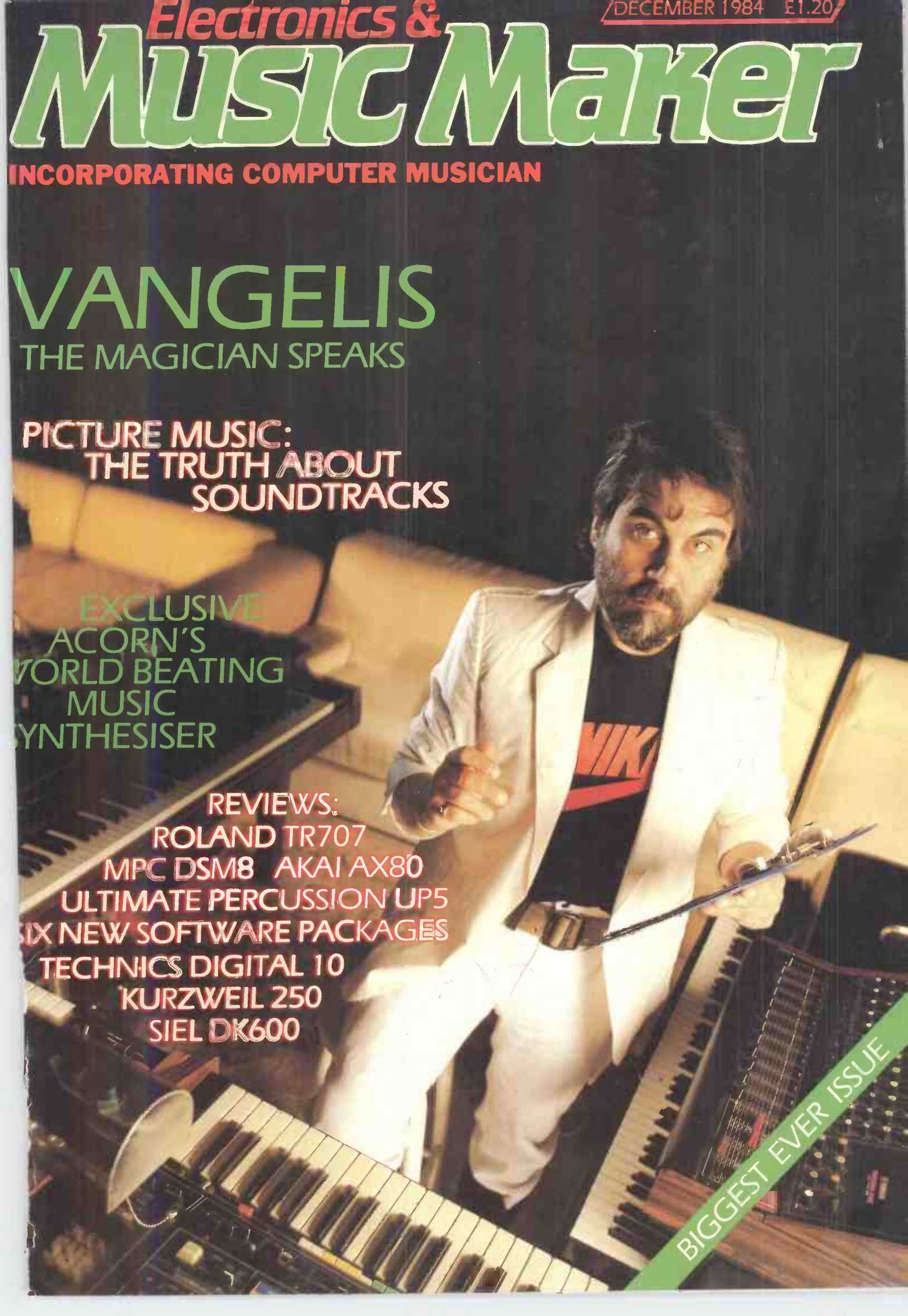
DECEMBER 1984 £1.20

Electronics & Music Maker

INCORPORATING COMPUTER MUSICIAN



VANGELIS
THE MAGICIAN SPEAKS

PICTURE MUSIC:
THE TRUTH ABOUT
SOUNDTRACKS

EXCLUSIVE
ACORN'S
WORLD BEATING
MUSIC
SYNTHESISER

REVIEWS:
ROLAND TR707
MPC DSM8 AKAI AX80
ULTIMATE PERCUSSION UP5
SIX NEW SOFTWARE PACKAGES
TECHNICS DIGITAL 10
KURZWEIL 250
SIEL DK600

BIGGEST EVER ISSUE

JUNO-106

PROGRAMMABLE POLYPHONIC SYNTHESIZER

MIDI

The JUNO-106 is a completely new polyphonic synthesizer that accepts all MIDI information. The Juno-106 features three MIDI jacks on the rear panel — In, Out, and Through — as well as a Function switch used to select the send and receive mode for I KYBD, II KYBD + BENDER + PGM CHANGE, or III ALL. The settings of all front panel controls (LFO, DCO, HPF, VCF, VCA, ENV, and Chorus) can be sent and received using the Exclusive Message in the ALL mode. There are sixteen MIDI channel select buttons on the front panel, enabling you to interface with other MIDI products. Several MIDI devices can then be simultaneously controlled using the MIDI Through jack. All instrumental parts of a composition can also be performed using the data stored in a computer.

ELEMENTAL PARTS

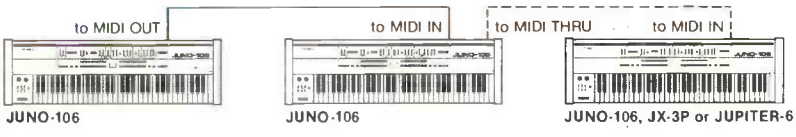
The JUNO-106, 61-key, 6-voice polyphonic synthesizer is easy to operate and packed with exciting functions. The JUNO-106 features a highly stable DCO, the same kind as used in Roland's famous JX-3P and JUNO-60. There are 2 groups (A and B) with 8 banks stored in each group. Each bank stores 8 patches for a total of 128 patch memories. All the LFO, DCO, HPF, VCF, VCA, ENV, and Chorus settings can be memorized. A cassette interface is provided to allow all program data to be stored on a cassette tape.
Since the program data of groups A and B are saved and loaded independently, it can be combined or rearranged as you like.
A memory protect switch is provided to prevent the program data from being accidentally erased.

PROGRAM MEMORY

The DCO's waveforms and ranges are selected by touch pads and the PWM, Sub-Oscillator, Noise and LFO controls are adjusted by sliding controls. The tone color is tailored at will by both VCF and HPF. The VCA has a level slider and ENV/Gate select switch. A Chorus effect is provided to reproduce realistic string or organ sounds. And for the first time in this price class, the JUNO-106 features a portamento function that is effective for both live performances and multitrack recording.

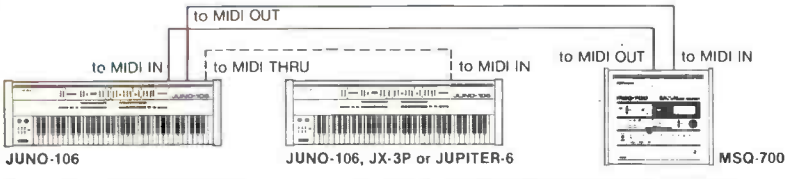
Typical set-ups using MIDI

A. JUNO-106 + other MIDI Keyboards



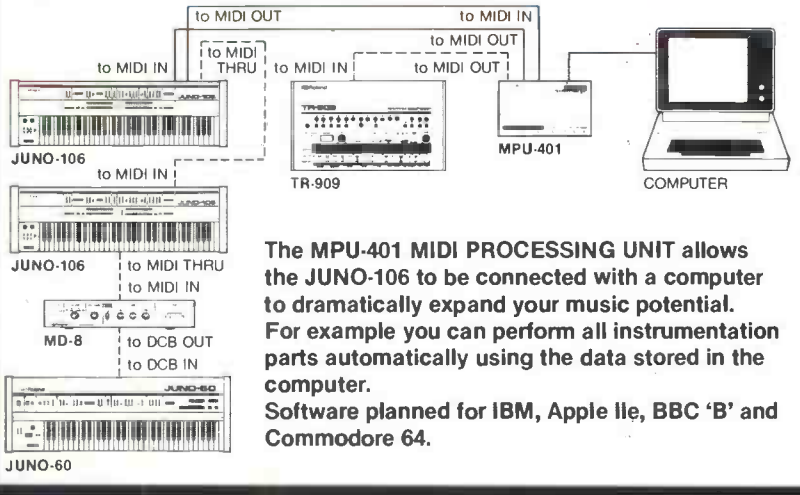
The JUNO-106 can control another MIDI keyboard. By connecting with its MIDI THRU jacks, the JUNO-106 can also control more than one MIDI keyboard simultaneously.

B. JUNO-106 + MSQ-700



When the JUNO-106 is connected with the MSQ-700 MIDI/DCB MULTI-TRACK DIGITAL KEYBOARD RECORDER, the MSQ-700 can memorize the JUNO-106's performance data.
If two JUNO-106 units are assigned different MIDI channels when writing performance data into the MSQ-700, the two JUNO-106 units can simultaneously perform two different instrumental parts.

C. JUNO-106 + MPU-401 + Computer

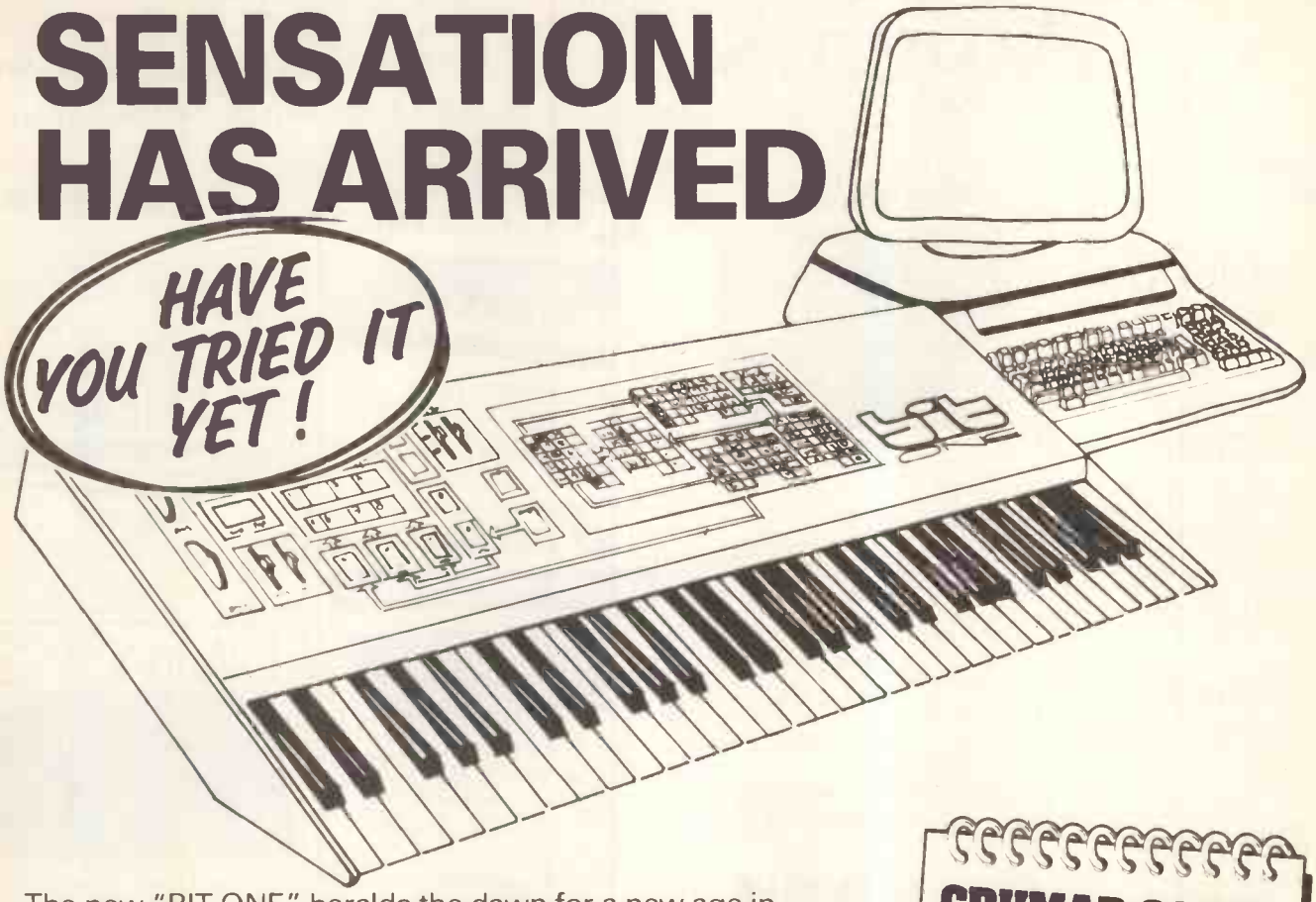


The MPU-401 MIDI PROCESSING UNIT allows the JUNO-106 to be connected with a computer to dramatically expand your music potential.
For example you can perform all instrumentation parts automatically using the data stored in the computer.
Software planned for IBM, Apple IIe, BBC 'B' and Commodore 64.

Roland

Roland (UK) Ltd Great West Trading Estate, 983 Great West Road
Brentford, Middx. TW8 9DN Telephone: 01-568 4578

THE CHASE "BIT ONE" SENSATION HAS ARRIVED



The new "BIT ONE" heralds the dawn for a new age in synthesizers. It is what every true musician has been waiting for – the ability to control musical expressivity from the keyboard alone.

Sounds Great
The keyboard is completely touch sensitive giving you total control through the velocity of the keys over the attack and envelope of the VCF's, the attack and amount of the VCA's, the pulse width modulation of the DCO's and the modulation rate of the LFO's – all by the way you touch the keys – note by note ...but you'll really have to hear it to appreciate the difference this makes.

Great Sounds
In addition this six voice dual oscillator synthesizer combines the perfect blend of Digital access controls linked to Analogue filters to give a unique blend of the benefits of each technology combined with assignable splitable keyboard, doubling mode, unison feature, stereo output and cassette and midi interfaces.

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Designed for simplicity of operation the "BIT ONE" is the first of a new series of modular electronics.

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YAMAHA RX15

Oscillator
PCM oscillator (256k bit Wave ROM x 4)
SOUND
15 Sounds
Bass Drum
Snare Drum x 2 (Medium, Hi Tune)
Rimshot
High Hat Open
High Hat Closed
High Hat Pedal
Tom Tom x 3
Cymbal Ride
Cymbal Crash
Hand Claps
Cowbell
Shaker
Output
L & R Phones
Display
16 LCD Alphanumeric LED indicator:
Pattern, Song, Run
Control Terminals
Foot SW, Midi IN-OUT
Cassette IN-OUT

IN STOCK CALL FOR PRICE

YAMAHA CX5M

MUSIC COMPUTER

The CX5M is an extremely versatile computer which interfaces with all MIDI compatible equipment, as well as Yahama's DX synthesisers and RX Drum machines.
The CX5M also has a built-in digital FM voice generator, in effect an "on-board" DX9 with 46 pre-programmed voices. However you can also check your own voices and then store them on tape.
You can use the CX5M as the nucleus of your Midi system as it will not only sequence all your synthesisers but will also control the tempo phasing and dynamics.
Furthermore there is an optional DX7 voicing programme where the parameters are displayed and editing then becomes simple.
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YAMAHA D1500

MIDI COMPATIBLE DIGITAL DELAY

In addition to being a top-flight Digital Delay line with a delay time of 1.023 seconds at a 20HZ to 18 KHZ bandwidth, it is equipped with 16 memory banks that can be selected (remotely), from a Midi keyboard or other Midi equipment. That means you can select a voice on your Midi keyboard, and the appropriate delay settings for that voice are automatically called via the Midi interface.

YAMAHA RX11

Oscillator
PCM oscillator (256k bit Wave ROM x 6)
SOUND
29 Sounds
Bass Drum x 3
Snare Drum x 8
Rimshot x 2
High Hat Open x 2
High Hat Closed x 2
High Hat Pedal
Tom Tom x 4
Cymbal Ride
Cymbal Crash
Hand Claps x 2
Cowbell x 2
Shaker
Output
Ind. 12ch L & R Phones
Display
16 LCD Alphanumeric LED indicator:
Led Display: Pattern, Song, Run
Control Terminals
Foot SW, Midi IN-OUT
Cassette IN-OUT
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Roland

MKB1000

NOW ON DEMONSTRATION.
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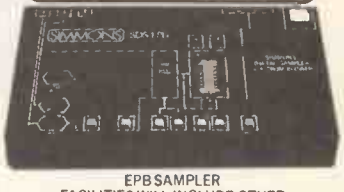
SIMMONS



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The new sampling device from Simmons. Allows the user to sample sounds from mic. or line source, review sample in RAM and if desired "blow" the sound onto 8 or 16 KBYTEE Prom. This E-Prom can then replace the E-Prom in a SDS7 module and can in turn be triggered from Simmons Pads.
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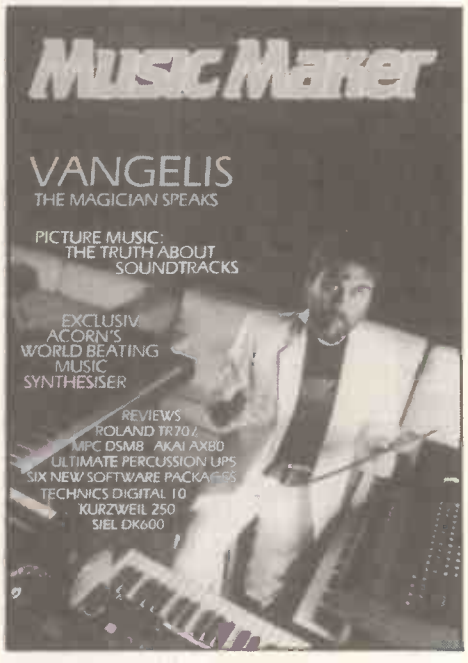
E&MM December 1984 Volume 4 Number 10

NEWS

HARDWARE

MUSIC



TECHNOLOGY

COMPUTER MUSICIAN

COMMENT

Bigger Means Better

November's E&MM saw us increase the size of the magazine by eight pages, and it probably hasn't escaped your attention that this month, we've added another eight. It's a reflection both of the growth in the electronic music marketplace and of the increase in the magazine's stature that this expansion has come about so swiftly. And it's for both those things that we owe such a huge debt to you, our readers.

More pages mean, among other things, more in-depth reviews – not press release re-writes or tentative previews – on the hardware that matters, more revealing interviews with well-known synth players and composers, more constructional projects and explanatory features, and more space into which our regular *Computer Musician* supplement can grow.

In short, the same formula we've all come to know and love, only more so.

It's also a fair bet that the increase in E&MM's cover price – to £1.20 – hasn't gone unnoticed either, and the most we can say in consolation is: it's not our fault. Inflation may have been comfortably in single figures for some while, but the publishing and printing industries have still got to face a whopping 25% increase in the cost of paper this winter. Faced with this daunting prospect, we decided that rather than cut paper quality or reduce the amount of colour inside the magazine, we'd give E&MM its first price rise for over 18 months.

What's your money bought you this month?

Well, on the review side of things, the first and only detailed report on the Kurzweil 250, an electronic instrument that can't quite reproduce all the colour and sparkle of a concert grand piano, but comes a damn sight nearer than any of its sampled-sound opposition; the first pro music products to come from two Japanese companies – Akai and Panasonic – intent on earning their share of what's becoming an increasingly profitable and wide-ranging cake; and four new electronic percussion devices – two Far Eastern, two British – that show there's plenty of innovation left in the field of electronic drums and drum machines.

Moving to the back of the issue and *Computer Musician*, you'll find an exclusive appraisal of Acorn Computers' Music 500, an extraordinary add-on for the BBC Micro that incorporates both a well-specified synthesis section and AMPLE, a music composition language second to none in terms of expandability and musician-friendliness.

There's also a roundup of six new software packages, three for the Commodore 64, two for the BBC B and one for the Spectrum. And the conclusion almost all our software reviewers come to is that, after a somewhat shaky start, the programmers now seem to be getting their act together, producing software that's both imaginative and easy to use.

Not that Vangelis, subject of this month's cover feature and one of the most influential composers of his generation, will care overmuch about software. As the interview shows, the great man has succeeded in producing most of his best-selling music without the aid of a single computer, preferring instead the immediacy of conventional analogue synths such as the Yamaha CS80. If nothing else, his attitude affirms the theory that, despite the onslaught of micro technology, there's still plenty of room for all shades of opinion in today's electronic music scene.

Talking of shades of opinion, next month's E&MM will include our annual readership survey, in which you'll get the chance to air your views on what we as a magazine should and should not be doing.

Actually, you needn't wait till January, as our regular *Interface* page is ready and waiting for your comments on the direction E&MM is taking. The many interconnection queries we receive have been dominating the letters page for some while now, so let's have some comment – of the constructive kind, preferably – to add that little bit of spice.

After all, the more feedback we get, the better the magazine will become. ■

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Roland

Juno 106	OH NO!
JX3P	YEAH?
SH101	You're kidding
MKB1000 mother k/b	Mums the word!
MKS10 piano module	Never!
MKS30 Polysynth module	Crumbs!
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Syncing Problems

Dear E&MM,

I've tried unsuccessfully to sync a Roland MC202 from the Trig Out of a Boss Dr Rhythm Graphic. What's the problem? And is there an interface I could buy to solve it?

Clare Newman
Bristol

Quite a common problem these days, as unlike the Titanic, these two products are virtually unsyncable. Although the Boss DR110 will fire some synths and sequencers, it only gives out one pulse depending, of course, on where the Accent has been programmed. Unfortunately, the MC202 is expecting a 24 pulses-per-bar (not per quarter-note as is commonly thought) sync code and is therefore incompatible.

Readers' Technical Directory

Dear E&MM,

In recent months, I have contacted various organisations that offered a communication service for electronic musicians. So far, none of these have replied, so I've decided to organise something myself.

What I propose is a co-operative system which would help everyone from those with little equipment (like me!) to those with a reasonable studio set-up, and this would involve the pooling of talents and resources. For example, I'm an electronics engineer with several years' experience in analogue and digital electronics and I enjoy building circuits, but my skills as a cabinet maker are less than spectacular, so my projects are usually boxed in a rather basic and unattractive enclosure. Similarly, there may be a musician with no electronic skills whatsoever, but who can build attractive cabinets. If a contact system existed, both of us would obviously benefit.

This is just a basic outline, very similar to E&MM's Technical Directory except that the idea can be extended to equipment exchanges and mutual assistance with recording or gigs. If the demand was there, newsletters and social functions could be arranged to provide greater contact between individuals. This, I'm sure, would go some way towards breaking the isolation a lot of home musicians experience.

If anyone is interested in this, they can contact me, with details of themselves and their music, enclosing SAE for reply. If the response is good, I'll send further details; if not, I'll send each person a list of interested people in their area.

John Palmer
33 Peel Road
N Wembley
Middlesex
☎ 01-908 4709

This seems like a perfect opportunity to print a list of readers interested in having their names included in a ***Readers' Technical Directory****. This was originally proposed in E&MM May 84 and, although the response has not been enormous, we hope this list will encourage readers to add their names to the system.*

P=Professional, A=Amateur, S=Student, F=Services offered free of charge.

Derek Burton, 34 Keymer Court, Burgess Hill, West Sussex RH15 0AA. ☎ (04446) 43684.

M Steele (S), 110 Kinghall Avenue, Northolt, Middlesex. ☎ 01-841 6123.

Christopher Rickenberg (P), 129 Ifield Drive, Ifield, Crawley, West Sussex RH11 0EA. ☎ (home) (0293) 36809 (work (0293) 28833 Ext 238.

M Camilleri-Ferrante (P), 35 Minster Road, London NW2. ☎ (home) 01-904 1262, (work) 01-435 4676.

Andy Wilson (P) (practically F), 64 Drew Gardens, Greenfield, Middlesex UB6 7QG. ☎ 01-903 4105.

Simon Batty (A), 3 The Poplars, Whitbarrow Road, Lymm, Cheshire WA13 9AZ. ☎ Lymm 3509.

K Singh (S) (F), 55 Willes Road, Winson Green, Birmingham B18 4PZ.

Alan Wright (A), 11 Tormusk Road, Glasgow G45 0BS.

S S Verik (P), Flat 60, Cornerfielde, Wavertree Road, Streatham Hill, London SW2.

A Question of Style

Dear E&MM,

I would like to play a polysynth (purely for home use, and without using multitrack equipment), but am unsure whether to use a piano or organ style of playing technique.

I'm learning to play keyboards on a twin-manual home organ, using left-hand block chords and a melody line in the right hand: this doesn't work on a single manual organ as the chords drown the melody.

Could you please advise me on a playing style to adopt, and suggest a suitable book, tutor or cassette course to help?

B J Kinder
Essex

The technique employed when playing a synth is dictated by a number of factors, but primarily by the type of sound the synth is set up to produce. With the exception of split-keyboard instruments, most models are only capable of producing one sound at a time, be that strings, harpsichord, electric piano, funky bass, 'Cosmic Waterfall' (!) or whatever. In imitative synthesis, in order to get the maximum benefit from a good patch, the playing style of the instrument being copied should be adopted as far as possible, ie. avoid block chords on strings, keep within the instrument's frequency range (no high-pitched tubas), and so on. Also, modulation (as well as vibrato, tremolo, glissando and so on) should be introduced as naturally as possible (delayed vibrato on solo violin, short pitch bends on fretless bass). Other factors governing technique include the actual keyboard, eg. whether it's touch-sensitive, if it has aftertouch, how many octaves it spans, and whether or not it has a split-keyboard facility. In non-imitative synthesis (ie. when the sound you're playing bears no resemblance to any 'conventional' instrument) anything goes. It's your personal preferences that should dictate things above all.

As far as publications are concerned, your letter indicates an unfamiliarity with sound synthesis in general, and if you'd like to avoid the (we hope, diminishing) number of synth players who consider the programmable memories on a synth as little more than presets, we recommend you take a look at The Complete Synthesiser *by David Crombie (published by Omnibus Press), the recently-released* Complete Synthesiser Handbook *by Michael Norman and Ben Dickey (Zomba books) or the brand new* Synthesiser & Electronic Keyboard Handbook *by David Crombie (see this month's* Newsdesk *and look out for reviews of these latter two publications in next month's E&MM).*

Remember that without a grounding in basic principles even the best playing technique won't make your music sound right! ■

BRITAIN'S BEST CHOICE

BUY WITH CONFIDENCE!

SPECIAL YAMAHA DEMONSTRATION ON DECEMBER 10th at the Bear Hotel, Esher, Surrey, 7.30pm to 10.30pm featuring CX5, DX7, RX11, RX15, QX1, T8PR. Admission free. Don't miss it!

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Roland Cube 60B	£250
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DE-200 Digital Delay	£POA
FV-100 Guitar Mono Vol. Pedal	£POA
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YAMAHA CSO1 SYNTH ONLY £99!

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YRM102 FM Voicing ROM	£36
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CA01 Single Cartridge	£19

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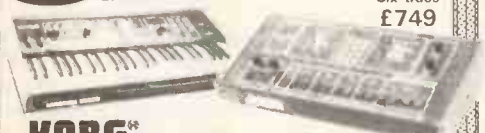

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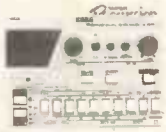
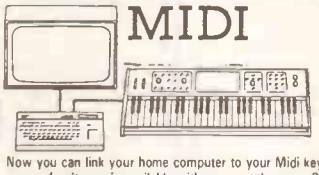


KORG RK100 MIDI KEYBOARD (poser machine!) £449

MIDI



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RMS 1M Midi Interface for Commodore	29.95
RMS 2H Midi Interface for Commodore/Spectrum	89.95
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Peavey Studio Pro 40	£169
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Westone Thunder 1	£135
Westone Thunder Jet	£135
Westone Thunder 1A	£157
Westone Spectrum 111	£189
Westone Thunder 1 Bass	£145
Westone Thunder 1A Bass	£160
Westone Thunder Jet Bass	£145
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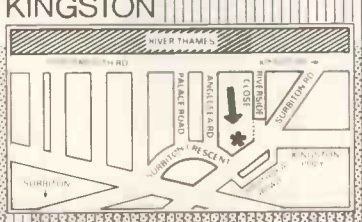

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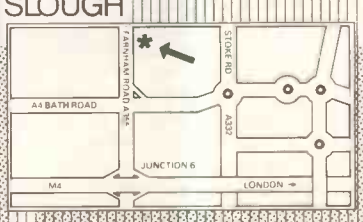

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HARDWARE

The new year should see the arrival of the **Casio CZ101,** the first in a new range of Casio keyboards aimed specifically at the pro synth market. The CZ101 is an eight-note polyphonic synth with a miniature keyboard (though a full-sized model is in the pipeline), possessing 16 preset digital voices and a further 16 programmable voice memories, these being storable on RAM cartridge. It boasts a selection of no fewer than 33 waveforms which can be mixed together, plus three envelope generators, two keyboard followers, and octave shift, pitch-bend, programmable portamento, solo voice mix and transpose functions. Fully equipped with MIDI, the CZ101 can be strapped across the shoulder for performers who want to pose, and will retail at just £395 including VAT.

Casio CZ101.

Casio have also launched a full-size keyboard version of their breath-controllable MT400V (labelled MT410V) which will retail at £345.

Further information from *Casio, Unit 6, 1000 North Circular Road, London NW2 7JD. ☎ 01-450 9131.*

First shown at this year's British Music Fair, the **Jen DT Piano 73** is a 73-note touch-responsive keyboard with built-in stereo speakers. It has three (mixable) piano presets, variable touch-sensitivity, a split-keyboard facility, and an onboard phaser section with adjustable speed and depth. It retails at £440 complete with sustain pedal, stand, cover and music rest.

Contact *British Music Strings, Bedwas House Industrial Estate, Bedwas, Newport, Gwent. ☎ (0222) 883904.*

Elka have made available a MIDI retrofit kit for their professional polysynth, the **Synthex,** while new Synthex models complete with MIDI as standard can now be purchased at a reduced price of £1199 (including VAT) from Oxford Synth Consultants, ☎ 01-767 7052.

For those unfamiliar with the Synthex, it's a five-octave, eight-voice split/layer synth with an onboard four-track sequencer that can use one or two MIDI channels. Unique features include digital ring mod and provision for cross-modulating the two oscillators. See full review, E&MM December 82.

Further information from *Elka-Orla (UK) Ltd, 3–5 Fourth Avenue, Bluebridge Industrial Estate, Halstead, Essex CO9 25Y. ☎ (0787) 475325.*

Linn Electronics have announced the release of the **Linn 9000,** the first product to integrate a MIDI-compatible keyboard recorder and digital drum machine in one unit, with programming operation identical for both. The 9000 keyboard recorder (or sequencer) memorises every aspect of performance – dynamics, pitch bend, modulation and patch change – for up to 16 MIDI-equipped synthesisers, with a maximum of 32 tracks.

Linn claim that the 9000 digital drum machine embodies all current technology for such devices (including the LinnDrum), while introducing several unique features. These include: 1) front panel velocity-sensitive rubber pads and/or rear panel electronic drum pad inputs for spontaneous dynamic programming; 2) hi-hat decay programming *via* manual control, allowing simulation of a drummer's varying foot pressure; 3) built-in mixer with separate slider assigned to each drum for programming of volume, panning and tuning; 4) 'Repeat' function providing quick programming of rolls and so on; 5) versatile tempo programming *via* 'tap' button or numeric entry (including tenths of a beat); 6) 18 drum and percussion sounds.

Recording and editing functions have been conceived to simulate the familiar operation of a multitrack tape machine, with record, play, fast forward, rewind and autolocate buttons among many others provided for easy and efficient operation.

Retrofittable options soon to become available will include: 1) a plug-in audio input circuit board for sampling sounds; 2) a 3.5" disk drive to augment the present cassette capability to load and store drum and sequence programs, as well as drum sound samples; 3) another plug-in circuit board to implement SMPTE interlocking.

Linn 9000.

For further information *contact Syco, 20 Conduit Place, London W2. ☎ 01-724 2451.*

STOP PRESS

One for the stocking . . . **'The Synthesiser and Electronic Keyboard Handbook'** is the title of an impressive new publication from one-time E&MM author David Crombie. Covering the history of keyboard playing, how to choose electronic keyboards, playing techniques, music theory, amplification and recording, the new book is published by Dorling Kindersley on November 15 and retails at £9.95, from all good bookshops.

A special **Yamaha** demonstration, held in association with **ABC Music,** will take place on Monday December 10, at the Bear Hotel, Esher, Surrey between 7.30 pm and 10.30 pm. The latest hi-tech equipment, including the DX synths, CX5M computer, QX1, TX816 and KX1 will be put through its paces by Yamaha's Ken Campbell and the ABC staff. Admission is free but by ticket only from *ABC Music, 85 High Street, Esher, Surrey. ☎ (0372) 66195.*

It's been a busy month for **Turnkey.** The **Turnkey Shop** was officially opened by Jools Holland recently. Solely dedicated to home and studio recording equipment, the store – which places the emphasis firmly on 'hands on' demonstrations – is at 14 Percy Street, London W1 (☎ 01-637 1701) . . . E&MM and sister magazine *Home Studio Recording* were present at the **Hands On Show** which, by all accounts, was the best yet and confirmed its position as the most important home recording show in Britain . . . And meanwhile, Fostex importers Bandive Ltd and Atlantex Music have announced a merger between the two companies, resulting in probably the biggest independently-owned music wholesaler/distributor in the UK.

The DX Owners Club and Yamaha-Kemble have announced the results of the recent **DX Voicing Competition,** designed to find the best new voices for the DX9. First prize of a Yamaha MT44 multitracker and PB44 patchbay went to John Pagan for his voice 'J M Jarre', and were presented to him by Martin Tennant of Yamaha-Kemble and Tony Wride of the Club.

A cassette containing the voice data for the Top 20 voices will be available shortly (and free of charge) from the *DX Owners Club, PO Box 6, Ripon, N Yorks, HG4 2QT.* Incidentally, the Club is now also geared to cater for the CX5M owners, and a cassette containing 48 new voices for the music computer is available to enrolling members.

If you're wondering what 'J M Jarre' sounds like – turn to this month's *Patchwork*!

Chase Bit One (E&MM November 84)

It was reported last month that the Bit One could only receive MIDI data at present, but it's been brought to our attention that the Bit One will communicate MIDI information both ways when used with a DX7 fitted with the latest MIDI software . . .

Step-Time Sequencing (E&MM November 84)

The following table should have been inserted before the fourth paragraph and allows the wiring to be checked without the program:

```
"Now type into your 64:
POKE 56579,255 (RETURN)
POKE 56577,32  (RETURN)"
```

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The London Rock Shops

Following the complete refurbishment of our London store we are delighted to present this new three page listing of Hi-Tech musical equipment. Both our London and Bristol stores carry the complete range of product that you see advertised here (subject to availability). We pride ourselves in giving you the best choice in Hi-Tech that you will find anywhere in the U.K.

We hope that this listing will help you make your choice and that you visit our London or Bristol stores for "Sound advice *and* a Better price".

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UMI-1B

(formerly advertised as Rocksoft)

The London Rock Shop has just released a professional sequencer/composer package for the BBC "B" computer and MIDI keyboards. Our unique hardware/software combination package is now called UMI-1B (Universal Midi Interface no. 1 for the BBC "B" microcomputer) and we are delighted to announce that UMI-1B is on display and available for sale exclusively in our London and Bristol stores. The outline specification of UMI-1B is now as follows:

Hardware MIDI interface unit:

Sync-to-tape In & Out
MIDI In (x1) & Out (x2)
Clock In & Out plus Start/Stop Sync 24 (Roland) 5-pin DIN output
Metronome audio output
Expansion port
Tempo control knob
Start/Stop & Step controls
Internal/External Clock switch

Software on sideways ROM with Aries 20K expansion board supplied:

Step-time sequencer with polyphonic, MIDI keyboard loading.
Real-time sequencer with quantizing and overdubbing.
Editing by note deletion from MIDI keyboard (real or step-time).
Step-time input allows varied velocity entries (DX-7).
16 channel full MIDI specification (no need for MIDI channel send information on DX-7) with expansion port for future multi-ACIA MIDI tasking.
Software control of External clock input speed (24, 48 or 96).
Pattern & Song display for Song creation with ± 8ve. transpose.
Pattern & Song dump to disk or cassette.
Yamaha DX-7 single voice patch dump to disk or cassette.
Song & DX-7 voice catalogue on one disk.
Built-in Sync-to-tape to use UMI-1B as master clock.
Digital tempo and memory used display.
Variables: count-in, metronome on/off, beats per pattern, beats per bar, steps per beat, clock speed, quantizing.
"Pack" control for modulation and pitch-bending increases overall memory facility for length of song.
Multi-screen colour display.

PRICE: £495.00 inc. vat. This includes the hardware interface unit (complete with mains cable and plug), software on sideways ROM, "Aries" B-20 20K RAM expansion board (from Cambridge Computer Consultants Ltd. value £70) and plastic-bound users' guide.

Sound advice AND a better price!

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The London Rock Shops

FOSTEX

FOSTEX: B-16 NEW 16-track on ½" tape
FOSTEX: 8090 remote control for B-16
FOSTEX: A-8 8-track on ¼" tape recorder
FOSTEX: A-2 2-track reel-to-reel recorder
FOSTEX: 350 8 into 4 into 2 mixer for A-8
FOSTEX: 3060 6 way meter bridge for 350
FOSTEX: 250 4-track Multitracker w/Dolby C
FOSTEX: X-15 NEW baby 4-track cassette
FOSTEX: MN-15 4-1 mini mixer/compressor
FOSTEX: 8070 AC mains adapter for X-15
FOSTEX: 9060 "Orange" foot drop in/out
FOSTEX: 3180 Stereo spring reverb
FOSTEX: 3070 Stereo compressor/limiter
FOSTEX: 3050 Digital delay with modulation
FOSTEX: 3030 Dual 10-band graphic equaliser
FOSTEX: 3040 4 ch. Dolby C noise reduction
FOSTEX: 2050 10 x 2 line mixer for mon mix
FOSTEX: 6301 Powered mini monitor
FOSTEX: SP-11 200w mini monitor 2 x 4"
FOSTEX: 3010 32 way all phono patch bay
FOSTEX: 8030 A-series remote control
FOSTEX: 8050 250/A-8 drop in switch

SPECIAL "GO FASTER" FOSTEX A-8 PACKAGE:

During December we are offering a ready-to-roll eight track system at a very special price including all the following items absolutely FREE:

8030 A-8 full remote control £46
8050 drop-in footswitch...£9
ACCESSIT compressor ... £51
ACCESSIT power supply for above.....£8
3 reels of AMPEX GM-1800 7" tape £24
plus all necessary cables. £27
Total FREE offer value £165
THIS SPECIAL OFFER MUST END DECEMBER 31st.

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TASCAM: 38 8 track on ½" recorder
TASCAM: 34 4 track on ¼" recorder
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HARDWARE

Kurzweil 250

Digital Keyboard

Its manufacturers claim the use of Artificial Intelligence enables the Kurzweil to sound better than any other sampled-sound instrument, but can it really replicate all the timbral characteristics of a concert grand piano? *David Ellis*

When the Kurzweil 250 made its first public appearance at the June 83 NAMM show in Chicago, it set a lot of tongues waggling and a lot of mouths salivating. A digital keyboard with high-quality sampled sounds that captured the dynamic timbral changes of a concert grand for under $10,000? Well, it couldn't be done. Could it . . .?

In fact Kurzweil have succeeded magnificently in casting aside all the carps of doubting Thomases, because what they've done works superbly well. But the 250 hasn't arrived without incurring a few penalty points along the way. For starters, when the 'under $10,000 price tag was first quoted, the pound was rather nearer the two-dollar mark than it is now, which means that a middling indentation into musicians' pockets has turned into an RRP further into the big league of computer music systems. As of October 22, both the Kurzweil's UK importers – Scenic Sounds and Syco – have agreed on an RRP of £10,995, and that's without VAT.

But let's look on the bright side first. Where the 250 really scores over its more expensive and world-wise competitors is in the way it approaches the technique of sound sampling. As I've said before, it's just about the easiest thing in the world to digitise sound into memory and then chuck it out again as a more or less pale imitation of the original. The only problem is that you rapidly find yourself on the receiving end of a reality that's doing its darndest to make life difficult, and which goes something like as follows:

1 High bandwidth sampling requires very fast sampling.

2 Very fast sampling chews up memory like there's no tomorrow.

3 Memory (ROM especially) is both expensive and power greedy.

4 The finished product ends up being costly, heavy, and hot.

Taking the 360 Systems keyboard as a commercial example of this flow of sampling logic, we find 352K of eight-bit storage space (48 × 2764 ROMs) being used for just a single sound – the bowed violin. And even though this is a realistic bowed violin that decays quite naturally without using looping to prolong the sound artificially, it's still only a collection of four string samples taken at various intervals, and more to the point, only at a single dynamic level. If you're happy to pay £700 for a high-quality string orchestra that's stuck in a single dynamic groove, look no further.

Background

However, Ray Kurzweil, principal designer behind the 250, had other plans in mind for his keyboard. His aim was to create a system that allowed sounds to be digitised, analysed, coded, modified, and played, taking into account timbre changes that are both pitch- and amplitude-dependent. His starting point was the piano. It's the instrument that just about every manufacturer has sought to emulate, but few have come within spitting distance of reproducing its vast range of colours. Kurzweil puts the pianistic sampling situation like this:

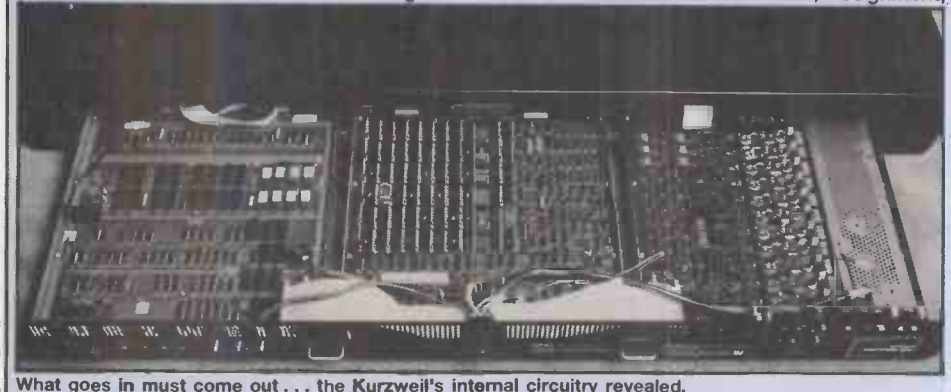
. . . each of the piano's 88 keys can create about 250 distinct timbres. Each of these 22,000 sounds lasts about 25 seconds for a total of about half-a-million seconds. If these were recorded using standard digital audio disk techniques (44,000 16-bit samples), it would require about 350 billion bits. With 256Kbit memory chips, that would require over a million memory chips for the piano alone!

Faced with all this mind-boggling mathematics, a lesser man would have given up and joined the West Coast lemmings for a life of sun, sea, and silicon dreams. Not so Ray Kurzweil. Fact was, he had another string to his bow in the form of the work his other company, Kurzweil Computer Products, had put into a machine called the Kurzweil Reading Machine. This is, basically, a $30,000 box of

tricks that translates printed text into phonetic speech (Stevie Wonder has one of these as well as his 250 Keyboard). What's important about the Reading Machine is that it uses the principle of Artificial Intelligence to learn as it goes, rather than just diving into the deep end every time a particular character is encountered. Kurzweil realised that a similar technique could be applied to sound, so that if a sound changes its timbre as it's played louder or softer, a computer can be used to analyse these changes and work out the rhyme and reason – the timbral algorithm, if you like (or what Kurzweil themselves call the 'Contoured Sound Modelling') – needed to recreate a particular sound at a given pitch and dynamic level.

The way this 'Contoured Sound Modelling' works goes something as follows.

Let's suppose you've got a friendly grand piano to hand that doesn't mind sharing its timbral information provided you promise to polish it next week. If you play a note as loud as the piano is capable of, and sample it for as long as it takes to decay, you'll have gained a single timbral point from the 250 sounds that Kurzweil claims for each key. At this stage, if a computer was asked to analyse the sound and suggest how it would differ if played at half the intensity, its only clue would be the height of the constituent harmonics, so a key played with half the intensity would imply half the levels of all the harmonics over the entire course of the note.



What goes in must come out . . . the Kurzweil's internal circuitry revealed.

To help the computer guess more accurately the next stage is actually to sample the note played at half intensity. This gives the computer a better representation of how the constituent harmonics change with intensity, so that if you then play a key at somewhere in between these two sampled intensities, the computer can interpolate between the two lots of sample information and come up with an educated guess. And, of course, it doesn't take a vast leap of the imagination to see that the more samples you take per note for different intensities of playing, the better the computer will be at filling in the gaps.

So what's being created is a system that improves its performance each time you give it more information. That, in a nutshell, is what Artificial Intelligence is all about, and what makes the 250's sounds tick. And according to Kurzweil's publicity info, the sound complexity captured by the 250 is 'at least 200 times greater than that of most other digital keyboard instruments'. Not 125,000 exactly, but still a lot closer to home.

Close Up

Make no mistake, the Kurzweil 250 is big. Big, black, and beautiful. Well, the last-mentioned lies in the eyes of the beholder, but remember that this near-as-dammit hundredweight of solidly constructed bulk won't spare those hernial orifices if it's manhandled solo. A bit like taking on Grace Jones without the assistance of Arnold Schwarzenegger . . . But there's more to come – the 22lb 'power pod' that doubles as power supply and foot pedal unit, to be exact. Clever idea, that – massive transformers are probably about as good as anything for preventing footpedal boxes from skating about on a polished floor. Also, putting the power supply on the floor gets around hum and heat problems.

The keyboard itself is an honest-to-goodness Pratt & Reed type covering an 88-note range. The keys are somewhat lighter in feel than the average concert grand, and they're also the standard synth length of 5.5 inches from back to front, but the keyboard plays like a very responsive grand, not a synth.

Central position of the control panel is occupied by a back-lit LCD. Underneath it, there's a trio of momentary contact switches (Yes, No, and Select) and a keypad with a cursor cluster to the right. Arranged around this focal centre are the Effect, Assignment, Program and Media control sections. To the keypad's immediate left lie buttons for Chorus, Split Keyboard, and Transpose, and next come switches and sliders for detuning and assigning functions to the two performance wheels. Finally, at the far left, we find the master tuning and balance/output level controls. On the keypad's right, you've got the section for program control – the means of setting up keyboards, instruments, and sequences – and at the far right, the media section for organising the 250's intercourse(!) with MIDI keyboards, sync receivers and senders, and computers. Oh, and before I forget, there's also a socket underneath the front of the keyboard ready to receive plug-in ROM sound cartridges (at £600 each), though there are conflicting reports as to if and when these will actually appear.

Unlike similar instruments that oblige you to wrestle with umpteen screws and hinged keyboards before you can find out what's where Inside the box, the 250 adopts the blindingly sensible approach of putting all the circuitry on a sliding plate that can be pulled out from the back of the keyboard by merely undoing a trio of screws. Superb for servicing or replacing ROM boards. This manoeuvre reveals three large PCBs that normally stretch their way underneath the keyboard. The first of these gives pride of place to a 68000 processor plus all its attendant circuitry, together with 108K of battery backed-up CMOS RAM (16 × 6264s – a cool £500-worth on the UK market!). Next, the middle board, which houses the massive amount of memory embodied in 60 × 23256 ROMs – a total of 2Mbyte. Now, it's only recently that these 256K ROMs (32K × eight-bit) have appeared on the market, which is probably one of the reasons for the delay in the 250 coming off the production line. And at a one-off price of $25 for a 23256 ROM, it's not hard to see where a healthy slice of that £11,000 is going. However, unlike the average drum machine ROM, where the data in the chips is essentially a brute-force digital recording of the original, what's ensconced in the 250's ROMs is a load of tables that represent Kurzweil's AI–derived model of the sound. So, if a note's played on the keyboard, the 68000 trots off to the ROMs to yank out the necessary information on that sound played at that pitch and velocity, performs some impressive number crunching to reconstitute all the necessary sound data, and then sends it off to the third board to 12 AD7545 12-bit DACs, attendant sample & holds, and some well-shielded switched-capacitor type low-pass filters to create the instrument's 12 output channels.

Finally *à derrière*, there's a host of inputs and outputs to cover most contingencies. Specifically, and from right to left, the 250 provides Line In, Mic In, a couple of jacks for footpedals, headphones, balanced left and right outputs, low and high outputs, the main multicore power/footpedal socket, MIDI Out, Thru and In, Sync Out and In, Click Out, Trigger In, and last but far from least, a 37-way D-connector marked 'computer', more of which anon.

Even given this generous list of ins and outs, what stands out as a curious omission is separate outputs for each of the 12 channels. No doubt Kurzweil will argue that separate outputs are irrelevant on a performance keyboard like the 250, but given that it's possible to set up 13 different drum sounds on the keyboard (as Kurzweil have done themselves – not once, but four times – in the factory keyboard setups) and record each one separately into the multitrack sequencer, it seems strange not to put the final layer of icing on the cake and provide individual outs for the performance and (especially) recording situations that demand them. Apparently though, Kurzweil are giving this one some careful thought . . .

Sound Comparisons

Kurzweil have made a great deal of advertising mileage out of their claim that the 250 'perfectly recreates the sound quality, as well as the dynamic range, of any acoustic instrument – even a concert grand'. At this year's NAMM show, an A–B comparison was staged between a 'top-of-the-line' 9ft concert grand and the 250, both played through a $40,000 sound system. According to Kurzweil, the general consensus was that it was impossible to distinguish any difference between the two. Hence the motto adopted by the company: 'you can't tell the difference'. Well, ever eager to take up the gauntlet, I dug out my dusty volumes of Rachmaninoff and Debussy, rang up a friend with a 9ft Bosendorfer concert grand, and arranged to drop round with the 250. Much back-straining and estate car groaning later (the things I do for E&MM!), I put the comparison to the test, as well as going through the other factory sounds in the 250's ROM catalogue.

