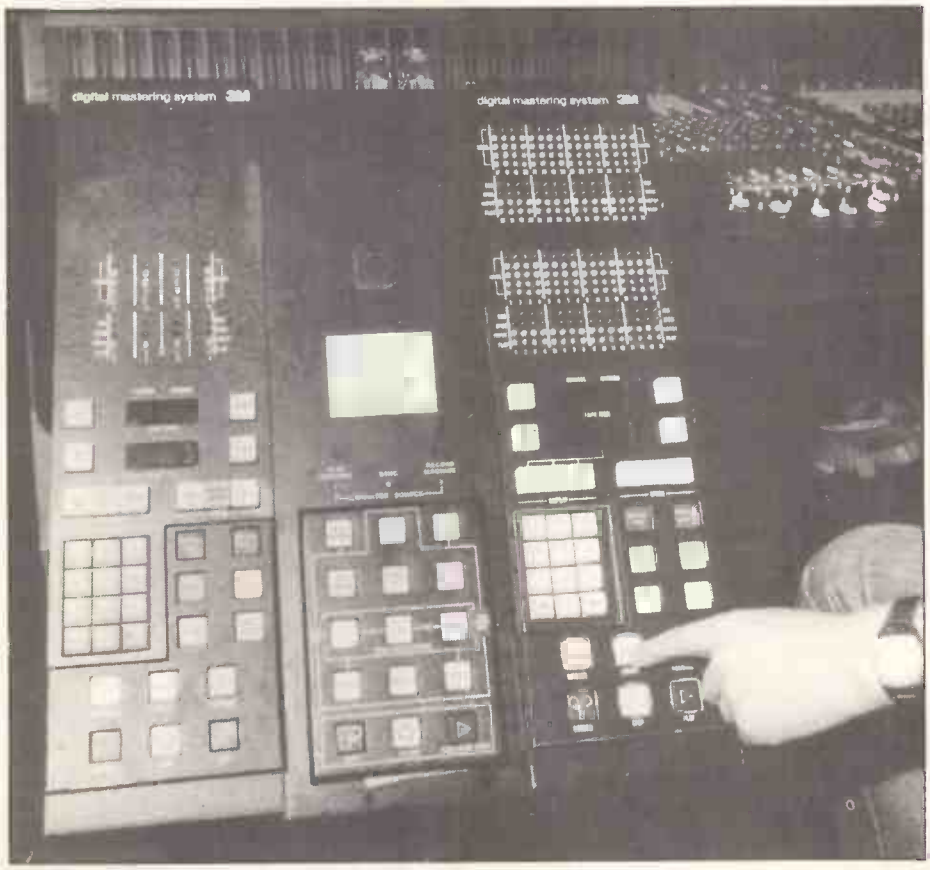
Uptake

There are currently more than sixty 3M digital recorders at work in recording studios in the USA and Europe. Studio rates on digital are higher than on conventional analogue recordings but then the results are superior. It's hardly surprising that in the Rock Music World a handful of top artists including Rod Stewart, Christopher Cross and Abba have used the system. On the other hand classical recording companies have been very keen to use the system. The reason for the outstanding quality of the recording process is the superior life of the master tape. The average rock album is deleted after a year but classical recordings have a life of ten years or more and it's important to produce a master tape of superior quality if several disc cutting masters need to be derived from it.

In the UK, once the heart of the music business, the uptake of digital has been confined to just two studios, Roundhouse Studios in London and now Lodge Studios in Suffolk. This attitude will have to change very soon. Most of the top Japanese hi-fi manufacturers have been demonstrating compact digital audio disc players and are committed to launching these products on the market within the next year. The compact digital audio disc, optically scanned and digitally encoded, enables the sound to be reproduced with the highest possible fidelity. What's more the disc is free of problems like static, scratching and dust so it won't wear out.

In order for recording companies to get the best possible results from the compact audio disc, it will be necessary for them to go digital and master using a digital recording process. According to Peter Gallen, Studio manager at Roundhouse Studios, this is where the 3M system will do well. "The 3M digital mastering system is the only digital system that has really been tested in studio conditions and it's the only one that is really compatible with multitrack analogue systems," he said. Roundhouse have been using the 3M digital system since 1980 and in two years their business has increased, despite the general downturn in the pop music business. They've also achieved a considerable degree of artistic success with the band 'Haircut 100' who've recorded their hit album and singles on the digital system.

Lodge Studio manager Lester Mortimer is also convinced that the digital boom is just a short way off. At the recent Association of Professional Recording Studios Exhibition he said that multitrack analogue had been pushed as far as it could go and that digital was now the only way forward. **E&MM**



This control panel makes the razor blade and sticky tape redundant. Using the 3M system, an edit can be rehearsed and refined by as little as a millisecond.

Micromusic

Musical Frequencies Table

by Per Hartmann

Here's a very useful program for anyone owning a micro and dabbling in music technicalities. Certainly, once you start tuning instruments, you'll find a knowledge of note frequencies most desirable. It's written in BASIC and will run with minimal changes on most micros.

The program prints a table of frequencies in linear steps that you can specify. When the program is entered, you simply state the start frequency in Hertz (variable FO) and the step size in Cents (variable C). There are 100 Cents in every semitone, corresponding to the black and white notes on a piano. If you require a table of descending frequencies, then quote negative cents.

Try this on your new Spectrum!

The listing here is for the Sharp MZ-80K and the main point to watch for is that you enter 0's or Ø's correctly. When using a Sinclair (e.g. Spectrum), make the following changes: Line 5 should be CLS; lines 20 and 95 insert GO TO after THEN; lines 35, 85, 120, 125 and 145 statements should start with LET; lines 80, 135 and 140 insert LET after THEN; and finally insert new statement at line 106 LET C1=Ø.

Example 1 shows 1 octave in semitone steps from A=440 (A above middle C).

Example 2 shows 8 octaves in octave jumps from A=55.

Example 3 shows 2 octaves in quartertone steps descending from E=1320. **E&MM**

```
5 CLR
10 GOSUB 50
15 GOSUB115
20 IF ABS(C1/0)>1200THEN45
25 IF(C1/1200)=INT(C1/1200)THEN GOSUB 130
30 PRINT TAB(0);F1;TAB(12);C1
35 FO=F1
40 GOTO 15
45 STOP
50 REM HEADING
55 PRINT "THIS PROGRAM PRINTS A TABLE OF"
60 PRINT "FREQUENCIES IN ANY SIZE LINEAR"
65 PRINT "STEPS. NEGATIVE CENTS FOR DOWN."
70 PRINT "By PER HARTMANN."
75 INPUT "ENTER START FREQUENCY(Hz)";FO
80 IF FO<1 THEN FO=220
85 P=FO
87 REM 100 CENTS = EQUAL TEMPERAMENT
90 INPUT "ENTER STEP SIZE(Cents)";C
95 IF C=0 THEN 90
100 INPUT "HOW MANY OCTAVES";O
105 PRINT "Hertz","Cents"
110 PRINT TAB(0);FO;TAB(12);C1
112 RETURN
115 REM SUB TO COMPUTE F1 FROM CENTS
120 F1=ABS(FO*(EXP(5.77633E-04*C)*SGN(C)))
125 C1=C1+C
127 RETURN
130 REM SUB TO RECTIFY ROUNDING ERRORS
135 IF C<0 THEN F1=P/2
140 IF C>0 THEN F1=P*2
145 P=F1
147 RETURN
150 END
```

Musical Frequencies program listing.

```
THIS PROGRAM PRINTS A TABLE OF
FREQUENCIES IN ANY SIZE LINEAR
STEPS. NEGATIVE CENTS FOR DOWN.
By PER HARTMANN.

ENTER START FREQUENCY(Hz) 440
ENTER STEP SIZE(Cents) 100
HOW MANY OCTAVES 1
Hertz      Cents
 440          0
 466.16424    100
 493.88432    200
 523.25275    300
 554.36756    400
 587.33257    500
 622.25783    600
 659.25989    700
 698.46224    800
 739.99574    900
 783.99898    1000
 830.61885    1100
 880          1200
END
```

Example 1.

```
ENTER START FREQUENCY(Hz) 55
ENTER STEP SIZE(Cents) 1200
HOW MANY OCTAVES 8
Hertz      Cents
 55           0
 110          1200
 220          2400
 440          3600
 880          4800
 1760         6000
 3520         7200
 7040         8400
 14080        9600
END
```

Example 2.

```
ENTER START FREQUENCY(Hz) 1320
ENTER STEP SIZE(Cents)-50
HOW MANY OCTAVES 2
Hertz      Cents
 1320         0
 1282.4215   -50
 1245.9128   -100
 1210.4435   -150
 1175.9839   -200
 1142.5053   -250
 1109.9798   -300
 1078.3803   -350
 1047.6804   -400
 1017.8544   -450
 988.87756   -500
 960.72564   -550
 933.37517   -600
 906.80332   -650
 880.98794   -700
 855.90748   -750
 831.54102   -800
 807.86825   -850
 784.8694    -900
 762.5253    -950
 740.8173    -1000
 719.7273    -1050
 699.2377    -1100
 679.33141   -1150
 660         -1200
 641.21075   -1250
 622.9564    -1300
 605.22173   -1350
 587.99194   -1400
 571.25266   -1450
 554.98991   -1500
 539.19015   -1550
 523.84018   -1600
 508.92721   -1650
 494.43878   -1700
 480.36282   -1750
 466.68758   -1800
 453.40166   -1850
 440.49397   -1900
 427.95374   -1950
 415.77051   -2000
 403.93412   -2050
 392.4347    -2100
 381.26265   -2150
 370.40865   -2200
 359.86365   -2250
 349.61885   -2300
 339.6657    -2350
 330         -2400
END
```

Example 3.

"...the quality of the colour display is excellent". Popular Computing Weekly.
"The graphics facilities are great fun". Personal Computer World.
"...the Spectrum is way ahead of its competitors". Your Computer.

"The world's best personal computer for under £500."

Clive Sinclair

Sinclair ZX Spectrum
16K RAM £125, 48K RAM £175.

This is the astonishing new ZX Spectrum – a powerful professional's computer in everything but price!

There are two versions – 16K or a really powerful 48K. Both have a full 8 colours, sound generation, a full-size moving-key keyboard and high-resolution graphics. Plus established Sinclair features such as 'one-touch' keyword entry, syntax check and report codes!

Key features of the Sinclair ZX Spectrum

Full colour – 8 colours plus flashing and brightness-intensity control.

Sound – BEEP command with variable pitch and duration.

Massive RAM – 16K or 48K.

Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.

High resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.

ASCII character set – with upper- and lower-case characters.

High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY and MERGE for programs and separate data files.

The ZX Printer – available now

The printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

ZX Microdrive – coming soon

Each Microdrive will hold up to 100K bytes on a single interchangeable microfloppy – with a transfer rate of 16K bytes per second. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum – they're available later this year, for around £50.

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEPOST – use the coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

sinclair
ZX Spectrum

Sinclair Research Ltd,
Stanhope Road, Camberley, Surrey, GU15 3PS. Tel: Camberley (0276) 685311.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR. **Order**

Qty	Item	Code	Item price £	Total £
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			TOTAL £	

Please tick if you require a VAT receipt ☐

*I enclose a cheque/postal order payable to Sinclair Research Ltd for £

*Please charge to my Access/Barclaycard/Trustcard account no. Please print.

*Please delete/complete as applicable.

Mr/Mrs/Miss

Address

FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application. EMM 809

America

Jerry De Muth

"I do believe most of the output of the American plastics industry goes into cheese," English business writer John Michael Allsopp remarked to me in Miami Beach last November while holding a floppy yellow sheet that, if of larger dimension, would have made an excellent pad for a set of drums.

Well, in recent years, more American plastic has been going into basses and guitars. There have long been cheap plastic guitars, instruments that bore no more resemblance to their non-plastic models than American cheese resembles English Stilton, but recent plastic basses and guitars have been top quality instruments.

Steinberger Model L-2/5 Five String Bass.

One of the most successful has been the Steinberger bass, which was introduced two years ago by Ned Steinberger. Now his firm has introduced a new design, Model L-2/5 five-string bass. Like its four-string predecessor (see review E&MM, July, 1982) it is made of epoxy resin reinforced with graphite and glass fibre. (Traditionally, many cheap plastic guitars and basses have used acrylic resin which produces a body that has a striking glass-like transparency but offers poor acoustic properties).

The five-string can be strung in either low B or high C tuning without risk of bending or warping, according to Steinberger, and will take double ball-end strings for instant changing, as well as conventional strings. It is equipped with two low-impedance pick-ups, the Steinberger pivot plate and a snap-on leg-rest for playing comfort. All these features are contained within the dimensions of a standard bass neck.

An alternate model, the L-2/5A, is equipped with Active Equalisation and has controls for volume, pan, treble boost/cut and bass boost/cut.

The Steinberger bass' appearance is unique because the neck appears to have been chopped off since the tuning machinery is at the body end of the instrument. This made it possible to increase the mass and rigidity of the neck area to improve the sound yet avoid having an instrument that is neck-heavy and off-balance. Accurate tuning is accomplished by means of a simple, threaded rod and knob which cannot accidentally de-tune.

Last January, the original Steinberger bass, which has been played by bassists with the Rolling Stones, The Who, The Cars, The Dregs, Prime Time and Miles Davis, received the Society of the Plastics Industry's blue ribbon award in the consumer market category. The same month it won Time magazine's Best of 1981 Industrial Design award.

The SPI award praised the use of epoxy resin reinforced with glass and graphite fibres which, the awards committee said, "gets the credit for the guitar's improved harmonics and acoustic dynamics, not to mention its light weight and innovative design."

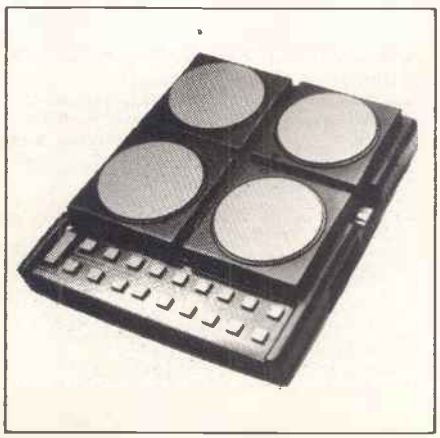
Last year it won the Industrial Designers Society of America's Industrial Design Excellence Award which noted that the bass did not "imitate the look, feel and sound of its acoustic parent."

