Electronics &
Music Maker
INCORPORATING COMPUTER MUSICIAN
APRIL 1984 95p

BRIAN CHATTON ON THE POLY 800

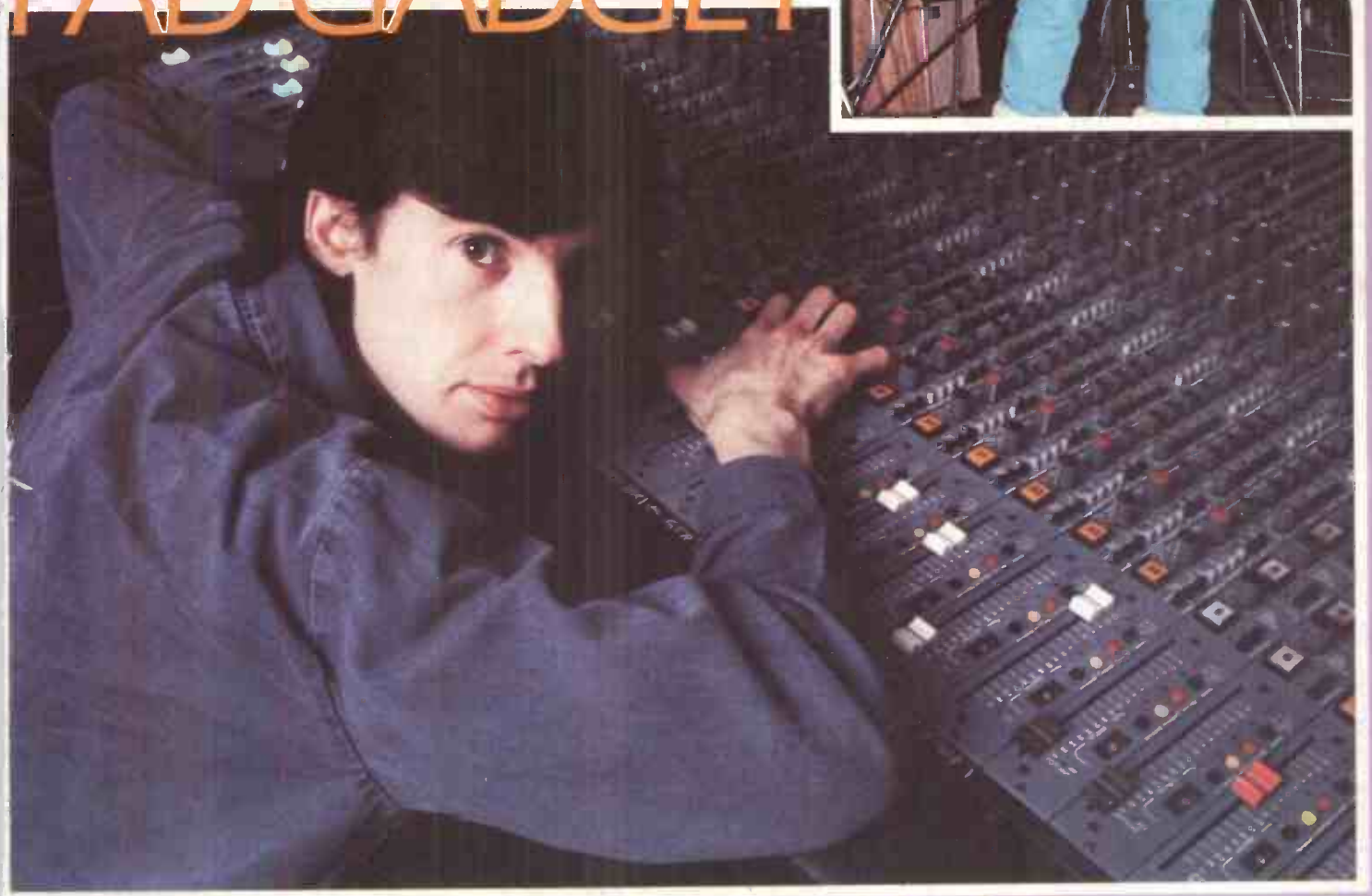
WARREN CANN ON THE NEW SIMMONS KITS

IAN BODDY ON THE JUPITER 6

REVIEWS

ROLAND TR909 & MSQ-700
CRUMAR COMPOSER
IBANEZ MULTI-EFFECTS
KLONE DUAL PERCUSSION SYNTH
VOX WHITE SHADOW BASS

FAD GADGET



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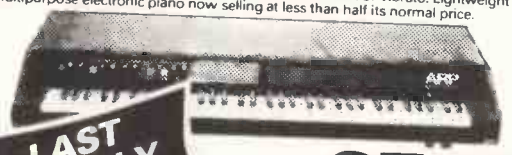

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Electronics & Music Maker

April 1984 Volume 4 Number 2

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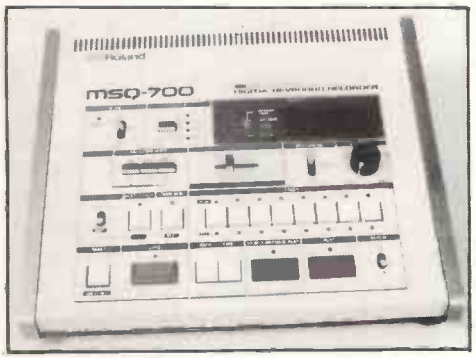

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Corrigendum
Due to circumstances beyond our control, the circuit diagrams for Paul White's two mini-projects in E&MM March were transposed. Readers should note that the diagram accompanying the Lead Checker text in fact refers to the S-trigger converter, and vice versa. We apologise for any misunderstanding that might have occurred as a result of this error.

The Means to Communicate

Most readers will be well aware that the subject-matter covered by E&MM in its editorial pages is extremely wide-ranging. Our field is by its very nature a very diverse one and, of course, the magazine's editorial coverage must to some extent reflect that diversity, with features and articles on a variety of different topics which (we hope) give most of our readers more than enough useful reading material to last them until the next issue appears on the bookstalls.

Finding one single concept that embodies E&MM's field of coverage is difficult, but if there is a single word that best sums up what we are trying to do, then that word must be 'communication'.

Through the pages of E&MM, well-known and respected musicians pass on tips to readers as well as giving some insight into how their careers have progressed; new electronic music hardware is assessed and evaluated from both a musician's and a technician's viewpoint; the latest developments in computer music are reported; and practical do-it-yourself circuits are provided for the electronics-conscious. Every editorial page of the magazine communicates a message of some sort.

When you think about it, any periodical that seeks to provide its readers with information of some kind must be playing a part in the communication process, but what is particularly important to us is that the communication does not occur simply in the one direction.

Reader feedback on published features is in some ways more important than the features themselves, because without it, the exchange of information would be only one-way – that's one very good reason why the Readers' Letters page will always be an essential part of E&MM.

Taking the same process one stage further, the magazine is also an ideal medium for the exchange of information between readers. *Patchwork* is a case in point: a simple enough idea that's already managed to generate a quite unprecedented amount of interest on the part of musicians and synth manufacturers alike.

Yet the content of *Patchwork* is dictated almost entirely by what readers contribute, and indeed there's no reason why other articles (whether of a general or a specific nature) shouldn't be contributed by readers in addition to professional writers and reviewers, since any information that's been of use to one reader will almost certainly be of interest to others.

So if you've written (or have contemplated writing) an article on a subject you feel might be of interest to fellow-readers, don't hesitate to send it in to us for possible inclusion in a forthcoming issue of the magazine. All authors of features accepted for publication will of course receive generous remuneration, and we'll consider articles on any topic regularly covered in the magazine, plus one or two that aren't!

Don't forget, E&MM is here for the benefit of everybody involved in electronic music, and it's through the medium of its pages that readers can exchange ideas, thoughts, tips, and techniques – to keep the level of communication rising, and to help the electronic music movement grow from strength to strength.

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YAMAHA DX-9, 20 Memories	Phone
KORG Poly-61, 64 Memories	£725
ROLAND JX-3P, 32 Memories	£695
KORG POLY-800, 64 Memories	Phone

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KORG MONO/POLY	£499
YAMAHA CE-20	£499
KORG SAS-20 with compu-magic	£485
KORG LAMBDA	£399
YAMAHA SK-15, Organ/Strings	£325
ROLAND RS-09, Strings	£325
EKO EM-10, Auto accompaniment	£295

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MOOG SOURCE	£549
KAWAI-TEISCO-110F	£375
YAMAHA CS-30, With Sequencer	£299
ROLAND MC-202	£289
ROLAND SH101, With Modulator Grip	£249
SHARP MUSIC PROCESSOR, Radio/Cassette	£199
ROLAND SH2000, Pre-Set	£199
ROLAND SH-3A	£199
ARP Pro DGX, Pre-Set	£195
MOOG ROGUE, Twin Oscillator	£189
ROLAND SH09	£149
MOOG PRODIGY	£149
JEN, SX-1000	£139
EKO-P15	£125
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KORG EPS-1, with String Ensemble	£895
YAMAHA PF-15	Phone
YAMAHA CP-35, Stage Piano	£799
KORG 80-S, With String Ensemble	£795
KORG 80, Symphonic	£649
YAMAHA PF-10	Phone
YAMAHA CP-30, Stage Piano	£599
YAMAHA CP-25, Stage Piano	£595
ROLAND HP 70	£435
FENDER RHODES MK II	£399
ROLAND HP 60	£359
WURLITZER EP-200	£325
YAMAHA CP-11	£285
ROLAND HP-30	£219
HOHNER CLAVINET D6	£125
ELKA PIANO	£125

SEQUENCERS

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ROLAND JSQ 60, 2,500 notes	Phone
ROLAND MC-202, 2,600 notes	£289
ROLAND CSQ-600, 600 notes	£199
ROLAND TB-303, Bass Line	£199
ROLAND CSQ-100, 168 notes	£125

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CASIO CT 1000	£295
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CASIO CT 101	£169
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CASIO PT-30, with Memory	£69
CASIO PT-20 with Memory	£49

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MT-35 Budget Model	£79

Phone for delivery dates on these New Models

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YAMAHA RB-30 Patchbay/Rack	£129
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IBANEZ DM-500	£245
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BOSS OD-1 Overdrive	£43
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BOSS TW-1 Touch-Wah	£48
BOSS DM-2 Delay	£79
BOSS OC-2 Octaver	£47
BOSS VB-2 Vibrato	£52
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BOSS SP-1 Spectrum	£29
IBANEZ AD-9 Delay	£89
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LOCO ANG-10 Noise Gate	£39
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BOSS PC-2 Percussion Synth.	Phone
AMDEK PCK-100 Percussion Synth.	£49
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MPC. Music Percussion Computer	£539
ROLAND TR 808	£499
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KORG KPR-77 New Low Price	£285
ROLAND TR 606	£189
SOUNDMASTER Stix	£115
BOSS New DR-110	Phone
MATTEL Synsonics with Memory	£99
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AMDEK RMK-100 Assembled	£59
SOUNDMASTER SR-88	£59

NON-PROGRAMMABLE

KORG KR 55B, 96 Rhythms	£299
ROLAND CR 5000	£235
MPC. The Kit	£145
YAMAHA MR-10	£85
SOUNDMASTER Latin Rhythms	£79
ELECTRO-HARMONIX DRM-16	£49
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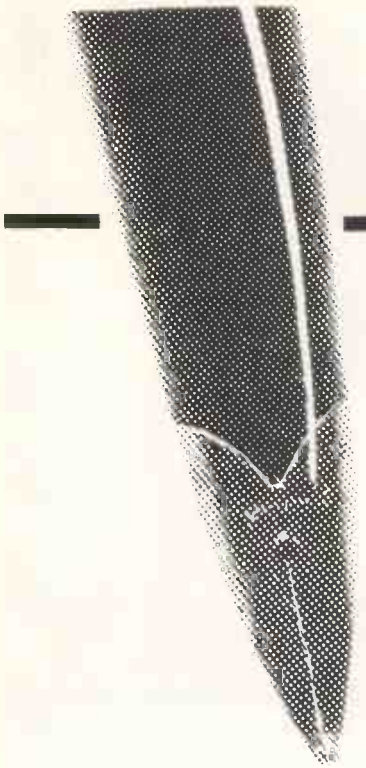

READERS' LETTERS

Send to: Readers' Letters, Electronics & Music Maker
Alexander House, 1 Milton Road, Cambridge CB4 1UY

Keyboard Amp

Dear E&MM,

I am a keyboard-player and request your advice concerning amplification. At present my keyboard set-up is a Fender Rhodes and a Prophet 600, but there is the possibility that I might buy a DX7 and then exchange the Rhodes for a Yamaha PF10 or 15.

Until recently I used a Peavey Deuce amp which I found to be a good amplifier, but it's really designed for guitarists. I have now purchased a Roland Cube 60K; the sound quality is very good but it just isn't powerful enough. What would you suggest? I am willing to pay for something of quality, possibly a separate amp and speaker.

Paul Diss-Holland
Croydon
Surrey

As you intend to update your keyboard set-up and no doubt purchase additional instruments in the future, we would recommend you go straight for a separate mixer, amp and speaker system. This form of system would give the maximum of flexibility as well as high sound quality.

A small six-channel mixer with echo send facilities would give you total control over your sounds and allow you to add effects. Add to this a good power amp – 100 watts or more – and feed the whole sound through a good speaker system. The speaker cabinet should contain separate drivers for at least bass and treble, and preferably mid-range as well.

Check out the following equipment: Roland PA-250 stereo mixer amp, Yamaha EM-150 and 200 mixer amps, Korg KMX-8 compact mixer. Separate power amps are numerous; they're made by Carlsbro, HH, ACES, and Roland, to name but four: are all worth considering. Speaker systems are even thicker on the ground. The best place to start is in your local rock shop: look at the names you have heard of before the shop assistant convinces you otherwise. The main point to remember is that if you intend to gig with the system, make sure that it's not too big to carry around and that it's of strong construction.

DX Owners' Club

Dear E&MM,

Having purchased a DX7 in October and spent innumerable hours programming and playing the instrument, the thought crossed my mind that what's missing is a 'DX Owners' Club'. I contacted Kemble Yamaha on the subject and spoke to Martin Tennant, who agreed that it would be a good idea and mentioned that several other people had also asked about such a club. Due to lack of staff and time, Yamaha themselves are unable to run such a club, but would help any individual who took it upon himself to do so.

To this end I have decided to set up a non-profit making 'DX Owners' Club' with the following aims:

1 To build up a register of all DX owners.
2 To build up a bank of voice data from club-member input and distribute that information.
3 Advise owners on how best to achieve a particular sound by referring to the 'voice bank' and Martin Tennant/Dave Bristow of Kemble Yamaha.
4 Help new DX owners by putting them in touch with 'experts' in their vicinity, arranging 'teach-in' sessions and so on.
5 Put DX owners in contact with each other to increase the exchange of information and musical awareness.
6 Circulate details of DX-associated products, eg. computer interfaces.
7 Arrange, in conjunction with Kemble Yamaha and dealers, demonstrations of new Yamaha equipment to club members.

DX owners who are interested in joining the club should forward a cheque/postal order for £1.00 (membership and printing costs) made payable to 'DX Owners' Club' together with a large SAE and the following details:

1 Full name, address and telephone number.
2 Age.
3 Which keyboard and where purchased.
4 Other equipment used with the DX (computers, other instruments, etc.)
5 Musical influences and favourite artists.
6 Musical status; pro, semi-pro, or amateur.
7 Whether you would be willing to help other DX owners program their machines.

For the investment of £1, you will receive a DX Owners' Club card, five new sounds to program and five blank patch sheets with which to forward your programs.

It is hoped that some well-known professional users of DXs (such as Howard Jones, Steve Gray, Vince Clarke) will join and be willing to exchange information.

Tony Wride
28 Balk Top
RAF Disforth
Thirsk
North Yorkshire

E&MM is very pleased to announce this news. We shall be giving our full support to the new Club and wish it the best of luck. Club news and events will be featured in the pages of E&MM together with acknowledgement of DX Owners' patches in our Patchwork *series.*

Drum Kits

Dear E&MM,

Help! I wish to build a modular programmable drum synth; it would consist of lots of E&MM Synbol and Syntom kits and would be programmed by the Electric Drummer (E&MM project 1981). Question: is the MPC board used in this project still available, and if so where can I obtain the parts?

S. Francis
Old Harlow
Essex

The Electric Drummer project you refer to was produced when E&MM was based in Southend-on-Sea and owned by Maplin Electronics. To our knowledge the project is not available in kit form, though it may be worth contacting Maplin to enquire about the PCB. All components should be available from most good electronics shops and indeed Maplin themselves.

On the subject of drum-machine projects, you should take a look at the new digital sampled drum project, Syndrom, in this issue. Perhaps you should consider building this project as it represents an up to the minute design incorporating great flexibility both in its use and modular construction.
Maplin Electronics, PO Box 3, Rayleigh, Essex Tel (0702) 552911.

Address Sense

Dear E&MM,

A thought has struck me. Numerous letters have appeared in the six months or so I've been reading your magazine in which people espouse the cause of co-operation and communication, or have a specific and complex problem which the staff are not able to devote a lot of time to.

I suspect that most readers are friendly and interested people who would willingly enter into correspondence on the problem they felt they could help with, or a project they would like to participate in. So why not print full addresses at the bottom of the readers' letters? Like newspapers you could give people the option of having their address withheld or abbreviated; I hope you'll give it some thought.

Anyway, having seen the March issue cover, I'm off to the barbers!

Michael Savage
51 Manor Drive
Upton
Wirral
Merseyside

When Joe Soap wrote to let the world know about his latest Fairlight residing in his fully-equipped home 16-track studio, we printed his address and lo and behold, the next week he was filing an insurance claim because somebody had nicked all his gear.

E&MM is happy to act as a go-between. Therefore, those people who are genuinely interested in responding to a reader's letter should do so via our office where letters will be re-directed to the person in question. We feel this to be the best solution for all concerned, though for an alternative system for exchange of information, see this month's Editorial Comment.

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DIGITAL RHYTHM COMPOSER + MIDI & TAPE SYNC

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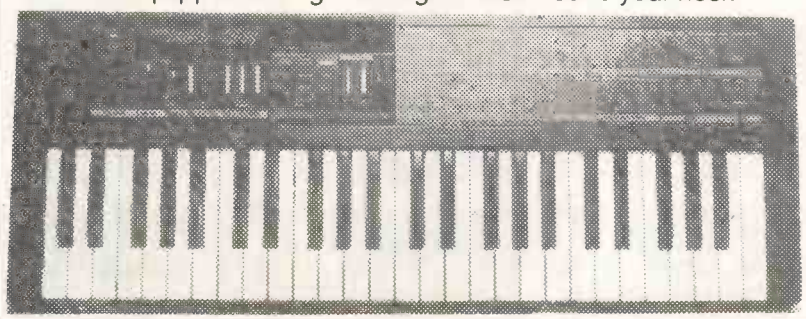
The final drum mix need never go onto the multi-track, each voice is fed through the mixer with independent E.Q. onto the master machine in time with the other tracks.

PLEASE 'PHONE FOR MORE INFO

KORG POLY 800

Fabulous new digital poly-programmable synth from Korg
Midi equipped and light enough to wear round your neck



BOSS DE-200

DE-200 DIGITAL DELAY BY BOSS

This excellent rack mountable delay line has the unique facility of trigger in on hold, enabling you to digitally sample an acoustic sound via a microphone, achieve a continuous repeat via the hold, then run in time with a sequencer/ drum machine via the trigger in. A must for the home recordist.

BOSS DR-110

DR Rhythm Graphic. Programmable rhythm composer with graphics, hand claps, expanded memory and the ability to chain-up.

ROLAND–ROLAND–ROLAND

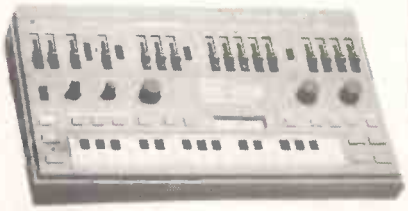
Roland Demonstration of their new equipment on Stand 48 Ideal Home Exhibition Preston Guildhall

Thurs. 29 March 12 noon–9 pm

ROLAND–ROLAND–ROLAND

ROLAND MC 202

2 Channel composer with 2600 note memory and three methods of loading. Built-in synth will sync to TR 606–TB 303–SH 101 etc. etc.



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In fact, you will have to invest something in the region of £2,300 in the new Bose sound system.

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A system that comfortably handles up to 500 watts of programme material.

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Birkenhead	Hammersound	051-652-7474
Birmingham	Hocken Sound	021-459-4242
Birmingham	Music Box	021-373-3701
Blackpool	Stardream	0253-32271
Bradford	Shipley Dial	0274-733828
Bristol	Guitar Workshop	0272-742675
Bromley	Michael Stevens	01-464 4157
Bromley	Prospersound	01-290 0343
Buckley	Apple Sound	0244-542671
Coventry	Coventry Sound Services	0203-453117
Doncaster	Music Ground	0302-20186
Dunfermline	Sound Control	0383-733353
Edinburgh	Northern Light	031-553-2383
Enfield	Christian Sound Services	01-363 2337
Epsom	Bootleg	03727-24528
Exeter	Stage Electrics	0392-70498
Glasgow	C.C. Music	041-339-0566
Guildford	Bodley Knose Audio	0483-504868
Hadleigh	Honky Tonk Music	0702-553647
Heywood	Wigwam	0706-68766
Inverness	A.D.T.	0463-225523
Leicester	Carlsbro Sound	0533-24183
Leicester	Roy Parker P.A. Company	0533-833471
Liverpool	Hessys	051-236-1418
London N7	The P.A. Company	01-607 0087
London N19	Gigant Music Ltd.	01-263 6524
London NW1	Myriad A/V Sales	01-380 0191
London SE1	J.W. Parker	01-237 7122
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London SW16	Gigsound	01-769 6496
London W1	Phonogenius	01-437 2676
Maidstone	CTL (Control Technology)	0622-79151
Malvern	C & P Sounds	06845-3607
Manchester	Drinkle & Mann	061-789-4209
Manchester	M.A.C.	061-794-1888
Mansfield	Carlsbro Sound	0623-65163
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Newcastle	Sound Electronics	0632-814248
Newquay	D.R.V.	06373-2804
Northampton	S.I.S.	0604-32965
Nottingham	Carlsbro Sound	0602-581888
Nottingham	N.J.D.	0602-414331
Reading	Orange Disco Centre	0734-589453
Scarborough	Mustang Communications	0723-582555
Sheffield	Carlsbro Sound	0742-640000
Shrewsbury	Salop Music	0743-64111
Spalding	Owl Music	0775-69882
Stanmore	National Sound Reproducers	01-951 0222
Stockport	Power Technics	061-431-3508
Stockton	Bandland	0642-605444
Wembley	Rossula Ltd.	01-908 2525
Wigan	M.A. Amplification	0257-426923
Wimbledon	R.G. Jones	01-540 9881
Windsor	Windsor Music	07535-66989
Worthing	Broadway Music	0903-202458
Yeovil	Light Systems	0935-26743

NEW PRODUCTS

Expected on these shores within the next couple of months or so, the **Korg** Super Section PSS-50 is a new programmable rhythm composer and is seen as a valuable assistant for the composition, practice and recording of backing tracks.

The PSS-50 allows you to programme a backing pattern made up from a choice of the following instruments: three types of piano, electric and acoustic guitars, banjo, brass, synthesiser, organ and strings.

An eight-piece drum-kit comprising bass drum, snare, open/closed hi-hat, low/high tom and handclaps concludes the instrument line-up.

The Super Section is divided into two compositional parts, one containing 48 pre-programmed rhythm patterns (disco, reggae, ballad, rock etc.) and the other containing 16 memory locations for user programs. Up to eight songs may be stored internally and played back automatically, and a tape interface allows further song programs to be stored on cassette. All drum sounds are digitally sampled.

Further information from Rose Morris, 32 Gordon House Road, London NW5. Tel: 01-267 5151.

M&A have informed us that recent research has shown that as well as the K2 all-in-one-stand format, there is a need for their Percussion Synth to be available with individual pads.

Custom kits with individual pads are now available, and allow drummers to have any set-up they wish. The user can specify the sounds he requires on the presets and build up a kit comprising up to a total of eight pads and link them to the eight-channel analogue electronics unit.

Details from Magic Music, Unit 13 Industrial Estate, Steeple Road, Mayland, Essex CM3 6AX.

An interesting new loudspeaker design has been announced by **Wilmslow Audio**. It uses four high-power 8" drive units by Peerless of Denmark in an unusual reflex configuration supplemented

VIC EMERSON

There can be little doubt that Vic Emerson is currently one of the UK's most respected keyboard players. From his early days in cabaret to the formation of the 'classical rock' Mandala Band and its subsequent reincarnation into Sad Café, he has been notable for being one of the few synth-players whose playing and programming ability has stood out in the context of a conventional rock band. More recently Emerson has played with 10cc on a number of major concert tours, in which that tradition has continued. E&MM caught up with him as Sad Café made preparations for their mammoth UK farewell tour. . . .

A recent Sad Café publicity shot, with Vic Emerson on the right.

'About fifteen years ago I used to play cabaret, and it was then that I came across one of the forerunners of what we today call a synthesiser: the Selmer Clavioline. I was in a band called Second City Sound, and I had three Claviolines wired-up to a Copicat echo, because the instrument was only monophonic and what I'd done previous to that was use one machine playing arpeggios through the echo unit, to give a vague impression of chords that way.

I think they first introduced the Clavioline in about 1934, so of course it was all valve and had more or less nothing resembling envelope shaping controls. What it did have was very short keys, and because each instrument's keyboard was so tiny, you could stack three of them together neatly and position them under a piano, for example. You could get some beautiful string sounds out of them, and they were once quite easy to find (I got all mine pretty cheaply) though I imagine they'd cost the Earth to buy now.

VCS3

My first 'proper' synth was a VCS3, which looking back on it you could say gave me a crash-course in how a synthesiser works and how you can use it. When you consider the complexity of how one of those things has to be patched up, you'll probably begin to realise that I really had to learn my stuff fairly quickly to keep up with it. It was a tremendous education but, to be honest, not a lot of use in any musical context. I think I used it live once: there were a lot of problems with it but the most obvious one was that every time you tried to change a patch on it, all its internal voltages went up the spout, which wasn't much help.

My first 'live' synth was a Minimoog, which really bore no resemblance to the VCS3 whatsoever. When I first got it I thought "Now Vic, remember everything you've learned, it's got to be in there somewhere," but it wasn't: a lot of my

early work with the Moog was fumbling around in the dark, but one thing that was obvious almost immediately was that it had an absolutely wonderful sound – still to be equalled, in my opinion.

So, if you can imagine it, my keyboard rack consisted then of the three Claviolines laid-out in a row for string sounds, and the Minimoog stacked on top for all the lead stuff. As well as being a pretty much ideal (for the time) set-up for live use, it was also great fun to use in the studio, because playing three string parts on three different instruments meant that you could record, for instance, a violin line panned left, a cello in the centre, and a double-bass line panned right, which sounded astonishing.

I did use quite a lot of other keyboard instruments in addition to synthesisers. For a long while my basic keyboard was a Hammond M100, and later on I acquired a Fender Rhodes and a Clavinet. I also got a Korg 800DV duophonic synth, which really is a delightful instrument. It's got a re-triggering facility that I've used in the push-pull mode to create some complete percussion tracks, sending various things into echo and EQs. You can end up with hi-hat, snare and bass drum, simply using two oscillators. It was pretty good at more conventional sounds as well!

Technique

It was really quite a jolt for me to actually decide to buy a polyphonic synthesiser at all, because I'd developed my playing technique on monosynth to quite a high degree. When it came to doing chords, I'd either played three different octave ranges using the Claviolines, or played two notes on the Korg and overdubbed the third one later on, which meant that the third note became not only the remaining note of the triad but also a completely different line in its own right.

Each polyphonic instrument has its own individual merits and I was fortunate enough to be able to sample each one more or less as it came out.

The Polymoog had some truly great sounds, but with no disrespect to it, I often looked upon it as a sort of highly tunable organ. I did use it on the first 10cc album I did, and it did the job perfectly, but I used their machine – I never dreamed of ever buying one myself.

CS80

The Yamaha CS80 seemed to me to be a much better proposition, because it had so many things going for it. Apart from simply being polyphonic, which was obviously the first thing I was looking for, it also offered touch-sensitivity, which allowed me a far greater degree of expression. As far as I can remember, it was the first electronic keyboard that offered me really usable touch-sensitivity. On a lot of instruments previous to the CS80, you could have velocity-sensitivity but it was really pretty worthless because it wasn't calibrated properly – it wasn't really suited to the way people actually played keyboards.

I used the CS80 extensively for the first time on *Facades*, and the way we worked was that the Yamaha would be in the control room while my old set-up would be in the main studio area, so that if I was working on something new I'd work it out on keyboards that I already knew well, rather than use the CS80 and get bogged down with its extraordinary sound.

I do feel quite strongly that people shouldn't pay too much attention to a particular sound, especially if it's a new one they've just discovered. Quite often you hear instances of that where people have come up with a revolutionary new sound and played a really lazy line, which really is a terrible waste of what that sound could be used for, if only people could be bothered to spend a little time with it. There have been a number of occasions when I've been doing sessions and come up with a sound everybody has liked instantly, and they've said "that's great, just play it like that", and I've had to reply "wait a moment, let me work on what I'm playing first". I do think that to a certain extent you've got to take the tools of your trade for granted.

SAD CAFE

I think the one word that sums-up best what I like about the CS80 is 'subtlety'. The filters really are beautiful – they're the key to the creation of those acoustic-type sounds it's so good at. The touch-sensitivity is very sympathetic to my style of playing. On the other hand, I personally find that the pressure-sensor on the CS80 is a little bit limited, because you've only got one LFO on the whole machine, so you're limited in the different sorts of vibrato you can create.

The shortage of user-programmable presets *is* a problem, and in fact it took me a fair while to reconcile myself to it. I did toy briefly with the idea of having my machine modified in the same way Duncan Mackay had his adjusted, but I never actually got round to it. I've never been in the position of having to open up the preset panel during a live set: I've adjusted things like the keyboard dynamics to suit whatever mood I'm in, but in general I've left the pre-set section alone.

The Chroma

I first came across the Chroma at a London Trade Fair. I'd seen a picture of it in a magazine – so I knew it had a keyboard and a few rather flat-looking switches – and I'd been using it for about ten minutes when the time came to start demonstrating it on the CBS-Fender stand! I think I managed to bluff my way through most of the show, and in time, of course, I got to know the keyboard very well indeed.

I have to admit that initially I was a little bit frustrated with the factory pre-sets, but there were a couple of things on there that actually sounded as if they made use of the Chroma's facilities, as opposed to just sounding like any other polyphonic synthesiser. After I'd read through the manuals two or three times, I became more and more convinced that it was a machine that was well worth following-up, and after a short while I put a couple of my own programs into the memory of the demonstration machine, and lo and behold, I realised that it really was quite an instrument.

Just before I started using the Chroma for artistic purposes as opposed to commercial ones, my keyboard set-up consisted of the Yamaha CS80, a CP70, an ARP 16-voice electronic piano, and a Prophet 5. Because the Chroma arrived when I was already in the middle of a Sad Café tour, I decided that the simplest thing to do was to try to replace the Prophet with the Chroma. It was simply a case of ergonomics – I wanted to see if I could replace every Prophet sound I used with an equivalent one on the Chroma. It took me a week or two to get them all absolutely right, but by the time the tour had ended, I'd managed to reproduce all the sounds of the CS80, too. The Chroma was *that* good.

The next tour I did I used only two instruments – the Chroma and the CP80 Yamaha electric grand. It made me think about whether or not we'd actually ever get to the stage where most keyboard-players require only one synthesiser which'll serve every function they demand of it. Personally, I don't think we're quite there yet – and anyway, there are so many different sorts of players around, no two keyboardists' requirements are going to be identical, so I think the universal electronic keyboard instrument is still some way off.

It depends I think to a large extent on whether you've come to the synthesiser from piano or from organ. I came to it from the organ, but previous to that I'd been playing piano for many years, so a piano sound has always been more or less a necessity for me. On the synth side, I find what I'm looking for is something approaching a console organ in layout, but incorporating both programmability and touch-sensitivity. . . .

Programming

Programming the Chroma can be a very complex process and I find in general it's best to think a new program through for a while before I touch the instrument at all. If I'm trying to transfer a successful program (from the CS80, say) to the Chroma, I'm obviously going to go about loading that sound into the Chroma in much the same way as I loaded it into the Yamaha in the first place. So long as you've got the routing fixed in your mind beforehand, it really is quite difficult to start, say, editing Oscillator B instead of Oscillator A.

There are certain cases when I adopt a "Let's have a fiddle and see what happens" attitude and forget about the thought process altogether, because there's no doubting you can come across some truly magical things when you do that. On the other hand, I do think it's very dangerous for synth players to spend all the time working in that way: you've got to be methodical about things for some of the time.

NEW PRODUCTS

by a bullet tweeter. Power handling is 250 watts RMS and suggested applications are: public address, overhead speakers for disco and side fills on large PA rigs. The speakers are available in kit form at £189.95.

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Monitor Systems Technology have been appointed sole UK distributors of Rauch Precision Power Audio products. MST are a new company set up by ex-HH Head of Sales Jerry Mead. New ranges of products will be introduced throughout 1984, the first of these being the X900/FET power amp. This is an 800-watt MOSFET amp which can be used in mono or stereo mode. Specifically designed for PA and studio use, the X900 features XLR connectors on all inputs and outputs, 5Hz-to-50kHz frequency response, −100dB hum and noise rejection, substantial mechanical construction and a forced-air cooling system.

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Klone Dual Percussion Synthesiser

The Klone Dual Percussion Synthesiser is a far more sophisticated beast than its predecessors. It offers – for a price tag of £299 – the chance to create exciting new (as well as boring old) analogue drum sounds. This is achieved by using the shells from the re-designed Klone Kit II, fixed on a heavy-duty tripod stand, fed into a new and far more flexible control panel containing two VCOs, a modulating LFO (unfortunately, this only affects Drum 2) and two very flexible Voltage Controlled Filters.

In giving the drum synthesist so much control, Honky Tonk Music (the Klone's designers) are pursuing to a logical conclusion the line of approach hinted at by the flexibility of the snare sound on the Kit II, and the only doubt in my mind is precisely how they feel the Dual Synth fits into the market. If, on the one hand, it's a stand-alone outfit, then at the price it's a cheap, two-drum kit; on the other hand, and this seems more likely, if it's meant to complement Kit II, the latter becomes a seven-piece kit for £800, and must therefore stand comparison with the acoustic alternatives. With this in mind, I'm still not totally convinced by the bass end of the oscillators on the Dual, or indeed on the Kit II. They don't seem to go low enough, or have the real punch a rock drummer needs. Above this range, however, they're superb.

Construction

The two black pads on the review model were mounted on a chromium-plated tubular steel frame of the 'Quick' type, and purpose-built for Honky Tonk by Jacques Capelle in France. This frame is well made, though some of the plating looked a little suspect and might not stand up too well to constant gigging. The three fixing brackets at the top of this stand are fully adjustable, and you can fix the pads and the control module at virtually any angle to suit yourself. Each clamp on the frame has an ingenious locking lever that folds over and holds the boom frame secure.

The touch-sensitive pads are of ABS plastic, in black, red or white, with a quarter-inch jack socket mounted in each. The actual playing surface is a rubber pad, which gives a reasonable stick bounce, mounted on plywood with a contact microphone in the centre. These pads respond well, even to tapping with a finger, and the feel and appearance is a great deal better than the first Klone Kits, which were very much the poor man's Simmons. Those first kits, built on the Remo RPS10, would stand up to very little real hammering, as they were designed to be a domestic practice outfit. . . .

The control module is simple in design and construction. The box itself is made of steel and measures 23cm wide × 18cm deep × 6½cm high at the back, where the sockets are, sloping down to 3cm at the front, with small rubber feet on the base. There is also a threaded hole in the base for mounting onto the frame. The mains lead, approx. 2½ metres long, is wired straight into the input stage, and all sockets are quarter-inch jacks. There are two input sockets, one for each pad, and all leads are provided.

There are two main outputs, a mixed mono out and a mono/stereo headphone out, which as anyone who lives next-door to a drummer will testify, can be extremely useful.

Controls

Now to the controls themselves. The two oscillators are identical, and have identical controls. To confuse you slightly, but also to make an exactly symmetrical layout, these controls are laid out in mirror image. So, the outside columns of pots are: Decay time; Pitch bend; Tuning; Balance. Next column in has Filter sweep; Resonance; Filter mode; and Filter frequency.

Next to this, and next to each other at the bottom of the display, are the volume knobs. Finally, in the middle of the panel is a Modulation section, on which every parameter of oscillator 2 may be modulated by a third oscillator. I hesitate to call this an LFO, because although it can be slowed right down, it will also generate fairly high frequencies. Its range is roughly 3Hz to 2kHz by my reckoning, and at the top of its range, this oscillator is clearly audible.

The front panel also sports three LED indicators – one for each trigger input and one for the Modulating oscillator. It's obviously useful to be able to see, quickly, which oscillator you are triggering with which pad, and the speed of the LFO is clearly indicated.

As anyone who has seen a Klone Kit II will know, the major difference and improvement embodied in the Dual Percussion Synthesiser is the control stage on each drum sound. Where the revised kit has three (crucial) controls for each drum, namely tuning, damping and volume, this pair of pads has ten controls for each, with a very welcome opportunity to modulate Drum 2 with a choice of Pulse Wave, Triangle Wave, VCA or VCO2 as available sources. This modulation may be directed, at variable frequency, to Pitch Modulation, VCA or Filter control, and provides an excellent and exciting source of variety without compromising sound quality, as is the tendency with the current favourite methods of enhancing cheaper drum synthesisers – EQ and effects.

This, for me at least, is the success of the Dual Percussion Synth over the

standard Kit II. Honky Tonk Music have at last managed to give us not only a reasonably made and moderately priced electronic drum kit, but also true flexibility and the ability to synthesise some very musical sounds indeed.

Geoff Twigg **E&MM**

The Klone Dual Percussion Synthesiser carries an RRP of £299 including VAT, and readers requiring further details should contact the manufacturers, Honky Tonk Music, 300-302 London Road, Hadleigh, Essex SS7 2DD. Tel: (0702) 553647.

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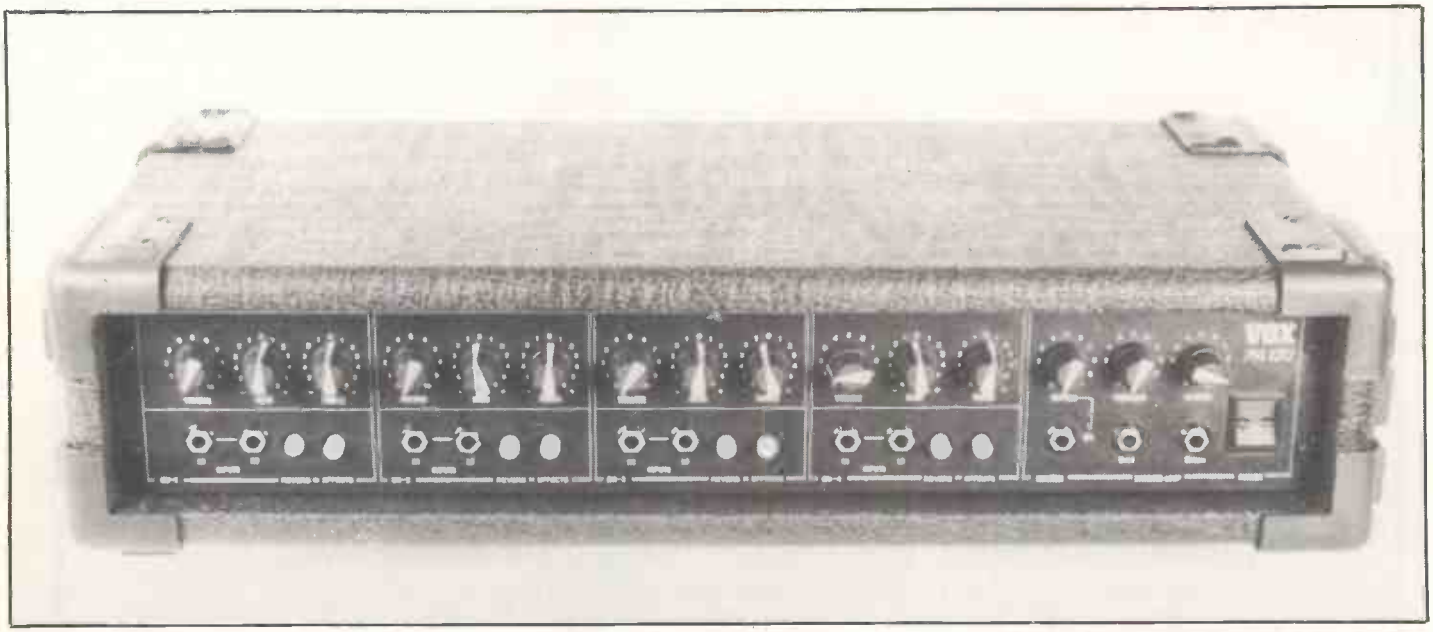

This is the PA system from Vox's new Venue range, cousin to the keyboard combo reviewed in E&MM March. In common with the combo, it has a certain resemblance to Carlsbro equipment, in this case the Marlin amp which was coincidentally E&MM's competition goody in that same March issue. The Vox costs about £100 less, and you only get four input channels as opposed to six, along with other omissions such as no balanced mic inputs.

Four microphone channels are quite sufficient for a normal-sized group where there wouldn't be more than four vocalists, and in any case there is insufficient power in reserve for feeding other instruments through the amp whilst keeping the vocals clean.

Facilities

All four input channels are identical, with volume, bass and treble controls. There are two input jacks, one roughly twice as sensitive as the other (5.6 and 11.3mV respectively), both at 47K impedance. Two push-switches activate a built-in spring reverb and external effects loop, which in a strictly vocal PA would probably be echo, I should have thought. The levels on the loop sockets are appropriate for Copicat-type units, although quite a few digital units would also work, including E&MM's, as would floor-pedal analogue types for the really cost-conscious. As with the combo, the loop sockets don't cut off the direct path through the amp; this is not so serious, and certainly avoids total loss of signal should the effects or their leads become faulty.

A master volume control is provided, along with reverb level and a presence control which operates on all channels. This gives a boost at 8kHz which helps the vocals to cut through in a crowded hall – you should be so lucky! The reverb can be turned off with an optional foot-switch, for making announcements and around the back there's an IEC socket for the detachable mains cable – no more ripping the cable off as you're loading up the van; with this amp you'll probably lose *it* instead – and quarter-inch jacks for two speakers, DI for recording your masterpieces, head-phones (yes really!) and slave amplifier should you need a bit more oomph.

120watts is really the minimum for a PA amplifier. A handy rule of thumb is to allow at least the same power as all the group's instrument amplifiers put together, always assuming that these are adequate and remembering that a drummer can easily generate 100 watts' worth!

Speakers

Efficient speakers, mounted on stands, can make all the difference to a low-powered amplifier, and the Vox PA112Hs are certainly efficient. Vox measurements indicate 121dB sound pressure level at 1 metre from the entire system, and the 12" speakers plus rectangular mouthed horns certainly whang it out, for want of a better expression.

Holes for stands are provided on the bottom of the speaker cabinets, which are otherwise of sealed construction with the drivers front-mounted behind a removable grille. The moulded corners are cunningly designed to allow speakers to be stacked on top of each other, though I wouldn't like to try this on top of a flimsy stand!

Two sockets are recessed into the back of each speaker, though you're not allowed to feed more than two speakers from one PA120 – it would overload the amplifier. Twin sockets might be handy for situations where both speakers are remote from the amp – only one long lead would then be necessary – but I can't think of another reason for having two.

Whilst I'm on the subject of leads, Vox's are a joke. They're only five feet long: not enough to stretch across my living room, let alone the most meagre stage. The custom seems to be to site the amp on one side of the stage, and one twenty-foot and one ten-foot lead is about right for most small venues. . . . Also, the jack-plug clamps don't clamp the outer cover of the cable but the inner leads: they'll wear through eventually (if you don't crunch the plastic covers first), then – blooey!