As far as the bass end of the piano was concerned, the poor old Bosendorfer hardly got a look in – even with its extra notes flap lifted. And yes, as some other reviewers have commented, the Kurzweil's piano *does* sound as if it's being piped in from a studio – albeit *via* some expensive monitors – rather than being actually there in front of you. In fact, it was a rather curious feeling – a sort of 'Out of Body' pianistic experience. But hang about, didn't I hear a difference in tone going from this note to that even though I was using the same touch? And what about that group of notes further up – isn't the hammer sound a little too strong for comfort? To be precise, what actually transpired from this critical going-over is that the 250's 88 notes split into about 16 clearly definable sampling regions, where both the notes below and notes above are timbrally different to their neighbours. The following notes illustrate what I noticed going up the grand piano keyboard from middle C:

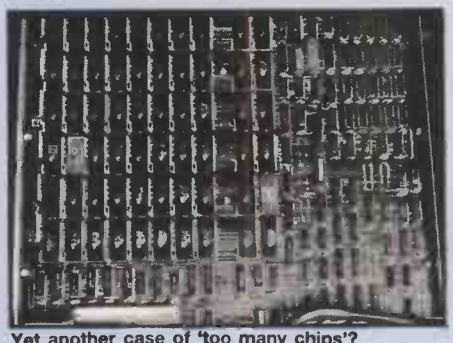
C–E: bright sound, velocity leads to brighter tone
F–C: darker tone, velocity leads to more hammer sound; pitch of hammer increases going up the group
C–F: thinner, noticeable delay glitch with pitch wobble over entire group
G–F: close-miked sound, very prominent hammer tone
F–D: wooden, very pronounced hammer strike which changes pitch with the note
E–F: brighter and louder, less hammer
G–C: same brightness, hammer rises in pitch

If there was a general impression to be gained from this devious detective work, it was that the bottom note of each group was darker and had a lower-pitched hammer tone than the top. Superficially, this sounds pretty much like what we've come to expect from the multi-sampling technique – not enough samples to cope with going smoothly from one section of the keyboard to another. But that's only one side of the story. What about the effect of velocity on the timbre? Well, it's here that the 250 really shines: the way the tone darkens and lightens with dynamics is nothing short of stunning. During the comparisons, this prompted me to start burying myself in sheet music to see how the 250 could cope with the tonal ebb and flow of Rachmaninoff and the atmospheric haze of Debussy. Perhaps not surprisingly, the Bosendorfer won on both counts, but isn't that what you'd expect from a £25,000 concert grand? The fact that the Kurzweil was a darn good loser in this (extremely unfair) competition only goes to show that its designers have got a lot right. And when you remember that this particular 88-note piano has been squashed into just 512K of ROM with an utterly natural dynamic performance complete with the requisite timbral changes, a smooth glitch-free decay that stretches off into the distance for tens of seconds, and a 50kHz sampling rate to boot, it's difficult not to be a little awestruck by what Kurzweil have achieved.

The rest of the stock factory sounds are roughly what you'd expect from a sampling system that's aiming to prove its point to as wide a range of musicians as possible. Namely, a mixture of organs of all shapes and sizes with key clicks that turn into noise chiffs down at the bottom end, various string sections seemingly caught in a time-warp, sundry brass instruments of which only the baritone horn really stands out as being exceptional, the very quirky 'endless glissando', which'd put even a barber's pole in a twist, a superb acoustic bass (similar to the DX7's, but without the gut-wrenching strain that comes from digging into the keys), an acoustic guitar that isn't *quite* there and shows an alarming inconsistency of tone below middle C, and about 13 different drum sounds arranged in a variety of somewhat bizarre drum kits.

As in the case of the grand piano, all these instruments (with the exception of the velocity-less electric organs), prove the usefulness of Contoured Sound Modelling. Strings bite more deeply, horns get brighter, kick drums get thuddier. In short, the technique works triumphantly.

But at the same time, the problems that cropped up with the grand piano appear just as significantly on these sounds. Taking the fast-attack strings as an example, we find a rich 'cello at the bottom – real C-string stuff, this – that wends its way up the keyboard changing quality here and there. Perhaps that's to be expected when you've a 'cello turning into a viola into a violin, but that doesn't explain why a sustained note should give a very good impression of glitched looping. This was especially bad above the C above middle C, where the cycling background noise (the bow sound?) plus an all too obvious loop point give a good impression of an altogether too groovy string section. Going up, the D two octaves above middle C has an annoying chirp at the start of it, and then in the top fifth of the keyboard, all the notes have a twenties-like portamento at the start of them, effectively



Yet another case of 'too many chips'?

transforming what should be sweet-sounding fiddle lines into something reminiscent of the shower scene from *Psycho* . . .

The lack of quality control between the different factory sounds was something that struck me repeatedly during the time I had with the 250. Take the baritone horn, for instance – a rich, silky sound of character and quality, and an asset to any musician. Next to that in the brass line-up, we find a rather weak trumpet, whose over-emphasised 'wah' results in a sound that's more reminiscent of a harmonium than any member of the brass family, and the distinctly flabby trombone, with a pitch wobble that can only be described as flatulent. Move to the percussion and you'll find a host of powerful timps, toms, and kicks, snappy snares, and crashing cymbals (with a decent if not generous decay time of 2 seconds). In short, excellent percussion that responds as dynamically as all the other 250 sounds. But doesn't it seem a bit bizarre putting drum kit percussion on a performance keyboard? Sure, it's a good way of extending the number of sounds on the ROM board up to the quoted 30, but shouldn't the remaining ten keyboard-orientated sounds be uniformly better than they are in reality?

> 'Ever eager to take up the gauntlet, I dug out my dusty volumes of Rachmaninoff and Debussy, rang up a friend with a 9ft Bosendorfer concert grand, and arranged to drop by with the 250.'

Modifications

Kurzweil's original promotional material made great play of the modifications that can be applied to sounds, both sampled and preset. The original intention of offering programmable VCFs seems to have been ditched in the production version, but what is now offered – 20 different functions for echo/chorusing, vibrato, tremolo, pitch bend, and envelope control – should be enough for most aspiring Kurzweilers.

And if it isn't, there's always the Sound Laboratory software to come, which should allow you and an Apple Macintosh computer to indulge in the analysis of sounds, simulation of filter sweeps, mergings, cross-fades, or whatever. In short, whatever your favourite form of sound manipulation may be, the Sound Laboratory should provide the means for its realisation.

Of the currently available options, perhaps the most interesting is to customise a particular instrument with its own ambient surroundings courtesy of the Kurzweil's chorus system. The main problem with this is that all the delay line effects consume extra channels, and the reason for this is that the effects are achieved by subtly-applied pitch offsets and staggered envelopes rather than a true recycling of a sound through RAM. Again, that's one of the limitations imposed on the 250 by ROM-based sound storage.

There are four types of effect available: doubling, full chorus, flanging, and echo. Full chorus is the greediest of the four in that it spawns chorused voices on either side of the root voice, thereby reducing the keyboard's 12-note polyphony to just four-note. In practice, it's not that bad because of the dynamic channel assignment, but you've still got to watch your Ps and Qs pretty closely. Personally, I'd be more inclined to add on a MIDI-controllable DDL (like the Yamaha D1500 or Powertran MCS1) than mess around with pre-defining delay line effects.

A further modification (of a sort) is the facility to combine different sounds across the keyboard, both as conventional splits and specially layered set-ups. Indeed, of the 40 keyboard set-ups preset in the 250, only 13 are of single instruments, the remainder including a wide variety of split arrangements (ranging from an acoustic bass/piano combination, with a single split at B2, to multiple-split drum kits) and more or less complex layerings (the slow strings and guitar or octave-detuned layered guitars, for instance). In fact, each keyboard set-up can have as many as six layers. Within each single instrument layer, the sound can be transposed, pitch-shifted, timbre-shifted (within the limits of LFO modulation and delay line tactics), or velocity-adjusted (less or more sensitive, or even anti-velocity sensing), and up to 50 of these user-defined set-ups can then be saved in the backed-up RAM. The advantage of all this is that particular keyboard set-ups will then function as automatic arranging tools, playing several instruments from a single key – if that's what turns you on. The disadvantage is that, like the 250's chorus system, layering uses up yet more channels.

Sequencing

Again, the sequencer looks wonderful on paper.

It would take a pedant and a half to complain about specs that run to 12 independent real-time polyphonic tracks, 8500-note battery-backed RAM (with the expansion RAM in place, which, depending on whom you ask or wave a bunch of green ones at, may or may not be fitted as standard), all manner of sequence and track editing, playback quantisation, multi-input tempo control (whatever that may be), and variable-rate external sync. However, the majority of these functions were missing from the software in the 250 I was using. Indeed, as you read through the sequencer section in the beautifully-Macintoshed manual, you come across comments such as 'you cannot currently edit sequences', 'none of the special effects (including sustain) are recorded in the sequence track (this will be remedied in future releases)',

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'as yet quantization is not available', 'tempo tap is not yet implemented', and 'this version of the sequencer is not doing append correctly'. Nuff said.

Don't get me wrong. The 250's sequencer isn't a bad sequencer, it's just an unfinished one. Which raises the question as to whether the release of this version was perhaps just a little too premature for Kurzweil's own good, bearing in mind how difficult it is to review features that are outside current reality. Another problem is that as the 250 stands, there's no way in which either instrument parameters, keyboard set-ups or sequences can actually be saved external to the battery backed-up RAM, aside from putting a £2000 Macintosh on-line to the 250. Again, this reflects an about-turn from Kurzweil's original promo material, in which an artist's impression of the control panel showed cassette controls and the specs list included 'off-line digital cassette storage'.

What I can say is that the sequencer works very well as far as it goes. But you can understand the frustration I felt when, having played in a track using the grand piano keyboard set-up, I discovered that the sequencer had omitted to lodge the function of the sustain pedal in its frame of consciousness. True, the manual informs you as such, but that doesn't stop it being a hell of a let-down after all the hype and expectation behind the 250. Still, the multitracking works more or less painlessly and the LCD is used to good effect to keep you informed about where your tracks and sequences are going, a factor that's vital if you want to avoid inadvertently erasing a sequence.

One point that's vitally important to bear in mind when using the sequencer is the fact that the 250 has 12 output channels. So, if you go overboard with your polyphony on the 12 sequencer tracks, don't be surprised if you fail to hear everything you put in. Remember that the thing's only human, and you'll be all right. In fact the 250's software includes a variety of different 'channel stealing algorithms' (also a feature of the Synergy, as it happens) designed to reallocate channels dynamically as and when they're needed, without giving the idea that notes have suddenly been cut off in their

Parameter selection and programming controls.

prime. I was impressed by the operation of this: even with lots of sustain and big power chords, you got the impression there were more than just 12 channels at work. Mind you, with multitrack facilities to hand, it would obviously be a safer proposition to use the 250's tape sync (when it's working, of course) to stagger recording the 12 potential sequencer tracks onto tape.

Anyhow, having laid down a couple of ditties on top of an excellent, driving drum pattern some kind personage had left in the sequencer, I scanned through the remainder of the 25 sequences that can be stored onboard just to see what others had been up to. And lo and behold, what should I come across but an 'arrangement' of Handel's *Arrival of the Queen of Sheba*, scored for fast strings and baritone horn presets. This proved a revelation, though not quite in the sense you'd expect. True, the intended string orchestra sounded as if it was playing most of the notes, but the quality of the playing and sound was such that it was all too reminiscent of those awful 78 recordings of *ad hoc* orchestras waging war with the classics. Mind you, not all the blame can be laid at the feet of the strings samples, because the lack of sustain was yet another thorn in the flesh. Which left the two baritone horns truly out-front with a style of playing and quality of sound that was completely at odds with the backing – though stunning nonetheless. Somehow, I don't think even the Alan Parsons Project would put up with these strings . . .

> 'Of the currently available options, perhaps the most interesting is to customise a particular instrument with its own ambient surroundings, courtesy of the Kurzweil's chorus system.'

Future Prospects

The future of the 250 is really summed up by that connector on the back of the keyboard marked 'computer'. Kurzweil ditched their efforts in the direction of linking the 250 with the IBM PC some time ago which, bearing in mind the comparative slowness of the IBM, is hardly something worth losing much sleep over. More to the point is the fact that the IBM PC's 8088 processor only has an eight-bit data bus, whereas Kurzweil's current chosen computer, the Apple Macintosh, uses the same 68000 processor as the 250, which obviously makes for easier communication and software compatibility.

The first, and for 99% of musicians, most crucial expansion facility is sampling. As things stand, the 250 can't sample unless some additional hardware and software is pressed into service. This comes under the name of the Sound Digitizer, and comprises a set of PCBs, the first holding 512K of conventional RAM (no battery back-up) and plugging into the 68000 board, the second including an anti-aliasing filter, 12-bit ADC, and sampling software in ROM and plugging into the analogue board. This combination is expected to retail for between £1000 and £1500, and should make its appearance early in 1985. What you'll then be able to do is sample up to 20 seconds of sound into the extra RAM (at a sampling rate contingent on sound length and bandwidth requirements), perform a limited degree of analysis on it (along the lines of Contoured Sound Modelling, but without all the bells and whistles), and then use the sound(s) in conjunction with the ROM board presets. However, this welcome addition carries the major penalty point that you won't be able to save your own samples unless you also attach at £2000 Apple Macintosh computer.

Exactly what the Composition/Notation software package will offer isn't clear at present, but the main aims would seem to be a non real-time transcribing facility that puts any piece of music played on the 250 onto the screen of an Apple Mac, a printout feature that supports a gamut of possibilities from orchestral to vocal score preparation, and perhaps most importantly, the implementation of 'KMS Language', Kurzweil's own MCL.

One major problem is going to be the cost of all the software enhancements necessary for getting a Mac communicating with a 250: namely £2500 for the Sound Modelling Program, £1670 for the Sound Laboratory, and a further £1670 for the Composition/Notation Software. Add on the approximate figure of £1200 for the Sound Digitizer, and that's £7040 on top of the £10,995, making the princely sum of £18,035 in all: not a figure to be sneezed at. And that's still without the extra £850 quoted for each alternative set of ROM-based sounds.

Finally, there's the MIDI side of the 250. The fact that Kurzweil have devoted 34 pages of the manual to this feature is a clear sign of their intent. More importantly for the uninitiated user, the manual takes great pains to guide the average MIDI interfacer over the bumpy terrain of getting one instrument to communicate with another. In fact, the 250's features *vis-à-vis* MIDI are pretty comprehensive, and include programmable channel transmit and receive and the capacity to utilise system exclusive information.

Conclusions

The fact that the 250 has so much expensive ROM inside it highlights the major problems associated with ROM-based sounds. If all 30 sounds were of equal value, that wouldn't be so bad, but the truth is that some of them are really rather poor, so an upgrade has got to be on the cards (pun intended) in the near future. The alternative is to make sure that when you buy your 250, you have a good listen to the different ROM sound boards that are available. After all, if you're not a piano man (*or woman – **Production Ed***) it's hardly worth sacrificing a quarter of the ROM space just for that one sound.

Doing the Devil's advocate bit, I have to say that I'm not convinced by the usefulness of ROM sound storage in a machine of this calibre and cost. It's fine for the drum machine market, where sounds are by tradition 'preset', and relatively high volume sales are the norm, but for this sort of quality keyboard, I'd have put my money on replacing the 2Mbytes of ROM with an equivalent amount of (cheaper) RAM, and then adding on a nice, fast (using DMA) double or quad density 5.25" disk drive for loading and saving sounds to and from RAM as and when you sample or need them. Indeed, it seems perverse in the extreme to go in the opposite direction to E-mu Systems, who've just added a further disk drive to the Emulator II (see review, E&MM November) in order to improve storage facilities.

Still, dress the 250 up with a nice, clean MacIntosh and you've got a dual-68000 system that outstrips all its competitors in the areas of sound quality, hardware design, and software intelligence. So I back the principles, if not the practicality, of the 250 wholeheartedly.

I can't help thinking that what I've been looking at represents the tip of the 250 iceberg, given the promises its designers are making for the future. And of course, there's still the question as to whether Kurzweil have any intentions to licence their software techniques to other manufacturers. That would really put the Artificially Intelligent cat amongst the eight-bit pigeons. ■

Further information on all things Kurzweil can be had from Syco, 20 Conduit Place, London W2, ☎ 01-724 2451; or Scenic Sounds Equipment, Unit 2, 10 William Road, London NW1 3EN, ☎ 01-734 2812. Review model supplied by Scenic Sounds.

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Roland TR707

Digital Rhythm Composer

It's taken them a while, but now that Roland have produced their first digital drum machine, they look set to re-capture their premier position among the world's electronic percussion manufacturers. *Dan Goldstein*

It had to happen sooner or later, of course. Roland had already had a brief flirtation with sampled-sound percussion in the form of the cymbal voices on their TR909 drum machine, and their MIDI Pad system unveiled at August's British Music Fair (and soon to appear in dealers' showrooms) was surely tailor-made for an entirely digital system.

Specification

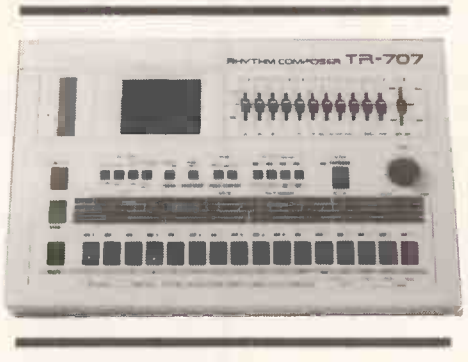
If the 707's appearance looks familiar, it's because the row of pushbutton voice selectors across the machine's lower half is similar to that on the TR808 (Roland's first fully-programmable drum box), the 606 (their budget version), and the 909 (their deluxe version, still in production). Also similar are the pattern and programming selector layout and the illustrations of the four timing options available to the budding programmer, but the 707 differs from its predecessors in having a large LCD readout that incorporates a 16-by-10 matrix display on which programming data is indicated, and a three-digit numeric readout that shows tempo, measure, or MIDI channel number, depending on the mode currently in use. In fact, the LCD grid is a refined version of that found on the Boss Dr Rhythm Graphic, and as well as looking smart, it also makes programming (especially in step-time) a lot easier.

Programming on the 707 takes place on four levels: steps, measures, patterns and tracks. A measure is made up of 16 steps, patterns are made up from a series of measures, and up to 64 patterns can be chained together to form a maximum of four tracks. However, twice that number of tracks can be stored on external RAM cartridge (optional extras, these), and one advantage the 707 has over the 909 is that the receptacle for the said cartridge is mounted on the front panel instead of the rear one, which makes access a great deal easier. Incidentally, Rolandophiles will probably be interested to know that the 707 uses the same RAMs – Roland designation M64C – as the company's MKS30 MIDI synthesiser module.

There are 16 digitally-sampled drum voices on the 707, and all of these fall into the loose category of 'kit' sounds. Two variations of bass, snare, and closed hi-hat are available, but whereas on the 909 the difference between such alternative voices was purely one of level, the 707's duplicates differ substantially in tone, which, given the presence of a programmable accent, would seem to make a lot more sense in programming terms.

Individual slider pots are used for independent level control (though two sliders govern both rimshot and cowbell and handclaps and tambourine respectively), and in addition to these, a similarly-configured group of individual voice outputs (all on quarter-inch jacks) resides on the 707's back panel – a real boon for multitrack recording. The other (though in this instance, less significant) side of the coin is that the odd tone control present on the 909 is missing on the new, cheaper model, and that although the 707's output is stereo, no provision has been made for users to pan sounds themselves as they see fit *à la* Yamaha RX series. Instead, the Roland's voices are pre-panned, as they are on Korg's DDM series, to form a vaguely realistic stereo picture.

The 707's back panel incorporates a veritable plethora of interfacing options, which is good to see at a time when so many instrument designers are fitting MIDI and MIDI only. The 707 has the dreaded five-pin In and Out sockets, of course, and these are made more useful by the fact that the machine can be programmed to receive and transmit data on any one of 16 MIDI channels. But the machine also incorporates Roland's own 24 pulses-per-beat sync standard (itself only recently



adopted by Korg, remember), and sockets facilitating syncing to and from tape, which incidentally doubles as the program dump-to-cassette connectors.

Programming

One thing that is fairly clear the moment you remove the TR707 from its protective packaging is that it's been designed down – rather than up – to a cost. The clever people at Roland in Japan must have drawn up a list of facilities they considered essential and then tried to think up ways of packaging them as economically as possible, in order to show some sort of profit at the end of the day. The results of all this are that (a) the 707 is astonishingly lightweight (some would say flimsy) in its construction, and (b) almost every control on the front panel – the level sliders excepted – is multi-functional, thereby eliminating excess hardware as far as possible.

To make selecting functions a little easier, Roland have stuck to the Shift key system pioneered on the TR909, and this makes mode and voice selection a lot less of a chore than it might have been.

Programming can be undertaken in either real-time or step-time (the 707 calls the former 'tap-time'), and the LCD matrix is particularly helpful in the latter mode, as it enables you to see at a glance which drum voice has been programmed and where. The grid operates in Play mode, too.

Real-time programming obviously has the advantage that all the 707's drum voices can be programmed simultaneously (in step-time you have to hold down the Instrument push-button and press the relevant selector each time you want to program a different drum, while a flashing cursor indicates the newly-selected voice on the matrix display), but thanks to the 707's logical layout, neither mode poses any real logistical problems. I suspect that the majority of readers will have come up against a programmable Roland drum machine before at some stage, and if you're one of that majority, things will be easier still.

It's worth noting that cost-cutting hasn't stopped the 707 from having both flam and shuffle program options, and these add greatly to the amount of 'human feel' that can be injected into a pattern.

Once you're happy with your patterns, these can be chained together to form tracks using, oddly enough, the same programming selectors you use to do the pattern writing, though this time in their Shift mode.

Ten of the 16 voice selectors double as numeric keys used to specify such things as measure number and MIDI channel number, while a further three are used for Insert, Delete and Copy functions (these see a lot of use during the chaining process), and the remaining three carry out the customary tape dump functions of Save, Verify and Load.

Sounds

I can remember it being speculated not all that long ago that the reason Roland were reluctant to bring out a sampled-sound drum machine was that their analogue voices were already well liked by large numbers of the modern music fraternity. Those sounds *were* well liked, and for good reason, because a number of them (I'm thinking of the 808's clap and conga sounds as examples) were just as good as anything digital technology could offer.

However, all that has now gone by the wayside, because the TR707 has brought Roland into the sampled-drum stakes with a vengeance. The 16 sounds on offer are uniformly and disarmingly good, and although the Roland lacks the variety of sounds offered by the Yamaha RX11 or the tuning options of the SCI Drumtraks, I doubt many musicians will have the courage to complain.

Both **bass drum** sounds are strong and punchy, with just the right length of attack and, interestingly, a hint of recorded ambience that reminded me a little of the ddrum's recorded-through-a-digital-reverb voices. Have Roland done the same with the 707? Well, personally I doubt it, as none of the other voices exhibits this reverb, but it's nice to have all the same.

The **snare drum** sounds are fashionably

mellow and rounded, and a far cry from the lightweight slap that characterised Roland's analogue endeavours in this direction. It's the second of the two that has the greater 'snare' component (remember the 'Snappy' control on the 808 and 909?), and after only a short while I found myself greatly preferring it, though there's no reason why you shouldn't decide on the first for one application and the second for a different one.

The three toms are also fashionable in that, although they've obviously been sampled from an acoustic tom (and it may have been just one: there's a slight aural suspicion that the trio might all be derived from the same sample and then tuned apart), the inconsistencies of the sampling process have made them just a teeny bit Simmons-ish.

The 707's **rimshot** is simply superb, though for some reason (probably because it's a sound that, in real life, occupies both a limited time span and a relatively narrow frequency spectrum, and is therefore easier to store in solid state memory), this is a sound most digital drum machines get right. However, unlike some of those computing machines, the 707's programming system *doesn't* prevent you from defying the laws of acoustic drumming and entering a rimshot and a snare voice together on the same beat. The wonders of modern technology, and all that.

Cowbell is perfectly competent if a little characterless, and much the same can be said of **tambourine**. The **handclaps** must have posed the 707's development engineers with a real problem, since as I've already explained, the clap sound is one thing Roland's electronics can reproduce Very Well Indeed. To be quite candid, these claps sound more 'electronic' than any other sample I've come across, which isn't necessarily to their discredit. Is it a sampled 808? Frankly, I suspect not, but you never know . . .

The three **hi-hats** and two **cymbals** (crash and ride) are absolutely wonderful, even if the crash and open hi-hat don't have quite enough decay on them to be utterly convincing. In fact, this is a problem that afflicts most of the 707's voices in one way or another, the degree of discomfort varying depending on how much decay the voice has on an acoustic kit. It's worth bearing in mind that digital memory still isn't nearly as cheap as a lot of people seem to think it is (let alone *want* it to be), so there are bound to be compromises on a machine in this price category, where storage space for samples is still very much at a premium.

Digital noise also makes an appearance, though it's similar in overall level to that produced by competing machines. In other words, quite noticeable when a voice is played repeatedly, thorough headphones, and in isolation, but not overly intrusive otherwise.

So yes, the 707's voices are excellent. Perfection is an entirely different matter.

Two further points worth making about the 707's sonic capabilities, both connected (no pun intended) with the unit's interfacing facilities.

As you kow, several MIDI-equipped drum machines are capable of sending their voices *via* the MIDI bus to a similarly-equipped synthesiser where they can be 'played' from that instrument's keyboard, but few of them do what the 707 does in allowing you to program which keys relate to which drum voice. Not only does this programming facility make remote performance a more logical process, it also turns the 707 into a simple-to-use and, obviously, rather cost-effective MIDI sequencer. I've tried it, and it's great fun.

Secondly, the inclusion of the combined Sync In/Out five-pin DIN socket enables the 707 to be linked up to older-generation gear such as Roland's own MC202 Microcomposer (actually, it's less than 18 months old, but that's progress for you), as well as the recent Korg digital drum machines.

Connecting the TR707 in tandem with a Korg DDM220 might be the makings of an unholy marriage, but the pairing certainly isn't an incompatible one, as the two sets of voices complement each other (only tambourine and cowbell are duplicated – the 220 is better at both) to form a truly unstoppable digital rhythm section. And the combined price tag is almost laughably small.

Conclusions

A very real advance not only for Roland but also for rhythm machines as a whole, the TR707 looks set to have as bright a future ahead of it as any other drum box from the same stable has ever had. It may not possess the fancy (and, it must be said, rather useful) programming functions of some of its competitors or the elephantine memory of its elder brother, the TR909, but the 707 sounds superb. It contains sufficient programming and interconnection facilities for just about any recording or composing situation, and most significantly of all, its price tag is neither too heavy nor too light for it.

Perhaps the header for this review should have been 'The Empire Strikes Back' . . . ■

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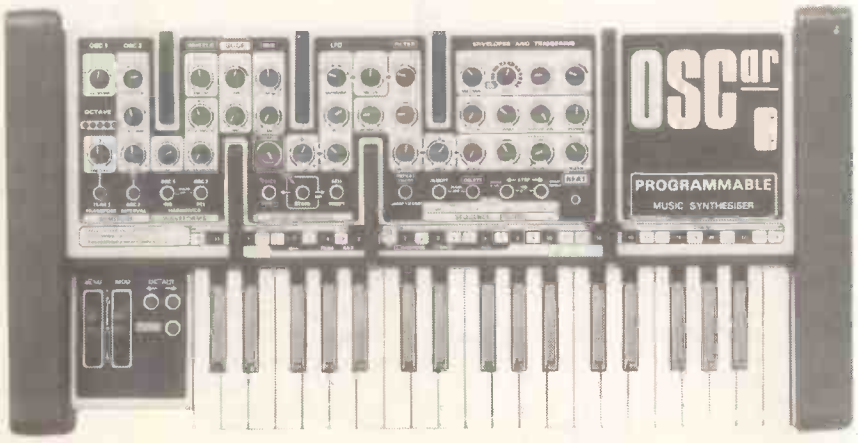

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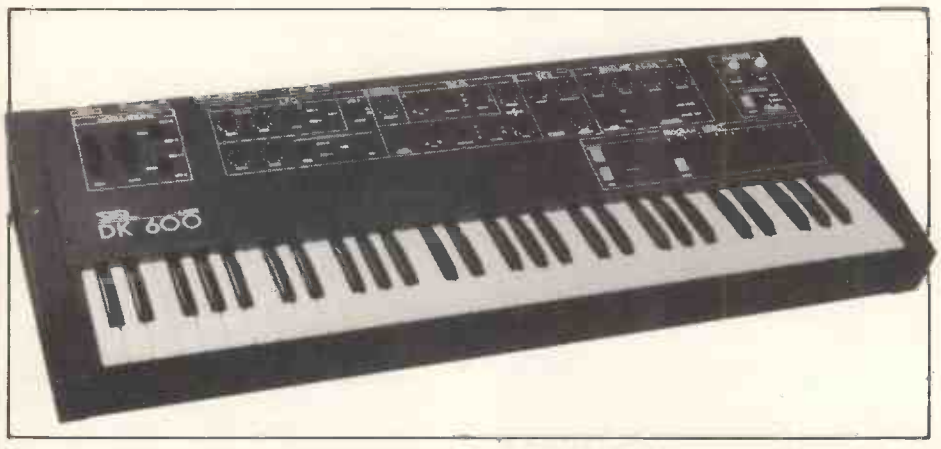
Siel DK600

Programmable Polysynth

The Opera 6 gets improved MIDI facilities, a cosmetic spring-clean and a significant reduction in price. How does it rate now? *Geoff Twigg*



As far as the basic specification is concerned, the new DK600 is almost identical to its predecessor, the innovative Siel Opera 6. That is to say, a programmable six-voice MIDI polysynth with two oscillators per voice, a VCF and a VCA, and a touch-sensitive keyboard which, seeing as the Opera was released marginally earlier than Yamaha's much-lauded DX7, made it a first for an instrument in this price category (under £1500).

The Italians pride themselves in their design skills, and while the Opera 6 was no eyesore, its successor is a definite aesthetic improvement. The layout of the controls is similar, but each control section is now distinguished by a pale blue outline instead of the solid blue background of the previous model, which tended to distract players from the job in hand.

However, the most significant changes are ergonomic as well as aesthetic. You may recall that the Opera 6's facia design incorporated small white pushbuttons (only 18mm apart) for program change functions. These were fiddly and unpredictable in live situations, and have therefore been replaced on the DK600 by a single row of (much larger) switches. Unfortunately, changing patches still requires three button pushes (two digits followed by Enter), and although this system enables you to select a new patch in advance of when you actually need to use it, the process is just a little too time-consuming to be a complete success.

Oscillators

The major hardware improvement incorporated into the DK600 lies in the fact that its oscillators are now digitally – as opposed to voltage-controlled. The good news is that these improve tuning stability and fine-tuning facilities, but the bad news is that no additional control options over and above those on the Opera 6 have been made available.

To be fair, the Opera's controlling possibilities are pretty good anyway. Oscillator A is taken as the reference pitch, while B may be coarse-tuned almost a fifth down from it: the fine-tuning control makes a difference of almost a semitone in each direction, and using both controls together, at maximum 'flatness', puts the oscillators exactly a fifth apart.

There is no provision for reducing the output of Oscillator A, but there is a Half Volume switch for B, while a level control for Oscillator A's noise element allows some sound-blending to be carried out. Both sound sources can produce pulse or ramp waves (or both together, or none at all), and both incorporate 16', 8', and 4' octave range options.

Somewhat confusingly, the DK600's front panel credits it with three LFOs, but in fact these are governed by only two sets of controls. Notionally, LFO1 controls the pitch modulation of Oscillator A while LFO2 controls that of B, but as these share the same set of Depth and Speed controls, the presentation is a little misleading. LFO1 is entirely separate, and may be directed to control either Pulse Width Modulation and/or the operation of the DK's filter.

> 'The DK600's filtering section is identical to that of the Opera 6, which is probably no bad thing, since filtering was one of the things the previous Siel did rather well.'

Again, the DK600's filtering section is identical to that of the Opera 6 (ie. a 24dB-per-octave low-pass design), which is probably no bad thing, since filtering was one of the things the previous Siel did rather well. There are six filters in all – one for each voice – and these are all programmed by a simple set of controls, *viz* Cutoff Frequency, Resonance, and ADSR Amount, with a switch for keyboard tracking.

Unusually, the Siel also incorporates a Dynamic ADSR section that can be assigned to either the VCF or the VCA, while the keyboard touch-sensitivity (programmable for the first time on the DK) may be directed to control this ADSR level or the attack time (or both, or neither). If you're a competent player, or even someone experiencing the joys of touch-sensitivity for the first time, these features should prove invaluable.

MIDI Functions

The DK600 is the first Siel synth to incorporate a fully-developed range of MIDI software facilities. As a result, it can receive information sent to it in either Omni or Poly modes, and can interact fully with Siel's own MIDI Expander and MIDI-equipped instruments from other manufacturers.

Selecting a Poly mode Channel number is accomplished by accessing voice preset 96 (which is, obviously, blank), and entering a number from 1 to 16 – or as the Siel system would have it, 00 to 15.

A further refinement lies in the facility for using MIDI to receive keyboard-split information. The way it works is this. The DK600 uses MIDI data to re-define the synth's keyboard so that it controls the DK's internals at the upper end and those of the connected MIDI instrument at the lower one. The precise point at which this split occurs can be set anywhere simply by pressing the appropriate key, and on each of these occasions, the Enter button works as a Return function, and the change is written into the DK600's software.

Conclusions

Sonically, the DK600 is little different from the Opera 6. In other words, it possesses a distinctly European character that makes it pretty good at brass imitations, OK for strings, and as good as any other instrument in its class at producing 'synth' noises of various descriptions. Digital control has given the DK a strength at reproducing percussion sounds too: the factory bell/gong preset – among several voices that make use of the instrument's programmable dynamics – is particularly impressive.

Not surprisingly, the DK's strengths and weaknesses are similar to those of its predecesssor, but the most dramatic change – the £300 reduction in asking price – has made it an altogether more attractive proposition. Just think, the DK's programmable dynamics and split-keyboard facilities almost match those of Roland's mother keyboards, but it does it all at a fraction of the price.

I freely admit that the Siel's characteristic sound is not my favourite, but even if it isn't yours either, the DK's performance functions make it a mighty impressive package, all things considered. ■

RRP of the DK600 is £999 including VAT. Further information from Siel UK, Ahed Depot, Reigate Road, Hookwood, Horley, Surrey RH6 0AY. ☎ (02934) 76153.

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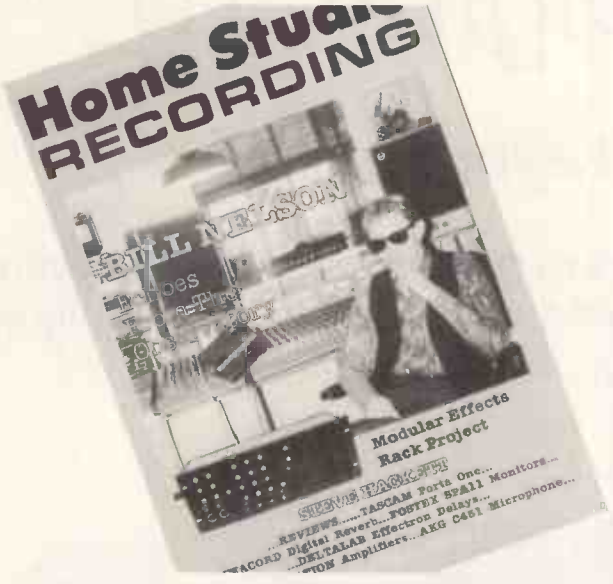

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Technics Digital 10

PCM Digital Keyboard

PCM voices come to the professional arena in the shape of Technics' new Digital 10, an electronic piano that should put the Japanese giant firmly on the pro keyboard map. *Trish McGrath*

Technics' move into the professional keyboard market has been a slow, deliberate process, because it must have been obvious some time ago to a few souls at parent company Matsushita that the PCM voicings incorporated into the firm's range of organs could find a place in the pro field.

PCM – or Pulse Code Modulation – is a relatively simple method of sampling a sound digitally and then storing it in solid state memory for later retrieval. It should theoretically be possible for PCM voices to sound at least as good as their FM – Frequency Modulation – equivalents, but one problem facing the former technique's proponents is that creating a user-programmable PCM instrument is far too expensive to be practicable. However, Technics have attempted to side-step this by incorporating an unusually wide variety of sounds into their Digital 10, so that although the instrument retains a piano bias, there are also a number of less common sounds available as well.

The Digital 10 is a five-octave (C to C), eight-note polyphonic keyboard measuring a mere 42" x 3½" x 16" and weighing in at under 30lbs. Two built-in loudspeakers positioned at each end of the keyboard literally 'pop' up when pressed (a bit like the headlights on a Triumph TR7) and provide ample volume (5W per speaker) for practice or domestic use. Both stereo phono and quarter-inch sockets are provided on the rear panel for routing to your hi-fi, should further amplification be required. Meanwhile, in a gigging situation the phono pair can be sent to the keyboard sub-mixer for monitoring while the quarter-inch jacks are connected directly to the main mixer for further processing.

The instrument is constructed from black plastic and sports grey lettering punctuated by incidental dark blue designs: in other words, another keyboard that declares its professional intentions even before it's switched on. The Digital 10 is supplied complete with music rack, AC cord and sustain pedal (though no pedal arrived with the review model), while optional accessories include a stand, bench, expression pedal (for controlling the volume), and headphones, as well as a smart blue carrying case.

Front panel controls are neatly laid out and comprise – from left to right – Main Volume, Tuning, Transpose, Tone Selector, Harmonic Control, Effect, Sustain and Power sections.

Sounds

Ten different PCM voices are available to the user at a push of a button, with an appropriate built-in red LED illuminating to show the voice selected. Best of the bunch to my ears were the 'keyboard' voices, namely Acoustic Piano, Electric Piano, Harpsichord, and Clavi, though these were all vastly enriched by the application of some sustain and a little tinkering with the Effect section (more on this later). **Acoustic Piano** certainly lives up to its name over the top two octaves where the sound is stunningly realistic, but sadly this lapses gradually into a more electronic version of the real thing as the keyboard is descended. **Electric Piano** performs well over the full octave range and benefits particularly from some added Chorus. To be honest, this voice sounds more acoustic in the bass octave than Acoustic Piano does!

Harpsichord becomes even more medieval than its name suggests when Chorus is applied, but the top octave is if anything delicate almost to the point of being drowned out by the volume of the remainder of the keyboard.

Most of the voices are greatly improved by the use of external amplification, but none more so than **Clavi** which really comes into its own on those funky bass riffs (man), while setting the Harmonic Control (see later) to its brightest tone adds further to this voice's authenticity.

Of the remainder, **Vibraphone** reacts well to a touch of sustain, but the general concensus of opinion seems to be that it sounds more like a xylophone than anything else. Still, it's a nice sound and may find a niche for itself in your repertoire. **Glockenspiel** gives a realistic impression in the top register and sounded great as an accompaniment to E&MM's

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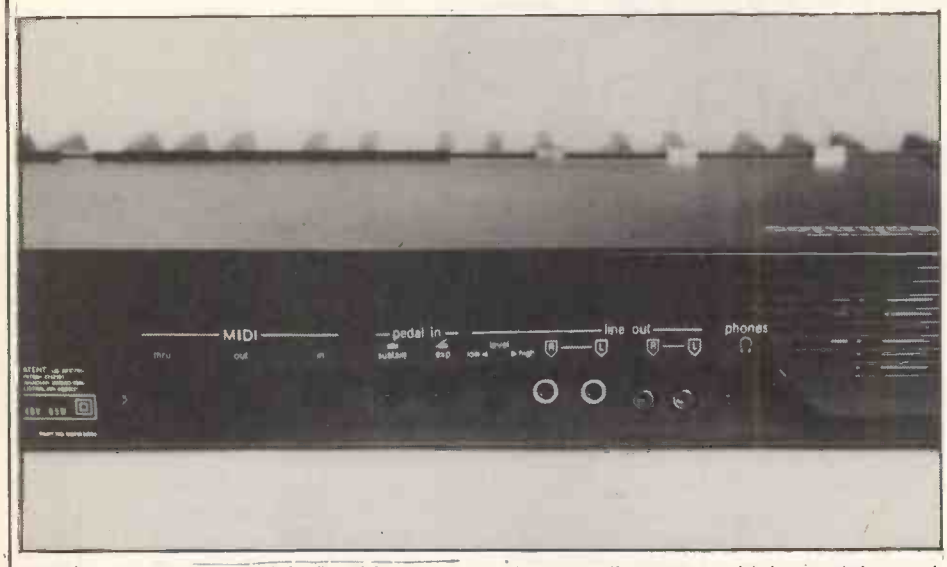

version of 'Jingle Bells' *(is this your attempt at being seasonal? – **Ed**)*, while the bottom half of the keyboard emits a koto-like sound which should also be quite usable.

Guitar voices are always difficult to reproduce on a keyboard instrument, but the Technics' **Acoustic Guitar** manages to capture the 'plucked' sound of strings reasonably well, particularly in the lower-mid section. **Jazz Guitar**, a mellower sound that's neither jazzy nor especially guitar-like, is capable of producing some pleasant harp tones in the upper register if some sustain is added, while a bright tone is a neat complement to the guitar voices generally.

I freely admit that calypso isn't really my cup of tea, but it must be said that **Steel Drums** as interpreted by the Digital 10 are simply excellent. And so to the final sound, **Banjo**. Well, another musical style that's not my favourite hot beverage is country 'n' western, but if it was *(you wouldn't be working here – **Ed**)*, I guess I could do worse than this Banjo to hooley-on-down to. In fact, in the All-comers' E&MM Blindfold Test, this voice was named in one by all except the Art Editor, who's tone deaf anyway. And if that doesn't convince you of the voice's realism . . .

Once you've selected your voice, the Digital 10 lets you modify it by routing it through three separate control sections. The first of these is labelled Harmonic Control and comprises two switches that allow you to assign either a mellow, normal or bright tone to any voice, the intensity of the effect varying slightly depending on the voice in use.

The rather more comprehensive Effect section offers a choice of Chorus, Celeste and Phaser effects (or none at all, if Cancel is selected) and it's these options that turn the Digital 10's mono output into a stereo one. **Chorus** produces the greatest stereo swirling between the speakers but doesn't quite 'create the illusion of many', **Celeste** adds an ethereal, slightly-reverberated touch, while **Phaser** is a slower, shallower version of Chorus. If none of these sounds particularly exciting, what is noteworthy is that the Effect section adds little or no noise to the keyboard's output, which certainly sets it apart from the crowd.

Meanwhile, Sustain can be applied to any voice and six positions are accessible *via* a graduated slider. 'Sustain' here actually refers to the 'release' time in synth language, and the minimum setting provides the same release time as when the effect is switched off. Personally, I think it's a shame piano manufacturers haven't got around to installing full ADSRs on their instruments, with an appropriate button to cancel the section if the normal voice is desired. Preset envelope levels (and particularly the sustain time) are often unsuitable for the job in hand, and increasing the 'sustain' level (ie. the *release* time) only serves to make the notes indecipherable and the keyboard less playable. Just a little extra point that would increase the usefulness and versatility of the presets enormously . . . Oh well, it seems you can't have your PCM cake and shape it.

Other slider controls are Main Volume, Tuning and Transpose, and the Power on/off switch. More specifically, tuning is variable between 428Hz and 452Hz (less than a quarter-tone flat and sharp) with the centre detent indicating A-440Hz, while the Transpose function has a range of G below to F# above the key of C. However, if you decide to transpose to a lower key, a number of the keyboard's bottom notes equal to the number of notes transposed do not function (ie. if you've transposed down a tone, the bottom two notes – C and C# – are rendered inactive). You have been warned.

> 'This is silly. The review model's MIDI sockets are recessed so far into the back of the instrument that no MIDI cable will reach . . .'

Rear Panel

Technics have wisely enabled the Digital 10 to communicate with other instruments and computers *via* MIDI, and standard In, Out and Thru sockets are provided. The Digital 10's MIDI is said to function faultlessly with a wide range of synths, but hang on a minute. This is silly. The review model's MIDI sockets are recessed so far into the back of the instrument that no MIDI cable will reach.

Now, Technics have assured us that this oversight has been cured on the later keyboards, but what hasn't been cured is the fact that the Digital 10 will only transmit and receive data on MIDI Channel 1. It seems a bit shortsighted of manufacturers to ignore the influx of multitrack MIDI computer software onto the marketplace, yet this is another example of that shortsightedness. I mean, what's the point of buying all that software if your collection of MIDI synths can only communicate on the *same* channel?

Anyway, the back panel also contains the aforementioned Line Outs, a headphone (quarter-inch jack) socket, and the power supply input (the mains lead is of the type that invariably gets left behind at a gig because it's detachable and that's what detachable leads enjoy doing). Sockets are also provided for the sustain and expression pedals: the latter allows the odd foot to adjust the volume when all hands are on deck.

Conclusions

At an RRP of £899, the Digital 10 faces some stiff competition, and buying decisions will probably boil down to whether you prefer this set of sounds over those provided on similar instruments, and whether the inclusion of MIDI is all-important to your particular set-up. The lack of a touch-sensitive keyboard is undoubtedly a weak point on an instrument of this sort, especially as it's a feature that's included on many competing models, but the Technics ivories, although plastic and a bit nasty, are as good as can be expected from a machine in this price category.

It appears that further refinements will be made to production models. For instance, the level of background noise will have been reduced to almost negligible proportions by the inclusion of Dolby C noise reduction, though the review model would still pass all but the most stringent of tests.

In all, the Technics is a digital keyboard that offers a nice selection of sounds, is MIDI-friendly, and does what's asked of it admirably. Perhaps more important, it should be good enough to encourage the Japanese parent company to make further moves into the pro end of the electronic keyboard market.

What more can I say? Play it again, Sam. ■

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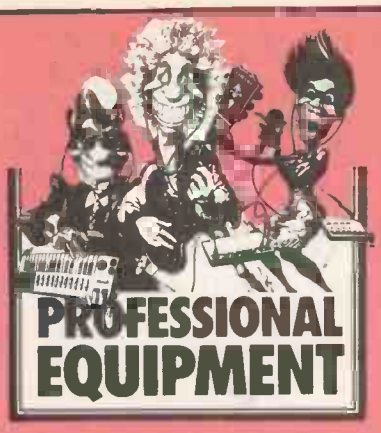

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Akai AX80

Programmable Polysynth

Another Japanese giant enters the electronic music field: Akai's first piece of hardware is a programmable polysynth with a novel parameter editing system. *Paul White*

To me, the name Akai conjures up images of robust reel-to-reel tape recorders and stylish audio rack systems, and I suspect I wasn't the only one to express surprise when the company first demonstrated their range of electronic musical instruments almost a year ago.

In addition to the AX80 reviewed here, the company are also about to release the MG1212, a self-contained 12-channel mixer and cassette machine that uses Akai's own design of half-inch cassette tape, the MR16 drum voice generator (or Rhythm Oscillator Bank, as Akai call it), and the MS08 MIDI sequencer (Music Processor) to drive both the AX80 and the MR16.

Despite the fact that the AX80 and MG1212 are unlikely to appeal to similar sections of the market, Akai are marketing all their first-generation hardware under the umbrella title of Micro Studio System, and in this context, the AX80 must be seen as the prime sound source, though further synthesiser models are promised for 1985/6. Whichever way you look at it, there's no denying Akai have moved into the music world in a wholehearted way: the Micro Studio System is no fly-by-night creation.

Beneath the AX80's stylish and fashionable exterior lies a fairly conventional eight-voice programmable polysynth with 32 factory preset sounds and 64 user-programmable memories: that's 96 memories in all. The design uses sound chips from Curtis ElectroMusic in the States (SCI use them, too), while each voice has two Digitally Controlled Oscillators and, unusually, a sub-oscillator. The sound processing sections are fairly standard, but the Akai incorporates one or two less commonplace features that set it apart from the crowd – more on these later. A touch-sensitive five-octave keyboard is present, and MIDI is implemented fully (In, Out and Thru sockets, 16-channel assignment).

Controls

As you'll no doubt be aware, the current trend amongst designers of low-cost polysynths is to use a single control to change the value of all variable parameters when the machine is in Edit mode. This system has the advantage of being a significant cost-saver for the manufacturers (all those knobs aren't cheap), but the major disadvantage is that synth players can't see where all the parameters are at any one time or assess how two or more parameters interact with each other.

Akai have attempted to get round the first of these problems by employing a not insignificant number of fluorescent displays that tell the user the condition of each parameter at a glance.

These take the form of five groups of bar graphs assigned to various sections of the AX80's internals, namely DCO1, DCO2, VCF, LFO, and EG/VCA. Below each graph are the membrane touch-switches that select each parameter (they double as memory selector switches), while the values themselves are adjusted using either the up/down touchpad or – if more drastic action is required – the large rotary Control pot, a last-minute (it's nowhere to be seen on the initial press photographs) but nonetheless very useful ergonomic addition.

> 'Thanks to the comfortable, positively-sprung keyboard, the AX80's sounds can be injected with a fair degree of user expression.'

Elsewhere, further thoughtful touches abound.

The AX80's dual performance wheels (the pitch-bend variant is centre-sprung) are sensibly located immediately to the keyboard's left, and not only does each wheel have a control directly above it which sets its maximum range, but the LFO mod wheel may be routed to either the VCF or the oscillators. Meanwhile, the instrument's rear panel is sensibly angled so that connections can be made without the user having to go behind the unit to fiddle about, and among the panel's features are sockets for storage of programs on cassette tape and connections for sustain and program change footswitches.

It's worth mentioning at this point that although the AX80 has a chord memory and a hold feature, these are in fact the only concessions its designers have made to the 'even the family pet can play it' school of keyboard marketing. I think I speak for most of E&MM's staff and contributors when I express relief that the dreaded preset arpeggiator seems to be making a swift exit from the pro keyboard arena. So Well Done, Akai for keeping up the good work in that department.

Parameters

Once you've got into Edit mode, altering parameter values is a simple matter of pressing the desired parameter button and using either the Control pot or the up/down touch switches to change it. The parameter value is displayed by the numeric LED display contained within the Data window at the front panel's extreme left, while the bar graph pertaining to the selected parameter is indicated by a red cursor. Neat.

Where a parameter can have either a positive or a negative value (the EG filter modulation, for example), the bar graph starts from a central position and moves either upwards or downwards as its value is altered.

A quick run-down of the AX80's various parameters probably wouldn't go amiss.

Available in 16', 8', or 4' octave ranges, **DCO1** may present either sawtooth or pulse waveforms, or a combination of the two: there's also the option of a further sub-octave, just to fatten things up. Pulse width modulation depth may be varied, and the rate of modulation is independent of the main LFO. Fine-tuning is carried out by means of the Master Tune control, and **DCO2** can be tuned in semitone steps, enabling harmonies between the two oscillators to be generated.

As it happens, these semitone increments cover a range from 2' to 16', and the two oscillators can be detuned if you're fond of chorus effects, or synced together for phase-sync fireworks. The second oscillator's pitch can be modulated by either VCA or VCF envelope generators, and in cross-modulation mode, this versatility should prove a real boon

for lovers of dynamic flanging effects *à la* Gary Numan.

The **VCF** is a conventional low-pass filter with the usual cutoff and resonance controls, but usefully, a high-pass filter can also be called into play to clean up anything with a woolly bottom, if you'll excuse the expression. This section's Envelope Depth and Keyboard Track facilities should be familiar to most synth users, but Akai have added a key velocity-dependent component: just the thing to spice up a lack-lustre live performance.

The **LFO** section is of particular interest as it allows three different forms of modulation to be set up for DCO1, DCO2 and the VCF. Four waveforms are available for this purpose, but although this section's completeness makes the creation of rich, dynamic sounds a painless operation, I still feel the addition of an onboard chorus unit wouldn't have gone amiss. Presumably Akai have figured most keyboard players prefer to specify their own external effects units, but all the same . . .

Moving on to the **EG**, this is based on the familiar ADSR format and also incorporates a Key Follow component. As with the LFO, three values may be set up to control either the VCA, the VCF, or both together.