More traditional electric instruments are the Les Paul, Stratocaster and Flying V guitars. But as produced by Phased Systems, they are two-thirds size, the Series II, and three-fourth size, Series III, versions. The mini Les Pauls have a single pickup and single volume and tone controls. The Strat has two single coil pickups, a single volume control, a single tone control and a three-way switch. The Flying V has a single pick up and volume control. Suggested prices start at $195 for Series II and $229 for Series III instruments.

Percussion

New materials, as well as electronics, have been coming to the percussion field, as well as to stringed instruments, as was underlined at last June's National Association of Music Merchants Expo in Atlanta.

A built-in micro computer enables even beginners to achieve professional-like sounds on the compact Synsonics Drums, introduced by Mattel Electronics. They can be plugged into an instrument amplifier or home stereo system. And, powered by batteries, they can be taken and played anywhere. A headphone attachment even makes it possible to not disturb anyone else.



Mattel Electronics Synsonics Drums.

Synsonics Drums features four drum pads arranged like a real drum set — snare, tom tom, cymbal and bass drum. They are played by either striking four pressure-sensitive pads with hands, fingers or drumsticks or by pressing individual control buttons, three for each drum. The drums can be tuned, the cymbal's sounds changed and a programmable record mode makes it possible to play back drum patterns individually, blended in sequence or layered indefinitely.

A new set of wood drums, the Gato Drum, has been introduced by S. E. Overton Co. They are all wood with mahogany tops, a clear redwood sound chamber and a hand-rubbed furniture oil finish.

Hand-rubbed oiled woods also are used for Camber U.S.A.'s new temple blocks, the Quintet. The system is comprised of five tone chambers of mahogany, oak and maple that fit any conventional accessory or cymbal stand.

Keyboards

Meanwhile the sounds and programs available to keyboardists has been expanded with the introduction of a new digital, polyphonic synthesiser from Moog Music and the improvement of an existing one by Kinetic-Sound.

KineticSound's the Prism, which was first described in these pages last December, has a new flexible 8-track, 8,000-note sequencer that enables a performer to record up to eight different passages on different tracks and then, if desired, play back any or all of them at entirely different speeds. Track transposition and tempo change are totally independent of each other. A recorded passage can be played back as any of eight instruments. And the playback speed can vary from 25 per cent to 400 per cent of recorded speed without pitch or timbre change.

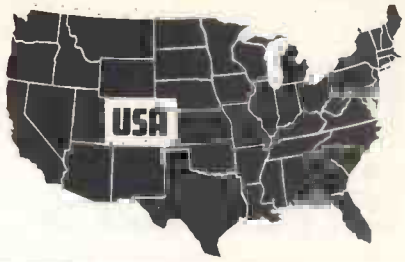
Tracks can also be edited note-by-note and mixed together to produce one perfectly balanced performance. Further, one or more tracks can be designated to automatically repeat completed passages. There is also a tempo cue that enables one to program an eight-pulse downbeat with time intervals from a tenth of a second to 10 seconds.

The improved digital bubble-memory offers built-in roadability with no moving parts to jam, break or become misalgined, no batteries that can fail, no floppy disks to get damaged or lost and no possibility of dirt or stray magnetism corrupting sounds.

The Prism, as before, has 24 voices, expandable to 40 and two five-octave, 61-note keyboards.

Moog's new Memorymoog is a six-voice programmable polyphonic synthesiser with each voice employing a signal path similar to the Minimoog. Each voice has three oscillators with adjustable and combinable waveforms routed through a mixer to the Moog filter. The filter and the voltage-controlled amplifier are each controlled by four-part contour generators.

The 61-note keyboard has several selectable keyboard modes that, depending on the



Memory Moog.

mode selected, allow long notes to complete themselves uninterruptedly or let repeated notes be sounded by the same voice. The hold function memorizes a chord of up to six voices and enables that chord to be played by one key.

The Memorymoog has extensive voice modulation capabilities, several unique contour options and can store 75 patches or programs that can be recalled by entering the number of the program directly into the system controller. Further, 20 program chains of 10 programs each can be stored and recalled with a footswitch. Two programmable footpedal inputs can control pitch, filter cut-off frequency, modulation amount, sync sweep and volume.

Combo Organs

Meanwhile, portable combo organs continue to add new features and sound capabilities.

Boss Micro Mixer.

Music Technology's new Crumar T3 organ features two four-octave manual C to C keyboards. Sounds available include organ, electronic piano and strings. The string section can have independent crescendos for each key depressed and has a built-in phase shifter which can be swept automatically or locked at any phase angle.

An assortment of pedals allows various sections of the T3 to come under pedal control. Multiple outlets let the player amplify each section separately, and a signal out function is also supplied for processing sounds through devices such as phase shifters, the Master's Touch wind controller and other devices.

Automatic accompaniment of bass, guitar and piano effects are supplied with the T3 and an optional rhythm accompaniment section whose sounds include cymbals is available.

The Crumar T3 lists here for $2,950 with the rhythm accompaniment unit and for $2,350 without it.

The number of battery-powered, mini-amps continues to grow. Kaman Music Distributors has just added a new battery-powered mini-amp to its Memphis line. The PS-200MB Memphis AC/DC mini-amp measures 7½ inches by 7¼ inches by 4 inches and weighs only 3½ pounds. The unit has a 4 inch 8 watt speaker, separate volume and tone controls, high and low input jacks, a line out jack and a three-way switch — off, AC, DC. It operates on either eight AA batteries or 115 volt AC.

Small size also has come to mixers and Boss's new KM-04 Micro Mixer measures only 5 inches by 3½ inches by 1½ inches and weighs less than a pound. A support bar under it prevents it from being tipped over by the weight of the four input and one output plugs.

Each of the four inputs is varied by individual channel volume controls and the overall volume is varied by the master volume control. A peak level indicator warns of potential distortion causing conditions. The high input and output impedance make the KM-04, which carries a list price of $70, ideal for line mixing applications, multi-keyboard use, drum miking and many other uses. **E&MM**

Manufacturers and Companies mentioned:

Boss Division, Roland Corp., 2401 Saybrook Ave., Los Angeles CA 90040 & Roland UK Ltd., Great West Trading Estate, 983, Great West Road, Brentford, Middlesex. Camber U.S.A., 101, Horton Ave., Lynbrook NY 11563. Kaman Music Distributors, P.O. Box 1168, San Carlos CA 94070. Kinetic Sound, Kinetic Systems Corp., 11 Maryknoll Drive, Lockport IL 60441. Mattel Electronics, 5150, Rosencrans Ave., Hawthorne CA 90250. Moog Music, 2500 Walden Ave., Buffalo NY 14225 & Lintis View Estate, Port Seaton, East Lothian, Scotland. Music Technology Inc., 105, Fifth Ave., Garden City Park NY 11040. S.E. Overton Co., 229, Eklenburg St., South Haven MI 49090. Paiste America Inc., P.O. Box 1027, Brea, CA 92621. Phased Systems, P.O. Box 38042, Hollywood CA 90038. Rogers Drums, Fender/Rogers/Rhodes/Squier, 1300 Valencia, Fullerton CA 92631 & CBS/Arbiter Ltd., Fender House, Centenary Estate, Jeffery's Road, Brimsdown, Enfield, Middlesex. Steinberger Sound Corp., 63, Tiffany Place, Brooklyn NY 11231 & Soundwave, 66, Victoria Road, Romford, Essex.

The Prism. Performance-orientated digital synthesiser.

Pearl Effectors

Pearl are the latest Japanese company to offer the musician their idea of the ultimate choice in sound processors. These units are intended to be used with guitar, bass, vocals, keyboards or any other signal which terminates in a ¼" jack plug.

The range is split into two sections; firstly, five 'Sound Splice' processors which include Flanger, Chorus, Phaser, Compressor and Overdrive and secondly, three 'Sound Choice' dual-programme processors Chorus Ensemble, Analogue Delay and Phaser.

Each effect is packaged in a very attractive matt black die-cast aluminium case, the pedal switch being formed in die-cast zinc. The control pots are smooth with positive action, the panel layout is clear and simple, and even the knobs have been specially shaped to feel comfortable between the fingertips and to complement the rounded contours of the case. A 'chunky' rubber pad attached to the base ensures stable operation of the pedal.

Power is supplied, when the input jack is inserted, by the standard PP3 battery or from an optional mains adapter which can be connected via a DC socket at the rear of the case. The pedal is a press-on/press-off type with the electrical switching performed by a CMOS FET circuit, which helps to prevent obtrusive transients caused by mechanical switching. Status indication is provided by a red LED above the switch.

Sound Splice Processors

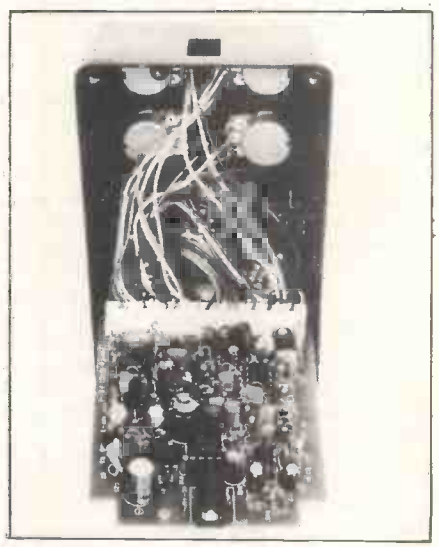
The pedals may look and feel great but the important thing is, what do they sound like? Starting with the 'Sound Splice' effectors, they performed as follows.

Flanger

The Flanger uses a 1024 bit bucket-brigade delay (BBD) line to provide a delay of between 1.8 and 20mS. The delayed signal is added to the incoming signal to produce a notch spectrum characteristic of flanging.

All of the range have four parameter controls above the LED. In the case of the Flanger these parameters are: *Manual* which sets the BBD clock frequency (i.e. delay time) and therefore shifts the centre point of the comb filter, *Feedback* which adjusts the amount of delayed signal which is reprocessed, and the modulation controls, *Speed* which can be varied from one cycle every twelve seconds to ten cycles per second and *Depth* which controls the amount of modulation.

These controls allow a wide range of unusual effects to be obtained, and with careful adjustment can include Phasing, Flanging, Metallic reverb and even Chorus.



Internal view of the Flanger.

The *Feedback* control has to be set with care, as with most flangers of this type, since settings above seven cause the circuit to oscillate. Setting the pot just before oscillation provides a very deep 'metallic' sound which, when used with no modulation, creates a very interesting 'vocoder' type effect on vocals.

Chorus

The chorus unit also uses a BBD chain to provide the analogue delay of between 1.8 and 11.5mS. In this application, however, the delay is used to produce pitch modulation or vibrato.

The four controls provided are: *Speed* of modulation which can be varied from one cycle every three seconds to ten cycles per second, *Depth* which varies the amount of pitch modulation, *Mix Balance* which can be adjusted from all input to all effect and *Tone* which provides treble cut.

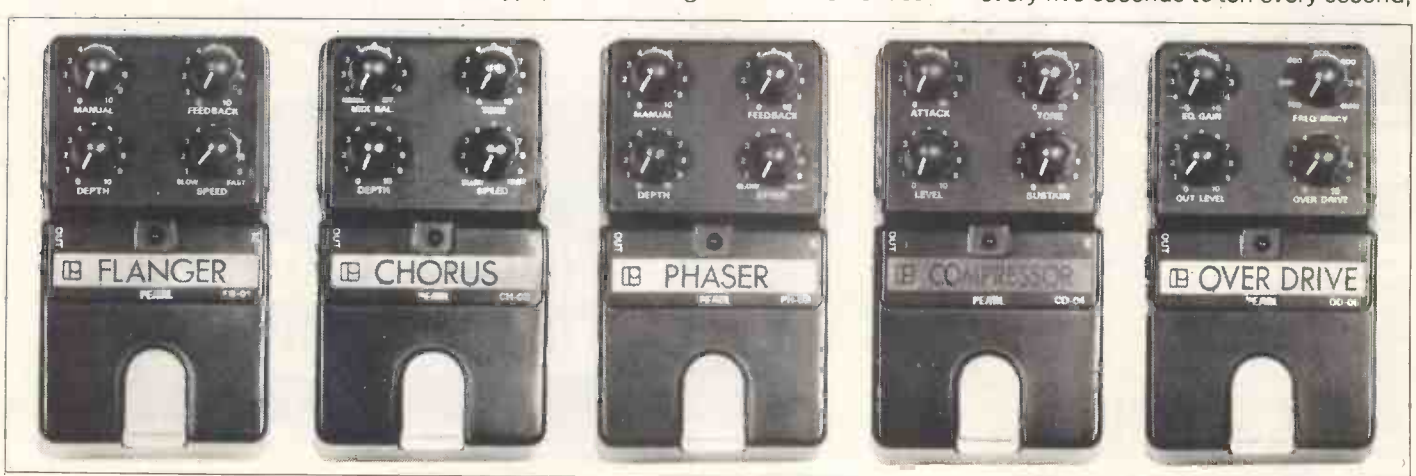
The *Mix Balance* control is very valuable, and when used in conjunction with the *Depth* control, can produce many pleasing chorus sounds. Care must be taken in setting *Depth* as the control is rather coarse. It would be better to have less modulation depth available to allow finer adjustment of the chorus effect to be made.