Construction

Construction is very similar to that of the keyboard combo; in fact, I imagine the entire range uses the same chassis with different pre-amps, hence the inclusion of strange facilities like a head-

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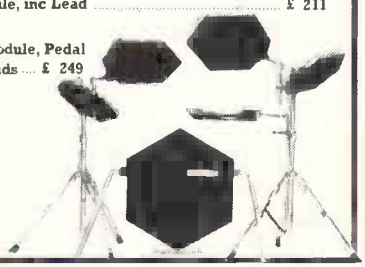

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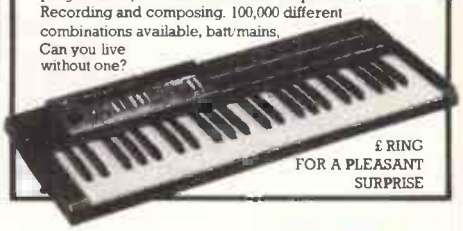

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phone socket on a PA amp. The chassis itself is plate steel, and the cover is the obligatory vinyl-covered chipboard with nice meaty corners and handle – pleasantly rugged.

There's a bit of a cloud over the electrical reliability, which is a pity since the standard of construction is good, with quality components. The first sample was mysteriously non-functional, but the mystery soon cleared up when I did a short-circuit test on the output of the second example and obtained identical symptoms. The manufacturers say that one or two duff output transistors may have slipped through on early amps, and that they all get a short-circuit test as part of production-line checking. I'd advise you to be careful with the speaker leads all the same; even if the amp doesn't blow up, you could still get some nasty noises. Just good practice really.

On the third sample, the reverb didn't work. I took the amp to pieces in true E&MM fashion(!) and discovered that none of the reverb unit's wires had seen a drop of solder in their lives. Only inches away from the four dangling ends was a lable saying 'tested' and signed Steve G. I hope his ears are burning! If I was a manufacturer sending an amp to a ham-fisted reviewer who'd already had two dead ones, I'd make extra sure the third one worked really well, wouldn't you?

On the Road

Cambridge band Project 4 kindly agreed to try out the system at a local club gig, in place of their normal PA of MM amplifier and home-built speakers. This is quite bulky, and the band were impressed by the compactness of the otherwise very similar Vox gear.

Project 4 change their personnel so often that their publicity pictures are deliberately blurred so that no-one will notice the difference; consequently, new guitarist Mick had his mic very close to one of the speakers, which was in turn hiding his crib sheet. Despite this, adequate volume was obtained before the dreaded feedback set in, due to the directionality of the speakers. This was in fact the cause of a complaint by the band, who couldn't hear themselves sing as well as they'd been used to.

The acoustics of the venue (if indeed there were any) were atrocious, and the band played quite loudly, but the sound out front was very stable. The vocals were always audible and intelligible, if a bit harsh. The Vox was straining a bit to keep up with three guitar amps, but there were no reliability problems and the back of the PA120 stayed at a reasonable temperature even though there are no fins to dissipate excess heat.

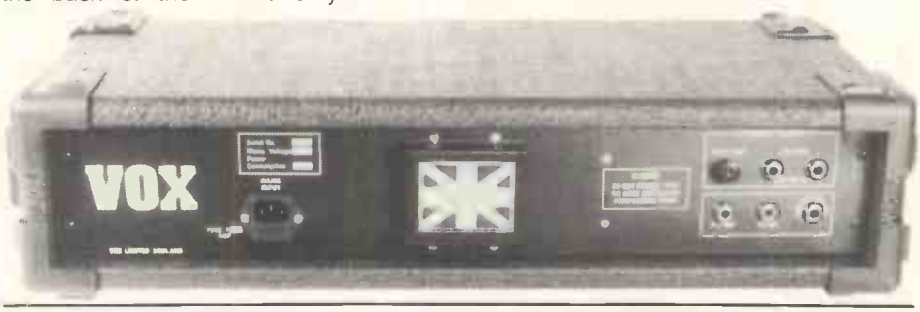
Conclusions

I've treated the Vox Venue system as a rock vocal amplifier, and it's certainly ideal for club and pub work, with a certain capacity for cutting through crowds of beer-stained punters. It could be used in many other applications where an easily portable PA system is needed; none of the components is at all heavy.

Hopefully my sample problems were just early production glitches (the speakers had handmade labels, for instance) and if Vox can step up the quality control a bit, the Venue will be real value for money.

Peter Maydew **E&MM**

The PA120 amplifier has a suggested retail price of £199 including VAT, with the speakers available separately, also at £199. For further information, contact Vox at 32, Gordon House Road, London NW5 1NE. Telephone 01-267 5151.



The New Simmons Kits

The race to design and manufacture the most complete electronic drum kit is hotting-up, and Simmons, the people who started it all, have been making strenuous efforts to stay ahead of the field. Their endeavours have now come to fruition in the form of two new kits, the low-cost SDS8 and the modular, analogue/digital SDS7. Ultravox drummer and long-time Simmons enthusiast Warren Cann **recently had the chance to sample both models, and here reports his findings.**

Having never previously experienced the Frankfurt Musik Messe, I had plenty of time during my flight home to reflect upon my folly of assuming I would be able to see all there was to see in just one day. I knew it was big but I really had nothing to prepare me for just *how* big it really was. Three huge halls contained within just two of the many buildings sighted on a gigantic exhibition complex displayed so much in the way of musical equipment and related products that I was at a complete loss as to where to look first.

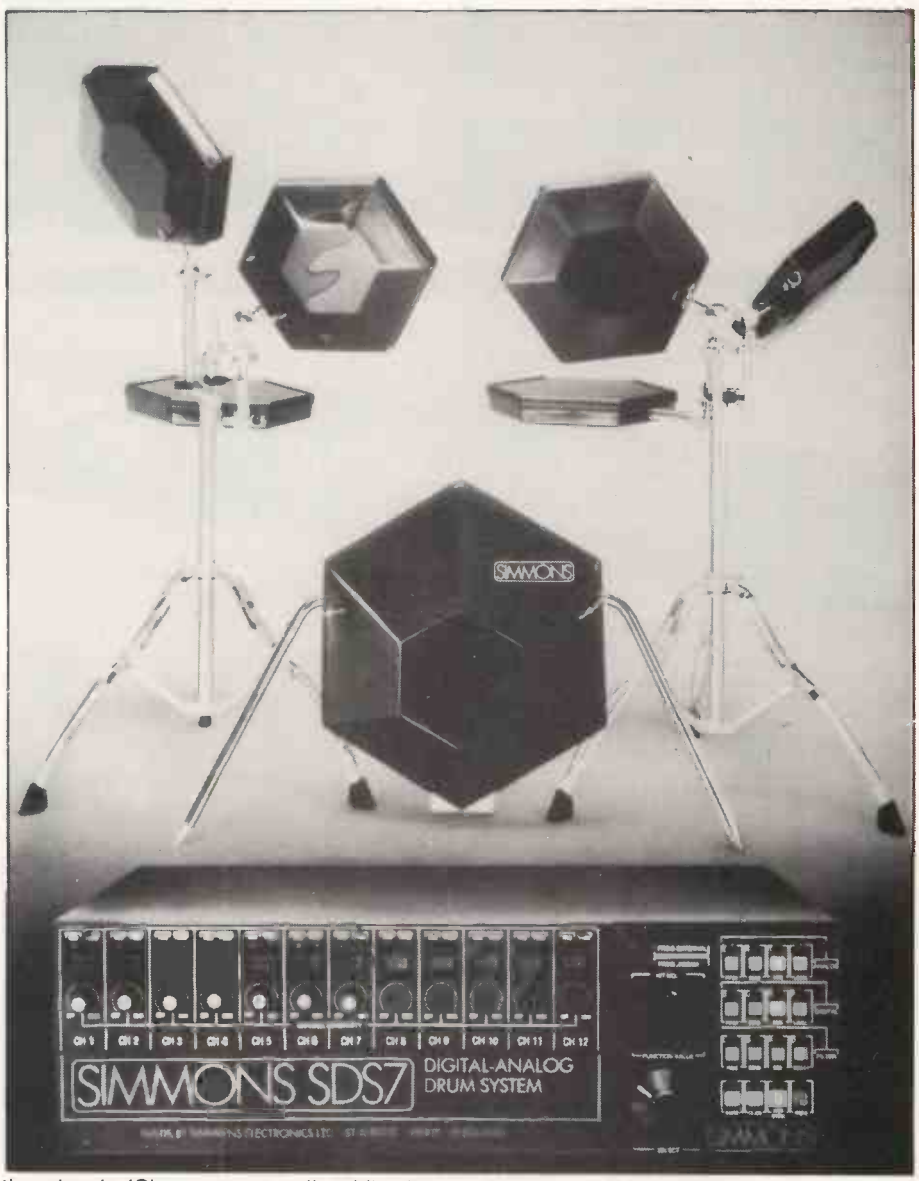
I decided that the best approach would be to establish a set of priorities and then endeavour to stick to them as closely as distractions (and there were many) would allow. The most sensible idea appeared to be to seek out the major manufacturers, the ones with the facilities and R&D budgets to develop their products to the outermost competitive edge, who have precedents to top.

I narrowed this down to a list of about a dozen companies and set out, and it'll come as no surprise to most readers that one of these manufacturers was Simmons Electronics. I had heard about their SDS7 and SDS8 systems and it was these, in particular, that I sought out on their lavish display stand. When I arrived I was informed that the SDS7 rack on show was a prototype and that they had been experiencing some difficulties with it, one of the vital chips inside having gone down and a second having to be flown out from England. That failure reminded me that the most wonderful piece of gear in the world is just so much superfluous junk if it doesn't work when you need it most. It's too easy for designers to forget the jolts, temperature shocks, and general environmental abuse that gear can be subjected to while they're in a cosy lab somewhere enthusing about a new circuit. . . .

Wishing to judge the SDS7 in somewhat less hectic (and more representative) conditions, I made arrangements to visit their new premises in St Albans. The new plant has only been in operation for a matter of weeks, but I was given a complete tour and it certainly seemed a well set-up and efficient operation: the worldwide success of Simmons drums now demands this scale of manufacturing facility. The complex contains a fully-equipped demonstration room, and it was there that I evaluated the company's latest products and chatted to a couple of its' staff about their capabilities, design approach, and of Simmons' aims generally.

The SDS7

The SDS7 is the successor to the SDS5 modular electronic drum kit, which was a purely analogue system. The 7 is a hybrid of both digital and analogue technologies, and this allows the musician a far greater degree of creative control over the sounds he assembles. The two major components of the system are the pads and the rack-mountable control unit. This latter is capable of holding a maximum of 12 modules, and each module can draw on three independent sound sources: analogue, digital and noise. The analogue source is the one to turn to if you want the classic 'Simmons sound', while the digital section contains a recording of a real drum stored on a chip.



The most important control on the rack unit is a large rotary pot labelled 'incremental controller' which lets you search up and down your storage of up to one hundred different 'kits' so as to access the one you want at any particular time, the selected kit number being displayed on a familiar-looking red LED display. The controller on initial pre-production models is undetented, but I understand Simmons' designers have now found a detented pot they are happy with, and it's this that'll be incorporated into all production samples. It's also possible, by means of mode switches, to use the controller to dial in sound processing for all the SDS7's sound-generation modules. Pitch of the sound sources can be altered up or down, modulation of variable speed and depth can be introduced, and variable levels of pitch and/or modulation can be routed through a filter with control over

resonance, cut-off frequency, and sweep of cut-off frequency. You can also control the decay time for each sound and the degree of 'click' at the front of the sound.

There's always the possibility I might change my mind a few months from now, but I certainly couldn't fault the SDS7 for lack of user control: the flexibility of the system is very impressive indeed. If you opt for all twelve modules and make use of all the available 'kit' memories, you'll be able to program up to 1200 different drum sounds, all of them available for instant recall. It's also possible to shift (or 'jigsaw', as Simmons call it) any sound you create to any kit memory, so if you come up with, say, a snare sound that you're particularly fond of, you can store it within any kit you choose.

There's a third item, as yet unmentioned, that completes the SDS7 system. It's called the 'selector pad' and it consists of a squarish box with sixteen Simmons-drum-shaped pads outlined on the front panel. These represent sixteen user-programmable kits, selected from the main memory by using the sound-generation switches on the rack unit's front panel (these are numbered one to sixteen for this purpose). All you have to do to go from one kit to another is to touch the pad to which your required kit is assigned. In this way you can store sixteen different kits for sixteen different songs in a set. Not bad at all.

I discovered that a moderately quick touch was more reliable than a quick tap in getting the unit to switch back and forth positively: switching is accomplished by having each selector surface scanned, and if you strike a pad with a stick too quickly, you run the risk of defeating the scan rate. Some people may find this troublesome (perhaps the unit I sampled could have done with an internal tweak or two), but only time will tell.

Pad Improvements

The Simmons pads themselves have been improved in a number of ways, and most noticeable is the new rubber playing surface. It's become fashionable in some circles for drummers to complain of 'Simmons Wrist' but, while I feel I must again mention that this can be largely attributable to the psychological effects of inadequate amplification, I will readily concede that the majority of players will find this 'softened' playing surface more pleasant to work with than the old one. Dynamic control does not seem to have been compromised: it might even be a tiny bit better.

Other improvements include XLR-type connectors for all connecting leads and a slight change in the positioning of the mounts which connect the pads to the stands – these have now been moved to the inside of each drum. This new arrangement certainly looks a lot tidier than the previous one, and the mount/clamp assembly is shock-mounted with rubber washers to eliminate transferrence of vibration which can lead to premature clamp failure and/or unwanted crosstalk.

On a slightly less positive note, I was assured that although the mount assembly looked slightly fragile, it was actually far more efficient than its predecessor. I'm not totally convinced about that. It seemed to me far too easy to rotate the pads about the axis of their mounting, and when you've both hands full keeping the beat going at a gig or a so-far-so-good 'take' in the studio, the last thing you want is to realise suddenly that one of the pads is turning round and round. . . .

Drum-stand design has in the past exhibited signs of ridiculous oneupmanship now that it seems to be a big selling point to have bigger, better, even more massively-constructed stands with cantilevered arches and flying buttresses, but the trend has been easing off recently with the realisation that mechanical efficiency is more important than brutish looks. I think Simmons could profit from an investigation into the designs used by some of the top acoustic drum manufacturers: in this way a neat, unobtrusive design could be fitted – one that offered repeatability of setting and complete positional strength. Such a mutual arrangement *could* put Simmons in a position of vulnerability regarding assurance of guaranteed supply (at the moment their operation is almost entirely self-contained), so it would be understandable if the company chose to wait until they're in a position to design and manufacture such a fitting completely in-house. I still don't like the SDS7 fitting very much: we'll see how it stands up to the rigours of constant use soon enough.

On reflection, I don't honestly think I had enough time with the SDS7 to make any constructive or intelligent criticism of the vast degree of sound control on offer. Frankly, I didn't need to make such an in-depth appraisal: a quick go on the kit (using the selector to gain access to the various different 'kits' available) was sufficient to show me that the SDS7 is a very, very big leap forward for Simmons and that, in most modes, it sounded great. As far as I'm concerned, the controversy as to whether or not electronic drums can achieve as much power as acoustics is now totally and irrefutably settled, once and for all. Linked to a powerful PA system, the dynamics of the SDS7 should be sufficient to induce a major-degree cringe on the face of the architect of whichever building the kit is let loose in. No wonder I liked it!

Sampling Techniques

During my discussion with some of the Simmons staff, I gained some insight into their philosophy regarding the application of digital techniques. On encountering the unit for the first time, I asked if I could hear the digital kit samples, bare and unprocessed by any other sound source. This is not, apparently, a rarely asked question, and their subsequent explanation does, I think, bear repeating here because often a company's attitude to product design can be a good deal more significant than the actual state of their product, itself only a transient condition.

When it came to sampling acoustic drums to provide the digital sound-generation section of the SDS7, Simmons' engineers attempted to find sounds that contained within them a structure that would lend itself most readily to acting as a building-block for further experimentation on the part of the user. It's for this reason that most of the 7's digital sounds are not, perhaps, as impressive in themselves as might be expected. Instead, the samples allow greater deviation from the original recording without sounding 'tampered-with'. In a nutshell, they offer greater harmonic content (and hence more scope) for the user to juggle with. With the SDS7's digital samples, there's more information available from which the musician can pick and choose, and to my mind, this approach is streets ahead of having to depend on all sorts of outboard equipment with which to process samples which are basically good but which, unfortunately, sound exactly the same as the next guy's.

Finding drum sounds that offer the sort of scope Simmons reckon musicians want hasn't been easy. They still sample a higher-tuned tom-tom for their 'high tom' module, a lower one for the low tom, and so on, but progress is being made, and judging from what I heard, the approach is obviously working.

In Conclusion

With the SDS7, Simmons have come up with an instrument that offers more control over the synthesis of percussion sounds than any other dedicated example in its' class (let's face it, price notwithstanding, a Fairlight CMI is a little on the overkill side for percussionists). The stance of Simmons Electronics as a company is reflected in the enormous scope of this unit, and I find their forward-thinking a breath of fresh air.

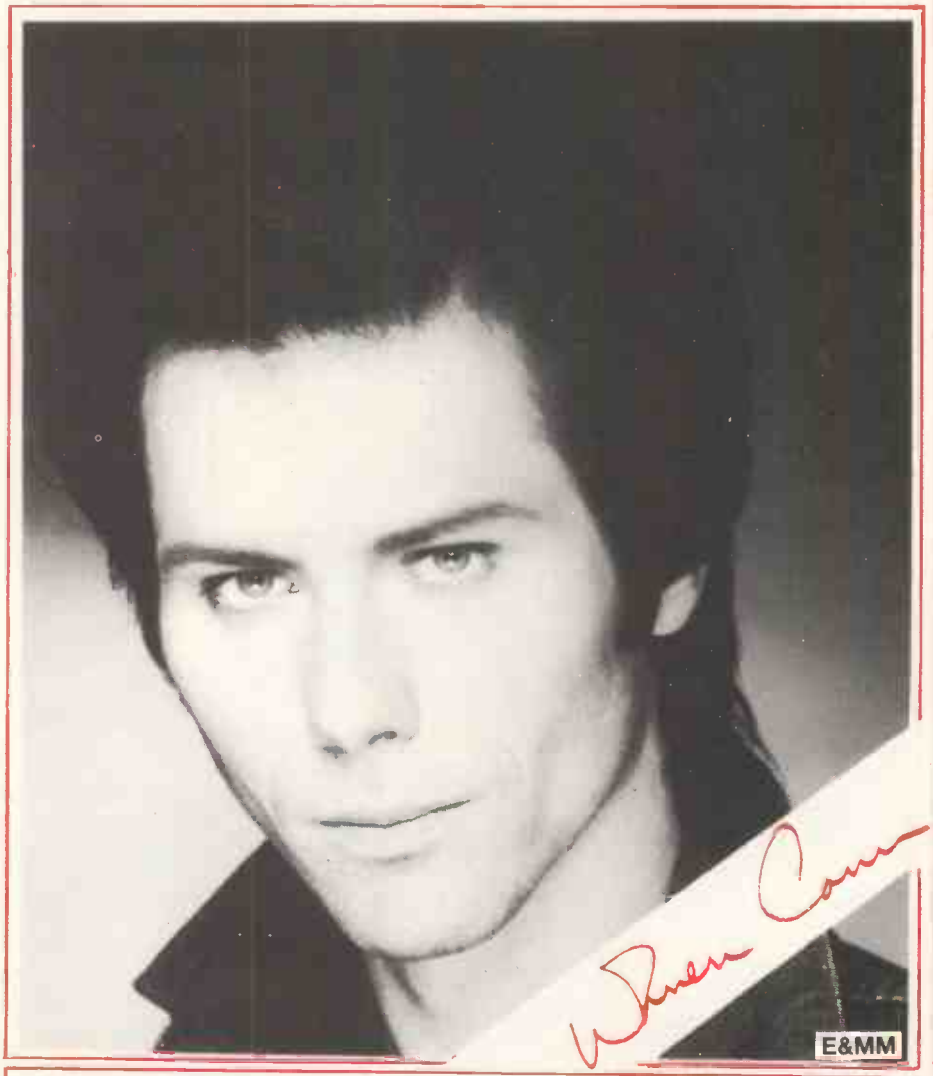
It's certainly not cheap, but I'd guess prices will begin to come down (as they inevitably do) once volume production is reached. The availability of a better instrument ultimately benefits everyone – though that's no consolation for those who'd like an SDS7 now but can't quite get the necessary cash together while it remains at its current price. But look at it this way: these days, you're looking at pretty much the same sort of money for a top-quality acoustic kit with cymbals, stands, cases and so on, and you're going to get an awful lot more in the way of versatility out of this Simmons. . . .

The SDS8

Although my attention has been focused almost exclusively on the 7, I shouldn't overlook the SDS8. Simply put, this is a non-modular, all-analogue, five-channel kit consisting of bass, snare, high, mid, and low toms. Each channel has a factory preset sound which, unlike the SDS5, the user cannot alter by popping open the case and adjusting the settings on the tiny internal pots. There is, however, a user-programmable option that allows individual control over each drum's sensitivity, pitch, decay, bend, filter resonance, noise-to-tone balance, and 'click' level. You can select preset sounds via a switch at the base of each channel's module or via an overall master select, activated either by a switch on the front panel or by a remote footswitch, to change all the channel presets automatically.

Naturally, each channel has an individual output, while an internal mixer enables you to run in stereo should you so desire. There's a multi-way sequencer input that facilitates interfacing with the SDS6 programmable eight-channel sequencer (the SDS7 also incorporates a similar facility), while the pads themselves have also been subjected to some of the improvements present on the more expensive kits, including, most importantly, the new rubber playing surfaces. Unlike the SDS7, however, connection is accomplished with standard quarter-inch jacks as opposed to XLRs.

And that's it: a basic, no-nonsense, all-business kit that gives the drummer the classic 'Simmons sound' at a newly-affordable price. For the percussionist who's just starting out or who's venturing into the world of electronic drums for the first time, I can't recommend any other player-activated system as being better value for money. Obviously you're not going to get the sort of creative scope of the SDS7, but then again that's not what this kit is meant to provide. . . .



The standard SDS7 'rack' of bass, snare, and three tom modules, plus stands and all accessories, costs £1875.00 excluding VAT. A cymbal module costs a further £196.50 (again ex. VAT), and £232.00 (ditto) is the cost of the hi-hat module.

The basic SDS8 kit described above costs £675.00 exclusive of VAT.

A combination system, entitled the SDS6.7 and consisting of both the SDS7 and the SDS6 sequencer, is also available, and further details of all the above products can be had from the manufacturers, Simmons Electronics Ltd., Alban Park, Hatfield Road, St Albans, Herts AL4 0JH. Tel: (0727) 36191.

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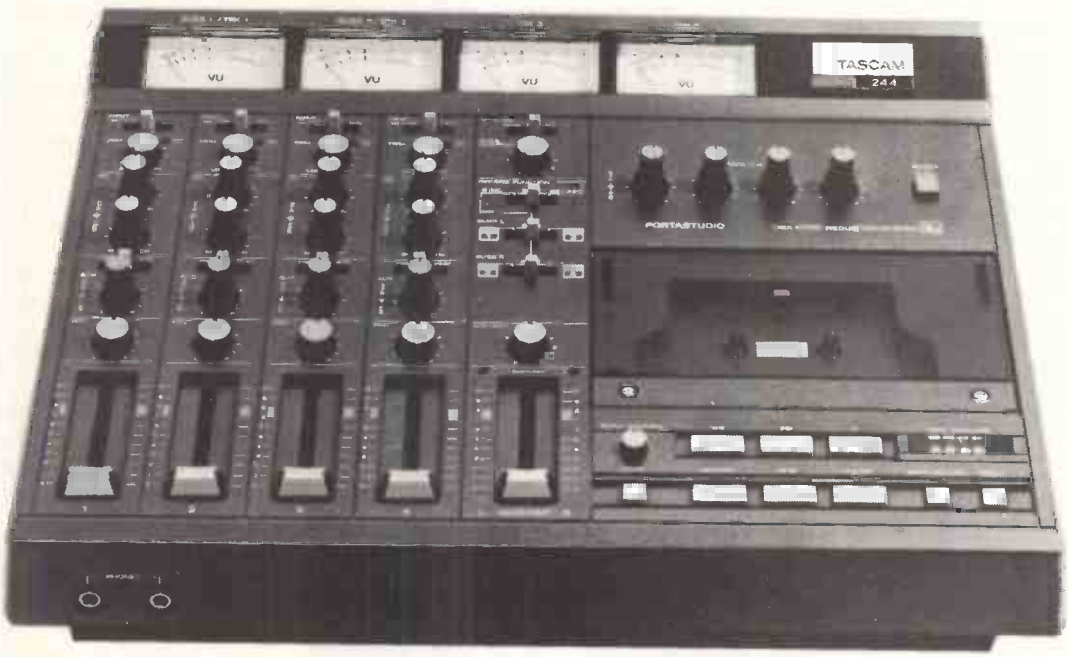

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Vox White Shadow Bass Guitar

Ever since Jaco Pastorius whipped the frets off his pet Precision, there has been a mass of argument for and against this drastic measure. How should the fingerboard be cambered, what woods should the neck be constructed from, and whether or not special pickups are required to capture this essential sound . . . these are the sort of questions bassists are continually asking.

The Vox White Shadow series of guitars and basses was first unveiled at this year's Frankfurt Musik Messe, and they were received with reserved but not uncritical attention by players and makers alike. The styling of the instruments is pleasing, and the woods used are of good grain and a very pronounced lightness – more on this later.

The long-scale Vox fretless bass was one model that we specifically chose to review after seeing it at the Messe. The reasons for choosing this particular instrument will become obvious, but suffice to say that it and its fretted counterparts form some of the cheapest quality instruments on the market. As such, they are also aided by the Vox moniker on the headstock: a head start, you might say, though the origins of this range are far from the home of the AC30. They are made in Japan to Rose Morris specifications, and should be available in the shops around mid-April.

Materials

The body is made from a wood called Sen. This is a light, compact wood, similar in some respects to ash or alder. It's blonde, with the accent on peroxide! A single-piece bridge/tailpiece is fitted with individual bridges for string height. This system works well, and on the review model had been set up very well, though there was still room enough to change the intonation and string height quite radically.

The staggered twin-coil pickups are of unknown design and origin, but worked well, with a wide – though somewhat top heavy – frequency response. This is something I find a hindrance, since it is too easy to set it too high and end up with a rather powerful 'squawk' rather than the roar required. On the other hand, I think constant use would soon educate you into developing a tone control technique, though the actual pots should still be stiffer. The two pots (with nice refraction dials atop) are a little 'loose' and require some intelligent(!) use. The problem is, the volume control and tone controls are a bit too responsive: a touch can send the sound spiralling from a sweet funky treble to a good Lemmy impersonation, with stacks of dull sustain. I'll get on to the sounds later, but apart from the controls, all that graces the rest of the body are a booster toggle switch to enhance the crispness and vitality of the sound, and an output jack.

Devoid of scratchplate or massed dials and switches, the White Shadow looks just what it is – a straightforward, no-frills workhorse of a bass. The fingerboard is of fine-grained rosewood, while the neck itself is of the aforementioned Sen though the colour match was not 100% so I'm open to correction on that one. A plastic nut precedes a white headstock with four Grover-type machines and a string retainer on the G and D strings. The machines are about 20-to-1 ratio, and their heavy chrome exterior bodes well for the future. It is unlikely to flake, though I would try and keep them fairly dry to be on the safe side.

Dimensions

The neck is very thin. That's the first thing that strikes you after the realisation that the instrument weighs in much lighter than a Precision or a Jazz. This thinness could be a problem: fretless players need to use the flat of the finger to slide adequately, not the point of the finger like classical guitarists, and while it's nice for a guitarist/classical player to be able to get to grips with this, the hard-line fretless player may balk at the finger angles – which could be uncomfortable. Another aspect of this neck is the fact that a heavy finger pressure can be brought to bear on the fingerboard, and with coarse round-wound strings, this could tear up the fingerboard quite rapidly. It just takes some careful playing, and a spot-check now and again to see that the condition of the neck is as it should be. (The best way to do this, incidentally, is to use an anglepoise lamp shone across the neck, so that any rough areas show up in the sheen – or lack of it in very bad cases!) The strings supplied were similar to the lighter Rotosounds, but still looked capable of damage. If it does occur, try a finer-wound string, and/or some Fretfast or similar concoction. It sounds a bit daft putting Fretfast where there aren't any . . . but still.

In Performance

Anyway, to the playing. Well, the sounds at the bottom of the neck are predictable: a rounded treble sound, devoid of any real punch. This is a common problem with fretless basses, and is curable with the amp and effects set to compromise between this sound and that of the treble regions, which are very trebly indeed!

For reference we'll use the notes on the top string. So, at around the C position it starts to energise, at F it starts to break up, and above this, you need to take down the tone to prevent your ears getting scorched. It really *is* that sharp. The whole of the White Shadow's body seems to resonate, which is strange considering there are three pieces of wood involved in the construction and the neck is a bolt-on. Either way, it suits a slapping technique admirably, given that the action should be lifted a bit to accommodate the movement of the string.

The guitar itself balances quite nicely, and the fact that it is slightly neck-heavy simply means that you need to 'hang' it more centrally against the body. Short-armed players may find this a problem, but to ensure the stability needed for sliding around on the neck, there is no real alternative.

On 'pop' sounds, the Vox fares less well; the depth of the bass is not quite powerful enough to provide the necessary drive, but then again, a bass booster only costs about £25 and would change the basic sound sufficiently.

On the rock side it is pleasant – but not as bass! Instead, those Del Palmer (Kate Bush Band, you ignoramuses) riffs slide around very nicely, and the 'honk' sound so prevalent in funk lines is turned to a melodic level that makes an excellent foil for lead-guitar.

To conclude then, this is a basic (no pun intended) bass, but at the price it offers a lot more than many of its counterparts. The quality of materials and workmanship is high, and the overall sound of the instrument is versatile and relaxing. It takes a while to get used to the White Shadow, but the lightness of the body is a joy. And for the price, it opens up bass-playing at a quality level for almost everyone.

Tim Oakes **E&MM**

The Vox White Shadow Fretless Bass retails for £189. A fretted version is available at £183. Information from Rose Morris, 32 Gordon House Road, London NW5. Tel: 01-267 5151.

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The Kit and Roland Competition Results

At last, the long-awaited results of the two competitions from E&MM August and September 1983.

Kit Competition winners

First prize
Chris O'Connell of Nottingham receives The Kit.
Second prize
D. Johnson of Suffolk wins The Tymp.
The five runners-up, who all receive a sweatshirt, are:
Andrew Wilson, Ware, Herts
Graham Gartside, Merseyside
P A Lawson, Leicester
Martin Tye, Basildon, Essex
Stuart Hunter, Sunderland

Roland Competition winners

First prize
Paul Rock, Skegness, Lincolnshire wins an SH101 synthesiser.
Second prize
Andrew Moorhouse, Blackpool, Lancashire wins the Amdek Drum Machine.

Five runners-up who all receive sweatshirts:
Paul Hanley, Clwyd, Wales
D G Evans, Southampton
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Congratulations to all winners, and to those who weren't so lucky. Better luck next time!

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FAD GADGET

Fad Gadget is Frank Tovey, one of the first UK artists to make a record – 'Back To Nature' – whose instrumentation consisted almost entirely of electronic devices. Since that record was released in 1978, he has continued to pursue his own musical experiments, using a variety of different instruments and songwriting techniques. Dan Goldstein **spoke to him shortly after the release of his fourth album, *Gag*, and a new single, 'Ideal World'.**

When I was at school I had a go at playing just about every musical instrument I could lay my hands on. The problem was, I didn't seem to have the coordination to be able to play any of them really well, so after a while I drifted away from the idea of playing music, and began getting involved in other art forms instead.

'For quite a time I studied visual arts at College, and really it was through doing that that I began to rediscover music, because I started feeling the need to give my mime act some sort of musical accompaniment. So I began recording a few very simple pieces, and initially a lot of my interest was based around recording and the manipulation of sound using tape recorders.

Tape Techniques

'I had an old Grundig tape-machine, and I managed to discover a way of disconnecting the erase head from the playback head. I built a simple switch between the two, so that I could decide whether or not the sounds already on the tape would be erased, and I spent a while building up collages of sound using that method.'

Having finished his full-time education, Tovey began working at various day-jobs and eventually managed to set up his own home studio, though it wasn't exactly a luxury facility. . . .

'There was very little space in the house I was living in in London, and the only place I could build a studio was in my cupboard. It was really just the Grundig and a few other odds and sods: at the beginning I didn't have any musical instruments in it at all.

'The first keyboard instrument I ever owned was a Crumar Compac electric piano. It only had three preset sounds on it, and that was just about it. At about the same time I bought a cheap drum-machine, a Korg Minipops. I can remember quite clearly that in those days (mid- to late-Seventies) you couldn't buy drum-machines in general group gear shops because they were extremely unfashionable. In the end I had to get mine from an organ shop – it was the only place near me that stocked them. It was much the same situation with synths: very few 'band' music shops wanted to know about them, especially cheap ones, and most of them were sold by organ shops as add-ons for home keyboards.

Filtering

'I eventually bought a Korg synthesiser to go with the drum-machine. By today's standards I suppose it was a pretty rudimentary instrument, but there were one or two nice things on it. The filtering, in particular, was very good: I think Korg must have changed the way they design their filter stages since then, because listening to the sort of things they're making now, they don't seem to have quite the same sound to them, and I think it's probably the filtering that's to blame.

'I suppose it was my lack of real musical ability that made me decide to go for synths and the like. It was possible with something like the Korg to make some pretty impressive sounds without really being able to play properly, and that was an idea that appealed to me a great deal!

With this selection of fairly basic equipment, Tovey began songwriting in earnest, and sent a tape of 'Back To Nature' to Daniel Miller at Mute, who liked it sufficiently to revive the label and issue the track as a single.

'We recorded 'Back to Nature' at RMS, a small eight-track in London. I hadn't really had any experience of recording at all outside what I'd done with the old Grundig, so I left most of the decision-making to Daniel. Most of the gear on the record version is mine, but we did use some of Daniel's stuff as well – an ARP 2600 and a Roland SH2, I think!

The single was enough of a success to enable Fad Gadget to produce a follow-up – 'Ricky's Hand' – almost immediately. Instrumentally, that record remains most notable for an astonishing sonic effect – what sounds like a human voice collapsing into a frenzy of LFO modulation near the song's end.

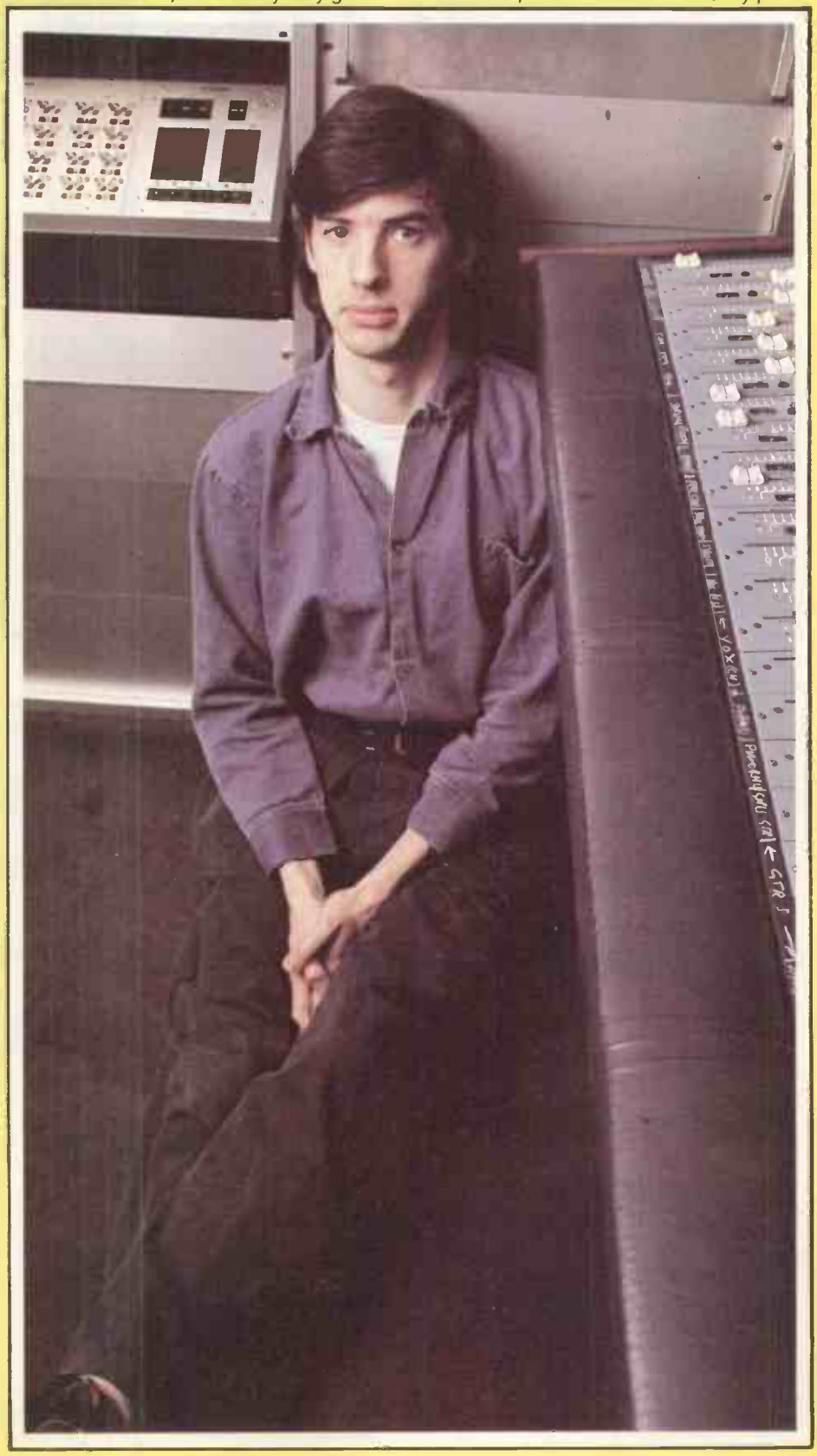
'The vocal line is my wife, Barbara, singing, but we recorded a synth under it at a very low level, and all that happens at the end is that the voice is faded out and the synth sound breaks up underneath. It was very effective.'

First Album

Eventually, things reached their logical conclusion and Tovey recorded an album, *Fireside Favourites*, at London's Blackwing Studios, this time without Miller's assistance.

'I simply felt that I wanted to work on my own, and in the end that decision had fairly mixed consequences. On the one hand nobody made any decisions for me, so I was able to see everything through myself, which I think was important, but on the other hand, I was really very green when it came to how to go about recording in a studio. Blackwing was only an eight-track itself in those days, but I still felt a bit daunted by all the equipment, and looking back on it I did make a few mistakes that I wouldn't have made if I'd had someone knowledgeable to help me.'

Just as important to Tovey at that time (as it still is today) was the concepts and ideas behind live performance, and he very soon gained a well-earned reputation for being one of the most exciting and original live acts on the electronic music scene. From the simple visual gimmick of playing the Crumar piano with his head (the fact that the keyboard was wired-up to a fuzz pedal rendered it virtually pitch-



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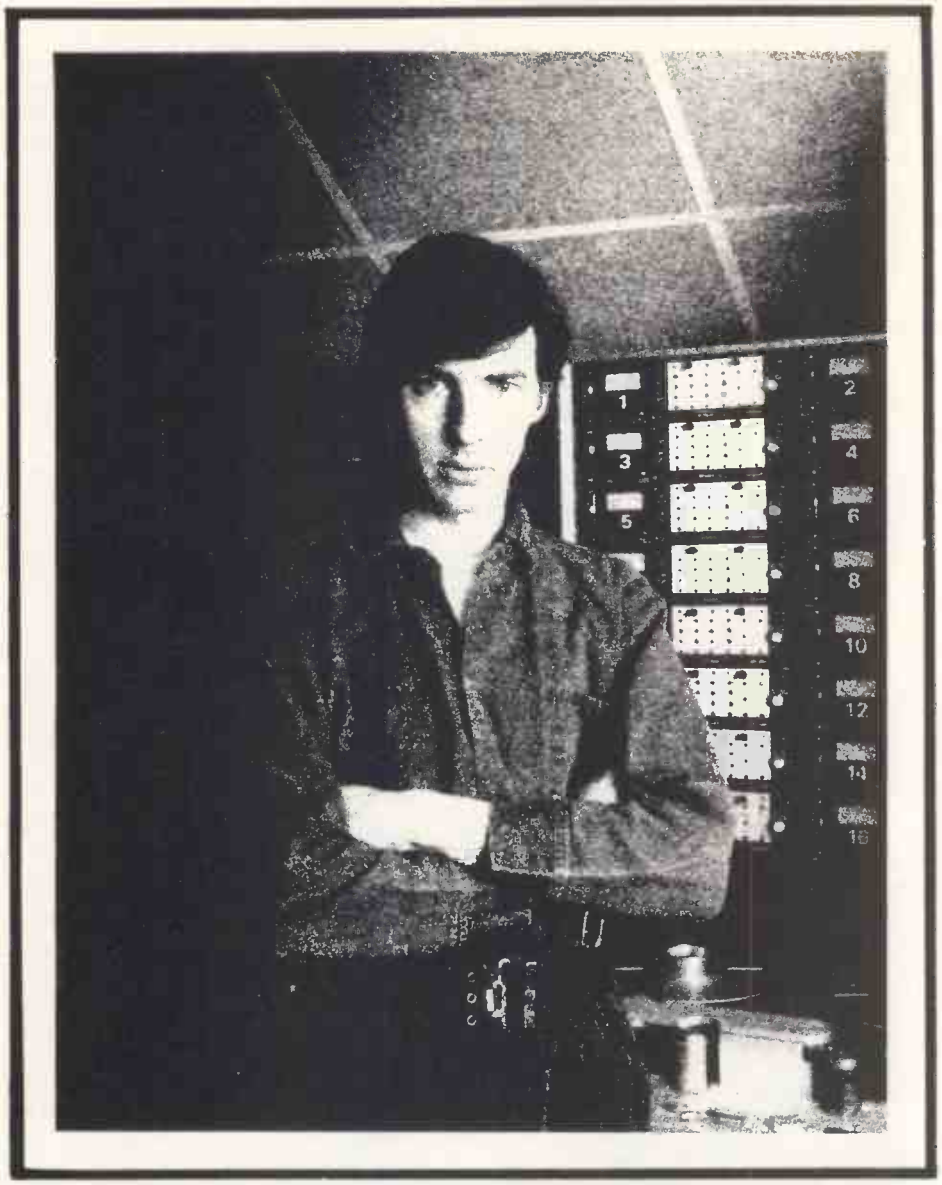

less, and meant that the anarchic playing style had minimal aural effect), Tovey progressed to dressing up in bizarre costumes and disguises. These were a logical step-forward from his Art College experiments, and they also complemented his ever-maturing lyric-writing.

'I'd always been interested in writing lyrics that really mean something – that really have something to say. Up until recently I couldn't see any point in writing songs about, say, relationships; I wanted to say something more. In the same way, I've never seen the point in playing live exactly what you've already done in the studio. To me a gig is a completely different musical event, so I never go out of my way to make a live performance sound like the record. For the latest tour, we're using a Juno 60 to make tuned percussion noises – it doesn't sound a bit like the real thing, but that doesn't bother me.'

Two further albums *Incontinent* and *Under The Flag*, followed *Fireside Favourites*, both of them recorded at Blackwing but both of them also representing a change in Tovey's music and the way it was recorded.

'As I went on recording, the equipment at Blackwing got more and more complex, though at the same time I was learning about recording and getting the best from the equipment that was available.

Microcomposing

'It was during the making of *Under The Flag* that I first started to use the Roland MC4 microcomposer. I wanted the music to be very flat, very controlled and using something like that, where almost every part can be played automatically, seemed to me to be the best way to go about doing it. The reason I wanted the music to be relatively uneventful was that the lyrics on that album were very intense, and I wanted the vocals to stand out – I didn't want the music to grab any of the limelight, if you like.

'The way I see it is that the music should act as a contrast to the what the vocals are doing, and I've carried that through to *Gag* as well, because the lyrics on it are much less intense, and then it's the music that's become more eventful.'

Hansa-by-the-Wall

Gag is in some ways something of a crossroads for Fad Gadget, since it represents his first major venture into the use of a band of musicians as opposed to playing everything himself. It sees a change of recording venue, too, and a fairly drastic one at that, in the shape of a move to Hansa Tonstudios in Berlin.

'I just felt I needed a change of scene, because although I enjoyed working at Blackwing, and all the staff there were very helpful, I wanted everything for Gag to be a complete break from the past, and obviously that included the recording studio. . . . Blackwing has a very dry acoustic, and I wanted to use something a bit more interesting.