The **VCA** is in fact incorporated into this section, and has two control variable parameters – Level and Key Velocity. And yes, you've guessed it, it's these two controls that are largely responsible for setting up the keyboard's touch-sensitivity.

Sounds

The AX80's factory preset sounds represent convenient starting points for further editing as well as being quite usable in their crude state. Usefully, Akai have split them into seven distinct groups that relate to their 'real world' equivalents, *viz* Percussive Keyboard, Brass, Woodwind, Strings, Bass, Organ and Synth.

The **Percussive Keyboard** sounds vary from something akin to a koto to some rather impressive electric piano voices, and although some of the remaining sounds are a little more obscure, that doesn't necessarily mean they're any less usable. All four **Brass** voices embody the kind of texture we've come to expect from polys of this calibre, but where the Akai scores is in the fact that dynamic control of the VCF adds greatly to the amount of expression the player can inject into the output.

> 'Patch editing is more easily accomplished on the Akai than any other synth employing digital parameter control . . . those bar graphs play an important part here.'

Things aren't quite so rosy in the **Strings** department, where the cyclic effect imparted by the oscillators tends to make things sound a little on the artificial side. That apart, the sounds are perfectly satisfactory, and especially so in the lower registers, where things get almost too realistic for comfort.

Three **Bass** sounds are offered, and all of these incorporate some degree of touch dynamics as well as being full, fat bass synth sounds in their own right – excellent for *Bird of Prey* impressions, I'd have said.

Finally, the **Organ** presets vary from *Stars on Sunday* to key-click Hammond, while the **Synth** voices are, well, synth-ish, though by no stretch of the imagination do they illustrate the instrument's capabilities fully.

As the review model came without any form of user manual *(wish I had a fiver for every time that happened – Ed)*, it was with some trepidation that I approached the opportunity to create sounds from scratch.

I needn't have worried.

Almost everything on the AX80 works as you'd expect it to, and there are even little status LEDs on the Master Control section to tell you which button is currently engaged, just in case you get stuck. During the review period, anything that wasn't readily apparent soon became so after a little tentative button-pressing, and I'll stick my neck out and suggest that you should feel perfectly at home with this instrument after the first half-hour.

Patch editing is more easily accomplished on the Akai than on any other synth employing digital parameter control, and not surprisingly, those bar graphs play an important part here.

As far as the MIDI goes, the AX80 exchanged information amicably with E&MM's small collection of similarly equipped instruments, other than those with known character defects, which shall remain nameless.

To be quite honest, it's a fair while since I came across a more user-friendly machine than the Akai: whatever you want to accomplish, it's never more than a button or two away.

Conclusions

A visually attractive synth, the AX80 is capable of producing a wide range of 'analogue' synth sounds, and thanks to the comfortable, positively-sprung keyboard and its associated velocity sensing, those sounds can be injected with a fair degree of user expression.

As I've already mentioned, the Akai has a number of useful extra features such as the trio of LFOs, cross-modulation facility, and of course those wonderful bar graphs.

Yet despite these facilities and the ergonomic soundness of the control layout, there's no escaping the fact that the AX80 has no distinctive sound of its own – which may or may not be a bad thing – and although I liked the velocity control of filter and amplitude, Akai's designers could at least have given it a decent dynamic range.

As a first-time effort from a company entirely new to the world of musical instruments, let alone professional electronic keyboards, the AX80 has everything you might reasonably want from a polysynth in this price bracket – plus a bit more into the bargain – without actually possessing a distinctive character of its own. Now, it's debatable whether many people put individuality high on their list of priorities when buying an instrument in this market sector, but if you're one of those who do, think carefully before you sign that cheque. ■

RRP of the AX80 is £1399 including VAT. Further information from Akai UK, Unit 12, Haslemere, Heathrow Estate, Silver Jubilee Way, Hounslow TW4 6NF. ☎ 01-897 6388.

Ultimate Percussion UP5

Electronic Drum Kit

Further refinements and a significant price reduction have given Ultimate Percussion a head start in the race to make the most popular electronic drum kit. The UP5's performance belies its price-tag, too. *Paul White*

With so much of today's recorded music being extensively 'produced' and a host of sophisticated electronic sound processors being used to create the end product, it seems the general public will no longer take the sound of an un-miked, untreated drum kit seriously. It's often been argued that electronic percussion modules don't sound like 'real' drums, but if your idea of real is what you hear on record, then neither do acoustic drums.

It's possible that, for much of their brief history, the complexity of electronic kits may have intimidated some drummers, especially as many that I've met can't tune their acoustic drums properly, but this new kit from Ultimate Percussion (formerly known as M&A, of course) should change all that.

What you get for your money (and just for a change, not much of this is required) is a visually attractive five-drum kit that's built like a tank, is easy to operate and responds in a very similar way to a conventional kit.

Instead of being faced with rows upon rows of knobs, the drummer has only a level control for each individual drum sound, a master volume and three push-buttons which, as any student of binary arithmetic will tell you, gives eight possible combinations. All these controls are to be found on the control module *(sounds logical to me – **Ed**)*, which houses the sound-generating electronics and comes in a neat metal case with a two-tone green front panel. Not exactly Habitat, but pleasant enough all the same.

The volume controls are fairly self-explanatory but the three pushbuttons warrant a few words of explanation.

The first of these is labelled Decay and offers a choice between a fairly well-damped sound and a longer, more 'electronic' effect. Next comes the Noise button which adds a certain amount of noise to the tom-tom and bass drum voices, though the snare drum contains noise anyway, quite regardless of this setting. Lastly, the Pitch button gives the option of a slightly slacker drum sound with a little extra pitch-bend, which can be quite effective. Of course, any combination of these three buttons may be used, giving a range of eight pre-set drum kit voicings.

The back panel contains jack inputs for all five pads and an output which may be either mono or stereo. In stereo mode, the drum sounds are panned across the stereo field in a manner similar to that of an acoustic kit, if you know what I mean.

Hardware

Ultimate Percussion's drum pads have been restyled slightly since we last looked at their produce in E&MM May, but are still built on a steel sub-chassis in the interests of strength and rigidity. An especially tough rubber is used for the playing surface, and this is mounted on a sheet of equally tough plastic which, in turn, is supported by foam to give a comfortable, resilient playing surface.

It's obvious that a lot of thought has gone into the design of these pads, and the transducers in particular, providing further evidence that the manufacturers would like to see these kits still in use in 20 years' time. Always assuming, of course, that technology doesn't make them entirely redundant.

The bass drum is built along similar lines, but is of course larger and solidly supported by its base plate and spurs. Premier stands are used for the four smaller pads, but the kit can be supplied without stands, should you wish to choose your own.

The pads connect to the sound-generating module by means of locking XLR-to-jack leads, and the whole kit succeeds in looking both stylish and reassuringly solid.

Playing

The first thing that sets these drums apart from the competition is their response. The playing surfaces are extremely comfortable and respond naturally to both light stick work and animal thrashing, having a useful dynamic range of around 60dB.

Taking the snare drum first, this sounds bright and explosive, and at short decay times sounds rather like a studio-treated snare drum. At the longer decay setting, the sound becomes recognisably electronic and therefore more contemporary, but still with bags of attack – most impressive.

The toms can also be varied from the well-nigh acoustic (compressed, gated, close miked) to the more fashionably hi-tech, while the bass drum is meatier and better defined than most if not all of the competition.

All the UP5's voicings are analogue and consist of the standard ingredients of noise, tone and stick click simulation, but the way in which these have been implemented gives the user a choice of eight very powerful and useful kit sounds.

Conclusions

By simplifying the necessary control circuitry, Ultimate Percussion have managed to produce an electronic kit that represents a viable, cost-effective alternative to acoustic drums. Additionally, by reducing the number of controls, they've effectively prevented the drummer from setting up duff sounds through lack of experience (or encroaching deafness).

The feel and responsiveness of the pads mean that most drummers shouldn't have to modify their technique unduly, and the UP5 could well be used for cabaret as well as pop or rock music. When the club secretary staggers over smelling of beer and says 'Tone it down a bit lads!', you can do just that, simply by turning a knob.

Personally, I like this kit very much. It looks the part, it sounds great, and it's built to last. Glancing at the UP5's paper specification for the first time, it occurred to me that the preset system would be a limiting factor, but in reality all my favourite noises were in there somewhere. The snare in particular is second to none, so if you're looking for an electronic drum kit, stick the Ultimate Percussion drums next to the competition, play them all, and see which one comes out on top. I have a feeling it may be the UP5. ■

RRP of the UP5 is £555 including VAT. Further information from Ultimate Percussion, Unit 13, Mayland Green Industrial Estate, Steeple Road, Mayland, Essex, CM3 6AX. ☎ (0621) 742244.

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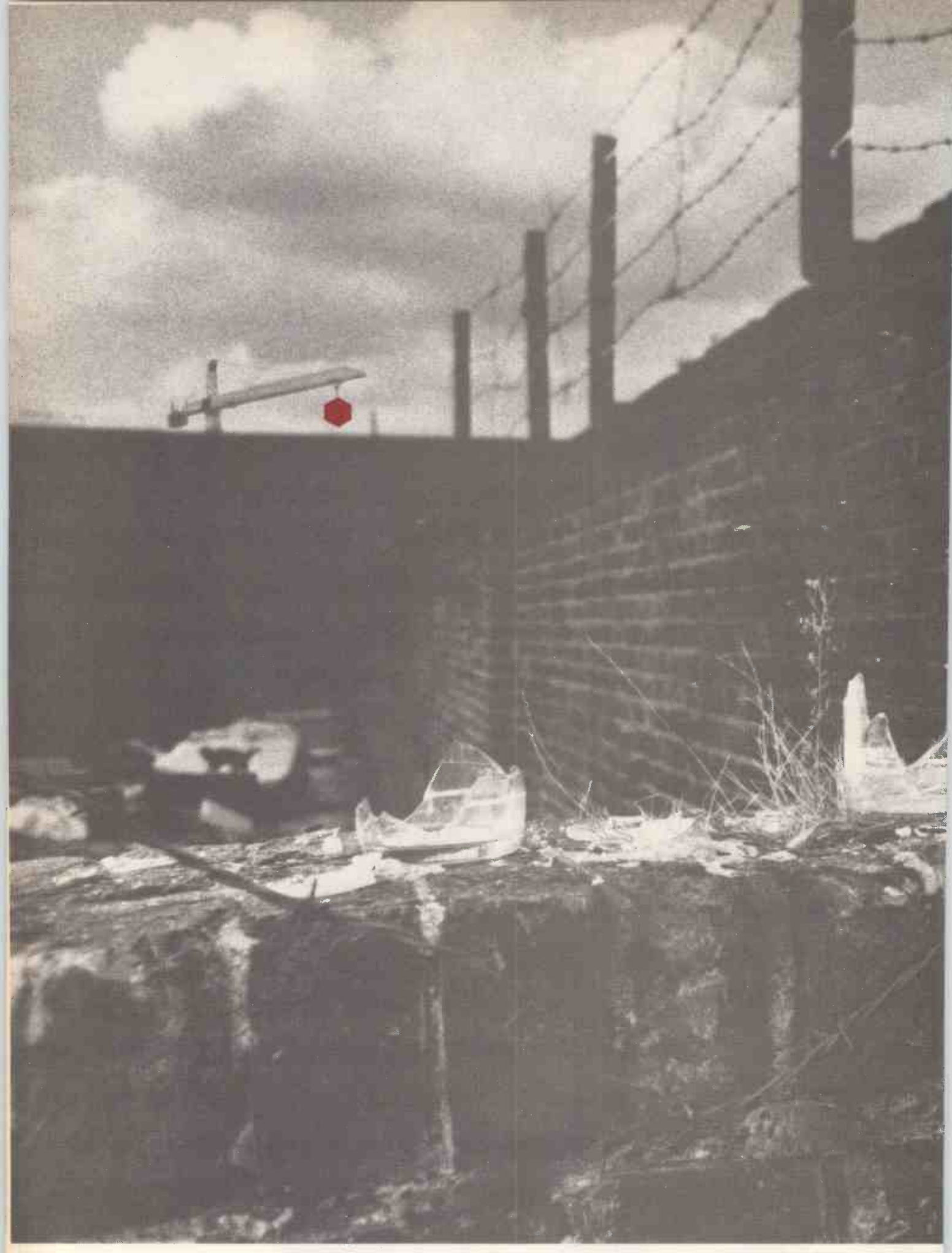

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Korg DDM110

Programmable Drum Machine

Companion to the Super Percussion model reviewed in October, Korg's Super Drums unit offers digital drum sounds for the price of an analogue machine. *Paul White*

As a logical and cost-effective follow-on from the DDM220 Super Percussion unit (reviewed in E&MM October), the 110 is virtually identical in all respects except for instrument voicing. For whereas the 220 majored on Latin percussion sounds, the second of Korg's budget rhythm boxes contains conventional kit voices. And as with the 220, all the Super Drums' sounds are PCM-encoded recordings of real drums.

There are nine sounds in all, and the machine can store up to six separate user-programmed songs comprising a maximum of 390 bars: all this information can be dumped to cassette for future use or further editing.

Furthermore, output is stereo so that each drum is panned to an appropriate point within the stereo image, but there are no level controls for individual voices (apart from a drum-cymbal balance control) and no separate channel outputs to allow level setting to be carried out externally, which is a shame.

Construction

Little larger than a box of chocolates, the DDM110 weighs a mere 800 grams, and will operate either from batteries or from the mains adaptor supplied. Dual (coarse and fine) tempo controls allow for accurate adjustment of speed, and there are three level controls for master volume, cymbal/hi-hat content (already mentioned) and metronome, this being a series of clicks generated in Program mode as a timing guide.

A record enable/disable slide-switch should help to reduce the risk of your precious drum patterns being erased accidentally, and programming is easily accomplished using the row of 15 push-buttons that lies along the lower section of the unit, most of these having more than one function.

Stereo and headphone outputs are on the machine's right-hand edge along with a socket for remote start/stop switching: all these are on quarter-inch jacks, as is the trigger output, which supplies an S-trigger pulse whenever a handclap is programmed, the clap sound being muted once a plug has been inserted into the socket. The other end of the box houses the 9V DC input, the power switch (not marvellously convenient, this, though it does reduce the chances of the 110 being switched off inadvertently), cassette machine connections, and the Sync socket. This five-pin DIN connector is similarly configured to – and compatible with – the (ahem) Roland system, and is therefore switchable between Sync In and Out functions. In practice, this means that the Super Drums can be synchronised to other drum machines, used in conjunction with a device such as the MPC Sync Track to lay down (and re-trigger from) a click-track on tape, and – using Korg's own KMS30 MIDI Synchroniser – linked to MIDI-equipped hardware.

Finally, a panel at the bottom of the attractive plastic case allows access to the six AA-type batteries which not only run the machine but also maintain the contents of the memory when the unit is powered down.

Operation

The 30 pattern memories can be programmed in step or real time, Patterns 1 to 16 comprising up to 32 steps and 17 to 32 comprising up to 16. As previously intimated, six songs totalling a maximum of 390 bars may be stored, and a repeat sign facility assists the user in making the most of this capacity. Naturally, full editing facilities are included and the numeric display contains all user-relevant information, nine different forms of data being displayed, depending on which mode has been selected.

All programming details are dealt with adequately in the comprehensive 54-page user manual, which for obvious reasons I'm not going to reproduce here, but anyone familiar with at least one other programmable drum machine should find little difficulty acclimatising themselves with the 110's operational characteristics.

Basically, all you do is enter the patterns required (in step or real time) and chain them together to form songs, interspersing a repeat at one point during the song. If you make a mistake, the Korg's editing system allows you to locate the fault and correct it by inserting and deleting bars. Should you decide to blow the entire memory on one song, this can be of up to 385 bars in length but, as Trish McGrath pointed out in her review of the Super Percussion model, any pattern formed by chaining two bars together is counted on the display as one bar, so it's vital to keep a clear head when editing.

There are two further points – one good, one bad. The good news is that three modes of resolution – 1/16, 1/16 triplet and 1/32, may be selected for each bar during programming, but the bad news is that once an accent has been programmed, it affects all voices programmed on that beat: there's no way of accenting voices individually.

Sounds

So, the price is right, the packaging is neat, and the operation isn't too mind-taxing, but what does the DDM110 actually sound like? Well, the fact that the voices are digitally-stored real drum sounds doesn't necessarily mean it's going to be a Linn-beater. It doesn't even guarantee a better sonic performance than comparably-priced analogue units.

In fact, the voices on the Super Drums vary dramatically, so I'll deal with each

one in turn.

Bass drum has a nice solid kick, though it lacks the percussive 'slap' provided by more expensive machines, or indeed the E&MM Syndrom. Still, it's a welcome change from analogue endeavours (generally weak in nature) and should be usable in a number of different situations. I was a bit disappointed with the **snare**: it sounds as if the technology is doing its best to make something out of a poor sample – badly tuned and lacking in punch or bite. I know the 110 is cheap, but surely Korg could at least have used a decent sample? The **rimshot** actually sounds more like a wood block, but is realistic and usable nonetheless. The machine imposes the same playing restriction as a real drum kit in that the snare and rimshot cannot be sounded together, which should help you retain some element of authenticity in your drum patterns. The **toms** (high and low) are reasonably authentic, but the 110's relative lack of memory has meant that the samples are a bit on the short side (the sounds just stop, instead of decaying as they should) and they also contain a fair degree of digital noise. Added to a complete mix with a little reverb, both toms should sound OK, but if your intended applications are more demanding . . . The **hi-hats** (open and closed) are very good indeed: I'm impressed! Again, you can't play open and closed voices on the same beat, but then you shouldn't want to, should you? The **cymbal** sound is interesting since the pitch sweeps down every time the voice is generated, presumably to extend the duration of the sample. Mind you, that doesn't prevent it from sounding quite realistic and I rather liked it. **Handclaps**, on the other hand, are a bit of a problem, since analogue clap sounds are now so good that they've gained mass acceptance and sampled 'real' handclaps sound like a pale imitation of the real thing. Isn't fashion wonderful?

Conclusions

Subjectively, the Super Drums unit does not have the attack and vitality of its Latin percussion counterpart (though whether that's partly due to the lack of competition faced by the latter, I'm not sure), but it's still streets ahead of a comparably-priced analogue machine. It's a well-behaved, stylish product that packs more features into its little box than you could reasonably hope for at this price.

> 'Analogue clap sounds are now so good that sampled 'real' handclaps sound like a pale imitation of the real thing. Isn't fashion wonderful?'

The Sync Out facility should prove a great help to many users, and the fact that it's compatible with both analogue Roland and (using Korg's KMS30) MIDI standards is a triumph for interfacing common sense. As mentioned above, the trigger output is to Korg's own S-trigger standard, and while this may prove useful for triggering the arpeggiator on a Polysix or similar, Roland synth owners will need to build a converter consisting of one transistor, three resistors and a battery in order to get everything running smoothly. Anyone requiring details of this modification should send their request on a stamped addressed fiver to me, and they will receive a signed copy of the circuit diagram by return of post (*actually, it's published elsewhere this issue in 'Everything but the Kitchen...' so no spin-offs for you, Mr White – **Ed***).

To be quite honest, I'm not entirely sure how Korg are going to put everything into this box, sell it for £229 and still make a profit. But then again, I'm not complaining. ■

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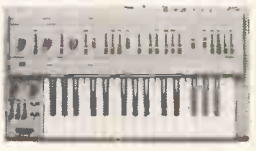

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This program gives you precise control over the CX5M digital FM voice generator to edit and alter the pre-programmed voices or create totally new voices of your own. The FM voice generator employs 4 operators, each with a sophisticated envelope generator, and a choice of 8 algorithms (different configurations of operators with different modulator to-carrier relationships). The YRM102 FM Voice Program lets you precisely set all parameters relating to the operators and algorithms, as well as extras like amplitude and pitch modulation, LFO waveform, keyboard scaling, transpose, etc. With a little practice you should be easily able to program just about any voice you can imagine. Save your original voices on any standard cassette recorder, and build up an original voice library. Voices you create can be used in arrangements created with the FM Music Composer program.

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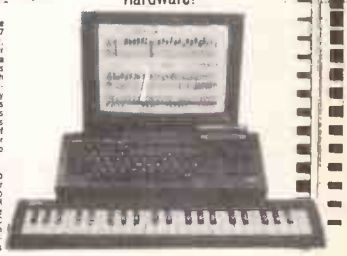

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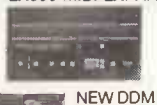

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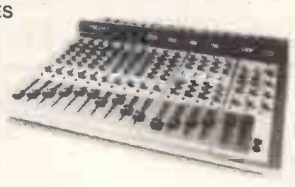

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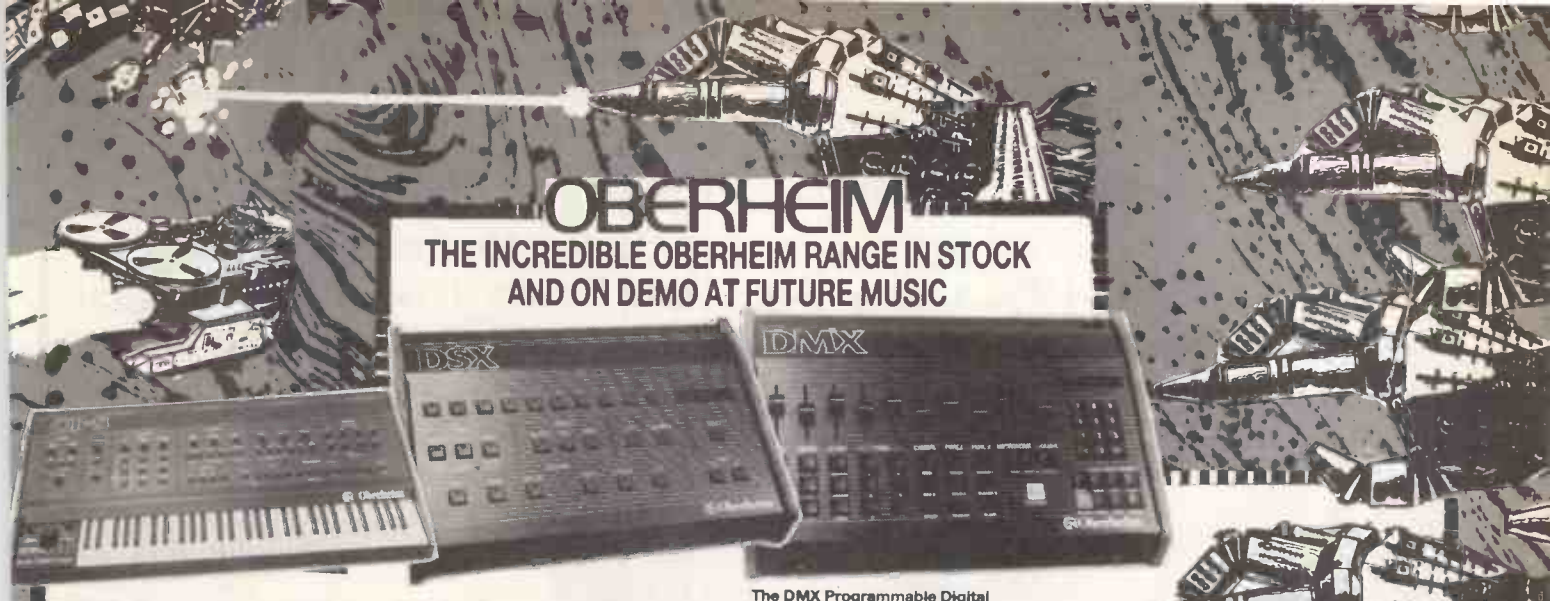

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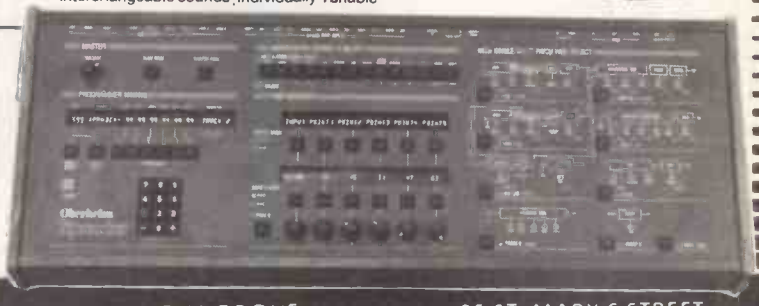

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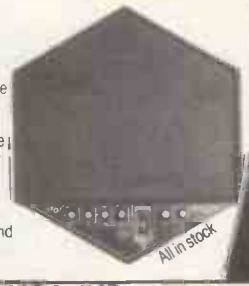

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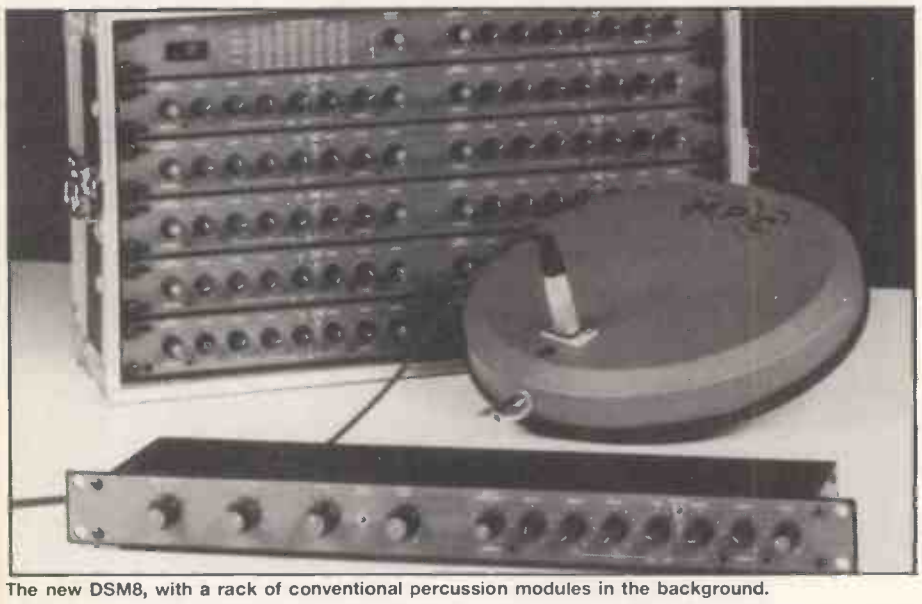
MPC DSM8 AutoTom

Britain is still ahead on points when it comes to the manufacture of electronic drums: MPC's new AutoTom shows how a little digital ingenuity can be applied effectively to analogue percussion. *Paul White*



The new DSM8, with a rack of conventional percussion modules in the background.

MPC are now well-known for their innovative designs in the field of live electronic percussion. Their first product, The Kit, was a revolutionary machine when it first appeared, and the company now offer a complete range of electronic percussion modules.

In simple terms, the new DSM8 (DSM stands for 'Drum Synthesiser Module') allows the drummer to simulate a roll round the toms from one pad. Housed in a 1U rack box, the unit houses both the voicing circuitry and the necessary sequencing electronics, though it doesn't contain a power supply: you have to plug into an outboard DSM power unit.

The front panel contains no less than 12 rotary controls and the back panel one accent control, the power input and five jack sockets. These allow the unit to be triggered from either a pad or a sequencer, and there is provision to connect two footswitches for holding or resetting the pitch sequencer.

The recipe for producing analogue drum sounds is now fairly standard, and this MPC unit gives control over all the necessary parameters. To produce the final sound, a pitch is mixed with filtered noise and a percussive click to simulate the stick sound: by regulating the pitch and decay, a wide range of modern drum sounds can be generated. A further switch labelled Tom/Bass alters the noise filter characteristics so that tom, snare and bass sounds may all be generated by the same module. A neat cost-saving device, that.

So far then, we have a voicing section identical to that on MPC's other DSM units, but what really sets the 8 apart is its built-in sequencer section.

AutoTom

Whenever the drum pad is hit, a counter within the DSM is incremented, and it's this that controls the sequencing. A Pitch Step control lets you pre-set the pitch change between the different sections that make up a drum fill, while the other three rotary switches determine how the sequence will behave.

The first control (labelled Beats/Step) is used to select how many beats elapse before the pitch changes, and may be set at every one to four beats inclusive. Next, the 'No of Steps' control determines how many times the pitch increases (or decreases, for that matter) before it changes direction and returns to its original state.

The Mode switch actually shows how the pitch rise and fall works. In its first position (there are four in all), the pitch rises until the preset number of steps is reached, at which point it returns instantly to its original value, allowing the entire cycle to start again. The second position gives an equal number of rising and falling steps, while position three gives the same thing inverted, so that the pitch starts high, falls, and then rises again. Lastly, setting four gives the inverse of setting one, so that the pitch falls and then, after the appropriate number of steps, returns to its starting value.

> 'With a bit of forethought, the AutoTom facility can be extremely effective when the unit is driven from a sequencer, as the number of steps and beats can be optimised in advance.'

Wonderful isn't it? All this science. But hang on a minute, what happens if you miss a beat? Does it mean that all your future fills will be out of sync? In a word, no. MPC have thought of that, too, for there is a switch labelled Auto Reset which, when active, resets the sequencer if the drum isn't hit for a period of longer than three seconds. You can of course reset the sequencer using one of the footswitch options, or you can hold any pitch indefinitely by using the Hold footswitch facility, in which case, all drum beats will be at the same pitch until the pedal is released.

In Use

Just like the man said, huge multi-tom drum fills (up to 16 of them, in fact) without the effort or expense of lots of pads. Even if you hit the drum fairly softly, the sequencer steps through correctly, though the manual *does* warn against turning the sensitivity right up and playing like a butcher. If you do this, the sequencer is liable to trigger more than once on each beat.

The Auto Reset is potentially a very useful feature, and with a bit of forethought, the Auto Tom facility can be extremely effective when the unit is driven from a sequencer, as the number of steps and beats can be optimised in advance. Definitely useful for all you home recording buffs out there.

Conclusions

Technically, the DSM8 is hardly revolutionary, but at least MPC have gone ahead and put it into production, which is more than can be said for some other people I could mention. It's a simple idea that works and works well.

There's no doubt that the DSM's sonic ingredients are going to make it sound somewhat like Sss . . . you know who. But then again, that's just what you want, isn't it?

Despite the outward simplicity of the unit, there's plenty of evidence that a fair degree of thought has gone into its design: the footswitch connections should be a boon in live applications, and the maximum of 16 pitch steps means you can go right over the top if you want to.

If your drumming technique leaves a little to be desired, you go through frequent attacks of laziness, or you suffer from the common complaint we technical journalists call Lack Of Money, this clever box of tricks offers a great deal for a relatively modest outlay. ■

RRP of the DSM8 is £199 inclusive of VAT. Further information from MPC Electronics, The Gables, Station Road, Willingham, Cambs, CB4 5HG. ☎ (0954) 60264.

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DREAM Sequence

Tangerine Dream, the band that took electronics from the inaccessible 'art music' ghetto to the record collections of millions, talk about technology, their new album, and seventeen years of working together.

Matthew Vosburgh

If they possess one quality that sets them apart from the majority of electronic music's greatest names, it is that their approach has been consistently fresh and innovative throughout their long career. Above all, it's been their unfailing determination to innovate that has kept them one step ahead of their countless imitators, and prevented their music from becoming stale or predictable for any length of time.

For example, the Tangs' only recent extensive tour was one of Poland last year, a country in which it is almost impossible to make money (they pay you in Zlotys), which has abysmal weather in winter (which is when the band decided to go), and which isn't exactly renowned as being a major market for electronic music (though Klaus Schulze, himself a former Dreamer, received a rapturous reception there when he played some concerts not long before).

The band's latest album, their first for the infant Jive Electro label, was recorded at one of TD's Warsaw concerts, and is entitled, simply, *Poland*. It's far from being their first live effort, so why the fascination for dedicating concert performances to vinyl?

'A key reason for us to produce live albums is that we play new material live, material which we haven't released before. So with the exception of a couple of encores, *Poland* is all new stuff, not just the same music with a different sound and a couple of variations.

'We recorded it on eight-track: that's about the minimum we could have used and still kept reasonably good channel separation. We had thought in advance about putting the tape out as a record, but we weren't absolutely sure about it because of the weather conditions. You see, on two or three occasions the power broke down and we had to stop the concert right in the middle. Sometimes it was upsetting.'

Poland is a double album comprising over 80 minutes of music. Surely some form of studio editing took place in order to shape it into its final recorded form?

'Yes. We've made a few changes to the original recording. You see, when you do a bridge section from one part to another, sometimes it works properly, but sometimes you think it could have been done better. Not just a bit better, but much better. If that happens, you sit down and add a little bridge or something, because our attitude is that the people who listen to the record should be able to get the feel of a piece and not be interrupted by a technical mistake or something.

'We've also cut a couple of parts to make the album more compressed. Some transitions just seemed too long, so we've cut out a minute here and there. But basically it's still the essence of the concert.'

A band whose line-up has previously embraced the likes of Schulze, the now New York-based Peter Baumann and recent UK Electronica hero Steve Jolliffe, Tangerine Dream have been a three-piece comprising founder Edgar Froese, Chris Franke, and Johannes Schmoelling for a number of years,

and it's the former two that contributed most to our conversation. Constantly interrupting each other – their English is excellent – Froese and Franke were keen to talk hardware.

Equipment

Well known in the past for the vast modular synthesiser systems which dominated the stage at each performance the band gave, Tangerine Dream are now employing a wider range of hardware than ever before, even if it's somewhat less unwieldy.

'We're using all kinds of synths these days – a Roland Jupiter 8, an Oberheim, a PPG with a Waveterm, a Yamaha DX7, a Prophet 5 and a Prophet 600. That's pretty much a bit of everybody.

'If we tour England again, you won't see the big modular system on stage any more, though there are a few modules that we still use, like ring modulators and special noise generators: the sort of things you don't find on a modern programmable polysynth.

'In a way, of course, the modular concept is coming back with the new equipment that's coming out now. The difference is that this time, one module contains a whole range of synthesisers and is controlled from a master keyboard. That kind of system is polyphonic and programmable, but it has in the background the same sort of idea as the old modular equipment.'

The Tangs' present sequencing and percussion department is also about as well-stocked as they come . . .

'Currently we're using digital sequencers that have been custom-built by a company called PVH. The sequencers are MIDI-equipped, so they can be used to control percussion as well as melodies.

'Our percussion machines include an Oberheim DMX, a LinnDrum, some Simmons drums and a couple of custom-built sampling units. We also use the PPG Waveterm and the Emulator for sampled percussion sounds. The Emulator is very good for percussion because it can be controlled from MIDI or from control voltages, and it's possible to change sounds just by swapping floppy disks: on a lot of machines you have to change ROM chips, which obviously takes much longer.

Sampling

'One thing we are very much into is the whole sampling philosophy, because it enables you to record a sound you are fascinated with and then start working with it, changing it, making it into something completely different. There's no doubt that sampling will become more and more important in our music. Several years ago we had a digital sampling unit with a very short sampling time built for us, which we used for percussion. That was the start of our digital sampling – at that time memory was expensive and nobody knew how to put it onto Winchester disks and things like that.'

> 'We like Eurythmics, Kate Bush, and Laurie Anderson – the people that have found a balance between technology and atmosphere.'

Have the band received any support from custom designers more recently?

'No. We haven't had any custom work done in that field, apart from having industry machines like the Publison Harmoniser, Emulator and PPG Waveterm customised for us. We've just had extra interfaces built into the machines to make them compatible with our sequencers and other keyboards.

'We're waiting for machines with better sample quality to come out, because at the moment the quality's not much better than what you'd get using a cassette recorder. We're also waiting for machines with longer sampling times, because time is sometimes more important than quality. Unlike many people, we've never really used a Fairlight, because the price-to-sound relationship isn't really very good. Its sampling time is very short, and using a machine like that on stage isn't always a lot of fun.'

'You must remember that we've been using sampling systems since the early seventies. At that time we had an analogue system with a different sample for each key, and every sample had a length of eight seconds. We didn't have looping, but we did at least have a good sample length and some form of multi-sampling. Of course, sound quality and pitch stability weren't very good . . . What was that instrument called? The Mellotron!

'Today, to have a digital sampling system with 32 samples of eight seconds is just a dream people would pay a lot of money to ▷

SDS1 = 8 Concert toms

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A clever little instrument — but eight concert toms?

The SDS 1 features a unique "run generator" which, when implemented, instructs the instrument to output the selected sound at a lower pitch for each consecutive strike of the drum. The period of time over which this effect is active can be controlled. Therefore, if the SDS 1 is struck eight times with the run time set at four seconds and a concert tom sound sample installed, the SDS 1 = 8 concert toms. Well done Simmons, stay at the top of the class.

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have. But these things should become reality very soon.'

Writing

Right from the start, Tangerine Dream placed improvisation high on their list of compositional techniques, though as technology has improved and the range of sound sources available to the band has increased as a result, conventional writing principles, have also begun to play their part.

'The technology we are using has obviously brought us to the point where we have to concentrate on structures and pre-programming. The improvisation is still there, but it's on top of that structure. We think a word like 'development' describes the way we write better than 'composition'. You can't just write music down and expect it to be good: in our music there are other things that are just as important, such as sound colour. Our way of working is to go in steps, programming and improvising as we get closer and closer to the final product.'

The Tangs' comparative lack of recent touring activity has been the result of their devoting their writing skills towards making music for films. Edgar Froese took me through the list of soundtracks and the reasons for doing them.

'We've done a lot of film music within the last year. I think we've learned a lot by doing it, simply because you have to use whatever you've learned through the years to create music quickly. You can't hang around and wait for inspiration when you have to hand the music in on schedule, but you still have to produce music with the same expression, the same feeling. Also, you can earn quite a reasonable amount of money from doing it, which you can use to take things further, developing hardware and software.

'The most recent film we did that you've seen in England is *Firestarter*, and there are two others coming out soon called *Flashpoint* and *Heartbreaker*. Then of course there was *Risky Business* a couple of months ago, and we've also just done an American TV series – *Street Hawk*. That's quite a lot for one year.'

Influences

Like their 'conventional' studio albums and live efforts, TD's film music is free from most of rock music's clichés and the constraints they impose. Their Imitators aside, nobody could be said to be producing music that is similar to the Tangs' in concept. So given that their music is quite unlike anybody else's, do the band ever listen to any other people's music?

'Yes. At the moment we like stuff produced by Eurythmics, Kate Bush and Laurie Anderson. Those people have managed to find the balance between technology and atmosphere. Atmosphere isn't something you can put into musical notes – it's there in between the notes.

'At the moment, everybody wants the big fat synth sound – which you can create just by connecting four keyboards in one – and they expect to get quality just through that fatness of sound. There are other people who use only a few notes but can get a lot more across. The 'wall of sound' approach can be fascinating for a while, but after a few pieces you feel as if you've eaten too much cake – it's just too dense. Other people produce better music.'

The band are also keen to point out the drawbacks of modern technology.

'Well, we shouldn't glorify the new technology too much, because it's not always a gift: sometimes it's a battle and a fight. A lot of the problems are caused by software, because machines are often put onto the market before the software has been perfected. For instance, I had an early Prophet 600 that went wrong not suddenly but very slowly. After a week the programs started to change slightly, then they became completely different sounds, and finally after a couple of months they were just noise. It turned out that the program in the EPROM running the machine had a bug in it.

'We are in a position where we can buy expensive machinery, which is fine, we are lucky. But if you want to create music and you've got the ideas, it's not necessary to have a multi-million pound cheque – you can do everything with very little equipment. It's your creativity that's important, not having the latest piece of technology. The machinery is there as a help, nothing more.'

I don't know about you, but I find that very encouraging. ■

DREAMestions

No fewer than 25 copies of Tangerine Dream's latest double live album, *Poland*, are up for grabs in this exclusive competition, courtesy of the good offices of the band's label, Jive Records. All you have to do to stand a chance of winning one is to fill in the five questions below and send the entry form into E&MM's offices to arrive no later than Monday, December 10. Christmas post being what it is, it may be wise to send the form off as soon as you can, but then again, the questions are so straightforward (some of the answers are given in the feature above!) that you shouldn't have to do very much in the way of grey matter searching. Best of luck!

1 'Poland' was recorded during a Tangerine Dream concert, but it's by no means the first live album the band have released. Name one previous example.

.....

2 The band's long career has seen only a handful of changes in line-up, but can you name two former TD members who are still making music under their own steam?

.....

3 The Tangs' first LP was released as long ago as 1970. What was its name?

.....

4 Throughout their career, Tangerine Dream have consistently performed at unorthodox venues. Name two 'non-concert halls' that have witnessed TD's music.

.....

5 The band took the name 'Tangerine Dream' from a lyrical reference on a Beatles song. Name that song.

.....

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Send your completed entry form to this address: Tangerine Dream Competition E&MM, Alexander House, 1 Milton Road, Cambridge, CB4 1UY. Closing date is second post, Monday, December 10, 1984.

RULES

All entries must be on the official entry form printed in E&MM December 1984: no photocopies can be accepted. The winners will be the senders of the first 25 all-correct entries picked out of the hat during the week following the December 10 closing date. The winner will be notified by post no later than December 24. The judges' decision is final, and no correspondence regarding the choice of prize-winners will be entered into. Employees of Music Maker Publications, Jive Records or Tadream Productions are ineligible for entry.

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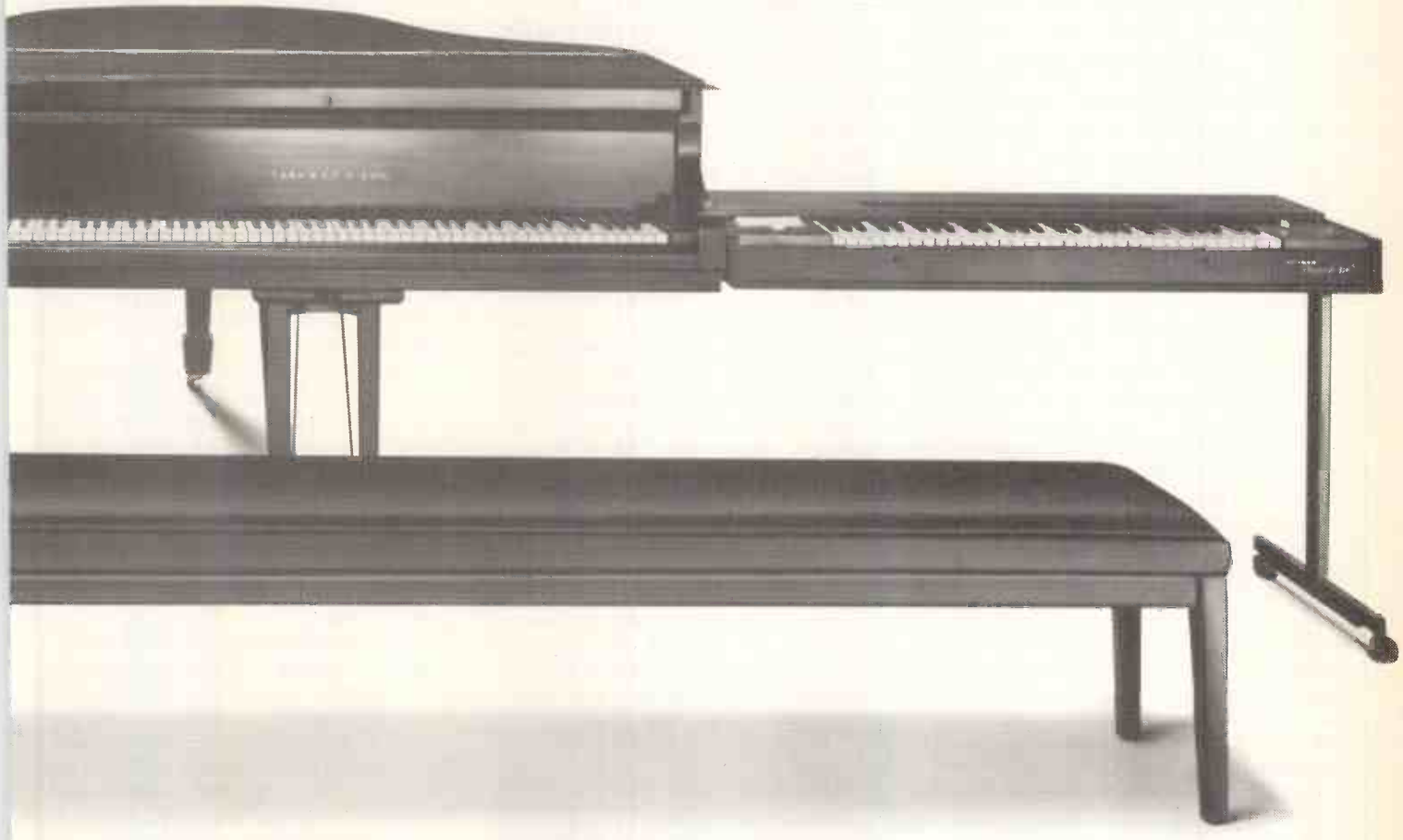

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ON RECORD

Another batch of vinyl releases examined in E&MM's inimitable fashion.

Dan Goldstein

After a few months of fighting against the inevitable, the *On Record* column finally succumbs to the pressure of new releases and drops its well-loved, orderly review format. No headers, no reference numbers, and not many pictures – a reflection of just how seriously the record companies take the commercial phenomenon we call Christmas.

By the time you read this, word will have got around that the **Frankie Goes To Hollywood** album, *Welcome to the Pleasuredome* on ZTT, is really pretty hopeless.

Even as I write, the two-album package has been displaced from its number one position in the nation's album chart, and the racks of secondhand record dealers are beginning to fill up with the gaily-coloured, well-preserved gatefold sleeves.

If by some remote chance you haven't managed to get a listen of *Welcome* yet, this is what it comprises. The first side is a collection of sampling doodles culminating in the title track, a lengthy piece that combines the best of 'Relax' and 'Two Tribes' in one and thus ends up being the best thing on the album. The second side is simply 'Relax', 'War', and 'Two Tribes', which you've got already. The third contains an assortment of cover versions that add nothing whatsoever to their forebears (this is especially true of the abysmal 'Born to Run'), and the fourth is an attempt to show that FGTH are A Real Rock Band and not just a set of faces to put in front of those well-known computer music initials, CMI, NED and PPG. Unfortunately, it only goes to prove that they're really just a mediocre Liverpool pub band that got lucky.

There's no shortage of reasonable songs on *Welcome*, but the band's first singles were so invigorating, so brilliantly produced, and so utterly *different* from anything else being touted in the pop nightmare of 1984, that this motley collection of cover versions and studio meanderings (lacklustre arrangements and dispassionate vocals are the order of the day) can only be a bitter disappointment.

'The Power of Love' is the new single, but it's about as forward-looking as the recent revival of interest in Victorian morals: trying to be tongue-in-cheek is no excuse for blandness of this enormity.

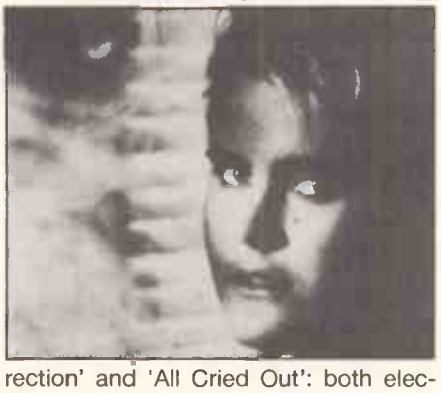
And just to make absolutely sure no one is fooled by the (wonderful) sleeve artwork and accompanying 'notes', the earlier singles have been re-mixed and relieved of most of their power and dynamics in the process. Don't get me wrong, *Welcome to the Pleasuredome* is still better than whatever Wham! and Culture Club are coming up with for the festive season, but it's a closer-run race than it ought to have been.

Remaining awhile at the top of the charts, we find **Chaka Khan**'s *I Feel For You* (Warner Brothers), the album of the single that was number one. You may not feel particularly at home with the genre, but you can't deny there's some impressive arranging on an album dominated by Fairlights and electronic percussion.

Each track on *I Feel for You* has been written, arranged, programmed and engineered by an entirely different team of people (though Arif Mardin takes the overall producer's credit), and this variety gives the album a cosmopolitan atmosphere, embracing just about every form of US electro funk currently in existence.

The single and the magnificent 'Hold Her' are the highlights, and although one or two of the remaining songs are decidedly second-rate, Miss Khan's vocal delivery is forceful and assured throughout, which is more compensation than these ears need.

If the Frankie album needed a production job of the same standard as the Chaka effort, much the same could probably be said of Alison Moyet's debut long-player, *Alf*, on CBS. Since leaving Yazoo, Miss Moyet has graced the charts with two excellent singles, 'Love Resurrection' and 'All Cried Out': both electronics-based and both written by Alf herself.



There are plenty more where they came from, too, as the album shows, but what puts a damper on things is the lack of imagination applied to the album's arrangement (Tony Swain and Steve Jolley are the men responsible). Instead of doing the sensible thing and giving the singles a commercial feel while injecting the purely album material with something a little more off-the-wall, they've given all nine tracks on *Alf* the same, unremitting dance beat, played with astonishing woodenness by drummer Tim Goldsmith.

'Where Hides Sleep' is a beautiful ballad in the 'Winter Kills' mould, but whereas that Yazoo track comprised only grand piano, vocals and background synth, the 1984 version struggles under the weight of excess pop padding.

This is a terrible shame, of course, because the warmth and power of Alf's voice is rarely given the attention and prominence it deserves, and the only songs that survive the Swain and Jolley 'let's record everything so that it sounds good on Radio 1' treatment are the brighter, bouncier ones like 'Honey for the Bees' and 'Money Mile'. Worth listening to, nonetheless.

Unfortunate production decisions are not a source of worry on *It'll End in Tears*, another debut album, this time by **This Mortal Coil**, a band who really only exist in the mind of Ivo, the album's producer and boss of the record label on which it appears, 4AD.

There are six tracks on each side of *Tears*, and no two songs have the same line-up playing on them, performers being taken from primarily-4AD acts such as the Cocteau Twins, Dead Can Dance, Modern English and Colourbox.

The album strikes a roughly 50–50 balance between covers and original compositions, and a similar symmetry exists between songs and purely instrumental pieces. Overall atmosphere is quiet and unassuming, with a wide assortment of unusual acoustic instruments (violin, gizmo, yang t'chin) reflected in some excellent DX7 programs, and the vocals of several singers – most notably the Twins' Liz Fraser and DCD's Lisa Gerrard – delivered with passion and precision, two qualities rarely found in such close proximity to each other.

It's Fraser's performances – on the indie hit 'Song to the Siren' and Roy Harper's 'Another Day' – that eventually shine out from the rest, but the whole album is beautifully recorded and spiritedly played, as well as being devastatingly original.

The same originality is present on the **Cocteau Twins'** third album, *Treasure*, released at almost the same time by 4AD. In a little less than a year since their last long-player, *Head Over Heels*, the band have succeeded in creating majestic, ethereal sound that's entirely new not only to them but also to modern music as a whole.

By comparison with 1983's effort, the songs on *Treasure* are more structured, the performing styles and arrangements more varied (Simon Raymonde has certainly made a difference), and the recorded ambiences better sorted. The vocals are also as good as they've ever been, and of the album's two opposing sonic atmospheres – melodic guitar thrash and ambient synth swirl – it's the latter, exemplified by 'Lorelei' and 'Persephone', that's more appealing in the long term.