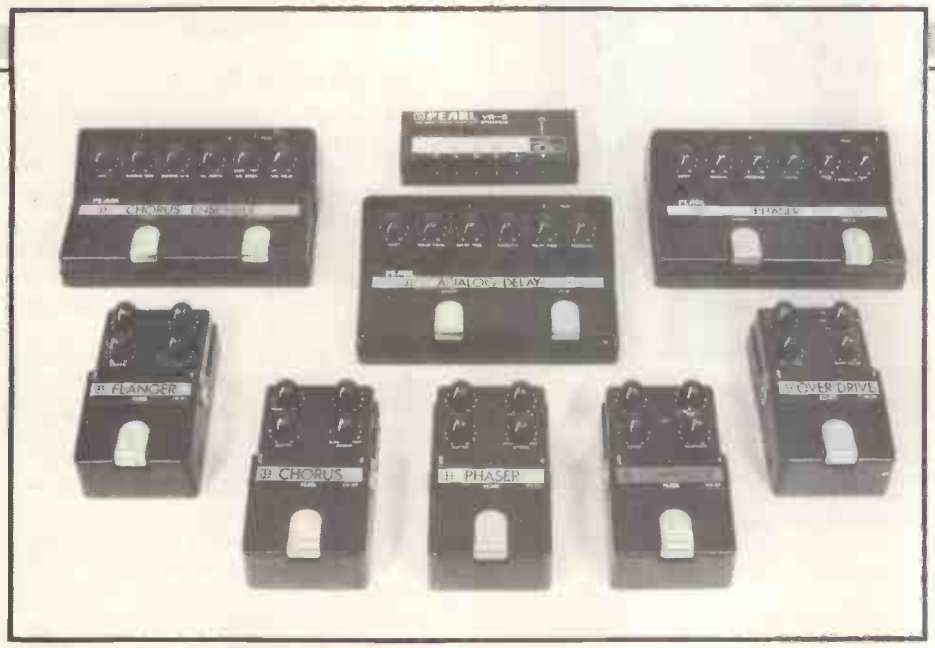
The *Tone* control is also a useful addition since without noise reduction circuitry the BBD line is noisy.

Phaser

The Phaser circuitry produces two notches in the output frequency spectrum. When these notches are moved up and down the spectrum the phase cancellations which take place audibly produce the characteristic 'jet-plane' phaser sound.

The four parameters which can be adjusted are: *Manual* which adjusts the centre point of the notches in the spectrum, *Feedback* which increases the peaks and troughs of the notches, and the modulation controls, *Speed* which can be varied from one sweep every five seconds to ten every second,





The complete Pearl Effector range.

and *Depth* which controls the range of the sweep.

The phase effect produced is very warm and mellow suiting many different playing styles. The *Feedback* and *Manual* controls are very useful for tailoring the sound but phased circuit noise is evident even with no input signal.

Compressor

This unit uses a transconductance amplifier to control the gain of the circuit, limiting excessive peaks, such as those found when finger-picking, and amplifying small signals to provide a measure of sustain on decays.

The four controls are: *Attack* which allows the speed of the compressor action to be adjusted, *Tone* which provides treble cut, *Sustain* which controls the extent of compressor operation and *Level* which obviously adjusts output signal level.

The Compressor works satisfactorily and with the *Attack* up full creates a very 'punchy' sound.

Overdrive

This is an interesting unit which combines parametric equaliser and distortion circuits. The parametric sections can be configured as a band-pass or band-stop filter.

The controls provided are: *EQ Gain* which adjusts the filter gain by ±15dB, *Frequency* which sets the filter centre point between 100Hz and 4kHz, *Overdrive* which adjusts the level of distortion and *Output Level* with a gain of 40dB.

The parametric section may be used separately by setting the *Overdrive* control to zero and adjusting *Gain* and *Frequency* to suit. The distortion section can also be used separately by setting the *Gain* of the equaliser to zero.

The range of effects possible is very wide including an almost 'valve' sound when used with a transistor amplifier, but watch out for noise with the equaliser on full boost at high frequencies.

Sound Choice Processors

The following three effects belong to the 'Sound Choice' range, which allow two sound settings to be selected with a second footswitch.

Chorus Ensemble

The Chorus Ensemble can be used in two modes. The first, *Program I*, produces a chorus effect with rate variable between one cycle every fifty seconds to four cycles per second. The second, *Program II*, features chorus with the same rate range, chorus ensemble (which is chorus with vibrato) and delayed vibrato or delayed ensemble.

The controls provided are: *Input Level* which should be set with the aid of the *Peak* LED, *Chorus Rate I, Chorus Rate II, Vibrato Depth, Vibrato speed* which is variable between 1.5 and 8Hz, and *Vibrato Delay* (with an integral on/off switch) which varies from 0 to 1.5 seconds. The *Program I/Program II* status is displayed by an LED above the selection switch.

The programme selection switch is also used as the delayed vibrato trigger when *Vibrato Delay* is on.

There are two outputs provided on the back panel. When each socket is used individually *Output 1* is used for chorus and vibrato and *Output 2* for vibrato only. When both sockets are used together *Output 2* now becomes an out of phase version of the chorus signal to provide an enhanced stereo image.

The unit can provide some very thick sounds when chorus and slight vibrato are added together. The delayed vibrato feature is very useful for adding expression to sustained notes or chords but the maximum delay time of 1.5 seconds could be extended.

Analog Delay

The Analog Delay unit uses a BBD yet again to provide delays from 20 to 350mS. With this unit the player can select between two delay settings with the program change switch.

The six controls are: *Input*, used to adjust input signals to below the Peak level, *Delay Level* which alters the amplitude of the delayed signal, *Program I* controls; *Delay Time I* which adjusts the BBD clock frequency and *Feedback I*, which sets the amount of reprocessed delay signal and *Program II* controls; *Delay Time II* and *Feedback II*.

The two outputs provided are *Direct* and *Effect* for use in stereo systems or external mixes.

The problem with analogue delays of this type is the compromise which has to be made between delay time and input bandwidth. Pearl seem to have decided that the delay time is more important and have limited the top end of the frequency range to 4kHz to provide a maximum delay of 350mS. As a result the delayed signal tends to sound 'dull' especially with 'bright' signals such as guitar or synthesiser.

However, the unit is quiet in operation, utilising a compander for noise reduction, and for general reverbs or short delays is quite satisfactory.

Phaser

This box is similar in operation to the phaser described earlier except that the circuit produces four notches in the output spectrum making the phase effect more pronounced. The unit has similar control parameters except for the Speed which can be adjusted between two settings. *Program I* is the slow speed which can be varied from one sweep every thirty seconds to three sweeps per second. *Program II* is the fast speed which can be varied from three sweeps per second to eighteen per second. The rate selected by the programme switch does not change instantaneously but gradually. Therefore switching between speeds produces 'wind-ups' and 'wind-downs' just like those produced by a rotating speaker.

The controls provided are: *Input* level, to adjust the instrument level below the *Peak* setting, *Manual* which adjusts the position of the notches, *Feedback* which accentuates the depth of the effect by increasing the peaks and troughs of the notches, *Depth* which sets the amount of modulation, and the programme options; *Slow* and *Fast Speed*.

Two outputs are again provided for use with stereo systems. Both outputs contain the dry signal but with phase opposing phase shifted outputs.

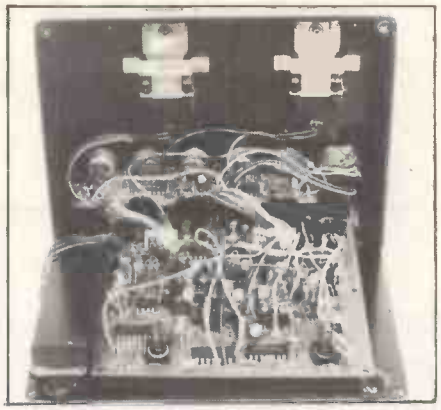
Optional Accessories

Although all of the boxes have their own internal battery supplies they each have provision for AC adaptors. The 'Sound Splice', processors require 9V while the 'Sound Choice' processors require 12-18V. Pearl supply two adaptors for this purpose the AC-90 and the AC-120.

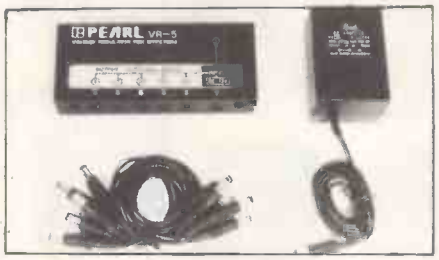
If you decide to buy several of the small effects you can use one 12V supply in conjunction with the Voltage Regulator VR-5 which provides five 9V outputs from one 12V input. The VR-5 is supplied with all of the connections required.

The three 'Sound Choice' units have provision for external footpedals for remote switching. The FS-1 is a single footswitch and the FS-2 a double. Either of these can be used to provide remote switching which means that the effects box could sit on your amp or somewhere else near to hand for quick and easy setting changes.

Lastly, an Extension Plug EP-1 can be used to create a stereo output from single output effectors, and a specially moulded rubber ring can be supplied to go over any of the control knobs for foot operation — neat idea!



Internal view of the Chorus Ensemble.



AC adaptor and Voltage Regulator.

Conclusions

Although Pearl have not introduced any technical innovations in the design of these effects they have produced a range of processors which are well engineered and playable.

Some of the effects tend to be noisy but a trade-off has to be made between the processed signal bandwidth and circuit noise (within reason!).

The voltage regulator, separate adaptor and five supply leads is not really the answer to the power supply problem for stage use. The musician really needs to have some form of interconnection board for both power and signal paths.

Overall the effects offer good value for money, are attractively styled, mechanically sound and, above all, musically creative.

Kenneth McAlpine **E&MM**

Summary

Unit	Order Ref.	Retail Price (inc. VAT)	Comments
Flanger	FG-01	£65	Good for normal flanging sounds and 'weird' metallic effects with manual setting.
Chorus	CH-02	£61	Difficult to set a good chorus sound without vibrato, but good range of modulation.
Phaser	PH-03	£50	Excellent variable phaser sound due to the inclusion of a feedback control — recommended.
Compressor	CO-04	£47	With attack/sustain controls good range of effects can be produced. Excellent for maintaining signal levels without noise.
Overdrive	OD-05	£43	Comprehensive distortion unit en-enhanced with the addition of Parametric EQ.
Chorus Ensemble	CE-22	£114	Very wide range of thickening and modulation options with a very expressive delayed vibrato section.
Analog Delay	AD-33	£129	Good range of delay parameters but delayed signal sounds less 'bright' than input spoiling the effect.
Phaser	PH-44	£97	Our favourite effects pedal in the range with the best electronic simulation of a rotating speaker we've heard.
Voltage Regulator	VR-5	£29	
9V AC Adaptor	AC-90	£8	
12V AC Adaptor	AC-120	£8	
Single Footswitch	FS-1	£13	
Double Footswitch	FS-2	£13	

Specifications

Sound Splice	
Input impedance	1M
Output impedance	10k
Dimensions (mm)	57 x 79 x 136
Weight (gms)	480
Sound Choice	
Input impedance	470k
Output impedance	10k
Dimensions (mm)	180 x 61 x 136
Weight (gms)	930

The Music Press called it '******** amazing'. We just call it CasioMagic!

The *'it'* they were referring to was the price of Casio's new digitalised synthesiser, the CT1000P. At **£375** rrp it's to be expected that they were amazed, although, as Keyboards and Music Player commented: *'...but then Casio has honed the art of cost effective design to such a degree that the price isn't really that surprising.'*

casiotone 1000P
£375 r.r.p.

Presets

So what is the CT1000P? In fact it is a *'cross between a preset and programmable machine'* (International Musician). The Preset mode has ten voices which *'if played correctly can give astounding simulations of their namesakes.'* (Home Organist).

To these presets you can add effects. Such as sustain, and light, heavy and delayed vibrato. Delayed vibrato operates independently for each voice – in other words, you can play and hold one note and the vibrato will gradually introduce itself, *'so a very nice subtlety here for the Casio – no cut corners.'* (Keyboards and Music Player).

Programmes

The Programmable mode is shown in more detail here and whilst it would take too long to explain, briefly you can combine any of ten 'feet' with any of ten 'envelopes' and any of ten 'modulations' thus giving you a basic choice of 10 x 10 x 10 ie: 1000 sounds (thus the 1000P!).

When you've selected a combination you can load it and nine others into the CT1000P's memory in addition to the ten presets. As Musicians Weekly put it *'not bad, eh?'*

Split Keyboard

You can also split the 61 note, C to C keyboard, using the lower half for one preset and the upper half for a different preset.

Arpeggio/Sequencer

One more feature unique to Casio is the programmable Arpeggiator. It can store up to 127 steps and *'can be more accurately described as a sequencer.'* (Home Organist).

The CT1000P also has a battery back up so that you can keep any of your programmed voices when the machine is switched off, a built in amplifier and speaker, a headphone socket for silent play, and an eight note polyphonic capability.

To sum up, we'll leave the last word to all the publications we've quoted from. *'An instrument and a half'* International Musician. *'What an instrument,' 'What a price!'* Musicians Weekly. *'An incredible instrument'* Home Organist. *'An amazing 10kg of instrument. What will they come up with next?'* Keyboards and Music Player.

CASIO

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Casiotone 1000P

In the tradition of the VL-Tones and the 701, the CT1000P digitalised synthesiser is yet another piece of Casio 'Magic' that is innovative in its access of sounds and arpeggio sequencing at low cost.

Its main difference from other synths lies in its sound programming function that offers the possibility of up to 1000 sound variations, with storage of ten programmed to your choice (even when it is switched off). The arpeggio/sequencer function stores up to 127 events, in addition to realtime arpeggio. A digital display is used for frequency tuning, transposition, tone storage and arpeggio indication. Ten preset sounds are also selectable along with the basic effects of vibrato and sustain. The 8-note polyphonic 5-octave keyboard can be split to give independent sounds for the lower 2 octaves and the upper 3 octaves. Like most of these home music making instruments, a built-in amp and speaker is included.

The instrument measures 11.7 x 91.65 x 36.35cms (HxWxD) and is smartly finished in 'velvet black' metal and plastic with silver trim. All the controls range in sections across the main panel from left to right: power switch, mode, arpeggio, tone program, effect, volume and speaker. On the rear panel are sockets for mono headphones, line output (1.4V max), AC mains power lead and external foot volume pedal and sustain switch. All the switch buttons except those in the tone program grid have LED indicators.