'There's nothing that can really prepare you for Hansa, because it really is totally unlike any other studio. For a start, the surroundings totally unlike any other studio because it's all very light and airy, and you can see through the control room windows out over the Wall onto East Berlin. Also, it's got an amazing main studio area that I've heard used to be a Nazi ballroom, though I'm not absolutely sure about that. Whatever it used to be, it's got some amazing natural echo characteristics. We used a lot of its natural acoustic properties when we recorded things like vocals, for example.

'The mixing-desk at Hansa is astonishing: it's an absolutely ancient old thing – I'd never seen anything like it. And then, when we came to mix-down, the mixing suite had a completely automated, computer-assisted console, which was a complete change. It was strange in a way, working with that, because with a computer desk, you have to think things out very clearly before you start – you have to know exactly where you are, and that makes you think of things in a much more logical way. I couldn't just amble through mixing the way I had with some of the other records.

'Working with a band was completely different, which was what I wanted. It was the first time I'd worked with other musicians and the first time I'd had to cope with all their ideas coming up in addition to mine. Quite a few of the songs on *Gag* are written by me in collaboration with people from the band. The girl who plays viola, Joni Sackett, wrote a couple of things, and so did David Simmonds, the keyboard-player. I found it quite refreshing, working with more people; I think it's given the music a lot more life, a lot more vitality, than it would have had otherwise.'

Although much of *Gag* sounds as if it was recorded using electronic instruments, in reality synths have been used quite sparingly, with acoustic instruments shouldering much of the arranging burden.

'David used quite a bit of Juno 60, but he also played quite a lot of piano and organ, as well as a lot of tuned percussion – marimbas, things like that. What we did do was use a lot of digital reverbs and delays – in addition to the natural acoustics – to make certain things sound more interesting, and they might have contributed to giving the album a slightly synthetic feel'.

'The thing is, I don't really see much point in using synths or electronics just for their own sake – just because they've suddenly become fashionable. When I first started using synths they were incredibly unfashionable – hardly anyone was using them – but I don't think I'll ever do anything just because everybody else is doing it. At the moment I'm equally interested in acoustic sounds, and I've started playing guitar again, too!'

A further instrumental diversion has

manifested itself in the form of the metal percussion of German band Einsturzende Neubauten, who guested on *Gag*'s first single, 'Collapsing New People'.

'Neubauten just happened to be in the studio for a little while as we were recording the album. They liked 'New People' a lot and we decided to see how it would work out with them playing along to it. What you've got to remember is that the song wasn't written with them specifically in mind: we already had all the backing-tracks down on tape when they came in and overdubbed all their metal percussion, and I think things might have turned out a bit better if I'd worked with the band on a song right from the start. We had to work quite hard at the mixing stage to get their contribution to fit in with the rest of the recording! But in the end it didn't come out too badly.

New Music

'I don't think there's anything very new in banging bits of metal to make up a percussion track – I was doing it back in my cupboard! – but, on the other hand, I think the music industry definitely needs some sort of stimulus, and that might be just the sort of thing that brings it about.

As far as I'm concerned, there's been very little really new musically that's happened since punk. Punk saw the return of music that could be played and enjoyed by people with very little innate musical or technical ability, but it seems to me that in a way we've now come full circle. To make a record nowadays that's going to sell well, you more or less *have* to have thousands of pounds' worth of computer instruments and the ability to play and program them. So in a way, I think we're back to the same state of affairs we were in in the early Seventies, with a very few people being able to afford exotic equipment and making all the music for all the rest of the people to listen to.

'I think that's wrong, and I'm not going to start using computer instruments just for the sake of it. If anything, I think I'm more likely to return to the sounds of acoustic instruments, rather than getting computers to re-create those sounds for me.'

Unlike some musicians, Tovey has very little in the way of fixed plans for the future: it could even be that he may shy away from making music altogether for a while. . . .

'I'm quite keen to get back to the visual arts – mime and so on – though it's quite difficult to talk about that sort of thing without it sounding pretentious. If I do carry on with music, I might well go back to doing things on my own, not because working within a band didn't work – far from it – but simply because I like to keep changing the way I work all the time.

On the other hand, I don't think I'm likely to go back to using something like the microcomposer exclusively – I think I'm past that stage. What I'm more likely to do is to carry on veering towards acoustic instruments – maybe even banging bits of metal again. I'll carry on using synths from time to time, of course. I like using them for approximations of acoustic instruments as well as slightly weirder, electronic-type sounds . . . I think that's what they do best.'

Dan Goldstein **E&MM**

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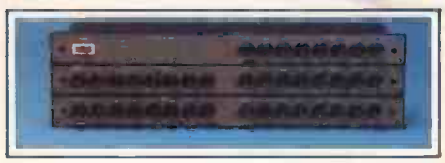

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The Cobra 90 PA is ideal for smaller bands and cabaret artists as well as functioning admirably as a keyboard mixer-amp. There are four separate channels each with one high-impedance and one low-impedance balanced line input. Clearly numbered controls are provided for Gain, Bass and Treble switches and you can select the built-in reverb on each channel. The master panel has controls for Volume, Reverb, and Presence which adds 'Punch' to your sound. Useful provisions are the Tape Replay/Record Socket, two effects Send and Return loops, Headphone and D/I outputs. The Cobra 90 PA comes complete with Reverb footswitch, cover, mains lead and a two-year guarantee.

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Cobra 90 PA System Star Features

A Four separate channels
B Compact tuned loudspeakers
C Includes covers, leads and footswitch
D Tape record/replay socket
E Bullet tweeter
F High and low impedance balanced inputs

*All you have to do is call into your Carlsbro dealer and get him to sign or stamp below. While you're there ask him to demonstrate the features of the Cobra 90 PA System. Then consider carefully the six star features above and list **FIVE** in order of importance to a live musician-performer.*

Finally, tell us which single extra feature you would have designed into the amp to give more value and make it more attractive. You will have to think carefully about the market, performance, cost, technology, panel space etc. . . . The winner will be the one who agrees most accurately with the judges' list and offers the most practical and useful idea.

Name .....

Address .....

.....

Write below which extra feature you consider would give more value and make the Cobra 90 PA System more attractive

Fill in your name and address and send your entry to **Carlsbro Star Prize, E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY**. Entries must be on this competition form **signed by your dealer**. The judges' decision will be final. The winner will be notified by post and sorry but no other correspondence can be entered into. Closing date is 31st May, 1984.

My top five Star Features are:

.....

Write below which extra feature you consider would give more value and make the more attractive

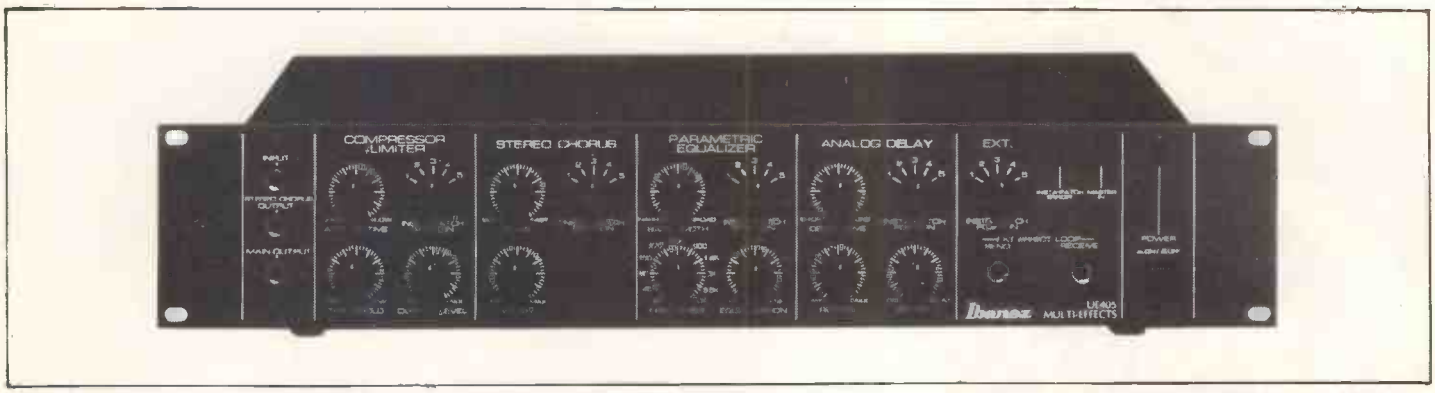
.....

.....

Dealer Stamp (signature)

Ibanez Multi-Effects

Ed Stenson **takes a look at two established modular effects units whose design attempts to combine the flexibility of a set of pedals with the neatness of rack-mounted systems.**



Whatever else is said about the business of making music, it is seldom the cheapest proposition in the world as far as the average individual is concerned. An instrument alone can set you back a fair bit and an amplification system as much again. If you then want to set about recording yourself with any appearance of high quality a further arm and a leg are often at stake. There seems no end to it all.

In fact, things are improving all the time, as indicated by the seemingly endless stream of new and better equipment that appears almost daily. This is undoubtedly due to the great advances in electronics made recently – who said the space race would lead to nothing? – and is most noticeable in the areas of keyboards (at both ends of the price range), recording equipment, and outboard effects.

One of the more interesting developments in value-for-money equipment is the range of Ibanez Multi-Effects. These are by no means new (E&MM mentioned them as far back as May '82) yet they are still of interest since they offer the studio approach of rack-mounted equipment for the price of good pedal effects and so will find favour, I suspect, with a good many potential buyers. Don't get me wrong: pedals are fine and are often ideal for the guitarists they are really designed for since they allow easy switching whilst playing, and in fact a good many household names use commonly available units. However for the keyboard player who is used to button-pushing when playing anyway and for the recording enthusiast, pedals can have drawbacks. Each unit needs its own battery, liable to run out at any moment or a power supply (more expense). Pedals get kicked around the floor (hardly the most sensible place to put pieces of quality electronic equipment) and jack plugs can part company with their sockets with surprising ease. A viable alternative is to get hold of a Multi-Effect – a rack mounting box containing four useful effects with a common power supply and a separate pedal board for switching each effect in and out – which will cost about the same as four good effects would if bought individually. Such a system can be kept well out of harm's way and so might hope for a longer life than a typical pedal.

Of course, the drawback with such an arrangement is that a Multi-Effect must be purchased as it stands and cannot be bought in stages as and when cash is available. Also, if any of the four effects is disappointing then the whole system is let down, whereas a weak link in a set of pedals can be easily avoided. Hence systems like these two from Ibanez must be very carefully designed to have any chance of success. . . .

Layout

The two systems under review here are each housed in 2U high, 19" cabinets which measure just 8" deep. The facias are black with gold legends and possess a scattering of small red LEDs showing status. The case itself is also finished in a smart metallic gold: presentation is excellent and the units would grace any home set-up. Input and output connections are on the front panel and an 8-way connector at the rear allows the pedalboard to be connected via a good length of cable (at least 3m). The connector is polarised and so cannot be fitted the wrong way round.

The pedalboard itself is finished in the same gold as the main unit. It houses five pedals – on/off for each of the four effects plus a master on/off switch which bypasses the whole unit. LEDs on both the pedalboard and the control box show which effects are on at any time and also show when the whole unit is bypassed. The pedal switches seem very rugged and sturdy and perfectly capable of withstanding the rough treatment they will inevitably receive at some time in their life. Two large sponge pads beneath the board help to stop it sliding around in use, which is another nice touch.

Signal connections are input, main output, and a separate stereo chorus output which is discussed later. Also present on the front panel are sockets for external effects Send and Receive. These connections allow any pedal effects to be added to the system to take advantage of its comprehensive switching facilities.

Each unit has 16 controls – a mixture of rotary pots and rotary switches – and a mains power switch. As can be seen from the photographs, the controls for each effect are split up into functional groups. In fact, the controls are very similar to those that would be found on simple pedal effects so no familiarity problems should be experienced.

The beauty of these systems is that each of the four effects is totally independent and may be connected to the others in any desired order using what Ibanez refer to as the 'insta-patch position' controls which work as follows. Each Multi-effect is divided into five functional blocks – the four effects plus the external FX loop. The blocks must be connected serially to form a chain of effects but the order in which they are connected is up to you. Each block has an insta-patch selector – a five-position switch to determine whereabouts in the chain the effect is placed. Hence, if the compressor is chosen to be first in the chain (a sensible move for a guitarist) then its' insta-patch is set at number '1'. If we then wish to add chorus (say), the insta-patch on the chorus generator must be set at '2'. This makes life very much easier than it might be if a series of pedals were regularly reconnected using jack leads.

Fortunately, the switching system has been very well thought out and an 'insta-patch error' LED is provided which flashes if an attempt is made to patch two effects into the same position in the chain. If such a deadlock situation occurs, the output is disabled until the conflict is resolved. The system is only happy when each patch selector is set at a different number.

To illustrate this, suppose we set up a sequence of effects in which the phaser is third in the chain (insta-patch 3) and

the overdrive is fourth (insta-patch 4). If we then decide to put the overdrive before the phaser (since phased fuzz invariably sounds better than fuzzed phasing) then the phaser insta-patch must be set at 4 (causing a temporary error situation) and the overdrive insta-patch must be set to 3. Such an arrangement might seem slightly complicated at first (it took me a while to figure it out, since the manual is not overly clear) but it really is marvellously powerful and easy-to-use, and could not conceivably have been made any simpler. External FX must be patched into the chain just like the other four modules even when no external unit is being employed.

Construction

Ten screws hold the unit together and once these are removed the front panel and electronics slide out easily from the case. In strictly mechanical terms this is one of the neatest arrangements I have seen. The circuitry is mounted on one large PCB including the power supply. The transformer is placed at one edge with a metal shield to reduce stray mains pickup. The PCB is single sided and, measuring about 16″ by 8″, fills the whole case.

All the LEDs and switches – and some of the pots – are mounted directly onto the PCB although there is still a great deal of (unshielded) stray wiring which can sometimes cause problems in a piece of equipment such as this. No apparent attempt has been made to keep the wiring short, which is surprising in a machine which seems well thought out otherwise.

Quality of construction is good in general although I did notice one or two slightly doubtful bits of soldering which, again, is surprising. Nevertheless, these comments are only really of any value to the perfectionist and it seems likely that anything that's going to fail will do so during the guarantee period so I wouldn't be inclined to worry too much.

The UE400

The UE400 is the cheaper of the two systems and retails typically at about £320. The four effects circuits included in it are compressor, phaser, overdrive, and a combined flanger/stereo chorus. Hence the system can actually produce five separate effects (or even six if you consider stereo chorus as distinct from mono chorus). The easiest way to discuss the unit is to take each module in turn.

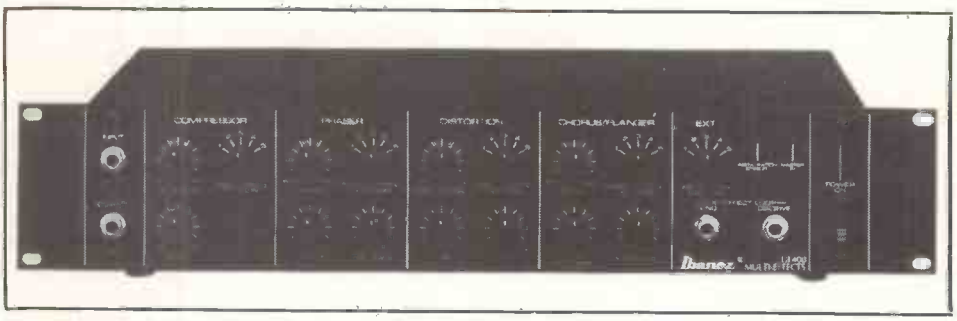
Compressor

This has two controls: output level and sustain level. The insta-patch control may be taken as read from now on since it is present on each module. The output level may be used to set the signal level as high as possible to the rest of the circuit to ensure that noise is minimised. This, of course, presupposes that the compressor is placed at the start of the chain. The sustain control sets the compression ratio, with low settings causing very little compression and allowing the signal to pass more or less unchanged. Sadly, the two controls interact and increasing the sustain level also increases the output level, making setting up just slightly more involved. Compression range is quoted as 40dB.

Phaser

It is slightly curious (though very welcome) that both a phaser and a flanger are included in the same unit since the two effects are essentially similar. The phaser features the usual controls – speed, feedback (or depth) and width.

A wide range of effects may be generated, ranging from typical high quality phasing through to the characteristic poor imitation of a rotating speaker. This is obviously a good example of a phaser: it features eight phase shift networks and for my money outperforms most of the phasing effects available from DDLs.



Overdrive

The overdrive is extremely flexible, with controls to set overdrive level (the actual harshness of the sound), tone, and output level (to bring the signal level back into line with that of the input). In addition, if the overdrive is placed immediately after the compressor, a judicious tweak of the compressor output level can add a bit of muscle to the effect. After all, who's going to worry about distortion setting in?

The module can produce a useful range of effects varying from soft, gentle colouration to full, powerdriving heavy-metal, and for a transistor unit the results really are quite respectable. The module is best used in conjunction with the compressor to get a more professional sound; the two effects complement each other well.

Stereo Chorus/Flanger

Obviously the most flexible of the modules, this features the same controls as the phaser with the addition of a switch (operated by pulling the width pot) to switch from flanging to chorus, since only one or the other is available at any one time.

The flanger ranks alongside DDL flangers in terms of quality and character and offers delay times from 1.46ms to 12.8ms, which is comparable to its digital brethren.

The chorus may be operated in one of two modes. If the main output alone is used a standard mono chorus reminiscent of a 12-string effect is obtained. However, if the stereo chorus output is used as well, an anti-phase, pseudo-stereo image is produced if the two channels are amplified separately. The results are very reasonable and thicken up a signal (especially a guitar) immensely.

The UE405

The '405 is slightly more expensive at around £399, due I suspect to the inclusion of the analogue delay. Again taking the modules in order we have:

Compressor

This differs from the simpler version discussed above since it includes controls for threshold level and attack time. In addition to providing sustain (by amplifying low-level signals) the module also reduces high-level signals back to more manageable proportions, quoted as 0dBm in the spec sheet. The circuit therefore acts as a compressor in the true sense of the word. The response time is variable between 6ms and 20ms, shorter settings tending to cope with sudden peaks better.

Stereo Chorus

This behaves in a very similar manner to the chorus/flanger on the '400, though no feedback control is included. The omission of a flanger combined in this module is surprising since it would add another useful effect to the system and would be unlikely to increase the price by very much. . . .

Parametric Equaliser

The equaliser has controls for frequency, bandwidth (Q factor) and equalisation (the degree of boost or cut). The circuit employed can offer amplification or attenuation of up to 15dB and may be set to operate on any part of the frequency spectrum from 25Hz to 10KHz, using the frequency control.

The bandwidth is claimed to be variable from one octave to seven octaves! Of course, this is somewhat meaningless without quoting the corre-

sponding attenuation seven octaves away from the centre frequency. Clearly they cannot be referring to the 3dB bandwidth – the range of human hearing is only about ten octaves, after all.

The equaliser may be used effectively to reduce unwanted frequencies (especially hum) or to make up for anomolies in the response of a guitar, for instance. If the frequency control is manually swept, an effect akin to wah or (rather poor) phasing is produced.

Analogue Delay

The delay has controls for setting the delay time, repeat level (feedback fraction), and dry/delay mix. The effect is very similar in performance to the Ibanez pedal of the same name. Delay times from 10ms to 300ms (albeit with a bandwidth of only 2kHz) are available.

The circuit can be made to oscillate at high feedback settings and I have heard this used very effectively as an effect in its own right, though I doubt if you would wish to use it too often. Short settings of delay with medium feedback give an approximation to reverb which is not without its uses.

Conclusions

I like the approach taken with these systems very much. To a guitarist the boxes appear little different to a set of pedals in that they must be set-up manually beforehand and may be switched using the pedalboard. In addition, the controls may occasionally be manipulated by a pair of unseen hands to ring the changes in a piece since the control box need not be kept particularly near to the player. For the keyboardist the systems represent very useful effects boxes (particularly the '405) which can sit happily next to a synth or two.

Having said that, I think the units were designed essentially for the guitarist, judging by the effects that are included. For the recording enthusiast the units seem almost ideal due to their convenient format, high quality and low cost. It doesn't take a great deal of mental arithmetic to realise that the asking price for these units is really quite reasonable when compared to equivalent effects pedals. Ibanez stress that 'each effect has studio quality built in'. Normally I would take such a claim with a pinch of salt but it is not entirely unfounded. Specifications for the noise performance of each module (quoted as equivalent input noise) vary between −90dBm and −106dBm. Note that these are not signal-to-noise ratios, however.

The modules all work well and there are no noticeably weak links in either system. I found it slightly difficult to choose signal levels suitably and tended to run out of headroom, driving the units to distortion. However, I did not have very long to play with the systems and perhaps practice would have improved matters. I would have liked to have seen an input buffer amp to enable levels to be set more easily, but this problem can usually be overcome by using the compressor level control.

Apart from that, the boxes are a pleasure to use. The manuals however are of a predictably low standard and tell you little that could not be deduced by fiddling with the controls for a few minutes.

The units score over DDLs (as far as comparisons can be made) in that they can produce several effects at once whereas a DDL cannot. Despite the fact that the Multi-Effects can achieve some of the same effects that a digital delay could, I can clearly see the two types of system complementing each other. The '400 in combination with a good delay line would be quite a formidable arrangement. There are still a few tricks that a DDL cannot be expected to do and even the most expensive of units must often be supplemented by compressors, fuzz boxes, equalisers and so on. A Multi-Effect seems like a good way to 'fill the gaps' in a DDL's repertoire.

Ed Stenson **E&MM**

The prices quoted in the text for the UE400 and 405 are what you can expect to pay in the shops: no RRPs exist as such.

For further information, contact Summerfields, Saltmeadows Road, Gateshead NE8 3AJ, Tyne and Wear.

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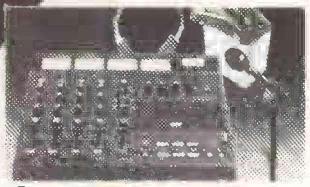

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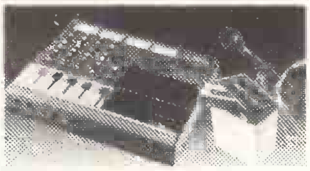

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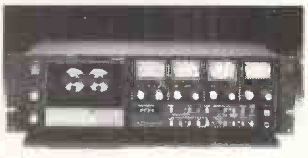

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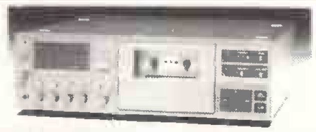

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PATCHWORK

This new series has already proved so popular that this month we've had to extend it to three pages. Still, there's plenty of room for more so remember, if you've got a patch for a synth sound you're particularly fond of, send the relevant details to us in table form – or better still, on one of the panel outlines provided in many user's manuals, with a blank one for artwork purposes – and we'll do the rest.

This month's selection quoshes once and for all the accusation that *Patchwork* is a subsidiary branch of the DX7 Owners' Club, and we'd like this increased variety to continue, so don't let the fact that your synth is a trifle obscure dissuade you from writing in.

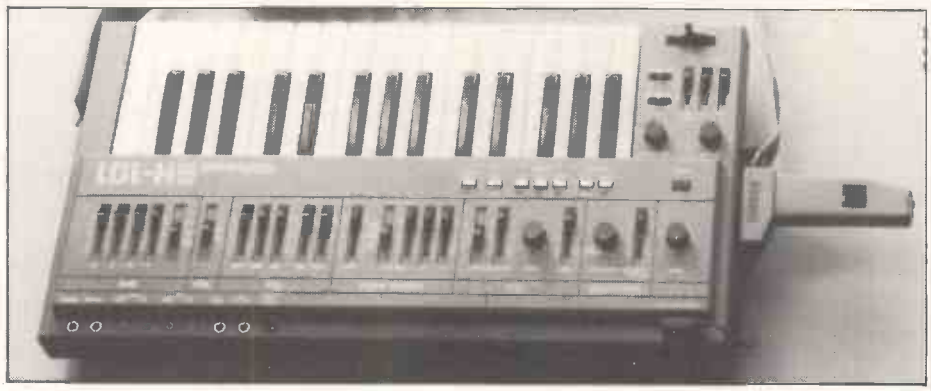
Send your patches to:
***Patchwork* E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY.**

There's no doubt that polyphonic synths have been the major growth area of the electronic keyboard industry, but almost every synthesist starts off with a trusty monophonic that usually remains on (even as the collection grows) to provide the necessary armoury of lead synth sounds. We've therefore concentrated this month on some of the most popular monophonics, as well as providing a couple of patches for the 'big guns' in the popular polyphonic end of the market, the Juno 60 and the Yamaha DX7.

ROLAND SH-101 — 'Pan Pipes' — Source: Mike Humphrey Dorchester

We kick off this month's *Patchwork* with the versatile and inexpensive SH-101, which has been manipulated by Mike Humphreys to produce a realistic Pan Pipe in the patch below. As the layout of the SH-101 is almost identical to the MC-202, this patch could be adapted quite easily to accommodate the MicroComposer if you don't have access to a 101.

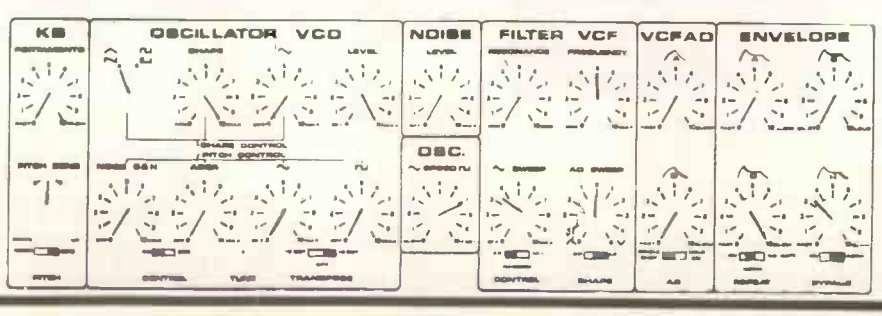
Mike comments that he finds 'the VCF Frequency setting to be the most critical, and that the Attack needs to be adjusted carefully to get the feel of Pan Pipes'.



MODULATOR	LFO/CLK Rate	5
	WaveForm	Sawtooth
VCO	Mod	0
	Range	8′
	Pulse Width	0
	LFO	On
SOURCE MIXER	Pulse Wave	10
	Triangle Wave	4
	Sub Osc	0
	2 Oct Down	On
BENDER	VCO	2
	VCF	2
VCF	Frequency	1½
	Resonance	1
	Envelope	5
	Mod	3½
	Keyboard	9
VCA	Env	On
ENV	Gate	On
	Attack	4
	Decay	10
	Sustain	10
	Release	4½
PORTAMENTO	On	1

POWERTRAN TRANSCENDENT 2000 — 'Vibes' — Source: Gareth Whittock Mid-Glamorgan

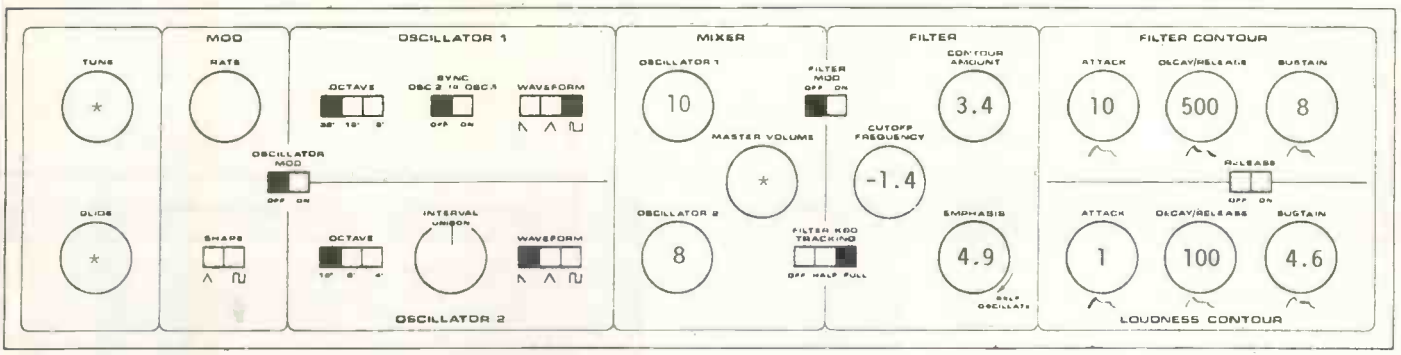
For those handy with a soldering iron, Powertran's inexpensive but versatile Transcendent 2000 produces a wide range of monophonic lead sounds. Among the patches submitted by Gareth is 'Vibes', which is effective over the full keyboard range, and he adds that 'by keeping your finger on the last note played, the decay time is effectively lengthened'.



MOOG PRODIGY — 'Burning Bass' — Source: Sarge O'Hara London N15

Although the Prodigy has since been replaced by the Moog Rogue, it proved to be a winner among synthesists looking for a cheap but powerful monophonic. Sarge, keyboard player with Tokyo Olympics, has found the Moog sound to be invaluable for those 'fat' bass-lines and his patch below makes good use of the dual oscillators, assigning them an octave apart and with different waveforms, and using the Mixer section to balance both levels. It is also worthwhile experimenting with the performance controls (Pitch Bend and Modulation wheels) for extra expression.

moog PRODIGY



KORG MS20 — 'Radiophonic Flute' — Source: Matthew Vosburgh London N1

The 'Radiophonic Flute', described by Matthew as 'similar to the flute sound used in *Dr Who* incidental music', uses the Korg monophonic dual-oscillator synth to good advantage. He has selected Noise on VC01 to introduce a 'breathy' sound which is then mixed low in comparison to VCO2. Further instructions entail patching *MG Triangle Output* to *VCA In* and *VCA Out* to *Total Input* (for delayed vibrato). Note also that EG1 fades in vibrato and filter modulation.

VCO 1

Waveform	Noise
PW	N/A
Scale	N/A

VCO 2

Waveform	Square
Pitch	0
Scale	4'

VCO MIXER

VCO 1	2½
VCO 2	10

	VC	HPF	LPF
Cutoff Freq		5	5
Peak		0	0

CUTOFF FREQ MODULATION

	VCO1	VCO2
MG/Ext	0	3
EG/Ext	0	4

FREQUENCY MODULATION

MG/Ext	1
EG/Ext	0

PORTAMENTO	0
MASTER TUNE	N/A

MOD GEN

Waveform	^
Frequency	2½

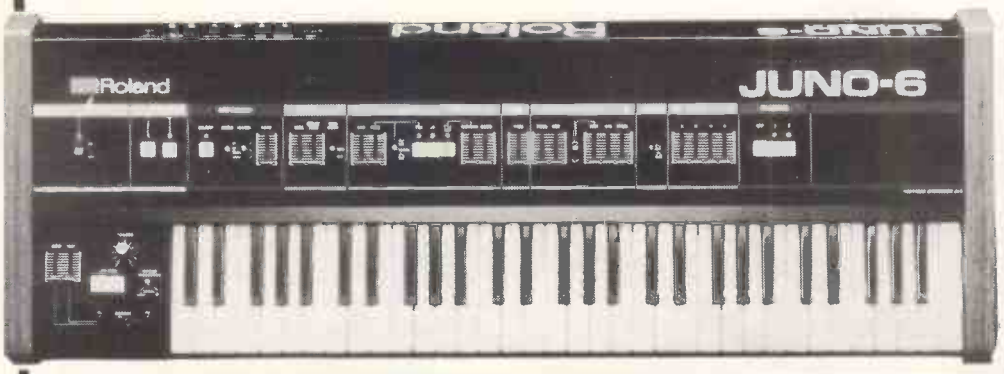
ENV GEN 1

Delay	1
Attack	2
Release	0

ENV GEN 2

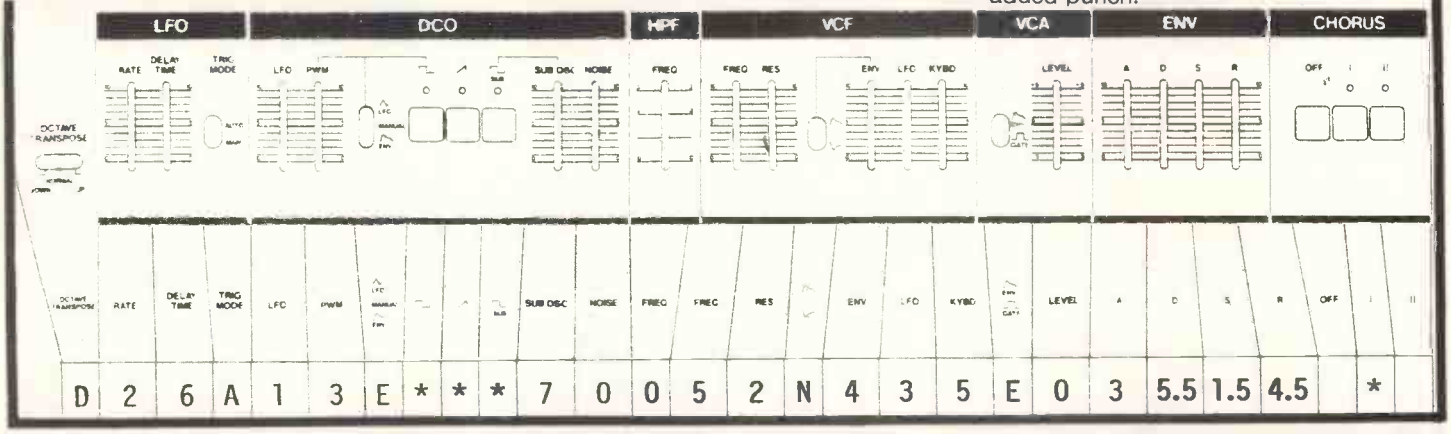
Hold	0
Attack	1
Decay	5
Sustain	5
Release	1

ROLAND JUNO 6 or 60 — 'Brassy Bass' — Source: Trish McGrath E&MM



The Juno 60, soon to be superceded by the imminent arrival of the Juno 106, has proved to be one of Roland's most popular synths, and the patch below should also duplicate exactly on the Juno 6, as it features an identical layout.

The sound has been constructed for playing over the lowest second and third octaves, and decay and release times may be varied to suit. Although not strictly a bass synth sound, 'Brassy Bass' should prove useful for those deep cutting synth lines (*à la* Human League's 'Don't You Want Me, Baby) or for doubling up on the bass-line for that added punch.



D	2	6	A	1	3	E	*	*	*	7	0	0	5	2	N	4	3	5	E	0	3	5.5	1.5	4.5		*			

YAMAHA DX7 — 'Grand Brass' — Source: Stephen Hunter Tayside

Yet another patch for the DX7! This month, however, we've managed to reproduce Yamaha's own Voice Data List to facilitate data input. Stephen describes 'Grand Brass' as 'almost a Brian May ensemble guitar sound in the upper range', and adds that 'heavy-handed playing in the bass (preferably playing octaves) produces a good grand piano emphasis'.

YAMAHA DX7 VOICE DATA LIST

DATE/PRESET No. : 14 Dec / 1983

VOICE NAME : GRAND BRASS

PROGRAMMER : S. HUNTER

OP	ALGORITHM	FEEDBACK	LFO WAVE	LFO SPEED	LFO DELAY	LFO PMD	LFO AMD	LFO SYNC	MOD. SENSITIVITY PITCH	MOD. SENSITIVITY AMPLITUDE
6										0
5										0
4										0
3	2	5	SINE	38	0	0	0	OFF	3	0
2										0
1										0

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	POLY/MONO	PITCH BEND RANGE	PITCH BEND STEP	PORTAMENTO MODE	PORTAMENTO GLISSANDO	PORTAMENTO TIME									
	POLY	12	0	FOLLOW	OFF	0 OR 10									

OP		MODE/SYNC	FREQ. COARSE	FREQ. FINE	DETUNE	EG RATE 1 2 3 4	EG LEVEL 1 2 3 4	KEYBOARD LEVEL SCALING BREAK POINT	KEYBOARD LEVEL SCALING CURVE L	KEYBOARD LEVEL SCALING CURVE R	KEYBOARD LEVEL SCALING DEPTH L	KEYBOARD LEVEL SCALING DEPTH R	KEYBOARD RATE SCALING	OPERATOR OUTPUT LEVEL	OPERATOR VELOCITY SENS.	PITCH EG RATE 1 2 3 4	PITCH EG LEVEL 1 2 3 4	KEY TRANSPOSE	VOICE NAME
6	R					99 99 99 99	99 99 99 00	A-1	-LIN	-LIN	0	0	0	0	0				
5	R		8	.00	0	50 42 42 99	82 52 00 00	A-1	-LIN	-LIN	0	0	0	90	7				
4	R		0	.50	0	60 99 99 99	99 99 99 00	A-1	-LIN	-LIN	0	0	0	90	0				
3	R	OFF	1	.00	+7	90 99 99 99	99 99 99 00	A-1	-LIN	-LIN	0	0	0	99	3	99 99 50 50	99 50 50 50	C3	GRAND BRASS
2	R		0	.50	0	50 30 99 40	99 46 46 00	C4	-LIN	-LIN	0	14	2	99	0				
1	R		1	.00	0	99 99 99 40	99 99 99 00	F#3	+LIN	-LIN	0	6	2	99	2				

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
MODULATION WHEEL				FOOT CONTROL				BREATH CONTROL				AFTER TOUCH			
RANGE	PITCH	AMPLITUDE	EG BIAS	RANGE	PITCH	AMPLITUDE	EG BIAS	RANGE	PITCH	AMPLITUDE	EG BIAS	RANGE	PITCH	AMPLITUDE	EG BIAS
65	ON	OFF	OFF	50	OFF	OFF	OFF	99	OFF	OFF	OFF	50	ON	OFF	OFF

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Yamaha Personal Keyboards PS200, PS300, PS400

The advent of the personal keyboard has prompted many musicians to invest in a creative tool that is portable, compact, and relatively inexpensive, and although personal keyboards have attracted mainly a 'home musician' type of buyer, there is no doubt that they offer many facilities that are very attractive to the serious musician. Trish McGrath **takes a look at three of Yamaha's most recent introductions.**

The Portasound PS300 and PS400, and the soon-to-be-released PS200, manifest themselves at the lower end of Yamaha's personal keyboard range (the pocket-sized Handysounds being merely easier on your wallet), and offer a wide range of features for quite minimal outlay.

All these keyboards operate on batteries (six 1.5V) but can alternatively be powered by a 9-12V DC mains adaptor or, if you're the travelling type, Yamaha supply an optional adaptor which can provide power to the instruments using the cigarette lighter socket in your car.

As the three keyboards are being examined together, the common sections (such as Orchestra, Rhythm, and Auto Bass Chord) will be looked at in detail later on, and some of the individual or additional features covered briefly below.

PS200

The new PS200, due to be launched shortly at an RRP of £99, is one of the smartest personal keyboards to pass through E&MM's doors, with a top body moulded from a very stylish dark navy and turquoise lettering. It's a three-octave (37-note) polyphonic keyboard featuring a built-in speaker with a maximum output of 2W and, in common with the rest of the PS range, an Aux Out phono socket allows the keyboard to be played via your hi-fi or whatever. Headphone mini-jack sockets are also provided on all keyboards.

The PS200 front panel boasts – from left to right – a Master Volume and Accompaniment Volume sliders, Auto Bass Chord, Rhythm and Orchestra sections (more on these later), and finally a selection of Programmed Music.

This last feature is activated by depressing the red Start/Stop button whereupon a rendition of 'Sur le Pont d'Avignon', Beethoven's Ninth Symphony, and Chopin's 'Nocturne' are played in sequence and looped. Although there is no facility for changing the programmed rhythm, tempo or voices, it is possible to play the keyboard itself while the music is playing back. By depressing one of the top three notes of the keyboard (labelled 1, 2 and 3) simultaneously with the Start button, each piece of music can be played back individually.

PS300

Apart from extra voices and rhythms, the PS300 is similar in layout to the 200. Again, it possesses a three-octave keyboard, but this also includes a Pitch Control on the bottom panel for fine tuning adjustment.

Our review model was dark cream in colour, and as with the more expensive PS400, maximum output is 1.4W from the mono 3" speaker on the left-hand side of the keyboard. An optional Expression Pedal is also available for controlling the overall volume level.

PS400

Constructed from a stylish navy casing, the PS400 features in addition to the Orchestra, Rhythm and Auto Bass Chord Sections, a 44-note keyboard (F-to-C), a Transposer for adjusting the pitch of the entire keyboard up or down a half-octave, a Chord Sequence Memory, an automatic Duet feature, and an Arpeggio.

The Chord Sequence Memory consists of three buttons (Off, Memory, and Play) and, as the title suggests, will memorise a chord progression which you can input either in real-time or step-time. In step-time, four notes at the top end of the keyboard are allocated different note lengths (whole note, dotted half-note, half-note, and crotchet), and the procedure is simply to hold down the desired chord key (see Single Finger Chord) and press the desired chord length. It is also possible to designate some measures to have the rhythm section replayed by keying in note length only (ie. spaces), and if you input an incorrect chord, it's possible to rectify it provided you do so immediately, since only the preceding chord can be cancelled.

In real-time input, the chord progression is memorised as you play, although on playback the chords are automatically replayed in accordance with the preset bass and chord patterns. The Chord Sequence facility is very useful for composing melodies and so on, although with a memory of only 32 measures or so and no way of 'looping', entire songs are not exactly possible.

The Duet button 'adds a harmonising note to every melody note you play', according to the user's manual. I played a simple run of G-A-B-C: technology added a lower D-E-F-A. Have Yamaha invented a new code of 'harmony' based on some ancient Japanese modal system? I would have preferred the inclusion of a simple sub-octave voice, or better still, a facility for transposing the entire keyboard up and/or down one octave.

The Apreggio, with its own volume control, adds a 'rippling' effect in sympathy with the auto accompaniment, this being governed by the Rhythm Section's Tempo setting and the notes of the accompaniment chord.

Orchestra Section

In normal mode, or with only an accompanying rhythm selected, the keyboards are seven-note polyphonic, but this deflates immediately to only three-note polyphony when the Auto Bass and Single Finger Chord features are in use.

A core of seven instrument voices (common to all three PS instruments) comprise useful Organ, Piccolo, Piano, Harpsichord and Guitar sounds, as well as (questionable) Trumpet and Violin.

The PS300 has the added bonus of a tasteful Vibraphone, while the PS400 possesses not only the Vibraphone, but Clarinet and Oboe voices as well.

Preset Delayed Vibrato has been built into the Piccolo, Trumpet, Violin and Oboe voices, and Sustain (which considerably improves the sound of some voices), can be added to the Orchestra voices if desired. However, the PS200 offers a second Sustain which, although not lengthening the actual release time, produces a very enhancing reverberation effect unheard of before on this type of instrument. Full marks.

Rhythm Section

Despite the term 'rhythm' which personal keyboard manufacturers have adopted, it is sometimes difficult to look upon this section as anything more than a fussy metronome. For example, Yamaha have chosen to provide these built-in non-programmable 'drum boxes' with tuned percussion sounds instead of filtered, noise-generated percussion, which can make the act of differentiating between bass drum, snare and everything else quite an art.

All units produce Swing, Slow Rock, 16 beat, Disco, Bossanova, March and Waltz Rhythms. The PS200 also has a useful Pops rhythm while Jazz Rock, Rumba and Samba rhythms are included on both of the larger models.

A slider is used to select a tempo (between 'Slow' and 'Fast') and the volume is adjustable between a 'Min' and 'Max' range. However, on the PS200, exclusive volume control for the percussion is not provided, but incorporated instead within the Accompaniment Volume slider, albeit with detents rather than a continuous action. Mention must be made of the fact that when increasing the volume of the Rhythm Section on the PS300 and 400, the sound was totally inaudible until the slider moved to about one-third of the range. Why not spread the range better for finer control?

A Synchro Start button (which doubles as a Stop button when re-released to the 'up' position) is provided on all keyboards and starts the Rhythm and Auto Bass Chord sections simultaneously (and in sync) by simply pressing any key in the lowest octave. However, this does mean that when you wish to play the Rhythm on its own, an unwanted note is created as soon as the rhythm is activated. The PS200 overcomes this (and scores above its' big brothers) by offering Stop, Start, and Synchro Start controls.

Unlike some of their contemporaries, the Yamaha's rhythm sections don't incorporate a 'fill-in' facility to liven up the patterns, although the PS400 has a '4-Bar Variation' which varies the rhythm pattern on every fourth measure.

Auto Bass Chord

This section spans the 14 notes at the lower end of the keyboard (from F to F#) and allows you to obtain an accompaniment of bass, chords and rhythm simply by pressing one key. It is possible to alter the rhythm (and thus the accompaniment) during play, and a Variation control selects a different bass and chordal accompaniment (basically, No 2 is a busier version of the simple backing of No 1).