Truly, this is beautiful music for the New Age. ■

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ON STAGE

An introduction to the world of Electro-Acoustic Music and a review of a concert festival devoted entirely to it – Musica Nova. *Adrian Jones*

One of the luxuries of attending music festivals – as opposed to one-off gigs – is the chance to observe, at the seminars and discussions that accompany the concerts, the reaction to new and perhaps controversial ideas from a variety of differing viewpoints. And at the sixth international festival of contemporary music, Musica Nova in Glasgow, these reactions were sparked off by a Yamaha DX7 demonstration given by Dave Bristow. Dave expressed an interest in introducing a cheaper means of sound synthesis as an alternative to the wildly expensive equipment so often used in 'serious' music studios.

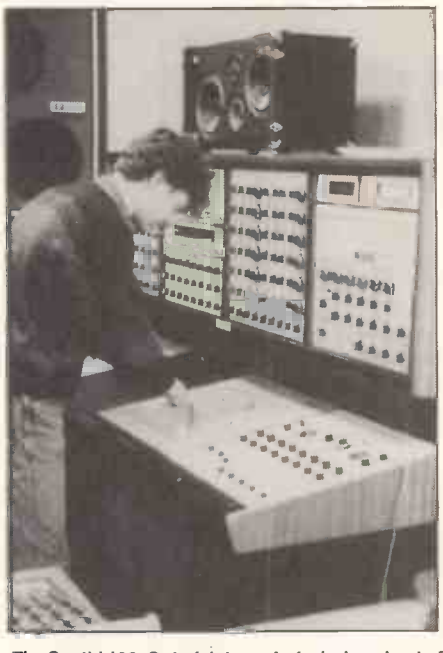
The festival, held at the University of Glasgow in September, was organised jointly by the Scottish National Orchestra and the London-based Society for the Promotion of New Music. Around 70 pieces were performed, and amongst the 14 concerts were two which concentrated on electronic or 'electro-acoustic' music. As some readers may not have come across this term, E-A (as it is commonly abbreviated) is a relatively new musical phenomenon developed in the late forties and early fifties by avant garde composers such as Stockhausen and Pousseur. E-A Studios are now based mainly in universities around the world and the music usually exists solely on tape, though pieces may include live performers, dancers, films, and so on. What makes it unique is that it deals in timbre, motion and space. You don't just *listen* to the sound, you can watch it travel around the hall.

All this probably sounds very pretentious and, I admit, some E-A works *are* very pretentious. Trying to describe any music in words is at best a compromise (you really have to hear it for yourself) but unfortunately, E-A performances aren't exactly two-a-penny, and many parts of the country don't have the facilities (or enough interested parties) to arrange one.

Anyway, back at the festival . . .

Dave Bristow began his demonstration by deliberately adopting a generally anti-electronic studio (and particularly anti-IRCAM) stance. His argument went something like this. Why invest in expensive equipment and limit production of E-A music to those places that can afford it (ie. universities and other academic establishments), when FM synthesis provides an opportunity for composers to work creatively (and at a relatively low financial outlay) outside ivory towers?

Well, the proof of the pudding is in the tasting. Mr Bristow spent a fair portion of his session demonstrating how good the DX7 is at reproducing live instruments, but



The Synthi 100. Out of date, out of mind, and out of reach.

the E-A composers present weren't particularly interested in 'acoustic' synthesis. What's more important to them is the creation of entirely new previously unheard sounds and their subsequent control, either through tape manipulations or *via* digital transformations.

In the event, I decided I needed to find someone involved with E-A who had used FM equipment. Fortunately, nestling among the tape compositions was a work by a young Scotsman, Charles Lyall, written using a DX7 and a multitrack recorder. He had worked with the standard university analogue synthesiser, the Synthi 100, and was able to compare the two systems: with a few reservations, the DX7 came out favourably, and what's more, unlike the Synthi 100, it doesn't

Charles Lyall at the 'sound diffusion' console.

make an enormous hole in your pocket or the living room ceiling!

Even if FM synthesis *does* limit your creative urges *(many would argue that limitation is the most creative thing of all – **Ed**)*, it's nothing compared to the restrictions the present academic set-up induces. At the moment, if you want to make avant garde tape music in this country, you need either a first-class degree to get the grant, or excellent contacts. Perhaps a benevolent sugar parent might come in handy, but all the same, this still excludes rather a lot of potentially good composers. It seems obvious to me that the greater the variety of people involved, the more E-A music will flourish: confining it to those within academic circles will only result in the electro-acoustic medium throttling itself.

Mind you, composition is only half the battle. E-A music is obviously at its best when performed over an excellent, multi-stereo or ambisonic speaker system. In fact, one of the key words in tape music is 'diffusion'. This requires a performer (preferably the composer) positioning sounds *via* a multi-channel mixing desk appropriately around the concert hall: relating the position of sound to musical meaning is one of the most fascinating aspects of the electronic medium.

Unfortunately, there are few venues in the UK that can provide both sympathetic acoustics and an adequate sound system. The facilities at Glasgow were limited. Only six speakers were available, offering little scope to the diffuser, though all the works in the second concert combined tape with live performance and this reduced the need for a good diffusion system. Particularly impressive – from my point of view – was Paul Lansky's 'As If . . .', which explored the relationship between 'performed' and 'synthesised' sound, with the tape acting as an acoustic backdrop to three string players.

In the first concert, which featured tape-only pieces, the limited speaker arrangement could only approximate the excitement that comprehensive facilities would have created . . .

The problems that beset Musica Nova as a rewarding occasion can be traced to the perennial problem suffered by the E-A movement as a whole. Lack of money. Personally, I think Dave Bristow's interest is to be commended, and any dialogue between the 'rock' and 'classical' worlds is bound to be healthy in the long run. It might even coax the latter genre out of its cloisters, though time alone will tell.

Who knows? Maybe rock groups will soon take on E-A composers and their music, in addition to the more conventional support groups. ■

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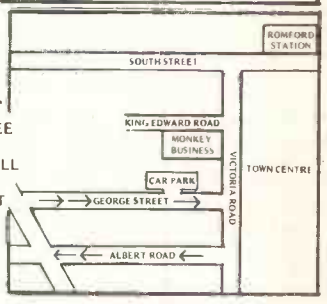

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This back issues page supercedes all previous listings, and the contents of each issue are presented in summarised form. See E&MM Feb 83 and Feb 84 for full Indices of 1981/82 and 1983 issues respectively.

1981

MARCH (SOLD OUT) ***Music*** BBC Radiophonic Workshop ***Hardware*** Yamaha SK20 ***Computer Musician (CM)*** Using Microprocessors ***Technology*** Advanced Music Synthesis (VCOs, FM), Spectrum Synth, Hi-Fi Sub-Bass Woofer

APRIL ***Music*** Warren Cann (Ultravox) ***CM*** Using Micros Pt2, Programming Micros ***Technology*** Advanced Music Synthesis (PWM), Spectrum Synth Pt2, Syntom I

MAY ***Music*** Tim Souster ***CM*** Apple Music System, Using Micros Pt3 ***Technology*** Spectrum Synth Pt3, Noise Reduction Unit

JUNE ***Music*** David Vorhaus ***Hardware*** Fairlight CMI, Yamaha PS20 ***CM*** Using Micros Pt4 ***Technology*** Mosfet Amp

JULY (SOLD OUT) ***Music*** Duncan Mackay ***Hardware*** PPG Wave 2 ***CM*** Using Micros Pt5

AUGUST ***Music*** Irmin Schmidt ***Hardware*** Resynator Synth, Casio VL1 ***Technology*** Harmonics, PA Signal Processor Pt1

SEPTEMBER (SOLD OUT) ***Music*** Kraftwerk ***Hardware*** Linn LM1 ***CM*** Using Micros Pt6 ***Technology*** Noise Gate, PA Signal Processor Pt2

OCTOBER ***CM*** Using Micros Pt7 ***Technology*** Harmony Generator, Effects Link FX1, dbx Explained

NOVEMBER ***Music*** Landscape ***Hardware*** Casio MT30, Roland GR300 and CPE800 ***CM*** Using Micros Pt8 ***Technology*** Speech Synthesis, EMT (Phasing), Auto Swell Pedal

DECEMBER (SOLD OUT) ***Music*** Rick Wakeman, OMD ***Hardware*** Yamaha CS70M, Vox Custom Bass & Custom 25, Roland CR5000 & CR8000, Elka-Orla X50, Vox AC30, aphaSyntauri, Fostex 250, ElectroVoice Mics ***Technology*** Synclock

1982

JANUARY ***Music*** Tangerine Dream ***Hardware*** Casio 701, Teisco SX400, Aria TS400, MCS Percussion Computer, Soundchaser, Beyer Mics ***Technology*** EMT (Flanging), Spectrum Synth Update Pt1, Volume Pedal

FEBRUARY ***Music*** Ike Isaacs ***Hardware*** Korg Trident, AKG Mics, Roland TR606, Fostex A8, Tokai ST50 and PB80 ***CM*** PolySequencing on ZX81 ***Technology*** Yamaha GS1&2 (FM) Explained, Digital Delay Line Pt1, Spectrum Synth Update Pt2

MARCH (SOLD OUT) ***Music*** Klaus Schulze, Robert Schröder, Kraftwerk 'Computer World' Music ***Hardware*** Firstman SQ01, SCI Pro One, Tascam 124AV, Shure Mics, Hamer Prototype ***Technology*** Power 200 Speakers, Digital Delay Line Pt2

APRIL ***Music*** Martin Rushent (Human League) ***Hardware*** Korg MonoPoly, Fostex 350, Roland TB303 ***Technology*** MF1 Sync Unit, MultiReverb

MAY ***Music*** Holger Czukay, Depeche Mode ***Hardware*** Moog Source & Rogue, Calrec Soundfield Mic ***Technology*** Soft Distortion, Quadramix

JUNE ***Music*** Jean-Michel Jarre, Classix Nouveaux ***Hardware*** Emulator, Carlsbro Minifex ***Technology*** Panolo, Multisplit

JULY ***Music*** Ronny with Warren Cann & Hans Zimmer, J-M Jarre 'Magnetic Fields' Music ***Hardware*** Roland Juno 6, Peavey Heritage, Steinberger Bass ***Technology*** Universal Trigger Interface

AUGUST ***Music*** Kitaro, Jon Lord ***Hardware*** Synergy, Korg Polysix, Tascam M244 Portastudio, Shergold Modulator 12-string, Yamaha Pro-FX ***Technology*** 8201 Line Mixer, Guitar Buddy practice amp

SEPTEMBER (SOLD OUT) ***Music*** Richard Pinhas ***Hardware*** Yamaha CS01, Jen SX1000, Casio 1000P, Fender Squier, Carlsbro Stingray, Pearl Effectors ***Technology*** Comp-Lim, Twinpak

OCTOBER (SOLD OUT) ***Music*** Kate Bush, Ken Freeman ***Hardware*** Fender Vintage Series, Rhodes Chroma, Kay Memory Rhythm ***Technology*** EMT (Performance Controls), ElectroMix 842 Pt1

NOVEMBER ***Music*** Patrick Moraz, Robert Moog, Bill Nelson ***Hardware*** Yamaha PC100, Technics SXK200, Casio MT70, Hohner P100, JVC KB500, Gibson Firebird 2, Alligator AT150, AHB 1221 Mixer ***Technology*** ElectroMix 842 Pt2, Sweep Equaliser

DECEMBER ***Music*** Cliff Richard ***Hardware*** Elka Synthex, Crumar Stratus, Tokai Basses, Shure PE Mics, The Kit ***Technology*** Transpozer Pt1, Canjak

1983

JANUARY ***Music*** Richard Barbieri (Japan) ***Hardware*** Westone Bass, BGW 750C Amp, Korg EPS1, Clef BandBox, Zildjian Cymbals ***Technology*** Synblo, Transpozer Pt2

FEBRUARY ***Music*** Isao Tomita, Human League ***Hardware*** Novatron, LinnDrum, Simmons SDS6, Klone Kit, Movement Drum Computer 2, Korg KPR77, MemoryMoog, Synclavier II, Powertran Polysynth, Vigier Guitars, Pearl Mics ***Technology*** Synbal, Caltune

MARCH ***Music*** Klaus Schulze, Michael Karoli, Francis Monkman, Bernard Xolotl, Chris Franke ***Hardware*** RSF Kobol Expander, Korg Poly 61, Aria Mics, BGW 7000 Amp, Ibanez Pedals, Tokai Flying V ***Technology*** Shaper, 842 Mixer Meter Bridge

APRIL ***Music*** Naked Eyes, Gabor Presser ***Hardware*** Casio 7000, SCI Prophet 600, Chroma/Apple Interface, Eko Bass pedals, Vox Guitars ***Technology*** Syntom II

MAY ***Music*** Keith Emerson ***Hardware*** Roland MC202, Fostex X15, Carlsbro Cobra 90 Kbd Combo, M&A K1/B Kit, Echo Unit Supplement (13 reviews, inc. Roland SDE2000, Fostex 3050, Korg SDD3000) ***Technology*** Introducing the MIDI, MicroMIDI, Active Speaker

JUNE ***Music*** Steve Hillage, Arthur Brown ***Hardware*** Synclavier II, Synton Syrinx, Emu Drumulator, Vestafire Dual Flanger, Arla AD05 Delay, Suzuki Mics, Clarion and Cutec four-tracks ***Technology*** OMDAC

JULY ***Music*** Marillion, Hans Zimmer ***Hardware*** Trident VFM Mixer, Kawai SX210, Aria U60 Deluxe BBS, Deanvard VA30K Amp, MXR Omni FX, Milab Mics ***Technology*** Yamaha DX synthesisers, Digital Signal Processing Pt1, Tap Tempo

AUGUST ***Music*** Bill Nelson, Hubert Bognermayr, Barclay James Harvest ***Hardware*** Roland JX3P/PG200, OSCar, 360 Systems Digital Kbd, MPC Music Percussion Computer, Yamaha SG200, Fender 100W Stage Lead, Frontline FX ***Technology*** Digital Signal Processing Pt2

SEPTEMBER (SOLD OUT) ***Music*** Peter Vettese ***Hardware*** Prophet T8, Oberheim DX, SCI Pro-FX 500, Rickenbacker 360 12-string & TR75 GT Combo ***Computer Musician (CM)*** Music Composition Languages Pt1, Sounding Out the Micro Pt1 ***Technology*** Which Synth Guide, Synclap

OCTOBER (SOLD OUT) ***Music*** John Miles, Andrew Powell ***Hardware*** Yamaha DX1, OctavePlateau Voyetra 8, Siel Opera 6, MXR 185 Drum Computer, Ross Pedals, Fender Elite Precision Bass 1, Steinberger six-string ***CM*** Sounding Out the Micro Pt2, Speech Synthesis, ***Technology*** Digital Signal Processing Pt3, Mains Distribution Board

NOVEMBER ***Music*** Tony Banks, John Foxx ***Hardware*** Seiko Digital Keyboards, Eko EM10, UC1 Sequencer for SCI Pro One, Doctor Click, Klone Kit 2, Ibanez HD1000, Korg KMX8 Mixer, Ibanez RS315SC Guitar ***CM*** Music Composition Languages Pt2, Software Envelope Generator (ZX Spectrum), MUZIX 81 (ZX81) ***Technology*** Digital Signal Processing Pt4

DECEMBER (SOLD OUT) ***Music*** Gary Numan, Psychic TV, Philip Glass ***Hardware*** Prophet T8, Yamaha PC1000, Carlsbro AD1 Echo, Personal Keyboard Guide ***CM*** Decillionix (sound sampling for Apple) ***Technology*** Valve Driver

1984

JANUARY ***Music*** Simple Minds, Saga, Hawkwind, Dave Hewson ***Hardware*** Oberheim OB8, Vigier Bass, Siel Cruise, Ibanez DM2000, The Kit + Accessories ***Technology*** Using Sequencers, Electronic Metronome

FEBRUARY ***Music*** Daniel Miller, China Crisis, Don Airey ***Hardware*** Korg Poly 800, Siel PX, Yamaha PS55, Eko EM12, Boss DE200, Roland Chorus Cube 60, Washburn Bantam Bass, Carlsbro Marlin, Dr Böhm Digital Drums ***CM*** Mainframe ***Technology*** Drumatix Mods, Voltage-Controlled Clock

MARCH ***Music*** Vince Clarke & Eric Radcliffe, Blancmange ***Hardware*** SCI SixTrak, Roland SDE3000, Roland System 100M, Electronic Percussion Guide (nine reviews inc. SCI Drumtraks, Boss DR110, AHB Inpulse One, Hammond DPM48) ***CM*** Music Composition Languages Pt3 ***Technology*** S-trigger Converter, Lead Tester

APRIL (SOLD OUT) ***Music*** Fad Gadget, Vic Emerson (Sad Café) ***Hardware*** Simmons SDS7 & SDS8, Jupiter 6, Roland TR909 & MSQ700, Yamaha PS Kbds, Crumar Composer, Ibanez UE400 & UE405, Klone Dual Percussion Synth, Vox White Shadow Bass ***CM*** Gentle Art of Transcription Pt1, Ins & Outs of Digital Design ***Technology*** Understanding the DX7 Pt1, Syndrom Pt1, Bass Pedal Synth

MAY ***Music*** Wang Chung ***Hardware*** PPG Wave 2.3 & Waveterm, Roland Juno 106, Roland JSQ60, Casio 310, M&A Electronic Drums, Dynacord PDD14 ***CM*** PDSG Pt1, ***Technology*** Understanding the DX7 Pt2, String Damper ***MIDI Supplement Pt1*** Specification, Theory & Practice, Product Guide, MIDI By Numbers (Steve Levine)

JUNE ***Music*** OMD ***Hardware*** Roland GR700/G707, SynthAxe, Siel Expander, SCI Model 64 Sequencer, MFB512 Digital Drum m/c, Jen Musipack 1.0, Boss DD2 Delay Pedal ***CM*** Gentle Art of Transcription Pt2, PDSG Pt2 ***Technology*** Understanding the DX7 Pt3, Syndrom Pt2, Multiwave LFO ***MIDI Supplement Pt2*** Inside MIDI, MIDI & The Micro, BeeBMIDI Interface Pt1

JULY ***Music*** Human League, Steve Jolliffe, Jade Warrior ***Hardware*** Yamaha DX9, Korg Super Section, Yamaha MK100, Microsound 64 Kbd, TED Digisound, Ibanez DM1100 DDL ***CM*** JMS MIDI Software, PDSG Pt3 ***Technology*** Spectrum MIDI (SCI SixTrak and DX7 Patch Dump), Understanding the DX7 Pt4, RackPack, BeeBMIDI Pt2

AUGUST ***Music*** Rusty Egan (Visage), Cocteau Twins, Hans-Joachim Roedelius ***Hardware*** Synclavier Update, Technics SXK250, Yamaha PF10 & PF15, Siel Piano Quattro & PX jr, Roland HP300, HP400, PB300 & PR800, Garfield Electronics MiniDoc, Electro Harmonix Instant Replay & Super Replay ***CM*** EMR BBC B MIDI Software, Fairlight Explained Pt1 ***Technology*** Understanding the DX7 Pt5, BeeBMIDI Pt3, Syndrom Pt3, Miniblo, SynthMix Pt1.

SEPTEMBER ***Music*** Thomas Leer, Chris & Cosey ***Hardware*** Oberheim Xpander, Korg EX800 & RK100, Digi-Atom 4800, Cutec MX1210, Microlink ML10 System, Roland MPU401, Sycologic AMI & MX1 ***CM*** OMDAC Update, Passport MIDI/4 Software, Fairlight Explained Pt2, Steptime Composition on the SCI Model 64 ***Technology*** SynthMix Pt2, Dual VCLFO, Understanding the DX7 Pt6

OCTOBER ***Music*** Ultravox ***Hardware*** Roland Mother Keyboard System, 360 Systems Update, Yamaha PS6100, DDrums, Yamaha RX Series, Korg DM220, Tama Techstar Electronic Kit, Frazer Wyatt Speakers ***CM*** Yamaha CX5M & Software, Greengate DS3 Sampler, PDSG Pt4, Fairlight Explained Pt3, OMDAC Update 2 ***Technology*** Powertran MCS1 Pt1, Understanding the DX7 Pt7.

NOVEMBER ***Music*** Cabaret Voltaire, Peter Hammill, Axxess ***Hardware*** Chroma Polaris, Emulator II, Chase Bit One, Casio CT6000, Yamaha D1500 Delay, Action Replay ***CM*** Amstrad CPC464, BeeBMIDI 4, Fairlight Explained Pt4, PDSG Pt5, Drum Sequencer (BBC B), Wasp/CBM64 Sequencer ***Technology*** Powertran MSC1 Pt2, Everything but the Kitchen (Syncing to tape).

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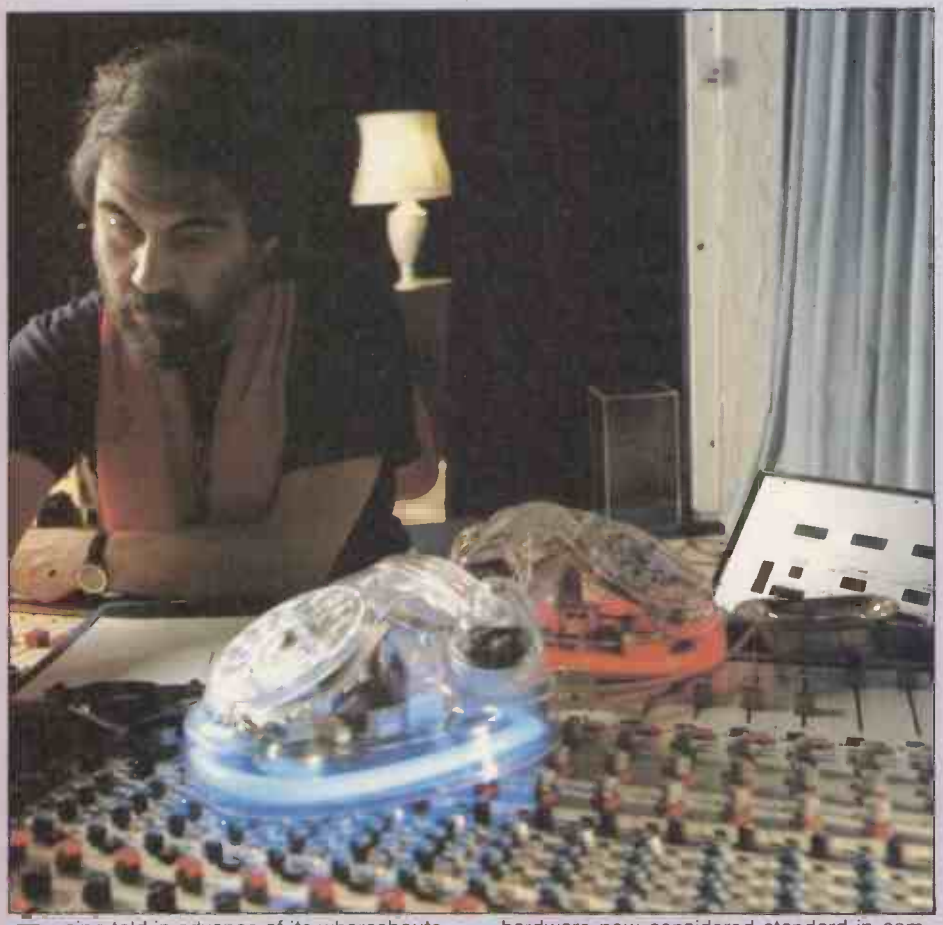
SOIL FESTIVITIES

VANGELIS SPEAKS

With a host of solo albums, film soundtracks and collaborative efforts to his credit, Vangelis is one of the most influential synthesiser composers in the history of modern music. Yet until now, the methods, incidents and philosophies behind his unique compositional style have remained a mystery . . . *Dan Goldstein*



Being told in advance of its whereabouts doesn't necessarily make finding Vangelis' recording studio any easier. It's located on the fourth floor of a large, unprepossessing, and unadorned building in a tiny back street that even the most experienced of London's cab drivers has to consult his atlas before tracing, yet a good aim and a following wind would take a pebble from one of its windows to the ground beneath Marble Arch, one of the capital's best known and most central landmarks.

The studio is called Nemo, and has been Vangelis' only place of work since he came to England from Paris over a decade ago. Even before his soundtrack to the film *Chariots of Fire* put his name on the lips of cinema-goers the world over and brought him the vast collection of gold and silver discs that now adorn his studio walls, Vangelis was an electronic composer whose brilliantly-conceived and originally-arranged music had earned him considerable respect among the burgeoning synthesiser fraternity and a cult following that grew in significance with the release of every album.

Yet in many ways, Nemo is an uninspiring place, lacking not only the mass of hi-tech hardware now considered standard in commercial studios with any serious pretentions to the title 'State of the Art', but also the visual and acoustic decorations that make so many recording venues appear similar: the shag pile carpet, the triple-glazed windows, the subtle back-lighting. None of these things are included in Nemo's specification, nor are they ever likely to be.

In many ways, Vangelis' workplace is a reflection of the worker himself. Unconvinced by the worth of technology for its own sake and unimpressed by the conventions imposed by commerce and marketing, he remains true to the musical philosophies that impressed themselves on him when he first began tinkering with his parents' upright piano in his native Greece at the age of four.

History

'That is my earliest memory. Playing piano, some percussion and whatever else that was available that made a noise. Right from the start, I was only interested in playing my own music, not other people's, and very early on I had a desire to create my own studio in which to write my music.

'But at the time I was very young and still at school. I had a very good time in Greece, but after a while I felt I wanted to get away so I moved to Paris, where I worked my way up through the music industry to get enough money to start a studio.'

While in Paris, Vangelis played keyboards in a couple of rock bands he considers too embarrassing to talk about, as well as meeting Yes' Jon Anderson – who would later become the composer's partner in a number of joint musical ventures – for the first time.

Around 1972, he made the move to London, where he signed his first major recording contract (with RCA), the proceeds from which were used to construct Nemo . . .

'That was not a very easy time for me', the composer reflects. 'I was trying to put together the studio while recording my first album, *Heaven and Hell*, at the same time. In fact, the studio *was* Hell because there was unmixed concrete everywhere, builders all over the place making a lot of noise, and next to all that, there I was, trying to finish my album.

'There was no limit as to how much time I could spend working on the album, but I felt I just had to do it, and in any case, the only way you can complete the construction of a studio quickly is to start working in it before it's actually finished. If you try to wait before the building work is complete, you'll end up waiting forever!'

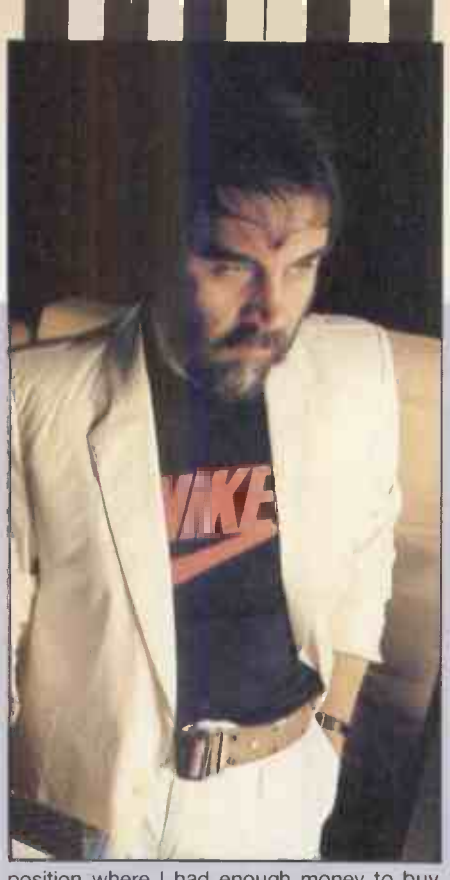
Electronics

In the technological thunderstorm that is 1984, it's perhaps difficult to imagine how refreshing the delicate synth soundscapes of *Heaven and Hell* were when the album was first released. While the rest of Britain's pop culture was still under the spell of Glam Rock and Glitter Power, Vangelis' first vinyl product was stunning in the beauty of its arrangement and the originality of its structure. Its creator used synthesisers as the sonic base for his compositions, and paradoxically, their solid state automation added warmth and colour where most other contemporary music had none.

'Keyboards have always been my main instrument, and as soon as synthesisers became available, I had to have one. My first electric instrument was a Hammond B3 organ. At the time I got it, it provided me with a whole new spectrum of sound (though obviously it had its limitations), and it served me very well: I drive all my instruments very hard, so that's a compliment.

'My first synthesiser was a Korg 700 monophonic. It's a lovely little machine: I still have it – I never throw *any* keyboards away – and I still enjoy playing it. It's full of possibilities no organ can even approach.

'Once I'd got the Korg, new synthesisers started becoming available every six months or so, and I used to go around the shops in London to see if there was any synthesiser offering anything new. Luckily, I was in a



position where I had enough money to buy more or less what I wanted.'

Vangelis describes the electronic instrument market during the early and mid-seventies as a 'low-key situation: synthesisers were still quite basic, but they weren't really all that expensive, either'. Nowadays, he views the hardware scheme of things in a detached and philosophical manner rarely found amongst the synthesiser world's elite.

'One half of the market is now completely oriented towards domestic users, with the Lowrey and Hammond organs and little Casio keyboards, while the other side embraces the Fairlights and Emulators of this world. Those instruments are very sophisticated and – I think – unnecessarily expensive. You could say there's also a kind of middle-ground made up of the programmable polysynths from the likes of Roland and Korg, which I think is going through a bit of a crisis at the moment. Well, perhaps crisis is too strong a word, but those polysynths haven't offered anything really new for quite a while.'

Nothing really new? What about MIDI? What about the DX7? Vangelis has sensed my disagreement.

'The DX7 is a nice, commercial little toy, at a reasonable price. But it's a little bit noisy, and I think the main reason so many people have bought it is that it has such a clever library of sounds. I don't want to criticise it too much – it's good for studio work and nice to have around. I've used one myself quite a bit, but to me it's the equivalent of what the Korg 700 was ten years ago. A popular instrument, it is to the synth world what the Renault 5 is to cars. The Renault 5 was a hit because it was very versatile and you could park it anywhere . . . What I really don't like about it is that, for Yamaha, it's a step back from the CS80.'

It transpires that there is no instrument Vangelis admires more than Yamaha's late seventies synthesiser flagship. In the couple of hours I spoke with him, his individual command of English was used to describe his feelings on the CS80 more than any other subject.

'The most important synthesiser in my career – and for me the best analogue synthesiser design there has ever been. It was a brilliant instrument, though unfortunately not a very successful one. It needs a lot of practice if you want to be able to play it properly, but that's because it's the only synthesiser I could describe as being a real instrument, mainly because of the keyboard – the way it's built and what you can do with it.

'Today, the only thing that matters to synth makers and synth players is the supply of different sounds – nothing else. I think the manufacturers have a responsibility to fit synthesisers with better keyboards so that people get some encouragement to play better, because if all you do is use synths as a source of sounds, you'll never be a complete performer. You'll never be a player in the practical sense, you won't acquire fast reactions.'

But if the likes of the DX7 are enough for most players, what's wrong with the manufacturers giving them what they want?

'Nothing, really. I can understand why manufacturers do what they do for the middle ground, but that should only be one part of the market. Take Yamaha, which is an enormous company: they can go ahead and sell DX7s, but there's no reason why they can't also build an extraordinary instrument. There's the DX1, but to me that's a disappointment – awkward to use, and really quite inflexible. When Yamaha created the CS80, I expected them to refine it and improve it, make it lighter, put new sounds on it, but they didn't.

'I think what I'm saying will make more sense in 10 or 15 years' time. By then, someone somewhere should have created The Instrument – the ultimate synthesiser. I don't mean in terms of sound, because we can create anything we want these days, but in terms of being an extension of the performer – a true performance instrument.

'To explain, if you look at the piano today, it's the result of about 200 years' continuous development, but there's not one synthesiser that's been developed over anything like that length of time. When a synthesiser comes out, it's Top of the Pops for two years, then it's scrapped and replaced by another one with more memories or whatever. When manufacturers stop adopting that attitude, that's when they'll get closer to creating the sort of instrument I'm after – a true performance synthesiser.'

So we're still quite a long way from that?

'Well, nothing since the CS80 that I've used can act as a natural extension of a player's ability. Nothing can be as immediate. The situation is even worse now with the arrival of computers.'

Computers

Aha! Now we come to the real bone of contention. It seems computer technology doesn't really fit into Vangelis' scheme of things at all. He's used them, of course, as and when they've become available, but he remains unconvinced by their usefulness as performance instruments, while grudgingly acknowledging the enormity of their sonic potential.

'In terms of communication, computers are the worst thing that has happened for the performing musician. Why? Because you have to learn to talk to the computer. Having to talk to a piece of equipment moves you one step away from spontaneous creation, things are no longer immediate. When you want to play a piano, you just sit down and play it – you don't have to talk to it. You don't have to say 'give me some sustain here', but unfortunately that's exactly what you have to do with the Fairlight, for example.

'Of course, if you take the time to program computers you can do quite incredible things, but you still lose the immediate contact and response. In that respect, all the new digital and computer instruments are a failure.

'The one computer instrument I've used a great deal is the Emulator. I wasn't expecting much from the Mk I because . . . well, because it was the first. It had its problems but I could understand that, and although it was primitive it was a very useful instrument. But again, the new Emulator is a bit of a let-down to me. They should have fitted a bigger, better keyboard, and made it more human, easier to use. Still, I don't want to be too critical. The sound is much, much better now, and it's very useful for studio work.'

OK, End of Hardware Story. Vangelis' tirade against what the latest modern technology can offer the performance-oriented musician has been a surprise. It's certainly strange, the idea of a man who received no formal classical training whatsoever, who has access to the most sophisticated electronic instruments money can buy, putting immediacy and response highest on his list of synthesiser priorities.

Then again, perhaps it shouldn't be so surprising. After all, comparisons between Vangelis' musical output and those of his contemporaries almost invariably show his to be the less contrived, the more natural-sounding, the more immediate. And that's something that's true of his solo work (he refers to it as 'pure' music), his collaborations with the likes of Jon Anderson, and his scores for film, ballet and opera.

How does he keep up the standard?

'Well, I think it's important not to get stuck doing one thing all the time. For instance, since I did *Chariots of Fire* I've had about 50 offers to do soundtracks every year, but I'd rather not do too many because I don't want to be known only as a filmscore composer. The most important thing for a composer is to have the freedom to become involved in any musical field – that's the most inspiring way of working.

'Of course, inspiration can come in different ways, depending on what field you're working in. When I'm writing music for a film, inspiration will come from the subject matter and visual images, because I don't agree to any offers of ▷ 58

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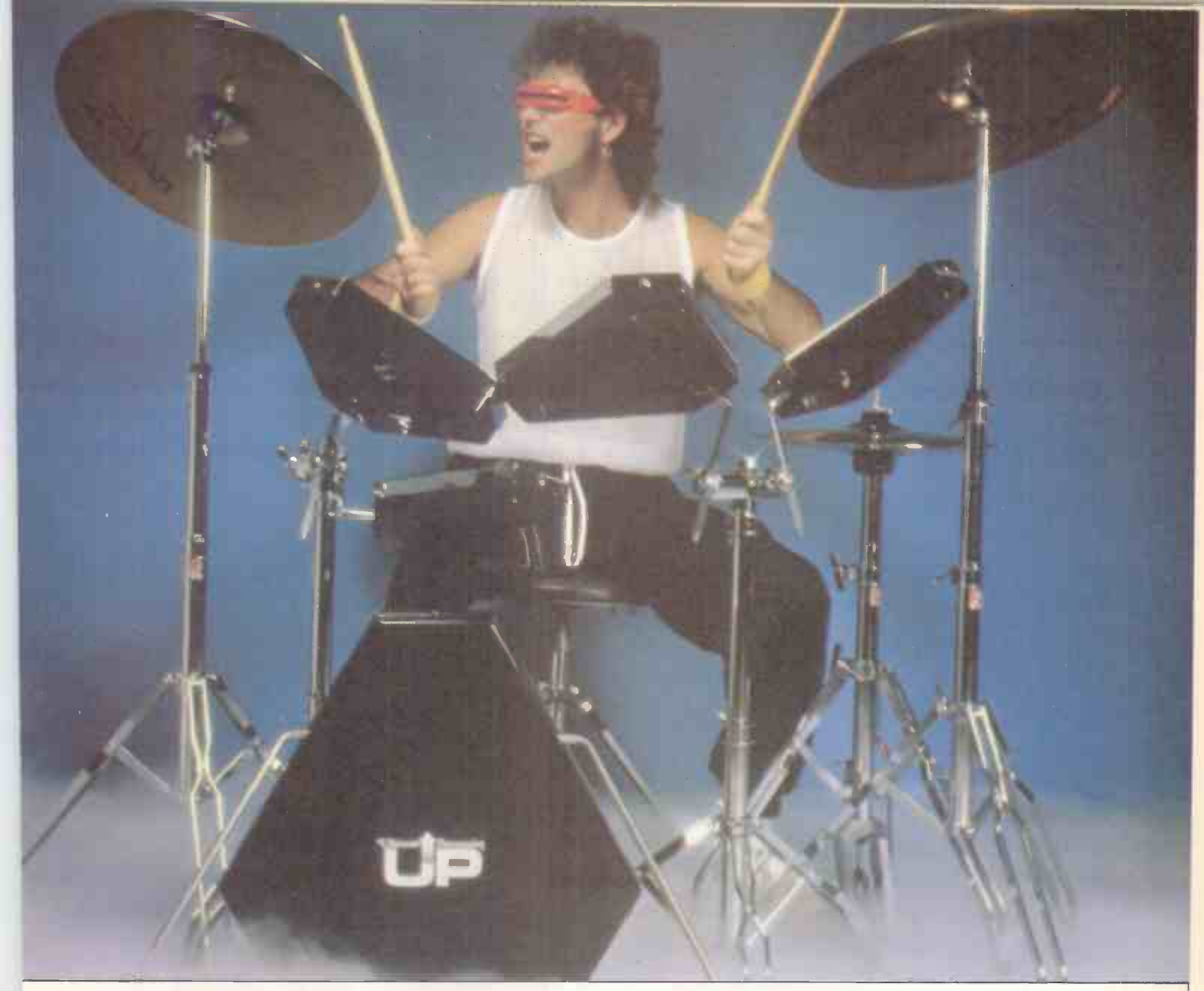

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55 ▷ film work unless I believe I can add another dimension to the film. But if I'm writing music purely for myself, inspiration comes naturally, from everything around. I absorb every experience in life, every situation, because anything can become a source of inspiration – positive or negative. In general I'm influenced more by everyday concepts – nature, the city and so forth – than by hearing other pieces of music. Neither do I find any special inspiration from working in a studio. Obviously it makes life a lot easier to have 24 tracks to record on, and I use the studio as a tool to help in the writing process. I see the mixing desk really as another instrument, the conductor for all the others. But although the tape recorder and the console are just as important as the keyboards, I haven't equipped my studio with a lot of hi-tech effects: I'd rather spend time searching through my sound library to get the exact colour I want.'

Commercialism

The longer our conversation continued, the more it became obvious that Vangelis regards his own commercial achievements with amusement rather than excitement. It's clear that he has little time for what he calls 'junk food music', or records that are made merely to fulfil commercial ambitions, and dreads the thought that he might one day be forced into a similar way of working.

'For every album I've ever made, I've written many times more music than has actually been released, and the way I choose which music appears is almost totally random, but one thing I have never done is to make music for the sake of commercialism.

'I write music primarily for myself, though it's lovely if everybody goes out and buys the records. My new album – *Soil Festivities* – was made because I wanted to make music, not sell a million records. I don't think it's possible to guarantee commercial success for an album anyway, because nobody really knows what is commercial and what isn't. Even if I went out of my way to make an album that was more accessible to the public, that would not guarantee its commercial success.'

Soil Festivities is in fact Vangelis' first album of 'pure' music to be released for some while, though as this conversation has already shown, that's unlikely to be due to lack of endeavour on Vangelis' part. An album inspired – more than any of its predecessors – by the beauty of nature, *Festivities* is a celebration of the natural elements, with their characteristic sounds sampled by Emulator, mixed in with 'conventional' polysynth sounds, and occasionally backed by Vangelis' now familiar acoustic percussion patterns.

And although it's unlikely to match the commercial success achieved by his film soundtracks and Anderson singles, Vangelis can draw satisfaction from the fact that his latest album reaffirms his position as a leading electronic arranger and a composer of the highest calibre. Perhaps more excitingly, it may well be that his own happiness at how *Festivities* has turned out brings him back to the concert arena, something he's visited all too infrequently during his long career.

Playing Live

'From the creative point of view, live music is always different to what appears on a record because everything is spontaneous and you're influenced as a performer by your audience. The negative aspect of live work is that the audience expects to be entertained, and not only that, the record company and the promoters expect you to be successful. But to me, the theatre is a meeting place where something unpredictable happens, not necessarily successful, maybe pleasant, maybe not. That's how I think a concert should be, but in reality things have to be planned down to the last detail, you have to rehearse with other musicians so the scope for improvisation is lessened, and these things prevent a concert from being a truly spontaneous affair. In a way, this reality makes me less keen to do concerts, but in essence I do like playing. I enjoy the risk.'

So the idea of live improvisation is important?

'Yes. I'd really like to do some concerts of completely improvised music, but one of the reasons for doing a concert is to experience the enjoyment of the people there, so you have to include excerpts of music from previous albums because they want to hear something they already know and like. There's nothing wrong with limiting your spontaneous playing to just improvising around old themes, but what is wrong is playing a concert solely to promote a certain record. I've never done a concert tour just to promote *Heaven and Hell* or *Chariots* or anything like that. That sort of thing seems pointless to me.'

Closing Comments

Returning to the subject of the sound-generating hardware that's now available to the modern musician, it seemed reasonable to inquire whether the magician had ever considered delving inside, say, a CS80, in the hope of bringing it up to the standards of his 'ideal instrument'.

'Well, to be honest I don't think it's necessary to find out how pieces of equipment work. I would prefer to know how music works, or how my body and my mind work. After all, it's more useful to know how to drive a car than it is to know what makes it go.

'Of course it's important to know certain things about a machine, but I don't need to be able to build my own synthesiser. It strikes me that the people who do build them don't know how to play them, so I'd rather find out more about playing.

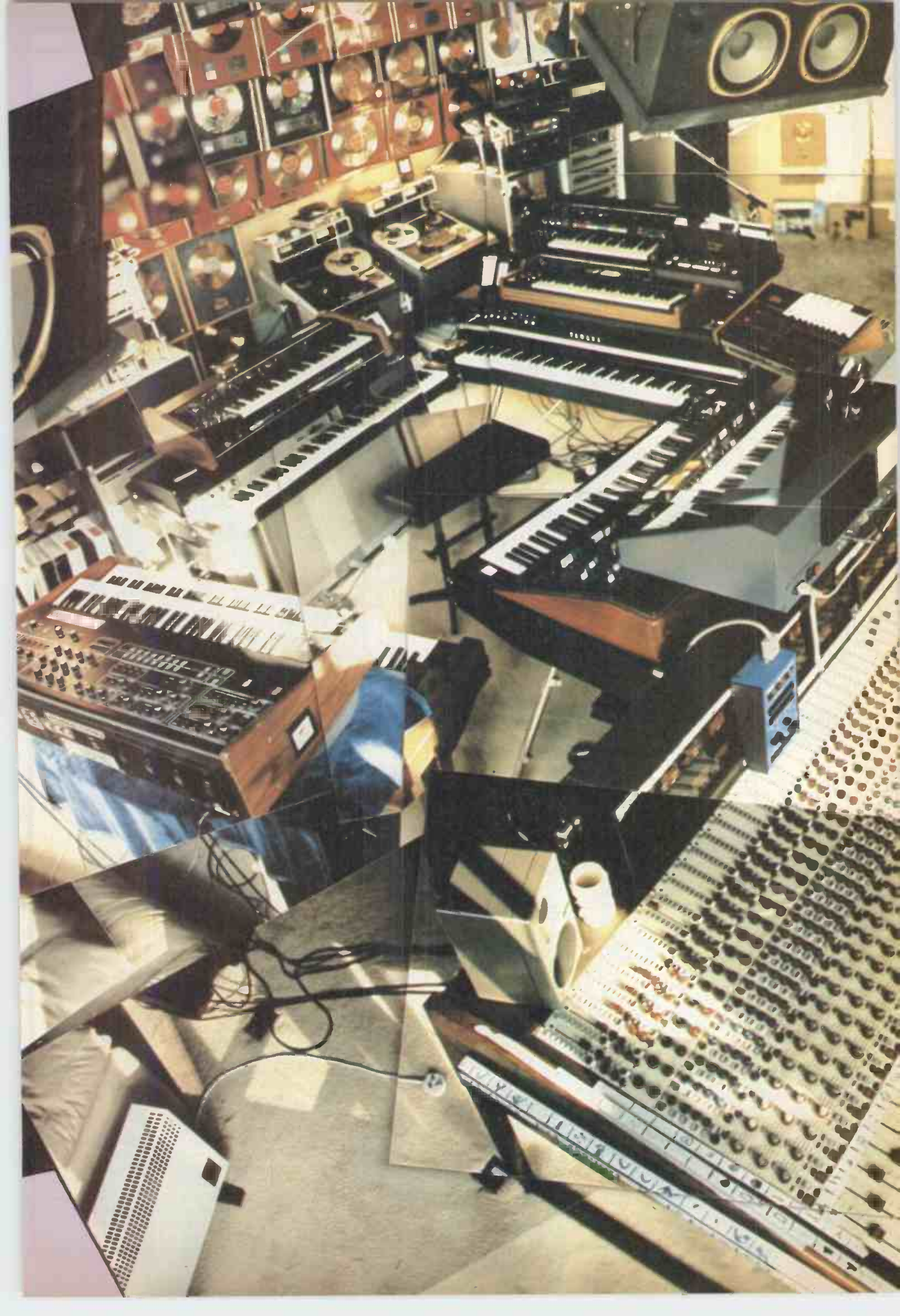
'That's probably why I don't rush out to buy all the latest technology. In fact, I find it quite boring at the moment, simply because so much of it *is* just technology – nothing more. I buy something if it really appeals to me, if I think it will add another dimension to what I have at the moment. Don't misunderstand me: I think it *is* important to have as many different instruments as possible, with different libraries of sounds, and different characteristics. But some people adopt the attitude that if they had enough money they could have all the machinery they wanted, and that would somehow make their music better. That's simply not the case.

'The way I see it is that the ear works on several different levels, like the eye. If you're trained to look carefully you see more than people who aren't, and the same goes for the ear. If your ears are well-trained, you can hear not just a range of pitches but other sounds that most people just miss.

'This is another reason why it's important not to become obsessed with technology. You've got to remember that however a sound is generated – acoustically, electronically, digitally – it's still just a sound, a part of nature.'

There is a trace of sadness in Vangelis' expression as he contemplates, perhaps, a musical future dominated by the will of technicians and marketing men.

There's no doubt that Vangelis has done as much to bring electronic music into the realms of public acceptance as anybody else. All he desires now is for those who design electronic musical instruments to take the needs of musicians into account a little more than they seem to be doing at present. And there aren't many more honourable desires than that. ■



Picture MUSIC

Fancy yourself as another Vangelis? Writing music for film and television isn't nearly so straightforward – or as easy to get into – as you might want to believe. *Steve Howell*

Making music with modern technology isn't always as straightforward as it should be. (Still from the film *Electric Dreams* courtesy of Virgin Films.)

First of all, if you seriously intend carving yourself a niche composing synthesiser music for film and/or television, there is one thing you simply cannot afford to be without – adaptability. You have to be unbelievably versatile as a composer because you'll be required to supply music in an almost limitless variety of styles. Time and the odd Oscar or two might elevate you to Vangelis-like status and all the artistic independence that implies, but to begin with, and probably for some while afterwards, you'll have no option but to meet the demands placed on you by the people that matter. Otherwise, you'll soon find no demands are placed on you at all . . .

This musical adaptability must be matched – if not bettered – by a willingness to program more or less any type of sound at will. If the producer wants the theme tune to sound like Depeche Mode and the incidental music to be a cross between Tangerine Dream and Bucks Fizz, you've got to be able to comply both melodically *and* sonically.

And as a synthesist you'll be expected to provide sound effects as well as music in its accepted sense, so be prepared to exercise rather less in the way of experimental restraint than you're used to. Again, time may gain you a reputation for a certain distinctive brand of background music, but until that stage is reached, you've got to be prepared to imitate other people's styles of synthesis.

So, never forget that you're providing a soundtrack for someone whose musical preferences may be as far from your own as the laws of aesthetic taste will allow. And however banal their requirements may seem, always bear in mind that they're paying for the next month's HP instalment . . .

Instant Music

The second point to remember is that the music you write must be 'instant' in its appeal and effect. Unlike record or cassette listeners, film and TV audiences will probably only have one chance to hear your creation, so it's got to convey the right mood and atmosphere straight away – otherwise it's a failure.

In the world of picture music, there's little or no room for self-indulgence. Whereas a conventional pop or rock song can use five minutes or more for all its melodies and variations to be aired, a theme tune has no more than a minute or two to make its impact, so your composition has got to be concise and to the point. You may be lucky and find time to develop themes a bit more during incidental music, but the problem here is that melodies and arrangements that are too strong could well overpower the action of the film. And if they do, your music won't be used nearly as extensively, if at all.

It's nice when it arrives, but don't treat a commission for a film or TV score as a licence to record that great synthesiser epic you've had lying around in the vaults for the last couple of years. In almost 100% of cases, soundtracks are tailored to match the film they accompany, not the other way around, so whatever you write, it's got to be both striking and economical.

The problem of music overshadowing action must also be borne in mind when you're balancing the various sounds in your composition. A huge Gabrielesque drum sound will almost certainly cut through too much, so if your music does feature drums, keep them well back in the mix. The same goes for whiney, narrow pulse sounds and highly resonant filter effects: you've got to remember that a great many TV sets possess annoying resonant frequencies, and as soon as a note on the soundtrack hits that frequency, half the television sets in the country will start vibrating in sympathy. Unfortunately, predicting exactly which frequencies to avoid is well-nigh impossible because each model of TV is slightly different. The best you can do is to be aware of the sorts of sound that can be troublesome and avoid using them. Low bass sounds can also upset TV speakers – far too often, these have a very poor bass response – so watch those when mixing, too.

You should by now have gathered that mixing on the finest quality studio monitors is pointless, as the music will eventually be heard on something resembling a ripped paper bag – even Auratones are too good. The only way you can *really* judge what your composition is going to sound like through a TV speaker is to use one at the mixing stage. If it sounds OK

on that, it'll sound good on the airwaves.

Filmscore composers are fortunate in that sound quality for motion pictures is probably higher now than it has ever been. However, most cinemas are not equipped to cope with such a glut of sonic information, so a similar – though obviously less drastic – set of rules to those for TV music must be adhered to.

You may think that a natural sound balance will be the only way of getting your soundtrack heard at its best, but nothing could be further from the truth. It may seem like a compromise at the time, but tailoring the shape of your mix to match the characteristics of typical playback media can bring rich rewards.