Internal layout is exceptionally tidy, with foam wadding round wires and boxed-in 4" speaker rated at 10W. Included with the instrument is a score holder (music rest!), dust cover and batteries that provide a year's back-up power for the memory chips.

Preset Operation

When the 1000P is switched on, the circuitry is reset and the display indicates a number from 0 to 9 for one of the ten presets normally available: Pipe Organ, Brilliant Organ, Bassoon, Wah Brass, Piano, Vibraphone, Celesta, Chime and Flute. These are individually selected by simply pressing one of the numbered buttons in the centre tone program section. Volume can be adjusted with the main volume rotary control for the whole keyboard in this initial mode.

As you'll probably realise from the choice of 'feet', plus a glance at an oscilloscope during playback, all the sound waves are nearly all smooth in appearance due to the use of anti-aliasing filters which clean up the digital waveforms.

There is no doubt that the actual sounds of the Casio presets are improving all the time: Pipe Organ fills in well on chords with a group or church music; Brilliant Organ has a bright, rich mixture for toccatas, fugues and Jon Lord solos; Jazz Organ puts a percussive punch to your playing for more jazzy and funkier pieces; Bassoon is a fair representation that uses added resonance; Wah Brass is not as brassy as it should be but it is useful as a back-line accompaniment; Piano has an enjoyable tone with a sharp percussive envelope. It's nice to compose with; Vibraphone and Celesta are both bright percussive instruments for occasional use (and the Dance of the Sugar Plum Fairy); Chime is really for bells and other 'atmospheric' playing; and Flute is a smooth tone for blending sounds together.

The sounds tend to have an 'organ drawbar with occasional percussion' feel about them and you'll have to keep an eye on the meters during recording as the volume changes considerably over the keyboard span (getting louder on the low footages descending). I missed the strings and the woody clarinets and these can't be programmed either, but you'll learn a lot about using footages and envelopes for a host of interesting sounds once you get on to the programming which more than compensates.

In the effects section there are 4 switch buttons selecting vibrato (either normal, delayed and heavy) and sustain (which in synth terminology is really a long release). Vibrato depth is set the same for normal and delayed, with the latter more musical in use, bringing in the effect after approximately 1 second. But heavy vibrato is over-strong in its modulation from a square wave and is only suitable as a 'weird' effect, especially as the modulation depth is fixed.

Split Keyboard

A sensible feature of any single manual keyboard instrument is a split facility, for allocating different sounds to lower and upper parts. In the mode section a 'split' button enables the lower 2 octaves to be balanced separately from the upper 3 octaves, using the lower volume control, although the 'main volume' pot still sets the final output level. Each split section has 4 note polyphonic playing and the lower part is raised an octave to give identical pitch from keyboard octaves 2 and 3. There is also a 'tone set' button that allows a choice of individual tone programs for left and right ranges when switched on or off. The sounds used can be either from the presets or your

CASIOTONE 1000P £325

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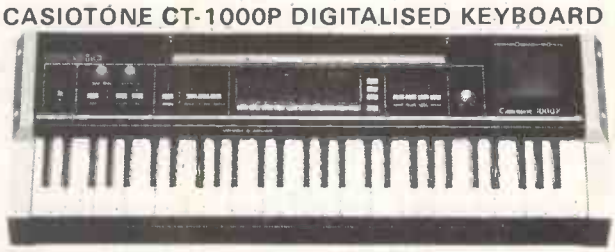
CASIOTONE CT-1000P DIGITALISED KEYBOARD



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CT-101. Similar to the 202 but with 25 voices, which, like the CT-403, include Piano, Organ, Harpsichord, Accordion, Xylophone, Chimes, Clarinet, Flute, Violin, Mandolin, Guitar and synths. 30⅜ x 11¾ x 4⅝ inches.

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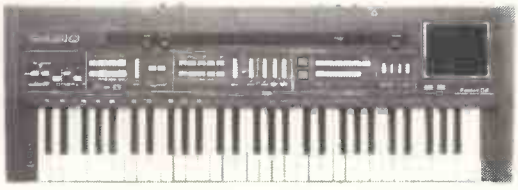

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own programmed sounds, with the addition of the arpeggio function in the lower part if desired.

Sound Programming

Now we come to the most important section — the tone program — which is set out as a visual data chart with a 10x3 grid that's squared off to show legended sound characteristics, either in words or shapes. Underneath the data chart are the 10 sound selection numbered buttons that do most of the programming. Each row of 10 'elements' corresponds to a different selection of FEET, ENVELOPE, and MODULATION. (See Figure 1).

First, the 'Program/Preset' button is pressed once to switch to program mode (pressing again reverts to Preset). The LED display will now add a hyphen between digits to indicate selection of a Programmed instead of Preset sound. Whichever number is selected at this point will show where your new sound is stored.

To enter a new combination of your own choice, Feet, Envelope, and Modulation buttons are pressed in turn, followed by the numbered selection button vertically in line with the chosen element. The LED display will change automatically to show each of the selected numbers as 3 digits from left to right.

The Feet elements let you choose the pitch for your sound, using combinations of 16', 8', 5⅓', 4', 2⅔', 2', 1⅗' and 1⅓' in very much the same way as a drawbar organ (except volume is fixed). The Envelope elements give a wide variety of sound shapes from fixed ADSR settings. Modulation elements then treat the frequency and/or amplitude in contrasting ways to produce Wah, Wait (pitch mod. to 5⅓' then 4'-2'), attack (delayed, upward pitch change or 5⅓' or 4' added percussion), extended sustain, treble or bass emphasis, metallic sound (high resonance), or off. A second press of the Modulation button completes the programming of a sound. Nine other sounds can be similarly allocated and during your 'editing', you can keep experimenting with combinations of elements by manipulating the appropriate buttons. Visual indication is confirmed by a flashing digit in the display.

Having completed the sound programming, you'll end up remembering your favourite sounds as 797 (xylophone), 385 (raindrops), 608 (electric bass) and so on! Several examples are given in the comprehensive instruction manual with effects as well as tone program settings.

Although it is theoretically possible to achieve 1000 different combinations, like the drawbar system, you'll no doubt find that your choice regularly narrows down to less than 40 favourite sounds. Still, it's fascinating experimenting with the tone program section and there's always the excitement of coming up with something new for performing with!

Arpeggio Making

While arpeggio/sequence programming is being done more often by LEDs on or above keys, a different method is adopted here. The sound selection buttons are used in conjunction with Record, Memory, Up/Down and Program buttons in the arpeggio section of the control panel. A little thought and preparation is required before playing in order to set an arpeggio pattern. This will consequently operate on any notes held (either manually or by means of the Memory button) in the lower two octaves. A pattern is set by numbering in order of playing a chosen chord shape. For example, a C major chord triad with notes played up and down would be 1, 2, 3, 2. The whole arpeggio pattern is methodically entered using the buttons with trigger tempo adjusted by a 10-turn 'continuous' pot from approximately 1 to 17 Hz.

The program button LED shows the first beat of the arpeggio pattern. Only one pattern at a time can be set, but arpeggios can sound three notes played over three octaves higher (providing these notes can be reached by the oscillator!). Up to 9 note pitches can be allocated, plus a rest(0) for a total of 127 steps. If you go over the limit, 'End' will appear on the display.

Because an arpeggio pattern can start with any number of your 'chord' pattern, a sequence can also be created by numbering each individual note of the passage (lowest to highest, 1 to 9 max), and inserting rests of correct length with 0's. Having entered the correct order for the numbered notes, all you have to do is play all these at the same time on the keyboard! Jotting down on a manuscript your required notes helps a lot, and will no doubt encourage you to experiment and study further.

Finally, the Up/Down button provides a permanent 16-step pattern for you to call on at any time.

Tuning and Transposing

Very accurate tuning is possible for matching the 1000P with other instruments and, since the range of tuning is over 1½ octaves, transposition is also easily achieved.

A press of the sound selection button '0' produces a sustained sine wave tone, and with the 'Tune' button pressed, 442 will appear on the display to indicate A=442 Hz.

Any tuning or transposition pitch required is then done by turning the Tempo control (over the range A = 221-662 Hz). For example, '393' sets your playing so that a Bb clarinettist can read your music too. It also looks as if I'll have to change from A = 440 to A = 442 if I'm to stay with Casio!

Conclusions

The 1000P offers great scope at low cost for musicians looking for a preset and programmable instrument in one, with the bonus of an arpeggio/sequencer, but you *must* hear it before you buy it.

Points to note are the absence of an external trigger in/out for the arpeggio, making it difficult to synchronise with a drum machine; the use of richer harmonic waveforms would extend the sound possibilities but dramatically increase price (say Casio); and keyboard filter tracking would have helped maintain steady volume output.

Nevertheless, the instrument stands as an example of how Casio can take concepts of polyphonic design previously found on much higher priced instruments, so that the new technology applied can be enjoyed by the ever growing number of music makers.

E&MM

The Casio 1000P is distributed in the U.K. by Casio Electronics Co Ltd, Unit 6, 1000 N. Circular Road, London NW2 7JD. Tel: 01-450 9131. Recommended retail price is £375 inc VAT.

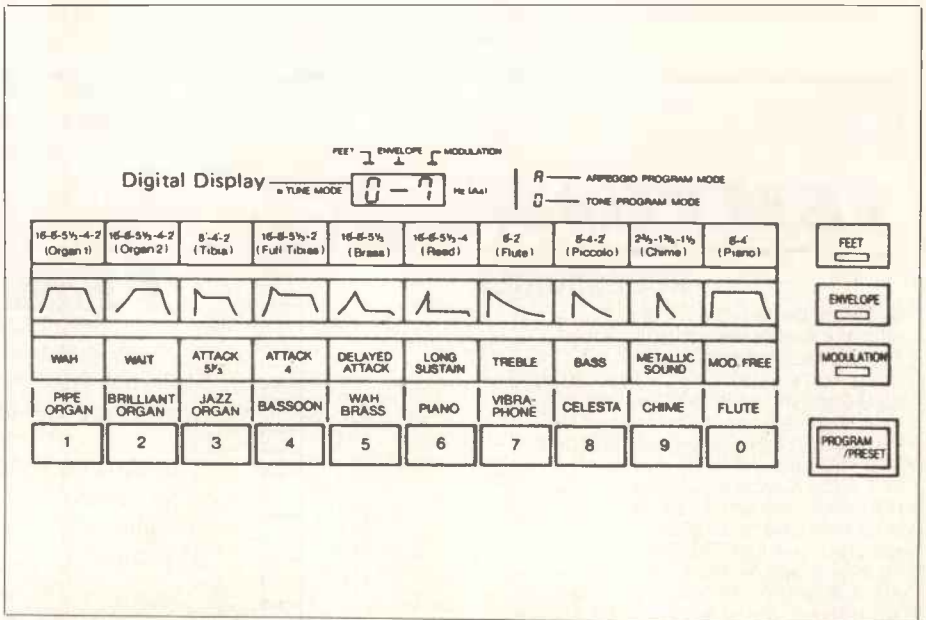

Figure 1. The special Tone Program section.

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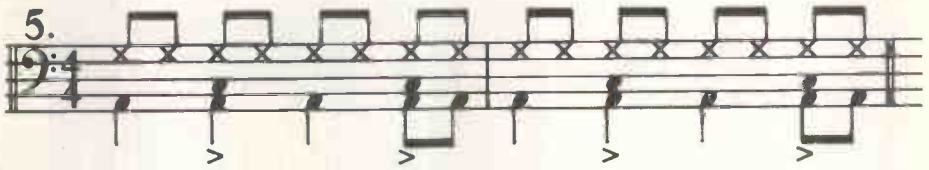
WARREN CANN'S
Electro-Drum Column Part 2

This month E&MM are pleased to bring you part two of the Electro-Drum Column written by our consultant drummer Warren Cann. Warren has again taken time out from his work with Ultravox to provide some more patterns for you to try out at home, in the studio, or on stage.

"In last month's Electro-Drum Column I demonstrated four different rhythm patterns based on the basic disco beat. This month I am taking them a stage further and introducing syncopation on the bass drum and variations on the high-hat.

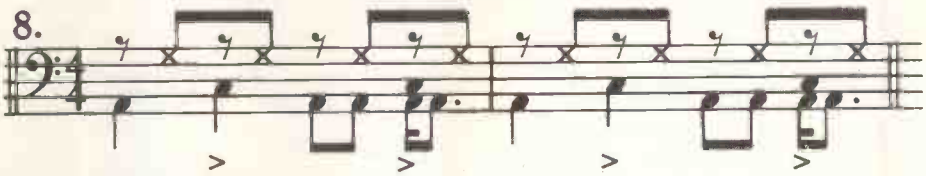
"For the programmer there should be no difficulties but for the novice acoustic player a couple of these patterns might pose some problems initially. It's worth persevering, though, as these variations on last month's rhythms really do add an extra dimension to any rhythm section."



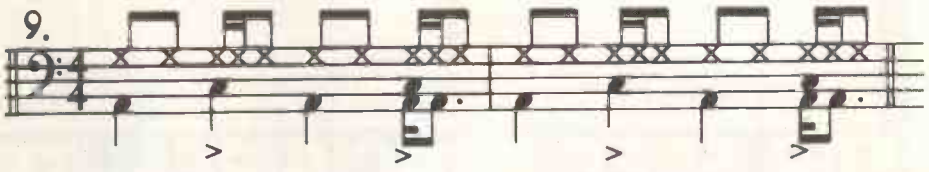
5. Same bass drum and snare drum as example 4 but with eights on the high-hat.

6. Same bass drum and snare drum as example 4 but with quarter note off-beats on the highhat.

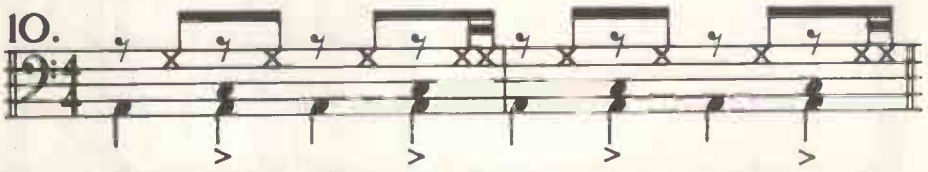
7. Eights on the high-hat, 2 and 4 on the snare but a funkier bass drum.