Tempo is controlled by the Rhythm Section's Tempo control, and a blinking LED, which flashes on the first beat of every bar, functions as a visual metronome. An individual Volume control is provided for the Auto Bass Chord section, except on the PS200 where it is integral with the Rhythm in the Accompaniment Volume slider. As the levels are well balanced, this should pose no problems in practice.

It's possible to select Single Finger Chord without the automatic bass and rhythm by switching the section on and pressing a key in the Auto Bass Chord section. This enables you to play a major chord by pressing the root note only. By simultaneously pressing the next black key to the left of the root note, a minor chord is produced. Similarly, by depressing the next white note to the left, a seventh chord is sounded, and a minor seventh is produced by keying both the next black and the next white key to the left of the root. However, quite often an inversion of the chord is produced (ie. the root note is not the lowest note of the chord) and this can alter the sound of a chord progression quite dramatically.

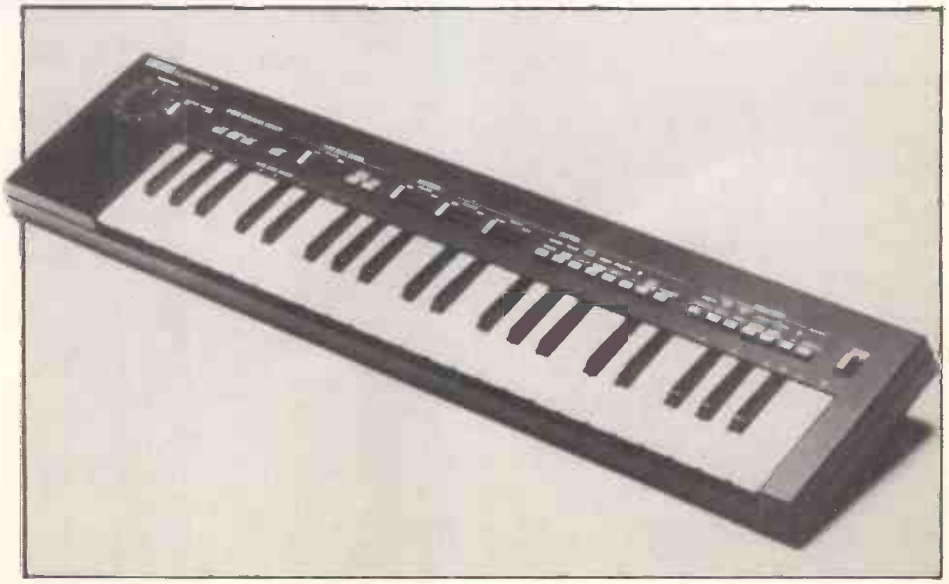
This section, although spanning just over an octave, has another rather annoying method of replaying the pitch of the selected bass and chords. For instance, the lowest seven notes (F to B) play back an accompaniment that is higher in pitch than the (supposedly) top end of the section (C to F#). In fact, there is absolutely no difference between the backing produced by selecting the low F to that produced by the higher F (and the same applies to the two F# pitches). This duplication also occurs when the Single Fingered Chord feature is selected on its own.

Conclusions

Apart from the few minor quibbles mentioned above, there is no doubt that the PS range of keyboards represent good value for money, and contain a host of features to aid and abet not only songwriting, but also the pure enjoyment of simply making music for its' own sake. If the Fostex X-15 is the 'sketch-pad' of the multitrack market, could the PS200 be described as the 'doodle pad' of the composer?

Trish McGrath **E&MM**

PS200 RRP £99; PS300 RRP £179; PS400 RRP £229. Further information from Yamaha Musical Instruments, Mount Avenue, Bletchley, Milton Keynes, Bucks. Tel: (0908) 71771.



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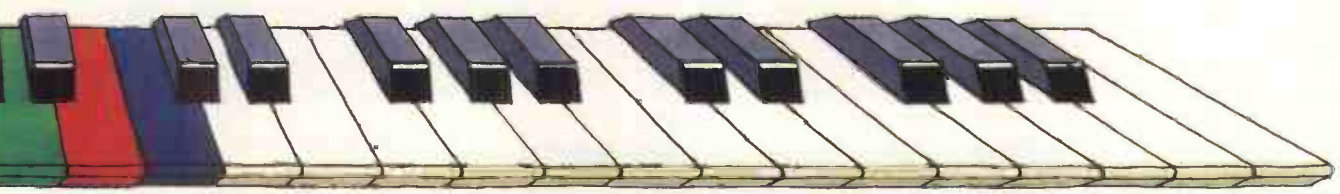

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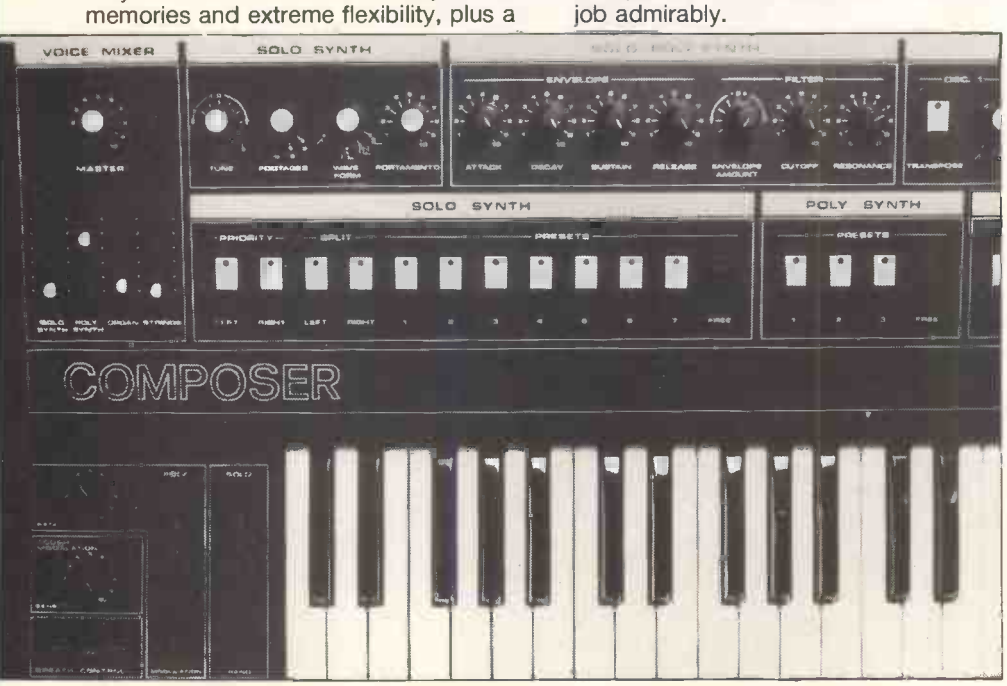
Crumar Composer Polysynth

Currently, the Composer occupies the top-of-the-range position in the Crumar line of pro keyboards. It offers a versatile solo synth section in addition to poly, organ and strings sources, and as Geoff Twigg **recently discovered, more than a surprise or two besides.**

It would seem that the once simple task of going out and buying any sort of instrument is becoming vastly complicated by the headlong rush of technology. Manufacturers are constantly striving towards developing a better, smaller, more flexible keyboard instrument at a lower price than ever. We can only dream of where it will all end, but where does that leave the interested but not-too-technical amateur? Between the wonders of the DX7, with algorithmic FM synthesis, and the Casio VL-Tone's pure, inflexible presets, there are a lot of people who need to be able to make an impressive, full ensemble sound without too much hassle.

This is where the Crumar Composer enters the market, and this is the context in which to judge it. OK, you could buy a Poly-800 for the same money – 50 memories and extreme flexibility, plus a sequencer – but a lot of people prefer a simple, single multi-purpose keyboard with enough variety for the user not to get bored with it in an hour and not so much in the way of controls to daunt him at the start.

The first time I came across one particular digital synth, for instance, was in a recording studio on the south coast. I had asked the band to hire a synth for me, and when we got it I was horrified to see that it was totally without instructions or guidance of any kind, apart from the cryptic clues on each touch-sensitive panel. Of course, I've since worked out how to achieve the desired effect, but it cost us quite a lot of expensive studio time just fiddling with the numerous controls and on a couple of tracks we had to settle for second-best. On that occasion I would have been rather pleased to have had a Crumar Composer; and it would have done the job admirably.



Construction

The Composer is a fully polyphonic instrument, well designed in the Italian tradition, and weighs around 38lbs – that's at least heavy enough to warrant taking the lift rather than trying to struggle upstairs with it. It's very sturdy, and I reckon should stand the rigours of life on the road very well. The controls are on a slightly raised, angled panel of metal, with wooden end-pieces. The pots and push-select buttons are colour-coded: yellow for the solo synth, red for the poly, grey for the organ and blue for the string section. These four main sections each have a separate output channel, but are wired initially to a single main output, governed by a master volume control. The mix into this mono output is controlled by a four-channel voice mixer, with sliding faders that also act as separate volume controls for the direct outputs: all outputs are quarter-inch jack sockets. There's a master pitch control on the rear panel, with a range of roughly a fourth either side of concert pitch (A=440).

It must always be difficult for designers of this kind of instrument to decide where to place the performance controls such as pitch-bend, modulation depth and rate, and so on. Crumar have provided two wheels on the Composer, one for pitch-bend on the solo synth, the other for square-wave LFO modulation of pitch on the poly. There's also a rate control for this LFO, but unfortunately no other waveforms. However, the most interesting performance control is the breath controller which is switchable to act upon the combined solo/poly synthesiser VCA and VCF sections, of which more in a moment.

The preset allocation is as follows. Solo: seven presets and access to all parameters on a 'Free' button; Poly: three presets and access to the same Envelope and Filter section as Solo; Strings: one preset sound with variable

timbre, sustain, and so on; Organ: four presets plus programmable percussion wave.

Solo Synthesiser

This section has one oscillator which can be set to 32′, 16′, 8′ or 4′ octave ranges and de-tuned a maximum of approximately one semitone. There is a five-way waveform selector giving a choice of ramp, triangle, square and medium or narrow pulse waves. Next to this is a *portamento* speed control, which at maximum gives a very slow pitch change of four octaves in six seconds, though no quantisation is available. The solo amplifier section has traditional ADSR envelope controls, and a low-pass filter is also added to the circuit: this can be effected by the envelope shaper. Filter controls are Envelope amount, Cut-off frequency and Resonance, and the latter self-oscillates to reinforce the cut-off point.

There's a two-way keyboard split at Middle C of the four-octave keyboard, so that either half may be dedicated to solo synth alone. There is also a very useful priority assignment which directs the solo synth to left or right; that is, to the highest or lowest key depressed, to emphasise the melody line or bass respectively.

Crumar provide seven preset voices, including some pleasant brass and clarinet sounds, and most of these are quite usable.

These presets are not affected by the waveform selector, ADSR or filter sections, but detuning, footage selection and portamento can be allocated to them. At the right-hand end of the preset bank is a black button marked 'Free' which allows you to set-up and modify totally new sounds. I found the solo synth to be a remarkably flexible instrument, though I would have preferred to have more control of pulse width, perhaps with the opportunity to modulate this using the LFO.

Polyphonic Synthesiser

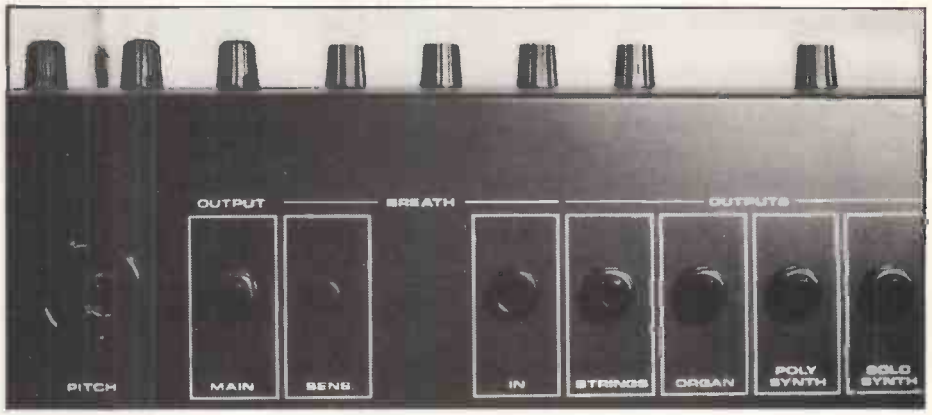
The poly section has two oscillators, on each of which ramp and square wave may be selected. In addition, each oscillator has a Transpose button which lowers them one octave; strangely, a detune control, placed in the middle of the second oscillator section, actually works on oscillator one. It has the effect of lowering the oscillator a maximum of a fourth, or raising it as much as a tritone (augmented fourth). Next to this is a Cancel button, acting on oscillator two. There are three presets for the polysynth section, and again the 'Free' assign button, which routes the poly through the same ADSR and filter stage as the solo synth, with all the benefits and disadvantages this implies.

Organ and Strings

The Organ section has four separate sounds which are very effective, and to each of these may be added a 4′ and/or a 2⅔′ percussion stop, with separate volume and decay controls. The organ is provided with a variable-length sustain, and a Rotary Sound System with two speeds. This RSS can be used to obtain some very convincing Leslie effects, especially since when a speed change is selected it takes effect gradually, I know it *sounds* strange, but it's surprisingly realistic.

The string section is perhaps the most disappointing part of this instrument, though it can be quite useful and effective in filling out the texture of the ensemble. It has two octave settings, 16′ and 8′, together with controls marked Crescendo, Sustain and Timbre. The first two of these form an attack-release envelope, which responds like all the other sections to the single keyboard trigger. The problem with this system is that a single note moving independently of a held chord can cancel the sustain of all the others, which can be quite an inconvenience.

The Timbre control alters the tone of the strings, though it must be said, not by a very great deal.



The envelope for the string section is, of course, linear and could never sound like a real string instrument; however, with a suitably slow attack time ('crescendo'), it can give a reasonable impression. The actual waveshape used is not unlike that of a string ensemble, but there is an unfortunate phasing effect, impossible to lose, which gives an insistent rhythm in 5/16 time. A further problem is encountered when holding a low to mid-range chord on strings, as distortion becomes clearly audible, due to the oscillators trying to do more than they should. . . .

Breath Control

The Breath Controller consists of 2m. of black plastic tubing with a small mouthpiece fitted to one end. Actually, two tubes and several mouthpieces are included for the purchaser, so that you can let your friends have a go without endangering your/their health! The tube fits onto a small nipple at the rear of the console, next to the main output. There is a three-way switch marked 'solo/off/poly' at the left of the front of the instrument, which directs its use to the ADSR/filter stage of either synth, though not both together; only the Envelope stage of these two sections can be accessed from the Breath Controller.

The amount of control can be set by using the Envelope Amount stage of the filter – on selecting positive envelope control, blowing creates a very pleasant brass-like envelope, while sucking stops the sound almost immediately. Turning the Env. Amount to its negative side gives the reverse effect, which – for reasons that are frankly beyond me – is both more difficult and more exciting to use. I'm looking forward to having a lot of fun with this way of controlling the filter though for the more self-conscious it may be a little too awkward or embarassing to use on stage. If the user were asked to use a microphone, or a larger mouthpiece mounted in some way, it might be less daunting. I'm sure many in my audience would wonder what I was drinking, or perhaps smoking, through that tube disappearing round the back of the instrument!

Summing-Up

The keyboard is nicely weighted, with individual springs for each note that offer a suitable resistance to each touch. The weight and spacing of all notes is remarkably even, and this helps to make the Composer a very pleasant instrument to play. Although its design is not the most up-to-date, with many separate and rather limited ICs instead of larger-scale integration, the sounds and capabilities of the instrument will certainly be more than adequate for many people.

The clear, colour-coded layout of the various sections makes it extremely easy to understand, and to use on stage. It also has enough flexibility for me, at least, to spend several happy hours discovering and re-creating sounds with the solo and polysynths that are still fresh and musical. While many manufacturers are giving us more and more control parameters, digitally produced sound and additive synthesis, there will continue to be a market for, and interest in, simple and effective multi-purpose keyboards. In this market area, the Crumar Composer is certainly worth looking at.

Geoff Twigg **E&MM**

The Crumar Composer can typically be bought for £649 including VAT, and further details should be available from the importers, Chase Musicians, 58 Oldham Street, Manchester M4 1LE. Tel: 061-236 6794.

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WE HAD A QUICK WORD WITH ANDY ABOUT HIS MUSIC AND HIS EQUIPMENT JUST BEFORE HE WENT INTO REHEARSALS.

ANDY, THE OBVIOUS FIRST: HOW OLD WERE YOU WHEN YOU STARTED?

I WAS ABOUT THIRTEEN AND I STARTED ON GUITAR. BUT I USED TO BASH ABOUT ON MY MUM'S PIANO TOO, AND MY LOVE FOR KEYBOARDS STARTED FROM THERE.

AND WHO WERE YOUR INFLUENCES?

OH, LOADS – COLE PORTER, STUFF LIKE THAT. BOWIE OF COUR

WHEN DID YOU START USING SYNTHS?

I USED TO PLAY KEYBOARDS FOR STACKRIDGE AND WHEN OUR FLUTE PLAYER SAID HE WAS GOING TO LEAVE I BOUGHT A SYNTH TO FIL HIS SOUND.

BUT THE GUY DIDN'T LEAVE AFTER ALL.

HOW DID YOU DEVELOP YOUR SOUNDS? WAS IT SIMPLY A MATTER EXPLOITING AND EXPERIMENTING ON IT?

YES, I SUPPOSE SO.

I'VE ALWAYS BEEN FASCINATED BY ELECTRONIC NOISES. BUT IN EARLY DAYS YOU COULDN'T EXPLOIT A SYNTH THAT MUCH 'CAUSE IT DIDN HAVE THE PROGRAMS. IT WAS AROUND THE TIME I GOT MY FIRST KORG T I REALLY GOT GOING.

YOU SAY YOU USE KORG. WHAT ARE THEY LIKE ON THE ROAD?

THEY'RE VERY GOOD. THEY STAND UP TO ALL THE KNOCKS AND
MPS BETTER THAN I DO – I LIKE BEING WELL LOOKED AFTER.

AND WHAT ABOUT THE NEW KORG POLY 800?

WELL I HAVEN'T HAD CHANCE TO FULLY EXPLOIT IT YET BUT I LIKE
AT I'VE SEEN AND HEARD VERY MUCH. IT'S GOT 64 PROGRAMS, SO
RE'S BOUND TO BE PLENTY OF INTERESTING NOISES IN THERE. IT'S GOT
OD TONES, LOOKS GOOD AND IT'S PORTABLE OF COURSE. THERE ARE
IER SYNTHS AROUND, BUT THEY COME IN AT LEAST FOUR OR FIVE TIMES
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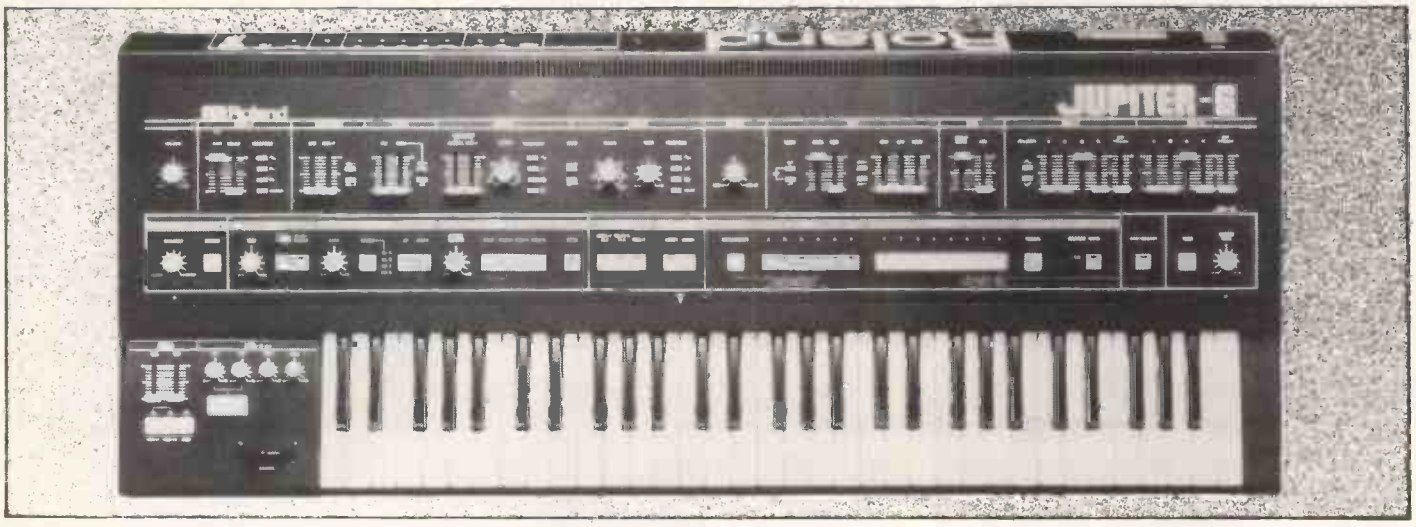
Ian Boddy on the Jupiter 6

With the advent of FM and digital synthesisers at prices that put them well within the reach of many electronic music-players, conventional analogue instruments have taken something of a back-seat in recent months. Composer and multi-keyboardist Ian Boddy **thinks such a state of affairs is unjust, and here examines Roland's mid-price Jupiter 6 polysynth as a prime example of well-applied analogue technology.**



Basically, the JP-6 is a 6-note, 6 voice, 12 VCO programmable polyphonic synthesiser that has been designed to fall between the very expensive Jupiter 8 and the more affordable Juno 60. However, it is not just a scaled down version of the former because, although it has two fewer voices, it also has several refinements over its bigger brother including a couple of surprises normally reserved for modular synths. Its' recommended retail price of £2,250 is still fairly hefty, but it actually sells at considerably less than two grand. However, this could still put it out of the range of many people who might prefer to opt for one of the host of synths around the £1000 mark, so why spend the extra on a JP-6?

There are two main reasons. First, it possesses a sophisticated split-keyboard facility that can effectively transform it into two instruments in one, and second, some of the functions available have only previously been found on keyboards costing the earth.

Manual Section

This runs along the top of the control panel and contains some excellent features, the filter and VCO modulation sections being particularly notable. Let's start at the extreme left however, where we find a rotary knob for overall volume. Unfortunately, this can't be written into the instrument's memory, and this can make balancing your program levels a bit awkward.

The main Low Frequency Oscillator (LFO) has the usual two sliders for rate and delay-time. The latter can be set to a maximum of 2.5s but has no effect on either Pulse Width Modulation or VCA modulation. This is a shame as you don't often find VCA modulation (ie. tremolo) on a synth and it would have been nice to have been able to delay this effect. A red LED gives a visual indication of LFO rate and four small buttons switch between the four available waveforms: triangle, ramp, square and random.

The Jupiter 6 has two VCOs per voice, and this of course gives it considerably greater scope for sound production than the smaller, single-VCO Juno 60 or 6. Both VCOs have unusual octave range controls: a complete break from the familiar rotary knobs with click-stops for the different footages. The JP-6 re-design is free-running and has a 'dead-zone' around each octave setting, so that turning the knob slightly to the left or right has no effect. However, once outside this area the pitch increases in semitone steps which makes tuning the two VCOs apart to a musical interval refreshingly easy. Furthermore, VCO2 has the additional features of expanded low (1.5-50Hz) and high ranges and a rotary knob for mild detuning from VCO1. Full marks to Roland then for putting fresh thought into a function that has been unchanged for many years.

The waveforms available are: VCO1; triangle, ramp, pulse, and square, and VCO2; triangle, ramp, pulse and noise. A pity no sinewave is provided; it's a bit of a surprise on so sophisticated an instrument (even the humble SH2 has one). These waveforms are selected by small push-buttons, as for the LFO, and can be mixed by pressing two or more down simultaneously, though no facility is available for balancing the relative waveform levels. Both VCOs can be phase-locked together, providing a sync function that's particularly good at producing screaming synth solos (even more so if you use the bender to alter the pitch of the VCO being locked). A simple mixer section allows the relative volumes of the VCOs to be adjusted.

Extensive oscillator modulation controls are provided in the shape of VCO, Pulse Width, and cross-modulation. The first has two sources, the LFO and Envelope 1, with sliders for modulation amount and push-buttons for selecting whether the VCOs are modulated together or individually. The PWM section has two sliders, the first of which sets the pulse-width and the second the amount of modulation. The source of PWM, again selected by two small push-buttons, is either LFO or Envelope 1. The final modulation function is cross-modulating VCO1 by VCO2, the amount again being set by sliders. The modulation can either be continuous or, alternatively, the modulating output of VCO2 can be controlled by Env-1. For those not familiar with the term, what cross-modulation means is that VCO1 is being modulated by an audio frequency (ie. VCO2) rather than an LFO (ie. vibrato). This is more correctly called frequency modulation or FM (go to the bottom of the class if you haven't read about FM synthesis recently!) and it's rather good at synthesising pseudo-ring-modulated sounds and other unusual tones.

Next we come across the filter which, as with most Roland synthesisers, has five sliders for VCF frequency, resonance, envelope modulation, LFO modulation and Keyboard Follow amount. This latter controls the amount of the keyboard CV being routed to the filter frequency, allowing high notes to be as bright as low ones on low filter settings, and can be set to a maximum of 120%. Four switches are provided, two to select which of the two envelopes are being used for modulation and two to select the filter mode. It's this latter mode that provides a degree of sophistication not normally found on anything other than modular systems, in that the filter can be either low-pass or high-pass or, if both buttons are depressed, a band-pass filter. . . .

The VCA has two sliders for Envelope 2 and LFO modulation amounts, while at the extreme right of the instrument is the dual Envelope Generator module. Both have the usual four sliders for attack, decay, sustain and release. Envelope 1 can be inverted if required, and both have sliders for Key Follow to allow higher notes to have shorter decay times than lower ones: this is particularly useful for synthesising piano-type sounds, for example.

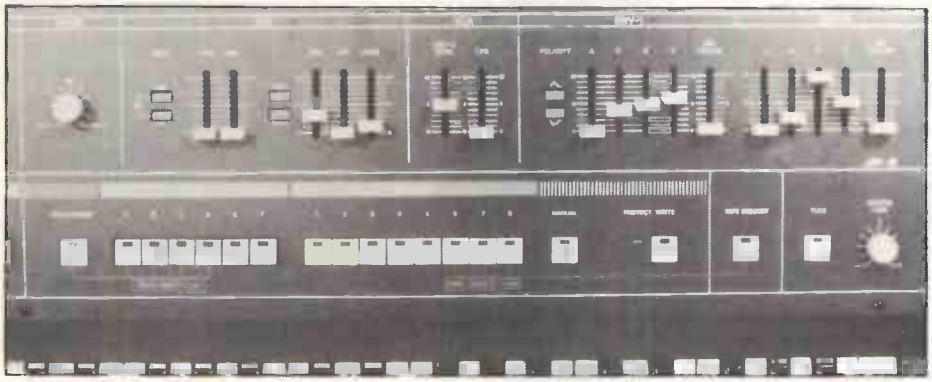
Performance Controls

This section is to the left of the keyboard (which is just where it should be) and houses the familiar Roland bender which can be used to control the VCOs and VCF, the amount of effect on each being set by two sliders. Three white buttons allow the bender to be selected to control either VCO1 or 2 (or both) or to select a special wide range of over 3 octaves, if you're feeling in an extreme mood! A second sinewave LFO can be brought into play by pressing down on a large white push-button and four small rotary pots cater for VCO and VCF modulation amounts, rate (1-10Hz) and rise-time (the time required for the LFO2's modulation to reach the depth set). This second LFO is nice for momentary effects brought into play with your left hand during a performance, but you can't keep the effect on continuously without actually keeping your finger on it (another use for my lead weights?).

Memory Panel Section

This section runs the whole length of the instrument just above the keyboard, and houses all the programming and keyboard mode facilities, plus some other assorted effects. At the

extreme left is a rotary knob for balancing the relative levels of the lower and upper sections when in Split mode, and a push-button for switching the bender on or off. The latter is used when programming in Split mode if you only want one half of the keyboard to incorporate bend functions. The Glide section has a choice of *portamento* or *glissando*, as well as a Glide Time knob, and when in Split mode these effects can also be assigned individually to the lower and upper sections. The arpeggiator allows the JP-6 to sequence any notes played on the keyboard in the order they are played. The range can be varied from one to four octaves, but only one push-button caters for this. This can be a problem if you're arpeggiating over a two-octave range and want to go back to one octave range, for example, as you have to press this switch three times to step through three, four and then back to a one-octave range. Up and Down push-buttons allow for four arpeggiator modes of Up, Down, Up & Down or Down & Up. The last two sound very similar in practice, and a more useful option (I feel) would have been the inclusion of a random mode. The arpeggio rate is set by a rotary pot and this can of course be synchronised to an external clock, such as a trigger from a drum-machine, via the rear panel.



The Jupiter 6 has five assign modes which determine how the six synthesiser voices are applied to the keys played. The Solo mode turns the JP-6 into a single-voice synth with last-note priority, while Unison mode has a variety of effects. If one key is pressed all six voices sound, while two keys give three voices each, and three keys have two voices each. Four to six notes played give one voice each. The Solo Unison mode is (surprise, surprise) accessed by pressing the solo and unison mode buttons simultaneously, when the JP-6 is turned into a monophonic synth, which in the Whole mode assigns all six voices to each key. Finally, two Poly modes are provided which assign one voice to each key played. However 'Poly 2' has the added advantage that only the last note or notes played together receive their natural release length, which makes it suitable for performance with *portamento* or *glissando*. A rotary knob provides oscillator detuning for ensemble effects, and a further push-button provides Key Hold, the level being determined by the sustain level of Envelope 2.

Three Key modes are provided to give Whole mode and two Split modes, where four voices are applied to the lower section and two to the upper or vice versa. Two panel mode push-buttons allow the upper and lower sections to be programmed individually when in Split mode. The split point is automatically set at C to give a lower section of 2 octaves and an upper of 3, but this can be changed if desired. Unfortunately, this information cannot be stored in memory.

The remaining right-hand half of this memory panel section is taken-up by the programming controls. It's possible to use either 48 patch memories or 32 patch presets. Six blue buttons (labelled A-F) determine which bank of memories is being utilised, each bank having 8 memories selected by white push-buttons (note that with patch presets, only banks A-D are available). No LED display is provided as it is on the Jupiter 8 to monitor which programs are in use, but all the push-buttons incorporate small red LEDs that serve much the same purpose.

It's possible to edit any of the memories without permanently re-writing the program, and a further white Manual switch gives access to the Manual section. The patch memories are for the pre-programmed sounds provided (or your own tone-colours), whereas the patch presets store a combination of patch memories with key and assign modes and various performance parameters, which is ideal for live situations. In other words, a patch memory can only hold one sound, whereas a patch preset can hold two if operating in the Split mode. Furthermore, performance parameters such as *portamento* or the arpeggiator cannot be written into the patch memories because if you call up a patch preset in Split mode and these effects are applied to both the lower and upper keyboard sections, the rate must be the same in both.

A Memory Protect switch is located on the rear panel and must of course be turned off to rewrite a program. A battery back-up maintains the memories when the instrument is turned off. Programming and writing new data is very easy, achieved simply by using the Manual and Write buttons: an accompanying LED glows red when the Memory Protect switch is on. As an added safety precaution, it's possible to protect either the patch memory you are working with (orange LED) or one you're not (green), the latter being particularly useful for arranging the order of the patch memories. Indeed, it's possible to re-order memories very easily by copying different patch memories into the same bank, for example. Furthermore, if you use two tapes (one to hold all the memories and the other to hold rearranged banks) it is possible to rearrange all the memories from a totally disorganised state into eight pre-arranged banks, which can then be used for eight separate songs, for example.

The last three controls in this section are for tape memory, auto-tune of all 12 oscillators and overall tune.

Tape Memory

Two sockets are provided on the rear panel for saving and loading patch memories and patch preset data onto an ordinary cassette recorder. When the tape memory button is held down, memory buttons 6-8 each take on a second function; number six becomes Save, seven Verify and eight Load. It is recommended the user gives a data name to each set of programs stored by using a bank letter, as this enables loading to be accomplished that much more easily. It is also possible to save selected bank memories rather than all 48 together.

External Control

Several external control options are provided on the rear panel, of which the Arpeggio Clock In has already been mentioned. Patch Shift allows a foot pedal (eg. Roland DP-2) to step through patch numbers in the same bank but not to change banks. Pedal Hold allows switching this function on or off again via a DP-2, or alternatively a foot volume pedal (eg. Roland FV-200) can control the VCA and VCF. The MIDI In and Out DIN sockets appear on the rear panel as well, the information available being Keys Played, Auto Tune and Patch Preset Selection. The rear panel is completed by a headphone socket and an unbalanced output (switchable high, medium and low) and a balanced output. It would have been nice to have had a stereo output option by incorporating a stereo chorus (as in the Juno 60) and it's debatable whether the Oscillator Detune function can make up for this omission.

Construction

The JP-6 is a fairly large keyboard (1.06m (W) × 0.12m (H) × 0.43m (D)) and weighs a fairly hefty 35lbs. As with all Roland products, both the external and internal construction are to a high standard, the instrument being smartly finished in matt black with silver end-cheeks, and the overall appearance is that of a well-designed, well-thought-out synthesiser. The large number of controls certainly looks impressive but could at first be rather daunting. However, the manual is mostly very clear and once the various assign and key modes and programming facilities have been mastered it should be plain sailing from there on in. The keyboard spans five octaves (C-scale) and is pleasant to play, having a nice spring to the keys. Sadly, though, no touch-sensitivity is provided.

Conclusion

The Jupiter 6 is a very versatile instrument, and I'd say it's particularly well-suited to live work. The large number of controls in the Manual section allow sounds of great complexity and subtlety to be created, while the comprehensive programming facilities allow quick and easy arrangements of patches to be stored for retrieval, either during performance or in the studio.

The Split facility is particularly powerful in allowing the various performance parameters to be assigned to the lower and upper sections individually. For example, you could have the lower section playing a funky bass via the arpeggiator and the hold facility, thereby freeing the left hand for using the bender and/or the LFO2 pushbutton. The upper section could then have a string sound with up to four voices *and* be programmed for *portamento* and pitch-bend, thus effectively making the JP-6 two instruments in one.

The overall sound is typically analogue, being particularly good for full, 'fat' ensemble-type sounds and powerful solo voices. Several people have asked me recently which is best: analogue or digital synths. My answer is neither. They both have individual merits and characters of their own. You wouldn't ask whether a piano was better than an organ: they are both keyboards but their methods of sound production are completely different. So if you're looking for a programmable polyphonic synthesiser with sophisticated sound-production capabilities and powerful performance options including a split-keyboard facility – and you're after the 'analogue sound' – then give the Jupiter 6 a close look; it could be the synth for you.

Ian Boddy **E&MM**

Review model supplied by Rock City Music, 10 Moseley St, Newcastle NE1 1EF. Tel: 0632 324175.

For further information on the Jupiter 6, contact Roland (UK) Ltd, Great West Trading Estate, 983 Great West Road, Brentford, Middx. TW8 9DN. Tel: 01-568 4578.

Roland TR909 and MSQ-700

Rhythm Composer and Digital Keyboard Recorder

Roland were one of the first electronic musical instrument manufacturers to realise the potential inherent in running a drum-machine in sync with a sequencer, and the first to help that potential become reality by producing devices that were designed specifically to work in tandem.

Now that design has taken a further step nearer complete integration with the introduction of the TR909 rhythm composer and the MSQ-700 digital polyphonic sequencer, two machines that share not only common aesthetics, design philosophies and modes of operation, but also complete electronic compatibility thanks to the inclusion of MIDI in and out sockets on each.

Both products are now fully available in the UK, and Dan Goldstein **and** Geoff Twigg **put the two of them under test in E&MM's studio.**

If you're ever asked which drum-machine has appeared on more records than any other, whatever you do, don't answer with the word 'LinnDrum'. That honour goes to the TR808, the Roland Corporation's first attempt at a fully-programmable, multi-voice electronic percussion unit. What the 808 offered at its introduction was a wide selection of mostly pretty listenable analogue percussion voices, a memory large enough to store more patterns than most live drummers are capable of remembering, and separate voice outputs that made the unit all but ideal for studio use, plus a price-tag about 75% less than anybody else's. Hence its widespread use as a recorded programmable rhythm machine.

However, very little is sacred in the fast-moving world of Japanese product development, and the humble 808 has now been augmented by the device under review here, the TR909.

The 808 also had two matching monophonic sequencers in the shape of the CSQ-100 and 600, themselves only recently deleted. However, the advent of the MIDI link has made polyphonic sequencers much more of a realistic possibility in recent months, and Roland have latched on to this with accustomed alacrity and come up with the MSQ-700, a 'digital keyboard recorder' with a memory capacity of 6500 notes, stored in eight memory tracks. As well as the MIDI and conventional tape sync connections, the 700 also incorporates a standard 14-pin DCB connector, enabling the sequencer to be used in conjunction with pre-MIDI Roland instruments such as the Jupiter 8 and Juno 60.

The TR909

Measuring 486 × 105 × 300mm and weighing in at a mere 4.5kg, the TR909 is a prime example of how rapidly technology has made electronic instruments lighter and more portable, without compromising constructional quality. By comparison with some of Roland's earlier rhythm machines, however, the 909 does seem to be a little too light, its standard of build being not quite up to the level of, say, the 808 or CR-series. In fairness, though, none of the machine's controls felt anything but firm and durable, and it would be rather surprising to find that the 909 proved any less reliable than its predecessors simply as a result of a couple of pounds' reduction in overall weight.

A run-down of the 909's most important facilities was given in our preview (E&MM March), but just in case you missed it, we'll re-cap briefly here.

To begin with, there are eleven percussion voices to choose from. Unlike many of its similarly-priced competitors, the 909 uses digital sampling techniques for the generation of only two sounds – the crash and ride cymbals. All the others are analogue creations, and judging from subjective comparisons, it seems likely that some of them utilise exactly the same circuitry as their counterparts on the TR808. It's possible to program the bass drum, snare, the three toms and the closed hi-hat at two different levels, the accented one being selected simply by that voice's alternative Main Key.

Sound Quality

There are several points worth making as regards the sonic quality of the 909's percussion voices.

The first is that, by analogue standards, most of the sounds on offer are of extremely high quality, while not unexpectedly, the digital cymbals are also very usable. The 909's clap sound is well-nigh identical to that on the TR808, which means it's one of the very best available, while the toms represent a considerable improvement over the earlier machine's, though on the debit side, the 808's higher-pitched conga option is not carried forward to the dearer model, which is a shame. Also missing is the clave (again, a higher-pitched version of another voice, in this case the rim-shot) and the cowbell, though there shouldn't be too many people who'll mourn the departure of that ill-tuned monstrosity.

Fine Tuning

The TR909 is perhaps a little lacking when it comes to providing the user with parameters for adjusting the preset sounds. As on the 808, the bass drum has user-variable tuning and decay, and in addition, the 909 goes one better by offering adjustable attack as well, though the effect of turning this control to maximum isn't particularly realistic or musical. The snare is also slightly more flexible than its 808 counterpart in having adjustable tuning as well as tone and 'snappy', which varies the amount of 'snare wire' signal.

All three toms have adjustable tuning and decay, while the digitised cymbal sounds are also individually tunable, so that quite a variety of different cymbal sounds can be generated.

Programming

The good news here is that the TR909 has dispensed with the plethora of multi-function rotary selectors that made programming and chaining song patterns such a drawn-out process on the 808. Instead, the percussion voices are selected by the sixteen pushbuttons already alluded to, while a bank of six smaller push-switches act as the prime function selectors.

This isn't quite as foolproof as it sounds, however. To select the open hi-hat, for example, you have to push both the accented and non-accented closed hi-hat selectors, which makes real-time programming of that voice more than a mite tricky. In general, however, the 909's layout is quite a bit more logical than that of its forebear, and once you've grown accustomed to the few idio-syncracies its switching does possess, programming becomes almost an automatic process.

To program in step-time, you select the Shift key (bottom-right of the group of six smaller switches) and, while this is held down, press one of the three Pattern selectors. You then press the Clear button at the same time as holding down one of the Main Keys to erase any data that might be stored in the corresponding memory, after which touching the large white Start button sends a red LED 'running' across the main keys at a speed corresponding to the selected Tempo. To select your required voice, all you do is press the relevant main key while holding down the Instrument Select pushbutton.

The vast quantities of red LEDs on show act as a valuable guide to the newcomer who might otherwise get lost during what is initially a fairly complex process. A particularly nice touch is the way the Main Key LEDs for accentable voices glow more brightly when they are programmed with accent than they do when loaded at normal volume. Digital readout of Tempo is also a vital pre-requisite on an instrument where that parameter is programmable within each track, and the 909's LEDs are clear and easy-to-read. You can't really go wrong.

MIDI Interconnection

If you're playing or programming the TR909 from the keyboard of a MIDI-compatible instrument, interconnection is accomplished simply by wiring the drum-machine's MIDI out to the synth's MIDI in, at which point the sixteen Main Keys and their functions are transferred to different keys on the keyboard.

We used a Jupiter 6 in this mode and encountered few problems: the key assignment should in theory be identical for any MIDI synthesiser, that is a serial sequence starting with Main Key 1 assigned to the C two octaves below middle C and going up in semitones to key 16 at the D# of the following octave. You then program in exactly the same way as you would the 909 in isolation.

If you use the 909 in conjunction with a MIDI synth whose keyboard is touch-sensitive, the percussion voices can be controlled 'dynamically', which really lifts the sound of the machine onto an altogether higher level. Despite its analogue sounds, it can still sound pretty much like a real drummer, and that's saying something.

In addition to the MIDI connection, the 909 also boasts a fair selection of more traditional interfacing possibilities, including Sync in and out (you use these to link the machine up to the MSQ-700 sequencer) and a Trig out that uses the signal from the Rim Shot percussion voice, which is just about the sound most suited to this function. It's also possible to sync the 909 to tape in the conventional manner, but if you don't want to make use of this facility, the Tape in and out sockets double up as the interconnection for loading data onto cassette. However saving and loading is accomplished more quickly and more easily by using the optional M-64C RAM cartridge, which plugs into the unit via a small cut-out on the 909's rear panel.

The cartridge effectively doubles the 909's memory capacity, enabling it to memorise 192 different rhythm patterns in two banks of 96. It also enables the machine to store a total of 3584 measures in four banks instead of 1792 in two, which is pretty impressive going by anybody's standards.

The MSQ-700

Representing Roland's most sophisticated sequencing device to date, the 700 is styled in a similar manner to its partnering rhythm machine, but is obviously built at a different manufacturing plant, since its construction is primarily metal instead of plastic and it is subsequently quite a bit weightier (and sturdier) than the TR909. The unit measures 346 × 328 × 108mm, and weighs about 5kg, so that although it's forcefully constructed, it remains extremely portable and perches neatly among the keyboards it is designed to control.

A multi-function LED display screen acts as the 700's visual nerve-centre. Its design is successful in that it is easy to get used to and provides a simple check panel on all active parameters of recording, number of tracks, and so on.

As already mentioned, the sequencer's memory capacity is 6500 events, and like any other comparable device, these can be single notes or rests, but, thanks largely to the designers' adoption of the new agreed standard interface codes, the 700 can also store – within each event – coded information about precise envelope and filter settings, the particular voice used, and whatever performance controls were activated, so long as the machine is used in conjunction with a MIDI- or DCB-compatible instrument.

A small lithium battery conserves the memory and should last approximately five years. The memory can also be protected from accidental erasure by a Memory Protect circuit and its accompanying LED indicator. When this circuit is switched into operation, any attempt to over-write the memory is met with the message 'Prot' appearing in the display window.

Next to the Protect switching is a three-way mode selector, with positions marked Chain, Normal and Tape. Tape enables you to save, load, and verify data from the 700 onto an audio cassette; Chain can be used to link together as many as 78 tracks in any chosen order from the eight stored in memory; and Normal is the mode under which sequences are written and played back.

Simplicity

We used a Jupiter 6 polyphonic synthesiser (see Ian Boddy's review elsewhere this issue) connected to the MSQ via MIDI, and found recording a sequence to be remarkably simple. Having first selected a preset voice on the synth, you then move to the Beats Per Measure section on the 700, on which it is possible to select 1, 2, 3, 4, 5, 6, or 8 beats per bar, or alternatively you can switch to Free mode.

If you're using measures, the screen display can be made to update information on each beat for precise-as-possible monitoring. There's also a clearly-audible metronome that can play continuously, only during Record/Playback, or not at all.