Sound Quality

Mind you, just because your music has to have an unconventional – by studio monitoring or hi-fi standards – sound balance, doesn't mean to say you can forget all about signal quality.

The finished master tape must be of as high a level – and as hiss-free – as possible, because it's not uncommon for incidental music to be dubbed four times or more from one medium to another before the film/TV programme is complete. A typical procedure would see your masterwork transferred first from your own two-track to sprocketed tape, then to a further quarter-inch reel for editing, on to a video tape and thence to a separate master video tape.

So, as with a recording that's intended for cutting onto vinyl disc, picture music often benefits from a bit of extra brightness just to make sure all those generations of recording don't remove too much in the way of top end.

So much for the rules your soundtrack output should follow. What about the work itself?

Well, as I've already hinted, the music for a film or television programme is more often than not an afterthought. The filming itself may well have taken many months, but chances are you'll only be contacted to write the music when the film has reached the editing stage. And as a result, you may only have a few days in which to write the music, get it approved by the powers-that-be, and record it. You should, of course, have access to the screenplay, from which you can gauge a measure of the film's mood and atmosphere. It'll also give you a rough idea of timings (just read through the cues at a sensibly dramatic speed: remember that normal conversation or reading speed is a lot faster than acted dialogue), but don't expect more than that, because it might not come.

If you're lucky, you *might* be invited to see a rough edit of the visuals, which is always a help. If at this stage you find your views on what form the music should take to be at odds with those of the producer, now's the time to air your discontent. If you wait till the music is finished, the producer may take the decision to reject your recordings and use library discs instead, or worse still, employ somebody else.

OK, it isn't always this hectic and there are times when the soundtrack composer is given plenty of breathing space in which to produce everything, but these are the exception rather than the rule, so it's best to be prepared for panic situations. My own soundtrack-writing career has been littered with rush-jobs, none more hectic than the occasion on which I was contacted late one afternoon to provide three pieces of music by the following morning. I lost a lot of sleep, but the master tape was on the producer's desk before he arrived for work the next day. And what's more, it fitted the pictures exactly . . .

What to Use

I said right at the beginning that to be a successful picture music composer, you've got to be adept both as a composer and as a programmer. Naturally, the latter involves being familiar with a variety of synthesisers and their associated technology. This may seem quite a basic requirement, but you'd be surprised just how many musicians try to take on film work with a knowledge of only a couple of instruments, if that. Creating a certain sound texture may be beyond the resources of the hardware in your possession, so hiring in some gear may be unavoidable. Just remember that if you do hire some equipment, it's best to be at least familiar with its basic operating principles, because with time being so critical, the last thing you want to do is spend priceless hours working your way painstakingly through an instrument you don't understand.

It's always nice to have access to – as well as a knowledge of – a wide range of musical and recording equipment. In fairness, this isn't absolutely essential since you can always resort to hiring, but in the initial stages of presenting your output to a producer, it helps to have the means of making your demo sound as good as possible – hence the recording gear.

> 'Mixing on the finest quality studio monitors is pointless, as the music will eventually be heard on something resembling a ripped paper bag.'

Still, no matter how much recording equipment you have, if you're working on a TV soundtrack you'll still have to re-record everything at a television studio – it's a Union regulation. This can be a major stumbling block, since even if you've had plenty of time to work at home, you'll only have a morning or so to put it all together at the TV studio. And that's not the last of your troubles, because it's very unlikely that said TV facility will be anything like as well stocked with synths and the gear necessary to connect them as your own. Television engineers are notoriously 'textbook' in their approach to recording, and you may come up against one or two raised eyebrows if you turn up with a whole load of music computers and outboard processing gear. Having said that, even trained engineers are reasonable human beings, so unless you go out of your way to be provocative, you should receive their full support.

The need to re-record your music shouldn't arise if you're working in collaboration with a freelance video production company (such as those used extensively by Channel 4, for example) or a film crew, but that in itself requires your own studio facilities to be reasonably comprehensive, which is why it's always a good idea to re-invest any royalties you do receive in the purchase of more equipment.

Getting the Break

If you think you can fulfil the requirements discussed and are capable of tackling the many logistical problems that can arise, you're probably wondering how you go about getting into writing soundtracks in the first place.

My honest answer is that I don't know. I fell into it by accident. I was asked to write some music for a play which was seen by someone who needed some music for another play. This happened a few times until one particular play was seen by a TV producer from the local independent station who required some music himself. Word got around the television studios and I found myself doing more and more work for them. Producers move around the country a fair bit and my cassettes tend to go with them. So they get heard by other producers at other stations which, in turn, brings me the chance of more work.

And so it goes on. Partly through word of mouth recommendations and partly as a result of my own perseverance, the level of work coming to my door is now fairly steady, with commissions from throughout the UK and, with luck, other countries too.

It's possible that you could follow the same route. Hassle a local theatre group, write some music for them and see what happens.

Alternatively, put together a demo tape and send it to as many TV stations and production companies as you can find. Be prepared for disappointment, however, as it's quite likely that your cassette won't even get a fair hearing. You stand a better chance than the multitude sending demos to record companies in search of a deal, but not much.

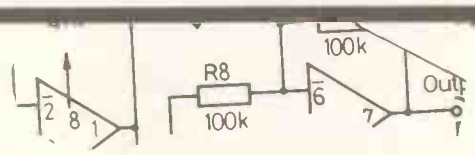
As a writer of soundtrack music that is predominantly electronic in nature, you do at least have two points in your favour. The first is that there are literally hundreds of organisations working in this field, and although many of them will already have regular sources of music that they tend to stick by, the more people there are to send demos to, the more likely it is that someone, somewhere will hear your tape and consider it worth following up.

The second advantage is that producers and their ilk are becoming increasingly aware of the potential inherent in using electronic music for a soundtrack. The inception of microprocessor-based instruments such as microcomposers – and indeed music computers themselves – has increased the speed with which scores can be created and recorded, as well as easing the syncing of soundtracks to video tape considerably. If you're a bit unclear as to the usefulness of sync codes and so on, I can only refer you to last month's instalment of *Everything but the Kitchen* . . . which explains things with admirable clarity.

Qualifications are of absolutely no use. In fact, they may even be a hindrance. I know of several highly qualified musicians who stand little or no chance of breaking into the world of picture music because their output is so classically stylised that any attempt to write more 'modern' (for want of a better word) pieces results in a lacklustre amalgamation of musical clichés. The same is usually true of musicians trying to do things the other way around.

Don't expect things to happen overnight, either. Getting yourself established is invariably a slow process, and over and above your musical abilities (or lack of them), you'll also need other, personal attributes in some quantity. These include drive, stamina, determination, patience, and a fair degree of diplomacy (for dealing with producers, engineers and the like). And in amongst all the artistic headaches that will inevitably come your way, you'll have to keep some semblance of organisational ability to cope with the bureaucratic ravages of contracts, accounts, tax, VAT, music publishing, PRS, MCPS and production meetings.

It may be a precarious and demanding lifestyle, but it beats having a proper job! ■



Powertran MCS1

Part 3: How it Works

Last month saw the MIDI Controlled Sampler's circuit diagrams reproduced in full. Now we take a look at what those circuits add up to in real life. *Tim Orr*

To re-cap for those who might have missed the first two parts of this series, the Powertran MCS1 is a digital delay unit that can also act as a sound-sampling device. This means that in addition to providing all the commonly used time delay effects such as chorus, echo, flanging and so on, the MCS is also able to sample externally-generated sounds digitally and store them in memory. The pitch of the stored sound can then be altered *via* either a MIDI keyboard or a one-volt-per-octave one.

The description that follows refers to the four circuit diagrams we published in E&MM November, so it's important you have that issue in front of you, otherwise you won't understand a word of it (some of you probably won't understand a word of it anyway, but . . .). Although the reproduction of some parts of the circuit wasn't quite as good as we would have liked, you shouldn't experience too many problems in identifying which bit goes where.

With luck, this description should assist newcomers to the world of electronics design in getting acquainted with some of the principles behind the MCS1, as well as giving experienced readers a detailed insight into how well-tried design conventions have been applied carefully to make the Powertran unit a high-performance machine whose cost-effectiveness is second to none.

Diagram 4

I know it sounds strange, but let's kick things off with a look at the last of the four drawings published in November.

IC 400 is a variable-gain preamplifier whose input sensitivity can be selected for high-level or low-level operation from a low-impedance microphone. The RC4558 is a low-noise op-amp that's used at various points throughout the MCS1's design.

IC401 forms a four-pole low-pass filter followed by IC402, which forms a notch. The combination of these two creates an elliptic filter (Figure 1) with a 12kHz low-pass response and a notch at 24kHz: this filter stage precedes the mobile tracking filter, IC403. This is a switched-capacitor four-pole low-pass filter presented in an eight-pin package and manufactured by National Semiconductor. The break frequency is determined by dividing the input clock frequency by 50 (ie. MFCK/50). The package is used in this circuit as an anti-aliasing filter (see Part 1, E&MM October, for an explanation of aliasing and what can be done to eliminate it), but seeing as it is itself a sampled-data device, it needs an anti-aliasing filter of its own, albeit at a frequency 50 times higher. This explains why the fixed active filter precedes the mobile one.

A further low-pass filter, IC404, is used to provide further filtering and to remove any high-frequency clock breakthrough from the mobile filter. The MF4-50 (IC403) is claimed to have a dynamic range of 80dB. In other words, it can pass a peak signal of 2.8V rms and the residual noise, band-limited to 20kHz, will be 0.282mV rms. I measured it and made it 79dB, which for a noise measurement is *very* close. Anyway, the second half of IC404 is the pre-emphasis circuit, and this can be switched on to give treble lift, thereby masking quantisation noise (again, see Part 1 for details) at the de-emphasis stage. The complete anti-aliasing filter stage is shown in Figure 2.

The signal is now ready to be converted into digital data by the analogue-to-digital converter.

IC405 is a sample-and-hold device, and this freezes the analogue signal long enough for a conversion to be performed. The ADC itself comprises IC406 (a fast voltage comparator), IC408 (a successive approximation register, or SAR for short), IC409 (a companding DAC set in encode mode) and IC407 and 410, steering logic.

How does the converter operate? Well, the SAR is given a command called SC (for Start Conversion) and a clock signal, ADCK. The SAR then performs a series of tests on the frozen analogue input, and these are as follows.

First, it tests the MSB (Most Significant Bit) of the code to a 1 and all the others to zero: the DAC output can then be compared to see if it's bigger or smaller than the analogue input. If the DAC output is smaller (ie. less positive) than the analogue input, the MSB is stored as a 1. The next bit of the code can then be tested by setting it to a 1, and the whole process is repeated. In fact, all the bits are tested in this way, the results being stored by the SAR.

As this process continues, so the DAC output successively approximates towards the magnitude of the analogue input. After eight tests, the conversion is complete, and the DAC output is then equal to the analogue input, ± ½ LSB. As far as time is concerned, the whole conversion process takes nine ADCK periods, and when it's completed, the output data becomes stable and can be written into the memory.

Data is read from the memory by latching it into IC412 and then feeding it into IC413, a companding DAC set into encode mode. The DAC output can be seen at the output of IC414.

IC415 forms a four-pole low-pass filter, used to recover the analogue signal from the 'crunchy' DAC output. The signal is then filtered by another mobile four-pole low-pass filter, IC421. Some replay rates are very slow (perhaps as low as 2kHz), so the mobile filter has to track at least an octave below this if the 2kHz sampling rate is not to be too noticeable. Again, the mobile filter is followed by a fixed low-pass one, IC422: the second part of this is used to provide the de-emphasis circuit.

T402, T403 and IC424 form a simple voltage-controlled attenuator used in the MCS1 as a mute circuit, the first-mentioned being a junction FET (field-effect transistor). When the voltage on the gate is about −3V, the FET is turned off, and the channel resistance is about 50Mohms, the attenuation through the circuit in this mode being about 90dB. By comparison, when the gate voltage is 0V, the FET is turned on and has a channel resistance of only 400ohms. This attenuates the analogue signal as seen at the positive end of C441 to about ±60mVp, and therefore allows distortion operation through the FET. See Figure 3. The last stage of IC424 is an output amplifier driven by the mix between direct and delayed signals.

The MFCK signal that drives the switched-capacitor filters is generated by IC416, 417, 418 and 410. This is a phase-locked loop (PLL) which multiplies the system conversion frequency (CK/N) by a number between 8 and 32 – this is the filter offset. The break frequency of the mobile filters is given by the equation:

$$Fb = \frac{CK/N \times Z}{50} \text{ Hz}$$

where Fb is the break frequency and Z the filter offset.

Circuit operation is as follows. The CK/N pulse is fed into the phase comparator of the phase-locked loop, while the output of the PLL VCO is used to clock a down counter, IC417. This counter counts down to zero, whereupon the RC output causes it to load in a four-bit code. The counter is then loaded with this code and proceeds to count down to zero again: thus a programmed division is performed. The RC output is divided by 2 by IC410, which generates the square-wave output fed into the other half of the phase comparator. The feedback loop is now complete.

The PLL VCO will adjust itself to be equal to CK/N multiplied by the total loop division number, the latch IC416 being used to store this number. Occasionally, the PLL will be commanded to generate an output frequency in excess of 700kHz, but will not be able to do this simply because its own VCO cannot exceed this frequency. And seeing as the MF4 mobile filters have a clock frequency maximum of 1MHz, this enforced limitation is actually desirable.

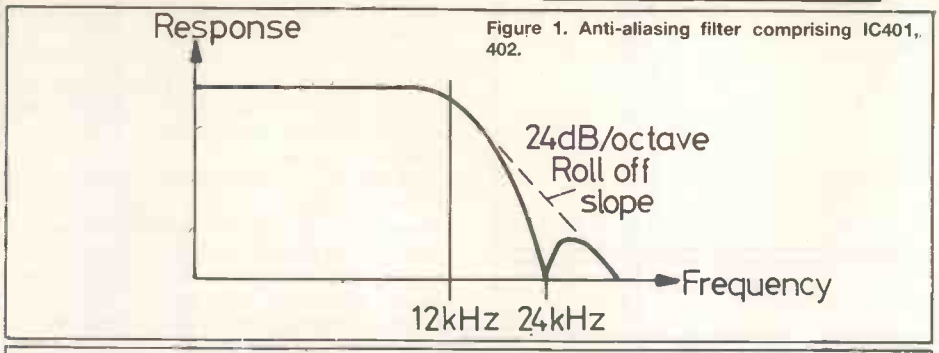


Figure 1. Anti-aliasing filter comprising IC401, 402.

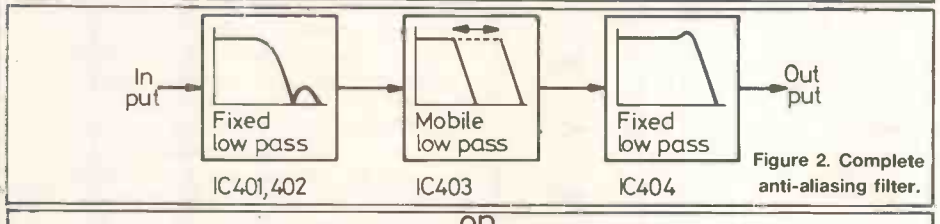


Figure 2. Complete anti-aliasing filter.

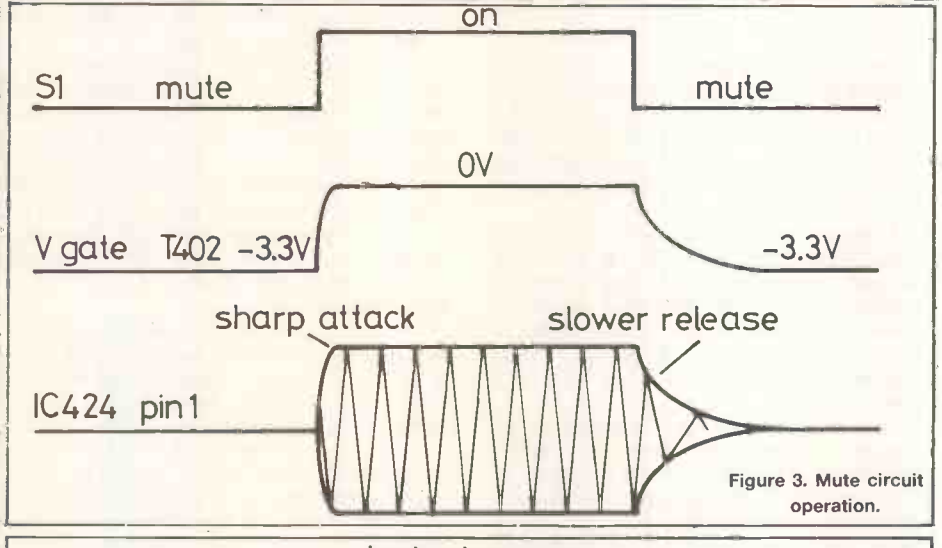


Figure 3. Mute circuit operation.

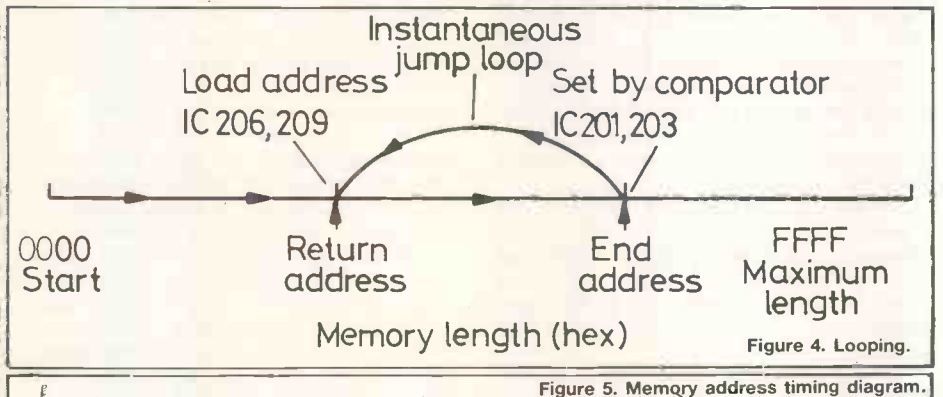


Figure 4. Looping.

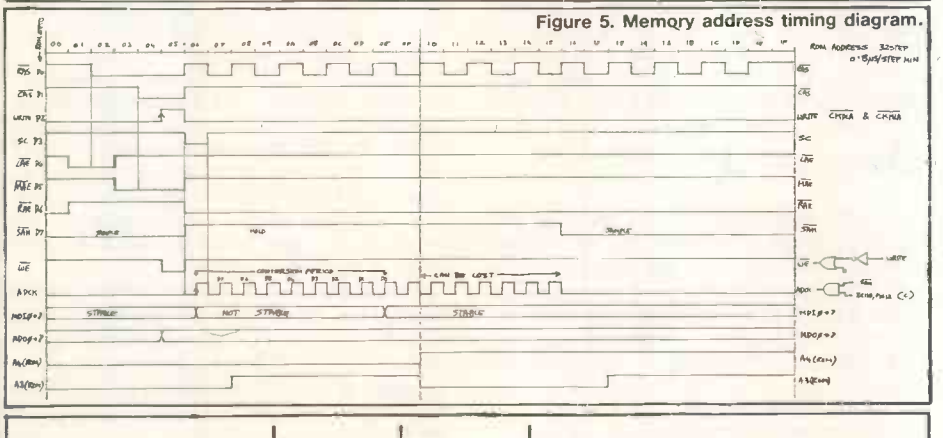


Figure 5. Memory address timing diagram.

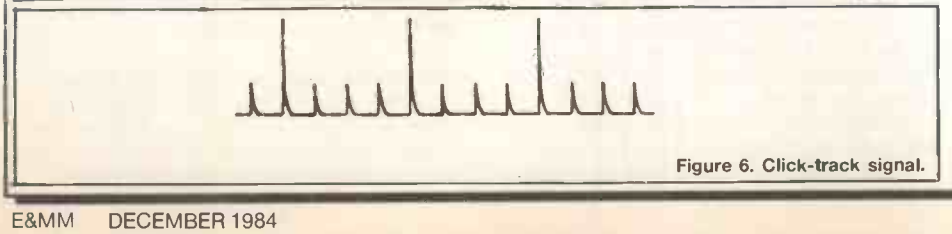


Figure 6. Click-track signal.

Diagram 2

The MCS1 memory is 64Kbits long, and therefore requires a 16-bit address counter in the shape of IC207, 208, 210 and 211. These counters are used to count through memory locations for both Record and Play functions. They can be set to any 16-bit address simply by being loaded with the data stored in latches IC206 and 209. This data is H0000 for the Delay Line mode and front panel-selectable in Edit mode.

A 16-bit comparator (IC201, 203) compares the memory address with the data held in latches IC200 and 202, and when the memory address is greater than or equal to the address stored in the latches, it generates a load pulse for the memory address counters. IC200 and 202 hold the memory end address and IC 206 and 209 the memory return address. See Figure 6.

The logic hardware performs all the looping functions, with the MCS1's microprocessor merely setting up the two 16-bit parameters. Note that the circuit allows these parameters to be any number between the start and finish of the memory – this makes both very short memory lengths and continuously variable loop lengths possible.

IC212 and 213 are used to multiplex the memory address into the MCS1's DRAMs. First, IC212 is enabled, and the bottom eight bits of the memory address are entered into the DRAMs as the ROW address. Next, IC213 is enabled and the top eight bits of the memory address are entered as the DRAM's COLUMN address (see Figure 5).

The DRAMs are actually 64K dynamic devices and are refreshed by performing ROW reads. This is why the fastest moving part of the memory address (the LSB end) is used to select the ROWs. In fact, many of the refresh requirements are generated by the natural reading process. The refresh time as quoted by manufacturers is usually between 2 and 4 milliseconds: that is, the refresh electronics should perform a dummy read on each row every 2–4mS. If for some reason this doesn't happen, there's a possibility that the contents of the memory will be corrupted.

I've tested the MCS1 DRAMs myself and found they actually needed a refresh every 25 seconds, whereas the makers specify 4 milliseconds. They might from time to time get a duff memory cell that actually discharges itself in that time, but personally I have my doubts . . .

Anyway, to make absolutely certain that no refresh problems are encountered, a high-speed refresh counter (IC224) and buffer (IC223) are used to perform the dummy reads.

Data can be transferred from the DRAMs to the microprocessor data bus *via* two latches, IC222 and 225. These routes are used to transfer the memory data to and from the external floppy disk, and also to clean out the memory on powering-up the MCS1. Just to illustrate how important this function is, imagine getting 10 seconds of digital junk blasting out of the audio output every time you turn the MCS1 on.

Moving on, a click-track (IC227) uses the MSBs of the memory address counter to contrive a metronome beat, and a graphic illustration of this is shown in Figure 6.

Diagram 1

The whole delay line (but not the microprocessor) is driven from a master clock generator IC101, which runs at frequencies between 2.5MHz and 10MHz. The oscillator is voltage-controlled, and can therefore be controlled by a voltage from any conventional one-volt-per-octave music synthesiser. Obviously, this voltage has to be converted into an exponential

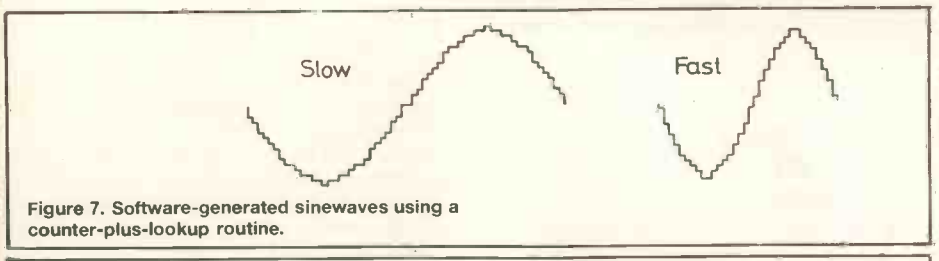


Figure 7. Software-generated sinewaves using a counter-plus-lookup routine.

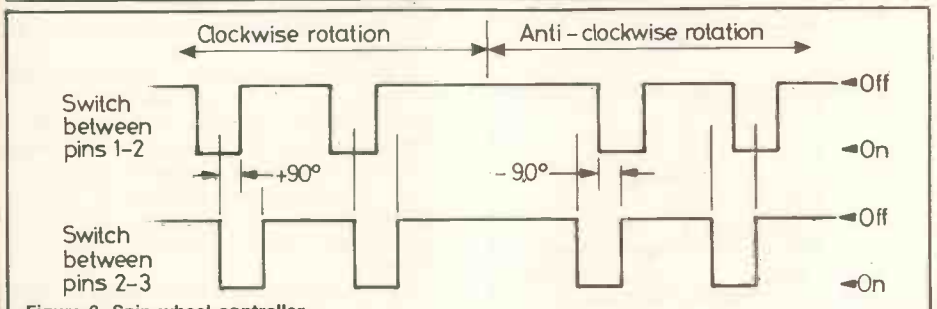


Figure 8. Spin-wheel controller.

signal by a simple log converter, and this is made up from IC121, T100 and T101.

As we mentioned in Part 1, a two-octave range can be obtained using the voltage control input, but the MCS1 can also add a large musical transposition to the output signal.

The voltage control is a Play mode function, and a two-way switch (IC107) selects either one-volt-per-octave or microprocessor control of the master clock generator. By using a latch (IC118), a DAC (IC119), and a low-pass filter (IC120), the microprocessor can generate sinusoidal sweep and pitch-bend control voltages.

The sinewaves are generated in software with a counter and lookup table. A number is generated by the sweep frequency controller (a panel function, this) which is added to the counter at regular intervals of time. The counter is used as a pointer to read the magnitude of the sinewave in the lookup table: as the pointer moves through the table, a sinewave is generated and turned into a voltage by the DAC. The number added to the counter determines the sinewave frequency – if the number is small, the pointer will take a long time to travel through the lookup table, and so on. The filter is used to smooth out the crunchy shape of the sinewave generated by the DAC, though it really isn't all that bad in the first place. If you want a visual representation of the software-generation of sinewaves, look no further than Figure 7. Incidentally, amplitude control of the sinewave is also performed in software, by a multiply routine.

The control voltage electronics as a whole is actually rather difficult to align, while the master high-frequency oscillator contains a non-linearity which can cause detuning at low frequencies. The best musical results are obtained by optimising the log circuit for operation over the top octave range, because if you try to align it over the full keyboard range, tuning errors are simply inevitable. The MCS1's two-octave CV range is still useful for effects purposes, while CV devices can be used to drive the sampler over a six-octave range if you can get your hands on one of the analogue-to-MIDI converter units that are either available now or are soon to become so. You'll also need a MIDI keyboard, of course.

The master clock generator is fed into a divide-by-N down counter comprising IC102–104. The value of N is stored by latches IC105 and IC106. The counters count downwards to zero, and when they reach zero, an RC pulse is generated by IC104, and this loads the counters with the value of N. They then count down to zero again, so as you can see, they don't lead a particularly interesting existence.

The CK/N signal generated by this timing process is the sample rate of the system as a whole. Thus, by changing the value of N (N is a 12-bit word), the sample rate can be modified directly. In fact, this mechanism is used to vary the sample rate continuously *via* the control on the MCS1 front panel.

Additionally, and as a result of having a lookup table of values of N that result in a musical distribution of CK/N frequencies, it's possible for the microprocessor directly to control the pitch of the output signal in semitone steps. And yes, this control information can be obtained by decoding MIDI pitch data.

Now, while a source of MIDI codes can be used to generate the Play pitch for the MCS1, the method of dividing a master frequency by N to generate equally-tempered tuning is not without its problems. For one thing, N has to be an integer, and while this results in good pitch resolution for low notes, things aren't quite so consistent further up the scale. The overall resolution can be improved by increasing not only the size of N but also the frequency of the master oscillator: the MCS1 uses a maximum N value of 4096 and a maximum frequency of 10MHz.

On the basis of that 4096 figure, the first (lowest) octave has 2048 values of N at its disposal to define its 12 semitone frequencies, but the fifth (highest) octave has only 128. In other words, tuning resolution is still rather better at low frequencies than it is at high ones . . .

Moving still further ahead, ADC and read-write timing is generated by two counters (IC110, 111) and a bipolar ROM, IC112 (again, see Figure 5). If the CK/N period is long, extra refresh counts are generated by the RAS and RAE signals, ORed together by IC114.

Diagram 3

The microprocessor at the heart of the MCS1's design is a 6802, shown on the drawing as IC309. Strange though it may seem, this device generally has nothing much to do. It scans all the panel controls, loads up all the control latches and display registers, and then waits patiently for something to happen.

The reason for this inactivity? Simply that most of the MCS1's functions do not depend on the active intervention of the microprocessor for them to operate smoothly. The 6802's busy time is when it's generating a software sinewave or loading from or saving to floppy disk. A data bus buffer (IC321) has been used because the microprocessor would otherwise be unable to support loading on the data bus. The program is held in an EPROM, IC308.

A static RAM (IC307) is used as a scratch pad memory for items such as filter offsets and current values of N, while IC310–312 generate all the address decodes for the memory-mapped devices.

All the MCS1's front panel display details are handled by two chips, IC304 and 305. These are 34-bit long-shift registers with parallel outputs that can drive LED displays directly. Display data is entered serially as a 34-bit-long chunk, and the IC does the rest. No seven-segment decoding takes place inside the IC because the segments that have to be switched on are controlled directly by the input data stream. The four-digit display and the illuminated panel switches are driven by these ICs.

The pitch-controlling keyboard is scanned by IC315 and 316. The former pulls one row at a time low while the latter reads the keyboard in four-bit nibbles: any key depression is detected as a low voltage, and the six rows and read sequentially. IC316 also reads some of the other system signals.

IC328 is a control latch, the outputs of which are used to enable various functions. Serial data is handled by the ACIA (IC323), and transmission and reception between the ACIA, the BBC Micro (a future update), and MIDI is performed by enabling various tristate buffers (IC235, 326). The MIDI In signal is coupled to the MCS1 *via* an optoisolator IC327: this helps prevent the ground loops and other unwanted hiccups that so often occur while equipment is being interconnected.

The Gate, Audio and spin-wheel controller signals all generate a hardware interrupt (IC317, 318, 319, 320 and T300). When an external Gate signal occurs, it clocks flip-flop IC318, setting the Q output (pin 5) to a 1. This turns on T300, which in turn generates an interrupt. The microprocessor services this interrupt by reading the contents of bus buffer IC320. It discovers it was the Gate that caused the interrupt (the Gate signal is also available for reading at IC316), and takes appropriate action by generating a clear interrupt (CLINT) signal which sets the flip-flop back to a zero. The remaining two interrupts are similar.

The Audio signal is fed into a voltage comparator (IC317), and when the voltage at its input pins exceeds ±50mV, the interrupt is set: this circuit is used to trigger the start of a recording at the beginning of memory.

The spin-wheel controller is an important part of the circuit because it is the manual interface between the user and the MCS1's internal control parameters. The controller (Figure 8) is a rotary switch with 50 positions per revolution: there are two switch contacts 90° out of phase with each other, and the rotation range is a full 360°.

Inside the MCS1, IC319 is used to detect the controller's rotation and the direction of that rotation. One switch output is used to clock a D-type flip-flop, the other provides the data input. If the rotation is clockwise, the Q output is set to a 1, and if it's anti-clockwise, a zero. The individual switch pulses generate an interrupt and need to be cleared if the next event is to be recognised.

The MCS1 software provides for three control sensitivities for the spin-wheel, these being Fine, Medium and Coarse. Just think, if you only got 50 'clicks' per revolution of the wheel in reality, it would take a grand total of 1310 turns of the controller to travel the full length of the MCS1's memory address. ■

The MCS1 retails at £499 plus VAT as a complete kit of parts, £699 plus VAT as a ready-built unit. Further information from Powertran Cybernetics, Portway Industrial Estate, Andover, Hants. ☎ (0264) 64455.

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MODULAR SYNTHESIS

More on Using Sequencers

A look at using a VCA for pre-programmed sequencer level control.

Steve Howell

This month sees the final instalment of sequencer usage and makes use of a synth's VCA module for pre-programmed level control. To re-cap on a patch given in E&MM November, Figure 1 shows how the second CV output of a sequencer can be used to control the synth's volume, and uses a second VCA after the main 'shaping' VCA.

But what happens if you're a bit short on hardware and possess a sequencer that has only one CV output? Referring to Figure 2 should solve your problems. In this example, a sequencer has been laid down on Track 3 in the normal fashion with no dynamic control, and a click-track has been recorded on Track 5 to be used as a master clock. We now feed Track 3 into the VCA on the synthesiser, and by routing the click-track into the 'Step' input of the sequencer and then routing the sequencer's CV output into the control input of the VCA, you can program your dynamics into the sequencer. As the tape rolls and the click-track steps through the sequencer, the volume of each note on Track 3 will vary in accordance with the sequencer's voltage levels. The VCA's output can be fed into another track on the multitrack tape (the original can then be wiped to accommodate another part) or, alternatively, if you keep the click-track until mixdown you can feed the VCA's output direct to the mixer.

Any sound can be processed in this way: a snare voice from a drum machine, a polyphonic synth as discussed last month – the list is endless. It's also possible to create crescendo and diminuendo effects on sustained sounds such as strings.

By inserting a lag-time processor between the sequencer and the VCA, the stepped output can be smoothed out as in Figure 3. Level changes will now be gradual and can be used as an effective single-channel computer mix. In this instance, you don't *necessarily* have to sync up the sequencer to a click-track: its tempo can be adjusted to suit the speed of your swells and fades.

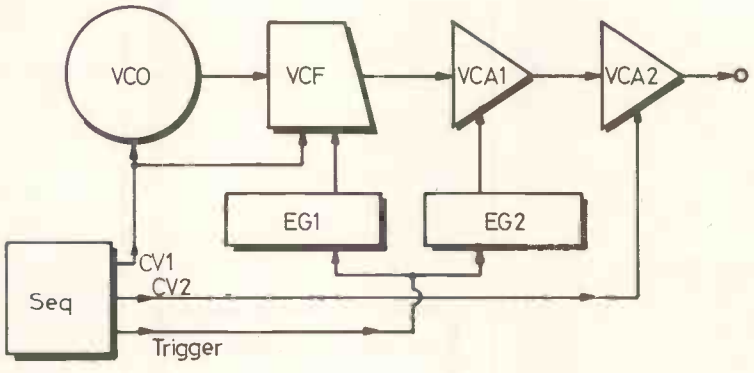

Figure 1. Patch for sequential control of dynamics.

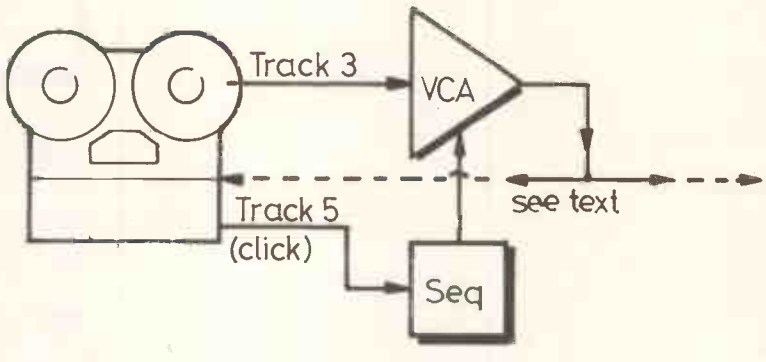

Figure 2. Sequential control of dynamics of a pre-recorded track.

Dynamics

Another technique well worth employing involves injecting dynamics manually into a sequencer track. Figure 4 gives a patch which utilises the Envelope follower, the CV output of ▷

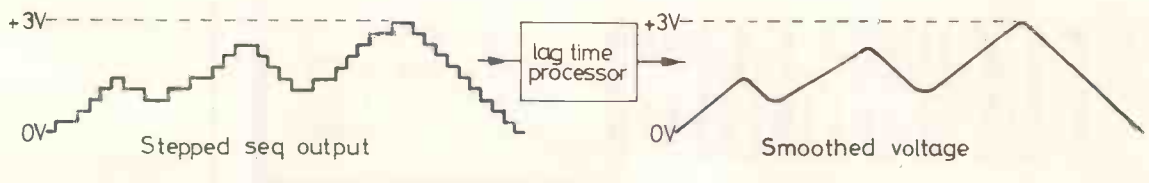

Figure 3. Effect of a lag time processor on a sequential voltage output.

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which is routed to the control input of a VCA. By connecting a microphone to the audio input of the envelope follower, you can vary the dynamics of the sequencer part simply by tapping the mic harder and softer. The sound source can come from a patch (as in Figure 1) or off-tape (as in Figure 2) and could therefore be a bass drum, snare drum, or whatever. Crescendo and diminuendo effects can also be achieved by 'AAAHing' into the mic at various levels.

Another method of varying levels is to use a switch to feed the preset bias voltage from a DC voltage source (such as a battery) which allows you to key in accents and dynamics as and when the mood takes you. Again, the sound source can be derived from just about anything, but the initial gain of the VCA must be set to allow sound to pass through when no bias voltage is applied. The greatest advantage of a modular synthesiser is that, because of the high signal levels used within the modules, devices can be used for purposes other than those originally intended for them by their designers. This is especially true of the VCA, as it can be used to control the level of a modulation source.

Figure 5 gives a patch for sequential control of vibrato. In this example, the sine or triangle wave output from an LFO is fed into the VCO(s) *via* VCA2, and the CV output of the second channel of your sequencer (or the CV output of a suitably synced second sequencer) is fed to the control input of VCA2. By setting the CV levels on the sequencer's second channel high, the LFO will be allowed to pass through the VCA2 and *vice versa*, so that pre-programmed amounts of vibrato can be introduced on specific notes during a sequence. Of course, a modulation source can be used with and routed to any voltage-controllable device. An envelope generator, for example, can be used for pitch-bend effects, a square wave for trills, and so on.

EG Triggering

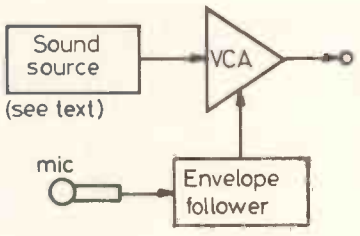
Another possibility – along similar lines – employs a technique we looked at quite recently, whereby the sequencer's second channel is used to trigger an EG. By setting the CVs in the second channel above and below the EG's trigger input threshold level, you can trigger an envelope cycle as and where you wish. Figure 5 shows a patch which'll allow you to introduce a delayed vibrato effect on certain notes. The example given in Figure 6 allows you to switch vibrato in and out, but this technique enables the gradual introduction of vibrato to be carried out. Note that the output of EG3 is routed to VCA2 *via* an inverter. This is to turn the envelope voltage upside-down, as it's the delay/release portion of the cycle that we're going to use. By setting the attack to instant, the decay and release times are adjusted to the required length of the vibrato decay. However, you still have to split the output from the sequencer's CV channel and route that from VCA2, so that when the voltage is low (ie. 0V) no voltage will flow through it. Otherwise, when EG3 is not triggered you'll have permanent vibrato: not a very inspiring state of affairs. By doing this, the VCA will normally be 'closed', so that when the sequencer's output goes high to trigger EG3, the VCA will also be 'opened' – the inverted attack will then 'close' it and it'll be 'opened' gradually by the inverted decay/release portion of the cycle.

Well, I hope all this has given you some food for thought on the creative use of sequencers in the context of a modular synthesiser system. As I hope you can see, the possibilities are almost limitless, and I've only been able to outline them briefly. Suffice to say, experimentation with these patches should yield a whole host of sophisticated effects, and with any luck your music will be more interesting as a result.

As I've pointed out before, the advent of MIDI and computer control doesn't make these techniques obsolete in today's somewhat higher-tech atmosphere. If anything, incorporating these techniques *alongside* those of newer technology gives you the best of both worlds, and for those readers who simply cannot afford to consider the new-fangled devices currently on offer, these patches should expand your sonic vocabulary considerably without incurring any additional expenditure. It's quite encouraging to remember that many of these patches and the sound they create just can't be done on the most sophisticated digital systems such as the Fairlight and PPG Waveterm . . .

Well, that concludes our look at modular synthesis for the time being, as most of the less obscure applications have now been covered. Having said that, there are still many possibilities that have not been explored, and seeing as these are also applicable to other, 'conventional' synthesiser systems, the next few issues will see your intrepid reporter covering non-specific subjects such as improving lead-line sounds using vocoders, combining FM synthesis and analogue equipment, and so on. ■

Figure 4(a). Using an envelope follower for dynamic control.



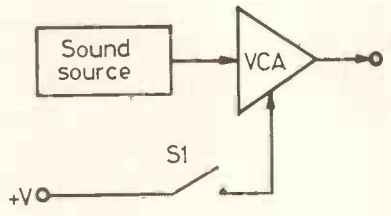


Figure 4(b). Using a bias voltage to vary dynamics.

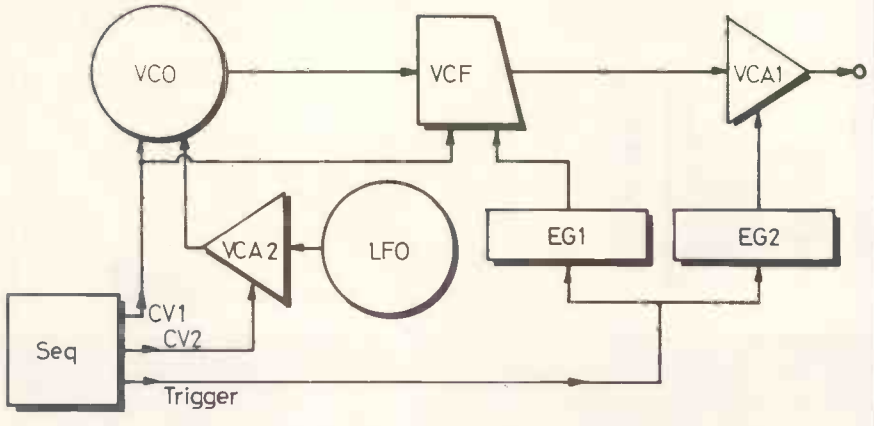


Figure 5. Sequential control of modulation.

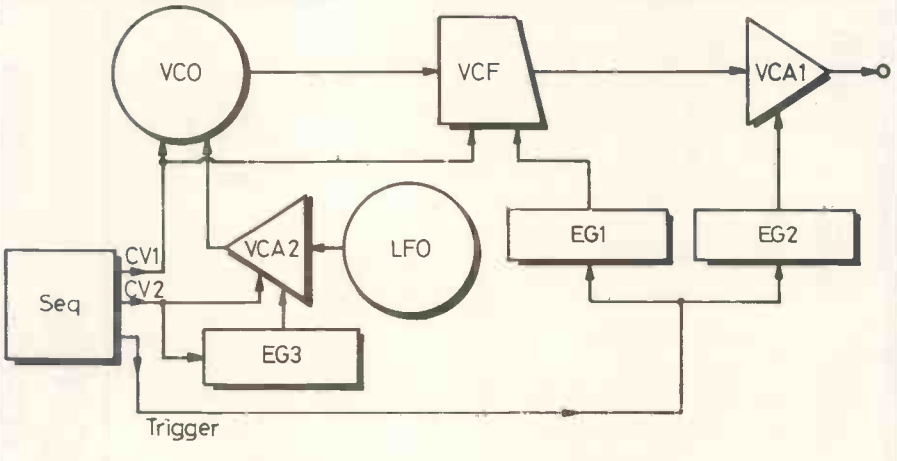


Figure 6. Patch for delayed vibrato under sequencer control.

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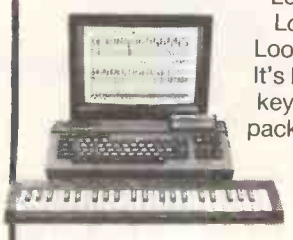

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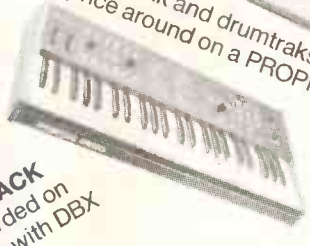

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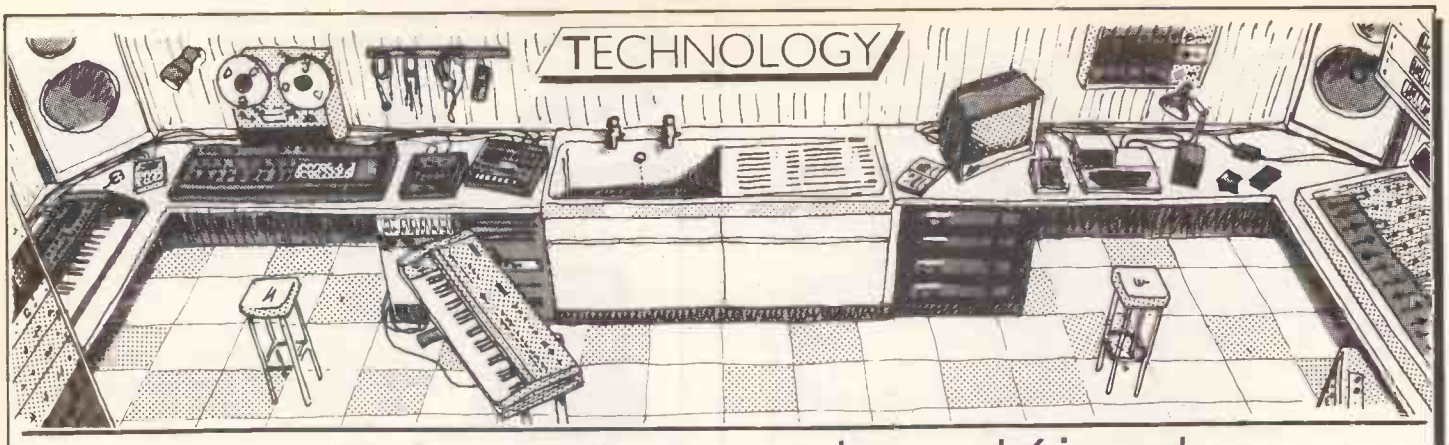

Everything but the Kitchen..

Or how to get the best from your electronic instruments by syncing them together. Part two looks at playing synthesisers from each other.

Steve Howell

What sets the synthesiser apart from every other musical instrument is its ability to be played by another instrument. Imagine the joy of, say, the world's trumpet players if they could suddenly and magically hook up their instrument to a piano so that every note they played would result in the second instrument following, either in exact unison or an octave or a fifth apart. Yet such arrangements are easily obtained in the world of synthesisers. All you need is a couple of leads and . . . the know-how necessary to connect two instruments from different eras and manufacturers. Which is where this month's *Everything but the Kitchen* . . . comes in.

History

In the mid-sixties, Robert Moog rationalised the whole concept of synthesisers by introducing a technique known as voltage control. This simple idea is based on the principle that by applying a voltage to the control input of any synth module, you can affect its working parameters. So for instance, if you apply a voltage that undulates up and down to the control input of a Voltage Controlled Oscillator (VCO), the pitch of that oscillator will rise and fall as the voltage increases and decreases.

Now, a synthesiser's keyboard represents a further voltage source which, scientifically speaking, is really no more than a switched variable resistor that allows more or less voltage through to the VCOs depending on which 'note' you play. A further requirement for the keyboard is that it should provide a pulse suitable for triggering the synth's Envelope Generators. So, what's now clear is that whenever you play a note on the keyboard, you actually generate two voltages – one to determine the frequency or pitch of the VCOs, and one to 'fire' the EGs. A keyboard, then, is just another control device and can't therefore be dispensed with in some instances: that's why many of the earliest synth designers didn't include one.

Interfacing

Figure 2 shows the layout of two typical synthesisers readily available from most music shops. The keyboard is routed to the VCOs, while the Voltage Controlled Filter (VCF) and the keyboard's trigger output are connected to the gate or trigger input of the EGs. Note also that there are two points on both synths – A1 and A2 and B1 and B2.

What happens if you connect these sets of points together? You've guessed it. One synthesiser can be used to control the other. I hasten to add that electronically, things aren't quite as simple as that, but it's all you need know about it in practice.

Points A and B appear on the back of most analogue synthesisers (though obviously they're not labelled as such), and it's these that allow your synth to talk to the outside world and strike up lasting friendships with other electronic instruments.

On some syths, you'll find separate inputs and outputs for both CV and trigger connections, but one important point to bear in mind is that these are switched jacks, so that whenever you plug something into one of them, you automatically override the synth's internal functions and replace them with those of the external keyboard.

The reason most manufacturers put override functions on their instruments is that presenting a module with two voltages (one from each keyboard, in this case) can cause a lot of technological confusion, which more often than not results in the synths drifting out of tune from each other.

And that's really what it's all about: overriding one function within a synth with something from a second, so that the latter instrument does all the controlling. Nowadays, MIDI and its associated technology have changed the workings of the concept a little, so that instead of a keyboard providing two discrete voltages, it supplies just the one digital code which is then multiplexed into two separate voltages for the purpose we've just analysed.

Having said all that, you're still going to run into a few difficulties . . .

The reasons for these difficulties aren't as complex as many people seem to assume, and really date back to the early days of synth mass manufacture when there was little communication between designers and each one went his own sweet interfacing way. As a result, certain incompatibilities cropped up.

The two leading manufacturers of the time – Moog and ARP – utilised the principle that every volt increase results in the doubling of a module's parameters. In other words, if the VCOs receive a voltage swept over a range of one volt, the pitch changes by one octave; if the VCA receives a similar voltage, the signal fed into it becomes twice as loud, and so on. Some early Korg and Yamaha synths utilised a volts-per-hertz system and were therefore incompatible with the volt-per-octave models; conversion could only be carried out by Korg's MS02 interface (more of which later).

Some time after, the former system was adopted as the industry standard and became known as the one-volt-per-octave rule. What the makers *couldn't* agree on was a standard form of trigger pulse, and even today, problems exist in this area (hence the rationale behind

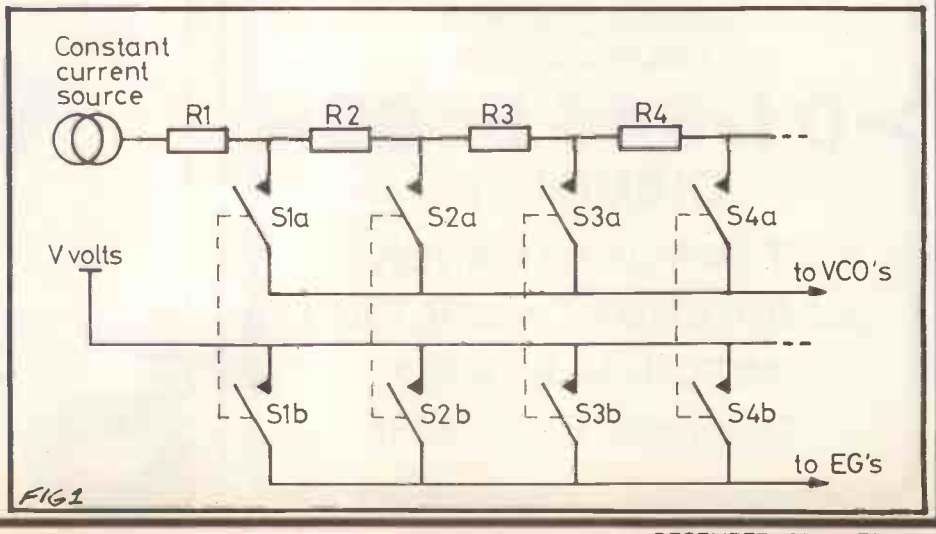

FIG 2

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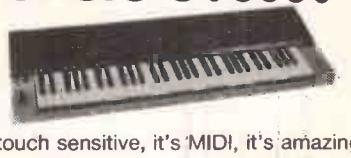

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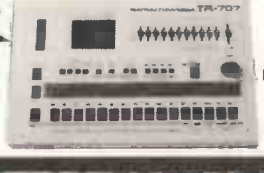

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this series of articles). There are currently three types of trigger signals in use, none of which will talk to either of the others without a suitable interface.