8. Another high-hat variation on beat 7.



9. The perrenial steady 2 and 4 on the snare drum, a syncopated bass drum part, and a variation on the high-hat that departs from the usual steady fours, eights or sixteens.



10. The disco beat yet again with a new variation on the high-hat, it's basically the off-beat pattern with an extra 1/16th quickly tucked in. This one does move nicely — simple it may be, but it sets up such a thorough groove that using it never palls.

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Personal Finl Mgmt
Purchase Ledger
Sales Ledger
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Stock Control
Telelink 1
Visicalc
Weekly Planner
Word Processor

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Beneath The Pyram
Fantasyland 2041
Galactic Quest
House Of Usher
Sands Of Mars
Waterloo
World War III

DYNACOMP
Alpha Fighter
Chompelo
Crystals
Forest Fire
Intruder Alert
Monarch
Moonprobe
Moving Maze
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Rings of The Emp
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Space Trap
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Triple Blockade

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Atlas of Canada
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Hickory Dickory
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Lemonade
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Attank
Avalanche
Babel
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Block 'Em
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Centurion
Checker King
Chinese Puzzle
Codecracker
Comedy Diskette
Dice Poker
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Domination
Downhill
Eastern Front
Galahad & Holy Grl
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Rabbotz
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Seven Card Stud
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Space Trek
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Terry
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Wizards Revenge

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Hi-Fi

Trends in Speakers and Amplifiers

Jeff Macaulay

1981 was an interesting time for the Hi-Fi world. Despite the ubiquitous recession, business appeared to be ticking over nicely.

Amongst the trends there has been general acceptance at last of active speaker designs, the re-introduction of DBX noise reduction systems and a gradual but noticeable move away from turntable obsession.

Crystal ball gazing is a dangerous business but I venture to predict that the emphasis will again turn back towards speaker systems.

Active speakers are at last becoming more common, although there is some way to go before they become standard. The improvements in sound come from perfect drive unit integration and superior transient response. Their acceptance means that more adventurous designs are possible once the 'sacred cow' of flat amplifier response is overcome. Most speaker systems, even the most expensive, suffer from response anomalies that could be removed by contouring the amplifier's response.

In fact, if one goes back a few years to examine the original aims of Hi-Fi equipment, they make interesting reading. For example: 'The function of a turntable is only to rotate at a constant speed without adding to or subtracting from the signal'. Even in the Linn Sondeck/Oracle era this rings true.

Amplifiers should be 'Wire with gain'. This is probably the most controversial of statements. It is interesting to note that scientifically controlled tests with selected listening groups could not reveal significant differences between good quality amps.

The frequency response required for good reproduction of sound has also been a disputed issue for decades. During the second world war, the BBC's own research department issued a report stating that perfect reproduction of voice and music could be obtained with a bandwidth of 30Hz - 15kHz. Since then we have seen amplifiers with bandwidths extending from DC to several hundred kHz.

The issue is about to become contentious again because of the introduction of digital technology. The upper frequency limit of a digital system is half the sampling frequency. Since the higher the sampling rate, the more expensive the equipment, standardisation is sure to be a problem.

On the periphery of audio other developments are poised to intrude. Sony's 35W/channel digital power amplifier for example. Perhaps, even more ominously, the combined video/digital tape recorder from Japan. When and if this is released on general sale here, the price is likely to be under a thousand pounds.

And what of micros? We have already seen these used to optimise tape bias on cassette decks. With the introduction of digitally encoded signals, the field seems wide open for their large scale involvement in future designs.

Unfortunately, British industry is not exactly poised to take advantage of these developments.

The new Hitachi DE99 Microcomputer controlled cassette deck with auto tape response system.

Small Speakers

In recent years small speaker systems have gained wide acceptance with the public. It's easy to see why, for they have a lot of things going for them. For example, a smaller drive unit has, all things being equal, a lighter cone than it's larger brethren and thus provides a better transient response. Small cabinet size means greater dispersion and hence a better stereo image. Lastly, but by no means least, it is far easier to strut a small speaker cabinet to reduce colouration due to flexing panels.

The only drawback of the small speaker is its limited bass extension. This a natural consequence of the small cabinet which pushes up the fundamental resonance of the bass unit. In principle, this drawback can be overcome by making the enclosure less efficient. Nevertheless, this is a difficult thing to do properly and requires careful design.

The Minimax speakers have been amongst the front runners in the small speaker market and I recently had the opportunity to listen to a pair of these at some length. At £70 a pair I must confess that I wasn't expecting miracles, but I was pleasantly surprised at their response.

The Minimax 2 is a two-way bass reflexed system with a 5" woofer and a 1" dome tweeter. Crossover is performed by a 6-element board mounted on the interior back panel. The crossover frequency chosen is 3.5kHz. The cabinet is soundly built of 19mm chipboard of the high density type and veneered in teak.

Apart from acoustic considerations, the speaker is an object lesson in how to produce a simple high quality enclosure and is well worth the attention of those who roll their own.

As with all equipment that I review, the speakers were humped around and connected to several different systems for evaluation.

First let it be said that the usual lack of bass extension was not as noticeable as might be expected. The bass that came through certainly lacked the solidity of larger systems, but was still well defined. The mid range was slightly recessed, but the upper registers were full of clarity. Stereo image was good, as expected, but the proviso here is that the speakers have to be used well away from the walls for their true abilities to be appreciated. As mentioned earlier, these speakers are reflexed. Unusually, the port is a length of steel tube inset into the enclosure from the front baffle.

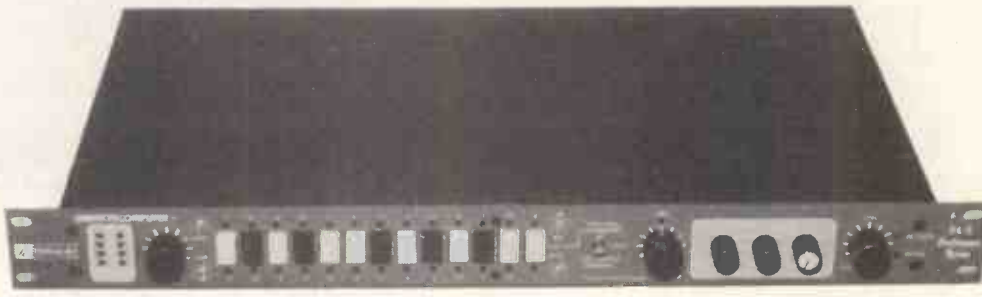
Having listened to the system at some length, I was genuinely impressed by their performance. I feel that these speakers would be of interest to those who are not unduly worried by the lack of deep bass or whose situation precludes the use of larger speakers — often the case in the home electro-musician's studio. Efficiency was quite reasonable. The manufacturers quote a maximum recommended amplifier power of 40W/channel. In practice I found that 20W was sufficient in my own 15' x 12' x 8' room to do justice to the speakers. I am often accused of listening to music at deafening levels anyway! **E&MM**

Minimax Speakers.

Delta Lab DL-5 Harmonicomputer

RECORDED ON E&MM CASSETTE

If you've always wanted to run the world whilst seeking the answer to the Ultimate Question, then a harmonizer is just the ticket, as it's particularly proficient at making mice of men (apologies to John Steinbeck). The same holds if you're into "foonting turlingdromes", and, as a friend behind the scenes at the Beeb put it, "space monsters would still be ring modulating each other if it wasn't for harmonizers". Eventide started the ball rolling with the first harmonizer in 1975; the Delta Lab DL-5 is one of the latest units to appear on the market, but, at £1,300, it's hardly cheap.



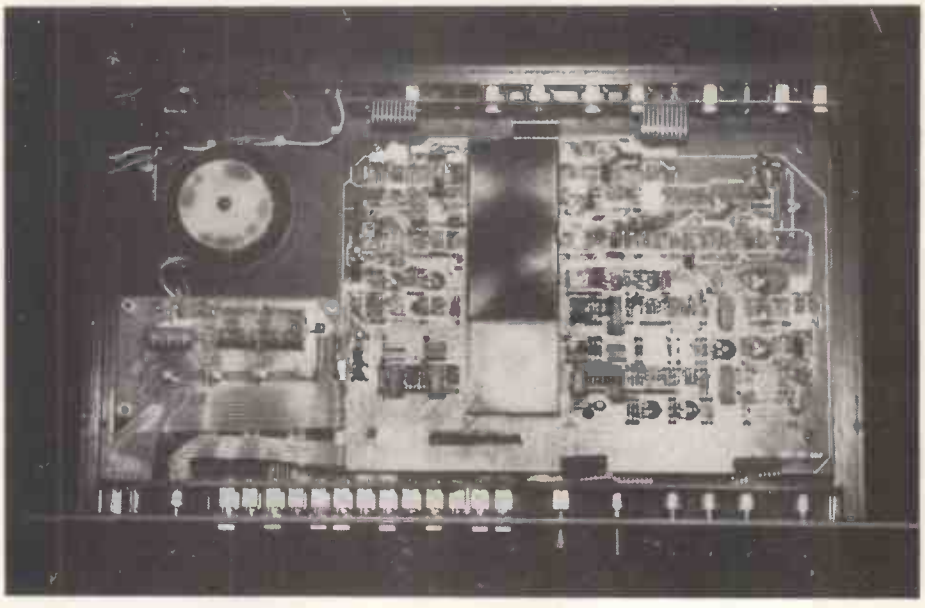
Glitches

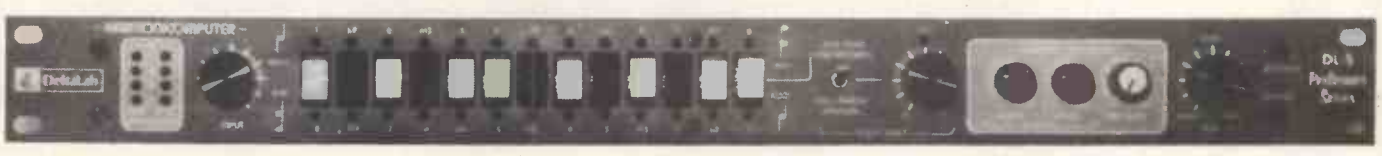
Until recently, harmonizers attracted a good helping of brickbats on account of their tendency to impose rather too much of their own personality on whatever was fed into them. This effect was given the picturesque description of 'glitching' and stems from the way in which the harmonizer customarily goes about its business. The basic principle is to read the input signal into memory and then clock it out at a different rate to get the transposed pitch. Unfortunately, during this read/write process, it's necessary to either cut out or add in cycles in order to create a continuous audio output. This well and truly mucks up the time base of the original signal, and one's left with the problem of how to fit the stretched waveform into the original space, or, in the expansion situation, what to do with the space left over after the waveform sample has been shrunk down. The obvious point of this bit of digital splicing is to smooth out the output signal so that it sounds as natural as possible. Not surprisingly, the further the harmony is removed from the original pitch, the more difficult it is to make a successful splice, and, as most harmonizers are far from 100% accurate in doing this, you end up with the aforementioned 'glitches', or, as somebody put it, "the notes get lumpy".

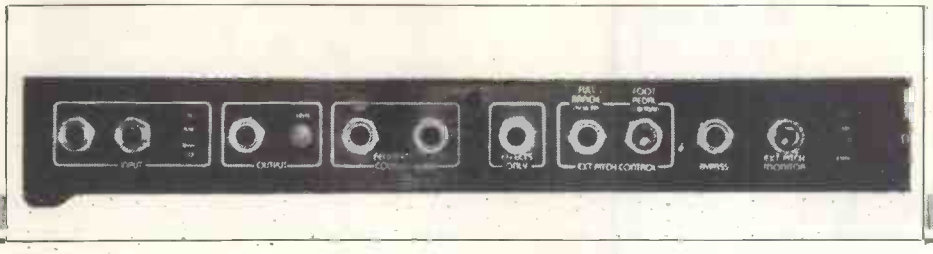
With the early Eventide harmonizer (now manufactured with all manner of de-glitching circuits), an interval of a 4th or 5th was asking for trouble, and the only way in which you could use such digitally generated 'harmony' was to put it somewhere like 30 dB below the original signal level, i.e., using it for a touch of colouring. The DL-5 takes the eradication of the glitching problem a good deal further, but it's still there, albeit as a reasonably subtle amplitude modulation that increases in speed as you get to the maximum of an octave above or below the input signal. This means that it's pretty important to keep the higher harmonic intervals at a reasonable level in the mix, but, then, if you're playing a top A at 7,040 Hz, it's unlikely that you'd want a 14,000 Hz octave harmony at an equivalent dynamic level. The other thing to bear in mind is that, unlike simple 'harmonizers' like octave doublers/dividers, units like the DL-5 are quite happy with any waveform fed into them — and that includes any sort of complex polyphonic information — even a Beethoven piano concerto!

Not Just a Pretty Face

Sleek and colourful describe the DL-5's appearance, as the sea blue front panel is just 1¾" high in the standard 19" rack-mounting format. Starting on the left side of the panel, there are two columns of LEDs labelled Peak and Slew Headroom. Moving stage centre from this visual feedback and an input level control, we come to the main crux of the matter, the 13 rocker switches for choosing one's harmonic message. By depressing each switch in the up direction, the harmony produced by the DL-5 increases in a chromatic scale fashion. Similarly, by depressing each switch in the down direction, the harmony descends into the depths of Vogonic despair. The pitch selection is voltage derived, with each ½ tone increasing/decreasing by 0.083V. Thus, +1V gives one octave lower, +2V no pitch shift, and +3V one octave higher. This arrangement makes external pitch control very straightforward and there's a jack on the back panel for this purpose. A fine tune control is also provided and this varies the overall tuning by approximately ± half a tone. The fixed keyboard control can also be disabled to provide the option of using the tuning control as a two-octave pitch sweep. Since the unit sensibly uses the 1V/octave standard, presumably any linear CV-produc-







ing keyboard could be plugged into the external pitch control input. To my ears, the more one progressed from the original pitch, the more a quick twiddle of the fine tuning was needed, but the tremolo effect caused by the small amount of glitching present may have contributed to any impression of slight pitch discrepancy.