The next step is to select the track on which you want to record (using, astonishing though it may seem, the Track Select button) and then put that track back to the beginning of its memory by pushing the Reset button.

When you're ready to begin recording, pressing the Load key brings the message 'Ready' to the LED display when in Free mode, but if you've opted for measures, you get a count-in from eight instead: recording starts automatically at the end of this countdown, or as soon as you touch any key on the synth's keyboard if you're in Free mode. To get a perfectly timed end to your sequence, it's obviously vital to press the Stop button in tempo.

So much for real-time programming – recording in step-time is slightly (though not overly) more involved.

In this mode, you have to work out the duration of the shortest note in your desired sequence and select that note length – all the other notes are then entered either in the same length or as multiples of it. As with real-time programming, you must first select the number of beats per measure or, alternatively, Free mode, and then activate the Step/Load function. Several controls on the MSQ have more than one function in life, and at this point you press the Beats Per Measure selector again, this time to determine the shortest note length. You've got a range of different durations from which to choose, from 1/32 note to 1/2 note. You then select the track number and press the Load key: the 700 will now accept each note you play as a single-note event, regardless of how long you actually play it. In order to record longer durations, a Tie facility is provided as part of the Multitrack selector. This stores a further value of the previous pitch as a parameter of that pitch, thus saving memory space.

Treatment

Once recorded, sequenced data can be treated in various ways in much the same way as on an analogue tape recorder. To begin with, there's the Multitrack Play option, which can start as many as all eight tracks simultaneously and run them in synchronised playback. If the Multitrack key is not depressed then selecting each track automatically cancels the last one.

Other possibilities include a Punch In/Out facility, Erase, and most exciting of all, the Merge facility. This allows up to seven previously recorded tracks to be mixed down on to a spare track, thereby freeing the remainder for further recording, and enabling the user to build up some extremely complex sequenced passages.

Incidentally, it's possible to 'bulk erase' several tracks, or all of them at once, by combining the Erase and Multitrack keys. The button marked 'Overdub' does not actually accomplish this in MIDI – instead it erases the track concerned. However, this function is totally operational in DCB, and, just in case you were getting worried, it's possible to obtain the same effect in MIDI by recording on a spare track and then Merging the two.

Tape Interface

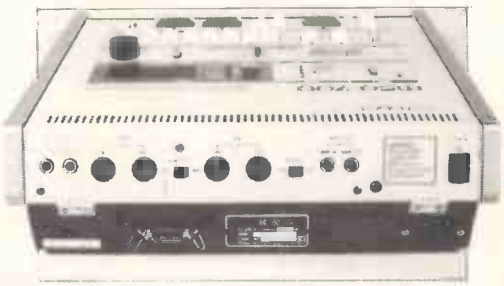
This system is well designed, and acknowledges several of the problems often encountered when storing data on cassette.

There is a simple Level Test procedure that instantly puts your mind at rest as regards recording and playback levels. In order to use it, you press the Clock Select and Save keys, and then press the Record button on your tape-deck. This automatically records your sequenced pattern on tape. Rewinding and replaying the cassette results in the message 'Good' appearing on the display screen, while a moving dot indicates the acceptable volume range. It's also possible to verify any file you save on tape, when a similar 'Good' or 'Err' message is displayed. Once you've established cassette files, you can load a specific file by writing in the appropriate number – if no number is given, the MSQ simply loads the next complete file on the cassette: transmission speed is approximately 3200baud.

Conclusions

There's no doubt that the MSQ-700 is a pretty versatile device, capable of playing extended, non-repeating pieces of music and thereby extending the versatility of the user's electronic keyboard range considerably.

Its memory is a little larger than that of competing models like Sequential Circuits' Model 64, for instance, but, on the other hand – and assuming you already have a Commodore 64 micro-computer – that sequencer only costs £185. In this context, the 700's RRP of £850 is a little on the high side, though only time will tell how much it eventually sells for in the shops.



However, what may well tip the balance in the Roland's favour is the fact that it incorporates rather more in the way of interconnection possibilities than a simple MIDI in and out. The 700's designers have made what we consider to be a highly laudable decision in opting to include previous interconnection standards into the sequencer's make-up: if only other manufacturers were more considerate in allowing for the fact that only a few – rather fortunate – individuals are in a position where they can equip themselves with the very latest technology in all departments of their instrument set-up. It's perfectly conceivable therefore that many musicians may opt for the MSQ in preference to other sequencers simply because it allows them to make use of its facilities in conjunction with their existing synth(s), before they are able to consider purchasing a MIDI-compatible keyboard.

The same sort of case can be made for the TR909, though it is slightly less convincing in this context.

There are considerable numbers of musicians who are not particularly enamoured of the aural effects of sampled rhythm machines, preferring traditional analogue sounds, and it is these people who will find the 909 most appealing, since it is capable of producing the very best analogue percussion voices available while at the same time offering a digital version of the one sound analogue techniques never quite seem to be able to manage with any conviction – the cymbal.

Operating the unit is a considerably easier task than it was on the earlier TR808, yet musicians used to that instrument will find adapting to the 909 a relatively painless exercise, since its control layout is essentially similar.

Many may argue that Roland could have made a better job of their top-of-the-line rhythm machine by making a complete break with tradition and giving the TR909 all sampled sounds, but, as with the MSQ-700, they would then have run the risk of alienating users brought up on their earlier products – an important factor rarely afforded the attention it deserves by manufacturers' R&D departments.

In any case, it could equally be argued that the incorporation of MIDI connections has made the 909 as up-to-date as it needs to be, particularly when the same company is also manufacturing a superbly-equipped sequencing device to go with it.

E&MM

RRPs of these new instruments are £995 for the TR909 programmable rhythm composer and £850 for the MSQ-700 digital keyboard recorder. Further information on both products is obtainable from the British importers, Roland (UK), Great West Trading Estate, 983 Great West Road, Brentford, Middx TW8 9DN. Tel: 01-568 4578.

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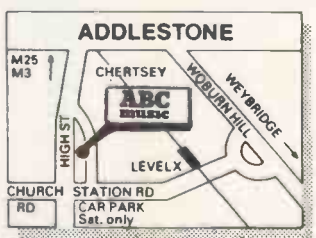

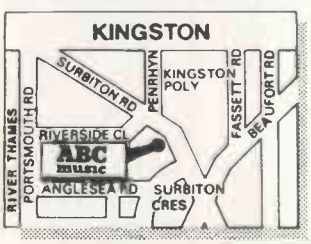

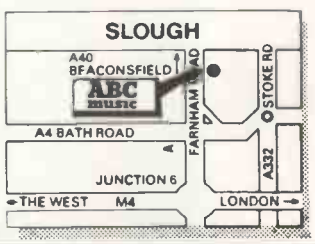

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John Miles

The Venue, London

In the world of Rock music, there can be no greater travesty than the way John Miles' music has been ignored, especially by the weekly music press. Musical skill has never been high on their list of pre-requisites for stardom and as soon as John's fifteen minutes of fame had terminated in the mid-Seventies, the shutters came down with a resounding bang. 'Passé' and 'old-fashioned' were the usual glib diatribes flung insultingly in Mr. Miles' direction with every subsequent record release, yet to those prepared to listen, each and every album contained material that consolidated his status as an exceptional songwriting talent.

Such talent extends also to live performance. John's heavily under-rated guitar playing is always a joy to behold in a concert situation and this was undoubtedly the case at The Venue. On classic tracks like 'Overture' from the *Zaragon* album, Miles let loose a riposte of screaming, fluid guitar solos that grew cleverly from apparent *avant-garde* meanderings into thundering melodic runs hung upon a musical framework as solid as a rock.

The evening's events were the culmination of a concentrated, low-key UK tour and a sense of release was clearly evident in all band members, none more so than in the relaxed flourishes of Brian Chatton's keyboard parts. A long-serving member of the band both on and off record, Brian displayed some tasteful playing alongside his rockier excursions especially when wielding his new 'cheese-board' – the Korg Poly 800, though his choice of sounds was a touch limited.

As if to end the tour with a bang, the band played a good but somewhat safe selection of hits from most Miles albums, including the funky 'Slow Down', the powerful 'Turn Yourself Loose', a rather unspectacular version of 'Stranger In The City' which evoked little response from the crowd during the final chant section, and a rowsing rendition of the classic 'Music' which now comes earlier in the set than his audience would ever have allowed if this concert were taking place in 1976 and not 1984.

Amongst the hits, John found time to air two new songs (hopefully from a forthcoming album?), one of which featured his playing slow, arpeggiated chords on a Korg Poly 61 synth, highlighted by one of the best vocal performances of the night.

Every song packed a refreshing punch, due one sensed to the powerful and solid drumming of Barriemore Barlow (ex-Jethro Tull) on a Simmons kit, and to the staunch, dependable bass playing of lyricist Bob Marshall.

The undisputed highlight for me came perhaps rather too early in the repertoire, when John eschewed the Les Paul guitar for a Yamaha electric grand and struck up the opening chords to yet another Miles anthem, 'The Right To Sing' from his last *Plays On* album. Although a heavily orchestrated tune on record, the song didn't suffer from its live setting thanks to the holes being filled capably by Julian Colbeck's Juno 60 synthesised string textures, which helped build the song to an emotional climax with a gorgeous guitar solo that simply tore at the old heartstrings.

All in all, an excellent evening's entertainment that should have been experienced by far more people than The Venue can hold. For the life of me I still can't understand why John Miles isn't as huge a star as he deserves – if the fashion-conscious music world was a just place, he most certainly would be. . . .

Ian Gilby **E&MM**

Herbie Hancock

Hammersmith Odeon, London

Not so very long ago, the idea of Herbie Hancock doing an essentially electro-disco concert with an essentially modern band at an essentially rock venue would have been about as unthinkable as Klaus Schulze appearing on *Top of the Pops*, but, such is the man's passion for keeping up with the times, the gig at Hammersmith was only one in a whole series of European dates, all of them incorporating the very latest instrument technology.

Accompanying Hancock were 'The Rockit Band' – two drummers (both Simmons-equipped), a bassist, a second keyboard-player and a singer, plus, of course, the inimitable Grand Mixer DST on turntables. Only his name sticks particularly long in the memory – none of the others did anything sufficiently outstanding to warrant any more than a passing mention, and that really was a major cause of the event's lack-lustre atmosphere.

First things first, though. Hancock's *Future Shock* album contains all manner of high-technology equipment in its enormous equipment list, and a fair slice of it was being played – with varying degrees of inspiration – on this particular occasion. Perhaps not surprisingly, the man himself was particularly well-endowed equipment-wise. Briefly, his keyboard stack incorporated a Fender Rhodes piano, a Clavinet D6, a Rhodes Chroma (complete with the latest version of the Expander module), a Yamaha DX7, a Moog Liberation, and a Fairlight CMI.

What most of the audience had come to see were renditions of most of the songs on *Future Shock* with, perhaps, a quick oldie or two just to keep the really hardcore fans happy. And, by and large, that was exactly what they got. The big problem was that only a couple of the songs were actually distinguishable from their recorded counterparts – the rest were little more than high-level album excerpts with the odd additional synth solo or percussion break thrown in for good measure which, given the reputation of the show's star and the enormous range of capabilities represented by the gear on show, was more than a little disappointing.

Few people can deny Hancock's courage in deserting his jazz roots in preference to today's – and tomorrow's – electronic keyboard technology. However, although he's put that technology to effective use on record, and gained a large, younger audience in the process, his stage performance lacked any real bite or imagination. Every Fairlight sound he used was identical to that used on *Future Shock*, almost every line he played could have been played just as well by a record-player, and the DX7 – itself not present on the album – was used so sparingly it might as well not have been at the gig, either.

There was the odd flash of brilliance – a startling, but brief, Liberation solo here, a quick burst of arpeggiating Chroma there, but in the main Herbie Hancock's playing was as grey as that of his backing musicians, and the event's only truly great moment was provided by manic scratching DJ Grand Mixer DST.

Armed only with two turntables and a couple of twelve-inch records – not exactly high-technology, you've got to admit – this man provided more excitement than the rest of the band put together. His stunning intro to 'Rockit', achieved mainly with the aid of a couple of BBC Sound Effects records, one suspects, brought the Hammersmith audience to its feet. His own personal departure from the way he'd played on *Future Shock* spread to the rest of the band (though not to Hancock, who seemed determined to do nothing but go through the motions, regardless), who succeeded in turning an utterly immemorable evening into one highlighted by a flash of golden imagination.

But one good song does not a happy concert make, and I for one left the auditorium with a sense of sheer disbelief that somebody so talented could do so little with so much, and *still* walk off stage with his audience pleading for more.

Dan Goldstein **E&MM**

Understanding the DX7

Although Yamaha's DX series keyboards have received nothing but praise for the quality of their factory-programmed voices, they remain something of an enigma where user-programmability is concerned. Not to put too fine a point on it, there seem to be very few users indeed who have managed to exploit their DX to the fullest. DX7-owner Jason Chapman **has worked his way painstakingly through his machine's workings, and in the first of a new series, guides us through a few simple experiments that should shed a little light on how the DX keyboards go about their sound-generating business.**

What I am going to attempt in this article is to lead you through a few practical experiments to demonstrate how the basic building blocks of the DX7 – the Operators – are used and what Frequency Modulation does. I'm going to assume you've read through (or at least glanced at) the Yamaha manual and that you can read the legends on/above/underneath all the pressure pad-type buttons. Note that some of the keypads have up to four different functions (hence all the different legends!) – I will refer to a keypad by its colour and the legend in question eg. 'the purple 'EDIT/COMPARE' keypad' actually has the '–' symbol on it and the 'EDIT/COMPARE' legend in white above.

Most of our playing about is carried out in Edit Mode where the user can not only edit or change the voice parameters to create a new voice but can also view them at his leisure. By altering parameters in a controlled and logical fashion and observing how the voice changes, you should, with luck, learn how to exploit the incredible potential of the DX7 a little more fully.

To get into Edit Mode you simply press the purple 'EDIT/COMPARE' keypad which causes the display to change from showing voice identification data to showing information about the parameters of that voice.

Frequency Modulation

To understand how the sound is built up from the Operators we first need to understand the Frequency Modulation technique used in the DX range. There is a good explanation in the DX7 manual so have a look at that and then try the experiments below to see the theory in action. . . .

You should have gathered that sounds on the DX range are produced by connecting together Operators in various configurations called algorithms. In this demonstration we will use just two Operators (out of the six available on the DX7) and connect them in only two configurations, both of which are simple sub-parts of the Algorithms available. These two simple configurations form a complete basis for the usage of Frequency Modulation techniques.

The Operators

OK, let's get to work. What is an Operator? Have a look at the diagram (Figure 1).

You might think for a moment things are beginning to look a trifle complicated but, fortunately, we can look on the Operator as being a sort of simple monophonic synthesiser with one module missing. The module the Operator lacks is the equivalent of the Voltage Controlled Filter – we shall see why it is not present shortly. Another difference worth noting is that the oscillator is only capable of producing a sine wave output, so no complex waveforms overflowing with rich harmonic content – well, not from one oscillator on its own anyway.

So, the first part of the practical work is to use one Operator and in doing so understand its capabilities by relating it to the design of a very degenerate monophonic synthesiser. In fact, to show how two Operators combine in the two basic configurations in the simplest way, we ignore envelope generation completely and concentrate on pitch control and, subsequently, waveform generation.

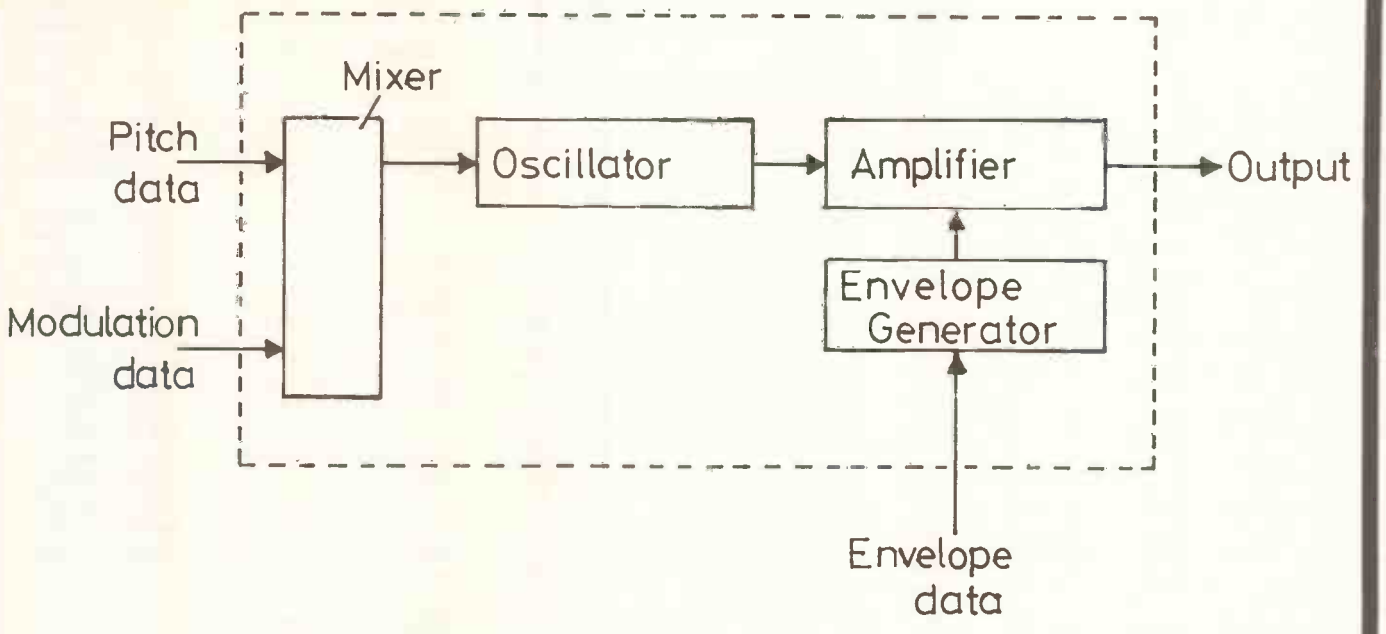

Figure 1.

Single Operator Demonstration

The first thing we have to do is get just about everything switched off so that we are playing with only one operator. Try the following:

– press the yellow 'FUNCTION' keypad
– press the green 'VOICE INIT' keypad
– reply to the question 'VOICE INIT?' (in the display) by pressing the green 'YES' keypad
– reply to the question 'ARE YOU SURE?' in the same way
– press the green 'OUTPUT LEVEL' keypad
– press each of the green keypads 2 through 6 once to turn all but operator 1 off – your display should look like this:

```
ALG 1 100000 OP1
OUTPUT LEVEL =99
```

You now have the DX7 almost at its most basic, one sine-wave oscillator taking its pitch data from the keyboard. The envelope generator is effectively ignored as the sound is on simply when a key is pressed.

On an even more basic level, you can make the oscillator ignore the keyboard pitch, setting it at a fixed frequency. To do this, first press the green 'MODE/SYNC' keypad and the lower line of the display will change to 'FREQUENCY (RATIO)' which, as far as we're concemed at the moment, means that the Operator in question is taking its pitch control from the keyboard. If you now press the green '+1' button, the bottom line of the display will change to 'FIXED FREQ. (Hz)'. In fact, pressing the '+1' and '−1' keys alternately will 'toggle' between the two possibilities.

In either case, we can now set the frequency of the Operator. In the fixed example we set the frequency absolutely whereas in the 'FREQUENCY (RATIO)' case we set the *ratio* of the actual output frequency to the frequency specified by the key played. This should be easier to understand if we do the following two experiments:

Fixed Frequency

– get into 'FIXED FREQ. (Hz)' as described above
– press the green 'FREQUENCY COARSE' keypad
– press the green '+1' keypad until the display bottom line reads:

```
F COARSE=100.0Hz
```

– press the green 'FREQUENCY FINE' keypad
– press a note on the keyboard (not for the pitch – we need the Operator's envelope generator 'on') and keep it pressed
– play with the data entry slider: you can hear (and see on the display) the pitch being set
– note that if you play a different key without moving the data entry slider, the pitch does not change
– try the different pitch ranges given by cycling through the 'FREQUENCY COARSE' settings (using the '+1' or '−1' keys to cycle)

Frequency Ratio

– get into 'FREQUENCY (RATIO)' as described above
– press the green 'FREQUENCY COARSE' keypad
– slide the data entry slider completely towards you
– press the green 'FREQUENCY FINE' keypad
– move the data entry slider until the bottom line of the display reads:

```
F FINE = 0.50
```

– back to 'FREQUENCY COARSE'
– press the '+1' key and you will have:

```
F COARSE=1.00
```

– the pitch of the Operator's oscillator now relates directly to that specified when you press keys on the keyboard, ie. if you press the A below middle C you will get 440 Hz (if the DX7 is tuned to concert pitch).

Having now reduced the DX7 to a rather expensive single drawbar organ (!) we can demonstrate the first, and perhaps the most obvious, of our two basic configuration sub-algorithms.

Configuration 1

In exactly the same way as we use two drawbars on an organ or two oscillators on a synth, we can mix the output of two oscillators (ie. Operators as we are using them at the moment), and by altering their pitch and amplitude relative to each other, we alter the overall harmonic content of the mixed output. On a normal drawbar organ we use the drawbars to alter the relative amplitudes of the harmonics but we cannot change the pitch of the individual drawbar outputs – on the DX7 we can!

The study of how the harmonics of a sound work together to create its timbre is beyond the scope of this article – I'll let another experiment explain things instead:

– do a 'VOICE INIT'
– turn Operators 2–6 off (press green keypads 2–6)
– press the green 'OUTPUT LEVEL' keypad
– you should have the basic one operator sound, ie. display reads:

```
ALG 1 100000 OP1
OUTPUT LEVEL =99
```

– try moving the data entry slider while repeatedly pressing a key and you will find the amplitude (or volume if you prefer) alters
– press the green '2' keypad to turn on Operator 2
– press the purple 'OPERATOR SELECT' keypad and you will see the 'OP1' in the display change to 'OP2' ie. any data we change which applies to an Operator will now affect Operator 2 rather than Operator 1
– press the green 'ALGORITHM' keypad and use the data entry slider (or the '+1' and '−1' keypads) to change the display from 'ALG 1' to 'ALG32'
– press the green 'FREQUENCY COARSE' keypad
– use the '+1' and '−1' keypads (or the data

entry slider) to change the 'F COARSE' value displayed to '2.00'
– press the green 'OUTPUT LEVEL' keypad – you should have:

```
ALG29 110000 OP2
OUTPUT LEVEL = 0
```

Have a look at the diagram on the DX7 front panel for Algorithm 32 and you will see that Operators 1 and 2 both feed in parallel onto the horizontal line that represents the output bus, ie. their outputs are mixed together. Ignore the rest of the algorithm diagram as all the operators are shut off: they are not contributing to the sound.

In musical terms, we now have the 'fundamental' pitch on Operator 1 and its octave on Operator 2. Why is it the octave? Well, the 'F COARSE' value of 2.00 means that the pitch of Operator 2 will be twice that of the pitch value indicated by the key pressed, whereas Operator 1 follows the keyboard exactly (hence its 'F COARSE' value of 1.00). Twice the pitch gives the octave, of course.

If you now vary the 'OUTPUT LEVEL' of Operator 2 ('OP2') using the data slider and keep playing a note repeatedly on the keyboard, you will hear the octave changing its volume relative to the fundamental. The timbre of the sound output changes also.

If, as well as varying the output level, you also vary the pitch (ratio) of Operator 2 using the 'FREQUENCY COARSE' and 'FREQUENCY FINE' controls as described earlier, you should start to get a feel for what can be done with this type of algorithmic configuration. The lovely organ voice 'E. ORGAN 1' is constructed literally on the principle just described.

Configuration 2

This uses two Operators, the output of one Operator modulating the pitch control of the second. This method of using two oscillators is by no means unique to Yamaha FM – most really 'fat' sounds to be heard from synths such as the original Minimoogs are based on the same configuration. What years of Yahama research has added to FM is the *control* that makes FM techniques of genuine practical use.

Let's get this part of the show on the road:
– do a 'VOICE UNIT' as above
– turn off Operators 3 through 6
– press the green 'OUTPUT LEVEL' key – you should have:

```
ALG 1 110000 OP1
OUTPUT LEVEL =99
```

We've just got back to our 'one drawbar' basic single Operator sound with the pitch controlled from the keyboard. The waveform of the sound is the simple sinewave: that's all the Operator's oscillator can produce.

In most synths we create a timbre by taking a complex waveform, a sawtooth for example, and filter out some of the waveform's complexity by using a Voltage Controlled Filter. With FM, we start with the simplest possible waveform, the sinewave, and *add* harmonic complexity – this is why the Operator has no equivalent to a voltage controlled filter. This harmonic complexity is added either by simply summing the outputs of oscillators having harmonically related pitches – the configuration above – or complex waveform by modulating a simple waveform with a second.

Before you push any more keypads, have a look at the diagram on the front panel for Algorithm 1 to see how Operators 1 and 2 are connected. You should notice that Operator 1 feeds onto the output (horizontal line) as in configuration 1 above, whereas Operator 2 feeds into Operator 1. In this context, Operator 1 is known as a 'carrier' and Operator 2 is known as a 'modulator'. What this means is that the carrier produces the sound we hear, while the modulator modifies the timbre, or harmonic content, of the output of the Operator it is affecting.

As always, things soon become crystal clear when we actually put them into practice instead of simply talking about them:
– press the purple 'OPERATOR SELECT' keypad (to get to 'OP2')
– vary the position of the data slider while repeatedly pressing a key on the keyboard
– hear the timbre change; this is simple FM in action

As you vary the slider you should hear the timbre change from the clean sinewave (at OP2 OUTPUT LEVEL = 0) to a more 'metallic' sound as you move toward OP2 OUTPUT LEVEL = 99. The other possibility here is to change the pitch of the modulator, OP2. Try setting the OP2 output level to something like 70, and by using the green 'FREQUENCY COARSE' and 'FREQUENCY FINE' keys, you should discover a whole range of different FM effects. Try some slightly detuned oscillator effects to 'fatten up' the sound by introducing beating. An OP2 frequency of 1.99 should do the trick. The rate of beating can be varied with more detailed control by using the green 'DETUNE' keypad.

The Future

In the next few articles we'll analyse some of the Yamaha's pre-programmed voices in the hope of shedding yet more light on how to control the DX7. And we might even try setting up a voice or two of our own. . . .

If you have any particular questions you would like me to (attempt) to answer on the wonderful world of the Yamaha DX series please write to me, care of E&MM, and I'll do my best to dig up some answers!

Jason Chapman **E&MM**

BACK ISSUES

Back issues are available at a special price of 75 pence each (inc. p&p) for 1981/82 issues only. 1983 issues are available at a price of £1.10 each (inc. p&p). All issues can be obtained from: E&MM, Mail Order Department, Alexander House, 1 Milton Road, Cambridge CB4 1UY.

Photocopies of articles in sold out issues (see E&MM February 83 for Index) can be obtained from the Mail Order Department at 50p per article.

NOVEMBER Patrick Moraz interview and Adagio For A Hostage music to play ★ Robert Moog ★ Bill Nelson ★ K. Schulze and K. Crimson in Concert ★ Reviews: Yamaha PC-100, Technics SX-K200, Casio MT-70, Hohner P100 and JVC KB-500 Minisynth Supplement, Gibson Firebird 2 Guitar, Alligator AT150 Amplifier, Allen & Heath 1221 Mixer, Eko Ritmo 20 ★ Projects: ElectroMix 842 Mixer, Amdek Chorus.

DECEMBER Cliff Richard interviews and Little Town music ★ Patrick Moraz ★ ARS Electronica ★ Digital Recording Pt II ★ Reviews: Elka Synthex, Crumar Stratus Synths, Tokai Basses, Shure PE Series Microphone, The Kit Percussion Unit ★ Projects: The Transpozer, Amdek Percussion Synth, Canjak

1983

JANUARY Richard Barbieri of Japan ★ Ultravox Music ★ Patrick Moraz ★ Ars Electronica ★ Reviews: Westone Bass Guitar, BGW 750C Amp, Korg EPS-1 Keyboard, Clef Band Box, Zildjian Cymbals ★ Projects: Synblo, The Transpozer, Amdek Compressor

FEBRUARY Isao Tomita ★ The Human League ★ The Novatron Revisited ★ E&MM Index 1981/82 ★ Reviews: Linn Drum, Godwin Drummaker 32P, Wersimatic CX-1, Mattel Synsonics, Simmons SDS Drum Sequencer, Klone Kit, Movement Drum Computer 2, Korg KPR-77 Programmable, Memory-moog, Synclavier II, Powertran Polysynth, Vigier Guitars, Tokai TA35 Amp, Pearl Mics ★ Projects, Synbal, Caltune, Amdek 6-2 Mixer

MARCH Klaus Schulze ★ Michael Karoli ★ Francis Monkman ★ Bernard Xolotl ★ Chris Franke ★ Frankfurt ★ Reviews: Jen Piano 73, 5 Casio keyboards, RSF Kobol Expander, Korg Poly 61, Aria Mics, BGW 7000 Amp, Ibanez Effect Pedals, Tokai Flying V Guitar, Oric-1 Microcomputer ★ Projects: The Shaper, 842 Meter Bridge, Amdek Rhythm Machine Kit

APRIL Naked Eyes ★ Gabor Presser ★ Scarlet Party ★ Frankfurt Show Report ★ Ambisonics ★ Magnetic Cartridges ★ Reviews: SCI Prophet 600, Casio 7000, Chroma/Apple Interface, Eko Bass Pedals, Loco Box Pedals, Aiwa Dual Cassette Deck, Vox Guitars ★ Projects: Syntom II Percussion Module, Amdek Metronome

MAY Keith Emerson ★ Guitar Buyers Guide ★ Roland MC-202 ★ Introducing the MIDI ★ Reviews: Fostex X15 Multitracker, Echo Unit Supplement, 13 echo reviews, M9A K-1/B, Yamaha Portasound MP1, Carlsbro Cobra 90 Amplifier, Technical Projects DI Boxes, Boss TU-12 Tuner ★ Projects: MicroMIDI, Home Active Speaker, Amdek Flanger Kit.

JUNE Jean-Michel Jarre ★ Classix Nouveaux ★ Studio Sound Techniques ★ Making Music with the Microfan 65 ★ Reviews: Carlsbro Minifex and E-mu Systems Emulator ★ Projects: Panolo and Multisplit.

JULY Ronny with Warren Cann and Hans Zimmer ★ Drum Machines Buyers Guide ★ Jean-Michel Jarre Music Supplement ★ Reviews: Roland Juno 6 Synthesiser, Peavey Heritage Amplifier, Steinberger Bass Guitar, TI-99/4 Music Maker Software ★ Projects: Universal Trigger Interface, Electric Drummer

AUGUST Kitaro ★ Spectro Sound Studio ★ Jon Lord Interview & 'Before I Forget' music to play ★ Reviews: The Synergy, Korg Polysix, Tascam M244 Portastudio, Shergold Modulator 12-String Guitar, Yamaha Professional System Effectors ★ Warren Cann's Electro-Drum Column ★ Projects: 8201 Line Mixer, Guitar Buddy practice amplifier.

1981

APRIL Syntom Drum Synthesiser ★ Workshop Power Supply ★ Direct Inject Box ★ Ultravox ★ Paia 8700 review ★ Matinee ★ Spectrum Synth

MAY Noise Reduction Unit ★ Lowrey MX-1 review ★ Apple Music System ★ Matinee ★ Spectrum Synth

JUNE Wordmaker ★ Guitar Tuner ★ Hi-Fi/Group Mosfet amp ★ Fairlight CMI review ★ David Vorhaus ★ Matinée

AUGUST PA Signal Processor ★ Powercomp ★ Hexadrum ★ Matinée ★ Resynator/Casio VL-Tone reviews ★ Irmin Schmidt

OCTOBER Harmony Generator ★ Securigard burglar alarm ★ Effects Link FX-1 ★ Music at City University ★ dbx noise reduction & Blacet Syn Bow reviews ★ Micro Interfacing ★ Disco equalisation

NOVEMBER Landscape explored ★ Casio MT-30, Roland GR-300 Guitar Synthesiser, Roland CPE-800 Compu-Editor reviews ★ Melody Making on the Apple ★ Phasing ★ Auto Swell – Electric Drummer – Soundbooster – Toneboost projects

DECEMBER Rick Wakeman in 1984 ★ Orchestral Manoeuvres in the Dark ★ Bio Music ★ Yamaha CS70M, Vox Custom Bass & Custom 25, Roland CR5000 & CR8000, Alpha Syntauri, Fostex 250 ★ Synclock project ★ ZX81 music

1982

JANUARY The New Tangerine Dream ★ Japan Music Fair ★ Fact File ★ Guitar Workshop ★ Reviews: Casiotone 701, Teisco SX 400, Aria TS 400, M.C.S. Percussion Computer, Soundchaser, Beyer Mics. TC Effects Boxes, Tempo Check ★ Projects: Spectrum Synthesiser, Electric Drummer, Volume Pedal

FEBRUARY Ike Isaacs ★ Digital Audio Discs ★ Yamaha GS1 & 2 ★ Reviews: Korg Trident, AKG D330BT & D202 Mics, Menta Micro, Roland TR606 Drumatix, JHS C50PM & C20B amps, Fostex A-8 8-track Recorder, Tokai ST50 & PB80 Guitars ★ Vocal PA ★ ZX81 Music ★ Projects: Digital Delay Effects Unit, Spectrum Synth, Percussion Sound Generator ★ Resonant Filters

APRIL Martin Rushent, Human League in the Studio ★ Cardiff University Electronic Music Studio ★ Reverberation explained ★ Reviews: Korg Mono/Poly Synthesiser, Fostex 350 Mixer, Roland TB-303 Bass Line Sequencer ★ Projects: MF1 Sync Unit, Multireverb ★ Electro-Music Crossword

MAY Holger Czukay ★ Depeche Mode ★ Keyboard Buyers Guide ★ The Peak Programme Meter ★ Reviews: Moog Source and Rogue Synthesisers, Suzuki Omnichord, Acorn Atom Synthesiser, Calrec Soundfield Microphone ★ Projects Soft Distortion Pedal, Quadramix

JUNE Steve Hillage ★ Arthur Brown ★ Larry Fast ★ History of Guitar Synthesisers ★ Casio Modifications ★ Reviews: Synton Syrinx, Synclavier II, Clarion 4 track, Cutec MR402, Ovation Balladeer Guitar, Drumulator, Vesta Fire Flanger/Chorus, Aria AD-05 Delay, Suzuki, Mic ★ Projects: OMDAC, Amdek Power Distributor, Active Bass Guitar

JULY Marillion ★ Hans Zimmer ★ Programming Yamaha's DX Keyboards ★ Reviews: Kawai SX-210 Synthesiser, Aria U60 Deluxe Guitar, Trident VFM Mixer, MXR Omni Effects, Milab Mics ★ Projects: Digital Signal Processing For Sinclair Spectrum, Tap Tempo, Amdek Delay Kit

AUGUST Bill Nelson plus 'Chimera' music to play ★ Hubert Bognermayr ★ MIDI Dump ★ Barclay James Harvest ★ Reviews: Roland JX-3P/PG200, OSCar Synthesiser, 360 Systems Digital Keyboard, Music Percussion Computer, Fender Stage Lead Amplifier, Yamaha SG200 Guitar, Tubby Drum System, Frontline Effects ★ Projects: Digital Signal Processing (Part 2) – Echo programs for your Sinclair Spectrum, Amdek Phaser Kit

SEPTEMBER Peter Vetesse ★ Which Synth? Comprehensive Guide ★ Prophet T8 in focus ★ Goldsmith's Collect Studio ★ Reviews: Oberheim DX Drum Machine, SCI Pro-FX 500 Rickenbacker 360/12 String Guitar Rickenbacker TR75GT Amplifier ★ Projects: Synclap, Amdek Tuning Amp Kit

OCTOBER John Miles ★ Andrew Powell ★ Yamaha DX1 ★ ICA Vancouver ★ Guitar Month ★ New Pickups ★ Mains Distribution Board ★ Amdek Graphics EQ ★ Rockman ★ HH K150 Keyboard Combo ★ Fender Elite Precision ★ Steinberger 6 string ★ Octave Voyetra Eight ★ Siel Opera 6 ★ MXR 185 Drum Computer ★ Ross Pedals

NOVEMBER Tony Banks ★ John Foxx ★ Moog Profile ★ Muzix 81 ★ Ibanez HD1000 Harmonics Delay ★ Klone Kit 2 ★ Korg MX8 Mixer ★ UC1 Sequencer ★ Seiko Digitals ★ Eko EM10 Keyboard ★ Ibanez RS315SC Guitar

DECEMBER Gary Numan ★ Psychic TV ★ Philip Glass ★ Steve Gray on DX-7 ★ Personal Keyboard Special ★ Inkeys ★ Reviews: Decillionix ★ Prophet T8 ★ Korg MM-25 Multi Monitor ★ Yamaha PC 1000 ★ Carlsbro AD1 Echo ★ Project: The Valve Driver.

1984

JANUARY Simple Minds ★ Saga ★ Hawkwind ★ Dave Hewson ★ Reviews: Oberheim OB-8 ★ Vigier Nautilus Bass Guitar ★ Siel Cruise ★ Ibanez DM 2000 ★ The Kit Accessories ★ Projects: Electronic Metronome ★ Amdek Octaver

FEBRUARY Daniel Miller ★ Mark Stanway ★ China Crisis ★ Don Airey ★ Reviews: Boss DE200 ★ Roland Chorus Cube 60 ★ Washburn Bantam Bass ★ Carlsbro Marlin Amp ★ Yamaha PS-55 ★ Eko EM12 ★ Dr Bohm Digital Drums ★ Korg Poly 800 ★ Siel PX ★ CM: University of Surrey, Mainframe ★ Projects: Drumatix Modifications ★ Voltage Controlled Clock ★ Amdek Handclapper

MARCH Vince Clarke & Eric Radcliffe ★ Blancmange ★ Reviews: SCI Drumtraks ★ Hammond DPM-48 ★ Cactus Electronic Drum Kit ★ Yamaha RXX Series ★ MPC Stage Pads & DSM Synth ★ A & HB Inpulse One ★ Roland TR-909 ★ SCI Six-Trak ★ Casio Microlink ★ Vox Venue Keyboard Combo ★ Roland SDE-3000 ★ Dynacord Guitar Combo ★ Roland System 100M ★ Seiwa SR100 Guitar ★ Projects: S-Trigger Converter, Lead Tester ★ Amdek Delay Kit

ON RECORD

Dan Goldstein **gets our new-look record column off the ground with the latest electronic music news and reviews.**

RECORD OF THE MONTH

Thomas Dolby
The Flat Earth
Parlophone PCS 2400341

The work of eccentrics is by its very nature patchy and unpredictable, but in the past Dolby has side-stepped the possibility of such accusations by producing music that has been consistently exciting and innovative. *The Flat Earth* continues in that tradition, and if anything represents his finest creation to date.

Two aspects remain from this album's predecessor, *The Golden Age of Wireless*: Dolby's fascination, lyric-wise, with things scientific, and the extensive use of computers to help realise his musical aspirations. However, whereas on *Wireless* the computers played a relatively minor role, on the new album they rise to considerably greater prominence, though significantly, the Professor has still found it desirable to use 'conventional' musicians as well. These latter include singer Adele Bertei (that's her on 'Hyperactive!') Peter Thoms and Kevin Armstrong (sparkling brass contributions) and Matthew Seligman (splendid bass-playing throughout).

Of all the tracks on *The Flat Earth*, only 'White City' comes as a minor disappointment. From the remainder, 'Dissidents' is a powerful, open-ended bass-beat with a neat vocal line and some pretty canny Fairlight effects; 'Mulu The Rain Forest' is an ethno-technological experiment (not nearly as bad as it sounds) in the Gabriel fashion; 'Hyperactive!' is the mildly outrageous single we all know and love; and 'Screen Kiss' turns an absurdly simple guitar melody into a highly emotional – as well as intellectual – ballad and hence into the album's biggest technical, instrumental, and compositional success.

Yet it's the completeness of *The Flat Earth* as a whole rather than any song's individual strength that accounts for much of its appeal. Production is uniformly excellent, as we have come to expect, but not quite so well anticipated is the thoroughness with which the album's intellectual concepts have been thought out and how utterly they have been merged into an eventful, accessible, even commercial musical extravaganza, with as much of interest to the computer-crazed boffin as the devoted dance-freak or pop addict.

With *The Flat Earth*, Thomas Dolby has grown in stature considerably – from the vulnerable laboratory experimenter whose successes were much lauded and whose failures were tolerated in the hope that they might one day be of use to somebody, to a composer and producer of modern music who is now almost totally in command of all the technological materials he has to hand. The only remaining fear is that he may have difficulty keeping up with the high standards he has already set himself.

We shall see.

ALBUMS

Simple Minds
Sparkle In The Rain
Virgin V2300

After several abortive efforts, Simple Minds have at last succeeded in creating an LP with a genuinely 'live' sound, thanks largely to the influence of their producer, Steve Lillywhite. The result is *Sparkle In The Rain* – a record that, for the first time, gives the listener some insight into how the band work together as a live unit, something that's enhanced by the fair degree of musical improvisation present on the album as a whole.

The two singles – 'Speed Your Love To Me' and 'Waterfront' – are sadly presented here only in their seven-inch format, though they're still effective enough. Of the remaining eight songs, 'Up On The Catwalk', 'Book Of Brilliant Things', and 'C-Moon Cry Like A Baby' stand out as being the most instantly accessible, though with the possible exception of 'Street Hassle' (a Lou Reed cover that seems strangely out of place, despite some pretty forceful vocals from singer Jim Kerr), all the tracks have something to offer.

'Live' feel aside, the most striking thing about *Sparkle In The Rain* as a whole is the extent to which the band's musicianship has reached still higher levels of togetherness and competence. Keyboardist Mike MacNeil contributes some stunning polysynth playing ('C-Moon') as well as some more restrained, though no less glorious, organ work (on 'Shake Off The Ghosts', the closing instrumental). More striking still is the extent to which bassist Duncan Forbes and drummer Mel Gaynor have worked their performance into one of the most cohesive rhythm-sections around.

Not all in the garden is rosy, however. Giving *Sparkle* a slightly rough edge has certainly removed some of the shine that gave its predecessor, *New Gold Dream* , such a distinctive character. The Live production has obscured some details I for one would rather have heard intact, and it's not inconceivable that, had the band spent a little longer developing their compositions, the song structures on *Sparkle* would have been as satisfying as any they had previously produced.

Having said that, they are still fronted by one of the most powerful, sincere vocalists modern music has to offer, and Jim Kerr's contribution to the band's overall sound is heard for the first time to its fullest extent on this LP (previous albums saw him sink into an unfathomable deep somewhere between the bass drum and the hi-hat).

It seems that the band have yet to find a happy medium between studio overkill and live noise, and it could well be that there will never be a perfect Simple Minds album. Then again, that may be no bad thing.

Laurie Anderson
Mister Heartbreak
WEA 925 077-1

It's been some time since we've heard from celebrated performance artist Miss Anderson, but on the evidence of this, her second album, I'd say the wait has been well worth it.

Heartbreak sees her collaborate with a fair number of famous music-industry names, resulting in a painting that's generally a fair bit more colourful than her debut, *Big Science*. Among the most notable partners-in-crime are Peter Gabriel, Nile Rodgers, Herbie Hancock producer Bill Laswell, Phoebe Snow and author/luminary William Burroughs.

Like *Science*, the album is actually only an aural teaser for a major multi-media performance still to come to fruition, but in a purely musical context, *Mister Heartbreak* stands up extremely well – better, in fact, than its predecessor, despite the lack of a commercial (!) track along the lines of 'O, Superman'.

All seven pieces are beautifully conceived and executed, and instrumentally, the album marks Anderson's entry into the field of computer-synths – there's Synclavier II on almost every song. Meanwhile, the lady's musical and lyrical composition remains as quirky as ever – amidst the mass of experimentation and unpredictability, only the occasional fragment makes itself heard as being a recognisable rock melody or 'song' lyric.

Heartbreak's strongest track is probably 'Excellent Birds', a sparkling, ethnic song co-penned (and played) by Gabriel. In many ways, it's the one track that sums up the record as a whole. A simple but instantly memorable main melody, coherent and intelligent (though mildly annoying) lyrics, and a thoroughly modern presentation – it's certainly an appealing arrangement.

Mister Heartbreak is not a faultless album, but its irritations are primarily intellectual ones: from a musical and technological standpoint, it's as satisfying a package as you're likely to come across all year.