The **Positive V-trigger** is the most common form of trigger and can be found on synths from Roland, ARP, SCI and Oberheim. The trigger rests at zero volts when no note is played, rising to a positive voltage as soon as any key is pressed. This form of trigger is also found on almost all drum machines and sequencers, too.

The **S-trigger** is found exclusively on early Moog equipment, and is also known as a 'switch' trigger. It rests at +12 volts but goes down to zero volts when a key is depressed.

The **negative V-trigger** is used by Korg and early Yamaha analogue monosynths. Like the positive version, it rests at zero volts, but then falls to a negative voltage once you play a note.

Circuitry

So, what happens when you connect your Roland SH101 to a Moog Prodigy? Sadly, not a lot. In order to get the Roland to trigger the Moog, you'll need to transform the trigger pulse completely: a circuit is shown in Figure 4(a) which'll do just that. It will not, however, allow the Moog to play the Roland, so a circuit for this is given in Figure 4(b).

Converting a positive V-trigger to a negative one is relatively straightforward, and a suitable, circuit is easily constructed using a cheap and cheerful 741 IC: the diagram is shown in Figure 5. This little piece of electronic wizardry will enable you to trigger Korg sequencers and arpeggiators from Roland drum machines. Alternatively, you can use a Korg MS10 (or 20) to play a Pro One, no problem.

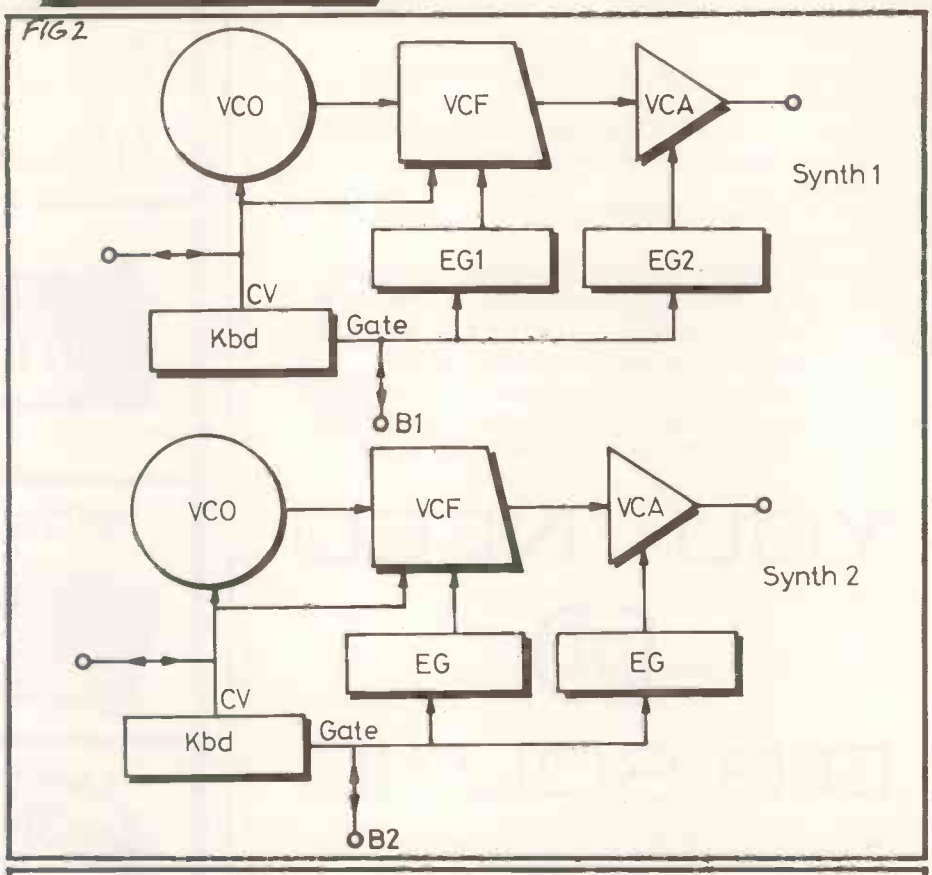
If all this circuit-building sounds too much like hard work, you could always take the easy (read 'more expensive') way out and purchase Korg's ready-built MS02 interfacing unit, although this may not be that easy as it's now obsolete. It used to retail around the £95 mark, but if you shop around you may be able to pick one up secondhand. As well as converting positive Vs to negative Vs and S-triggers (or *vice versa*, or any combination you can think of), the Korg also gives you the option of being able to trim control voltages so that both synths can be connected in the true and certain knowledge that they will be perfectly in tune forever.

If money's no object, there's always the Mini Doc and Doctor Click interfacing devices from Garfield Electronics. In fact, Garfield's UK importers, Music Labs, have just started bringing in a new range of low-price interfacing equipment from the American company, so they could be well worth checking out.

Of course, the arrival of MIDI has made playing synthesisers remotely from the keyboards of other synths no more complicated than fitting a couple of MIDI cables. However, the wonderful Oberheim Xpander excepted, few MIDI instruments are equipped with old-fashioned trigger sockets, so if you've got a couple of synths from differing generations (a DX7 and a Pro One, say) you're going to have to resort to an analogue-to-MIDI converter such as Sycologic's AMI or the London Rock Shop's DigiAtom 4800. ■

Sources of Information:
Korg MS02 *– Rose-Morris, 32–34 Gordon House Road, London NW5. ☎01-267 5151.*
Garfield Electronics *– Music Lab Sales, 72–74 Eversholt Street, London NW1 1BY. ☎01-388 5392.*
Sycologic AMI *– Syco, 20 Conduit Place, London W2. ☎01-724 2451.*
DigiAtom *– London Rock Shop, 26 Chalk Farm Road, London NW1. ☎01-267 5381.*

FIG 2



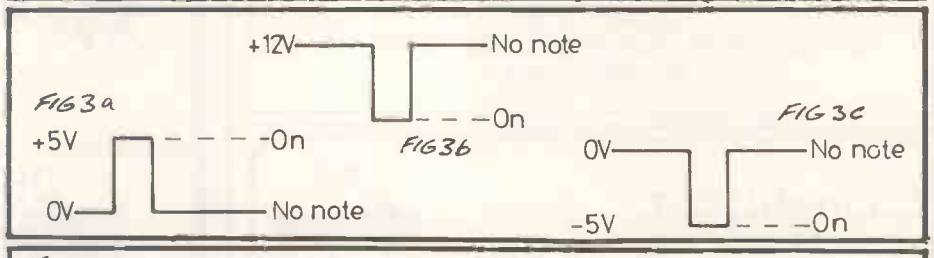


FIG 4a

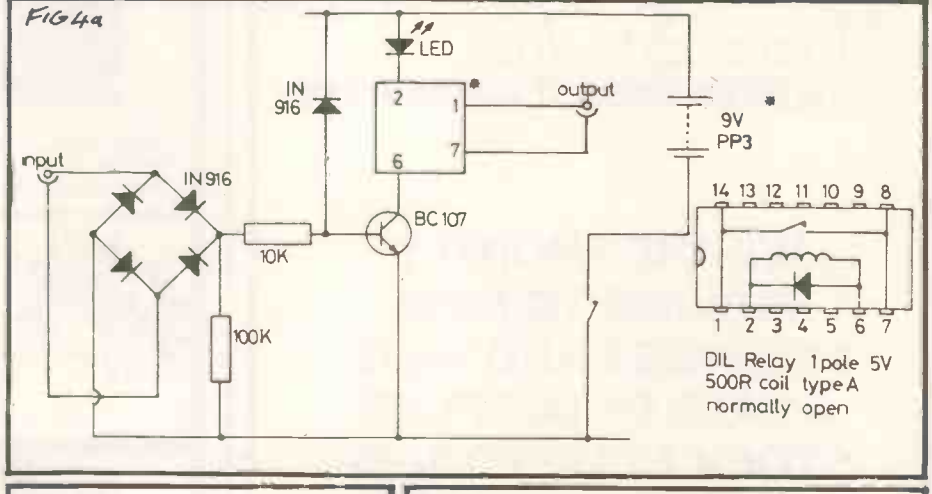


FIG 4b

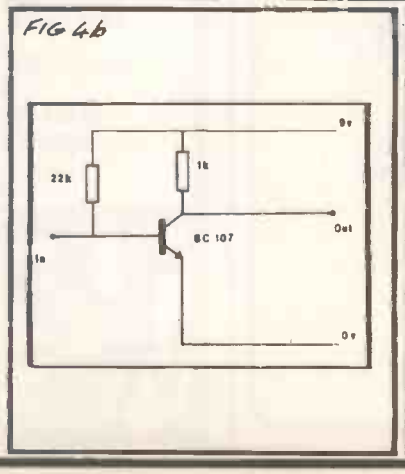
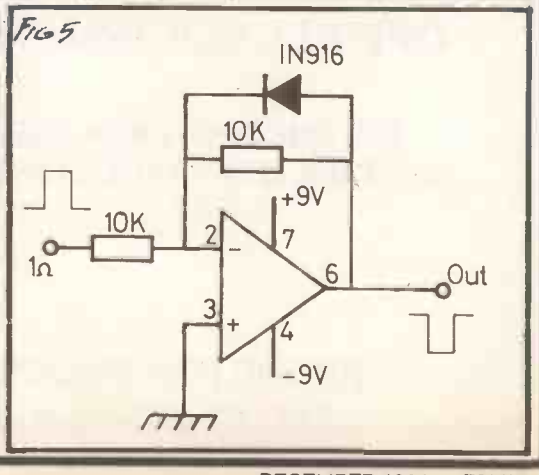


FIG 5



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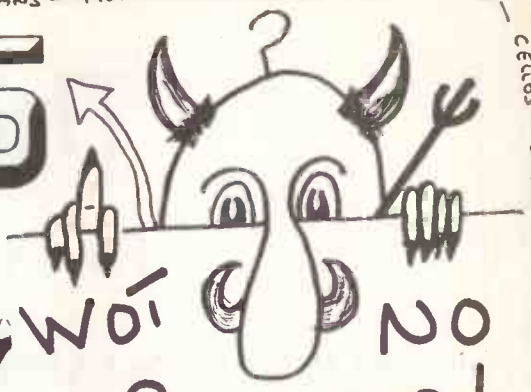

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The Syndrom

Part 4: Walking the Dog. . .

Circuits that enable E&MM's digital percussion unit to be triggered from any audio source and pitch-controlled from a synthesiser keyboard.

David Ellis, Clive Buxton, and Ken Pykett

Technical Editor Paul White has put together the above unit using six Syndrom modules, powered by the E&MM RackPack (July 84).

So, Part 4 of the Syndrom saga . . . isn't it amazing how time flies when you're having fun? No? Oh well, we promise that this will be the *last* instalment of the present incarnation of Syndrom.

In fact, this month sees the most important additions to the basic Syndrom circuit:

1 Audio triggering, including Simmons drum pads or microphones.
2 CV/trigger control from any one volt-per-octave synth.

Trigger Interface

As you'll no doubt be aware, the basic Syndrom will trigger from only a limited range of sources, ie. a +5V pulse or a piezo transducer. This trigger interface circuit, on the other hand, allows the Syndrom to be triggered from any audio source, including Simmons and other drum pads, microphones, or what have you. In fact, the dynamic range over which it'll trigger is 30dB or greater, and the sound can be of any length without re-triggering occurring.

The trigger interface circuit is shown in Figure 1. The input signal is DC-blocked by C1 and the level adjusted by VR1, before it's fed to the non-inverting input of the 1458 dual op-amp (IC1a). The gain setting switch enables gains of 50 or 500 to be selected. The output from IC1a is rectified by D1 and D2 and the peak amplitude is followed by C2, the time constant being set by the 470K resistor.

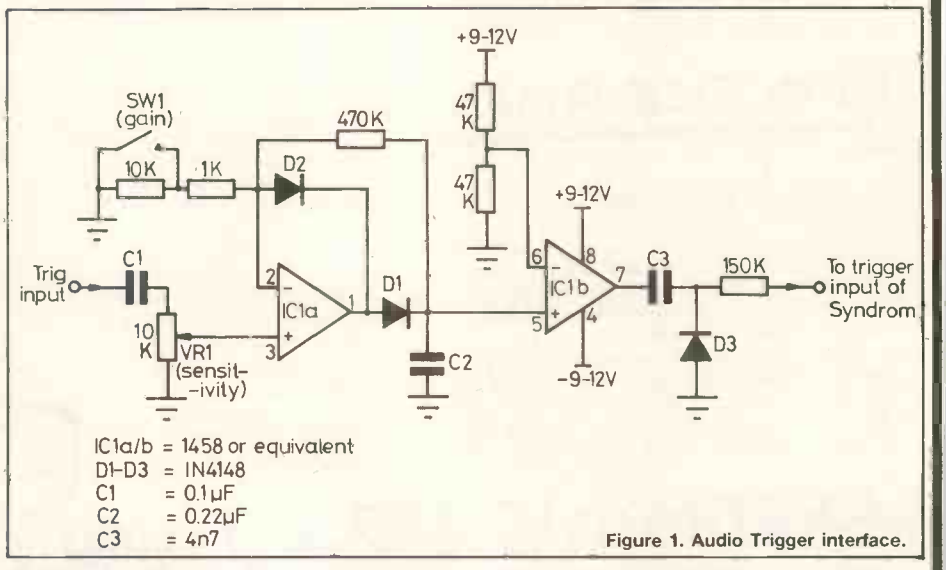

Figure 1. Audio Trigger interface.

The level on C2 is compared at IC1b with the voltage on the inverting input, which is set at a half the value of the positive rail (9 or 12V, depending on whether you're using batteries or a PSU like E&MM's RackPack). If the value exceeds this voltage, the output of IC1b will jump from the negative rail to the positive limit of the chip: this is then differentiated by C3/D3 to produce a positive spike, which is divided by the subsequent 150K resistor and the input resistor of the Syndrom to an amplitude of +5V if the rails are +/−12V, or slightly less in the case of +/−9V. This is where the Syndrom takes over, and the first gate, a Schmitt NAND, turns the spike into a TTL pulse to operate the Syndrom.

Using the circuit is straightforward. First, the gain should be set by SW1. Drum pads, microphones, and so on will

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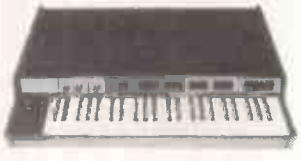

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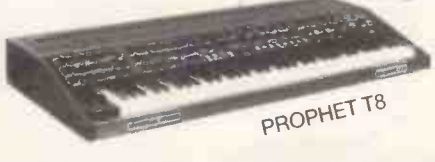

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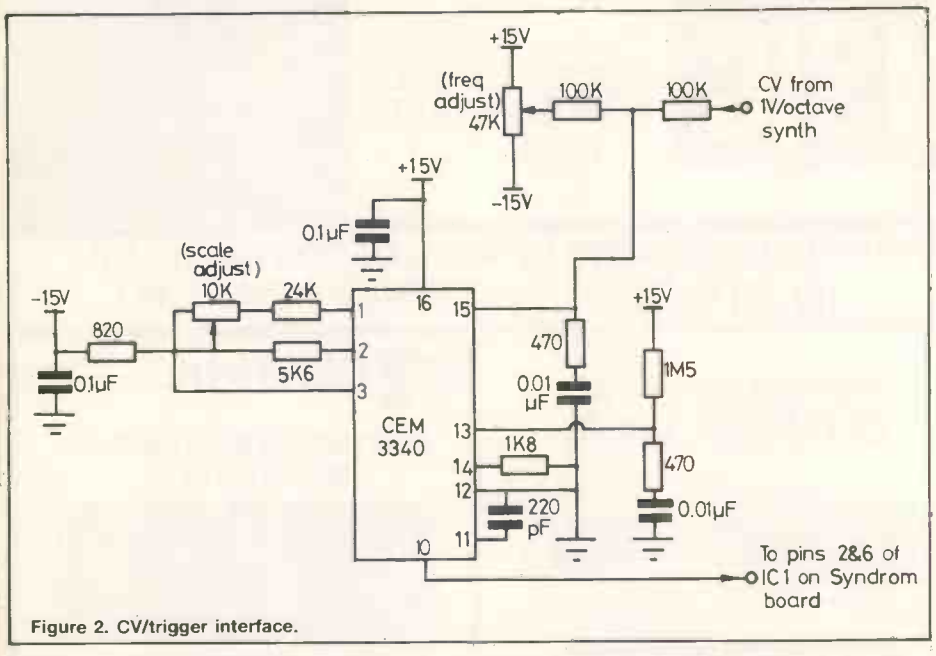

Figure 2. CV/trigger interface.

require the high gain setting (SW1 closed), while high level inputs such as line levels or another Syndrom will require SW1 to be open. Then, connect the sound source to the input and operate it repeatedly, adjusting VR1 until the Syndrom attached to the output triggers. When the circuit was first tested, a second Syndrom was used for the sound source, and this was triggered from a pulse generator. We found that the trigger interface was capable of distinguishing between sound envelopes even when they were repeated at a rate of about 10 times a second, so it should cope pretty well with just about anything you care to chuck into its input.

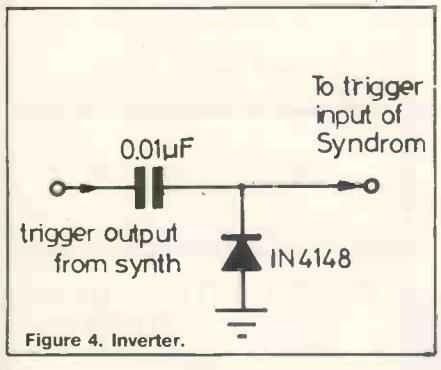

Figure 4. Inverter.

CV/trigger Interface

As anyone who's familiar with the Sequential Circuits Drumtraks will attest, a lot of mileage can be had out of a single drum sample if its pitch can be varied. But more than that, certain samples – slapped basses and orchestral thumps, for instance – are crying out to be used with a more rigorous control of pitching than can be achieved by just twiddling a pot in a more or less random fashion. This, then, is the rationale for the CV/trigger interface – a means of enabling the Syndrom to be controlled by any one volt-per-octave synth.

Although the 555 timer chip used in the basic Syndrom circuit functions as a voltage-controlled oscillator – twiddling the pot varies the controlling voltage, which alters the output clock frequency and therefore the rate at which samples are yanked out of the EPROM – these chips don't belong to any particular school of linearity, so attempts to make them function in a musically-meaningful fashion are doomed to failure. The way around this impasse is to bypass the onboard clock and substitute an external VCO that will work as nature really intended.

The circuit (Figure 2) is based around the CEM3340 VCO, a chip well suited for controlling the rate of sampling from an EPROM because of its superb specification and upper frequency limit of greater than 100kHz. Generally speaking, the

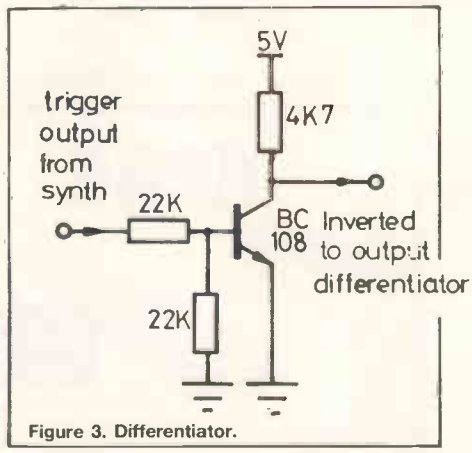

Figure 3. Differentiator.

circuit uses values recommended by the manufacturer, but the timing capacitor (between pins 11 and 12) has been reduced to 220pF to provide a higher frequency range. A full explanation of the IC's innards can be found in the data sheets supplied with the device. All components should be of 1 or 2% high-stability type, though it would take a mighty discerning ear to spot pitching discrepancies.

In order to get the VCO ticking to the Syndrom, the output of the VCO (pin 10) should be connected to pins 2 and 6 of the 555 (IC1 on the Syndrom board), ie. the trigger and threshold inputs. As pin 10 of the VCO is a triangular output, the 555 will regard this as if it were the rising and falling voltage on its own timing capacitor, and will therefore convert this to a TTL-compatible waveform to drive the counters. The existing timing components on the Syndrom board – R3, R2, and C1 – must, of course, be removed for this to work.

Triggering of the Syndrom in this situation will largely depend on what the synthesiser cares to pass on to the outside world. For instance, if the trigger rises to about 5V when a key is depressed, the combination of the 0.01uF capacitor and an IN4148 diode – a simple differentiator – will suffice as the conditioning circuit needed to be inserted prior to the normal Syndrom trigger input (Figure 3). On the other hand, if this voltage is exceeded, it's good policy to insert a zener diode (a 4.7V BZY88 type) in place of the IN4148, though with the same orientation. Finally, if the trigger is negative-rather than the more usual positive-going, a simple one-transistor inverter (Figure 4) should precede the differentiator.

Aside from the complication of the CEM3340 requiring +/−15V supplies, the operation of this add-on is again pretty straightforward. Once the VC and trigger from the synth have been connected to the relevant parts of the circuit, the only critical step is the adjustment of the two presets that determine the scale (RV1) and adjust the frequency (RV2). First, set RV1 to midway in its travel, and then adjust RV2 whilst playing the bottom key of the attached synth until the Syndrom falls in line with the pitch. Next, play octaves up and down the keyboard adjusting RV1 as you go, until you're satisfied that the Syndrom is falling in line with the one volt-per-octave standard.

Conclusions

Well, four instalments on, the Syndrom has expanded considerably from its humble beginnings. Lots of expandability, lots of circuits, and lots of headaches for anyone trying to cobble the whole lot together. Frankly, it's all very well adding on just a single circuit to the basic unit, but once you start talking about adding on multiple and audio triggering and CV control, life's getting a bit too complicated for comfort. We sympathise. Which begs the question of 'where do we go from here?' Well, we're seriously thinking about a 'Syndrom II', a PCB-based design that'll incorporate all that's been added to the first Syndrom so far plus a lot more. But because of chip prices and so on, this needs careful thought before we jump in at the deep end. So, as they say, watch this space for further developments. . . ■

Part 1 of the Syndrom featured in E&MM April 84, the PCB overlay and parts list followed in E&MM June, while additons to the original design appeared in E&MM August. The Syndrom is still available in kit form or as a ready-built unit, prices being £24.95 and £29.95 respectively. PCBs are also available from the E&MM Mail Order Department at £4.95. All prices include VAT and postage and packing.

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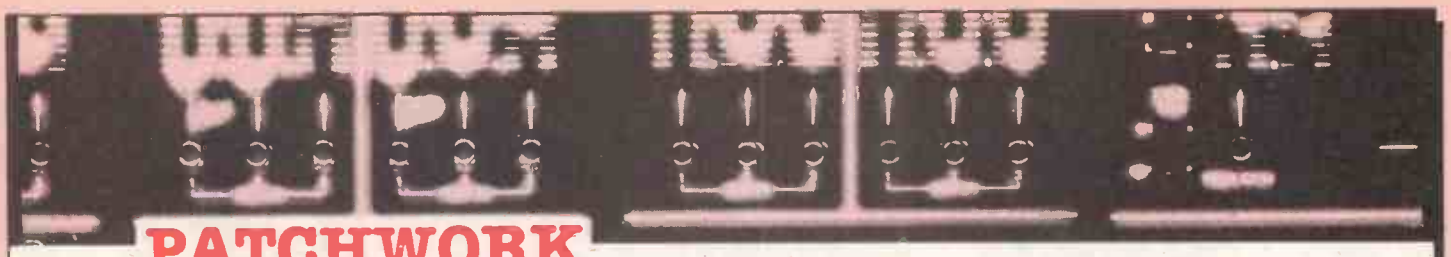

PATCHWORK

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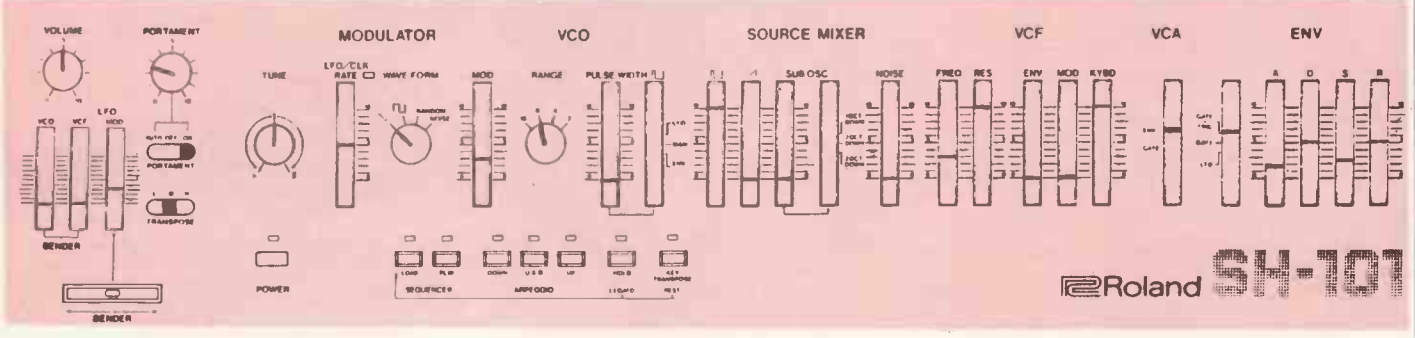
ROLAND SH101 — 'Tomita' — K Thomas, Mid-Glamorgan

A classic one this – full-bodied, clear and sweet (*have you been on the wine again? – Ed*). When setting the all-important filter controls, push the Resonance up to 10, then slowly slide Frequency up from 0 until the sound becomes really clean (should be about 3.5).



ROLAND JX3P — 'Vibraphone II' — Markus Aigner, Austria

No notes with this one, though we particularly liked the sound that emerged when B8 was reduced from 8 to 5. Values relate to the Edit facility on the JX3P, but these can be adapted to suit the PG200 programmer, facilitating further editing and the possibility of discovering new sounds along the way.

General Notes:
1. The patch may be achieved either with the PG-200 programmer, switched to manual, or by using the JX3-P edit facility.
2. The indicator column refers to the bank buttons A to D or, where appropriate, the Tone Selector indicators 1 to 16 which are set using the sens knob.
3. DCO-2 tuning (elements A-8 and A-9) is best accomplished "by ear".

			PG-200	JX3-P Edit	
				Element	Indicator
DCO-1	Range			A-1	A
	Waveform			A-2	C
	Freq Mod:	LFO		A-3	A
		ENV		A-4	A
DCO-2	Range			A-5	C
	Waveform			A-6	C
	Cross Mod			A-7	B
	Tune			A-8	9
	Fine Tune			A-9	9
	Freq Mod:	LFO		A-10	A
		ENV		A-11	A
Freq Mod	LFO Depth			A-12	5
	ENV Depth			A-13	1
	ENV Polarity			A-14	B

		PG-200	JX3-P Edit	
			Element	Indicator
VCF	Source Mix		A-15	9
	HPF Cutoff freq		A-16	6
	VCF Cutoff freq		B-1	3
	LFO Mod		B-2	3
	Pitch follow		B-3	14
	Resonance		B-4	1
	ENV Mod		B-5	9
	ENV Polarity		B-6	B
VCA	Mode		B-7	B
	Level		B-8	8
CHORUS			B-9	B
LFO	Waveform		B-10	B
	Delay time		B-11	2
	Rate		B-12	8
ENV	Attack		B-13	1
	Decay		B-14	10
	Sustain		B-15	1
	Release		B-16	11

SCI SIX-TRAK — 'Six-Trak Twosome' — Roger Holdom, Cheshire

A soft French Horn (A) that can double as a good solo sound or, if chords are played with the left hand, can be used for adding a bit of atmosphere or subtle backing. A slight amount of modulation can be added with the mod wheel if desired.

The second listing (B) is a staccato sound useful for arpeggiated bass lines, but chords aren't out of the question, either. Again, it may be worth experimenting with the performance controls.

	PARAMETERS	(A) VALUE	(B) VALUE
	OSCILLATOR		
00	COARSE FREQUENCY	24	12
01	FINE FREQUENCY		
02	GLIDE RATE		
03	LFO	01	01
04	ENVELOPE AMOUNT		
05	INVERT		
06	ATTACK		
07	DECAY	10	03
08	SUSTAIN		
09	RELEASE		
10	SAWTOOTH WAVE	01	01
11	TRIANGLE WAVE	01*	
12	PULSE WAVE	01*	
13	PULSE WIDTH		
14	LFO		
	LFO		
15	FREQUENCY	11	11
16	PROGRAMMED AMT		
17	TRI/SQUARE WAVE		
	FILTER		
18	OSC/NOISE MIXER		
19	CUTOFF FREQUENCY	68	78
20	RESONANCE		
21	ENVELOPE AMOUNT	04	10
22	INVERT		
23	ATTACK	03	
24	DECAY	09	03
25	SUSTAIN	09	06
26	RELEASE	02	04
27	LFO		
28	KEYBOARD	02	01
29	OSC TRI MOD AMT		
	AMPLIFIER		
30	ATTACK	03	
31	DECAY	07	
32	SUSTAIN	15	15
33	RELEASE	07	11
34	VOICE VOLUME	15	11
35	UNISON		

* or set to 00 if preferred

YAMAHA DX9 — 'J M Jarre' — John Pagan

DX9 Voicing Competition Winner

Winner of the recent DX9 Voicing Competition (see *Newsdesk*), this patch came into E&MM's offices without any additional sonic information. Still, if it won its creator an MT44 personal multitracker, it should be well worth entering into a DX.

A	F	WAVE	SPEED	DELAY	PMD	AMD	PITCH	AMP	OP
6	7	⌐	50	0	0	99	7	3	4
								3	3
								3	2
								3	1
ALGORITHM /FEEDBACK		LFO					MOD. SENS.		

1	2	3	4	5	6	7	8	9	10
	POLY/MONO	PITCH BEND RANGE	PORTAMENTO MODE	PORTAMENTO TIME					
	POLY	4							

OP	FREQUENCY COARSE	FREQUENCY FINE	DETUNE	OFF	EG RATE 1	EG RATE 2	EG RATE 3	EG RATE 4	EG LEVEL 1	EG LEVEL 2	EG LEVEL 3	EG LEVEL 4	KEYBOARD SCALING RATE	KEYBOARD SCALING LEVEL	OPERATOR OUTPUT LEVEL	KEY TRANSPOSE
4	4		+2		99	60	90	32	99	99	99	0			71	C2
3	4		0		99	41	40	32	99	98	95	0			85	
2	4		+7		99	41	40	32	99	98	95	0			99	
1	2		-4		99	41	40	32	99	98	95	0			99	
	OSCILLATOR				EG								KEYBOARD SCALING		OPERATOR	

11	12	13	14	15	16	17	18	19	20
	MODULATION WHEEL			BREATH CONTROL					
	RANGE	PITCH	AMPLITUDE	EG BIAS	RANGE	PITCH	AMPLITUDE	EG BIAS		
	6	ON	OFF	OFF						

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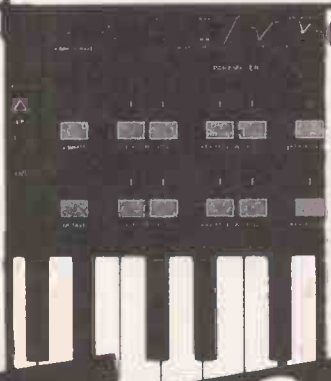

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EMM12.

COMPUTER MUSICIAN

You know, it takes a lot of guts to do what Acorn Computers have done with their Music 500 system (see exclusive review in this month's CM). I really take my hat off to them. A major company with a multi-million pound turnover producing a serious digital synth add-on for their flagship computer . . . Well, it's just been unheard of up until now, and it's going to be fascinating to see what effect Acorn's move has on other (less imaginative) companies.

It's worth noting that the only micro that's even vaguely on the horizon with as deep a concern for things musical is the one being developed by the Amega Corporation in the States. Aside from having a truly remarkable 4096 colours in any graphics mode – courtesy of a custom graphics co-processor – this machine also has sampled-sound capabilities that owe their existence to a further custom chip and the involvement of Sequential Circuits, or so I was told by SCI's John Bowen a few months back. But bearing in mind that Commodore have just purchased the Amega Corporation, and that Atari has sued Amega claiming that the sale to Commodore violates agreements between Amega and Atari over the licensing of the machine, the emergence of this 'under $1500' computer now seems a somewhat remote prospect. Which makes you all the more grateful for home-grown developments.

So, why have computer manufacturers been so resistant in the past to giving serious space to music? Take Apple Computers, for instance. They're zooming up the stock market, launching all manner of new and enterprising machines, but can't see beyond their collective noses when it comes to the sound specs of their machines.

You'd have thought that the Macintosh would have had a decent custom sound chip, wouldn't you? But no. Instead, that beautiful 68000 processor (the same as that used by the Kurzweil 250) is made to give up as much as 30% of its processing just for the sake of synthesising four channels of not-that-inspiring sound. And if you want to do that at the same time as using graphics . . . well, forget it.

Actually, I guess the real reason for this recalcitrance is quite simply that most people just don't know what to do with the facilities when they've got them.

It's all very well having this or that structured BASIC, but musical activities are easier said than done, especially when the language is doing its best to confuse the issue and makes scoring a piece of music an inelegant mass of DATA statements and convoluted GOSUBs.

No, for the music side of micros to *really* take off, a special language is needed that meets music's essentially multi-tasking requirements. Which is where the AMPLE side of Acorn's Music 500 steps into the picture or, at least, where there's a potential for it to step into the spotlight of public appraisal. To be honest, when the designers of this Advanced Music Production LanguagE first suggested to me that they were looking for its general acceptance as a music programming language, my first reaction was pretty sceptical. Well, arrogance has that effect on me. But I'm beginning to see their point. Perhaps the right software *is* the way to drag hardware designs into the next century, even if it's reluctantly and by the scruff of their necks.

Really, it's up to you, the musical consumer, and what you do with a language that offers flexibility and expandability on a plate. So cogitate gently, send us your AMPLE-scored pieces for publication, and let us know what you think.

David Ellis

Rumblings . . .

This month's round-up of all that's new in the world of computer music.

David Ellis

Springtime with Moog

At long last, information on **Moog's Song Producer** combination of MIDI hardware and software for the Commodore 64 has winged its way across the Atlantic, courtesy of their in-house promotional bulletin, *Interface*. Reading through the specs for the hardware is like taking what everyone else has done and then multiplying it by four. Not only does Moog's hardware have four MIDI Outs (that's four separate MIDI busses!), but also eight drum trigger outputs, clock in/out, start, and stop jacks.

Then there's two ways of running it. First, the real-time 'MIDI Command' software that uses graphics to show what's going down those four MIDI busses, makes any MIDI keyboard a split or layered one with eight definable split/layer points, and allows footswitch advance through chains of up to 99 previously-defined programs.

Second, on the recording side, there's 'Songstepper', a step-time sequencer package that permits eight voices of music to be distributed over the four MIDI busses (a claimed 32 notes simultaneously possible!) with full editing features, standard notation display, and printout facilities.

Impressive, eh?

Micro Arts

Having tried on several occasions to elicit some sort of response from a group calling themselves the Small Computers in the Arts Network (SCAN) in the States, it's good to see a similar sort of organisation emerging from the UK, though with the simpler title of **Micro Arts** and a rather more public presence. This is what they say about themselves, their magazine, and the software they're releasing:

'Micro Arts is a forum organisation for people working in microtechnology and the arts. The magazine covers micro art, music, general debate, and other more speculative areas. The software label will build up a catalogue of new artists' work, and can include anything that falls outside existing straitjackets.'

The contents of the magazines (two issues so far, costing 90p each), are nicely eclectic, ranging from 'Sextech – Sensuality and Technology' to the 'Electronic Beowulf', 'Programmer as Onanist', and 'Systems Music'. According to Geoffrey Davis, the founder of the group, they're now also thinking along the lines of releasing cassettes of micro-produced systems music.

For more information or copies of the magazines, contact *Micro Arts* at *PO Box 587, London, SW4 9PH. ☎ 01-720 4456.*

Erdenklang

. . . as you may recall, was the title of Hubert Bognermayr and Harald Zuschrader's 'computer-acoustic sound symphony' LP released last year. It also became the name of a new record label and publishing company in Hamburg who specialise in promoting computer music, and aside from the above-mentioned Fairlight-using duo, **Erdenklang**'s other artists include Klaus Prunster (described as a 'computer-teenie-bopper!), Tri Atma and Gyan Nishabda (who produce 'music to relax, to meditate, to dance', where 'rhythm guitars are orchestrated together with raindrops while seashells murmur behind the tablas'), Krystian Schultze (he of *Expedition Extra* fame), and Raven Kane and Klaus Netzle (producers of *Silicon Valley* – 'a conception album about the struggle going on between the passive emotions of man versus the computerised high-tech world that is taking over'). I know just how they feel . . .

Erdenklang's current plans are to produce a double album entitled The Story of Computer-Rock I, 1980-1985, including a version on Compact Disc. Aside from including Erdenklang's own artists, the company are also looking for unreleased material from other performers, and are inviting interested computer-musicians to contact them at *Haistenbeker Weg 17, D-2000 Hamburg 54, West Germany. ☎ 040-576035.* Why not give them a try?

Channel 8 MIDI

Channel 8 are a well-respected software house with a lot of games software under their belts, and unlike most of their blinkered colleagues, they've been quick to realise the value of the MIDI.

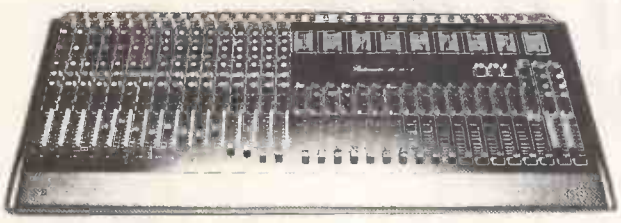
The end result of a good deal of observation of the MIDI software and MIDI synth industries has led them to come up with a package called MIDISOFT 1 which, when released later this year, will be 'without any of the usual limitations imposed by badly written and poorly designed software'. Or so they claim. In fact, their October advertisement in E&MM suggested that the product would be ready for the PCW show held at Olympia in September, but I'm told their plans have been held up by 'unforeseen circumstances'. Sounds like a familiar story, you think – could it be the advertise it at least two months before it's released syndrome? Well, personally I hope not – Channel 8 aren't a fly-by-night company, so there's every reason to expect the goods in the very near future.

Anyway, the Channel 8 hardware seems to be a fairly universal design, allowing either a BBC Micro, Commodore 64, IBM PC, or Sinclair QL to indulge in MIDI communications. Aside from a MIDI In MIDI Thru and three MIDI Outs, there's also a multiplicity of LEDs for indicating tempo, pulses-per-quarter-note, start/stop status, and trigger pulses in use, as well as outputs for clock, trigger pulse, start/stop, and a footswitch. Sounds like a thoroughly sensible design.

The software also sounds quite intriguing. Aside from offering a real-time sequencer that overdubs quite happily, it also incorporates a step-time mode that allows input from either the MIDI keyboard, a joystick, or the micro's QWERTY keyboard, displays the score as it's being edited, and allows sections of music to be CALLed from elsewhere in the score with transpositions, though *without* using up more valuable memory space.

And to put theory into hard-copy reality, there's also a graphic printout facility that allows a dot-matrix printer to indulge itself in specified sections of a score. Channel 8 also say that as part of their after-sales service, they'll be providing an update system which will entitle purchasers of MIDISOFT 1 to obtain anything from minor revisions to major rewrites of the software. They don't say how much that'll cost, but it all goes to show that they've got their heart in the right place . . .

The price quoted in September for the BBC Micro version of the package (with the software in ROM) was £189.95, inclusive of VAT. Whether that's also the price for versions running on the other chosen micros isn't known, but no doubt Channel 8 will clear the air once they've got over those unforeseen circumstances. In the meantime, Channel 8 Software invite you to send for their free brochure by writing to *51 Fishergate, Preston, Lancs. ☎ (0772) 53057.* ■



16.16.2

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16.8.2

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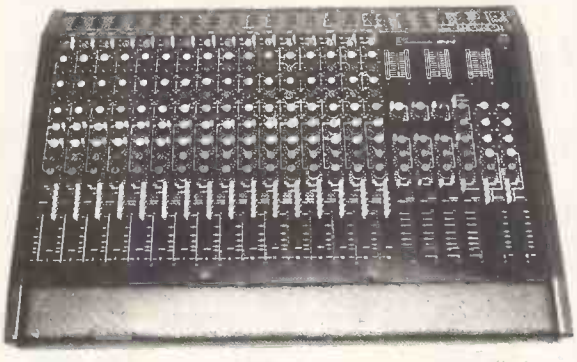

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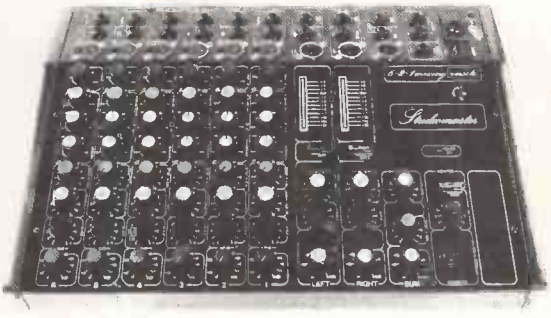

6.2.1

The new Studiomaster 6.2.1 mixing console offers features and performance normally obtained from mixers costing twice the price. With 6-channel add-ons available this makes trade-in losses a thing of the past. Free standing or 19" rack mountable this console will be difficult to surpass.

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SOFTWARE SURPLUS

As more and more musicians become aware of the potential of the home computer, software companies large and small are releasing new music packages on an almost daily basis. Some of the software is MIDI-compatible, some of it limits the user to micros' internal sound chips, but almost all of it is well-designed and user-friendly. And the best may be yet to come.

SOFTWARE : MUSIC MAKER
Manufacturer : COMMODORE
Computer : COMMODORE 64
Reviewer : Chris Jenkins

The Commodore 64, now the world's largest-selling home computer, is ideally suited as an introduction to computerised music. It has a powerful sound chip, (the sadly much-maligned Sound Interface Device or SID), plenty of available peripherals, and a wealth of useful software. Until now, though, it's suffered, as have all home computers, from being unplayable in the strictly instrumental sense.

There *are* some products available that enable you to upgrade your 64 to a 'real' musical instrument. The Autographics Microsound 64 music keyboard (£169) and the LVL Echo 1 (£99) are just two examples. But for the less than fully-committed computer musician, what's been missing is a cheap alternative – enter the Music Maker.

This tastefully-named unit (obviously someone at Commodore reads *all* the right magazines) costs a mere £29.95, and includes a clip-on two-octave mini-keyboard, a software package on either standard disk or tape, a set of keyboard stickers and a music book. The book is from the SFX series by Music Sales, the UK's biggest sheet music publishers, who have been developing the Music Maker in conjunction with Commodore. It's especially designed for home keyboards in particular, and is thus quite appropriate for the Music Maker system, which provides a similar range of capabilities to the smaller Casio or Yamaha home instruments.

A clip-on plastic keyboard fits over the top two rows of the 64's QWERTY keys, and though it appears a little flimsy, it does its job adequately.

Software

On loading, the software presents a menu from which selections are made using the function keys situated to the right of the keyboard.

You can start to play music right away, selecting a backing rhythm (with or without a bass line), and playing a solo over the top on the keyboard. Alternatively, you can go into Poly mode and play three-note chords, though since this leaves no oscillators free for modulation, the sounds tend to be a little on the sparse side.

What you must bear in mind is that the SID chip has only three voices, though filtering, waveshape and ADSR parameters are nonetheless highly controllable. Your 64 is never going to sound like a DX7 so long as SID is exclusively involved, but it will give good impersonations of a monosynth such as a Jen, a Transcendent, or a simple Casio. In fact, one of the major features of Music Maker is comparable to the system used on the popular Casio VL-Tone. In the sequencer mode you can enter the notes of a melody without any regard for timing, subsequently setting the tempo by tapping one key in sync with a metronome sound. It's therefore easy to build up convincing bass, rhythm and lead compositions with no musical ability whatsoever. . .

More adventurous users will probably want to experiment further than the 10 preset sounds allow, and this is achieved by the Voice Modify page. This allows most of the SID chip's internal parameters to be controlled. ADSR, in 15 steps; selection of triangle, sawtooth, pulse or noise waveforms; pulse width; low-pass, band-pass or high-pass filters; and resonance and cutoff frequency control: all modified with a simple function key selection.

Both voices and compositions can be saved to tape or disk, and there are three demo tunes included with the software package – 'Georgia', 'Snow Waltz', and, appropriately, 'When I'm 64'.

A couple of features of the system have obviously been incorporated at the advice of an experienced multi-instrumentalist. Take as an example the Tune function (controlled by the cursor keys) or the pitch-bend (accessed *via* the space bar) which makes the 64 sound a little like a MiniMoog, though not a CS80 – the bend doesn't work in Poly mode.

Conclusion

Three points to bear in mind.

First, Commodore have designed the Music Maker package to appeal largely to children who've become bored with zapping Space Invaders. Don't let this put you off. If the sequencing and synthesis facilities made available by the package are used to the full, there's no reason why they shouldn't be gainfully employed by serious musicians. Secondly, the actual quality of the sound output is never going to be anything special. The SID chip's audio output can be linked up to a hi-fi or other external amplification quite easily for better results, and guidance on how to do this is given in both the Music Maker literature and the Commodore 64 Programmers' Reference Guide. However, a significant amount of noise reduction will still be required should you wish to use the 64's built-in sounds for any serious home recording purposes.

Thirdly, if the facilities offered by Music Maker seem primitive compared to packages such as Waveform's MusiCalc, it's worth bearing in mind that Commodore are planning several other compatible software/hardware releases such as the forthcoming ProSynth and SFX packages. These will allow full use of the SID chip's facilities – including modulation, ring mod, sync and dynamic filtering – along with multitrack composition and graphic displays of music notation that can be converted to hard copy using a suitable printer.

Once these packages are available, Music Maker should represent a fascinating compositional synthesis set-up. Moreover, if you're still not convinced by the song of the SID chip, there have been tantalising rumours that Commodore have plans to introduce hardware that will allow the 64 to be synchronised to commercial synthesisers. Whether this means an implementation of MIDI, or something more individual from a company with a strong reputation for going its own way, time alone will tell.

But for the moment, the Music Maker system is an amusing and useful package that's cheap enough to be attractive and holds out the promise of better things to come. ■

Further details from The Commodore Information Centre, 1 Hunters Road, Weldon, Corby, Northampton NN17 1QX ☎ (0536) 205252; or Music Sales, 78 Newman Street, London W1. ☎ 01-636 7777; or Siel UK.

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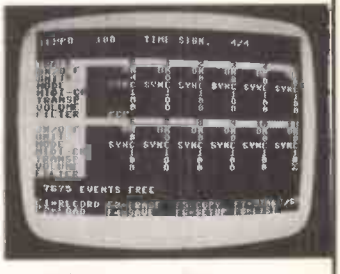

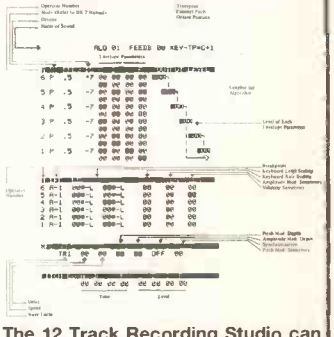

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SOFTWARE : EXPANDER EDITOR

Manufacturer : SIEL

Computer : SINCLAIR SPECTRUM

Reviewer : Geoff Twigg

Few companies have entered the field of computer music – in both domestic and professional fields – as wholeheartedly as Siel, an Italian company whose most impressive product three years ago was a string synthesiser. The parent company's British counterpart – Siel UK – has also got into micro music in a big way. Not only are they selling the complete range of Italian-designed MIDI software for the Commodore 64 and Spectrum, they've also modified both hardware and software to work with Britain's most popular home micro, the BBC B. And, as if that weren't enough, they're taking on music retail distribution for the two more domestically-oriented programs reviewed in *Software Surplus* – Commodore's Music Maker and Island Logic's Music System.

Over the last couple of weeks, I've spent some time in the company of two of Siel's packages for the Sinclair Spectrum, namely the Expander Editor and MIDI Live Sequencer. Both of these are designed to work in conjunction with Siel's own MIDI interface, which is identical to that used by JMS and has already been described in detail within these hallowed pages.

My overriding impression is that, if their Commodore and BBC packages are in the same league (and given the additional possibilities afforded by those computers, there's no reason why they shouldn't be better still), Siel have got very little to worry about.

Expander Editor

Siel's stand-alone MIDI Expander was one of the first such devices to appear – now the marketplace is full of them, from manufacturers as diverse as Yamaha, Korg, Oberheim and Roland. The idea behind all of them is that by buying one, you at least double the capabilities already afforded by your existing MIDI synth, and you don't have an extra keyboard to pay for.

The Expander is designed specifically for use with Siel's own Opera 6 polysynth and its immediate successor, the DK600 (reviewed elsewhere this issue), and since it employs digital parameter control for patch editing, one of these is essential if you're going to make proper use of the additional facilities it offers. Even then, editing isn't exactly a barrel of fun.

Or at least, that was the state of play before the arrival of Siel's Expander Editor program.

Briefly, what the program does is to display the Expander's controllable parameters graphically on the micro's monitor screen, with a key beneath that tells you how to access each parameter using specific keys on the Spectrum's QWERTY keyboard. In fact, each display represents a section of the DK600's front panel and the layout is identical, so if you're already acquainted with the DK, finding your way around the Expander Editor should be the technological equivalent of a piece of cake.

Dialling up Patch 95 followed by Record and Enter on the Expander enables hardware to communicate with software, though no confirmation that dialogue is taking place becomes apparent until the message 'OK, Data received' comes up on-screen. First time round, that's a very reassuring line to read.

There are four graphic displays in all, and these represent the LFO (accessed by selecting '1' on the Spectrum), the DCOs (2), the VCF (3), and the ASDR (4).

So much for the numbers. The QWERTY's letters allow you to do various things with a parameter screen once it's been selected. Amongst many other things, you can gain access to either the old settling (O) or the new one (N) for a particular parameter, play either a chord (C) or a monophonic sequence (M) that's pre-programmed to illustrate a selection of pitches in the patch you're editing, load from the Expander (L), dump in a new program (D), or turn to the software's Help Page (H) which guides you clearly through what each function is, what it does, and how you can go about altering it.

In addition, the Spectrum's arrow keys are used to move a bright rectangle around the display to affect individual editing units, keys R and T are used to increment pot values in steps of 1 (or steps of 10 if you hold the Caps key down), while S switches those parameters that are simply either on or off.