Next to the tuning control, there's a white box containing the controls for the Time Base Processor. The first two knobs control an LFO, with variable width and speed, that modulates the pitch shift producing characteristic vibrato effects. In practice, the narrow width (small pitch shift), slow speed effects work best, and, with just a slight amount of pitch shift selected, produce a really rich chorusing. Demo cassette No. 7 includes an example of this — making stereo out of mono! The Feedback control allows the pitch-shifted signal to be written back into memory to be further shifted, and so on. Thus, a single note or chord can be encouraged to perform a short arpeggio, upwards or downwards, based on the chosen pitch shift. This can lead to amazing Doppler-like effects which really create an extraordinary sense of ambience. The effect can be further heightened by adding in more delay (with the Delta Lab DL-4 Delay Line, for instance) into the return of the regenerated signal. Curiously, with longer delays between successive pitch shifts, and even though it's the pitch rather than the amplitude that's changing (the latter being the situation with reverb), the ear is fooled into thinking it's hearing the effect of ambience.

Obviously, you could use the DL-5 to provide harmony and it's particularly effective at doing this with vocals. However, the situations in which you can use a 4th or 5th above or below the lead vocal throughout a track are pretty rare (a short-cut to parallel organum, perhaps?), and this is the point where an external keyboard control (or pedalboard, perhaps) would be pretty useful for selecting harmonies at will. Who cares about backing singers if you've got a harmonizer instead!

Conclusions

The technical specifications of the DL-5 are impressive (frequency response: 20Hz to 15kHz ± 3dB; dynamic range: 90dB) and the unit is superbly constructed. Delta Lab's delta modulation techniques enable them to get these sorts of figures and they're also able to chuck out those less than ideal anti-aliasing filters common to any PCM system. Delta modulation obviously works well, and, if as they say, it's cheaper and easier to implement than conventional digital encoding/decoding techniques, then it'll be interesting to see what other products switch over to their way of thinking.

One point that concerns me is the discrepancy between what Delta Lab claim for their unit ("innovative multiplexing techniques totally eliminate the typical splice-glitch . . . the result is a clean sounding harmonizing unit that is not plagued with unnecessary side effects") and what I actually heard from the unit. Glitches are present, and there is a 'halo' of noise around everything that comes out of it. To be fair, the unit I had for review from Scenic Sounds was their peripatetic demo sample and it may well have been subjected to brutal, glitch-inducing knocks. It's a tough life being a harmonizer!

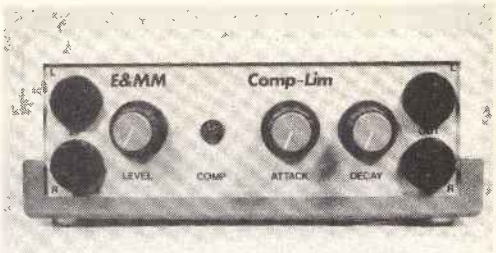
David Ellis **E&MM**

The Delta Lab DL-5 is available from Scenic Sounds, 97-99 Dean Street, London. Tel: 01-734 2821.

Comp-Lim

PARTS COST GUIDE £30 Complete kit

Paul Williams



- ★ **For amplifier & recorder protection, mix thickening or effects.**
- ★ **Two signal channels for stereo use.**
- ★ **Adjustable attack & decay characteristics.**
- ★ **LED indication of compression.**
- ★ **Precision full-wave control rectifier.**
- ★ **Control input for special effects.**
- ★ **Easy to use.**
- ★ **Studio quality.**
- ★ **Uses two low cost IC's.**

Have you ever wondered why your tracks or instruments always seem to sound so deliberate and separate, where as professional recordings and performances sound so full, thick and rich? The answer is by judicious use of a good compressor. A compressor reduces the upper dynamic range of a signal, such that above a certain threshold level, an increase in input level of, say 3dB might result in an output level increase of say 1dB, indicating a compression ratio of 3:1. The compressor can be used effectively on complete mixes, or on single instruments for special effects.

The limiter is an equally valuable device for both the home electro-musician and the gigging band. It is used for curtailing high signal levels applied to, for instance a tape recorder to prevent over modulation of the tape, or to a PA amplifier to prevent output saturation, either of which would otherwise lead to harmonic distortion. Vocals are a very good example of a signal source with a rather unpredictable level, ideally suited to the application of a limiter. Using a limiter, the system gain can be set to a higher level than normal, where the occasional high level peak will be taken care of by the limiter. This allows an improvement in signal to noise ratio to be achieved in the case of the tape recorder, or a higher average output power in the case of the PA amplifier. Limiters typically exhibit a compression ratio of 10:1 or more; that is a 10dB increase in the input level results in a 1dB increase in output level. There is also, of course, a threshold level, below which no compression takes place. The E&MM Comp-Lim was designed to fulfill both of these functions by using a compromised compression ratio of 6:1. Figure 1a shows how the output voltage changes with input voltage. Figure 1b shows the transfer characteristics in decibels. Notice the well defined 'knee', and the dramatic change of slope above the threshold level. Adequate control over the attack and decay characteristics is provided to further widen the range of applications. The input gain, and hence the input threshold can be varied, providing a convenient method of adjusting the amount of compression, indicated by an LED.

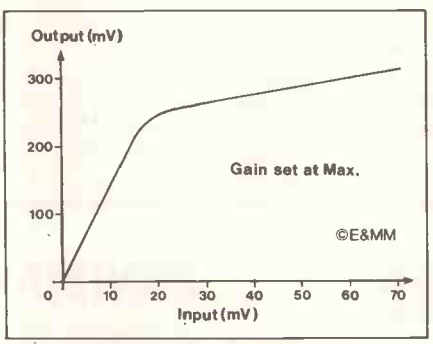


Figure 1a. Output voltage vs input voltage.

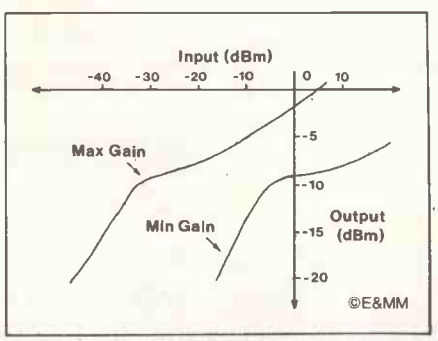


Figure 1b. Transfer characteristics in dB's.

Circuit

Referring to the circuit diagram, Figure 2; the left channel gain is determined by the amplifier IC2a, whose initial gain is set by RV1a, the input level control. IC2a forms an identical right channel. The outputs from the two channels are summed up by R19 and R20, the composite signal being passed via C4 to the full-wave control rectifier formed by IC2b&c. The resulting DC voltage at IC2b pin 14 is buffered by TR1 and subsequently passed through R2 and RV3, the attack control to charge C1, ultimately to the same voltage. In the absence of any signal, C1 is discharged through R2, RV3 and RV2, the decay control.

If a signal is sufficient in level to produce a DC voltage capable of overcoming the Vbe's of TR1 and TR3, then current will be sourced by TR3 and injected via R6 into pins 1 and 16 of IC2, the dual transconductance amplifier. IC1 a & b will then increase the current feedback around IC2 a & d, reducing their gain until the output signal level and hence the DC control voltage reaches the threshold level, where a state of equilibrium is attained. The control current and hence the amount of compression is tracked by TR2, driving the LED, D1, in sympathy with the control current.

The control signal path can be interrupted, and an external control signal applied at JK4 for special effects. When a mono signal is applied to just one input, the input socket switching arrangement allows the signal to be fed to both channel amplifiers, keeping the threshold level the same for either single or twin inputs.

Construction

All the components, including the potentiometers are contained on a single PCB, as shown in Figure 3. The assembly of which should proceed as follows: insert and solder the veropins first, then the wire link and all the resistors, bending the leads out at 45° to hold them in place. Now crop the leads and solder. Follow this procedure similarly for the capacitors, IC sockets, diodes and transistors. Position the potentiometers in the PCB, but before soldering, secure them to the front panel so that strain is not put on the joints.

SPECIFICATIONS

Minimum input threshold	-33dBm
Maximum input threshold	-5dBm
Output threshold	-10dBm
Maximum input level	20dBm (maximum gain)
Compression ratio	6:1 Approx.
Attack time	30uS to 30mS
Decay time	15mS to 1S
Frequency response	3Hz to 30kHz (-3dB)
Output noise	-67dBm (A) (maximum gain)
Output noise	-86dBm (A) (minimum gain)
Positive supply current	7mA
Negative supply current	25mA

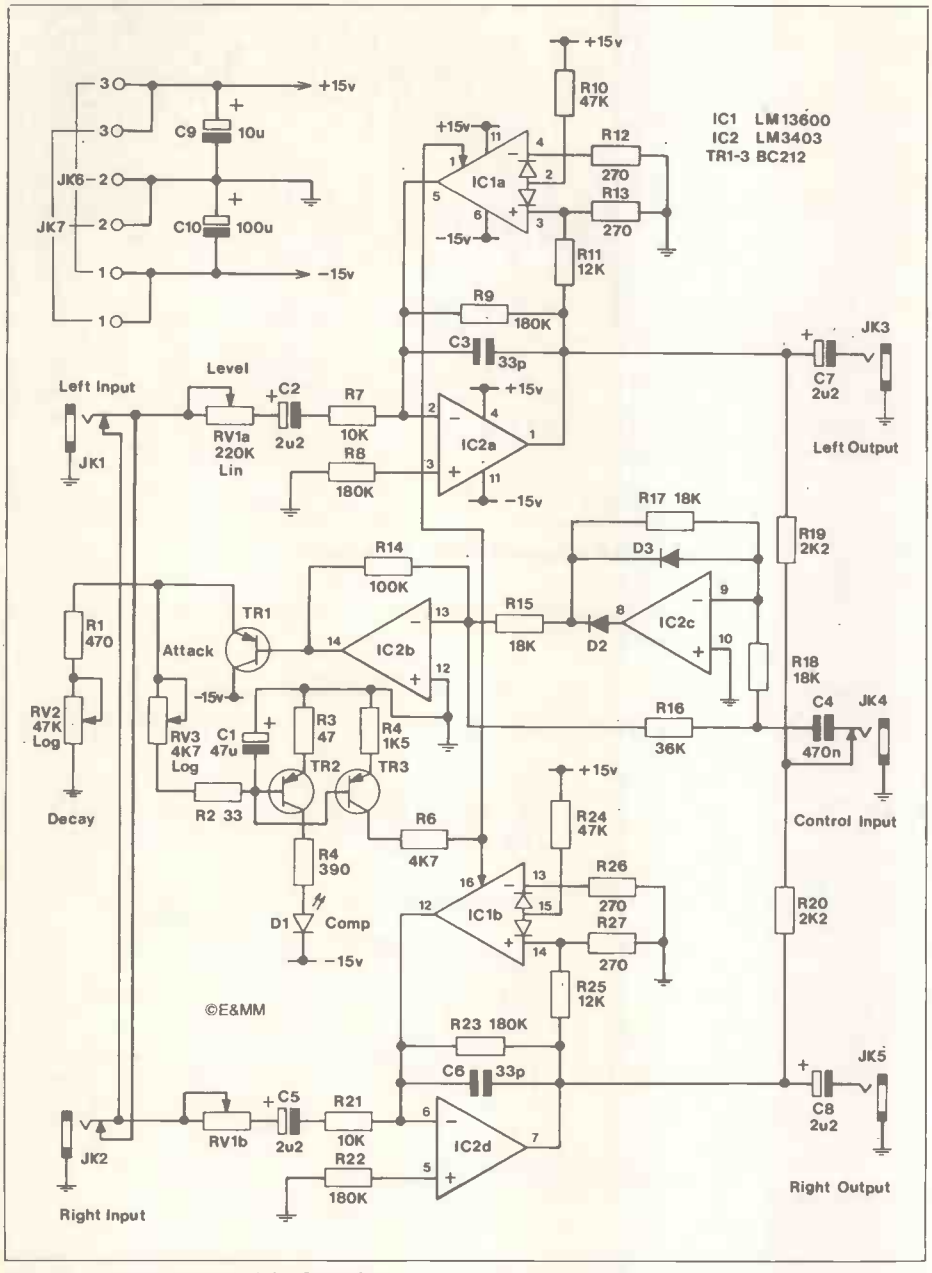


Figure 2. Circuit diagram of the Comp-Lim.

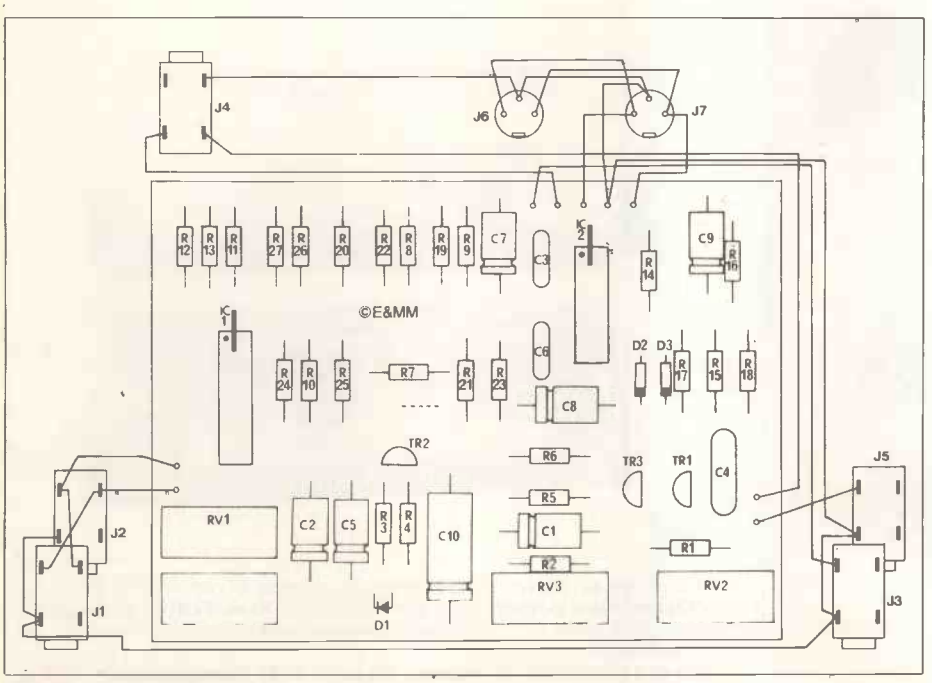


Figure 4. Inter-wiring diagram.