Howard Jones
Human's Lib
WEA WX1

Criticised in some quarters for his open commercialism and 'deep and meaningless' lyrics, Jones is in fact a singer, songwriter, and arranger of not inconsiderable talent. *Human's Lib*, primarily because it *isn't* simply an example of three singles backed-up with an awful lot of padding, proves that to be the case, and should make one or two friends where previously he had only enemies.

Because while all ten of the tracks on offer on this album are conventionally-structured songs, most of them display a degree of risk and innovation rarely encountered with purely 'manufactured' chart records. To be fair, producer Rupert Hine must take a fair proportion of the credit for creating a series of tracks that all have their own distinct identity and yet are still obviously a part of the *Human's Lib* whole. Jones' synth-lines and drum-machines (there are a couple of saxophones on 'Pearl In The Shell', but aside from that, the whole of the LP's instrumentation is dependent on electronics) are reproduced with crystal clarity, and while much of the production is forceful and dynamic (especially 'Conditioning' and 'Hunt The Self') there is never a trace of self-indulgence in Jones' performance.

Despite the use of the most up-to-the-minute technology (DX7s *et al*), few of the sounds on the album are new, but, again thanks to the composer's sensitive playing and the engineer's thoughtful sonic manipulation, the musical textures are in the main subtle and full of detail.

I still can't listen to 'New Song' without thinking of the early Wombles records, and 'Hunt The Self' – with its lead synth line identical to that on Blancmange's 'That's Love That It Is' and pseudo-Peter Garbiel (him again) African percussion climax – has got to be one of the most derivative electronic music creations of 1984, but on the whole *Human's Lib* is an album that livens you up, makes you think, and rarely – if ever – lets you down.

Whatever you do, don't dismiss it as pop.

The Smiths
The Smiths
Rough Trade ROUGH 61

Lead-singer Morrissey was once quoted as saying that if a synthesiser ever appeared on a Smiths record, he'd leave the band. In fact, there are hints of piano and organ at several points during this, the band's debut album, and if anything it's these syrupy instrusions that dissipate what might otherwise have been one of the most forceful first-LPs for some while.

For The Smiths are essentially a raw, powerful (in the best sense of the word) guitar-based band who rely to a large extent on the character of their frontman for much of their presence, whilst at the same time containing more than enough of genuine musical interest to put many more 'creative' acts to shame. Their sessions for BBC Radio 1, and their live performances in particular, have been an enormous *surge* of energy that has inspired the mind as well as the body, but sadly a more than unsympathetic production job has rendered their first album an entertaining aside when it could so easily have been a major and important statement.

It isn't just a matter of recording the odd keyboard-line or two where none were required. Outrageously echoed snare sounds and exaggerated acoustic guitar lines give much of the instrumental backing an unreal quality that could not have been more out-of-context, even if the songs' lyrics, and their delivery, remain matchless in their pure, uncontaminated honesty.

Hence the songs that translate best onto vinyl are those that relied less on instrumental power and more on sentiment: 'Reel Around The Fountain', 'Pretty Girls Make Graves', and the terrifying, masterful, 'Suffer Little Children'. By comparison, tracks like 'Miserable Lie' and the (diabolically) re-mixed 'Hand In Glove' are merely a shadow of their normal selves – a painful reminder of what might have been.

The Smiths are a band of immense interest and potential. *The Smiths* represents only a small portion of what they are capable of achieving.

NEWS

TD re-issues

News has reached us that Virgin are about to re-release several LPs from the Tangerine Dream, Edgar Froese, and Klaus Schulze back catalogues at mid-price.

The albums in question are as follows: Tangerine Dream – *Phaedra* (OVED 25), *Ricochet* (OVED 26), and *Rubycon* (OVED 27); Edgar Froese – *Aqua* (OVED 20), *Epsilon in Malaysian Pale* (OVED 22), and *Stuntman* (OVED 21); Klaus Schulze – *Black Dance* (OVED 23), and *Time Wind* (OVED 24).

This is an extremely welcome move, since it enables recently-converted fans of an artist's music to gain some insight into their earlier work without incurring much expense. Let's hope other record manufacturers will follow Virgin's example: is it too much to hope that EMI will do some low-cost re-issues of the early Kraftwerk releases, long since deleted?

Inkeys No7

The latest Inkeys tape is hot off the copying machine and available now. Issue number 7 contains a fascinating interview with Chris & Cosey, plus a good selection of music from both British and foreign electronic musicians.

Side A

Chris & Cosey	*Love & Lust*
Steve Hillman	*From Distant Shores*
Peter Tedstone	*Eve of Dawn*
Techno & Dr Phil	*Timephaser*
Martin Kornberger	*Bal Macabre*
Bernd School	*Tales of Fantasy*, plus an unreleased piece
Cultural Noise	*Aphorisms Insane*

Side B

Pegasus	
Gerard Bik	
Enno Velthuys	*Encounter 7*
Synchestra	*Daydreams*
Iasos	*Elixir*
Adelbert Von Dayen & Dieter Schutz	*Inventions*

Inkeys No7 is available from Inkeys, 50 Durell Road, Dagenham, Essex RM9 5XU.

Readers' Own

Next month's *On Record* will contain a special report on how various readers went about getting their own music onto vinyl and the sort of problems they encountered along the way, as well as full reviews of all the relevant finished discs. There's still (just) enough time for further records/reports to be submitted for inclusion, so if you've got something suitable, rush it to: Dan Goldstein, Music Editor, E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY.

E&MM

ON CASSETTE

Tim Oakes **casts a critical ear in the direction of this month's readers' recordings.**

If you've made a musical recording you'd like us to hear, send it to us in a padded envelope – accidents do happen – and with as many personnel/ equipment details as possible. A recent photo would also be appreciated. The address for all tapes is E&MM, Alexander House, 1 Milton Road, Cambridge CB4 1UY.

ONE TO ONE (Barry/Bristol). *'No. 54' (four tracks).* Russell Charles: Simmons Drums, monosynth, lead vocals. Gary Spokes: bass and rhythm guitars. (With Minos Makris: Prophet synth. Huw Bowen: Neil Angrove, vocals).

A tight, commercial sound from this duo, aided by a clever Minos on the Prophet. Despite some good equipment, there seems to be a problem on the recording side – the quality of the sound is a little dull – and while the band have worked hard on the vocal arrangements, this is lost in the problems of a rather overpowering bass response. Nevertheless, there is some real innovation here, with a potential hit single in 'All The People', a mid-tempo synth track, with some excellent bass work and a neat hook-line.

The title-track, 'No. 54', shows a good grasp of the dynamics of delay effects, and the bass sounds very good indeed. One aspect of this tape that does grate, however, is that the individual members seem to be holding back a bit – the musical ability is obviously there, but doesn't get pushed to any extreme. Good songs, though, and a decent producer would probably sort out the minor difficulties. He could even make One To One into a very tight unit indeed.

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

SOME OTHER YEAR (London). *Four tracks.* Stewart Allen: Gibson Les Paul, Washburn A20, Roland GR300 guitar synth, vocals. Simon Wynn: Fender Squier Precision bass, Custom fretless bass, bass pedals, Roland SH101, vocals. Simon Starns: Premier drums, Paiste Cymbals.

A vocal sound quite akin to that of John Wetton pervades this tape, and the beauty of that voice allows a more flexible backing. Some Other Year have obviously worked on this, and have created four very different tracks, starting with the Policesque 'Nice & Safe', complete with flanged guitar (though this is hampered by a somewhat subdued drum sound and thin guitar synth solo).

'In The Pit' which follows features the same guitar sound, but the time changes add up to a nice Rush-like feel to the proceedings, culminating in a beautiful, dynamic guitar solo. SOT are a shade over-indulgent in the length of their tracks, but obvious difficulties with distorted rhythm-guitar apart, an effortless sound from a promising new band.

Music: 7 Production: 5 Presentation: 3 Tape: 5

TAPE OF THE MONTH

DUNCAN (Leeds). *'Home Taping Is Killing Me!'* Duncan: Yamaha BB400S fretless bass, Yamaha SG2000 guitar, Marshall 50 combo, Roland TR606 Drumatix.

'Over The Edge' is a slow, sophisticated MOR track with elements of Police, though with a vocal style that ought to make Sting worry a bit. The Drumatix is a bit over-prevalent, but this is outweighed by some classic guitar work, utilising a Boss Chorus pedal to the full. Take away the drum-machine and put a good responsive drummer on the tape, and you'd have an essential, original, 1984 sound.

Of the four tracks here both 'Over The Edge' and 'The Way It Is Now' have the capacity for chart success given some better basic sounds, while the other two are ideal LP material. Rare praise indeed, but deservedly so.

With stereo vocals and some clever double-tracking, good vocal delivery and lyrics, this man has some talent for what he does. With a Fostex 250 as the main recording instrument, the sheer work involved in getting such a complex structure recorded must have been mind-boggling. No wonder it's killing him! Keep in touch Duncan.

Music: 10 Production: 10 Presentation: 8 Tape: 9

(Torvill & Dean where are you. . ?)

XIV (Milford Haven). *Five tracks.* Nicky King: keyboards, vocals. Neil Hadar: guitar, vocals. Ben Henricksen: keyboards. Mark Solomon: drums.

An uncluttered and melodic, if slightly predictable sound from these South Wales musicians, who use the sequencer intelligently, and possess a fine art in 'filling' gaps on the songs they record. This adds up to a flowing sound, *á lá* Jarre, but with some clever – and commercial – vocal lines. They have worked in conjunction with a local dance team, Déjà Vu, and this may well have added an edge to their music that puts it above straight electro-synth sounds. The beats are even and time changes interesting, though on the whole some more variation in the basic sounds would have been welcome.

Best track is 'Reformation', which sees XIV's Soundmaster rhythm unit being used to trigger the Juno 6 arpeggiator, recorded at double speed and slowed down for the final mix.

Music: 6 Production: 4 Presentation: 4 Tape: 5

MONTH OF SUNDAYS (East Sheen) *'Through Unknown Lands'.* Jamie Dexter: Casio 403, Mattel Synsonics Drums, lead vocals. Nick Midgley: bass. Paul Rayski: Casio 403, Casio MT11. (With Andrew Wadsworth: occasional guitar).

We first met MOS In December '83, and they're certainly developed their musical style, technique and general skills a great deal.

The first track, 'Departure', features some excellent harmony vocals laid over a backing that is spartan but tidy. The band have recently brought in Andrew C. Wadsworth as producer, and a Tascam 244 – both work very well! The track lengths have been cut down, and the tightness of the musicianship and production bodes well for the future.

Music: 7 Production: 8 Presentation: 7 Tape: 6

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MODULAR SYNTHESIS

PERCUSSION SOUNDS

Having concentrated on pitched sounds recently, Steve Howell **takes an in-depth look at the generation of percussive voices which can either be played manually from your synthesiser's keyboard or triggered from a drum machine's clock or trigger outputs.**

This month's feature looks at conventional drum-kit sounds and how to synthesise them: more exotic 'electronic' voices will be discussed next month. Some sounds are – not surprisingly – easier to simulate using a synthesiser than others, as you'll see under each individual sub-heading.

Snare Drum

The snare is basically an ordinary two-headed drum which has underneath it a set of wires (the snare) which vibrate in sympathy whenever the drum is struck, and it is these snares that give the drum its' characteristic 'crack' – take the snares off and it sounds like an ordinary drum. These two elements can easily be synthesised on even the most basic synth but a modular instrument will give you far more control over the final sound than any pre-patched instrument or drum synth module.

Referring to Figure 1, you will see that we have two 'channels' – one for the pitched drum and one for the snare (the noise generator). You will note that there are no filters involved: this is a matter of taste as you *can* filter the noise generator for special effects if you wish, though for a realistic snare sound I prefer to leave it out. Choose a sinewave from the VCO or failing that, a triangle wave, though I feel a sine is usually more effective. If your VCOs don't have a sinewave output (and many don't), use a VCF with the resonance control full up as this can produce a very pure and undistorted sine that is particularly good for drum sounds; indeed I find myself using this method even though my synth does have VCOs with sinewave outputs.

By careful experimentation with the tuning of the VCO and with various ADSR times, you should be able to create a host of snare drum sounds from a deep concert snare to the high, Bill Bruford snare sound as well as many synthesiser snare effects and 'cracks', the VCO adding more depth than if you used the noise generator alone. As with a real snare drum, the sound can be improved with judicious use of EQ on the mixer or by adding reverb, and there's no reason why you couldn't process the sound through an outboard effects device for further variation. A harmoniser will provide you with a reasonable approximation of the deep snare sound Bowie used on the album *Low*, for instance.

Bass Drum

The bass drum is in actual fact quite difficult to synthesise, but it *is* a very important part of modern music, so it's worth spending some time getting it right. Figure 2 shows a patch for a bass drum sound. Again, there are two channels, one which handles the 'click' and the other the drum itself. Although there are no vibrating snares on a bass drum, the noise generator can still be employed to add the percussive 'click' that is very much in vogue these days – it's not essential but it does help the bass drum to cut through the mix when lots of other instruments are added. Again, as with the snare drum, the pitched element can be derived from an oscillating VCF. The ADSR times must be extremely fast and the best results will probably be obtained by tuning the VCO (or VCF) right down to minimum and adjusting the EG sweep to create the sound you require. Unfortunately, Daniel Miller, whose bass drum sound is just about the best I've ever heard, is not prepared to divulge the secret of how he obtains it, but suffice to say it is produced in much the same way as the method outlined above, using an ARP 2600.

As with any acoustic bass drum, you can employ all sorts of tricks such as compression and copious amounts of EQ (usually, hefty top boost to emphasise the 'click' and low cut to attenuate the 'boom') to tailor the synth sound to your needs, and you can then trigger it off your drum machine (if you have one) to augment or replace the unit's bass drum sound.

Toms

The patch in Figure 2 can also be used for these drums, but this time with longer decay and release times on the EG to allow for the natural 'ring' of toms. You can adjust the sweep of the EG to suit the sort of effect you are after, and adjustment of each of the channels will enable you to create an assortment of tom sounds from realistic synthesis of acoustic toms through thundering Simmons to cheap and nasty 'pew-pew' effects. Reverb will enhance the sound as will EQ. You might also like to use this patch for a snare drum as it is currently very popular to have a degree of pitch sweep on the snare sound.

If you think the patches look similar to a Simmons module or E&MM's own Syntom modules, you're right, except that in these examples, the noise element (which is actually a very important sound of a drum) has its' own envelope shaper. One of my major criticisms of all the drum modules currently available (manufacturers please take note!) is that the noise and the pitch elements both share the same envelope generators, which results in long 'splashes' of noise in the context of long decay times.

This *can* be very effective but there are many occasions when it isn't, in which case I ditch the Simmons in favour of my trusty modular ARP. Using the patches I have given here should enable you to obtain long pitched decays with just a short burst of noise for the attack transient, and this is often much more effective. It also means that you can individually EQ and process each separate element of the sound for even further control. What you lose, however, is the drum 'feel' and the touch-sensitive properties of pads, but for the bass and snare sounds this needn't be as much of a problem as it sounds, as a lot of modern music relies heavily on an unfaltering, solid back-beat. You also lose the acoustic 'spacing' of having separate tom modules panned across the stereo image, but this can be partly overcome by panning the mono sound manually during mixdown or by creating a pseudo-stereo effect with double-track echo, chorus or mild flanging, or by using a stereo reverb. On the whole, though, these patches will give you a lot more creative possibilities than most commercially available units, and they can also be usefully employed giving the sounds of your drum machine more variation.

Additional Percussion

The rest of the kit is not so easily synthesised, however. Cymbals are notoriously difficult to recreate which is why some drum computers use sampling even when all the other drum voices are synthesised. To be perfectly honest, to date I have not been able to capture the sound of any 'kit' cymbal on a synth, but it is possible to create a sound which can be effectively used in place of a cymbal using a ring-modulator.

Referring to Figure 3, you can see that two

VCOs (using the sinewave outputs again) are fed into the RM, and that by tuning the VCOs to various intervals you can create some interesting metallic sounds: the sum and difference frequencies produce the dissonance cymbals are famous for. You will note also that a noise generator has been used to create the 'splash' of the cymbal and if you wish, the noise generator can be used on its' own as an effective cymbal substitute. I recommend you put the metallic element of the sound through slow, mild flanging, as this may help a little, as will a slow, mild sweep of one of the VCOs by an LFO. More VCOs might help you build up a more complex cymbal sound. Alternatively, you could adopt Peter Gabriel's 'no cymbals' philosophy. . . .

Hi-hats, particularly the closed variety, are not so difficult and Figure 4 shows a simple patch which should supply you with an effective, metallic 'tick'. The resonance of the VCF is set to a point where it is on the verge of oscillation and the cutoff frequency should also be set fairly high, depending on the effect you require. By triggering this on 8th or 16th notes you should be able to provide an effective hi-hat pattern, or alternatively, make use of the programmable trigger output from a drum machine to set up a more intricate rhythmic pattern. One interesting effect you can use is to program the drum machine's hi-hat and the 'external' hi-hat on alternate beats panning the sounds hard left and hard right respectively to give you a 'ping-ponging' effect.

Unfortunately, open hi-hats are not so easy and require a separate trigger pulse and voice module. Use the patch in Figure 4 but adjust the ADSR times to give a slower decay and release with full sustain. By leaving a gap in the closed hi-hat pattern and triggering the open hi-hat in the gap, you should be able to create the effect of an open and closing hi-hat rhythm: however, you will probably need to gate the open hi-hat to sustain it a little and the decay/release times will have to be adjusted very delicately to close on the arrival of the next closed hi-hat. Be prepared to spend a lot of time on this one as it *is* quite a tricky procedure. As with the closed hi-hat, the cut-off frequency can be adjusted to taste, though it's as well to keep it the same as that of the closed hi-hat, thus ensuring some consistency between the two sounds.

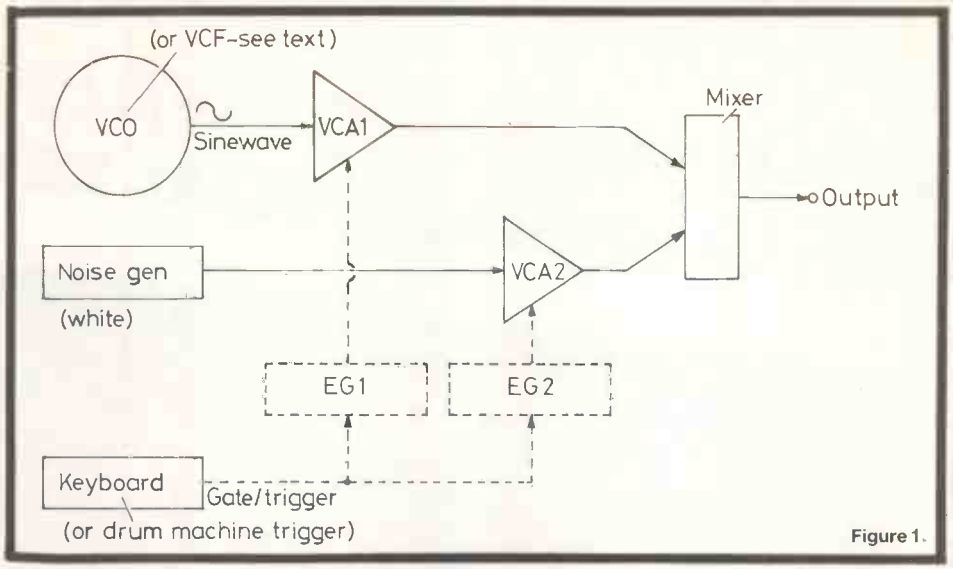

Figure 1.

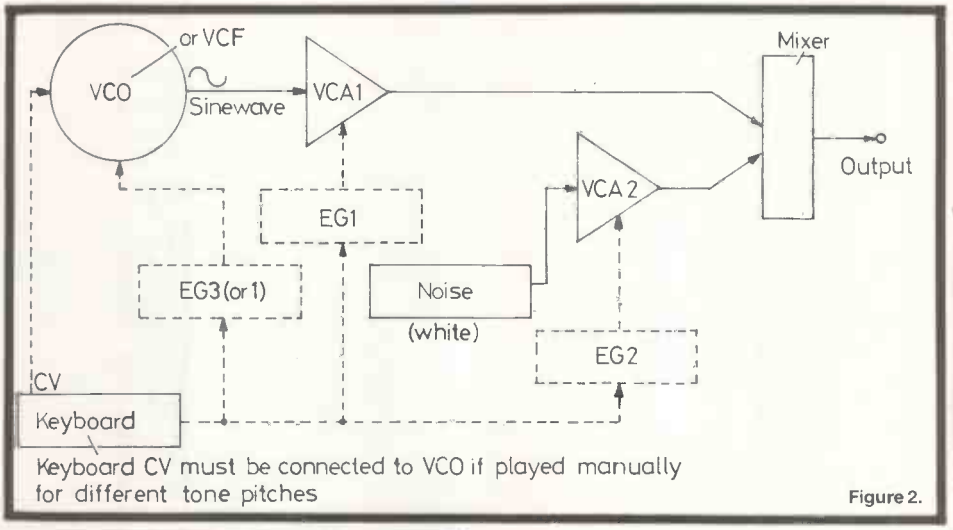

Figure 2.

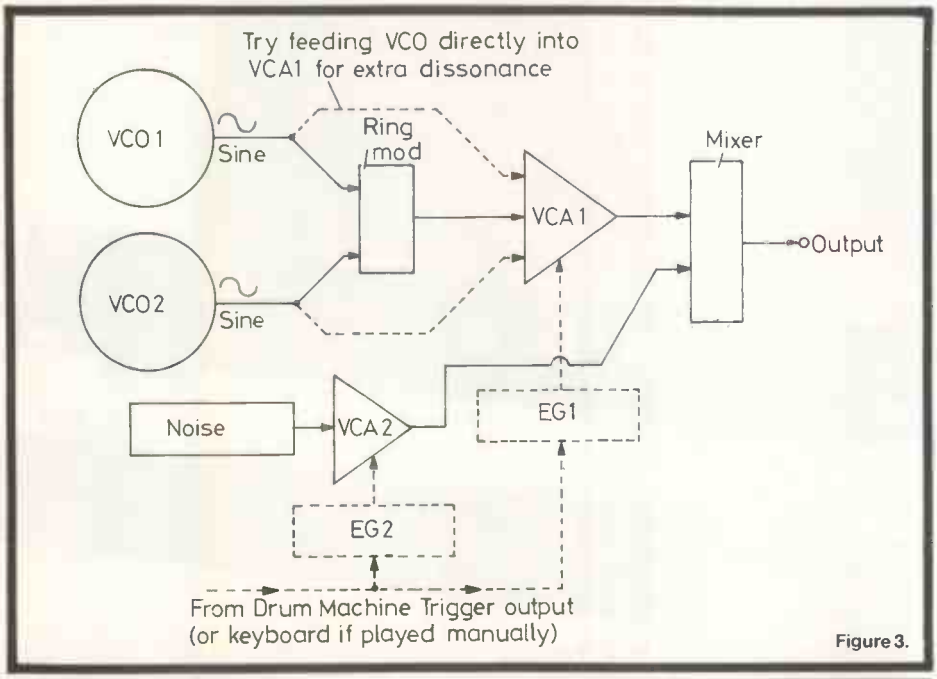

Figure 3.

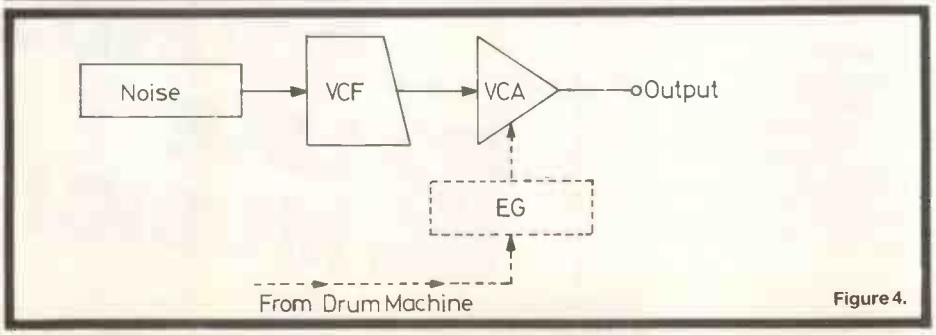

Figure 4.

To obtain these sounds simultaneously without resorting to overdubs (which can use up a lot of tracks on the tape machine) you'll not only need to have a lot of modular hardware but also a very sophisticated drum machine with a lot of trigger outputs, or else a multi-channel trigger sequencer. I doubt if many amongst you have such facilities, but simply using one or two of the patches given should greatly improve your drum sound.

Summing-Up

In fairness, even the humblest of drum machines can provide quite good and useable drum sounds these days, and it would appear that there are more to come. As technology brings the price of equipment down, the need to go to elaborate lengths to create these sounds will diminish, but it's worth bearing in mind that as these devices become more readily available (and at more reasonable prices) there's a growing tendency for machines to sound 'samey', and this is especially true of drum sounds (have you played 'Spot-The-Linn' at a disco lately?), so even if you do opt for the new breed of drum synthesising devices, it's worth considering setting up some of these patches as an alternative. They can sound equally as effective as any commercially available 'off-the-shelf' device, though possessing at the same time a distinctive character of their own.

Steve Howell **E&MM**

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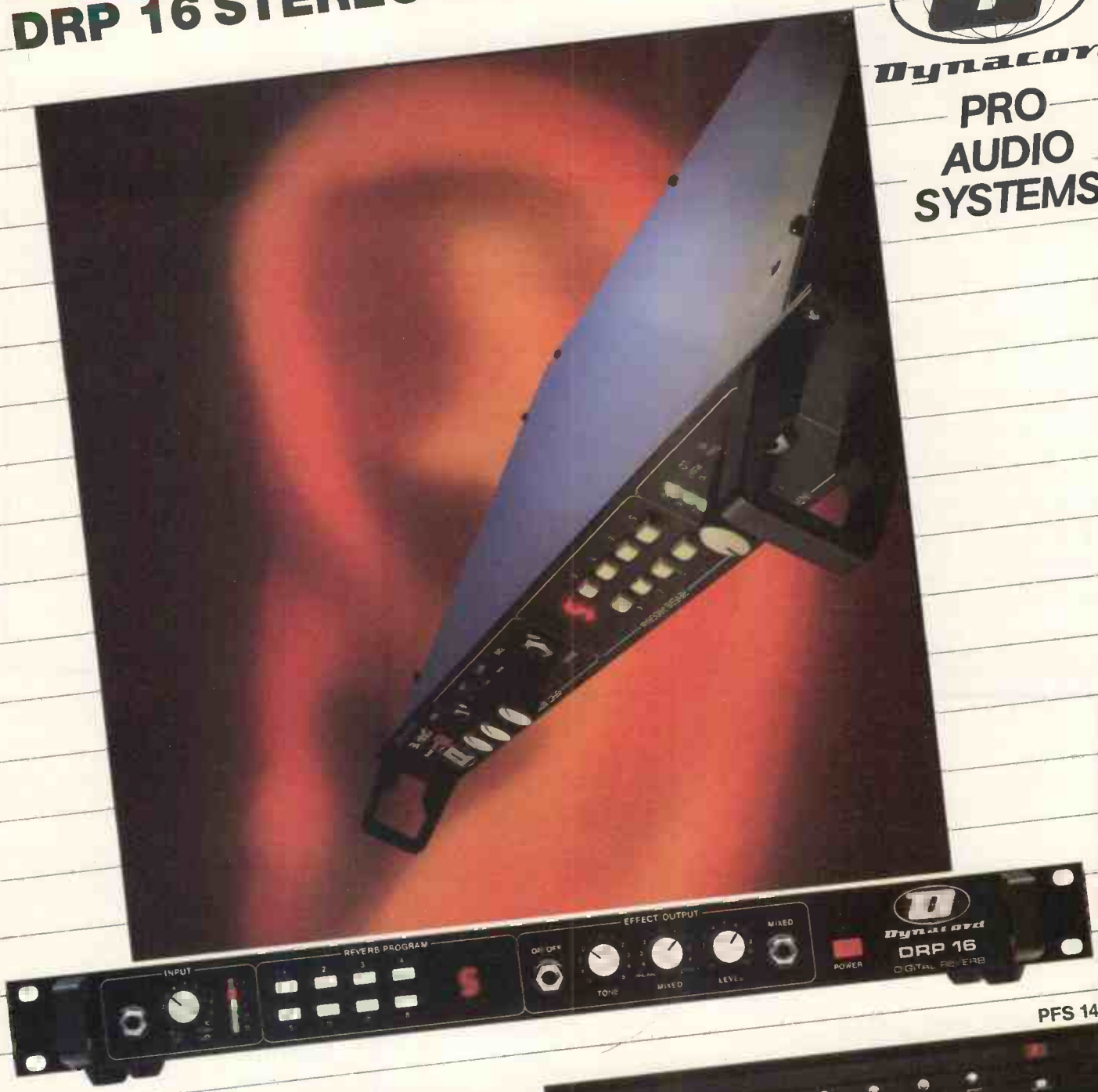

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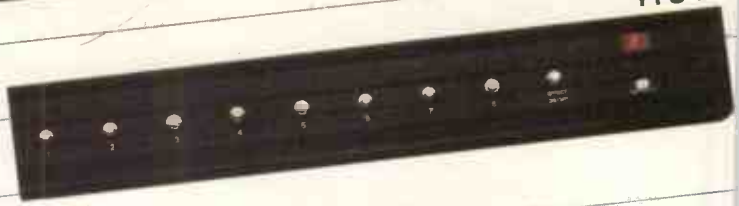

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Brian Chatton on the Poly 800

The Korg Poly 800 has been on sale in the UK for only a month or two, but pro keyboardist Brian Chatton **has already used one on an extensive nation-wide tour as part of John Miles' backing band. Here he reports on how his example stood up to life on the road.**

Reviewing any new keyboard after just three weeks, two of them having been spent touring the UK with John Miles, is not exactly an easy task, but even in that time I've managed to collect together a number of observations – some of them a mite sketchy, I admit – that you'll find detailed below.

Digital Access Control

This is the process – rapidly becoming more and more readily accepted – by which the synth's various parameters are varied and the subsequent values stored in memory.

One advantage of this system over conventional analogue control is the degree of precision – using numbers rather than rotary pots – with which you can shape the sound you require. Having a series of numeric values to remember instead of a vague idea of control settings makes sound selection and adjustment a straightforward, instant process: with the Poly 800, as with other synthesisers that make use of this system, there's no margin of error whatsoever to worry about.

The other advantage is principally an economic one. With the elimination of mechanical knobs and switches, ninety per cent of accident-prone moving parts are also removed, which should cut potential repair and maintenance costs down to the bare minimum, as well as making the keyboard a lot cheaper to manufacture in the first place.

Waveform Creation

The Poly 800 makes use of a process known as 'additive square-wave synthesis', in which different combinations of square-wave harmonics produce various different waveshapes. If all you require is a straightforward square-wave, all you do is select a value of one for the waveform parameter. If, however, you desire something more complex such as a sawtooth, selecting value two will give you the opportunity of combining harmonics at different individual levels, enabling quite a wide variety of different timbres to be generated.

I've found the Korg to be particularly good at producing thick, raunchy foundation sounds that ensure whatever line I'm playing is heard above the rest of the band. John Miles isn't the easiest of guitarists to play with when it comes to trying to make keyboards heard, so being able to create a good basic 'forward' sound after only a few minutes or so's experimentation proved a godsend.

This particular sound was discovered initially by splitting the DCOs, giving one a sharp, 'plucked'-type envelope and the other a subtler cello-like timbre. Once each sound had been individually treated to the delights of the Poly 800's envelope generator (more on this later) and VCF, the synth is put in Doubling mode, effectively doubling the intensity of each note played (though at the same time limiting the polyphony to four notes at any one time). The Korg's excellent chorus unit can also then be added to taste. If I'm making something of a meal of this one sound, it's because it was the first sonic aspect of the Poly 800 that really fired my imagination: it goes without saying (I hope) that a considerable range of impressive sounds can be got from the Korg, again with the minimum of fuss, and there can't be many situations where it'll completely fail to deliver the sonic goods.

Envelope Generators

The Poly 800 has six-stage EGs, the two new stages (in addition to the traditional ADSR) being 'break-point' and 'slope'. These add either a second attack or a second delay respectively, and I've found in practice that combination of these two together can result in some interesting, complex filter-shaping the like of which is often not possible on synths costing upwards of four times what Korg are asking for the Poly 800.

In Performance

There are two features of the 800 that I've found particularly useful during a live performance. The first is its compact size and consequent lower-than-average overall weight. I'm sure I'm not alone among keyboardists in often wishing I could free myself from having to stand behind my set-up in one corner of the stage, and now, with the Poly 800, I've got a polysynth I can wear around the shoulder for a fair amount of time without any real discomfort whatsoever The keyboard is small (four octaves) for a polyphonic instrument, but, as this magazine's review (*E&MM* February) pointed out, there are very few occasions when the average keyboardist will find this insufficient.

The second practical advantage of the Korg is its 256-step sequencer. The fact that such a facility is available at all on an instrument of this price must be deserving of a mention in itself, and in a concert situation, being able to recall, say, a complete solo at the touch of a button enables you to layer synth-lines very quickly and easily. It also leaves you with the freedom to concentrate your attention on what's happening in the front-row of the audience, should you so desire. . . .

Problem Areas

Having exhausted just about all possible areas of praise for this new Korg, I think it's only right I inform you about one or two minor design deficiencies that have come to light during the time I've had the Poly 800. The first is the surprising ease with which the above-mentioned sequencer's memory can be totally erased, simply by leaving the back-panel switch on 'Enable'. This switch is in an extremely vulnerable position completely out of sight of the user in normal operation, and this is particularly dangerous on a dimly-lit stage. To ensure your sequences will be stored, it's best to get into the habit of always flicking the switch into 'Disable' or, for extra insurance, dumping the relevant data onto cassette.

The second, and potentially more hazardous design hiccup, has to be the danger of inadvertently wiping out all your program and sequence data, due to the lack of a failsafe long-term battery. Having given the user a DC battery pack that enables all the Korg's functions to be operated wherever and whenever required (and that's something that's pretty rare among 'professional' keyboards of any sort, even in these days of high-technology miniaturisation), it seems a shame the Poly 800's designers have not been able to get memory and instrument power running from the same source. Until our Oriental friends develop a solution to this (highly significant) problem, I think it would be a wise precaution for every Poly 800 user to carry an extra set of batteries with him at all times, or alternatively to use the built-in mains lead except in situations where using batteries is absolutely necessary.

More positively, although the Poly 800 is certainly no heavyweight in the construction stakes, in the few weeks I've been using it on tour there's been no hint whatsoever that it might go down on me. In fact, I'd say that such an event is about as likely as Derek and Clive appearing at The Royal Variety Performance, and that's something that can probably be said of most Korg keyboards, from the humble (and now, sadly, defunct) 800DV monosynth to the giant 3200 poly – a synth which, if it wasn't for its formidable size, I would probably still find capable of giving me just about any sound I required in any situation.

Brian Chatton **E&MM**

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Mind Over Music

Andrew Morris **on the similarities between piano-playing and typing, plus a brief insight into an experiment aimed at quantifying pianists' sight-reading techniques.**

Ever since Seashore (1938), one of our most distinguished musicologists, developed a method of converting the time and force of playing keys into a mechanical record, psychologists have endeavoured to quantify musical performance. Technically, it shouldn't be too difficult to study piano playing as a discrete time-series of responses. But, as Seashore discovered, there are inherent problems, not least of all the vast quantities of data produced.

In the early days, the records obtained were entirely mechanical, punched or printed on copious volumes of paper. More recently, methods have been developed of transferring performance details directly on to computer, facilitating complex analysis. Nevertheless, the impact of computer sicence and electronic technology has been largely in the field of typewriting. So, for a decade or more since the advent of the electric typewriter, psychologists have chosen to study typists rather than pianists using the rationale that typing and piano-playing are members of the same family of skills sharing the same phenomena. As the technological tools necessary to study piano-playing have only recently been developed we have had to be content using typing skills as models of piano skills. One of the most notable investigators to capitalise on recent advances is J.A. Sloboda at Exeter University. The present study is based largely on a series of experiments performed by Sloboda in 1977 (cf. Shaffer, Deutsch).

Equipment

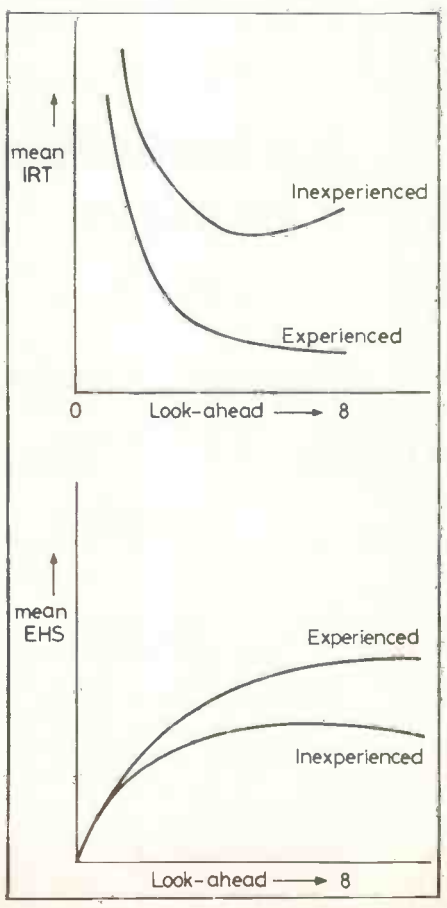
The equipment set-up can be seen in the photograph (note that the tuner was not part of the experiment but it did help to while away the protracted hours spent programming!). The instrument on which the subjects played was a Yamaha CP30 electric piano with touch-sensitive action. The monitor in the centre displayed a single stave of music which was controlled by the Apple II micro.

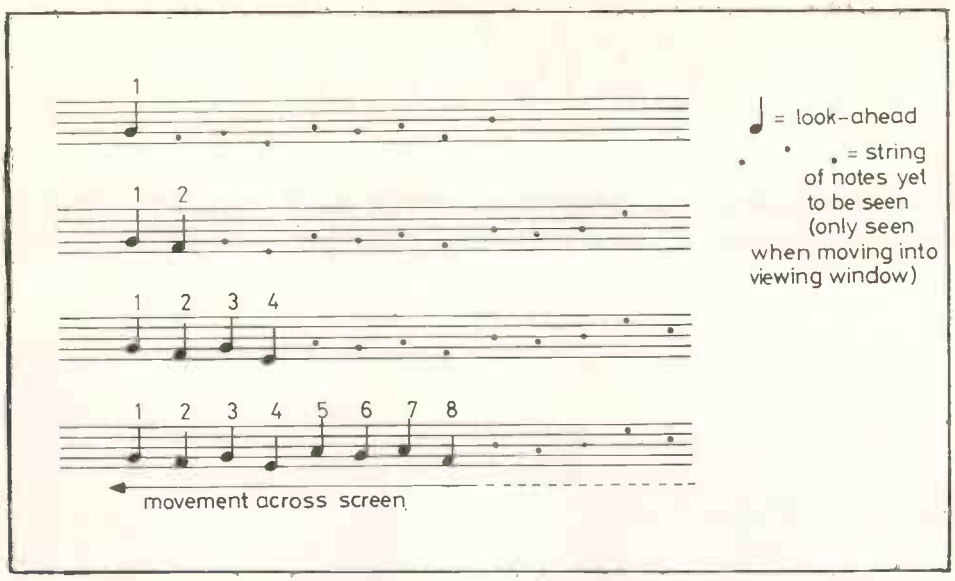
Inside the piano casing a set of microswitches were activated each time a key was pressed. The leading edge of the resultant voltage-change operated a purpose-built solid-state monostable circuit, which in turn activated one of the one-bit pushbutton inputs of the Apple's games control. The software was such that on each key press a millisecond timer was started which counted the time up to the next key press. These inter-note times (which are known as Inter-Reaction-Times or IRTs) were

stored continuously in textfiles for later analysis. The aims of the software were many: to display a single treble stave across the monitor screen; to present a single line of notes across the stave; and to shift this one note to the left on each key press creating new notes on the right, causing notes on the left to move off the screen. The whole process of renewing the music text had to be extremely fast, otherwise each reaction time would have been an artifact of the software. Consequently, the Applesoft programs were compiled into machine code.

Random Melody

One cannot help but wonder how much simpler and more elegant it would have been to use a Chroma/Apple set-up but, alas, a Chroma was not forthcoming. However, the system worked remarkably well and the performers found it surprisingly easy to adjust to sight-reading from a TV screen rather than manuscript. They were required to play at sight two types of melody, one consisting of random notes and the other of notes in a Baroque style. The hypothesis was that the Baroque type melody would be more 'meaningful' than the random melody and so would be played faster and with greater fluency. The explanation of this is simple. If a person is uncertain about an event, he will find it difficult to predict that event. In other words, the more random or meaningless the melody, the more choices there are associated with the next note, thus making prediction difficult. Secondly, the two melody types were displayed so that the sight-readers' look-ahead was limited to 2, 4, or eight notes, or just a single note depending on the experimenter. This is shown in Figure 1. By doing this it should be possible to tell how far ahead a sight-reader looks in order to play fluently. The number of notes in this look-ahead is called the Eye-Hand-Span (EHS). This phenomenon has been demonstrated in typing studies but not so much in those concerned with piano playing.





After each subject had practised long enough to minimise any practice effect, they were launched into half an hour of experimentation during which each melody was displayed in all the look-ahead configurations. The data was stored on floppy disk for each subject which was subsequently analysed in accordance with the hypotheses.

– In all performers there was a marked EHS effect, that is, both the speed and fluency of performance was severely effected by the amount of look-ahead available. In short, the fewer notes available, the slower and more erratic the performance. Typically, the performers were reading 4 to 6 notes ahead of the ones they were playing. These results are in line with those of typing studies and other similar keyboard players.

– The differences in performance of the random and Baroque melodies were also significant. The random melody led to increased uncertainty about which note was coming next and was consequently played much slower, with less fluency, and with more errors than the Baroque type. It was found that the more meaningful the melody, the more the performers 'chunked' together sets of notes.

– The most effective chunking method consisted of taking six notes or less at a time and playing the whole unit whilst scanning the next unit.

– Sight-reading was at its best at the beginnings and endings of the melodies, the majority of errors being made in the middle. This, suggests Sloboda, is because these parts carry the most information about the whole, whereas the middle is to a certain extent determined by the surrounding context and the rules of music.

– Inexperienced performers do not chunk so readily or play as fluently as experienced performers because they do not as yet have the action plans or motor programs necessary to make simple transcription automatic. Experienced performers do have these and so can concentrate more on strategies to play sequences of notes as efficiently as possible.

Results

The results of this experiment confirm that piano-playing is a member of the family of skills that includes typing, but that it is incredibly more complex to study. The elucidation of these processes is invaluable to the complete theory of music, but they represent only one level from which it may be tackled, as with many other human information processing mechanisms. It can be studied from the fundamental perceptual processes involved in pitch recognition, for instance, or from the real-world aspect on which the present study is based.

Andrew Morris **E&MM**

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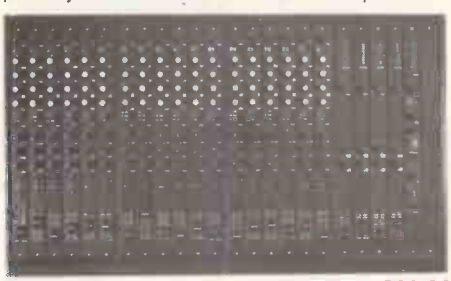

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MUSIC VILLAGE

Meanwhile, back in Romford. . . . We decided that this month we wouldn't move too far from our exposé of the peanut industry at Monkey Business, and take a look at a new retailer just a couple of miles away at Chadwell Heath.

The Music Village opened around November last year, occupying a superb new shop space on the main London-Essex road, and having a wide area full of clubs, live music pubs, and a mass of musicians in East London to serve. The shop was started by Brian and John who previously ran Brian & John's Music Store. But far from just changing the name with their move, the pair wanted to ensure that they had an entirely new music shop. Brian explained:

'We wanted to find a place that had enough space for all the different types of instruments and equipment that you really have to stock now. The industry is changing, and we wanted to have the room to show home recording equipment, the new generations of keyboards, and a section for people to come and try some computerised music systems.'

To this end they have extended the store back from the main room and built on a new 'wing' to the shop, which currently houses the drums, amplifiers, and their stock of secondhand amps and cabs.