How does it work out in practice? Well, the comprehensiveness of the display and the easy-to-remember commands make the whole process hugely entertaining as well as useful. As you press R to increase a parameter value, a little indicator moves round the 'knob' in an approximation of where the real thing would be, while the value displayed inside the control increases simultaneously. Switches have light and dark patches to indicate whether they are on or off, and react instantly to any press of the S key.

This is probably the best sound editing program I've ever seen. It's extremely effective, user-friendly, and makes using a home micro a pleasure rather than a chore. At an RRP of £53.50 for the Spectrum version, it seems excellent value for money, and it liberates the Expander for use with MIDI synths other than the Opera 6/DK600. So well done Siel for not letting commercial considerations get in the way of a terrific piece of software.

Live Sequencer

Like the Expander Editor, Siel's Live Sequencer program for the Spectrum is cassette-based, and allows the recording of a single polyphonic sequence and its subsequent speeding up and slowing down on playback. The sequence can also be looped to play continuously, should you be very enthusiastic about your composition (or anyone else's, for that matter).

The program loads quickly and easily. As Spectrum owners will know, the procedure is ...LOAD (the keyword on the J key), followed by SYMBOL SHIFT and P... twice, not J twice as it says in the manual. You're kept well informed while the program is loading, and the screen display (there is only one) appears once the process has been completed.

The display comprises a menu that lists six available options as follows. **Play**, somewhat confusingly, actually enables you to record your sequence, and is operated by pressing 1 and Enter. Once you've finished playing, pressing Break returns you to the original menu, where the Memory Used message should contain a percentage of storage capacity taken up by the sequence: if this still shows 100, your sequence hasn't been recorded – start again.

The sequence is replayed using the second menu option, **Playback**. Whichever MIDI keyboard you're using remains usable for additional performance, though as no overdubbing is possible with this software, only the original sequence will remain stored in memory. Tempo control is also effected in this mode, key 5 slowing the track down and key 8 quickening it up.

The remaining four options are **Load from Tape** and **Save to Tape**, which are pretty self-explanatory, **Correct Time**, which resets a post-performance tempo adjustment so that the sequence is replayed at its original speed, and **Refrain**, which is Siel's equivalent of a loop.

This software package is exactly what it purports to be – a real-time entry sequencer that faithfully records, stores and replays any sequence you care to put into it, so long as it's not of gargantuan length. It's easy to use and well-presented but, for obvious reasons, rather limited. I kept on wanting to overdub further sequences as the inspiration took me, despite the fact that such feats are impossible on the live Sequencer.

Still, at £22 I don't think there can be any complaints, and this package would make an ideal starter program for someone just getting into computer music *via* a MIDI synth and Siel's interface. Which, as chance would have it, is exactly how the Live Sequencer is being marketed . . . ■

Further information: Siel UK, Ahed Depot, Reigate Road, Hookwood, Horley, Surrey RH6 0AY. ☎ (02934) 76153.

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SOFTWARE : THE MUSIC SYSTEM

Manufacturer : ISLAND LOGIC

Computer : BBC B

Reviewer : Jay Chapman

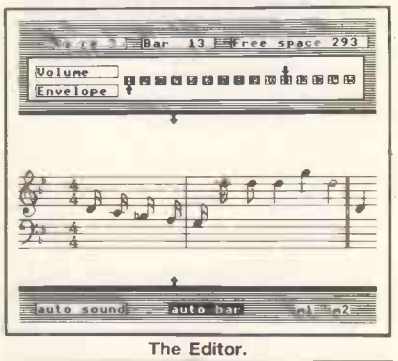
The Music System (TMS) is a software package developed by Island Logic (Island as in the record company, Logic as in NAND gate) in a joint venture with disk and tape manufacturers Memorex. TMS is used to enter, edit, store and print out music played on the BBC micro's internal sound chip, and also allows the sound synthesis capability of the said chip to be exploited to the full.

TMS is available in both disk and cassette versions, and the disk version reviewed here is supplied on a dual standard 40/80-track 'System' disk and comes with a 'Song and Sound Library' disk containing numerous examples. To use TMS, you simply insert the system disk in Drive 0 and do a SHIFT-BREAK boot. If you use 80-track disks, you'll have to use a utility supplied with TMS to copy the library files onto an 80-track. Boot the library disk for instructions.

The disks come in a video-tape sized case with a 75-page manual and a function key definition strip. As soon as you see the artwork on the outside of the case, you begin to realise that TMS is no run-of-the-mill production. This impression is confirmed by the quality and content of the manual, which is not only extremely comprehensive but also beautifully laid out on quality paper – no faded two-page photocopies here! The text is well written, helpful, and supported by a wealth of diagrams that relate the instructions in the manual to what you will actually see on the BBC's screen.

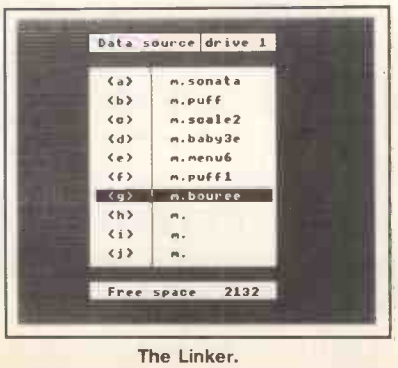
After booting the system disk and viewing a suitably vitriolic copyright message for a few seconds, you're presented with the main control screen. This displays five icons (easily remembered symbols) representing the five modules that make up TMS, these being the Editor, Keyboard, Linker, Printer and Synthesiser. Pressing the space bar causes each icon to be highlighted in turn: pressing the return key brings the highlighted module into play.

Music System Control Screen.



The Editor.

The Keyboard.



The Linker.

The Modules

The **Editor** allows you to edit the musical score for each of the BBC micro's four (three pitch and one noise) sound channels. Each channel is edited individually, but you can switch between the scores with ease if you want to check that chords are lining up correctly. Pitch, volume and envelope are easily selected for each note, and bar lines are inserted automatically according to the time signature. Key signature can be specified, and accidentals are effective for the rest of the bar, as you'd expect. In addition, triplets can be used, first and second time repeats can be added and transposition (disk version only) is also possible.

Each note is considered and drawn individually so that rhythmic groupings are not marked or enforced, which means that sight-reading requires a little more care than usual. Rests corresponding to all note lengths can be used at will, but for some reason dotted rests are not allowed: this is a pity and makes compound time signatures more than a little tedious. Anyway, each note can be sounded when entered, and either individual monophonic lines or the whole polyphonic shooting match can be played back and then re-edited, with insertions and deletions permissible at any point.

The **Keyboard** allows the music data for one channel at a time to be played into a software-implemented four-track recorder direct from the BBC's QWERTY keyboard. The function key strip contains a diagram to remind you which keys give which notes, while a two-octave music keyboard displayed on the screen (this maps onto any two octaves of a five octave range) gives a visual confirmation of each key press.

Still on the subject of the screen display, highlighted icons show the status of the recorder, while there's even a metronome on-screen that ticks audio-visually, if you get my drift. As on a multitrack tape machine, you can play back pre-recorded tracks whilst laying down a new one, and music data can be saved and later loaded up into the Editor for correction or the Printer for hard-copy production of a full score.

The **Linker** (disk version only) simply allows as many as 10 separate compositions to be played back in a user-defined sequence. This facilitates key changes during a piece and also allows repetition of sub-compositions.

The **Printer** is capable of printing out all four monophonic channel scores, on a grand stave each, with bar lines aligned if required. This is accomplished slowly (thanks to graphics mode printing) down the length of the paper, and is both neat and readable. The manual informs us that Epson FX80 and RX80 printers are supported as well as the Star Delta 10: I used an Epson MX100 successfully, though the tails on the notes didn't *quite* attach to the stems properly and an extra rest appeared at the end of one of the channel outputs. A small bug somewhere, perhaps?

The **Synthesiser** is, quite simply, the best piece of software for controlling the BBC sound chip's facilities I've yet seen. The use of graphics, icons and windows (superb throughout TMS, as I hope the examples show) is particularly impressive in this module. Up to 15 'music envelopes' at a time can be defined,

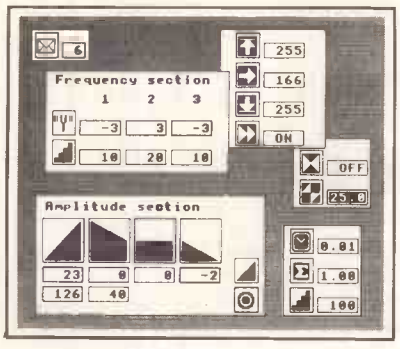
stored and used on an individual note basis in your compositions. Envelopes can be listened to as each change is made, while for those of you interested in using the sound chip's facilities in your own programs, TMS will set up and file away the BBC BASIC envelope commands corresponding to the sounds you create with the Synthesiser module. Stirring stuff.

User Friendly?

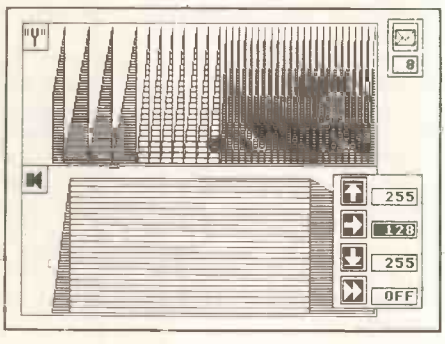
Great care has been taken throughout The Music System to make the software as user-friendly as possible. Software is often advertised as user-friendly these days without good reason: TMS actually delivers the goods. Instead of trying to pack masses of text describing current status and sets of possible commands onto the screen, the software keeps everything clear and readable. If you need more information or wish to play with a particular set of parameters, a window pops up as and when required and then disappears again when you've finished. This means that graphic displays can take up the whole screen if necessary (which makes them easier to use) without space being lost for lists of parameters and data entry questions. Given that a picture is worth a thousand words *(Ha! Ed)*, I can't do justice to the visual icon/window approach in the space of this review, so try to see TMS in action for yourself. You won't be disappointed.

Another contribution to the system's user-friendliness is that parameters have default values, which means you don't have to set all of them explicitly. Where a parameter has a specific set of values, you can select the value you require simply by using the cursor control keys.

In fact, the amount of typing you have to do is reduced to an absolute minimum throughout.



The Synthesiser (1).



The Synthesiser (2).

Once you've read the manual (and I suggest you read it thoroughly, if only to be sure that you don't accidentally ignore half the facilities offered by TMS), using the package rapidly becomes intuitive.

Conclusions

The Music System is one of the best pieces of software – music or otherwise – I have ever used. A complex piece package offering a host of useful and well thought-out facilities has been made immediately and intuitively usable thanks to Island Logic's innovative use (on an eight-bit micro!) of default values, graphics, icons and windows.

The Sheffield-based development team involved in the production of TMS are justifiably proud of their achievements, and are apparently intent on further developing both this and other products.

Rumours of a MIDI add-on for the system are rife, and this would release budding computer musicians from the constraints of the Beeb's internal sound chip which, though it comes out rather well after comparison with the Spectrum's beep, does fall a little short of a DX7 in terms of sound quality.

If you're into making your own music and have access to a BBC Micro, The Music System will broaden your horizons both in terms of the facilities it offers and in the way it deals with the computer-user interface. Go on – treat yourself. ■

Disk version of The Music System retails at £24.95 including VAT, while the cassette variant carries an RRP of £12.95: two cassettes are required to complete the system. Further information from Island Logic, 22 St Peters Square, London W6 9NW. ☎ 01-741 1511.

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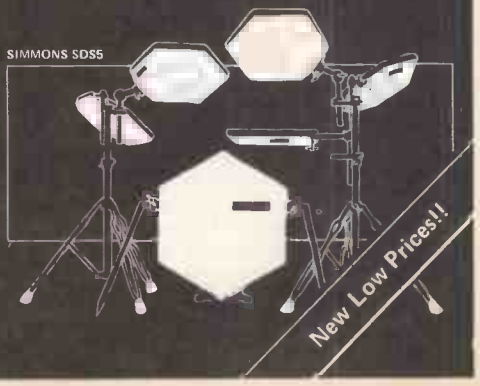


SOFTWARE : UMI 1B

Manufacturer : LONDON ROCK SHOP

Computer : BBC B

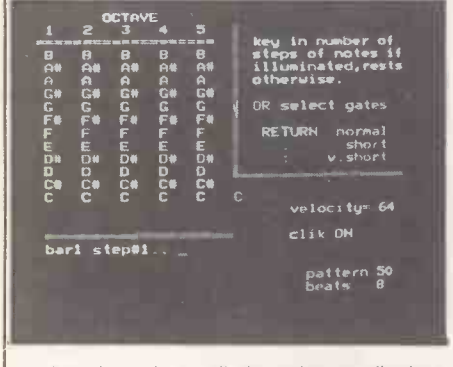
Reviewer : Dan Goldstein

My first reaction to the UMI was the obvious one. £495 is an awful lot of money to pay for a piece of MIDI software. Yet the more you know about the UMI system – what it sets out to achieve and how it goes about achieving it – the more you realise why it costs so much.

The software – written by Lynton Naiff and marketed exclusively by The London Rock Shop – incorporates allowance for input in both real and step time, editing, chaining and copying facilities so extensive they ought to be advertised under the well-worn banner 'the answer is yes – now what's the question?', full MIDI channel assignment of tracks and storage of all conveyable MIDI data (velocity, aftertouch and so on), sensible external hardware connections, and even a DX7 voice dump program, should you be one of the 10 million or whatever it is that have now bought one.

Recording

The UMI's main menu is beautifully clear and straightforward (especially after the efforts of some software writers), though in fact, the themes of simplicity and attention to detail are



carried through to all the relevent displays within the UMI system's repertoire. Anyhow, nine modes are available to the user at this point, and these are listed – together with the BBC function key needed to access each of them – to the left of the control section. A further range of options becomes available if you hold down the Beeb's CTRL key, and these are indicated to the right of the display, a resumé of default values and a Memory Left value (expressed as a percentage, that one) occupying the screen's lower half.

Step-time composition (f9) really couldn't be simpler. After the tortuous data entry procedures that accompany similar systems, the UMI's way of doing things is blissfully refreshing.

The first screen in this mode shows the time signature (default value 4/4, but others are possible) and the legend 'write pattern' against which you simply type in the number of the pattern you want to record: a thoughtful 'written so far' section at the bottom gives you a spot-check on which patterns are and are not available. If you haven't used any patterns at all, the pattern number can be anything between 1 and 127, while the length of the pattern is also adjustable (default value 8 beats).

Once you've entered this information, the main step-time operating screen appears, and the main focus of attention here is a display of five columns that each represent a D-to-C octave range in semitone steps. Now, that obviously makes a total of five octaves in all, and this is one area where the synergistic relationship between the UMI and the DX7 really shows through: quite what happens if you hook up a somewhat lengthier MIDI keyboard – Roland's MKB1000, say – I'm not entirely sure.

Design

A major contributor to that price tag is the fact that UMI's controlling software is contained within sideways ROM (which has the advantage that loading the program takes no longer than the bat of an eyelid – ideal for studio sessions when the pressure is on) and that the comprehensive facilities afforded by the package require the addition of an Aries B20 20K RAM expansion board (about £70 worth) to the BBC's overworked memory. All these chips fit quite neatly into the BBC's internals, and should the idea of fiddling around inside a micro with a soldering iron scare you to death, the Rock Shop will do the installing for you for nothing.

Of course, the software has got to be connected to the MIDI instruments it's being used to control, and this is where the UMI interface comes in. Now, in many respects this is similar to E&MM's own BeeBMIDI board or the interfaces being marketed by Siel and EMR, but where the UMI unit scores is in its range of external control options. From left to right, there's To and From Tape Sync (the sync-to-tape code is novel in that it consists of short bursts of audio and can therefore be used as a marker during tape editing), Clock In and Out (Out set at 24 pulses-per-beat; In software-controllable to be 24, 48, or 96), a MIDI In and two MIDI Outs, a Roland-standard Sync Out (gets around the problem of Roland clocks not turning themselves off by making the 5V start/stop signal controllable *via* one of the interface's pushbuttons – more on these later), and an expansion port that may, in the not-too-distant future, be used to connect several UMIs together in order to control more MIDI instruments than the mind can comfortably conceive (though the appropriate software doesn't exist as yet). Finally, a 34-way ribbon cable terminates in an IDC connector for plugging-in to the BBC's good ol' 1MHz bus.

This interface is also peculiar in having three pushbuttons and a rotary pot, where most similar units have nothing at all. The latter is used for tempo control (a digital readout of same is proffered on the main menu screen display), but the pushbuttons are unlabelled, presumably because future software developments will render them multi-functional. This is disconcerting at first, but seeing as the software's various screen displays continually shove graphic representations of all three of them (one is rectangular, the remaining two square) together with explanatory notes on what they're used for in the current mode, there are few problems in practice.

Each time you play a note on the connected MIDI keyboard, the appropriate letter within the five-column matrix illuminates, indicating that it is about to be stored as part of that pattern. If you decide you don't like that note any more, you can erase it simply by pressing it again, and if you want a chord you simply play all the constituent notes in any sequence you care to, before moving the whole process forward one step from the QWERTY keyboard.

Should you require an especially short gate-on time (ie. one of less than a step), you can choose from Normal (75% of a step), Short (30%), and Very Short (10%). All utterly logical.

Provided your keyboard playing skill is up to it, real-time recording (f8) is if anything easier still.

The rectangular button on the interface acts as the run/stop controller, an internal metronome counts you in (you've guessed it – the number of beats in the intro is user-programmable), and you're away. As soon as you come to the end of your desired pattern length, your performance is replicated by the computer continuously – warts an' all – until you press the rectangular button again. You can record as many patterns (up to 127) as you like in this fashion, before going into Edit mode (f3) to make fine adjustments.

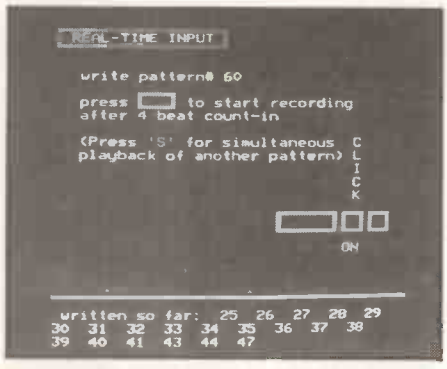
Editing

As I mentioned briefly at the start, one of the UMI system's many valuable assets is its ability to remember MIDI information relating to keyboard velocity, aftertouch, and pitch and mod wheel usage. However, what many people don't seem to realise is that this data – and the wheel data in particular – is extremely memory-sensitive, and can therefore prevent large chunks of RAM being used for note storage if applied in even moderate quantities. Fortunately, UMI's programmers have realised this, and have therefore provided a Pac (for compaction) facility which lets you filter out at the editing stage some of the data that doesn't have any audible effect on the proceedings. It's a simple process, a) because it soon becomes audibly apparent that your compaction technique has gone too far, and b) because you can see how many bytes of memory you're saving as you go along, simply by gazing up at the Edit sub-menu.

Compaction aside, the Edit page also allows auto-correction, re-recording, and overdubbing (15 tracks of it, if necessary, all 16-note polyphonic) of already-recorded patterns. And once again, the procedures involved are so straightforward and the displays so informative, even a member of Iron Maiden's road crew could probably manage something.

The remaining 'pattern' sub-menus – Erase (f4), Copy (f2), and Play (f1) – don't require much explaining, but like the Edit page, all of them are applicable to step-time as well as real-time patterns, and this sequencing egalitarianism is continued to the Write/Edit Chain mode (f5), where finished patterns are chained together to form songs.

The chaining process is really the only part of the current UMI software where the user has to do a lot of fiddling with the whole range of the BBC QWERTY keys (the rest of the time, tasks are undertaken by the Beeb's Function and cursor keys or the interface's pushbuttons), but even so, a simple display that shows a list of the various chain options to the right and a



record of what you've put together so far to the left makes the process a lot less soul-destroying than it could have been.

And when your *meisterwerk* has reached its logical and successful conclusion, it can, of course, be saved to either disk or tape.

Conclusions

It would seem that unlike most other software designers – and a fair few hardware ones, too – the UMI's programmers have taken MIDI firmly by the horns and developed a package that really makes the most of the system, in addition to acknowledging its deficiencies.

It's a sad fact that there aren't nearly enough multi-channel MIDI instruments – let alone multi-timbral ones – available really to do the UMI track and channel assignment facilities justice, though there are signs that some manufacturers are beginning to wake up slowly to what can be done, given a little thought.

One thing the UMI *won't* do is to remember patch changes as part of a song, so this has to be done manually during playback. This wouldn't be any cause for concern if it weren't for the fact that far too many of today's synths experience a momentary loss of output while changing from one program to another. It can sound more than a little odd.

And yes, the UMI is expensive when compared with the rest of the software under review this month. But one or two reservations like the one just mentioned aside, its cost can be justified without too much difficulty. After all, if you're going to spend upwards of £2,000 on a MIDI synth system that conveys all the information over MIDI that the 1.0 specification requires of it, there seems little point in using controlling software that can't distinguish a pitch wheel variation from an eclipse of the sun, or assign all the tracks with the same MIDI channel. The price tag compares favourably with those of dedicated MIDI sequencers, and the fact that UMI is software-based could shield purchasers from the worst ravages of planned obsolescence: I shudder to think what Lynton Naiff is working on at the moment.

A well-designed, comprehensive and straightforward software package that was designed for, grows with, and never talks down to the impatient, ignorant and indecisive beast that is the modern musician. ■

Further information: The London Rock Shop, 26 Chalk Farm Road, London NW1. ☎ 01-267 5381.

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SOFTWARE : 6-TRACK COMPOSER/ARRANGER

Manufacturer : SIEL

Computer : COMMODORE 64

Reviewer : Steve Howell

Siel's first piece of sequencing software for the Commodore 64 is a six-track step-time only composer with a capacity of around 1500 events per track, each of these being monophonic. Key velocity information can also be stored (assuming that your keyboard is velocity-sensitive and is capable of transmitting dynamic information *via* MIDI), and unlike some other systems I've come across, the Siel doesn't seem to need much memory space to store this data.

Operation

On powering-up the computer, the software is accessed by inserting the disk and typing LOAD"CMP1.1",8,1. When the computer responds with READY, you type in SYS50000, and the micro goes a-hunting for the main program, which takes a few minutes.

When this has been done, the main menu appears, and this presents you with three options, these being **Composer** (accessed by typing C on the 64's keyboard), which allows you to record, edit and replay music; **Disk Operation** which lets you load, save, rename and erase music files; and **MIDI** which enables you to assign any of the six tracks to different MIDI outputs and to select one of three MIDI modes.

As an example of the way this bit of the software works, let's take the factory demo piece that comes with the disk.

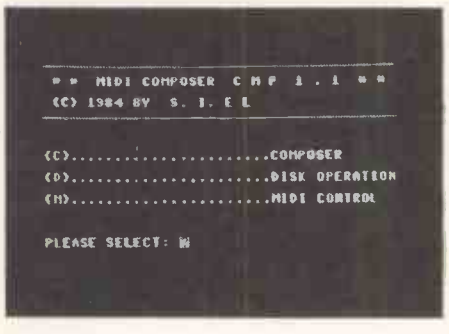
Now, the first option you select is obviously D. Once you've decided which file you want, and given the computer your instructions (luckily, single keystrokes are the order of the day here), the micro will obey and return you to the main menu automatically once the file has been located and called up. It's worth noting that if the file in question is a little on the long side, the loading process can take a long time too (about five minutes, to be exact), which is a bit tedious and more or less rules the package out for live work.

Anyway, once you're back in the main menu, selecting M takes you to a further sub-menu from which you can select MIDI modes and channels. All three modes are offered, namely **Omni** (all parts played exactly the same), **Poly** (different parts can be assigned to different synths), and **Mono** (for use with multi-timbral synths such as the Oberhelm Xpander and SCI SixTrak, where each monophonic track can be given both a different part *and* a different sound.

If you've selected Poly, the sub-menu will also let you assign MIDI channels (between 1 and 16) to each of the synths you've put under software control. Pressing RETURN then gets you back into the main menu, after which the third and final option – Composer – can be selected.

In this mode, the computer displays the current status and lists a summary of the data currently on-line by showing MIDI mode, which of the six monophonic tracks is assigned to which of the interface's MIDI Outs, and the total note values of each of these. To listen to a file, you have to type (in this particular case) P . 1 88 R. This asks the computer to play (P) all the channels (.) once (1) at a tempo of 88 beats per minute (88). And R sends all those requests.

If everything runs smoothly, you should then be treated to a rendition of the first movement

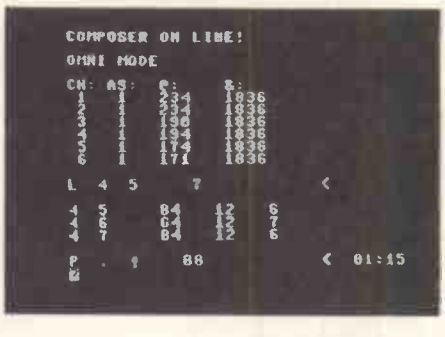


from one of the Brandenburg Concerti, and very splendid it is too.

Recording

However, I suspect that most musicians will buy this package to record their own music rather than spend all day listening to Bach, and as already intimated, such recording is also accomplished in the Composer mode.

Now, to input music, you have to define rather a large number of parameters for each



note, *viz* the channel number, step number, the note itself, the note length, and finally the gate-on time (which is normally two-thirds of the total note length, to allow for the release portion of the ADSR cycle). To end the piece, you define a step and type in a '@'. Just to give you some idea of what this definition entails, here's what a typical note might look like:

1 23 E5 24 18 (space bar)

As you can see, rather a lot of typing for just one note. It doesn't take a wild stretch of the imagination to realise that entering complex compositions with this software can take an awful long time – far longer, I suspect, than most musicians will tolerate.

I'm no slouch at data entry (before I started all this scribbling nonsense and playing music, I had a proper job as a data processor), but a sequence that took just a minute or two to enter into a Roland MSQ100 still took over 12 minutes with the Composer/Arranger. Given that in the professional music world, time is money, and that few pro musicians are therefore likely to have sufficient time on their hands to make the most of the recording facilities afforded by this package, I think it's a pretty fair bet that this particular Siel program was written by computer programmers who know little or nothing about musical performance. Even if you're one of the minority that positively relishes the prospect of row upon row of figures to enter into a computer, the processes involved are so mind-bogglingly slow, they're almost bound to sap your enthusiasm eventually.

Thankfully, the software's saving grace lies in what it lets you do to a sequence once you've recorded it. Like most step-time input programs, the Composer/Arranger allows extensive editing to be carried out on existing tracks, and relative to what you have to do to record a sequence, this process is surprisingly straightforward. All you have to do to amend a step is to type it in again, but although it's possible to insert blocks of data wherever you like, you can't erase either blocks or single lines, which is a shame.

Excellent copying and transposition facilities are also available, while in addition to the software's ability to store MIDI dynamic information, the Composer can also be programmed to change patches (again, using MIDI data transfer) on one or more synths at a given point during your sequence. A nice touch.

Conclusions

Well, there I was all set to give this package the thumbs-down on the grounds that this particular form of step-time entry is a waste of both time and effort, and that Siel should really be turning their attention to writing real-time programs, when the Editor steps in and tells me the company have already done just that.

The Live Sequencer, as the new package is called, is capable of recording 16 tracks of fully polyphonic MIDI note information, its capacity – in its Commodore 64 incarnation, at least – being approximately 9000 MIDI events. And once a pattern has been recorded, it can be linked together with other patterns to form songs. It looks on paper to be good value at £64 (tape) or £69.50 (disk), but obviously a full appraisal will have to await a future issue.

So what of the Composer/Arranger? Well, if you're after extensive editing facilities and don't object to the laborious method of data entry, I suppose it ain't half bad. However, during the time I used the package it crashed on numerous occasions, one of which proved somewhat embarrassing as I was demonstrating 'the wonders of computer music' to a group of schoolchildren at the time.

Computer programmers and frustrated keyboardists who can't play a note will probably find the Composer/Arranger attractive, but traditional musicians like myself will probably opt for the Live Sequencer, when it appears.

The phrase 'horses for courses' springs to mind . . . ■

RRPs are £34 including VAT for the cassette version, £39 for the disk. Further information from Siel UK, Ahed Depot, Reigate Road, Hookwood, Horley, Surrey RH6 0AY. ☎ (02934) 76153.

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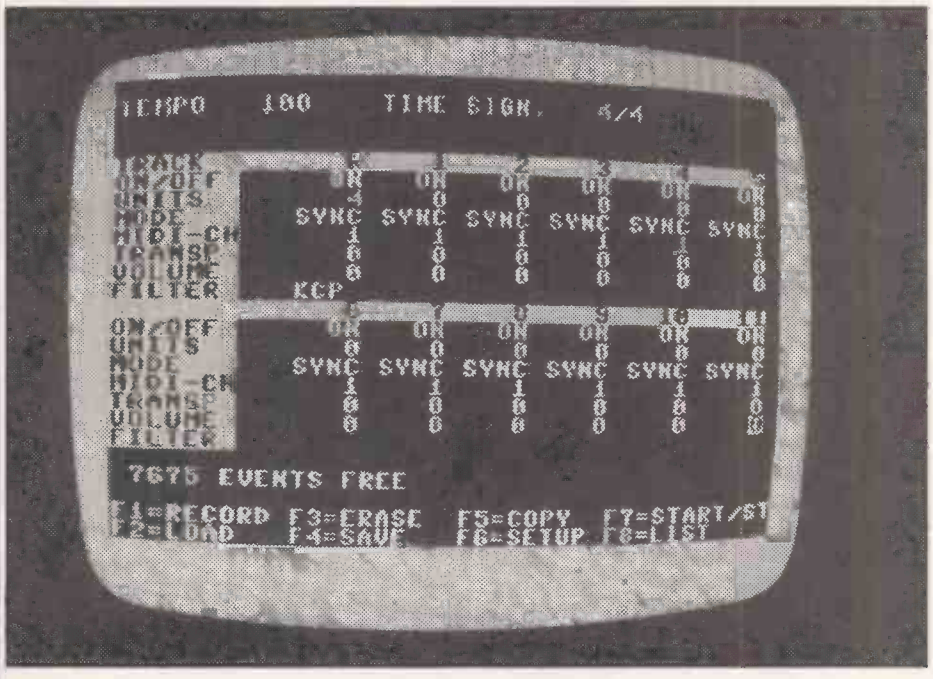
SOFTWARE : 12-TRACK RECORDING STUDIO

Manufacturer : JELLINGHAUS

Computer : COMMODORE 64

Reviewer : Trish McGrath



Jellinghaus Music Systems have been marketing a MIDI interface and associated software for the Sinclair Spectrum and Commodore 64 for some time now (see reviews, E&MM July 84). but this latest package is definitely a cut above the rest.

Basically, the disk-based JMS MIDI Recording Studio allows 12 polyphonic tracks to be recorded in real-time using up to 7677 MIDI events, and each track can subsequently be assigned to a separate MIDI channel, transposed to any key, looped, quantised, listed, edited, and printed. Program changes and modulation parameters can be memorised and tempo and time signature changes carried out freely. And if all that hasn't whetted your appetite and sent you running for your flexible friend, the piece being composed can be given a name and saved to a standard diskette for future retrieval (ie. when further inspiration dawns).

Hardware requirements stretch to a Commodore 64 or SX64 with matching disk drive, a MIDI computer interface, a MIDI synth (the more the merrier), and the necessary MIDI cables. The JMS interface loaned with the review software consists of three MIDI Outs, a MIDI In, a MIDI Thru, and an In Control, which serves no purpose as yet.

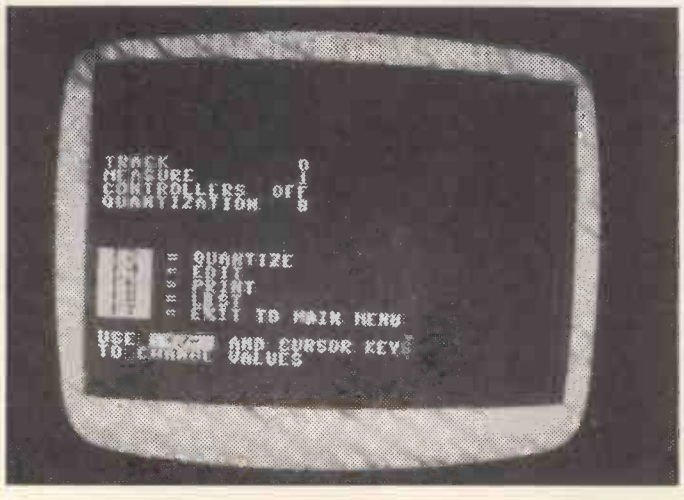
Before we go any further, I think I ought to point out that the MIDI Recording Studio won't transform your solo MIDI synth into an electronic orchestra. With the exception of the multi-timbral SCI SixTrak and Oberheim Xpander, the average MIDI synth is capable only of receiving and transmitting MIDI data on one channel, and of playing just one program or sound at a time, and using a limited number of voices (depending on the make and model), these voices being allocated to different tracks either monophonically or polyphonically as the software permits. Seeing as quite a few synths can only communicate on MIDI Channel 1, it's not beyond the bounds of possibility that some keyboard players may own two synths that are both hard-wired in this manner. If you're using this software package with one MIDI synth assigned to Channel 1, and record a bass line on Track 1, chords on Track 2, and a melody on Track 3 (utilising a total of six DCOs, say), these will all replay using the one program or preset. It's not an enviable task, trying to program a sound that's suitable for all three parts. At best it's a compromise.

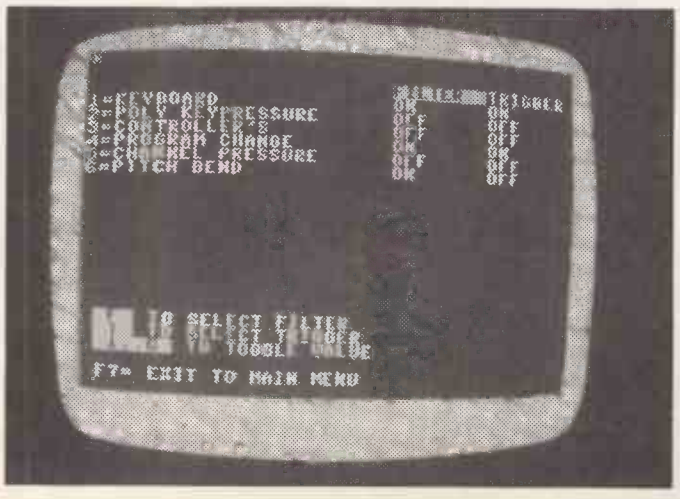
And of course, having two synths stuck on the same channel means that *all* the tracks are now played on both synths, though obviously with a different sound on each.

So remember that multitrack doesn't *necessarily* mean multi-timbral, and that unless you're fortunate enough to have at least a couple of MIDI synths with assignable channel numbers, the full benefit of this type of software probably won't be realised. Not yet at least.

Parameters

When the program is loaded, you're given the option of using either the computer or a drum machine as the master synchroniser, as





well as starting and stopping the recording by means of two footswitches. Loading takes about 90 seconds, after which the screen displays the main Recorder menu, with data relating to the 12 tracks (labelled R and 1 to 11) occupying the best part of the screen.

Tempo defaults to a moderate 100 crotchets per minute but is variable (even during playback) between 40 and 200. However, since neither of the keys used to adjust this parameter have an auto-repeat facility, carrying out dramatic changes to the Tempo value is both tedious and time-consuming. Surely a method of using the computer's numeric keys could have been incorporated into the software? Time Signature is defaulted to 4/4 time and similarly variable.

The cursor is positioned at Track R (the only track on which data can be recorded) on booting up, with movements carried out by the cursor's arrows (logical) and values altered by the plus and minus keys.

Parameters on each track consist of **On/Off** (for switching tracks on and off during playback), **Unit** (denotes the number of beats recorded on that track), **Mode** (either SYNC or OSTI), **MIDI Channel** (for allocating each track to a channel between 1 and 16), Transpose (to transpose the track during playback up or down a number of semitones), **Volume** (for balancing the dynamics of each individual track), and **Filter**, which indicates what data has been recorded on each track according to the SETUP page.

More specifically, setting a track to SYNC means that it is restarted synchronously with the longest track during multitrack playback, while in OSTI mode, the track is looped continuously: great for repetitive basslines and chord sequences.

Before recording commences, F6 allows you to SETUP a track to record pitch-bend, program changes, aftertouch, and keyboard dynamics (the latter two, not unnaturally, can't be used if your MIDI keyboard isn't appropriately equipped), or to 'filter' out certain options in the interests of saving memory. Bear in mind though that using aftertouch and pitch-bend and effecting program changes on one track will affect *all* tracks assigned to the same MIDI Channel number. Common sense, really.

Recording

For the purposes of this review, the three MIDI Outs from the JMS interface were connected to a Yamaha DX7 (receiving and transmitting on Channel 1), an Akai AX80 (receiving on Channel 2), and a Yamaha RX15 drum machine (on Channel 16 and allowing control over its clock and start/stop functions). Seeing as the software records on Channel 1 only, the DX7 was used as the master keyboard and connected to the MIDI In.

Once all the necessary connections have been made (and it can take a while), recording a track really couldn't be simpler. If you're not using a drum machine, the computer sends a metronome signal to the monitor, and this allows a one-bar introduction, though the resultant output is noisy in the extreme.

Using a MIDI drum machine is the most hassle-free solution, as its operation can be controlled directly from the computer. Recording can be activated by either the first keyboard note, the footswitch (an optional accessory, this), or F7, should you require a pause at the beginning of the piece. When you've finished playing the first track, pressing F7 stops the recording and the system switches automatically to playback. As recording is always undertaken in complete bars, it's necessary to stop recording before the last beat of the bar (especially if you plan to loop the track), otherwise a blank bar will be added at the end.

Once the first track has been recorded satisfactorily, it's copied to any track from 1 to 11 and assigned a different MIDI Channel or Mode as necessary. Note that Track R is not erased – merely duplicated – by this process, so the first track can be copied again, transposed up or down an octave and sent to another MIDI Channel for simple layering effects.

Editing

LIST (F8) offers not only quantisation, but also the option to Edit, Print, and List a particular track.

Since quantisation cannot be 'undone', it's best carried out as soon as a track is recorded and copied (ie. if the track quantisation is unsatisfactory, Track R can simply be copied again and re-quantised to another value, with no harm done). Quantisation can be carried out to 1/4, 1/8, 1/16 or 1/32 of a crotchet (as well as their triplet counterparts) calculated on 48 time events per crotchet, and proves a real boon in tidying up a less-than-perfect performance.

LIST – not surprisingly – commences listing of the track in question and displays the measure number, note on/off, key velocity, and controller and program change data, all of which can be altered *via* the EDIT page. Editing is quite straightforward once you overcome the MIDI language barrier, and again, values are changed by using the cursor and plus and minus keys.

PRINT (you've guessed it) enables you to make a hard copy of the track listing – guess it might be useful to somebody . . .

Building Tracks

Meanwhile, back at the main menu . . . Subsequent tracks are built up in exactly the same way as the first, and previous tracks can be used as guides or switched off on playback as desired. Deleting tracks can be carried out easily by pressing F3 (ERASE), though there's no need to erase Track R, as going into record mode does this automatically.

Your masterwork can be named and saved to disk (F4) at any time, but oddly enough, when I saved a piece with two recorded tracks (Tracks 1 and 2), they loaded back as Tracks 15 and 16, with any unused controllers 'filtered' out. Doesn't seem very logical to me.

Finally, a number of tracks assigned to the same MIDI Channel can be 'mixed down' onto one track by simply connecting MIDI Out to MIDI In, recording the total on Track R, and copying to an empty track as per usual.

Conclusions

A couple of bugs and the *hopeless* manual notwithstanding, I was pleasantly surprised at the ease and speed with which complex pieces can be composed and recorded with Jellinghaus' latest real-time software.

The bad news is that, contrary to the bumpf and the manual, syncing a non-MIDI drum machine operating at 24 pulses-per-quarter-note requires an edge connector (from the user port) to DIN (sync socket of the drum machine) lead, at a further cost of £18. However, the good news is that updated software to cure this oversight will be on the market before the end of the year, and Rosetti will replace the present version with the new for a nominal fee. This will bring the In Control socket on line and enable you to use a rather cheaper DIN lead.

It's certainly heartening to know that JMS are busy refining the MIDI Recording Studio and, personally, I hope the Germans will consider adding a facility for commencing playback from a chosen bar number instead of the beginning of the piece, a Bar Count readout, and the means to playback one particular channel, which would save switching off all the other tracks.

Still, even in its present form, the JMS MIDI Recording Studio goes a long way to realising some of the ideals of the MIDI concept, and provides a flexible, easy-to-use 12-track polyphonic sequencer for use on one of Britain's biggest selling computers. Just think, if they added a sync-to-tape facility this software package could transform a Portastudio into a powerful multitracker: any advances on 37 tracks? ■

RRP of the Recording Studio disk is £99.95, while the JMS MIDI Interface retails at £89.95, both inclusive of VAT. Further information from Rosetti Music Systems, 138 Old Street, London EC1. ☎ 01-253 7294.

THE FAIRLIGHT *UNEXPLAINED*

Gary McLeod.

THE FAIRLIGHT EXPLAINED

Sampling may be the CMI's most talked-about feature, but as this article shows, defining sounds using harmonic information can be just as dramatic.

Jim Grant

So far we have discussed only one method of actually creating sounds with the Fairlight sampling. This aspect of sound formation is probably the single most important feature of the CMI, and was certainly the focus of public attention when the machine was announced. However, the ability to specify sound by means of harmonic information can not only result in some very interesting sounds, it's also rather useful in an educational environment.

Two display Pages, 4 and 5, allow the construction of waveforms by harmonic data. They deal with exactly the same information but present it to the musician in different ways.

First of all, though, let's clear up a little mystery that's been evading us for some months – the Mode switch. Actually, this is very simple and is therefore something of an anti-climax. When a voice operates in Mode 1, only the first 32 segments of waveform RAM (4k bytes) are used to represent the sound. An unlooped Mode 1 sound will stop at the 32nd segment, even though another 96 segments of RAM exist. In order to compensate for shorter note event time as played on the keyboard, each of the 32 segments is looped several times before moving on to the next segment: this maintains a fairly constant net event length for any pitch. Mode 4 uses the entire waveform RAM (all 128 segments of it) and is always used for sampling since long, high bandwidth sounds need lots of numbers to represent them.

So what's the use of Mode 1? Well, calculating a time waveform from harmonic data can be quite time-consuming, especially if the supplied data is detailed and enables subtle nuances of sound to be generated. However, more often that not, only a simple waveform is required, and to calculate the RAM waveform for all 128 segments when a short loop is all that's needed is rather wasteful, to say the least. There's no hard and fast rule about which Mode a sound should be in: the choice is entirely the musician's. However, using a voice as the destination for sampling data *always* results in all 128 segments being overwritten, even if the voice selected is Mode 1.

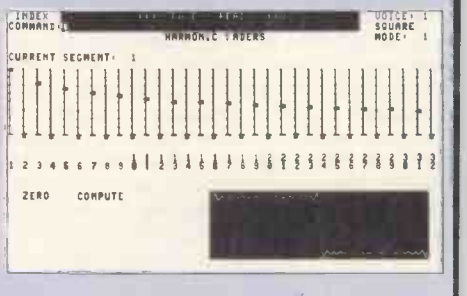
Page 5

Figure 1 shows a typical Page 5 display. This page displays the harmonic overtone series as a set of 32 'faders' similar to those on a graphic equaliser. Each fader is logarithmic in nature and has a range of zero to 255, allowing a good degree of control over harmonic amplitudes and thus enabling the application of a Fourier type harmonic series.

As an example, Figure 2 shows a square wave generated by the CMI, computed from the values of Fourier components shown on the faders. The resultant waveform is visually very similar to the real thing, and perhaps more importantly, sounds indistinguishable.

However, the power of the CMI lies in its ability not only to compute a complex waveform from a set of Fourier components so that it can be played on the keyboard, but also to compute a different waveform for each segment. Every segment has a unique Page 5 display, so while a Mode 1 sound has 32 sets of faders, a Mode 4 one will have 128! The current segment number is indicated on the display, and this allows a synthesised sound to change drastically throughout its duration, simply by the user filling each segment with a different waveform calculated from its own Page 5 fader settings.

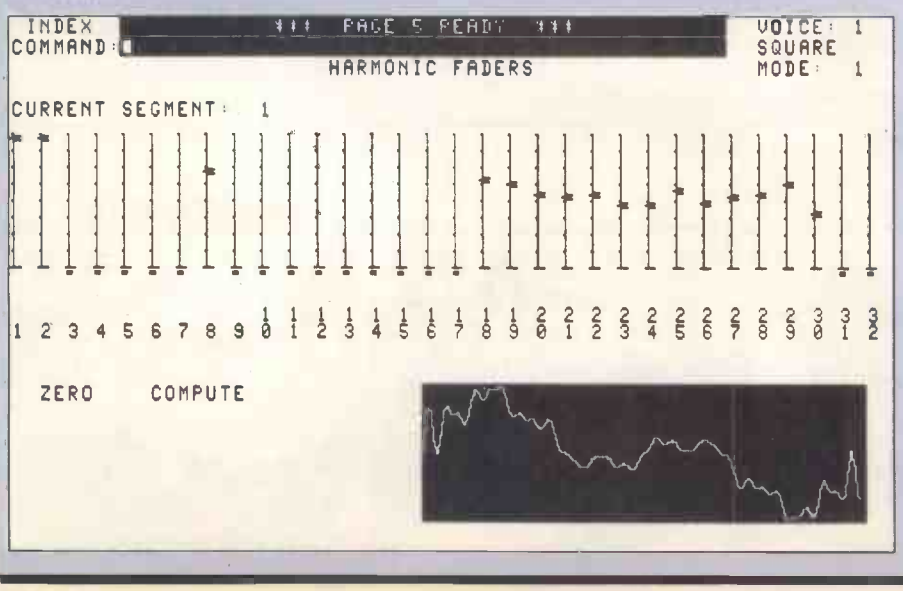
Figure 2.



In fact, the technique of using different waveform segments as the sound progresses is very much the domain of PPG synthesis. Generally speaking, these progressions are known as wavetables, and in the PPG, a sound consists of a set of 64 waveforms that reside initially in EPROM (they are transferred to RAM on power-up) which are read out sequentially when a key is pressed. The idea behind this system was to circumvent the need for filters by constructing wavetables that held a set of representative waveforms of, say, the classic filter sweep. Unfortunately, this results in a very hard, metallic sound, as the sound changes abruptly from one waveform to another, slightly different one. It's still a good sound, but in the interests of flexibility, PPG have chosen to incorporate the usual VCFs and ADSRs as well as extensive wavetable modulation.

The CMI is also capable of this form of synthesis to a limited degree, using the loop controls on Page 7. For example,

Figure 1.



suppose we had filled all 128 segments with waveforms that change very slightly as we progress through the waveform (see Figure 3). Now, if the loop controls were set up as shown in Figure 4 (this is a Page 7 display), moving CNTRL1 on the music keyboard would result in a different timbre when the note was played. Using this technique allows for some expressive playing, since the principle is rather akin to varying the filter frequency control on a synthesiser, the only difference being that the actual timbres can be radically different from one segment to the next.

To increase the timbral movement within a sound, CNTRL2 can be patched to 'LOOP LENGTH' on Page 7, resulting in sections of different waveforms being read out repeatedly. Since the waveform data is computed by the CMI, it's always constructed so that the waveform fits exactly into one segment, thereby overcoming looping problems.

Fourier Series

Well, with all this talk of 'Fourier components' and the like, some of you may reasonably be thinking 'what's it got to do with music?' The answer, of course, is not much. Only scientists and engineers delight in quantifying the world which our senses seem to handle perfectly adequately. However, in order to express ourselves explicitly and unambiguously about a wide variety of concepts (some of which may be abstract) we need to use the language of mathematics. Fourier analysis and synthesis are mathematical statements about something which is not intuitively obvious: the fact that any truly periodic waveform can be decomposed into an infinite sum of sinewaves, usually called harmonics. Similarly, any periodic waveform can be constructed from the sum of an infinite number of sinewaves. The sinewaves have frequencies that are related to the fundamental of the waveform in such a way that the second harmonic lies at twice the fundamental frequency, the third harmonic lies at three times the fundamental, and so on. The fundamental itself is often referred to as the first harmonic.

Of course, obtaining a reasonable representation of a desired waveform does not require an infinite number of sinewaves: more than 16 is enough to give a good approximation. The Fairlight uses a maximum of 32 harmonics, which enables most waveforms to be synthesised with a fair degree of accuracy. Figures 5 to 8 show the development of a square wave by successively adding further harmonics and using Page 5 to compute the resultant waveform. The square wave doesn't contain any even harmonics (2, 4, 6 and so on) and we can see that the lower harmonic numbers set the basic square shape while the higher ones fill in the bumps and sharpen the edges. Even with all the odd harmonics the Fairlight can compute, the square wave is still not visually perfect, but it sounds OK. ■

Figure 3.

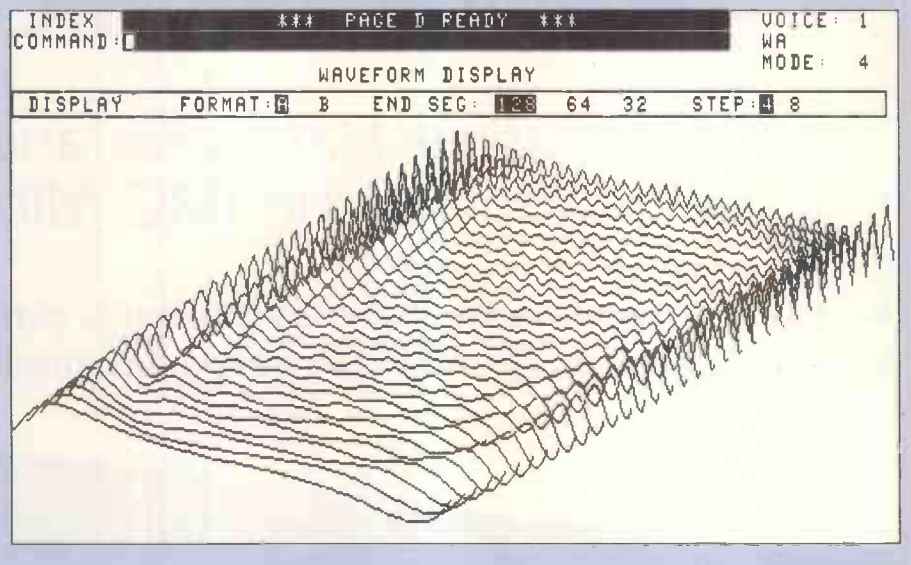


Figure 4.