To fit the LED, bend its leads down at 90°, about 7mm from the body and pass the leads through the PCB, checking polarity. Now push the LED clip bezel into the front of the panel and slip the ring over the LED. Offer the LED into the clip and push the ring over to secure. The LED can now be soldered in place.

Check very carefully the orientation of diodes, electrolytic capacitors and transistors. When you are sure that the assembly is correct, and that all the soldered joints look healthy the IC's can be loaded into their sockets, checking orientation carefully.

Now prepare the case and install the panels with all the sockets fitted. The PCB is held in position by means of the potentiometers, and requires no further retention. Finally, complete the small amount of inter-wiring shown in Figure 4.

Testing

There are no presets to adjust, so your Comp-Lim should be ready to use. The DC power can be obtained from almost any regulated ±15v supply. The E&MM Twinpak power supply makes an ideal companion for the Comp-Lim. The supply is connected to one of the DIN sockets, the other socket being intended to extend the DC supply to another audio signal processing unit in a "daisy-chain" fashion.

Limiter

For use as a protection limiter, set the attack control to minimum, and the decay control to the 9 o'clock position. The input level control should then be adjusted so that the loudest passages cause the LED to glow. The input sensitivity control of your amplifier or tape recorder can then be adjusted to give the desired maximum level when limiting takes place.

Mix thickening

For mix thickening, use fairly low settings for the attack and decay controls, although beware of very low settings of both controls simultaneously since this can lead to modulation of the signal by the low frequency notes. The input level control will then determine the amount of thickening. Remember though that 20dB of compression will take 20dB off your signal-to-noise ratio, so if you want a lot of compression, you should have a low noise source, preferably not from tape unless you have a very good noise reduction system. By increasing the attack control position to halfway or so, the effect will be that of accenting the percussiveness of the sound, resulting in a very 'punchy' sound. Single instruments too will have much stronger attack characteristics, an effect particularly noticeable on bass guitars.

Control input

The control input can be used to reduce the level of the main program, dependent on the level of the control signal, such as for voice-over ducking, where an amplified microphone signal would be applied to the control input. Also using the control input, a particular instrument can be 'lifted' out of a mix by allowing the signal from the track of that instrument to control to level of the remainder of the mix. This result in a very powerful, dynamic effect when used on a lead guitar.

After some experimentation, the Comp-Lim will soon become one of your most used studio or stage audio processing units.

PARTS LIST FOR COMP-LIM

Resistors — all ¼W 5% carbon.

R1	470	
R2	33	
R3	47	
R4	390	
R5	1k5	
R6	4k7	
R7,21	10k	2 off
R8,9,22,23	180k	4 off
R10,24	47k	2 off
R11,25	12k	2 off
R12,13,26,27	270	4 off
R14	100k	
R15,17,18	18k	3 off
R16	36k	
R19,20	2k2	2 off
RV1	220k lin stereo pot	
RV2	47k log pot	
RV3	4k7 log pot	

Capacitors

C1	47uF 10v electrolytic	
C2,5,7,8	2u2F 63v electrolytic	4 off
C3,6	33pF ceramic	2 off
C4	470nF ceramic	
C9	10uF 25v electrolytic	
C10	100uF 25v electrolytic	

Semiconductors

IC1	LM13600	
IC2	3403	
TR1,2,3	BC212	3 off
D1	LED red	
D2,3	1N4148	2 off

Miscellaneous

JK1-5	Jack socket	5 off
SK6,7	3 Way DIN socket	2 off
	Case, Vero 212	
	Knob	3 off
	Knob cap	3 off
	14 Way DIL socket	
	16 Way DIL socket	
	LED clip	
	3 Way DIN plug	2 off
	3 Core cable	
	Wire	
	Veropins	
	PCB	

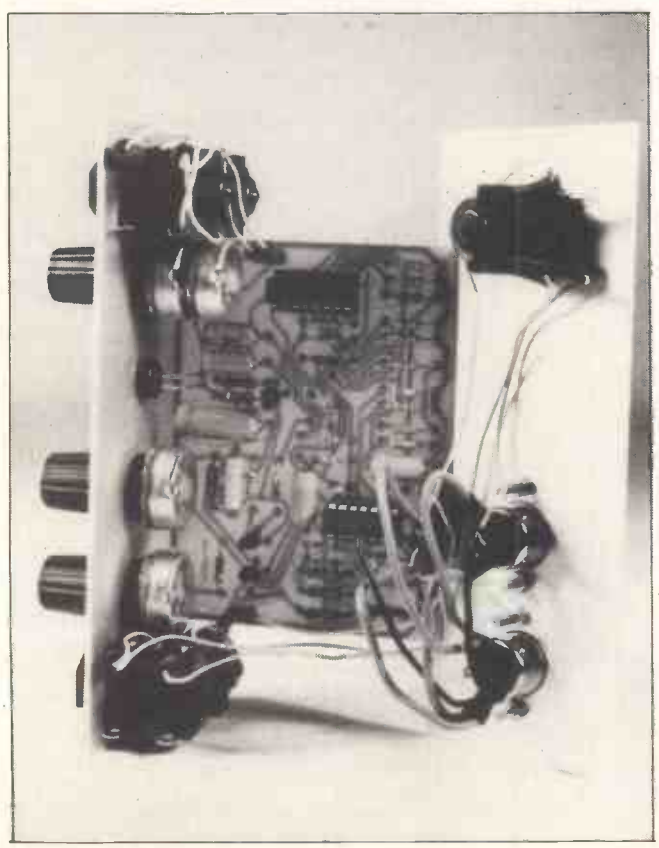


Figure 4. Internal view of the Comp-Lim.

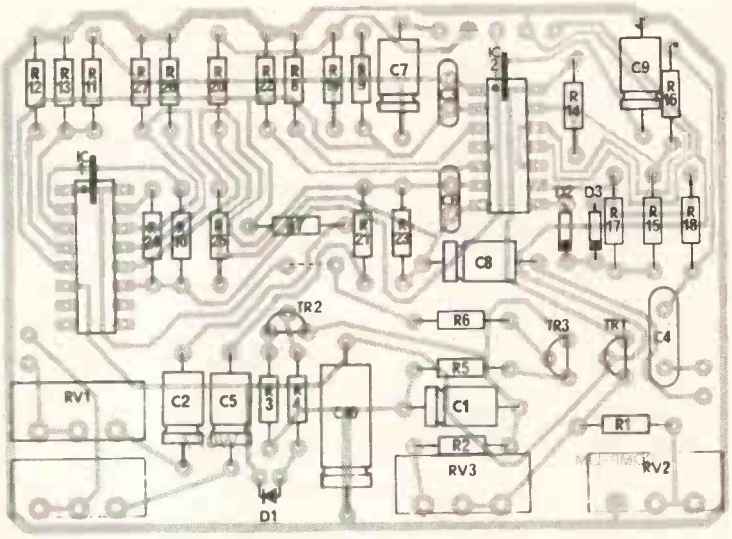


Figure 3. PCB component overlay (not to scale).

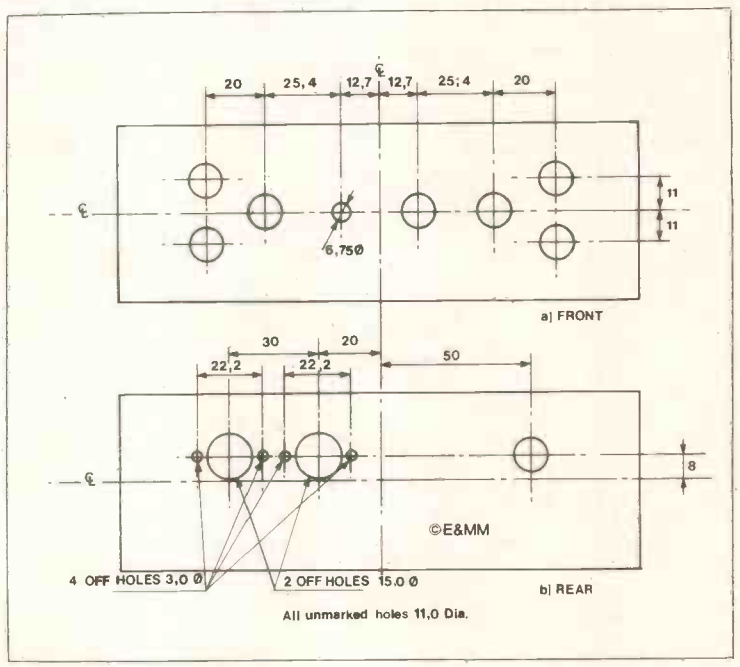


Figure 5. Inter-wiring diagram.

A complete set of parts for the Comp-Lim including all components, hardware, PCB and case is available from E&MM, 282 London Road, Westcliff-on-Sea, Essex SS0 7JG, at a cost of £29.95, including postage, packing and VAT. Please order as: Comp-Lim Kit.

The PCB is also available separately at a cost of £2.99, including postage, packing and VAT. Please order as: Comp-Lim PCB. **E&MM**

Twinpak

Paul Williams

PARTS COST GUIDE £25
complete kit

When you are all set up with your guitar or keyboards to record a track, there is nothing more annoying than the battery in one of your effects units deciding to give up the ghost. Even more frustrating and embarrassing if it happens when you are doing a gig. The specifications of battery operated units usually have to be compromised to allow for the unregulated, and possibly non-ideal voltage delivered by batteries. Today's operational amplifier based circuits invariably work better, and can be designed more elegantly using twin supply rails. This means that either two batteries have to be provided, or a single battery voltage has to be split using resistors to form two low voltage rails, increasing the battery drain, and lowering an already marginal headroom.

One obvious solution is to provide each unit with a twin regulated mains operated supply. The problem then is that if you have ten mains operated units, there will be ten mains leads and ten plugs requiring ten mains outlets. The danger of an earth hum loop will be increased ten fold, and think of the cost of duplication of transformers, capacitors and regulators!

The E&MM Twinpak provides the ideal solution. It delivers a twin regulated supply centrally, intended to be distributed to audio processing and effects units by 'daisy - chaining' from unit to unit, eliminating the need for a 'birds nest' of supply cables.

The E&MM Twinpak.

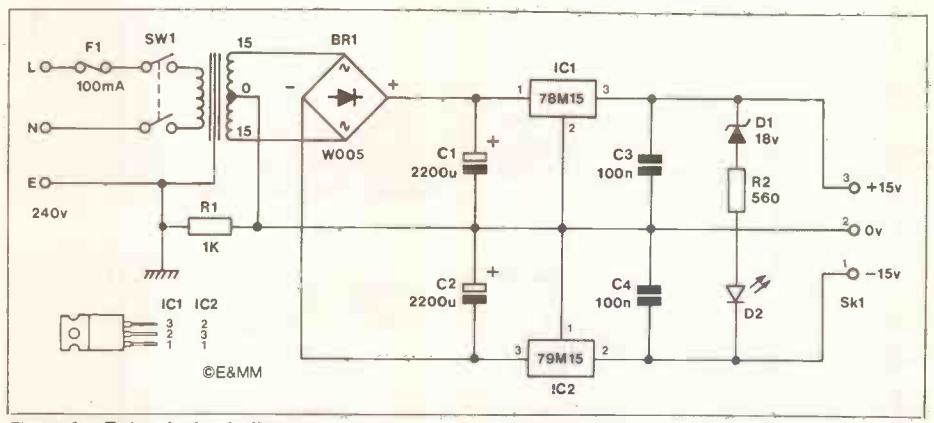


Figure 1. Twinpak circuit diagram.

Circuit

The circuit shown in Figure 1 is quite conventional in most respects. The full-wave bridge rectifier, BR1 rectifies current from the transformer, TX1 in to the reservoir capacitors, C1 and C2. Regulation is carried out by two monolithic regulators, Capacitors C3 and C4 cater for any transient current requirements on the output. The LED, D2 obviously illuminates when the supply is switched on. The zener diode D1, however, will cause the LED to rapidly dim if either supply voltage drops due to current limiting or thermal overload, giving an early warning of any trouble.

Resistor R1 provides the signal 0V to mains earth connection, but with a high enough resistance to prevent earth hum loop currents circulating. The components used have been deliberately over-rated so that the unit runs cool for a long, reliable life.

Construction

All the parts, except the transformer are mounted directly on the PCB as in the component overlay shown in Figure 2. Assemble the PCB as follows: Insert and solder the veropins and the fuse clips first. Next, insert the resistors then solder and crop the leads. Now locate D1 and the capacitors, bending the leads out to secure before soldering and cropping. Locate and solder the regulator IC's and the bridge rectifier in a similar manner. Before soldering the switch in position, cut a piece of 1/16" SRBP (veroboard will do) about 6 x 12mm and glue it using an epoxy resin type adhesive to the underside of the switch. Apply the adhesive also to the other side of the SRBP, then hold the switch firmly in its position on the PCB until the adhesive sets (watch your fingers though!).

If you are constructing the unit using the panels shown in Figure 5, fit a solder tag to the back face of the front panel

- ★ **Twin regulated DC supplies**
- ★ **+15v outputs at 120mA each**
- ★ **LED status indicator**
- ★ **Designed for long life & reliability**
- ★ **Easy construction**

using a 6BA countersunk screw, nut and a serrated washer. With the switch button fitted, hold the front panel in position over the front of the PCB assembly. To fit the LED, bend its leads down at 90° about 5mm from the body. Locate the leads in the PCB holes, noting correct polarity. Mount the LED to the panel using the LED clip and solder the LED leads in place, making sure the assembly is square. Check the assembly thoroughly at this stage, paying particular attention to the orientation of polarised components. Mount the transformer on the right hand pair of moulded bosses using self-tapping screws, inserting a solder tag with a serrated washer under one of the screw heads. Fit a 6BA screw in the drilled hole and tighten with a nut. Screw another nut down to the same height as the moulded bosses. Slide the front panel into position and secure the PCB on the two left hand bosses, and the 6BA screw. Before positioning the rear panel, fit the DIN socket and clamp the mains cable in place using the grommet.