The main room of the shop is split into three sections, one area holding their battery of keyboards, with names like Sequential Circuits, Yamaha, Roland and Casio among others, while an entire wall is given over to their guitar gallery, with a wide range of all types of electric and acoustic guitars from Fender, Gibson, Washburn, Westone, Aria, Ibanez, Squier and Yamaha, plus a good selection of secondhand instruments, with prices that start at around the £50 mark.

'We like to keep a fair stock of secondhand equipment in, simply because it maintains a good turnover of stock,' explained Brian. 'We like to cater for the musicians who are trying to find the right piece of gear and who also like to keep up with the latest in instruments . . . they like to change, and we like to help!'

Service

The helping hand of the Music Village also extends to their after-sales service; they offer a rare six months guarantee on all secondhand stock, and they also have a large and well equipped repairs and spares department to deal with the majority of equipment problems. This department is at the far back of the shop, beside a very large storeroom/warehouse that MV are intending to set up as a demonstration room, doubling as a showcase for visiting 'roadshows' such as the Fender or SCI extravaganzas that have been trekking the UK lately.

Currently, their home recording equipment occupies one corner in the shop, but both the proprietors expect a move for this department to a more prominent position in the near future. Their current stocks include Fostex, Teac and a range of parts and accessories to keep even the most ardent home recordist happy. The supply situation as regards this sort of equipment has caused Music Village some concern in the past – especially the X15 Multitracker. Brian commented – 'We just can't get enough of them, and it's the same story all round. The market for secondhand home recording equipment is getting stronger every day, too.'

Computer Music

One unusual aspect of Music Village is reflected in part by their attention to the home recording equipment market – they like to innovate, keeping up with the new advances that appear on the market. This includes things like computer music hardware and software, and they recently took in stocks of Commodore computers, screens, and the Sequential Circuits Commodore 64 MIDI sequencer and software. This is one product they are particularly excited about, and they've already received plenty of real interest, not only locally, but also from dim and distant parts of the UK.

It's always nice when we are visiting retailers to look at the local trends, which vary enormously across the country. Music Village is no exception. Their 'big sellers' include the obvious DX7 ('Ridiculous demand . . .' – Brian), the new Sequential Circuits Six Trak and Drumtraks ('Some of the most exciting new equipment for ages – it doesn't take anyone long to very work them out . . .' – John) and the Roland JX3P, which both the proprietors doodled on while we visited.

Regional variations apart, the position commanded by Music Village on the High Road at Chadwell Heath is imposing, and visible for miles (Visitors should also note that the numbering on the High Road is mad – *and* it runs for about four miles . . . just ask anyone holding a guitar case or a synth box).

So, a shop with a great secondhand pricing and guarantee policy, all the new ranges under one roof, and an unhurried and friendly atmosphere. If only there was one on every high street!

Tim Oakes **E&MM**

The Music Village

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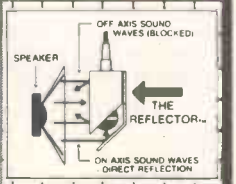

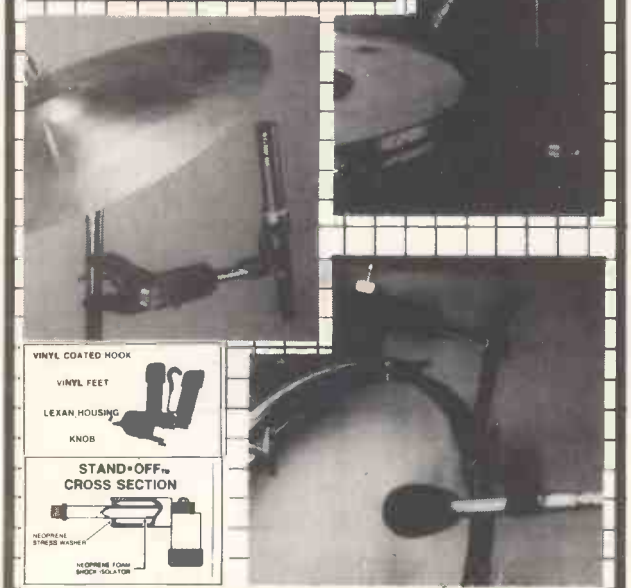

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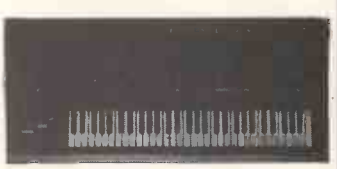

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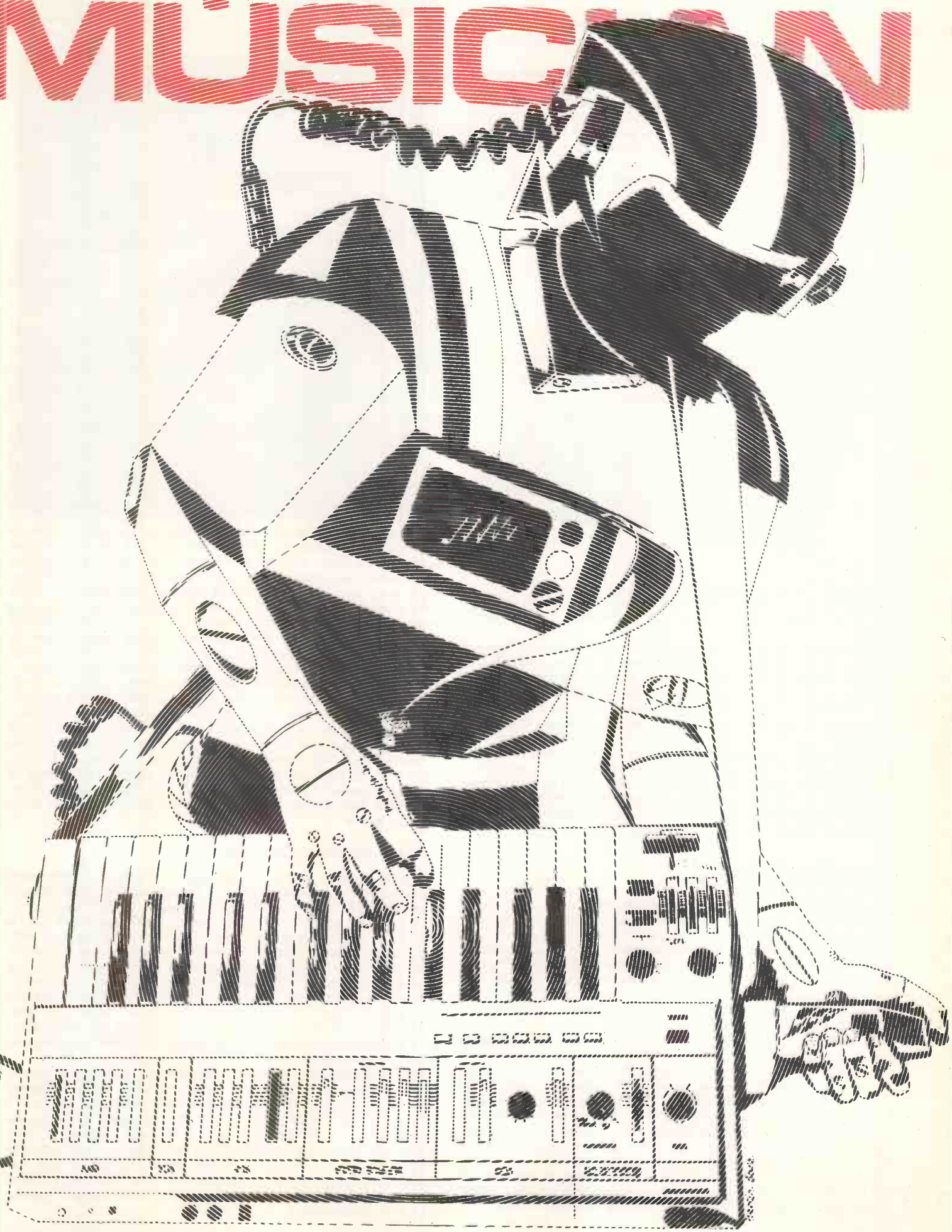


RUMBLINGS

Graphic Rhythm

The sampling drum machine that's always guaranteed to get nice things said about it, by both punters and pundits alike, is the Drumulator from those awfully nice E-mu people in Santa Cruz, California. Old E-mu aren't to be done out of the micro-interfacing bit, so they've now released a software/hardware package called the Graphic Rhythm Composer for running the Drumulator via the RS-232 serial link from the Apple II/IIe (and probably also the Commodore 64). From what I can gather, the long and the short of this communications freeway is a 'Page R'-type rhythm sequencing set-up, whereby notes can be seen on the monitor screen as well as heard. A big point in favour of this visual approach is that it's a darn sight easier to work out where to put all

those 15 levels of dynamics that the Drumulator waves at us on in the spec sheet. Not waving, but drowning . . . in dynamic subtlety. . . .

On the same front, E-mu are now putting the Personal Computer Interface on the Emulator to work in some sort of way. When I last spoke to Dave Rossum (el designero of both the Emulator and Drumulator) in mid-1982, he said there wasn't sufficient interest in this side of things to go ahead with a proper software development programme for micro control of the Emulator. However, times they are changing, and E-mu are now saying that they'll tell those well versed in the art of software how to use an Emulator and a computer to create custom Drumulator ROMs. Interesting, but an expensive way of burning your own EPROMs, all the same. . . . For more on the explanation front, contact either E-mu Systems at 2815 Chanticleer, Santa Cruz, CA 95062, USA (tel: 408-476-4424), or Syco Systems, at 20 Conduit Place, London W2 (tel: 01-724 2451).

Fairlight Upgrade

Even the jolly old Roller needs a lick or two of paint now and again, and the Roller of the synth world is being treated to a right royal going over by its Australian designers. First off is the imminent arrival of some music printing software that'll take in your melodies from Page 9 (the sequencer), Page R (the multi-layered rhythm generator), and the MCL, and then turn out camera-musician-conductor-ready copy. And there'll be an option shortly available that effectively turns the guts of the CMI into a Lamborghini lookalike. Well, as far as speed is concerned, anyway. . . .

The point is that the machine we all know and love currently centres its activities around a pair of 6800s, an ilk of 8-bit processor that predates even the much-maligned 6502. The upgrade option instead offers us the delights of a pair of 6809s (as used in the Dragon micro) and the PPG Wave 2.2 entering the Fairlight ark. That's on one card. In addition, there'll be four other new cards as part of this upgrade: a double-density disk interface (doubling the capacity of the drives), a bigger and better video card, a de-bugging card, and a 256K system RAM card (compared with the present 64K).

And the price for all this? Well, this is the amazing bit (considering that you're actually getting a pretty impressive minicomputer, albeit in card form) – just £1,500. The good news extends to the fact that the price is likely to hold true whether it's a retrofit to a model of yesteryear or as a souping-up option for a current system.

Third on the Fairlight wash n' brush-up agenda is a further option that'll add SMPTE code reading and writing for tape synchronisation. This card will also be tempting us with – you guessed it – MIDI. Four channels of it, in fact, and this'll work with either MCL or Page R. Now, bearing in mind that MIDI is on the slow side (did you know that the data for an eight-note chord takes 11.6 ms to get from one bit of MIDI equipment to another?). You might be forgiven for thinking that marrying the super-dooper dual 6809s of the Fairlight GT with MIDI is a bit like, er, running the

aforesaid status symbol of the Cannes set on paraffin, but there's method in this madness, because there's yet another upgrade option on the cards for later in the year, which centres around the CMI's other synthetic half, the voice cards. Now, the original voice cards were possessed with 16K of RAM for sound storage. That's OK for short sounds, but not too great for longer ones or anything with lots of HF. Over the years, these have seen various improvements, and now the claimed frequency response for the 'Series II' voice cards goes right up to 20,000 Hz, along with an 85 dB dynamic range and a ten-fold improvement in transient response.

The 'Series III' option goes much, much further. First, the cards will provide for 16 channels (rather than the present 8) of 14-bit audio from a shared memory system that'll accommodate up to 4 megabytes of waveform RAM. On top of that, software will greatly expand Page R so that it works on 64 channels. And that, of course, is where those MIDI channels come in. Imagine a trio of DX7s, the 'Series III' Fairlight, and something like the new SCI Drumtraks all working in perfect harmony. . . . Oh well, one can but dream. In the meantime, Syco Systems can provide more food for thought at the address above.

More Music Center

Following on from what I mentioned about Music Center's MIDI software in the December issue, it transpires that Digisound are negotiating the UK distribution rights of Music Center's products. In fact, this German firm have developed two MIDI interfaces. One is connectable to nearly all micros (whether with Z80, 6502, or 6510 processors), while the other is specifically for the Commodore 64. Using the former as the synthetic umbilical cord, they're developing a range of Sinclair Spectrum software, including a real-time sequencer, arpeggiator, cassette interface for the Yamaha DX7 and DX9, a polyphonic composer, and what they describe as 'computer-made sounds for DX7' (whatever that means). All the above apart from the arpeggiator should also be available for the Commodore 64 within the very near future.

No doubt Digisound would be delighted to answer any queries anyone has about the availability and operation of these programs: they can be reached at 14/16 Queen Street, Blackpool, Lancs FY1 1PQ (tel: 0253 28900). Alternatively, try the direct approach by contacting Music Center themselves at Martener Hellweg 40, 4600 Dortmund 1, West Germany (tel: 0231 171921). By the way, we're still waiting to get a package for review. Whether that's a sign that development isn't entirely finished, or that someone's being recalcitrant about exposing it to the eagle eyes of E&MM's editorial staff is anyone's guess. . . .

David Ellis

The Gentle Art of Transcription

David Ellis **takes a look at the various transcribing devices that currently exist, from Yamaha's MP1 personal keyboard to alpha Syntauri's Apple-based system: with more to follow next month. . . .**

Part 1 Setting the Scene

These days, just about everyone's doing it . . . transcribing music, I mean. It's not difficult to see why. Music notation has a splendid sort of arcane quality to it that evokes glazed expressions from those that don't understand it, and a certain awestruck regard from those that do. But let's be honest, there's an awful lot of re-writing, conscious or otherwise, that goes on in getting through to the real musical substance of many a complex score. And I'm guilty of that transgression myself.

So, wouldn't a more commonsense way of going about creativity be to work from the opposite direction, working tried and tested instrumental lines into the full score? Stravinsky did it, after all. Of course, most composers aren't multi-instrumentalists, and Stravinsky's efforts in the direction of pre-performing his compositions were generally restricted to piano and percussion parts. However, in the case of rock (or whatever) music, many musicians *are* multi-instrumentalists, so there's no reason why, rather than writing the score first (an ability which only a handful of rock musicians seem to develop – quite probably because it kills the improvisatory spirit), the starting point shouldn't be a performance, or at least a step-time equivalent derived from 'keying-in' of MCL, that's then transcribed by the computer for storing on cassette, disk, or in RAM. Once that's finished, the 'soft' score might then be subjected to editing, performance, or printing out as a 'real' score which even the most diehard of session musicians could appreciate, if not play.

You could argue that transcribing a musical performance into real printed notation is gilding the lily at best, superfluous at worst, and generally of limited value to anyone in the commercial field. But there are many instances where a printed version of a piece of music that only exists in the mind of the performers or on record would be extremely useful:

1 **Copyright reasons:** The Performing Rights Society in the UK encourage composers to write down the lead line of every song they have published. For greater copyright protection, the entire transcribed score can be kept locked away in the PRS's vaults.

2 Arranging: String and brass parts can be produced without recourse to outside arrangers. 'Intelligent' transcription might provide facilities for automatic transposition of parts, harmonising on the basis of other parts, and error-trapping that prevents lines from being written outside the natural range of the instruments.

3 Film scoring: Ditto orchestral parts for use with or without pre-existing synthesised parts. Film work frequently involves having to make changes at the last minute to accommodate an added or deleted split-second or two. With the 'soft' score facility, this becomes straightforward, as the synthesised parts can be edited in the normal sequencer fashion and a revised set of orchestral parts then printed out as and where necessary.

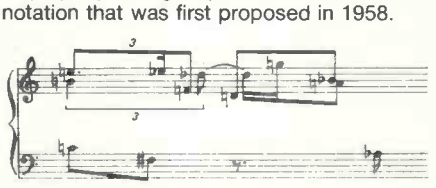
4 Educational purposes: Showing a musician what his keyboard performance looks like in notational actuality.

Creative Relegation

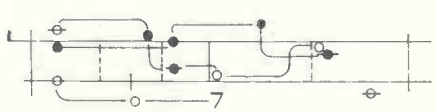
The problem with putting performance before scoring is that the interaction between eyes and ears stands a good chance of being relegated to the 4th Division; no MCL or step-time display is yet capable of showing all the vertical relationships that might exist in a piece of multi-part music with the same clarity as notation on manuscript paper. What this means is that the ears get the lion's share of sorting out the harmonic wood from the melodic trees. There's no harm in that, of course, but there's also no denying that people in general are not that good at remembering what tune was played five minutes ago. What we really need is a modicum of visual help applied in the direction of our meagre efforts at musical memory.

The first and most obvious place to look is at the screen display of the computer that has our score under lock and key. However, as things stand at present, high-resolution graphics just can't do justice to more than a handful of musical parts. In short, we run out of pixel power. Of course, you can head in the direction of Xerox's Mockingbird (see later in the series) for much classier musical graphics, but the computer that it runs on (the Xerox 1132) doesn't exactly grow on trees, and it isn't exactly a Sunday afternoon programming session to get a screenful of music looking anything like as good as what Mockingbird produces. On top of that, Mockingbird requires financial resources that zoom up into the six-figure region. . . .

There are really two potential solutions to this predicament: first, use screen displays for editing the score part-by-part and a high-quality printer to allow visualisation of all the parts together; and second, start investigating easier and more efficient ways of getting parts together on graphics displays of limited resolution. The second option is obviously the more exciting, but it's somewhat difficult to know where to start. You could, for instance, have a go at translating traditional notation into a format that's suitable for the average graphics display by using Equitone, the alternative notation that was first proposed in 1958.



Conventional notation.



Equitone translation.

The obvious advantages of Equitone over traditional notation include a reduction in the number of lines (these occur only at intervals of an octave), a general saving of space, the eradication of tricky (for micros) note beaming, the ease with which multiple parts can be indicated on one stave, and the potential of turning the notation into a simple

The Gentle Art of Transcription

shorthand that could be used as the basis of a QWERTY keyboard MCL. And for greater visual effect, colour could be used to differentiate parts further. There are problems, too, but the beauty of Equitone is that it retains the same space and time axes of traditional notation. In fact, as the above example shows, if anything it makes them clearer. The fact that the traditional head-and-tail notation of duration is abandoned in favour of the horizontal position between beats and bar-lines, and that pitches are derived from their vertical position between octave lines, is surely a further point in its favour if, like me, you view the restrictions of conventional notation with some frustration.

Well, that's something of a personal hobby-horse, and you'll not be surprised to know that an Equitone MCL is something that's processing away in the cavernous recesses of my mind for a future issue, but for the more conceivable present, it looks as if we'll be obliged to tag along with the principles of conventional stave notation if we want to peruse all that makes a complex piece of music tick. And even supposing that we did have megabyte graphics displays readily available, or an ideal sort of alternative musical graphics, you'd still lose out on that useful manuscript paper feature of being able to flick from one page to another, compare parts, and generally inwardly digest what's going on over a long time-span. Of course, word processor users get accustomed to scrolling through text to check paragraphs and the overall feel of a piece, but you're still basically reliant on good, old-fashioned hard copy for the proof of the pudding. Plus, if we're being honest about it, there's something rather satisfying about seeing the fruits of your hard labour in the form of a printout. Text stored on a disk just doesn't seem the same.

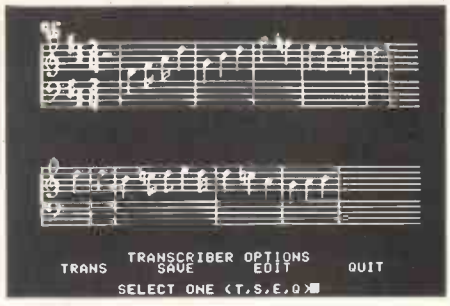
The point about printing out musical graphics is that the formatting of the printed page can include several screens' worth of staves, and if you've access to an X-Y plotter like the Roland DXY-100 or one of the up-market Hewlett-Packard jobs, then the sky's virtually the limit as far as quality and putting on extra bits and bobs is concerned. So, it's to some sort of printout rather than a display that those wanting lots of parts with the added luxury of a healthy tangible quality are obliged to turn, and what follows is a description of some of the transcribing options available on (in the broadest sense) computer music systems as diverse as the Yamaha MP1, Soundchaser Notewriter, Syntauri Composer's Assistant, Con Brio ADS-200, Fairlight CMI, Synclavier II, and, last but far from least, Xerox Mockingbird.

Yamaha MP1

At just £480 or thereabouts, the MP1 is undoubtedly the cheapest way of getting into the transcription act, as it provides the wherewithal for turning a keyboard performance into monophonic printed lines of music complete with chord names, bar numbers, and so on. In fact, it's the sort of thing that's ideal for the songwriter who wants a hard copy version of his tunes, and there's also plenty of space on the print-out for writing in lyrics, expletives, and so on. The printer itself is an ingenious device that's really an X-Y plotter in miniature, and it's this fact that accounts for the very high quality of the printout – much better than with any dot-matrix printer. The main limitation to what the MP1 can do is the 2.25" wide paper roll, but an all-out pasting-up operation can help to get around this in part. That doesn't mean to say that "full orchestral scores can be produced with the ease of using an electric typewriter", as Yamaha's advertising copy so blithely puts it!

Like all good and obedient machines, the MP1 provides the options of transcription in both real- and step-time. If you go for the former, it's also possible to select timing assistance in the form of a whole gamut of auto-accompaniment features (which may or may not be to your fancy). As we'll see with the Synclavier and Notewriter, one problem with real-time transcription is making sure that your notion of accurate timing coincides with that of the micro's quartz crystal when it's doing the job of analysing your efforts. The MP1 takes this human limitation into account by providing a 'sensitivity' button that quantises your notes to the nearest beat and does a fair job of making a silk purse out of a sow's ear.

MusicSystem digital synthesis hardware, and the inevitable Apple II. In principle, it looks impressive: a real-time music transcriber with

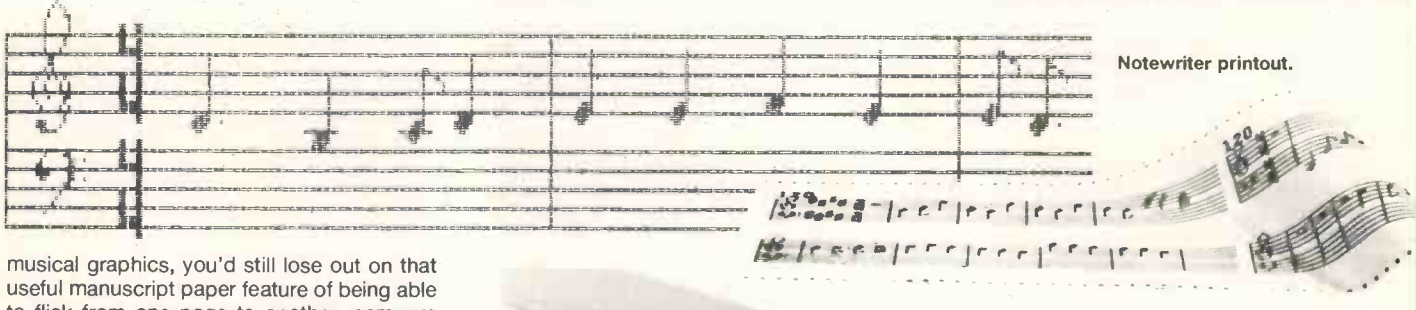


Notewriter screen display.

notes played on the keyboard (almost) simultaneously appearing in conventional music notation on the screen.

In practice, life isn't so kind, and the main problems lie with the eagerness of the micro to register the user's timing discrepancies and the slowness of the editing side of the program. The point is that to enter notes in real-time, you're obliged to play them against a metronome which, as a bleep from the Apple's speaker, is rather less than forceful. Still, with more practice, it is possible to optimise your interaction so that you and the micro roughly agree on the essential matters of your performance. But it'd take an extremely metronomic, not to say boring, individual who'd manage to play a long lead or bass line without making a balls-up somewhere along the line, so use of the editing facilities is virtually inevitable.

In fact, the real-time side of the program is utterly flummoxed by triplets and fast runs of notes, and the editor is the only way of getting



Notewriter printout.

The Yamaha MP1 printer.

Soundchaser Notewriter

The Notewriter is a $99 program that's designed to be used in conjunction with the Soundchaser keyboard, Mountain Computer

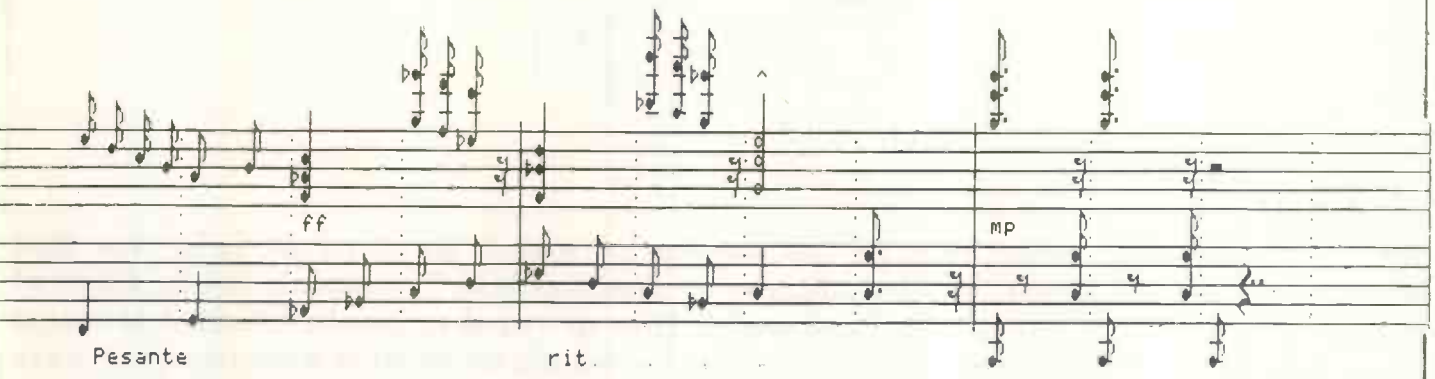
those inserted into the score. It's unfortunate, then, that the Notewriter's editor is so difficult to use. If this was a nice, helpful step-time editor, then everything would be rosy, but, as it happens, even the simplest changes to notes involve learning a command syntax that

makes Wordstar look positively Samaritan-like. Still, perseverance pays off, and the printout isn't at all bad, even if it is monophonic and lacking in a certain calligraphic finesse.

What must be borne in mind is that the Notewriter program has the *potential* to do much better. In fact, a number of improvements have been (or are being) introduced, including pre-selectable transcribing accuracy to get over the problem of the performer occasionally jumping the beat (or the micro getting ahead of itself, if that makes you happier . . .) and the option of converting Notewriter files into the format that's required by the four-track performance software. The Soundchaser people are also working on a software package called Polywriter, which should provide some pretty sophisticated polyphonic transcribing features, but, of course, that remains to be seen. . . .

Syntauri Composer's Assistant

Syntauri's transcribing program for their Apple-based system costs a good deal more than Notewriter ($295 at the last count), and it's also very much a non-real-time approach to musical transcription. In fact, the way the program works is by first analysing the multitrack note files generated and stored on disk from previous real-time keyboard performances with their Metatrak software, and then creating further files on a second disk-drive that represent the program's graphical interpretation of the notes. These can then either be displayed on screen and edited, or printed out on something like an Epson MX80 printer.



Composer's Assistant printout.

The program is really quite flexible. For instance, you can select which of the 16 Metatrak tracks you want transcribed, tailor the score analysis to your own brand of playing accuracy, and add text for the sake of dynamics, lyrics, chords, and so on. However, there are limitations: first, the display can only cope with a couple of bars at a time; second, the program eschews beaming (the joining of notes into groups) in favour of all note tails heading in the same direction (upwards); third, the analysis can only cope with 1000-note segments, so you're obliged to segmentise your compositions; and fourth, all the analysed parts end up compressed onto just two staves.

But, on the plus side, both the display and printout have a nice clean quality, which, if not 100% ideally suited to performing from, is certainly adequate for copyright purposes and less involved arranging.

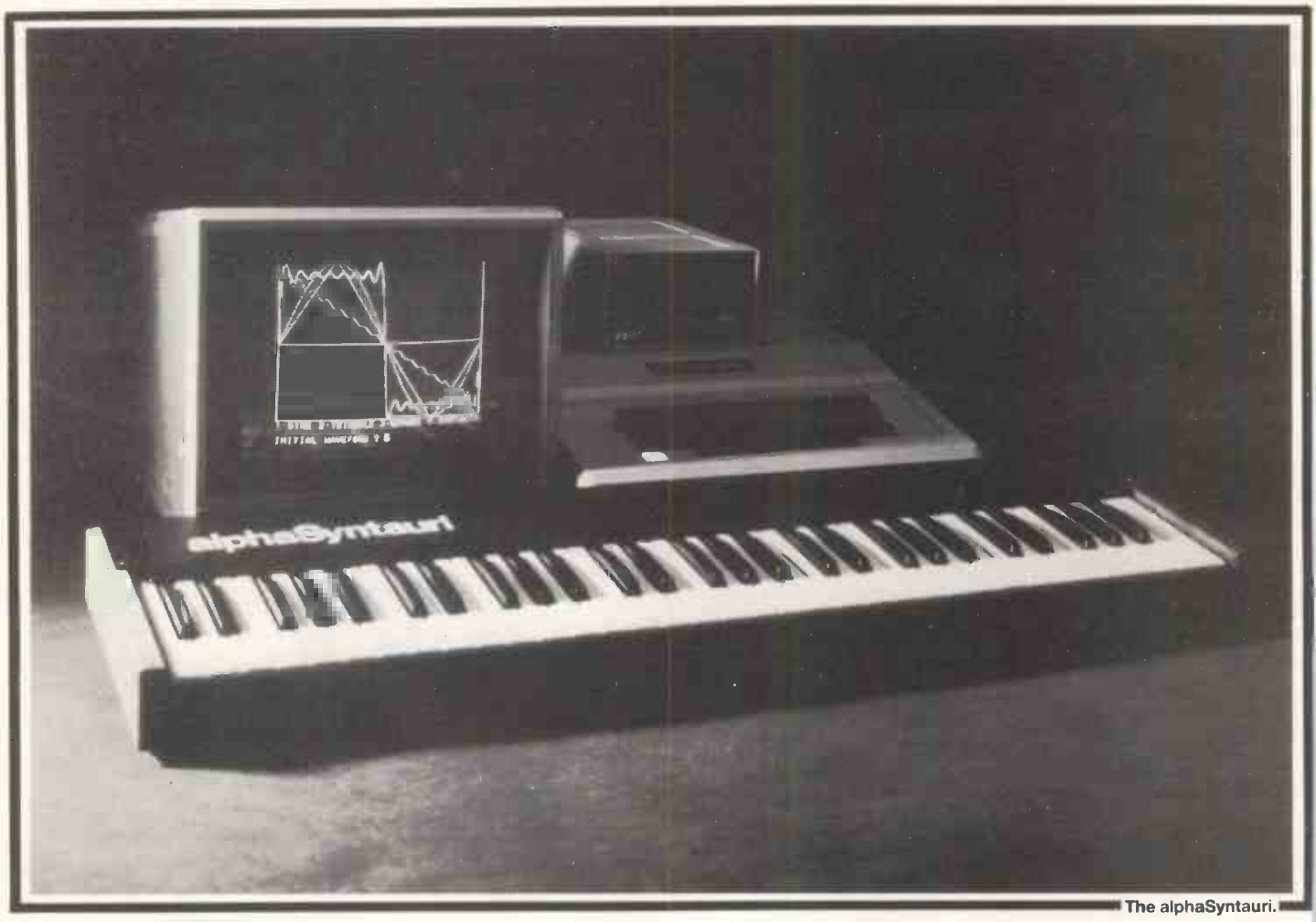
The overall impression I've gained from using Composer's Assistant is that it's more concerned with strutting its stuff than actually being a helpful amanuensis (*secretary!*). Bearing in mind that the Metatrak software offers only real-time note entry, it's sad that Composer's Assistant doesn't provide the wherewithal for editing out duff notes and conversion of the analysed and corrected note files back to the format required for performance by Metatrak. That's what I'd like to see my assistant doing anyway. . . .

Next month, from Fairlights to Mockingbirds.

David Ellis **CM**

The Ins and Outs of Digital Design

As the next few months will be seeing a good deal of activity on the practical design front, in the shape of the *E&MM* Programmable Digital Sound Generator, David Ellis **lays out a few ground rules in Digital Design by taking a look at some of the cogs and wheels of digital sound synthesis – time-multiplexing and filtering. And, to put things in a thoroughly practical perspective, he's also included the circuit for an ultra-sharp low-pass filter for improving the synthetic lot of the Mountain Computer MusicSystem digital hardware, known and loved (?) by all owners of alphaSyntauris and Soundchasers. . . .**



The alphaSyntauri.

There's a touch of delicious irony in the fact that the mainstay of analogue synthesis, the low-pass filter, is a major bone of contention in the digital field. Everywhere you look, you read about the magical role of these objects for such neo-mystical operations as 'anti-aliasing', 'waveform smoothing', and the like. Whether it's a cheap and cheerful Casio for a few tens of green ones or a Fairlight at three orders of magnitude more, the ultimate proof of the pudding is down to what the inevitable low-pass filter on the output of one or more digital-to-analogue converters feels like passing on to the outside world. And one commercial product which particularly shows up this fact is the 16-channel MusicSystem hardware from Mountain Computer, the synthetic *raison d'etre* of both the alphaSyntauri and Soundchaser systems.

Time-sharing Sounds

The way the hardware works is by employing 16 'digital oscillators' to part with waveforms over a wide range of frequencies and amplitudes as a result of relevant values received from the host micro (an Apple II, as it happens). Nothing startling in that. But the main claim to fame of this hardware lies with the fact that

the programmability of these digital oscillators also extends to the timbre of waveforms being spewed out at nineteen-to-the-dozen. This is the result of some circuitry on the boards that periodically flips the switch so that the right waveform samples are yanked out of relevant locations in the host micro's memory and then sent directly to the digital oscillators – a very trendy technique called, not surprisingly, Direct Memory Access.

Now, if you've got some hardware in front of you that waves the magic wand of 16 digital oscillators, it shouldn't take much more than a modicum of intelligence to surmise that each of those digital oscillators probably has one DAC that's turning waveform samples into analogue sound, and a second DAC that's performing the amplitude control. Tried and tested techniques, after all. . . . In fact, you'd be wrong. Those so-called digital oscillators don't quite exist in reality; they're actually much more philosophical in nature. The term the designers use to describe them is 'conceptual', meaning that they're almost there but not quite.

The truth of the matter is that there's actually just a single extremely hard-working DAC receiving waveform samples in turn for all 16 of the 'digital oscillators' – a new and highly mystical experience for digital synthesis called time-multiplexing. This is a bit like the equally new but highly unmystical time-sharing scheme for owning and using holiday villas. The idea is that, rather than each sample of the holiday-going population buying one villa and going there for the same two weeks out of the year, 26 families split the purchase and then agree to use the villa for two weeks in turn. The hassle with this is that you've got to get everyone around the table to agree to a particular part of the yearly cycle. And, in fact, that timing requirement is as much the problem of time-multiplexing lots of sound channels through a single DAC as it is for time-sharing lots of holidays in a single villa.

The really nice thing about time-multiplexing is that it's so much cheaper to have just one DAC split umpteen ways. But, once out of the DAC, the cobbled together channels then have to be de-multiplexed with sample & holds and switching in order to restore some semblance of individuality to the stereo outputs. The point is that the last thing you want is an outbreak of rampant wife/husband-swapping amongst out-of-sync time-sharers, and the equivalent problem of cross-talk with time-multiplexing has to be watched out for.

Anyhow, minor problems aside, time-multiplexing now seems to be the most popular method of getting multiple output channels in mid-cost equipment, and is equally applicable to keyboard instruments like the Synergy (which uses 32-way time-multiplexed hardware originally developed at Bell Telephone Labs.) and digital drum machines like the Drumulator and MXR Drum Computer (both of which use a single DAC that's fed samples in turn from all the different sound EPROMs). It's also the technique behind the operation of the Programmable Digital Sound Generator project that we'll be commencing next month.

Now, in the case of both MusicSystem and Synergy hardware, the rate at which any particular waveform is sampled for one channel is around 31.2kHz. This means that the highest theoretical frequency that can be sampled and reconstituted is half that figure, ie. 15.6kHz, the so-called Nyquist limit. But note that tag 'theoretical'. In practice, digital synthesis is rarely quite as wonderful as the theory.

A necessary evil of putting waveform samples through a DAC at a particular sample rate is that the samples and the sampling rate tend to enjoy interfering with each other – a fact of digital audio life called 'aliasing'. In fact, if you try to sample and convert a waveform with a particular set of harmonic components, you'll discover that these will then generate a whole mass (not to say mess) of beat frequencies with the fixed sample rate. So, taking the above 31.2kHz sample rate, a sinewave regurgitated at a frequency of 14.5kHz would lead to a beat frequency of 16.7kHz (31.2–14.5). As this extra component lies within the hearing range of most young ears, and a few olduns as well, nobody's going to be too delighted listening to the raw 14.5kHz sinewave complete with the added beat frequency complications.

Low-Pass Filtering

So, by hook or by crook, something has got to be done about removing all those frequencies that come above the maximum synthesisable frequency, and that's where the low-pass filter comes into play. However, the higher the frequency you're synthesising, the nearer the beat frequencies will be to the actual frequency you're trying to synthesise, and in the end you're in danger of throwing away the baby with the bathwater. The sorry truth of the matter is that low-pass filters aren't usually capable of chopping out all you don't want without encroaching into the area you do want. In short, filters don't come sharp enough.

On this basis, the low-pass filters on the outputs of the MusicSystem are really pretty blunt, and tend to cut off high-frequencies with unduly wild abandon. For this reason, a major improvement to the performance of the system can be had by replacing them with some external filtering circuitry. In fact, when I was trying to work out the correlation between measured frequencies and written frequency bytes (by writing values to the relevant frequency registers on the boards and putting the output into a Digital Frequency Meter) it transpired that once I went above a 10kHz sinewave, there wasn't enough amplitude left in the signal even to trigger the DFM into making a reading! That's generous low-pass filtering for you. . . .

So, for this reason, it seems entirely reasonable to search for an alternative to the low-pass filters used by the MusicSystem, and, of course, the outcome of this search might be valuable to anyone else contemplating the construction or use of digital synthesis hardware where optimisation of frequency response is an important consideration. Now, anyone who's read Hal Chamberlin's *Musical Applications of Micro-processors* will have come across a chapter that includes a whole chunk on the ins and outs of filtering, and they might even have attempted to work out all the component values for one of the ultra-sharp Chebyshev-type filters using seven or more stages. Not the easiest going of subjects, is it? Well, the circuit described below takes the easy way out by employing one of the new breed of switched-capacitor filter chips based on bucket-brigade technology, the R5609 from Reticon. The remarkable thing about this chip is that it achieves a filter slope of at least 100 dB/octave.

Construction & Workings

The de-multiplexed analogue signals (left and right) go from an MC14018 chip on the digital side of Board 1 of the MusicSystem to the four dual op-amps, configured as two low-pass filters, inside the ground plane on the same board. The point of the current exercise is to sidetrack these signals away from the evil grabbings of the resident filters, and take them to pastures new in the shape of the R5609 ultra-filters. A convenient place to extract the pre-filter analogue signals is from pin 5 of U2 and U4. At the same time, the positive and negative power rails and ground can be tapped off, and the whole lot cabled together for sending off to the external filter circuitry.

Aside from the operation of the R5609 chip itself, the filter circuit is totally uneventful. As the R5609 can handle an input of 12 volts peak-to-peak, a buffer stage (IC1a and IC2a) suitably conditions the signal emerging from the Music System. The 10K pot varies the rate of oscillation of the 4047 (IC3) so as to provide a variable clock for the R5609s. Since there's a 1:100 ratio between the cut-off frequency and clock rate, this pot determines the filter cut-off. Altering C1 above or below the recommended 22pF value varies the range over which the filter operates.

The prototype of the circuit was put together on a small piece of Veroboard, which is a fair way of going about it since there aren't too many components involved However, watch out for that clock getting onto the signal lines! The R5609 spec sheet is fairly insistent that the positive and negative rails shouldn't go above 10 volts. In fact, the power rails going to the filter op-amps on the MusicSystem board are at + and – 8 volts (pins 8 and 4, respectively), which suits both the switched-capacitor filter chips and op-amps to a tee. Only one side of the filter is shown, so for two channels, a further couple of op-amps and a second R5609 will be required. Note, however, that both R5609s are clocked from the same 4047 clock.

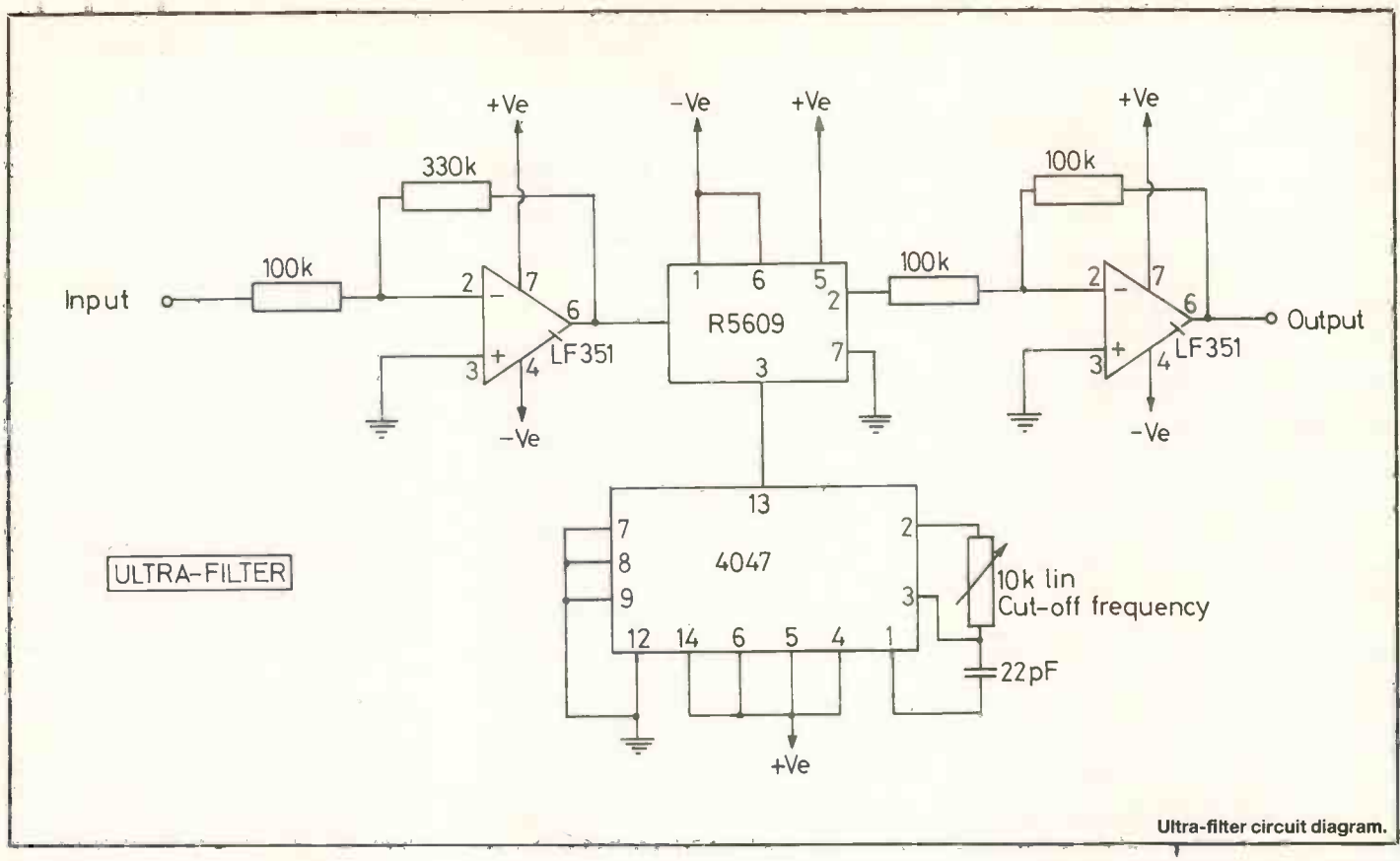
One annoying drawback of adding a further clock to the system means that beat frequencies are also generated between the sample rate that's directing samples to the bucket-brigade stages of the R5609 and the sampling rate of the MusicSystem boards. The Reticon application note casually suggests that you can put a further low-pass filter on the output of the R5609 to get around this sort of problem. . . . The manner in which these new beat frequencies are manifested is as a high-pitched whistle that varies in pitch as the clock-rate pot is twiddled. However, this is only really troublesome when the cut-off is set really low, and in practice, once you've adjusted the clock-rate so that the filters are just biting audibly into the extreme top frequencies, the problem vanishes. Another possible clocking arrangement would be to use the 7MHz 7M clock of the Apple, divide this down twice to 1.75MHz, and then use this to drive the R5609s. This would give a fixed cut-off frequency of 17.5kHz, which, though somewhat higher than the Nyquist limit, doesn't actually seem to lead to any noticeable increase in aliasings, clock whistles, or other disasters.