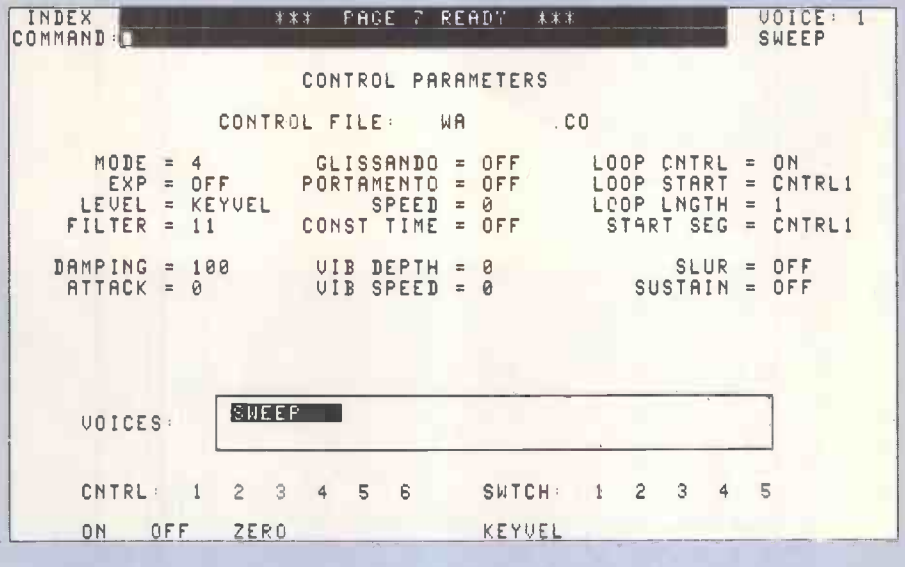


Figure 5.

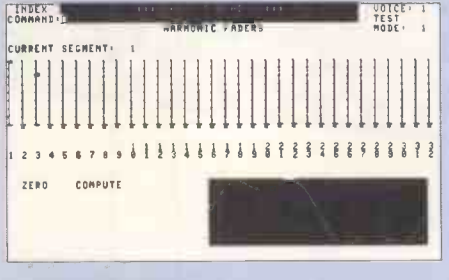


Figure 6.

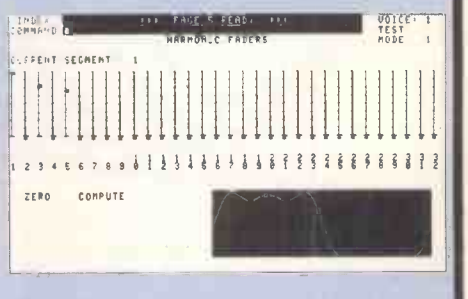


Figure 7.

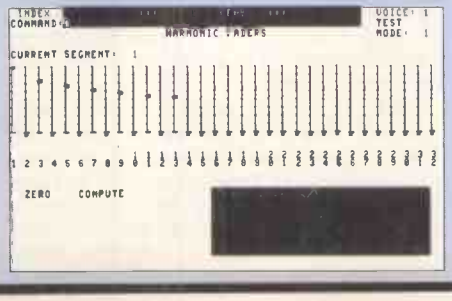
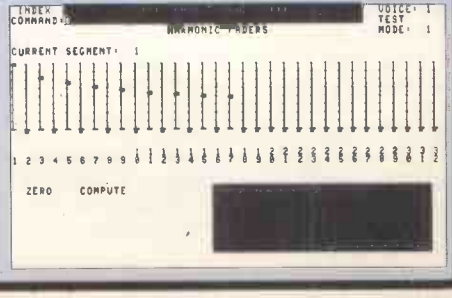


Figure 8.

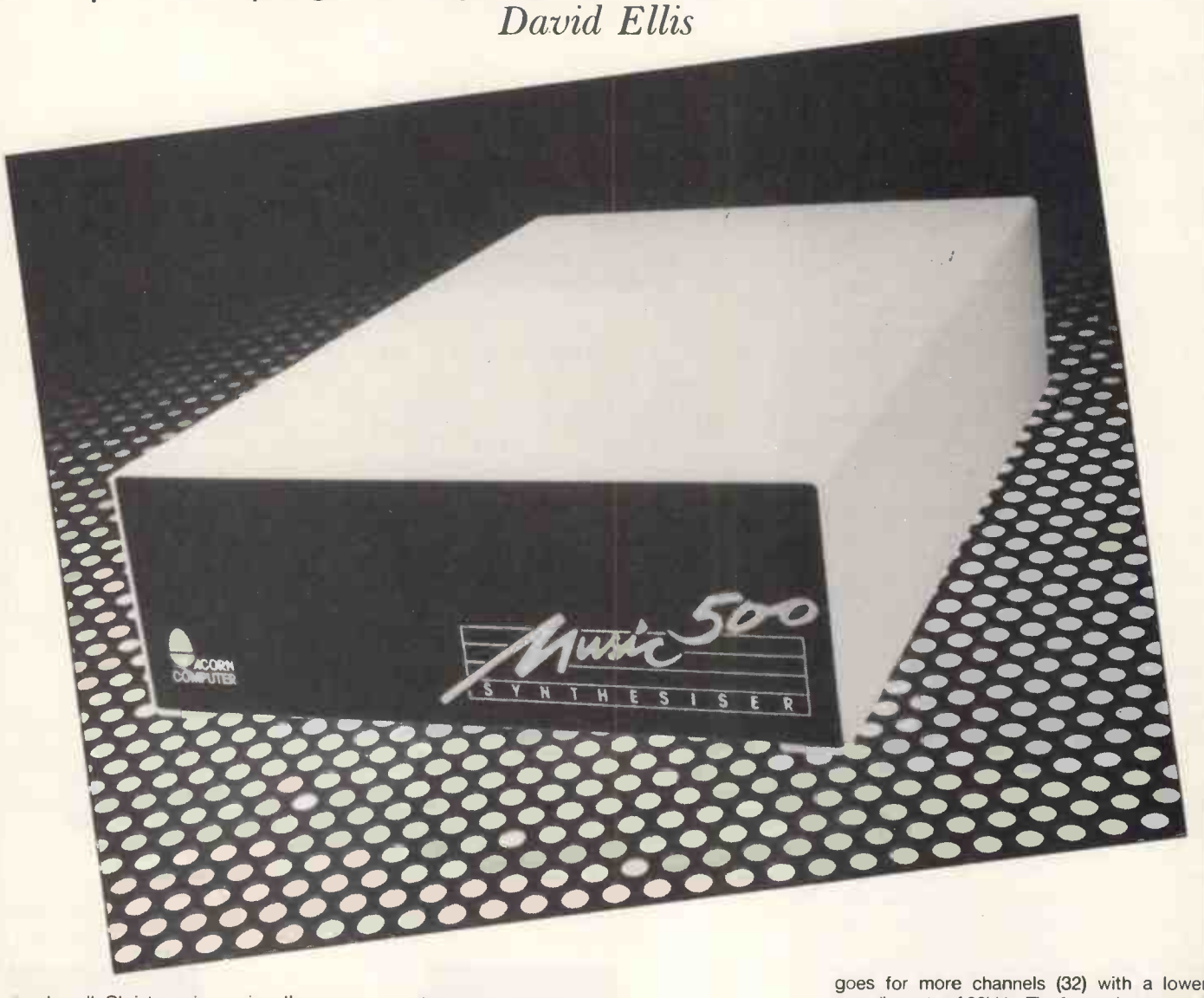


Acorn Music 500

Synthesiser Hardware and Software for the BBC Micro

An exclusive review of a new British-built computer music add-on that incorporates a programming language designed specifically for musicians.

David Ellis



Ah well, Christmas is coming, the geese are getting fat, and people are thinking of pressies – a ripe time for the launch of Acorn's latest box of merriment. But no, this isn't the Model C BBC Micro, or indeed anything to do with their growing interest in business computing. Instead, in all but name, the Music 500 is a second processor specifically designed for high quality sound synthesis, but inclusive of some special software by the name of 'AMPLE' (standing for Advanced Music Programming LanguagE). And as I hope this review will show, it *is* remarkably advanced, knocking spots off all previous attempts at giving musicians their own programming language, and for an astonishing all-inclusive price of £199.

Background

Well, there are two sides to the story – the hardware and the software – and both start with another Cambridge company by the name of Hybrid Technology. We first reported on their endeavours in *Rumblings* back in E&MM October 83, when the story went something like this:

'Well on the way are a couple of really smooth British (about time too . . .) programmable digital sound generators for home micros. Specs are elusive at present, but one would appear to have 12 channels each with a 64kHz sampling rate and offering all sorts of yummy modulation options, whilst the other goes for more channels (32) with a lower sampling rate of 32kHz. The former is expected to appear initially for the BBC Micro, and not surprisingly, Acorn are showing a lot of interest. With expected price tags of under £200, these look like just what the doctor ordered . . .

A year later, the pudding turns out to have proved itself in no small way, though the hardware almost undersells itself in its disk drive-sized case (actually, it *is* a disk drive case) that plugs into the BBC Micro's 1MHz bus and produces a stereo output *via* a five-pin DIN socket. The Music 500 synthesiser box also includes its own power supply, so there's no question of over-stretching the Beeb's resources.

The design of the hardware mirrors the 'time-sharing' principle of both the alphaSyn-

tauri's five-year-old synthesis hardware and the Clef Products system featured until last month in the E&MM Digital Music series, the second system referred to in the above quote. But Hybrid Technology's design goes much further. Gone are the days of annoying aliasings and restricted bandwidths, because with an individual channel sampling rate of 46.875kHz (a couple of kHz faster than the Compact Disc, in fact), there's quite simply more harmonic space to play around with. Add to that some ingenious design concepts like 'oscillator indexing' at a rate of six every microsecond, which permits all manner of powerful modulation tricks like FM, ring modulation, pseudo-random noise, and synchronisation, and you begin to get a taste of the thought that has gone into the hardware. Then, for the icing on the cake, there's the logarithmic coding of wavetables, which allows digital multiplication to be achieved simply by adding logs together (remember school days?), thereby getting around the breakfast cereal crackles and pops present in other systems. And with a complementary multiplying DAC, this gives a dynamic range typical of the best companded eight-bit systems.

AMPLE

Where Music 500 really stands or falls is by the software that runs the synthesiser. The basic aim behind this was to create a programming environment that would grow from the base up to result in a powerful, integrated system. Indeed, the intention has now been extended even further in the direction of a standardised language for producing music on different micros. Grand ideas, to be sure, so AMPLE has got a lot to live up to.

But let's start by seeing where AMPLE and the Music 500 synthesiser fit into the standard BBC Micro picture (Table 1). In essence, the Music 500 system works in a similar manner to the BBC Micro, where running a program directs the Operating System's queue control to send bytes in an orderly manner to the humble sound chip. But even given BBC BASIC's callable PROCedures, and their strong similarities to the organisation of musical material, BASIC is a poor language for musical activities. The point is that music is all about simultaneous events rather than events carried out in turn, which is where AMPLE really comes into its own. Indeed, if there's one principle that sums up AMPLE, it's 'concurrency' – meaning doing a number of things at the same time – and you can bet your bottom dollar that it'll be this that earns musical computers their slice of the bread in years to come.

One of the intriguing things about AMPLE is that features that users can easily write for themselves aren't provided as standard. Instead, the features that are already present are there to allow you to build other features. If this sounds like a tautological conundrum, take the building industry as a comparison. Bricks, mortar, wood, and cement are provided as standard, but if you want to build a Taj Mahal in your back garden, it's up to you to draw up the plans and construct your own suburban folly.

Starting at the system's most basic level, there are the note words illustrated in Table 2. Then, applying some duration values to the last-mentioned, and giving the whole thing a name and an instrument to play it, we get the contents of Table 3. At this juncture, we've already experienced a number of important things about AMPLE. Namely that a) notes are specified in both cases – upper case to go up and lower case to go down, b) note durations are of values commonplace with 48 pulses-per-quarter-note drum machines, and c) the language works on the principle of 'words' for labelling music ('GstQ'), instruments ('HM's tpt'), instructions, or whatever and wherever your creative urge takes you. The reasoning behind the use of combined-case notes goes something as follows:

1 Music is essentially linear – it goes up and down and moves to the right.

2 The printed score shows this by the direction of lines joining groups of notes, but doesn't make any visual distinction about octave break-points, unlike MCLs running on systems as diverse as the Fairlight and a Spectrum MIDI sequencer.

3 When home computers were only capable of upper-case display, notes could only be shown in upper case, yet the practice has lingered until the present day.

4 AMPLE attempts to mimic this visual linearity of music by using both upper and lower case note words. At the same time, this reduces the number of key entries required to enter such tricky things (for MCLs) as trills (especially between B and C!), scales, and octave shifts.

But it's the 'word' side of AMPLE that's the most important to take home from this review. Like the languages FORTH and LOGO, with which AMPLE has a lot in common, Hybrid's brainchild works using a stack of words (50 in all) that can be defined by the user for whatever purpose he has in mind. Thus, in the case of the Pachelbel example (Table 4), you'll find a couple of words used to define the two parts, a word for instructing the ARTS as to how the piece is to be conducted (key signature, tempo, and the number of beats in the bar), a further word to get all the parts and instruments orientated in time and space, and finally the words used to define the actual instruments. But you could just as well define a couple of words to produce major and minor arpeggios, a word to set a transposition action, and then a further word to get the whole lot together into a playable entity, as in Table 5.

What all this tells us is that AMPLE is a Music Composition Language – no, a Music Production Language – that grows with you. If your only interest is the straightforward rendition of Bach with pseudo-authentic Baroque instruments, then fine. That's easily accomplished. And you've a choice of entering it using either the text buffer to store lines of music, or for more complex pieces, a word processor like VIEW to assemble the text, which can then be *EXECed into AMPLE. But AMPLE goes a great deal further than the plain coding of music and its synthesis. Because AMPLE is a true programming language, with a host of programming words for performing operations on numbers and strings, control structures, and input/output, it's ideal for extending the user's horizons into the realms of algorithmic and chance procedure composition. Take a line like the one in Table 6, for instance. Transpose it up and down a few octaves, do a few permutations of the notes, assign it to a number of contrasting percussive instruments, add a high C eighth-note pulse, and you've got a realisation of Terry Riley's 'In C' that will never sound exactly the same, simply by virtue of AMPLE's RAND word.

And that's just the tip of the iceberg.

Synthesis

AMPLE nominally configures the system's 16 output channels into eight pairs. However, you're entirely free to reconfigure them, if that's what you wish. But the real beauty of the system lies in the way in which multiple-waveform voices can be set up with all manner of inversions, offsets, sync, timbral variations, and stereo field spreads. In fact, once you've experienced the mind-blowing chorusing, phasing, and sync sweep that ensues, you realise that the Music 500 is one system where asking for separate output channels is somehow missing the point . . .

When it comes to envelopes for pitch and amplitude modulation, users have the option of either using files of presets supplied with the system or constructing their own. The latter takes a good deal of effort, as shown by the example in Table 7 for playing alternating fifths with a slide in between.

Still, surely it's better to have that sort of flexibility than not at all? And if you get stuck, you can take heart in the fact that the excellent manual and reference section provides plenty of examples. Not surprisingly, the definition of waveforms can be similarly complicated if you choose to use all 16 of the permitted harmonics. On the other hand, you can also elect to fill a waveform simply by using that rather useful RAND word (Table 8). And if you want authentic-sounding percussion with built-in ambience,

Table 1.

Music 500:	AMPLE	--->	ARTS	---> Synth box
	programming environment for notes and instruments		software extension of synth for queuing of events and dynamic note control	production of sounds
BBC Micro equivalent:	BASIC	--->	O.S.	---> Sound chip

Table 2.

```
CEDGAB                  % rising scale
Cbagfedc                % descending scale
cCcCcC                  % alternating octaves
CCDbCD EEFedc DcbC      % 'God save the Queen
```

Table 3.

```
"GstQ" [ 0:48,CCD 24,b//C 48,D EEF 24,e//d 48,c Dcb C ^ ]
"HM's tpt"[ 1 VOICE 2 CHAN brass AENV 1 CHAN 2 WAVE 50 OFFSET
```

Table 4.

```
% excerpt from Pachelbel Canon...

"leadpart" [] "basspart" [] "conductor" []
"play" [] "stringy" [] "cello" []

"leadpart" [ 48,Fedc ¦ baBC ¦ Dcba ¦ gfGe ¦ 24,dFAgfdFe ¦ dbDAgBag ¦
fdECDFAa ¦ BgAfdD 12,D//c ¦ DcDdcAeFdDcbCFAB ¦ gfeGfedcbagfeGfe ¦
dEFGAeAgfBagAgfe ¦ dbBCDcbagfeBaBag ¦ 24,fFe/^d 48,F ¦ BaBC ¦
24,Ddc/^^ 48,^ ¦ ]

"basspart" [ 48,-1: DaBf ¦ GdGA ¦ ]

"conductor" [ SCORE K( +F +C )K 48 4 £* BAR 1: ]

"play" [ 25000 TEMPO 4 PLAYERS
1 PLAY( stringy conductor 192,^ ¦ ^ ¦ leadpart )PLAY
2 PLAY( stringy conductor 192,^ ¦ ^ ¦ ^ ¦ ^ ¦ leadpart )PLAY
3 PLAY( stringy conductor 192,^ ¦ ^ ¦ ^ ¦ ^ ¦ ^ ¦ ^ ¦ leadpart )PLAY
4 PLAY( cello conductor 10 FOR( basspart )FOR 48,DA^^ ¦ )PLAY
GO ]

"vib" [ 2 EMOD 10 2 CYCLE 1 EMOD 14 2 CYCLE ]
"stringy" [ 1 VOICE 4 CHANS SOUND ALL CHAN 128 AMP
1 WAVE ODD CHAN vib 1 PENV EVEN CHAN vib 2 PENV 1 ODD CHAN -3 POS
EVEN CHAN +3 POS 4 FOR( INDEX CHAN INDEX 1 £- 20 £* OFFSET )FOR ]
"cello" [ 1 VOICE 2 CHANS SOUND ALL CHAN 128 AMP 1 CHAN 7 WAVE
2 CHAN 4 WAVE 1 CHAN -2 POS 2 CHAN +2 POS ]
```

Table 5.

```
"majarp" [ 6,0:cEGeGCgCEcEGeGCgCEcEGeGC ¦ ]
"minarp" [ 6,0:c-EG-eGCgC-Ec-EG-eGCgC-Ec-EG-eGC ¦ ]

"!" [ transp £! ]  % sets transposition by n! semitones

"lead2" [ 0! majarp 9! minarp 5! majarp 0! majarp
0! majarp 4! minarp 9! majarp 7! majarp 5! majarp ]
```

Table 6.

```
"inC" [ RAND? 100 AND 25£+ FOR( 48,CDE 12,G 36,F ¦ )FOR ]
```

Table 7.

```
  2 EMOD                          % select envelope 1 for mod
  1   4 0 ESECT                   % use four segments for effect
127   1 1 ESEG    0 1 ELEV  % jump to normal pitch at start
  1 100 2 EGRAD  12 2 ELEV  % wait for 1s at lower pitch
112  50 3 EGRAD 112 3 EGRAD % slide up over 0.5s
  1 100 4 EGRAD 113 4 ELEV  % wait for 1s at higher pitch
-112 50 5 EGRAD   0 5 ELEV  % slide down over 0.5s
```

Table 8.

```
"randwave" [ 128 FOR( RAND? INDEX WG )FOR WGEND ]
```

Table 9.

```
"cymins" [ 1 VOICE 4 CHANS SOUND 1 CHAN perc AENV
6 WAVE 0 OFFSET YES RM 2 CHAN 6 WAVE 3000 OFFSET
3 CHAN perc AENV drop PENV 128 AMP 4 CHAN perc AENV
drop PENV 128 AMP 30 SHIFT ]
```

```
Music 500 Synthesiser specifications:


CHANNELS: 16
SAMPLING RATE: 46.875 kHz per channel (750 kHz overall)
DYNAMIC RANGE: 72 dB
S/N RATIO (to thermal noise): 70 dB
OUTPUT FILTERS: 3-stage, -50 dB roll-off at 23 khz
STEREO: 7 software-definable positions, left to right
PROGRAMMABLE WAVEFORMS: fourteen 128 byte x 8 bit
                        on-board tables
FREQUENCY CONTROL: 23-bit, 0.0 - 23,437 Hz,
                   with 0.0052 Hz resolution
MODULATION: FM, ring modulation, syncronisation,
            and pseudo-random noise
AMPLITUDE CONTROL: logarithmic, 10ms time resolution
ENVELOPE TIMES: 0 - 320 seconds for each segment
TIME-BASE RANGE: 2.55 - 655 ms, with resolution of
                 10 us within that range
```

▷ try this Simmons lookalike sound (Table 9) that makes excellent use of ring modulation.

The Future

Hybrid Technology are currently working on a four-octave keyboard that has its own processor and will plug into the BBC Micro's 1MHz bus. AMPLE will then support the use of the keyboard both as a conventional real-time input device and as a scoring device for creating musical 'words'. On top of that, you'll also be able to define your own highly-specialised keyboard instruments that will insert into the data stream from keyboard to synthesiser box.

Of particular importance when it comes to the acceptance of Music 500 by more studio-minded musicians is the news that Hybrid are working on a simple time-code system that'll enable the BBC Micro to send and receive sync data when connected up to a multitrack. There are various technical problems to be sorted out first, but the system has a head-start in using a time-base that's identical to that of the LinnDrum *et al* (48 pulses-per-quarter-note) and is therefore an ideal sync source.

MIDI has also entered into Hybrid Technology's thought stream, but they're reluctant to make any positive moves in its direction until 'MIDI comes of age', as they put it. However, the point about the system's modular design is that adding on MIDI is actually very straightforward (it's really just a question of replacing ARTS – the software extension of the synthesiser – with whatever's needed for interfacing Music 500 with the MIDI).

One of the other intriguing developments Hybrid have come up with for their own internal use is a pitch input box that allows the Music 500 system to be controlled from any pitch source – keyboard, voice, or otherwise – by the simple expedient of plugging in a microphone. Initial teething troubles with harmonically complex sources (my voice, for instance!) seem to have all but vanished, and although Hybrid have no immediate plans to market the thing, there's no doubt that a similar facility will be figuring in their future plans.

Conclusions

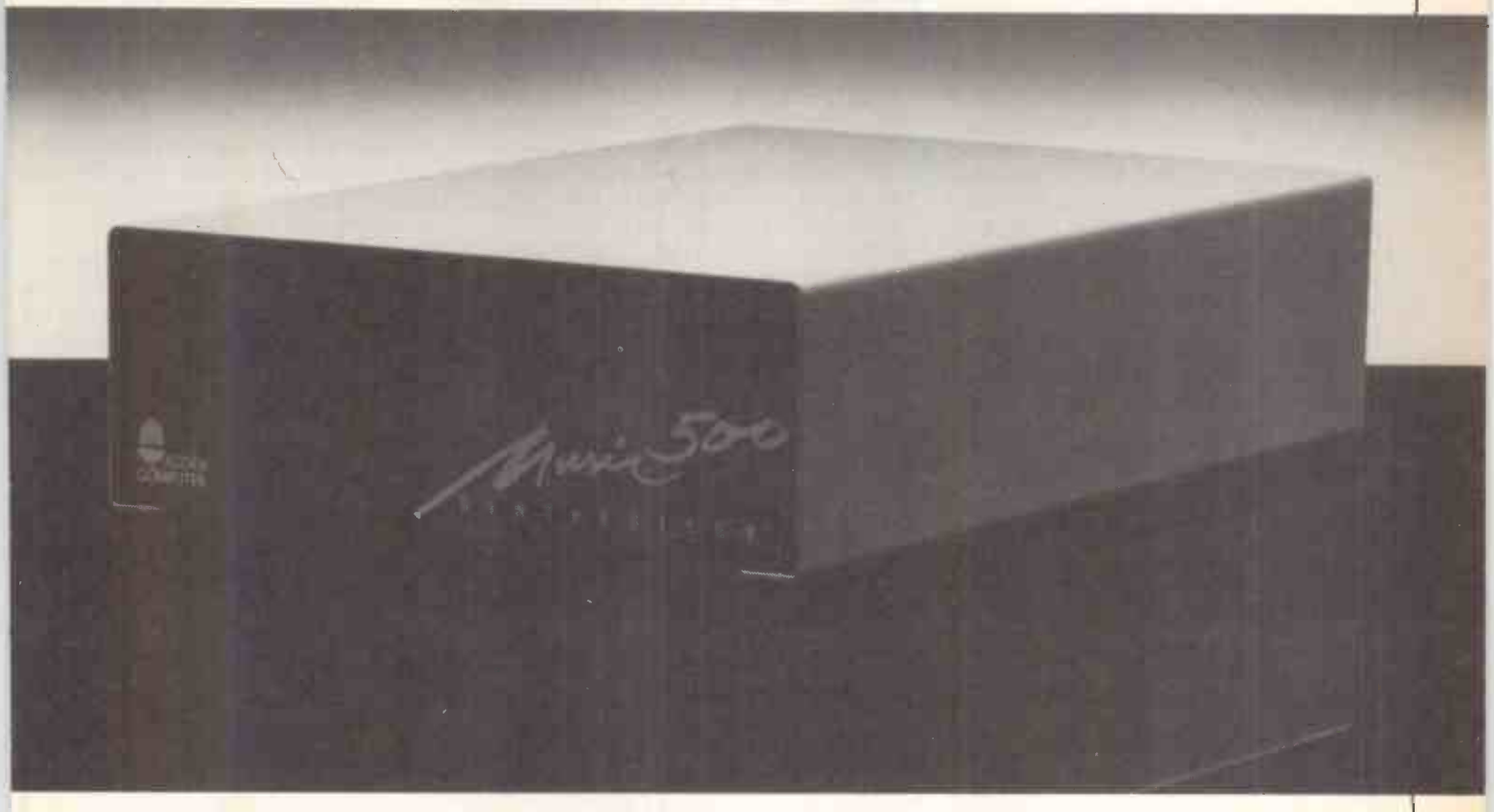
Acorn must have a winner here. The price is right, the quality of sound is simply superb, and AMPLE is the bee's knees.

If there's any criticism to be made, it's that getting the best out of the system takes time, and that's especially true when it comes to constructing genuinely new and interesting instruments using the various modulation and envelope options. But like buildings, complex sonic edifices aren't manufactured overnight, so a measure of exploration and experimentation is inevitable. Anyhow, any problems in that direction are overshadowed by the fact that AMPLE offers musicians (at long last) the opportunity to program in a language that's designed for *them* rather than head-bangers, hackers, and the like. And the fact that a music keyboard isn't involved at present may in fact be a blessing in disguise, in that it should encourage users to get the most out of a system that makes a virtue out of positively encouraging continually changing creative directions.

In short, I'm hooked by it. ■

Further information: Hybrid Technology, Unit 3, Robert Davies Court, Nuffield Road, Cambridge, CB4 1TP. ☎ (0223) 316910.

The Acorn music synthesiser will blow your mind. (But at £199, not your savings.)



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I enclose PO/cheque payable to Acorn. Or charge my credit card.

Card Number_____
Amex/Diners/Visa/Access (delete)

Name_____

Address_____

Postcode_____

ACORN COMPUTER Signature_____

EM12

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BeeBMIDI 5

The second of two articles in which we look in detail at how to receive data from MIDI In. Last month was the theory half – this month is the practical. *Jay Chapman*

Last month I discussed in detail the sort of problems that can arise if data is lost during real-time input from MIDI In. The obvious solution to the problem would seem to be the use of interrupts, but as that first article explained, if interrupts are masked out for too long, our own interrupt may be ignored for such a length of time that data is still lost. So, how can we use interrupts *and* ensure that all the data arrives and is safely stored?

Perhaps the most obvious solution, and certainly the simplest, is to avoid the interrupt masking problem and the use of interrupts altogether. The reason we considered interrupts at all was that testing the ACIA status register from our MIDI program can be interrupted by all the background processing that the BBC Micro is doing on our behalf (eg. incrementing the TIME pseudo-function value). If you don't mind this processing not being done, you can stop it – and thereby ensure that your MIDI program has the micro's full attention – by 'masking out', or disabling, the interrupts that are responsible.

The author's own MIDI software makes use of interrupt facilities for several MIDI-related background functions. For example, a VIA timer is used to count through the MIDI clock time interval and then interrupt to say that another 'tick' has occurred. For this and other reasons, the normal interrupts should *not* be semi-permanently masked out, so NMI interrupts are employed instead to guarantee response.

If you want to take the easy way out – and it does let you get away with writing very little assembly code – then you should disable interrupts (meaning IRQs, but not NMIs) at the start of your real-time input routine and enable them again at its end. You can do this with two routines that are CALL-able from BASIC, and these are shown in Table 1. You can assemble the two routines into a suitable area of memory (the user character buffer &C00 is assumed in the Table – if this is already in use you could always reserve space with a DIM statement) using the BBC's built-in assembler. If the routines are stored at location &C00, then CALL &C00 will 'mask out' IRQs and CALL &C02 will re-enable them. If you 'bracket' your real-time input code with a disable CALL at its start and an enable CALL at its end, your response problems will be dealt with at a stroke.

Overview

The use of interrupts may well be the most complex thing you've yet attempted on your BBC micro. In just a few pages, I can't possibly teach you all you need to know on this subject and seriously recommend that you beg, borrow or buy a copy of the Advanced User Guide, which will broaden your horizons considerably!

Anyway, what do we have to do to use interrupts to deal with MIDI In?

Well, first we have to write a routine that will be invoked when the relevant interrupt occurs: this is our 'interrupt handler'. This routine must check that the interrupt has been caused due to a byte arriving *via* MIDI In and put the byte somewhere safe so that the real-time input routine can pick it up at a convenient moment. The interrupt that spurred the routine into action must be turned off so that we don't attempt to deal with it twice, and the interrupt handler must then exit gracefully so that the code it interrupted is not disrupted in any way.

Second, we need somehow to connect the interrupt handler to the hardware interrupt mechanism so that the code will be invoked when the interrupt occurs. Since it's likely that other interrupt handlers are already connected, we've got to ensure we don't disconnect them when we connect our routine. Even worse, there's also a risk of our leaving nothing connected at all! Since the disk and econet systems both use NMI, we could end up with quite a mess if we're not careful.

Third, we need to arrange some foolproof means of communication between the interrupt handler and the main program. Without interrupts, all the programming we've done so far has been serial. Do this, then this and then that, in other words. With interrupts, we're dealing with (apparently) concurrent, asynchronous activities – which means that, in general, we have to be very careful where two

Table 1.

```
.disable        sei     \ disable IRQ's         (&C00)
                rts     \ return from CALL      (&C01)

.enable         cli     \ enable IRQ's          (&C02)
                rts     \ return from CALL      (&C03)
```

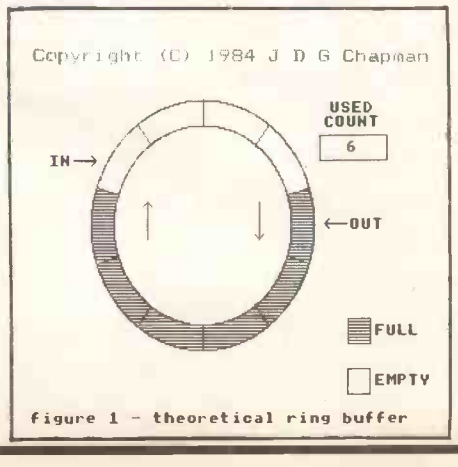

figure 1 - theoretical ring buffer

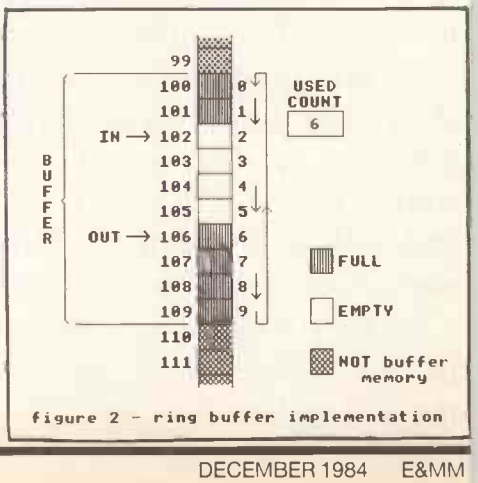

figure 2 - ring buffer implementation

pieces of code might be changing the same memory location 'at the same time'. This problem is unfortunately too complex for me to discuss in detail here, and in fact the nature of our specific problem deals with it quite naturally anyway.

Buffer in Theory

Whether you use IRQ or NMI interrupts, you need to arrange for each incoming byte to be kept safe until your main program can pick it up. Now, it may well be that more than one byte arrives – and is safely gathered in by the interrupt handler before your main program can turn its attention to incoming bytes. It is not sufficient, therefore, to have one 'safe' location in which to leave an incoming byte: you may need to deal with a second byte, and perhaps a third, or even a fourth . . .

To deal with this problem we use a circular or ring buffer. Figure 1 shows what such a buffer looks like in theory, while Figure 2 shows how it's actually implemented in practice. There are two pointers associated with the buffer. The input pointer (In) points to the first empty location: this is where the next byte received will be put. The output pointer (Out) points to the buffer location containing the oldest buffered byte, ie. the byte that arrived first out of those currently buffered. We also keep track of how many bytes are currently stored in the butter in the 'used count' location.

Every time there is a Receive Register Full interrupt from the 6850, we pick up the byte received, store it where directed by In, and move In on to point at the next free location: we must also increment the count, of course. Whenever our real-time input routine is ready to deal with a new byte, we check that the count is greater than zero to make sure that at least one byte has been received. If one has been received, we pick up the byte pointed to by Out, move Out on to point at the next used location, and decrement the used count.

If the used count is zero, In and Out will actually point at the same ring buffer location, but that in itself causes no problems since we will not try to pick up an Out byte after checking the count. If too many bytes come in too quickly, we may lose bytes because the buffer 'overflows' – you try storing 11 bytes!

The solution to this problem is to make the buffer so large that the real-time input routine *always* has time to catch up. I make mine 256 bytes long, but if your MIDI input routine gets that far behind, you've probably switched the computer off anyway!

Buffer in Practice

Seeing as we haven't got any suitably circular memory chips readily to hand, we've got to make do with ordinary RAM to make our ring buffer. Figure 2 shows that we simply take a section of RAM (locations 100 to 109 in the diagram) and create the circularity we require by manipulation of the buffer In and Out pointers. When we increment a pointer, we check whether it has gone off the end of the buffer, and if it has, reset it to the start.

My own software uses the 256-byte block of memory from &C00 to &CFF as the ring buffer. Using 256 bytes has the advantage that when I increment the counter location, which is one byte in memory, it automatically 'wraps round' from 255 (&FF) to 0 (&00), which gives the necessary circularity without any further effort on my part. If you use a different-sized buffer, you'll have to do a little more work.

It's worth mentioning that if you intend writing a lot of assembler code, the BBC's own assembler can become a limiting factor in that both the source and the assembled code need to fit into memory at the same time. If you use a full 80-column line in order to give each assembler instruction a descriptive comment, you can run out of memory all too quickly. You're stuck with the BASIC editor rather than a word processor, though in fairness there are ways around this.

Now, the VASM disk-to-disk assembler allows you to prepare source files (with View in my own case: Wordwise and other editors would also work), and there are other facilities which could also prove very useful. If you can't afford the Acorn Assembler Development System (which is another solution to the same problem but needs a 6502 2nd processor) then VASM might not be a bad idea. For more details on the system, contact VIDA REBUS, PO Box 256, Watford WD1 8HY.

Interrupt Handler

Figure 3 shows the interrupt-handling routine. Ignore the first three instructions for the moment – we'll come back to them when we consider how to connect the routine to the hardware interrupt mechanism.

Before we do anything, we must be sure that the interrupt that invoked this piece of code is actually the one we're interested in! To do this we get and then check the contents of the 6850's status register. If bit 7, the IRQ bit, is set (ie. is 1) to say that the 6850 is interrupting, then the bmi (branch on minus) instruction's condition is true. This is so because the status register with bit 7 on is negative when considered as a 2's compliment binary number. The bmi therefore causes execution to continue at the label '1%' if the 6850 interrupted, and to exit *via* the jump &D03 otherwise (this will be explained later). '1%' is a VASM local label – if you're using the BBC's assembler, substitute an ordinary one.

If we arrive at the label 1% we know that the interrupt was for us, so we pick up the byte in the receive register (1da Rxreg) and store it in the first free location in the ring buffer pointed to by rxbufIN (ldy rxbufIN; sta rxbuf,y). We then incre- ▷

```
\-------------------------------------------------------------------------\
\ RXINT          MIDI IN (6850) NMI Interrupt Routine.                  \
\-------------------------------------------------------------------------\
\ Description    RXINT receives and buffers a MIDI IN byte and correctly \
\                maintains the ring buffer input pointer and counter.   \
\                                                                       \
\ Note:          RXINT is connected into the NMI service routine at &D00 \
\                by the main program initialisation code.               \
\-------------------------------------------------------------------------\
\ Registers      IN                 None.                               \
\                OUT                None.                               \
\                DESTROYS           None.                               \
\                                                                       \
\ Global         rxbuf, rxbufin, rxbufcnt.                              \
\-------------------------------------------------------------------------\

.rxint           pha                \ do register store that was at &D00
                 tya                \ these 3 bytes were over-written by our

                 pha                \ inserted instruction 'jmp rxint'


                 lda statreg        \ have we had a MIDI IN interrupt
                 bmi 1%             \ yes - deal with it
                 jmp &D03           \ no - goto untouched part of NMI routine

\ note - all checks (e.g. space left, overrun error) have been removed
\     for the sake of simplicity

1%               lda Rxreg          \ get the MIDI IN byte (clears interrupt)
                 ldy rxbufIN        \ point to next free buffer location
                 sta rxbuf,y        \ and put it into the buffer
                 inc rxbufIN        \ advance the IN pointer
                 inc rxbufCNT       \ count one more byte in
                 pla                \ restore the registers we saved in reverse
                 tay                \ order because they were stacked
                 pla
                 rti                \ rti not rts (this was an interrupt)
```

figure 3 - Interrupt Handler code.

ment rxbufIN to point to the new 'first free' location (inc rxbufIN) and increment the count (inc rxbufCNT). Note that this is done last so that at no time does the count say there are more bytes in the buffer than we've actually stored.

Main Program

Having got the bytes coming into the buffer, it's not difficult to see how the main program (in my case the real-time input routine) picks these bytes up. Figure 4 shows typical code to do the job.

We check the buffer count and branch to the pick up code if it is not zero (1da rxbufCNT; bne 1%). If it *is* zero, we continue with the various 'housekeeping' chores (jmp loop). We point to and then pick up the first of the buffered bytes (1dx rxbufOUT; 1da rxbuf,x) and then move the Out pointer on (inc rxbufOUT) and decrement the used count (dec rxbufCNT). We now have the received byte in the accumulator and can deal with it at our leisure, happy in the knowledge that the interrupt routine will safely gather in any byte that might arrive at some inconvenient moment. Provided we don't take so long that the buffer overflows, that is.

How do we connect the interrupt handler routine to the hardware interrupt mechanism and BeeBMIDI? Well, whatever you do, don't forget to connect the NNMI link (x–z) on the BeeBMIDI board as shown last month.

When an interrupt occurs, the BBC micro automatically starts executing code held at a particular place in memory. To cut a long story *very* short, the address that execution starts at for the NMI interrupt is &D00. What we want to do is somehow insert a 'hook' into this code so that our NMI interrupt is also dealt with. There are official ways to claim the NMI interrupt facility, but these are only available from ROM-based software, so we have to improvise!

Figure 5 shows the code that needs to be run to insert our 'hook'. Before writing this code, I disassembled the first few bytes held from &D00 onwards. The job in hand was to insert the code for 'jmp rxint' at &D00 so that whenever an NMI occurred, the interrupt handler will be executed. Since 'jmp rxint' takes up 3 bytes, the first three bytes of the existing &D00 routine had to be replaced. And as the first three bytes (pha;tya;pha on my Watford DFS disk-based system) are all single-byte instructions, they could be moved without difficulty. If any multi-byte instructions had been involved, I would have had to be careful always to move complete instructions.

Looking back at Figure 3, you can now see the reason for the first three instructions which we ignored earlier. They are the ones we've replaced by 'jmp rxint'. The pha;tya;pha sequence saves the accumulator, while Y registers on the stack so that the NMI routine can use these registers for its own purposes *without* overwriting, and thereby losing, the values the interrupted program had in them.

When we exit from our part of the NMI routine we must, of course, restore these saved register values. This is the purpose of the pla;tay;pla sequence of instructions just before the rti instruction that causes the interrupted code to be executed again from where it was stopped.

If the NMI interrupt turns out not to be for us, we do a 'jmp &D03' which runs the original NMI code to deal with the disk or econet. You should remove the hook from the NMI code when you're not using a BeeBMIDI board, as well as resetting the 6850 by writing a 3 into the control register (or simply turning its power off). If you don't – and if the 6850 is left with an interrupt pending (because your MIDI software crashes, for example) – you'll find your disks won't work properly.

6850 Interrupts

Having made the hardware/software connection, we must finally configure the 6850 ACIA on the BeeBMIDI board so that it uses interrupts. In the past, we've used the 'Receive Register Full' bit in the status register to check if a byte has arrived. We still use it (as a confirmation that we know what's going on – we still need to check the status register for errors anyway), but we also ask the 6850 to interrupt whenever the Receive Register Full event occurs. The configuration is accomplished by the (1da #&95; sta ctrlreg) code shown in Figure 5. ■

```
\-------------------------------------------------------------------\
\ Check if any bytes have arrived on MIDI in.                       \
\-------------------------------------------------------------------\

                lda rxbufCNT    \ see if counter > 0
                bne 1%          \ yep - at least one byte HAS arrived
                jmp loop        \ byte NOT arrived - go round again

\-------------------------------------------------------------------\
\ MIDI IN byte HAS arrived.                                         \
\-------------------------------------------------------------------\

1%              ldx rxbufOUT    \ point to next received byte
                lda rxbuf,x     \ get the MIDI IN byte
                inc rxbufOUT    \ move buffer out pointer on
                dec rxbufCNT    \ since we've just used one


          figure 4 - main program buffer communication code
```

figure 5 - initialisation and finalisation code

```
\---------------\
\ INITIALISATION \
\---------------\---------------------------------------------------\
\ Connect the BeeBMIDI 6850 ACIA Rx Interrupt Routine into NMI code.  \
\-------------------------------------------------------------------\

                lda #&4C        \ &4C is the opcode for JMP
                sta &D00        \ overwrite first 3 bytes of NMI code
                                \ with 'jmp rxint'
                lda #rxint and &FF\ low byte of address first
                sta &D01

                lda #rxint shr 8\ then high byte of address
                sta &D02        \ (shr = shift right)

\-------------------------------------------------------------------\
\ Configure ACIA (to include interrupt on Receive Register Full     \
\-------------------------------------------------------------------\

                lda #&03        \ Reset the 6850 by writing a 3 into
                sta ctrlreg     \ its control register

                lda #&95        \ Configure the ACIA to include
                sta ctrlreg     \ interrupts on Receive Register Full

\===================================================================\

\---------------\
\ FINALISATION \
\---------------\---------------------------------------------------\
\ Tidy up - set the NMI code back to what it was originally.        \
\-------------------------------------------------------------------\

                lda #&48        \ restore original NMI contents - pha
                sta &D00        \ ('peeked' before writing code!)

                lda #&98        \ tya
                sta &D01

                lda #&48        \ pha
                sta &D02

\-------------------------------------------------------------------\
\ Reset ACIA to avoid a permanent NMI ...                           \
\-------------------------------------------------------------------\

                lda #&03
                sta ctrlreg
```

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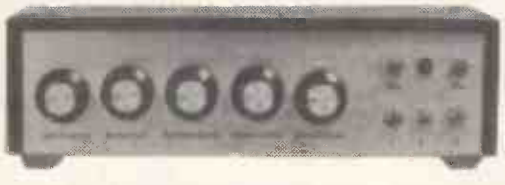

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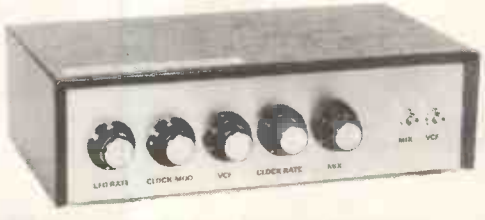

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EmmSoft has taken under its wing both past micro-based projects and will include future E&MM software developments. The following guide summarises the EmmSoft projects for which printed circuit boards and software packages are available, and this will be updated every other month. All prices quoted are inclusive of VAT and postage and packing – please allow 28 days for delivery. Send your order, with payment in sterling cheque, postal order or bankers' draft payable to Music Maker Publications, to ***EmmSoft,* E&MM, Alexander House, 1 Milton Road, Cambridge, CB4 1UY.**

MicroMIDI *May 83*

A single-board serial interface that will link any MIDI synth to the Sinclair Spectrum microcomputer. Features include three parallel I/O ports, crystal-controlled data transfer, and opto-coupled output.

The PCB is available from EmmSoft at £4.25.

MicroMIDI II *July 84*

A revised, simpler version of MicroMIDI was published subsequently which incorporated the same facilities with the exception of the three parallel I/O ports.

The PCB is available from EmmSoft at £4.25.

As part of the 'Spectrum MIDI' article in E&MM July 84, two software programs were published – a SixTrak Patch Dump and DX7 MIDI Dump – both of which will run on either version of MicroMIDI.

A cassette containing an expanded version of Steve Parr's DX7 MIDI Dump program (including a short sequencing routine) can be obtained from SDS, 18 Cambalt Road, London, SW15 6EW, for £5.95 including postage and VAT.

OMDAC *June 83*

The OMDAC, when used in conjunction with a Z80-based microprocessor, will provide eight sets of gate, trigger and control voltages compatible with most one-volt-per-octave synthesisers.

A 'Patch Change' program for the Spectrum was published in E&MM September 84, while the second OMDAC Update (E&MM October 84) enables the hardware to be modified to run on the BBC microcomputer. Further OMDAC software is in the pipeline (see also 'Drum Sequencer', E&MM November 84).

BeeBMIDI *June & July 84*

A MIDI interface for the BBC Model B microcomputer, Part 1 of BeeBMIDI contained the technological and constructional details, while Part 2 continued with a full parts list and some MIDI software routines. The PCB is available from EmmSoft at £4.95.

BeeBMIDI Software *August 84*

A full listing of a comprehensive dump program written in BBC BASIC and 6502 Assembler for the Yamaha DX7, with the software also available on cassette (for the sore-fingered) from EmmSoft, price £7.95.

Further software for BeeBMIDI is currently under development. This will include voice dump and MIDI polyphonic sequencing programs.

Drum Sequencer *November 84*

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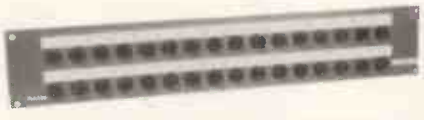

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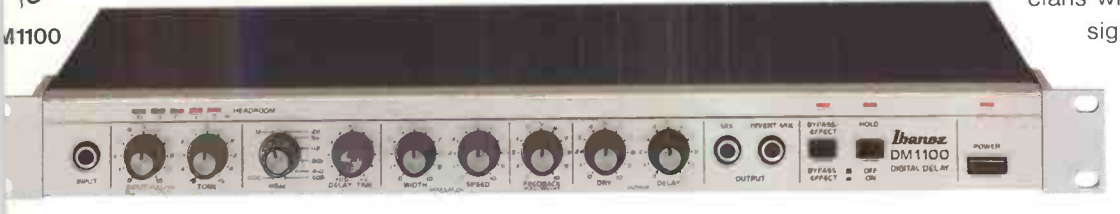

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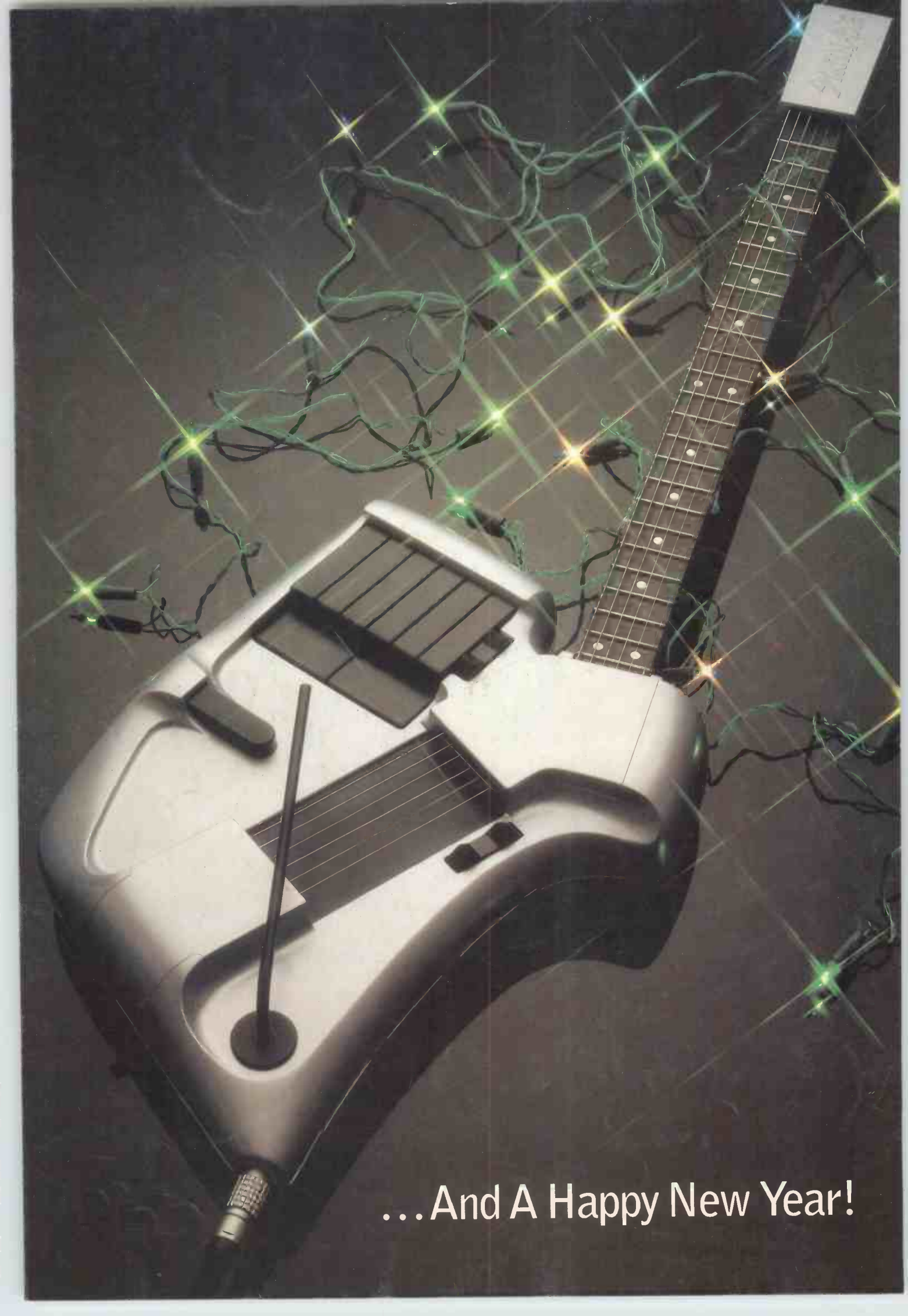
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