Complete the inter-wiring as shown in Figure 3, taking extra care with the safety earth connections. They are at the transformer mounting lug, the 6BA screw on the front panel, and the DIN socket on the rear panel. Under no circumstances omit any of these connections. Double check all the connections for safetys sake.

Testing

Connect the unit to the mains and switch on. If the LED does not light, switch off immediately and disconnect the mains. Do not switch the unit on again until the fault has been rectified. If all seems well, leave the unit on for a couple of minutes, then switch off and disconnect from the mains. If nothing has become unduly hot, then all should be well and the lid can be snapped into place. Connect a 120 0hm 1W resistor across each supply rail to 0v for a few seconds, making sure that the LED does not dim. If you have a voltmeter, check the output voltage of each rail which should be 15v±5%.

The unit is now ready for a long, reliable life. Connect it to your first audio processing unit, such as the E&MM Comp-Lim, using a DIN to DIN lead made from a short length of mains lead. The DC power can be extended from there to the next unit in a 'daisy-chain' fashion. All E&MM units designed specifically for use with the Twinpak will have two cross-linked DIN sockets for this purpose.

PARTS LIST FOR TWINPAK

Resistors - all ¼W 5% carbon.

R1		1k
R2		560

Capacitors

C1,2	2 off	2200uF 25v electrolytic
C3,4	2 off	100nF polyester

Semiconductors

D1	BZY88C18
D2	LED red
BR1	W005
IC1	78M15 regulator
IC2	79M15 regulator

Miscellaneous

		15 0 15v
TX1		6VA Transformer
SW1		Mains latchswitch
SK1		3 pin DIN socket
F1		100mA 20mm Fuse
	2 off	Fuseclip
		Case, Vero 212
		LED clip
		Switch button
		3 core cable
		Grommet
		Veropins
		Wire
		Mains plug
		Nuts & bolts etc.
		PCB

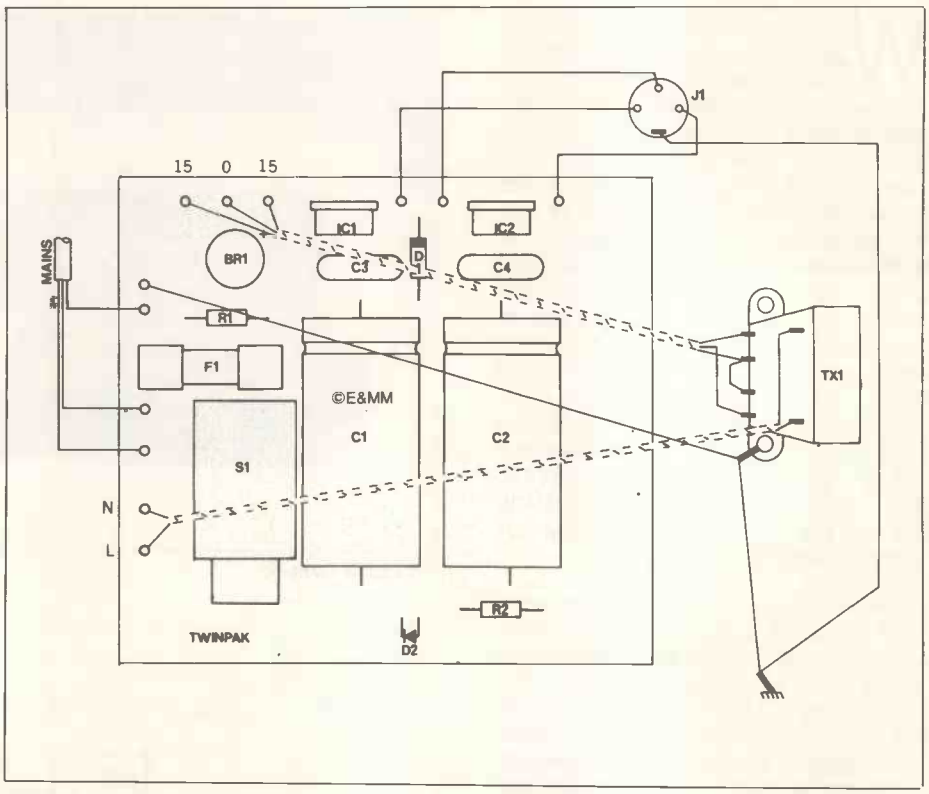


Figure 3. Inter-wiring diagram.

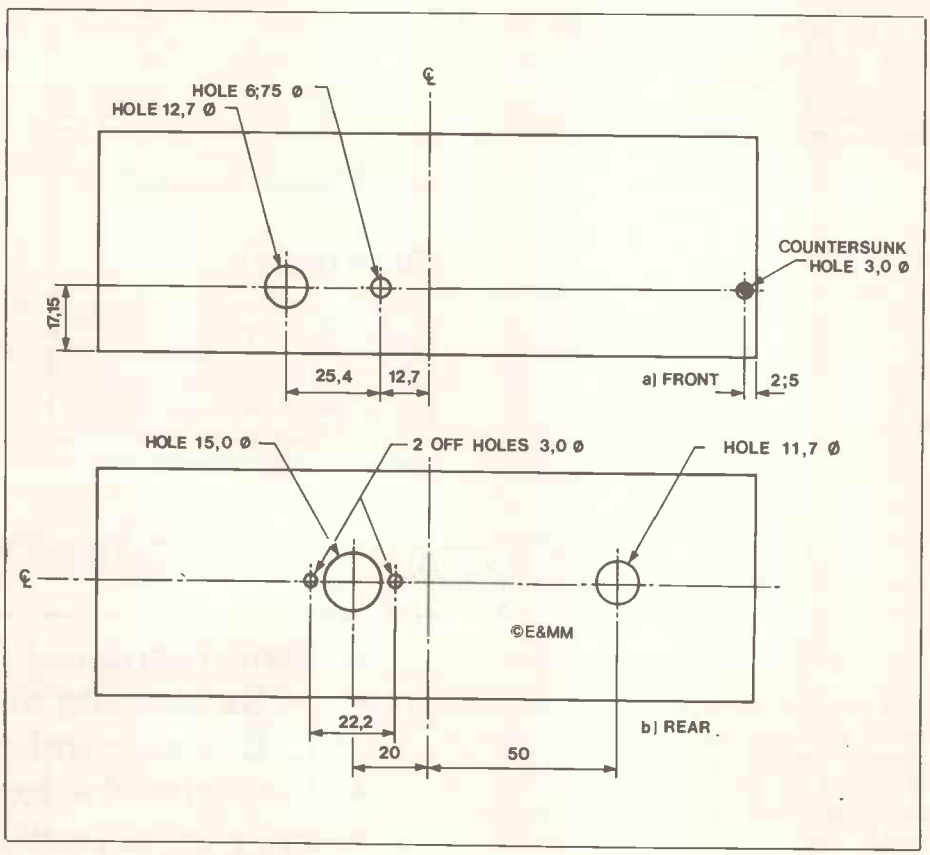


Figure 4. Panel drilling detail.

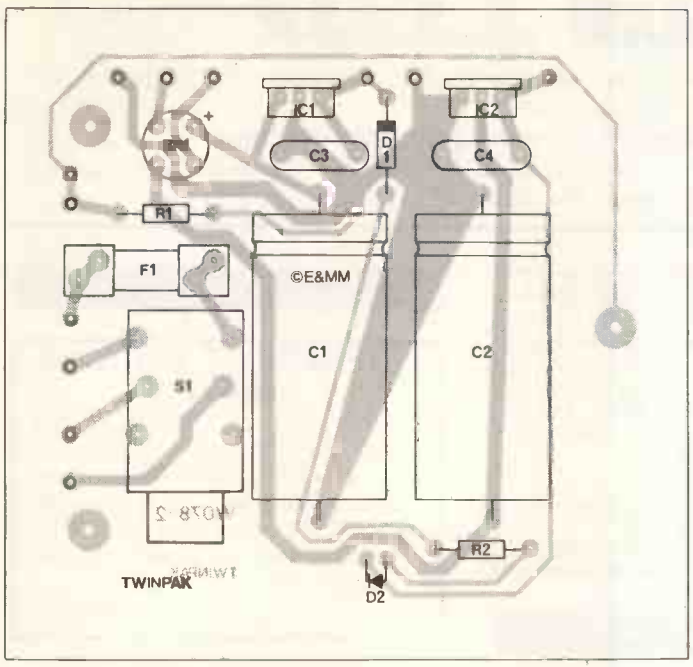
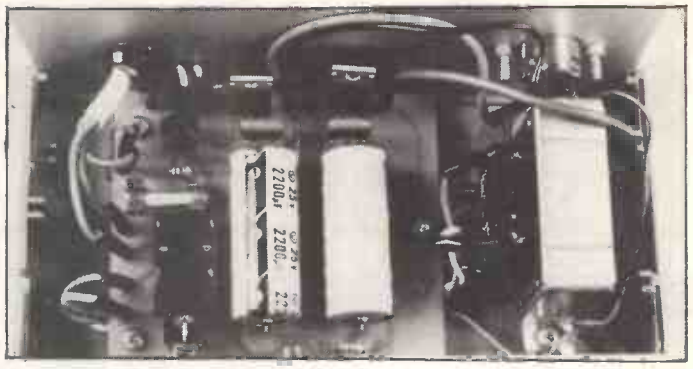


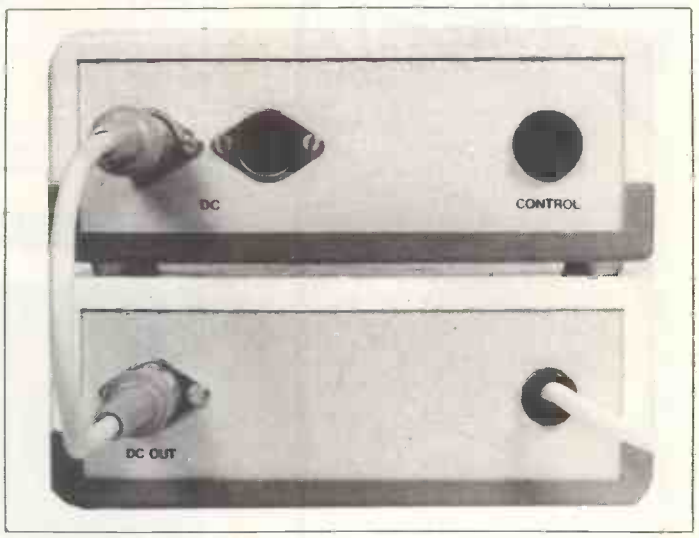
Figure 2. PCB component overlay (not to scale)

A complete set of parts for the Twinpak including components, PCB, case and hardware is available from E&MM at a cost of £24.95, including postage packing and VAT. Please order as: Twinpak Kit.

The PCB is also available from E&MM at a cost of £2.25, including postage, packing and VAT. Please order as: Twinpak PCB.



Internal view of the Twinpak.



The Twinpak and Comp-Lim.

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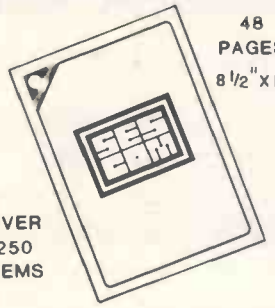

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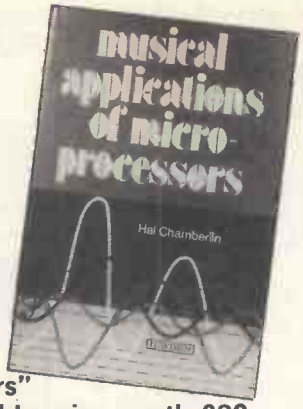

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Across

1. Style of music developed by the American Negroes (5)
9. Note or frequency which is a multiple of another frequency (8)
10. See 10
11. Scouse band, as featured in E&MM, Dec '81 (10,10,2,3,4)
12. One of ARP's range of synthesisers - entering into the unknown! (8)
14. Poems (4)
16. See 10
17. Top of the Bill is a rotating sun! (4,4)
20. See 10
22. Musical pauses (5)
24. Electronic 'black boxes', specifically for changing data from one format to another (8)
25. Much loved stars, but sounding very lazy (5)

Down

1. Part of a stringed instrument, mounted on the body (6)
2. Single distinct reverberation (4)
3. Classical composer, much synthesised (4)
4. Break, a good selling record (5)
5. Percussive instrument (5,4)
6. Musical progressions (6)
7. Common term for a fault (5)
11. Surplus guitar part - ready to fit if your fingerboard warps (5,4)
13. Abbreviation for a lot of volts (1,1,1)
15. Sequence for playing numbers (5)
18. Fitted to guitars - for shortening the vibration time of the strings (6)
18. Unwanted signals (6)
19. Slade become essential for carrying electro-music (5)
20. Company responsible for copper strip PCBs (4)
21. Output, specifically to effects units (4)

July's Answers

Across: 1. Edison; 5, Sensor; 8. Synthesis; 9. Opus; 10. Board; 11. Glass; 14. Gnat; 15 and 24. Ike Turner; 16. Iron; 18. Force; 19. Alloy; 20. Open; 22. Detection; 23. Strobe; 24. See 15.

Down: 1. Dryjoint; 3. Saturation; 4. Noel; 5. Shielded; 6. Stops; 7. Rossi; 9, Oscillator; 12. Discrete; 13. Monotone; 17. Cones; 18. Fever; 21. Beat.

July's winner: Mr. T. Horton from the West Midlands.

We acknowledge with thanks the cooperation of John Wiley & Sons Ltd, who distribute "Musical Applications of Microprocessors" in the U.K.

This book, reviewed in E&MM July 1981 issue, is available from: Maplin Electronic Supplies Ltd order ref. WG40T price £22.65 inc. p&p.

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