The R5609 is difficult to get hold of at the best of times, and it's also rather expensive (approx. £27 as a 1-off in 1983), so it's probably best to go direct to the horse's mouth, EG&G Reticon, Seymour House, The Courtyard, Denmark Street, Wokingham, Berks RG11 2DR (tel: 0734-788666). EG&G Reticon can also provide a data sheet on the R5609 which'll help to fill in the gaps about the operation of these interesting chips.

Psychoacoustics

In fact, the filtering story is a good deal more complicated than merely a question of sharpness. For instance, there's evidence that very sharp filters might lead to unpleasant psychoacoustic phenomena. The argument goes something like this. The brain expects a continuum of frequencies over the audible (and possibly sub-and super-audible) spectrum. If some fool comes along and plants a whacking great filter slope reminiscent of a Sarajevo slalom run right in the middle of this, the brain's inclined to wonder what the Hell has happened and feels pretty miffed as a consequence.

So, if in the design stage it's a question of either using very sharp and expensive filters at a lower sampling-rate (around 32kHz, for instance), or less sharp filters at a higher sampling-rate (in excess of 50kHz, to play safe) the latter seems to be the best bet.



Ultra-filter circuit diagram.

Another point to bear in mind is that a high sampling-rate means that high harmonics can be outputted with ease, whereas a low sampling-rate is always going to mean some sort of compromise when playing high notes with lots of high harmonics (though you've always got the option of just putting up with the aliasings).

To complicate matters further, filters have a habit of adding their own whims and fancies to whatever's being passed through them because of their inherent transient response. For instance, the Sony standard for Compact Disc samples sound data at the rate of 44.1kHz and then passes the DAC output through a sharp low-pass filter. But because this is a fairly high sample-rate, the main requirement of the filter is to avoid burning out tweeters, leading bias oscillators astray, and generally rodgering the direction-finding capability of your friendly neighbourhood bat population. Even so, hi-fi pundits are complaining that the Sony Compact Disc low-pass filtering introduces phase distortion in the high register, a point that may add credence to the much-voiced opinion that the Compact Disc is tiring to listen to.

Digital Hazards

A classic demonstration aimed at convincing an audience of computer musicians that digital audio was positively injurious to one's health was perpetuated last year at a Stateside symposium. A group of people were made to stand on stage and listen to classical music on Compact Disc over headphones. It is reported that 'a significant number of the group developed involuntary repetitive motor activity after a short period of listening', and it was claimed this was entirely due to the insidious effect of digital audio on the brain. Hmmm. So where was the control group, then?

To be honest, though, I'm not entirely unswayed by this criticism of digital audio, and a case in point is an experience I had with the Synclavier. The Synclavier has the simplest of all low-pass filters on its output (just a capacitor to ground), so it's tempting to remove this and see what effect it has on the sound. In fact, performing that capacitotomy doesn't result in a vast difference to the perceived sound quality (hardly surprising since it uses a 50kHz sample-rate), but it didn't take long before I started to feel distinctly uncomfortable – something like having my head in an invisible vice.

Now, it's obviously going OTT to label digital sound as a potential bio-hazard, but there is just a chance that very high frequencies may have some sort of subliminal effect on the brain without actually being perceived as sound. And if that's ever shown to be the case, the humble low-pass filter is going to be a jolly useful chap to have on your side!

David Ellis **CM**

Sony's CDP-101 Compact Disc player.

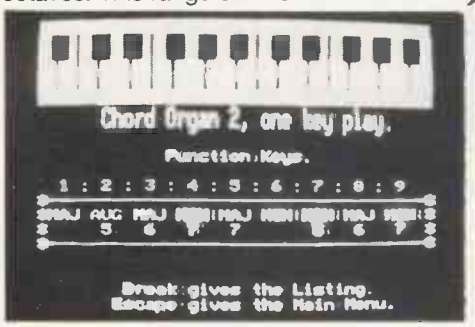
Softly, Softly

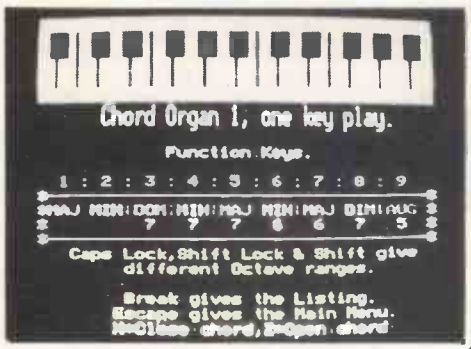
Musicsoft produce a number of different software packages for the BBC micro and Trevor Jones **has been putting one of them – *Keyboards* – under the CM microscope.**

If you fancy tinkling the ivories but can't quite afford a baby grand, Musicsoft have an alternative in the form of their *Keyboards* program for the BBC Model 'B' microcomputer. Keyboards is an apt name since the cassette contains not one but five separate programs, each of which works independently and can therefore be considered a separate entity.

The tape arrived in the usual standard cassette packaging, with the instructions and a brief explanation of the programs contained in a small sheet of printed notes. The programs are selected from a menu which is displayed on the monitor screen along with some more detailed user instructions.

The first program is a simple real-time three-voice organ in which keys *Q* to *up cursor* on the BBC's keyboard are used for one note each, giving a range of two octaves. This range can however be extended by the *shift*, *shift lock*, and *caps lock* keys. In general the keyboard worked satisfactorily although I was able to produce notes using keys other than those prescribed in the instructions.



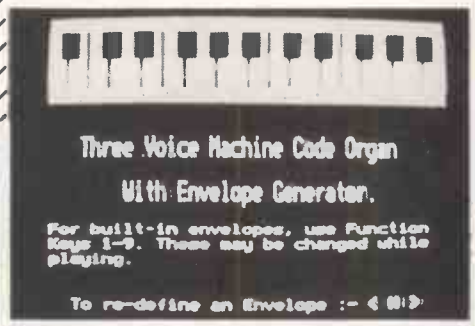


Program two is essentially the same as the first, though it differs slightly in being partly written in machine-code. The program also incorporates a pitch-bend facility, activated by use of the inequality keys. This function worked really well, a wide range of bend being possible, though on the debit side, it could perhaps have been a little slower in its operation.

Mini-Synthesiser

All the remaining keyboards are an extension of this machine-code organ. Third in the suite of five is a three-voice organ that substitutes an envelope definer for the pitch-bend. In some respects this program resembles a mini-synthesiser, since the Function keys *F1* to *F8* represent pre-programmed envelope settings. Intelligent use of these keys can produce various effects, among them delayed vibrato, percussive sounds, echo, and a sort of piano-xylophone hybrid. Different envelopes can be freely selected while you're playing, so you can change from one sound to another very quickly and easily.

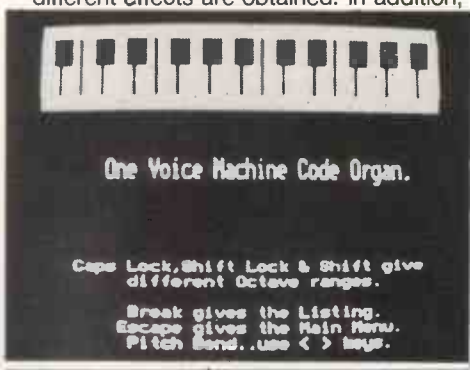
In addition, if the pre-programmed sounds are not to your liking, envelope parameters can be altered by following the instructions on the screen. Changing

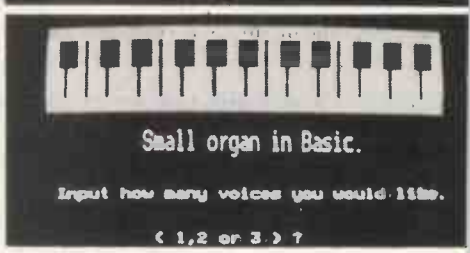


to the new sound is accomplished simply by depressing the BBC's space bar. Some weird and wonderful effects can be obtained in this mode; with the lowest octave selected, it's possible to make the sounds issuing forth from the BBC's built-in speaker bear more than a passing resemblance to those of an outboard motor running on low-octane grade fuel. . . .

The final two programs are two variations on the chord organ theme. These operate on the 'One Finger Chord' principle, so that instead of pressing three keys to form a triad, each key pressed sounds three notes simultaneously. The relationship between these notes, and therefore the type of chord produced, is decided by the eight Function keys. Major and minor triads, dominant sevenths, and augmented fifths are among the chords available. The second of the two chord organ variants allows various inversions of these shapes to be played. Both the programs performed as per specification, though again it proved quite possible in practice to sound chords using keys other than those officially prescribed in the instructions.

One feature common to all the programs is that their author has made every effort to make them as readable as possible, and has included within the menu an option to list the programs so that the user can gain some insight into how the different effects are obtained. In addition,





the programs incorporate plenty of REM statements which could be a great help in understanding how the programs work. The author even goes as far as to encourage the user to incorporate any of the routines in his own program(s) if he so wishes, and this sort of thing can only improve the exchange of information and techniques.

Conclusion

The five programs offered on this cassette enable the purchaser to see (and more important, to hear) exactly what the sound chip of the BBC 'B' is capable of doing. The programs on offer are not exactly revolutionary, but they can act as an aid in the learning process as well as providing entertainment in their own right. They are also relatively straightforward to use.

Quite a bit can be gleaned simply from studying the program listings, and this fact alone should make the cost of purchase worthwhile, though I do wish the author had found some method of disabling those keys not used by a particular program. It's also probably true to say that the graphics leave room for considerable improvement, but these points aside, I'd say the package is well worth a listen.

Trevor Jones **CM**

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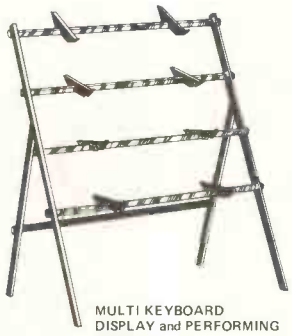

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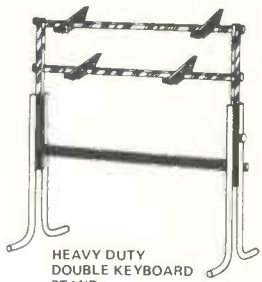

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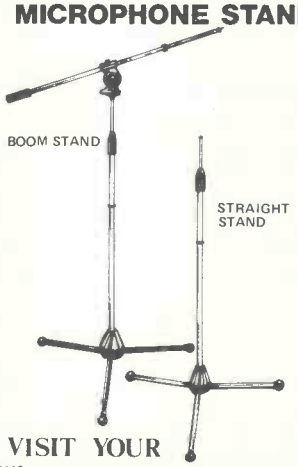

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Not to put too fine a point on it, I think this machine is a real winner. It is comparable in price to the Drumulator and Oberheim but with a wider range of instruments. In kit form it represents very good value for money, and anybody competent at fine soldering would be capable of constructing one in under 24 hours.'
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The Syndrom

Part 1 How it Works

Sampled drums have become so much the norm these days – a syndrom (e) of modern music, you might say – we felt it was about time we devoted an E&MM project to this area of musical technology. Because this technology is relatively new, a lot of it is priced well beyond the reach of the average modern musician, yet the Syndrom can be built for only the fraction of the cost of ready-built units. Design and presentation by Ken Pykett, Clive Buxton, **and** David Ellis.

Rather than presenting an entire digital drum machine project, where a dedicated processor is used to goad digitised sounds into action, we've elected to go for a more modular approach consisting of individual drum boards with pre-programmed sound EPROMs. And since each board will cost just £10 to put together, plus £5 or £6 for a pre-programmed 2716 or 2732 sound EPROM, there's very little financial outlay involved in starting the project.

In fact, the board is just about as basic as you can get, including as it does a clock, a set of counters, some triggering circuitry, the all-important EPROM, and a DAC and buffer to turn all the theory into acoustic reality. Definitely a no-frills or fancies approach!

We did think about adding a further counter to increase the address range to cover the use of a 2764 (8K) EPROM, but decided against this because of pin connection differences between this and 2716/32 EPROMs, and the fact that cymbal-type sounds really need considerably more than 8K to do them justice. We may well produce a further design specifically for longer sounds, however, in the not-too-distant future.

The point to bear in mind about the Syndrom is that it can be used in a host of different ways, and over the next few months we'll be looking at some of the following possibilities:

1 A means of adding on new percussion sounds to any drum machine.

2 A micro-interfaceable drum module.

3 A monophonic sampled voice for keyboard control.

4 A sound-effect foot pedal.

5 A dynamic live drum sound played from pads.

6 A means of finding out what your monitor ROM actually sounds like(!)

Some of these applications will require modifications (for CV control, for instance) and retro-fits (to enable dynamic pad playing) to the basic unit, and we'll be following these up as and when necessary.

A	B	C
0	0	1
1	0	1
0	1	1
1	1	0

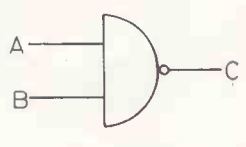

Figure 1. NAND-gate truth table.

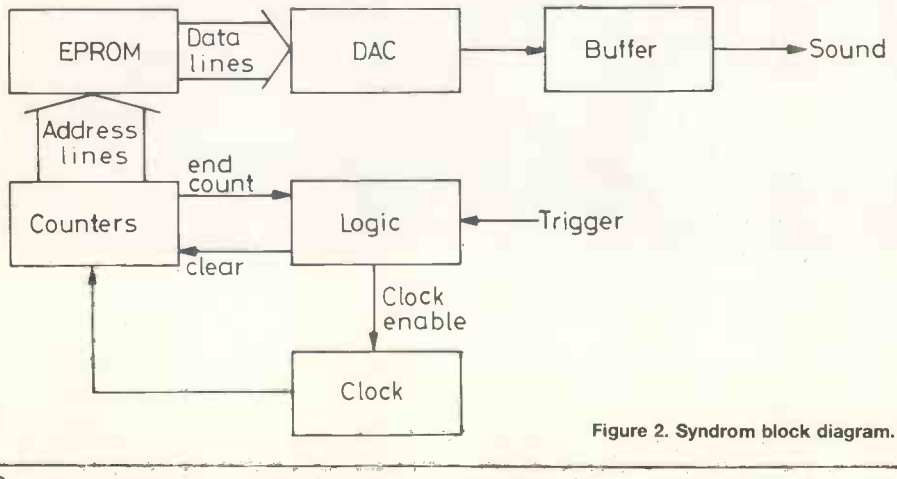

Figure 2. Syndrom block diagram.

Circuit Description

The first stage of the regurgitation process (block diagram shown in Figure 1) to consider is what happens when a trigger pulse is received by the board. At this point of the game, everything centres around the logic – four NAND gates, in fact – encapsulated in IC2. To understand what's going on, logic-wise, have a look at Figure 1. This 'truth table' lays out what happens to the output when certain things are going on input-wise.

To start the proceedings, the trigger pulse passes through the first NAND gate (IC2c), actually used like a Schmitt trigger inverter, and is then presented to the 'clear' inputs on the three 74LS163 4-bit counters (IC3,4,5) in order to clear the board as far as counting is concerned. At the same time, the output from IC2c causes the 555 clock (IC1) to charge its timing capacitor (C1).

Then, providing the trigger pulse is greater than the charge period (approximately 150us), the clear condition will be implemented by the rising clock pulse. If it isn't long enough, the pulse will be

regarded as noise and won't start the count. Once the counters are cleared, the appropriate Q output or terminal count (depending on which type of EPROM is being used) from the last counter will fall, and the clock enable input on the 555 will be held whilst the clock is putting the counters through their cycling routine. If

(A0-A10) are involved and Q3 of the third counter (IC5) goes to reset the triggering circuitry. If a 2732 EPROM is used, the Q3 line of IC5 goes to A11 (pin 21), and the terminal count output of IC5 goes to IC2a. To simplify these alternative matters, it's easiest if you add a switch (SW1) as shown in the circuit diagram, but, if only

board with a couple of PP3s), the output swing is rated at up to 20volts peak-to-peak, which makes for an extremely dynamic sound, and, what's more, the chip is less than half the price of the ZN425. R2 is provided to allow the user to vary the clock rate (and therefore the sample length/pitch of the digitised sound)

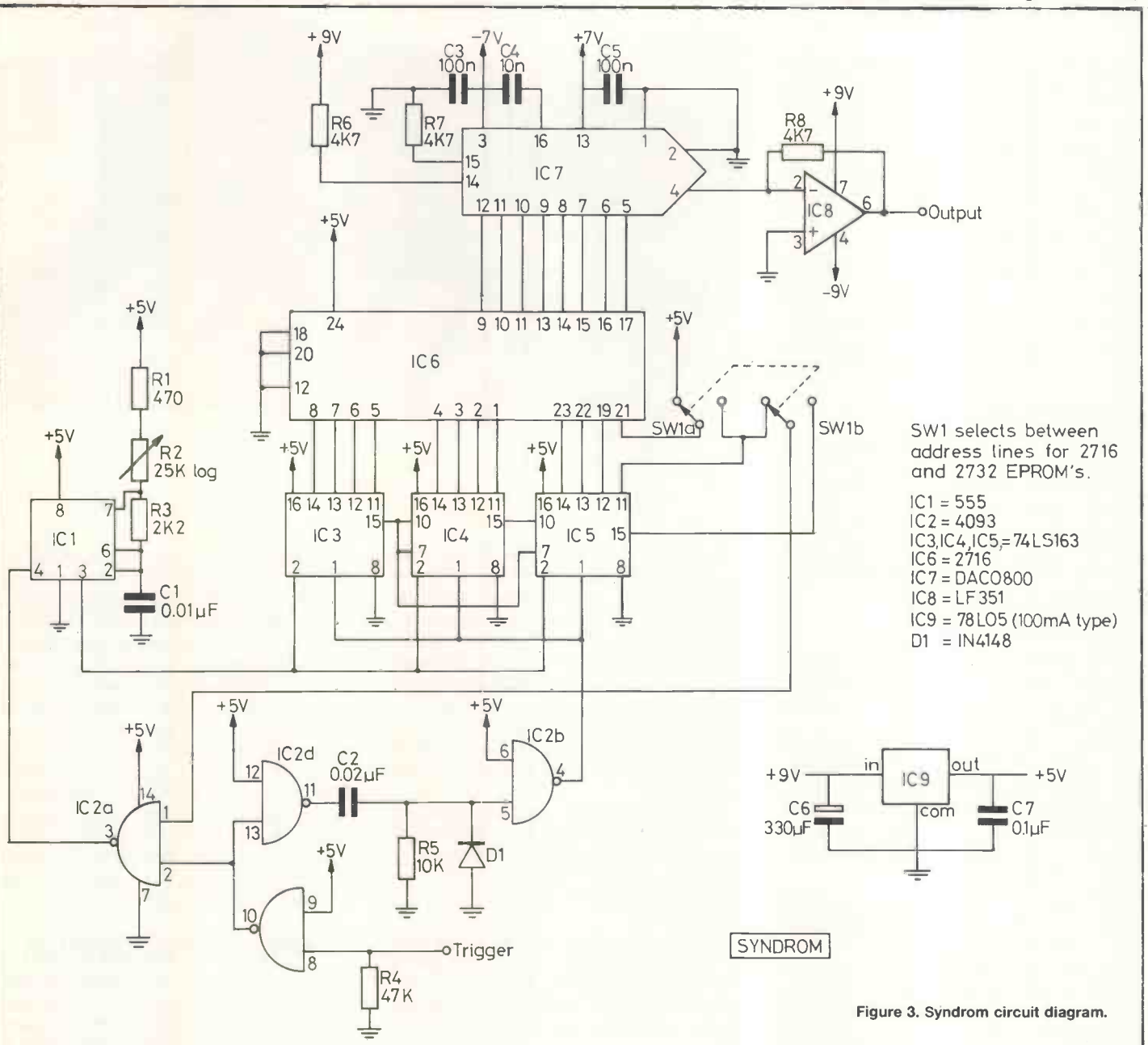

Figure 3. Syndrom circuit diagram.

the trigger input remains high, the counters will cycle continuously, thereby giving a roll effect to the sampled sound.

Alternatively, the method of triggering can be altered so that the count is initiated on the falling edge of a square wave by short-circuiting C2. The basic circuit therefore allows triggering from both positive- and negative-going trigger sources, and is also suitable for direct TTL-triggering from a micro. At the same time, if the trigger pulse is repeated before the entire sample has been used, the trigger signal is differentiated by C2, R5, and D1, with the result that the counters are cleared and the sampling output re-started, which is necessary if you're after the effect of a drum undergoing rapid paradiddles.

Sounds are supplied pre-digitised in 2716 (2K) or 2732 (4K) EPROMs. In the case of the former, only 11 address lines

one sort of EPROM is likely to be used, the switch can be replaced with links. Note, however, that using a switch also allows the contents of a 2732 to be played only as far as the first 4K, ie. halving the sample duration, a facility that may be useful in certain situations – especially when playing samples at a lower than normal pitch.

The EPROM is clocked by using binary synchronous counters configured to count up to a desired maximum according to whatever EPROMs are currently in vogue. The original circuit used a ZN425E DAC as the digital-to-analogue converter because of its blissfully untroublesome power requirements (single-rail, 4.5 to 5.5volts). However, even though the final choice of the DAC0800 makes life complicated by requiring bi-polar supplies (though this is easily achieved for a single

over a range of widely variable usefulness.

One circuit fact that needs a word of explanation is the present lack of any low-pass output filter. To be honest, trial and error has given us the impression that with short, sharp sounds like those from the percussive stable, the ear's so stunned by their dynamism that it couldn't give a hoot about what else is going on around the D/A converted signal in the way of clocks, grunge, and the like! On second thoughts, that sounds terribly unscientific, so we'd better say that filters will be added on later (together with dynamic control circuitry) as a retro-fit. . . .

Next month, we'll have the details of the EPROMs available for the Syndrom and how you can go about getting them. Also, a PCB should be available by then to make constructional life a little easier.

E&MM

Universal Bass Pedal Synth

Paul White **describes the design and construction of a pedalboard that'll interface easily with any one-volt-per-octave synth with CV and gate sockets. All the parts are readily available, while the PCB can be bought direct from E&MM.**

Unlike the Moog Taurus bass pedals and similar self-contained instruments, the pedalboard described in this article is designed to interface easily with any conventional 1 volt-per-octave synth, providing that CV and gate sockets are fitted. The circuit provides a control voltage and a gate pulse featuring first-note priority and multiple triggering. This is a useful system for pedals since it avoids some of the problems that may be caused by clumsy footwork and is probably more practical than the usual high-or-low-note priority systems common to most keyboards.

Interfacing

One big advantage in having a system that will interface with a variety of synths is that you can choose a model with a bass sound suitable to your needs. Another point worth noting is that with the rapidly expanding polysynth market, there are a lot of secondhand monosynths to be found at bargain prices.

Circuitry

The pedalboard switch contacts are digitally scanned by IC1, a switch encoder of the type normally used to encode computer keypads.

This IC, the 74C922, can handle up to sixteen sets of switches, but only thirteen are used in conjunction with the C-to-C pedalboard. Unlike conventional keyboard switching, only one pair of contacts is required per key, and these are wired to form a matrix. (See Figure 3.)

When a key is depressed, the four-bit binary number appears on the output of IC1, pins 14 to 17 inclusive. A 'Data Available' signal simultaneously appears on pin 12 of IC1 and this is buffered by the emitter follower formed by Q1 and R10 to provide the gate output. The 74C922 features what is known as 'two-key rollover', which simply means that the first key pressed takes priority and depressing a second key will have no further effect until the first key is released. On releasing the first key, the Data Available line goes low for a few milliseconds (the exact time being set by the debounce capacitor C8) before generating a new trigger pulse for the second key pressed.

The binary key code will remain latched until a new note is played, overcoming the problem of pitch droop when using long decay times, something many readers may have noticed on some analogue synths, especially in damp weather. Having released the key however, you are still at the mercy of the keyboard Sample and Hold circuit in your synth, so make sure that there is no undue 'droop' there.

IC2 is an 8-bit linear DAC that converts the binary key code into a proportional current, which in turn drives IC3 in order to produce the control voltage. VR1 sets the gain of IC3, and this is used to provide the correct 1 volt-per-octave relationship. VR2 provides the tuning voltage which, after being buffered by IC4, is summed into the inverting input of IC3, providing a tuning range of at least two octaves. The tuning range may be decreased by reducing the values of R8 and R9, while VR2 may be a preset or tuning pot on the back panel.

The power supply must be stabilised and Figure 1 shows a conventional split-rail power supply using two commonly available regulator ICs. Be careful with the pin connections here as the two ICs *are* different.

The circuit will work perfectly well from a half-wave supply, so if you have a transformer that needs using up, don't be afraid to depart from the design shown here – just double the values of C1 and C2.

Construction

Wire up the pedalboard switches first, referring to 2 and 3 and making sure that the eight wires are long enough to reach the PCB.

Assembly of the circuit-board is straightforward, but I would suggest inserting the PSU components first and checking this works OK before continuing. IC1 is a MOS device which means that you should avoid static electricity when handling. The manufacturers suggest not handling the pins, but have you ever tried inserting an IC without touching it? A more practical solution is to earth yourself to a cold water pipe and avoid tap-dancing on any nylon rugs. . . . Fit this IC last and then check the PCB for shorts, reversed electrolytics or backward ICs.

Finally, arrange the mains wiring so that all connections are sleeved and out of harm's way. You should also connect a wire between the metal part of the pedals and the ground point on the circuit board.

The case for the prototype was constructed from half-inch plywood and the pedalboard mounted on two blocks of wood glued to the baseboard. The important dimensions are shown in Figure 4 although a certain amount of artistic licence may be exercised. The pedalboard itself dictates most of the dimensions; just make sure that there's enough travel on the pedals to allow the switches to operate before the pedals hit the baseboard or the floor!

Testing and Calibration

Surround the unit with sandbags and switch on. Peer cautiously over the top and if there is no smoke or fire, measure the plus and minus twelve volt lines. If these are still OK, connect the gate and CV outputs to a convenient synth and press a pedal. The synth should play but the tuning will almost certainly be painfully bad at this point. Play top and bottom C alternately, and simultaneously adjust VR1 until they sound one octave apart. Next adjust VR2 until your C agrees with everybody else's and check that the octaves are still OK, tweaking VR1 again if required. If you can borrow a tuner at this stage it will make life a lot easier.

The gate output is approximately 12 volts positive going which should suit most synths. If you have a synth with an S-trigger requirement or a Transcendent 2000 which needs a negative gate pulse, substitute R10 for a reed relay and wire it as shown in Figure 6.

Well, that's the easy bit over with – now you've got to learn to play the things. . . .

Paul White **E&MM**

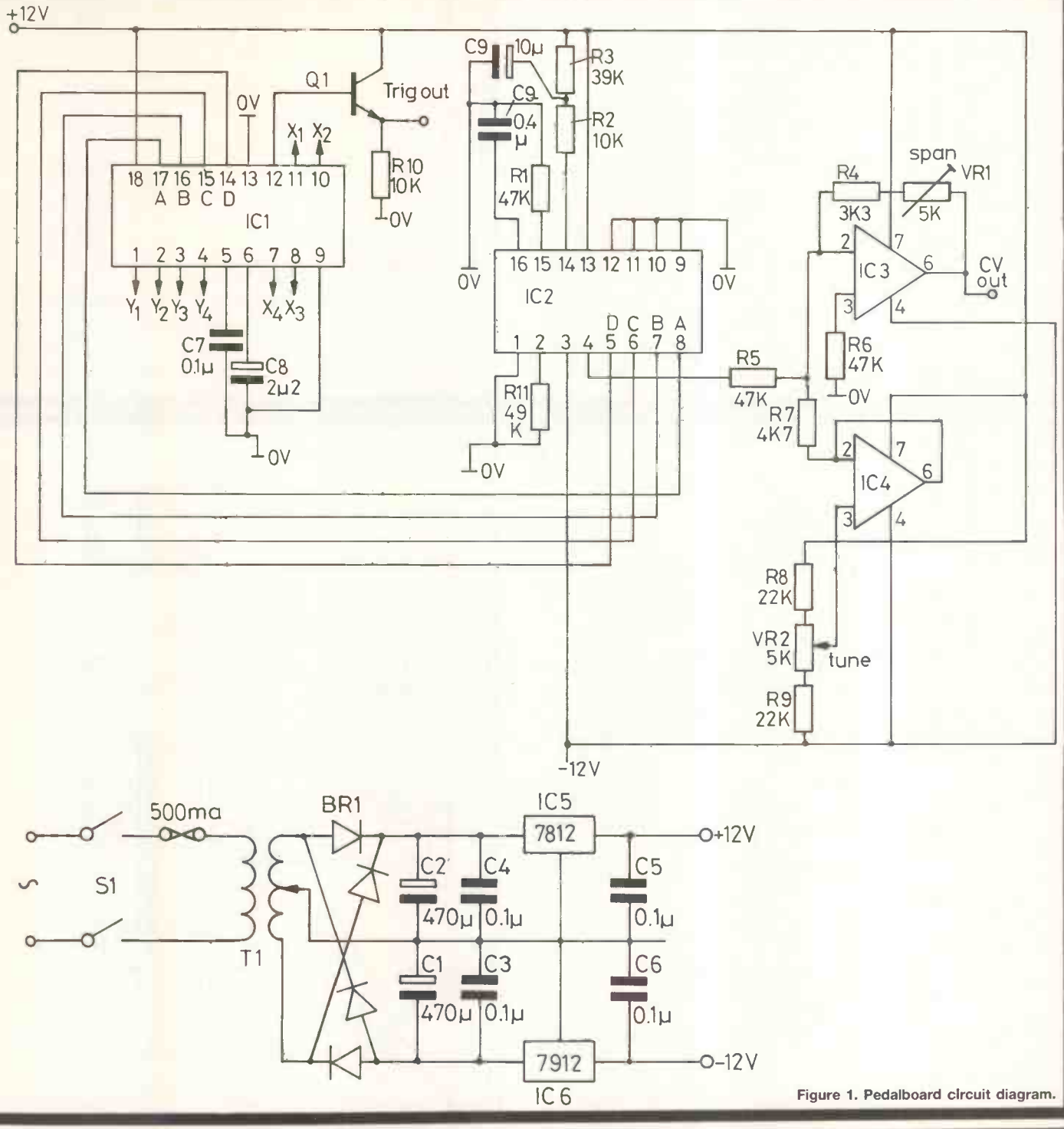

Figure 1. Pedalboard circuit diagram.

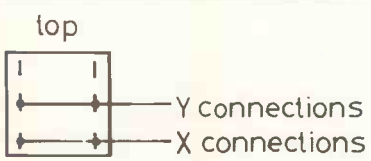

Figure 2.

Pedalboard switch contacts.

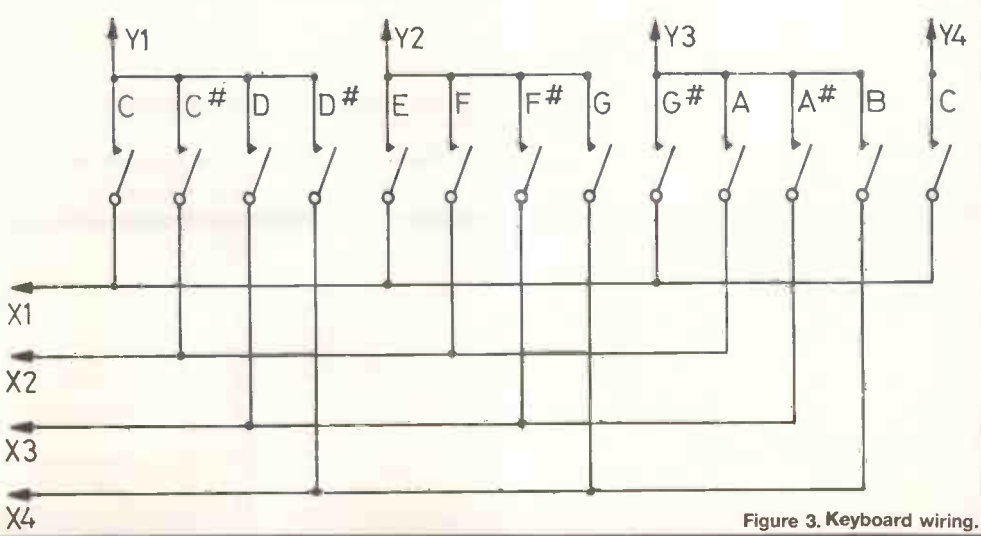

Figure 3. Keyboard wiring.

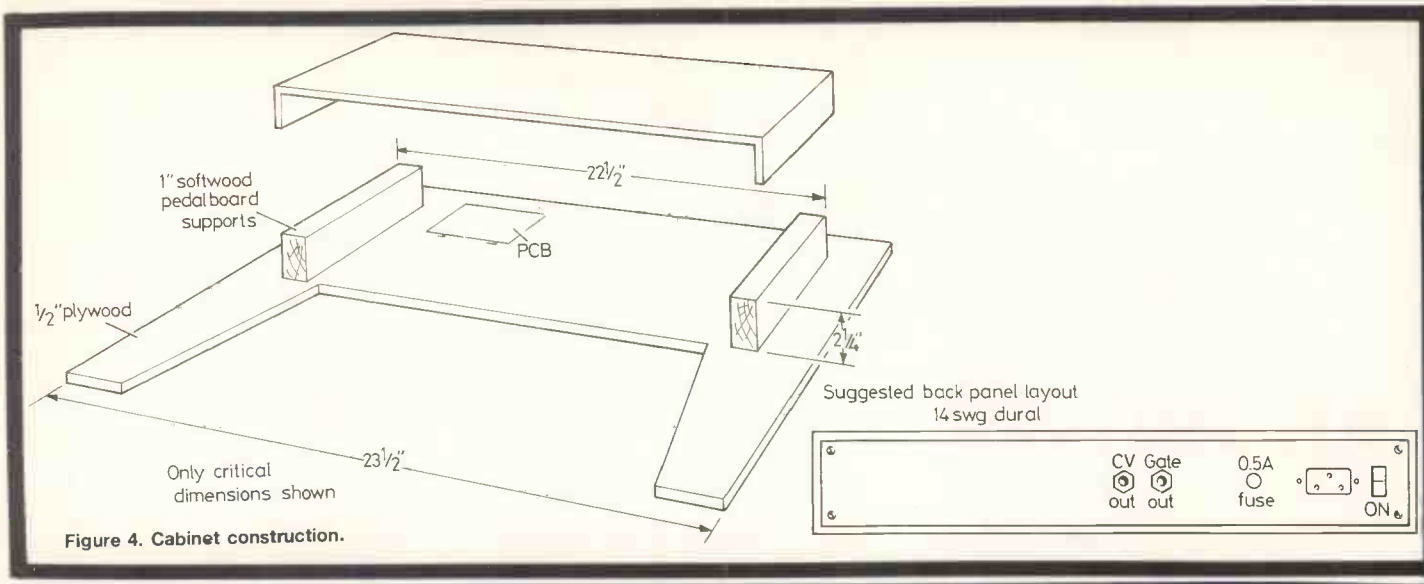

Figure 4. Cabinet construction.

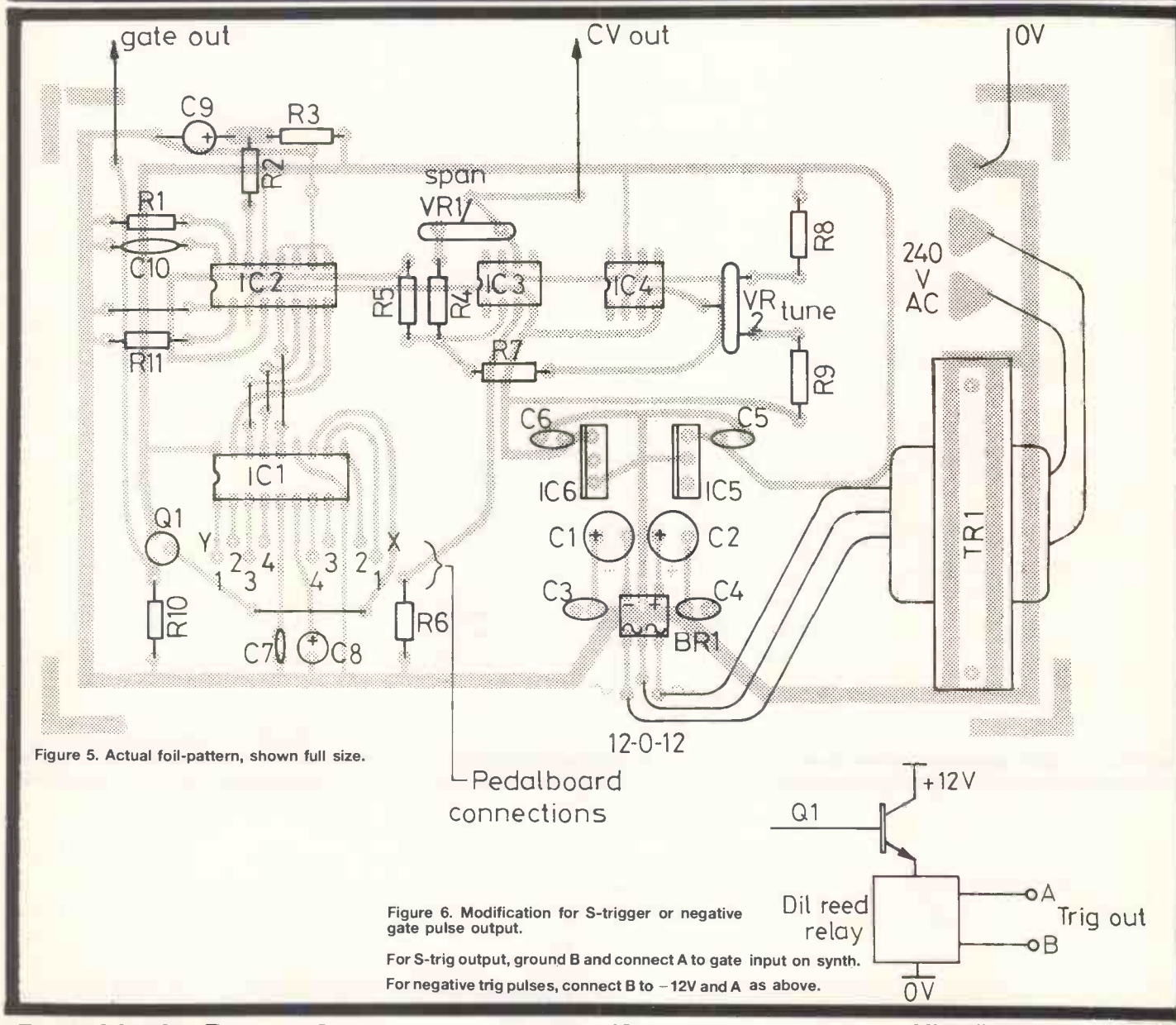

Figure 5. Actual foil-pattern, shown full size.

Figure 6. Modification for S-trigger or negative gate pulse output.

For S-trig output, ground B and connect A to gate input on synth.

For negative trig pulses, connect B to −12V and A as above.

Parts List for Bass Pedal Synth

Resistors (all ¼W oxide)

R1	47K
R2	10K
R3	39K
R4	3K3
R5,6,7	4K7
R8 9	22K
R10	10K
R11	47K
VR1	5K preset
VR2	5K preset or standard pot

Capacitors

C1,2	470/25V single-ended electrolytic
C3-7,10	0.1uF disk ceramic
C8 2u2/63V	single-ended electrolytic
C9 10uF/35V	single-ended electrolytic

ICs

IC1	74C922*
IC2	0800
IC3,4	741
IC5	7812 voltage regulator (+12V)
IC6	7912 voltage regulator (−12V)
Q1	BC107
BR1	bridge rectifier (DIL-type) or 4-off IN4001s
TR1	12-0-12V/100ma transformer
S1	two-pole mains switch

Miscellaneous

Fuse holder
Maplin bass pedals
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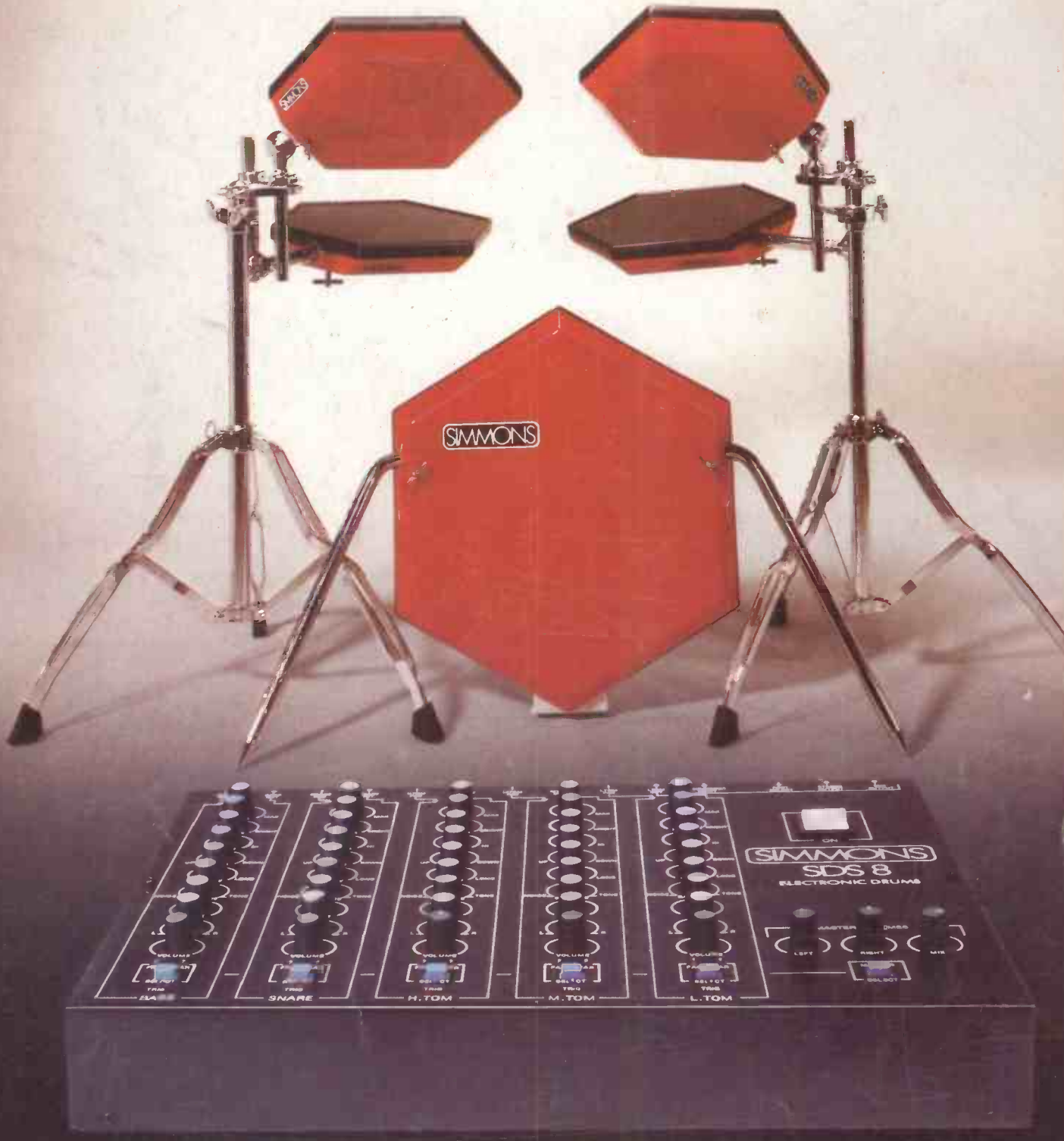

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